FUNCTIONAL ABILITY PROFILES AND YOUNG CHILDREN’S SOCIAL COMPETENCE: EXPLORING RELATIONSHIPS IN THE PRE-ELEMENTARY EDUCATION LONGITUDINAL STUDY DATA SET

By

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UNIVERSITY OF FLORIDA

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In memory of Robert Patten McLaughlin
ACKNOWLEDGMENTS

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<td>Activity</td>
<td>The execution of a task or action by a child or individual (WHO, 2007).</td>
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<td>Activity limitations</td>
<td>Difficulties a child or individual might have completing an activity (WHO, 2007).</td>
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<td>Body structures</td>
<td>Anatomical parts of the body and their components (WHO, 2007).</td>
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<td>Developmental delay</td>
<td>Disability category associated with “a condition which [sic] represents significant delay in the process of development” (McLean et al., 1991, p.1).</td>
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<td>Developmental domains</td>
<td>Broad physiological and sociological processes related to human development that might include motor development, communication and language development, cognitive development, social development, emotional development, or physical development (Bailey &amp; Wolery, 1992).</td>
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<td>Eligibility categories or disability categories</td>
<td>Fourteen categories described in the Individuals with Disabilities Education Improvement Act that can be used as part of eligibility determination or for administrative reporting purposes. Disability categories for children age 3 through 5 include autism, deaf-blind, deafness, developmental delay, emotional disturbance, hearing impairments, mental retardation, multiple disabilities, orthopedic impairments, other health impairments, specific learning disability, speech or language impairments, traumatic brain injury, visual impairments including blindness (NICHCY, 2009). Because definitions for each disability category might vary by state, definitions are not provided for each disability category.</td>
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<td>Environmental factors</td>
<td>Aspects of physical, social, and attitudinal contexts in which people live and conduct their lives (WHO, 2007).</td>
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<td>Functional ability profile</td>
<td>Identification of a child’s ability in relation to typical performance or ability of same aged-peers across a range of developmental or performance domains (Simeonsson &amp; Bailey, 1991).</td>
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<td>Impairments</td>
<td>Problems in body function or structure including a deviation or loss (WHO, 2007).</td>
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<td>Malleable characteristics</td>
<td>Attributes of a child that might change as process of development or intervention or might be altered by different settings and contexts (e.g., cognitive abilities, language and communication skills; IES, 2011).</td>
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<td>--------------------------</td>
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<tr>
<td>Non-malleable characteristics</td>
<td>Attributes of a child that are not altered or changed by interventions or varying contexts (e.g., age, sex, and race/ethnicity; IES, 2011).</td>
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<td>Parent, primary familial caregiver, or legal guardian used as the primary respondent for the PEELS parent interview (Carlson, Posner, &amp; Lee, 2008).</td>
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<td>Participation</td>
<td>A child’s or individual’s involvement in a life situation (WHO, 2007).</td>
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<td>Preschool population</td>
<td>Children ages 3 through 5 years-of-age.</td>
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<td>Severity of disability</td>
<td>The cumulative influence of a child’s disabilities across a range of domains that impacts a child’s performance and functioning in daily activities, with recognition of the influence of contextual factors on children’s functioning (Simeonsson &amp; Scarborough, 2001).</td>
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<td>Social competence</td>
<td>A term used to refer to a multi-dimensional construct of children’s performance of social behaviors defined by evaluative judgment of children’s behaviors including (a) skills to achieve social goals and using appropriate behaviors for a given social context (i.e., social skills) and (b) the absence of or refraining from inappropriate use of behaviors (i.e., problem behavior) in a social context (Odom, McConnell, &amp; Brown, 2008; Odom, McConnell, &amp; McEvoy, 1992).</td>
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<td>Young child with a disability</td>
<td>Child 3, 4, or 5 years-of-age who has been identified as eligible for special education and related services under Part B, Section 619 of Individuals with Disabilities Education Improvement Act.</td>
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LIST OF OPERATIONAL DEFINITIONS

Child factors

Seven variables related to non-malleable child characteristics: gender, age, race/ethnicity, child’s home language, whether the child had an individualized family service plan (IFSP) before 3 years of age, number of weeks child was born premature, and child birth weight. Variables measured in the PEELS study and investigator-developed coding of PEELS data elements were used to define these variables (Appendix C provides complete descriptions of these variables).

Disability category

One of seven investigator-developed disability categories used in this study. These categories are speech or language impairments, developmental disability, autism, emotional behavioral disturbance, mental retardation, learning disability, and low incidence disability. Children’s disability category was identified as the primary disability category identified in the PEELS data set. Primary disability category is provided in the child demographic file and represents the disability category used to identify the child for special education services.

Environmental factors

Seven variables related to a child's community and school environment: Neighborhood safety, community income level, school/program quality, parent satisfaction with special education services, program support of social interaction, number of children with and without individualized educational programs (IEPs) in child’s class, focus of child’s IEP goals. Variables measured in the PEELS study and investigator-developed coding of PEELS data elements were used to define these variables (Appendix C provides complete descriptions of these variables).

Family factors

Includes two types of variables related to families. The first type is described as family circumstances, which were living environment, respondent role, martial status, parent education, and family income. The second type is described as parent-child interactions, which were child activities, family-school activities, child participation in regular activities, regular child activities, and parent-child activities. Variables measured in the PEELS study and investigator-developed coding of PEELS data elements were used to define these variables (Appendix C provides complete descriptions of these variables).
Functional ability profile subgroup membership: The probability that a child in the PEELS sample will be associated with a subgroup based on similar functional characteristics measured by the 15-items from the PEELS-based Disability Severity Index (Appendix B provides a complete description of the variables associated with the 15 items). Child assignment to a subgroup was based on results from latent class statistical analyses conducted using Mplus (Muthen & Muthen, 2007).

Low incidence disability: An investigator-developed category that included eight disability categories with small sample sizes in the PEELS data set: hearing impairment, deaf/blind, deafness, multiple disabilities, orthopedic impairments, other health impairments, traumatic brain injury, and visual impairment.

Mental retardation: An investigator-developed disability category that included mild mental retardation and moderate mental retardation as identified in the PEELS data set.

Social competence: The use of social skills and the absence of problem behavior as measured by teacher ratings on items included on the Preschool and Kindergarten Behavior Scales, Second Edition (Merrell, 2002). Social skills is measured by teachers’ evaluative judgments of 34 items that describe adaptive or positive behaviors that are likely to lead to positive personal and social outcomes. Problem behavior is measured by teachers’ evaluative judgments of 42 items that describe problem behaviors commonly seen in the preschool population.
FUNCTIONAL ABILITY PROFILES AND YOUNG CHILDREN'S SOCIAL COMPETENCE: EXPLORING RELATIONSHIPS IN THE PRE-ELEMENTARY EDUCATION LONGITUDINAL STUDY DATA SET

By
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Major: Special Education

Children with social competence have the skills to achieve social goals, they know when to use appropriate behaviors in social contexts, and they refrain from inappropriate behavior in social contexts. Social competence has been identified as a priority outcome for young children with disabilities. Research has been conducted to examine relationships between various child and contextual factors and social competence. The International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY) provides a framework to describe and quantify children's functional abilities and to explore associations among functioning, contextual factors, and child outcomes.

The present study was a correlational study conducted through secondary analyses of the Pre-Elementary Education Longitudinal Study (PEELS) data set. The purpose of the present study was to combine an ICF-CY approach to quantify children’s functional abilities with person-oriented analytic techniques (i.e., latent class analysis) to derive empirically subgroups of children with similar profiles of functional abilities. Regression analyses were conducted to examine relationships between subgroup
membership and children’s social competence, variance in social competence explained by subgroup membership and disability category, and if contextual factors moderated relationships between subgroup membership and social competence.

Results from the latent class analyses showed that five subgroups emerged. Each subgroup had a distinct and interpretable functional ability profile. Functional ability profile subgroup membership was associated with children’s social competence outcomes (social skills $R^2 = .20$ and problem behaviors $R^2 = .115$), and notable differences in these outcomes were identified between subgroups. Subgroup membership accounted for more variance in social competence outcomes than disability category. Four contextual factors moderated the relationship between children’s functional ability profile subgroup membership and social skills or problem behaviors.

The present study provides information about the prevalence and nature of different functional ability profiles found in a nationally representative sample of young children with disabilities. Findings demonstrate the use of person-oriented analyses combined with a functional approach shows promise for identifying subgroups of children with similar characteristics and for examining associations among functional abilities, contextual factors, and important outcomes. Results help inform policy and practice related to characterizing and quantifying children’s functional abilities.
CHAPTER 1
INTRODUCTION

In the present study, secondary analyses were conducted using an extant, large-scale, nationally representative data set involving young children with disabilities during their preschool and early elementary school years. This study was designed to examine relationships among children’s functional ability profiles, disability categories, and contextual variables and to examine the associations between these variables and children’s social competence. In this chapter, background information and the problem statement are described to situate the need for the present study. The purpose, the conceptual framework, and the context of the study are discussed and research questions are stated. The rationale includes a review of relevant literature and further describes the need for the present study. The importance of the study and a description of delimitations and limitations are included in this chapter.

**Background**

Preschool children with disabilities are eligible for special education and related services through the Individuals with Disabilities Education Improvement Act of 2004, 20 U.S.C.§ 1418 (i.e., Part B Section 619 Preschool grants). Over 700,000 children ages 3 through 5 years receive special education and related services (IDEA Data, 2008). IDEA guarantees these children a free, appropriate public education and related services in the least restrictive environments, access to the general preschool education curriculum, and individualized education programs (IEPs) to promote school readiness.

Fourteen disability categories are specified in the federal law and can be used to identify or describe preschool children with disabilities. The categories are autism, deaf-blindness, deafness, developmental delay, emotional disturbance, hearing impairments,
mental retardation, multiple disabilities, orthopedic impairments, other health impairments, speech or language impairments, specific learning disability, traumatic brain injury, and visual impairments including blindness (NICHCY, 2009). Disability categories are used for different purposes under IDEA. For example, disability categories are an integral part of preschool eligibility determination. Preschool eligibility determination refers to the procedures and definitions used to determine if a child meets the established requirements set by each state to receive special education services. The disability categories outlined in federal law might be used to determine eligibility for services. States choose which categories to adopt, how to define them, and determine the criteria for the categories (Muller & Markowitz, 2004). For a child to receive special education services under Section 619, they must meet the criteria for at least one disability category. Children are identified and “assigned” a primary disability category as a result of eligibility determination for special education services.

Disability categories also are used as part of reporting and accountability requirements specified in the law (Muller & Markowitz, 2004; Smith & Schakel, 1986). Under IDEA 2004, 20 U.S.C.§ 1412 (i.e., Part B Section 612 State Eligibility), states are required to submit state performance plans (SPP) and annual performance reports (APR) to report status and progress toward meeting established targets or benchmarks on various progress monitoring indicators. Within the context of services for children 3 through 5 years-of-age, states monitor and report data on a variety of indicators, including descriptive information on the number of children being served (i.e., child count data), educational placement, and the percent of preschool children with individualized education programs who demonstrate improvement in relation to three
functional outcomes. IDEA 2004, 20 U.S.C.§ 1418 (i.e., Part B Section 618 Program Information) accountability requirements specify that performance data be provided in relation to target populations identified by gender, disability category, race/ethnicity, and limited English proficiency (IDEA, 2004).

IDEA-mandated data that are collected annually from states are stored in a repository referred to as the Data Analysis System (DANS), which is managed by the Office of Special Education Programs (OSEP). In addition to accountability requirements under IDEA Section 618, OSEP, in partnership with the National Center for Special Education Research (NCSER) in the Institute of Education Sciences (IES) has funded seven national studies focused on implementation of IDEA 2004, 20 U.S.C.§ 1464 (i.e., Part D Section 664 Studies and Evaluations). National studies are designed to (a) assess the implementation and effectiveness of IDEA, (b) provide information on how to implement IDEA more effectively, and (c) provide information to inform legislation and policy related to IDEA (IDEA, 2004). These studies include the National Early Intervention Longitudinal Study (NEILS); the Pre-Elementary Education Longitudinal Study (PEELS); the Special Education Elementary Longitudinal Study (SEELS); the National Longitudinal Transition Study-2 (NLTS2); the Special Education Expenditure Project (SEEP); and the Study of State and Local Implementation and Impact of the Individuals with Disabilities Education Act (SLIIDEA). Secondary analyses of national studies are used to examine many facets of educational services and child outcomes for children with disabilities (OSEP, 2006).

Taken together, the DANS data related to IDEA Section 619 and the federally funded IDEA national studies that focus on young children with disabilities provide an
opportunity to examine educational services and outcomes for young children with disabilities. Analyses and secondary analyses of national data can help guide policy recommendations and future legislation, inform the development of prevention and intervention programs, improve service provision, and advance research related to childhood disability. The present study involved secondary analyses of the Pre-Elementary Education Longitudinal Study (PEELS) data set with a focus on examining correlates of children’s social competence.

**Problem Statement**

Children with social competence have the necessary skills to achieve social goals (i.e., social skills), know when to use appropriate behaviors in a given social context (i.e., social skills), and refrain from inappropriate behavior (i.e., problem behaviors) in a social context (Brown, Odom, McConnell, & Rathel, 2008; Conroy, Brown, & Olive, 2008; Odom, McConnell, & Brown, 2008). Social competence is a desired early childhood outcome for young children, including young children with disabilities. The importance of young children’s social competence in relation to overall developmental status and school success is reflected in the selection of two of the three IDEA Section 618 indicators for which states must demonstrate child progress. Under accountability provisions associated with the IDEA, states are required to report child outcomes related to (a) positive social-emotional skills (including social relationships) and (b) use of appropriate behaviors to meet their needs (Early Childhood Outcomes Center, 2009).

Research related to young children’s social competence has shown the development of social competence is influenced by child factors (e.g., age, gender, skills, and abilities) and contextual factors (e.g., family factors and environmental factors; Guralnick, 1999; McCollum & Ostrosky, 2008; Odom, McConnell, & Brown,
Child factors and contextual factors might facilitate or impede attainment of skills related to social competence (Huffman, Mehlinger, & Kerivan, 2001). For example, research has shown that children with poor communication skills often have more difficulties with social competence (i.e., child factor impedes social competence; Herbert-Myers, Guttentag, Swank, Smith, & Landry, 2006). Research has also shown that high-quality programs and responsive teacher-child interactions can help support children’s social competence (i.e., contextual factors might facilitate social competence; Burchinal, Vandergrift, Pianta, & Mashburn, 2010). Thus, the identification of factors that influence or are related to children’s social competence is important for the development and delivery of interventions and services that can help promote children’s social competence (Diamond, Hong, & Baroody, 2008; Fox, Dunlap, & Powell, 2002).

For children with disabilities, large-scale analyses that examine factors associated with children’s social competence often focus on children’s disability category (e.g., Blackorby & Cameto, 2004; Wei & Marder, 2011) or focus on children identified by a specific disability category (e.g., Sanford, Levine, & Blackorby, 2008; Wagner et al., 2006). Moreover, studies that examine correlates of social competence that involve children with disabilities have not consistently included other child factors or contextual factors that might be related to children’s social competence. Concerns have been raised about using IDEA-based disability categories alone to examine child outcomes such as social competence (Blackorby et al., 2002). Variations in state eligibility determination systems have resulted in disability categories that are idiosyncratic to individual states (Danaher, 2007; Muller & Markowitz, 2004). This variability presents
several limitations when aggregating data in nationally representative data sets and using disability category as a correlate of child outcomes (MacMillian & Reschly, 1998). Of primary relevance to the present study is the ability to (a) compare children by disability category from different states, and (b) distinguish differences between children within a disability category (Florian et al., 2006; Simeonsson, Simeonsson, & Hollenweger, 2008). Disability category provides limited information about a child’s functional abilities or levels of functioning and subsequent support needs, and offers limited, if any, information about secondary conditions or contextual factors that might facilitate or limit a child’s functioning (Florian et al., 2006; Forhan, 2009; Marder, 2009).

Given these concerns, the exclusive use of disability category as a correlate of social competence outcomes might hamper federal efforts to explain variations in children’s outcomes and interpret research related to childhood disability when examining social competence for children with varying abilities. Information is needed beyond children’s “static” disability category.

Beyond disability category, the identification of other individual variables potentially related to desired outcomes might not be a more effective approach. Referred to as a variable-oriented approach, analytic methods that examine the influence of individual variables on outcomes, such as social competence in a heterogeneous group of children, might help inform associations among key variables, but not account for complex associations between dimensions of children’s abilities (Haapasalo, Tremblay, Boulerice, & Vitaro, 2000). Analytic methods to identify subgroups of children with similar patterns of abilities, referred to as person-oriented approaches, are increasingly being used in early education and early childhood special education research.
A person-oriented approach uses analytic methods that cluster or group children who display similar patterns of strengths and needs across identified domains. These profiles are then examined in relation to desired outcomes. The rationale for a person-oriented approach is to focus on outcomes for children with similar characteristics by identifying common patterns or profiles of children’s abilities (Bergman & Magnusson, 1997).

For children with disabilities, child characteristics might be examined using a functional ability profile approach (Hobbs, 1975; Simeonsson et al., 2008). A functional approach focuses on specifying characteristics or abilities of the child across a variety of developmental or performance domains (Simeonsson, 2003) within the context of his or her environment, which might promote or constrain the child’s functioning or participation (Snyder, 2006). Functional approaches have been used to create an overall composite of functional ability or to generate profiles of children’s functional abilities across developmental or performance domains. Key aspects of children’s functional abilities have been associated with their social competence (e.g., communication skills, play skills; Odom, McConnell, & Brown, 2008). The exploration of patterns or profiles of functional abilities related to social competence might help identify associations that have important implications for the development of interventions and services for young children with disabilities (Haapasalo et al., 2000).

To enhance understandings about factors associated with desired outcomes for young children with disabilities beyond disability categories, functional approaches to describe children’s abilities might be combined with person-oriented analytic techniques to identify subgroups of children with similar functional ability profiles and to examine
relationships with social competence. To date, these methods have not been widely used with nationally representative data sets focused on young children with disabilities.

**Purpose of the Study**

The primary purpose of the present study was to explore relationships between empirically derived subgroups of children with distinct and interpretable functional ability profiles and their social competence. The present study evaluated whether use of subgroups formed on the basis of functional ability profiles were viable correlates of social competence and examined the explanatory power of both functional ability profile subgroup membership and disability category in relation to social competence. The extent to which contextual factors moderated relationships between functional ability profile subgroup membership and children’s social competence also was examined. To examine these relationships, secondary analyses were completed using cross-sectional data from the Pre-Elementary Education Longitudinal Study (PEELS) nationally representative data set. The present study offered an alternative methodological approach for characterizing children’s disability and function and extended substantive analyses to include the influences of contextual factors as moderators of the relationships between children’s functional ability profile subgroup membership and their social competence.

In the present study, a functional approach was combined with person-oriented analytic techniques to identify subgroups of children with similar characteristics (i.e., referred to as similar functional ability profiles) that were distinct from other subgroups identified through the analytic approach. Functional ability profiles represented common patterns of functional abilities that exist across subgroups of children. For example, within the PEELS sample of children with disabilities, there might have been a subgroup
of children who had no limitations related to communication skills, social skills, cognitive skills, and motor skills. Concurrently, there might have been a different subgroup of children with substantial limitations and need for extensive supports in relation to these skills. The functional ability profile subgroups represented children with different combinations of strengths and needs across select functional ability variables.

The number and profile descriptions of the subgroups were not determined a priori, but rather were derived from the data based on the selection of functional ability variables represented in the PEELS data set. Thus, person-oriented analyses related to identifying subgroups of children with similar functional ability profiles were exploratory in nature. The intent of these exploratory analyses was to examine if the data supported the hypothesis that distinct and interpretable subgroups exist in the PEELS sample of children with disabilities.

Following confirmation of distinct and interpretable subgroups with similar functional ability profiles, analyses focused on examining relationships between these functional ability profile subgroups and children’s social competence. The extent to which children’s functional ability profile subgroup membership was related to their social competence and added explanatory power beyond disability category was examined. To understand further associations between functional ability profile membership and social competence, the influence of contextual factors as moderators of the relationship between children’s functional ability profile subgroup membership and social competence was examined.

In the present study, functional ability variables, used to create subgroups with similar functional ability profiles, were considered malleable child factors. *Malleable*
Factors refer to the characteristics and conditions that might be altered by context or intervention (e.g., language skills, cognitive skills; IES, 2011). In contrast, non-malleable factors refer to attributes or conditions that cannot be altered by context or intervention (e.g., age, gender; IES, 2011). Current requests for applications from the federal Institute of Education Sciences emphasize the importance of conducting research to examine associations among desired outcomes, such as social competence, and malleable factors. This type of research should help inform the development and evaluation of interventions and policy related to malleable factors that can be affected by early intervention and early childhood special education services to improve outcomes for young children with disabilities (IES, 2011).

**Conceptual Framework**

The present study used the International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY) framework described by the World Health Organization (WHO, 2007) to guide the conceptualization of the study research questions, the creation of the functional ability profiles, and the identification of contextual factors hypothesized to be related to children’s functional ability profiles and their social competence. This framework offers a way to conceptualize and describe a child’s developing characteristics within his or her surrounding environment, while noting the influence of the child’s health, including disabilities, on the child’s functioning and adaptation. The ICF-CY highlights the unique nature of child development and suggests that patterns of a child’s functional ability or disability will change in nature, intensity, and consequence over time (Lollar & Simeonsson, 2005).

The current ICF-CY framework illustrates the multi-dimensional interactions among disability/health conditions, functioning and disability, and contextual factors that
affect all individuals (WHO, 2007). Figure 1-1 illustrates the primary components of the framework. Within the ICF-CY framework, a disability/health condition (i.e., disability from a diagnostic perspective) interfaces with key components related to functioning and disability (i.e., disability used as a global term). These components can be viewed from a positive perspective under the term “functioning” and include the integrity of body functions (i.e., physiological and psychological), body structure (i.e., anatomical parts), activities (i.e., tasks a child completes), and participation (i.e., the integration of activities in life). Alternatively, these same components can be viewed from a negative perspective under the term “disability” and include impairment of body function, impairment of body structure, activity limitation, and participation restriction (De Kleijn-De Vrankrijker, 2003; WHO, 2007). The framework highlights the influence of contextual factors, including both environmental factors (e.g., physical, social, and attitudinal environment) and personal factors (e.g., age, gender, ethnicity) on an individual’s overall well-being and adaptation with regard to human functioning and restrictions on functioning (WHO, 2007).

The framework provides a practical approach to classification of disability and function and documenting differences in children’s functioning. The framework outlines a series of categories, codes, and ratings related to dimensional features of function across body functions and structures, activities and participation, and environmental factors (Simeonsson, 2003). For each category and code of interest, children’s functional characteristics are classified by using a pre-specified taxonomy and by applying a standard numeric rating or qualifier. A rating of 0 is applied if the child has normal function related to the code. Normal function is defined by what is typical of the
average same-aged peer. A rating of 1 is applied if the child has mild functional impairment, limitation, or restriction related to the code. A rating of 2, 3, or 4, is applied if a child has moderate, severe, or complete functional impairment, limitation, or restriction, respectively, related to the code. This coding system provides direct information about the child’s functional abilities and level of functioning (or impairment) in relation to same-aged peers.

The ICF-CY taxonomy and related numeric ratings were not directly employed as a measurement system in the present study because this is not one of the intended uses for the ICF-CY. Rather, the ICF-CY framework was the basis for identifying variables related to functional ability and environmental context (i.e., family, school, and community) that were available in the PEELS data set.

**Context for the Study**

Data from the restricted version of the Pre-Elementary Education Longitudinal Study (PEELS), funded by the U.S. Department of Education, National Center for Special Education Research (NCSER), were used in the present study. The PEELS data set was obtained through a restricted-use license agreement with the Institute of Education Sciences (IES). The PEELS data set was selected for this study because it offers descriptive information on the characteristics, functioning, and school experiences of children with disabilities during early childhood and information related to children’s family, school, and community environments.

The PEELS data set is based on a nationally representative sample of 3,100 children with disabilities. Children in the PEELS sample were 3, 4, or 5 years-of-age and had an individualized education program (IEP) or individualized family service plan (IFSP) at the time they were recruited into the study. Data for the PEELS data set were
collected in four waves from the 2003 - 2004 through 2006 - 2007 school years, and follow-up data were collected during the 2009 - 2010 school year (Markowitz et al., 2006). Wave 1 cross-sectional data were selected for this study because they provide information on children in preschool or kindergarten settings.

PEELS data collection focused on the characteristics of children receiving early childhood special education, the programs and services they receive, their transitions from preschool to school-age settings, and how children with disabilities function and learn in preschool and school-age settings. The PEELS data set contains information about variables related to children’s characteristics (malleable and non-malleable), educational services, academic performance, and environmental conditions. In addition, the data set contains information on parents’ perspectives of their children development and functioning and their children’s educational services. The secondary analyses conducted in the present study focused on variables related to children’s characteristics, disability category, family and environmental conditions, and children’s social competence. In addition to the variables available in the data set, the PEELS data set was selected because Daley, Simeonsson, and Carlson (2009) conducted a previous study with the PEELS data set that used variables from the parent interview to identify or derive 15 variables related to children’s functional abilities. In the Daley et al. study, functional ability variables were used to create a composite score of functional ability and to examine relationships between this composite score and a variety of child outcome variables. The present study extends this work by using the same variables from the parent interview to identify subgroups of children with similar functional ability profiles rather than a summated composite score and to explore potential moderators of
subgroup membership in relation to children’s social competence. Detailed descriptions of the PEELS data set and variables from the data set that were used to address the research questions in the present study are provided in Chapter 3.

**Research Questions**

The following research questions guided the secondary analyses conducted in the present study:

1. What distinct and interpretable functional ability profile subgroups emerge when using person-oriented analytic techniques to examine functional ability variables contained in the PEELS data set for young children with disabilities?

2. What is the strength of the relationship between functional ability profile subgroup membership and social competence?

3. What are the individual and combined contributions of functional ability profile subgroup membership and disability category membership to the explanation of social competence?

4. To what extent do non-malleable child factors and contextual factors moderate the relationship between functional ability profile subgroup membership and social competence?

**Rationale for the Study**

Children’s social competence has been identified as a critical skill for school readiness, success in school, and emotional well-being. Studies that examine malleable factors related to social competence might help inform important prevention and intervention efforts for children with or at risk of poor social competence outcomes. The creation of subgroups with similar functional ability profiles was proposed in contrast to the traditional use of disability categories as a primary correlate of child outcomes for children with disabilities in national data sets. Functional ability profiles were used to address concerns about the validity of categorical descriptions of disability. In addition, the influences of non-malleable child factors and contextual
factors on the relationships between functional ability profiles and children’s social competence were also examined in the present study.

To justify the rationale for the present study, the following topics are discussed (a) social competence as a key child outcome, (b) the social competence framework used in the present study, (c) child and contextual factors associated with children's social competence, (d) issues related to measuring and examining social competence, (e) concerns with categorical characterizations of disability, (f) functional approaches as an alternate method to describe child characteristics, and (g) methods to create subgroups of children with similar profiles of functional abilities. In addition, the rationale for the present study was informed by previous investigations conducted using the PEELS data set and other empirical studies that used large-scale data sets to examine the child functioning related to child outcomes or to explore person-oriented statistical techniques. To conclude this section, a methodological rationale and summary of the substantive rationale for the secondary analyses conducted in the present study are presented.

Social Competence as Key Child Outcome

In recent years, the complex emotions and essential social skills that develop during the early years of a child’s life and the importance of increasing the probability of favorable outcomes for children through systematic and planned early interventions that target these skills have received national attention. Shonkoff and Phillips (2000) highlighted the critical relationships among children’s emotional well-being, social competence, and cognitive skills in the landmark book *From Neurons to Neighborhoods*. As noted by the National Council on the Developing Child (2004a),
children’s emotional development and social competence in the early years of learning will influence school achievement and emotional well-being later-in-life.

For children with disabilities, promoting social competence can be particularly difficult due to poor communication skills, difficulty establishing peer relationships, and the increased prevalence of challenging behaviors when compared to peers without identified disabilities or those at risk for disabilities (Dunlap et al., 2006; Guralnick, 2006; Odom, McConnell, & Brown, 2008). Evidence has shown that persistent maladaptive social and challenging behavior in young children might lead to continued problem behaviors, peer rejection, school failure, and other social and academic challenges throughout adolescence (Missall & Hojnoski, 2008; National Council on the Developing Child, 2004b). Given the potential for poor outcomes, measuring, monitoring, and promoting the development of young children’s social competence, particularly for young children with disabilities, is a national priority (e.g., IDEA preschool outcomes).

**Social Competence Framework**

For the purpose of the present study, social competence was viewed from a social-behavioral perspective. This perspective emphasizes performance-based assessment of social competence. Within a performance-based perspective, social competence is assessed through evaluative judgments of children’s overall performance in social settings (Odom, McConnell, & Brown, 2008).

The present study was guided by the definition of social competence presented by Odom, McConnell, and McEvoy (1992), which was updated by Odom, McConnell, and Brown (2008). These authors conceptualized social competence based on two dimensions of children’s behaviors (a) socially effective skills for achieving social goals or influencing a peer’s social behaviors, and (b) the use of social behaviors appropriate
for the social context. From this perspective, social competence is observed when children use social skills to achieve social goals (i.e., social skills), use appropriate behaviors in a given social context (i.e., social skills), and refrain from inappropriate use of behaviors (i.e., problem behaviors) in a social context (Brown, Odom, McConnell, & Rathel, 2008; Conroy, Brown, & Olive, 2008; Odom et al., 2008).

In addition to the performance-based view of social competence, Odom and colleagues (1992; 2008) highlighted the influential role of child factors (both malleable and non-malleable) and contextual factors (both family and environmental) on children’s social competence. The hypothesized contributions of child and contextual factors to children’s performance-based social competence are consistent with findings reported in the empirical literature (cf. Clements, Reynolds, & Hickey, 2004; Guralnick, 1999; McCrae & Barth, 2008; Rouse & Fantuzzo, 2009).

**Factors Associated with Children’s Social Competence**

When examining children’s social competence, previous studies have suggested that associations among child factors and contextual factors and children’s social competence should be considered. For child factors, both malleable and non-malleable child factors have been associated with social competence. Malleable child factors associated with social competence include aspects of children’s abilities and characteristics related to language and communication skills, cognitive abilities, level of assertiveness, activity level, ability to sustain attention, and regulation of emotions (e.g., Herbert-Meyers, Guttentag, Swank, Smith, & Landry, 2006; Qi & Kaiser, 2003). Non-malleable characteristics, such as child’s age, sex, race/ethnicity have also been associated with children’s social competence (e.g., Campbell et al., 2000; Mendez, McDermott, & Fantuzzo, 2002; Raver, Gershoff, & Aber, 2007).
For contextual factors, both family factors and environmental factors have been associated with children's social competence. Family factors associated with social competence include family characteristics such as family structure and size, socio-economic circumstances, marital status, parent education, and mental health status of caregivers (Krishnakumar & Black, 2002; Loeber & Hay, 1997; NICHD Research Network, 2003; Raver et al., 2007; Schmidt, Demulder, & Denham, 2002) and parent-child interactions such as parental attitudes and behaviors and parental involvement (Guralnick, 1999; Oravecz, Koblinsky, & Randolph, 2008; Raver et al., 2007; Schmidt et al., 2002). Environmental factors that have been associated with children's social competence include community factors such as the socio-economic status of the community or safety of the neighborhood, and school factors such as the quality of childcare or school programs or the provision of interventions or supports to promote social competence (Domitrovich, Cortes, & Greenberg, 2007; Loeber & Hay, 1997; Odom et al., 1999; Oravecz, Koblinsky, & Randolph, 2008; Romano, Kohen, & Findlay, 2010).

Researchers have examined the effect of contextual factors in terms of risk and resiliency on children's development. Research on risk has focused on the identification of factors associated with undesirable outcomes. Research on resiliency has focused on the identification of factors that protected or “buffered” against the negative influence of risk factors; these positive factors are referred to as promotive or protective factors (cf. Werner & Smith, 2001). A series of seminal research studies: the Isle of Wright study (Rutter, 1979), Rochester Longitudinal study (Sameroff, Seifer, & Zax, 1982), and Kauai Children’s study (Werner & Smith, 2001) have examined the influence of risk
factors, promotive factors, and protective factors on children’s development, including their social competence.

Researchers have noted the individual contribution of any one factor does not consistently predict or explain children’s social competence or other performance-related domains (Campbell et al., 2000; Krishnakumar & Black, 2002; Sameroff & Seifer, 1983). When multiple contextual variables are included in an analysis, the contribution of variables to predict or explain outcomes changes across samples and are affected by which variables are included in the analysis, the measures used to quantify the constructs, and the analytic techniques used (Gutman, Sameroff, & Cole, 2003; Raver et al., 2007; Sameroff & Seifer, 1983).

**Measuring and Examining Social Competence**

Measuring children’s social competence is a complex task. Odom et al. (2008) described the importance of an assessment method that integrates multiple sources and methods to generate meaningful information about children’s social competence. The recommendation for multi-component assessment of social competence, however, is tempered by the constraints of resources and the purpose for examining social competence (Odom et al., 2008).

The identification of factors associated with children’s social competence is also complex. Previous studies have shown a range factors associated with the development of social competence. As noted previously, the individual contribution of any one factor does not consistently relate to children’s social competence and the contributions of different variables changes across samples (Campbell et al., 2000; Gutman, Sameroff, & Cole, 2003; Krishnakumar & Black, 2002; Raver et al., 2007; Sameroff & Seifer, 1983). Current national efforts to examine factors associated with
child outcomes, including children’s social competence, emphasize the importance of exploring the relationships between outcomes and malleable factors, as well as mediators or moderators of identified associations (IES, 2011). The exploration of malleable factors is intended to guide policy decisions and inform the development of interventions and services that can improve outcomes for children (IES, 2011).

For children with disabilities, a common variable included as a correlate of child outcomes is children’s primary disability category. Given the focus on examining relationships between child outcomes and malleable child factors that can guide national policy and inform interventions, static disability categories might not be the most meaningful variable.

**Concerns with Categorical Descriptions of Disability**

Fourteen disability categories can be used to determine if preschool children are eligible for special education and related service under IDEA. To receive services, a child must meet the established criteria for a disability category and subsequently receive a primary disability classification or label. The federal law and associated implementing regulations provide only general criteria for determining eligibility for special education and related services by specifying the federal disability categories (Muller & Markowitz, 2004). Specific recommendations for eligibility determination are provided for only one disability category (i.e., learning disability). The absence of guidance in the law and in federal regulations has allowed states to set their own terms, definitions, and criteria for eligibility determination, although state systems must meet the requirements for federal reporting (i.e., Section 618 requirements).

Analysis of state systems have highlighted variations across states in the adoption of disability categories and the criteria for each category used to determine eligibility for
special education and related services for preschool-aged children (Danaher, 2007) and school-aged children (Muller & Markowitz, 2004). Florian and colleagues (2006) noted there is as much within-category variation as there is between-category variation for the IDEA disability categories. IDEA disability categories provide limited, if any, information about disability severity, limitations in functioning, or potential secondary or additional disabilities (Chambers, Perez, et al., 2004).

These between- and within-category variations have resulted in disability categories that are unique to individual states and provide limited information about the functional characteristics of the child identified with a disability (Simeonsson, Bailey, Smith, & Buysse, 1995). Because of the idiosyncratic and limited nature of disability categories, concerns about comparing data for children by disability category from different states and concerns about distinguishing differences in characteristics between children within a disability category when data are aggregated across states have been raised (Florian et al., 2006; Simeonsson, Simeonsson, & Hollenweger, 2008). Given the concerns about disability category and the need for better descriptions of children’s abilities, alternative frameworks to describe and quantify disability from a functional approach have been proposed (Hobbs, 1975; Simeonsson et al., 2008).

**Functional Approaches as Alternate Method for Describing Child Characteristics**

Researchers and organizations have proposed functional approaches as alternatives for characterizing and describing children with disabilities in relation to their abilities (i.e., strengths and weakness), level of functioning (sometimes referred to as severity of disability or impairment), and resulting support needs (American Association of Intellectual Developmental Disabilities Definition Manual, AAIDD, 2010; ICF-CY, WHO, 2007; Snyder, Bailey, & Auer, 1994). Functional approaches provide information
about these aspects of children’s characteristics related to selected domains of
development or performance (e.g., cognitive, motor, language, vision; Simeonsson, 2003). From an ICF-CY approach, function is viewed in terms of interactions among characteristics of the person, his or her activities, and his or her environment (Snyder, 2006). Functional descriptions of children’s abilities have been recommend to help guide decisions for individualized services and to encourage consideration of disability within social and environmental contexts (Lollar & Simeonsson, 2005). Functional descriptions of children have also been recommended for use in research to examine relationships between child characteristics and desired outcomes (Simeonsson, 2003).

The ICF-CY provides one framework and associated taxonomy to describe and characterize children using a functional approach. The use of the ICF-CY has been promoted as a framework that provides a common language to facilitate communication and knowledge related to childhood disability (Lollar & Simeonsson, 2005; Simeonsson, 2009). Functional measurement approaches, based on the ICF-CY (or previous versions), have been used to create an overall composite of functional ability (or severity of disability) or to generate profiles of children’s functional abilities across developmental or performance domains.

For example, the ABILITIES Index (Simeonsson & Bailey, 1991) is a judgment-based rating scale designed to profile the functional abilities of children across nine developmental and performance domains: audition (hearing), behavior and social skills, intellectual functioning, use of limbs, intentional communication, tonicity, integrity of health, eyes (vision), and structural status. The ABILITIES Index has been used to calculate an overall score to indicate the severity of disability and the index has been
used to examine profiles of children’s abilities with respect to each domain included on the index (Buysse, Smith, Bailey, & Simeonsson, 1993). Simeonsson, Bailey, Smith, and Buysse (1995) noted that the ability to cluster or group children with similar profiles might support the examination of relationships between child characteristics and important outcomes beyond children’s disability category.

**Methods to Create Subgroups of Children with Similar Profiles of Abilities**

Researchers in education, early education, special education, and early intervention are increasingly using methods to identify subgroups of children with similar characteristics and to describe these subgroups by profiles of abilities. Bergman and Magnusson (1997) refer to this as a person-oriented approach. A person-oriented approach contrasts with a variable-oriented approach. A variable-oriented approach examines the influence of individual variables on outcomes in a heterogeneous group of children and it is assumed that identified relationships apply across all children in the population (Collins & Lanza, 2010). A person-oriented approach examines individuals and individual patterns of characteristics and their relationships (Collins & Lanza, 2010). In order to study groups of individuals based on patterns of characteristics, person-oriented approaches can be used to identify subtypes or typologies in a population (i.e., homogenous groups from a heterogeneous population; Collins & Lanza, 2010; McCutcheon, 1987).

Researchers in early childhood have used these person-oriented analytic methods that cluster or subgroup children who display similar patterns of strengths and needs across identified domains (Campbell et al., 2000; Konold & Pianta, 2005). Each cluster or subgroup shares a similar profile that is distinct from other subgroups identified through the analytic approach. After subgroups are identified, additional analytic
methods can be used to examine relationships between subgroup membership and other outcomes. In addition to using person-oriented techniques to create homogenous groups from a heterogeneous population, this approach has been used to create subgroups of children with different patterns of functioning or ability within a homogenous population on defined attributes (e.g., race/ethnicity, gender; Mendez, Fantuzzo, & Cicchetti, 2002).

**Need for Additional Studies Using the PEELS Data Set**

The Pre-Elementary Education Longitudinal Study (PEELS) followed a nationally representative sample of children receiving special education services from 2003-2004 through 2008-2009. Reports about findings from analyses conducted with the PEELS sample have been published by PEELS investigators and are publically available on the PEELS website. The findings from PEELS reports highlight trends and patterns in educational services, transition experiences, and characteristics of young children with disabilities. In addition, PEELS and other investigators have published studies using the PEELS data set in peer-reviewed journals. Studies published to date have focused on a range of topics (e.g., information about data set preparation, parent satisfaction with services, the influence of home literacy environments on literacy skills).

To date, only one published study using the PEELS data set is directly related to the present study. Daley, Simeonsson, and Carlson (2009) used data in the PEELS data set to create a Disability Severity Index. Index items were based on responses given by parents of children enrolled in the PEELS study to structured interview questions, which focused on children’s functional abilities. To construct the index, the authors identified variables in the PEELS data set that represented children’s functional abilities and were related to domains associated with the ABILITIES Index (Simeonsson
& Bailey, 1991) and corresponded with codes on the ICF-CY. They examined a composite score from both a 15-item and a 6-item version of the index to scores on a range of child outcome measures and determined the patterns of associations were similar across both indices. For parsimony, the authors selected the 6-item version to create a composite score that represented a severity of disability index. The authors examined relationships between the composite score from the Disability Severity Index and select outcome variables, including aspects of social competence. They examined the contribution of the composite score from the Disability Severity Index to variance explained in the outcome variables beyond variance accounted for by the use of disability category. Daley and colleagues reported that children’s disability category alone accounted for 17% of the score variance for a measure of children’s social skills. Children’s functional ability composite score accounted for 19% of the variance in social skills scores. When children’s disability category and functional ability score were used together, 26% of the variance in social skills scores was accounted for by these two variables. The authors noted the increase in variance explained by the two variables illustrates “that [disability category and functional ability] are different constructs, with less overlap than might be predicted given traditional ideas about certain categories being more ‘mild’ than others” (Daley et al., 2009, p. 548).

Need for Empirical Studies of Social Competence and Functional Characteristics

Eight empirical studies directly relevant to the present study were identified in the extant literature. All identified studies included a large sample of children (i.e., children ages 3 through 5 included in study). Studies were analyzed to examine the extent to which investigations (a) were conducted with U.S. based nationally representative samples, (b) were conducted with children with disabilities, (c) were based on ICF-CY
framework, (d) examined children’s functional characteristics, (e) used person-oriented analytic techniques to identify subgroups with similar profiles, (f) compared functional ability to disability category, (g) examined outcomes related to social competence, and (e) considered contextual factors as part of the analyses. Table 1-1 shows the relevant studies identified for review and the components of each study that relate to specific aspects of the present study. Four of these studies were conducted with nationally representative samples. Two studies were conducted with children with disabilities. All studies included children ages 3 through 5, however, three of these studies were conducted exclusively with young children (i.e., ages 3 through 5). Two studies were based on the ICF-CY framework. Three studies examined children’s functional characteristics. Six studies used person-oriented techniques to create subgroups of children with similar profiles. Two studies compared children’s functional abilities to disability categories. Six studies examined the relationship between descriptions of children’s characteristics and social competence outcomes. Six studies considered contextual factors as part of the examination of relationships between descriptions of children’s characteristics and other outcomes.

Although no single study included each aspect included in the present study, studies reviewed were helpful for informing the design of the present study and building support for the substantive and methodological rationale for the present study. The extent to which each study reviewed contributed to the present study is described in Chapter 2. Nonetheless, given the limited research that integrates all aspects of the present study into one investigation, the secondary analyses conducted in the present
study offered a unique contribution to the research base in early childhood special education and related fields.

**Methodological Rationale**

The present study employed statistical analysis techniques to create subgroups of children with similar functional ability profiles. The possible techniques to create these subgroups aim to identify groups with internal cohesion (i.e., homogeneity within group) and external isolation (i.e., separation from other groups; Everitt, Landau, & Leese, 2001). These techniques are exploratory in that “the numbers of groups as well as their forms are unknown” (Vermunt & Magidson, 2006, p. 1).

An important aspect of the present study was examining a potential technique to create subgroups based on profiles of functional abilities for young children with disabilities. Given the diversity of young children’s abilities across and within disability categories, the ability to describe children by subgroups with shared characteristics and level of functioning offers an alternative way to examine relationships between child characteristics and important outcomes. Although previous studies have used person-oriented techniques to create subgroups of children with disabilities with similar functional ability profiles (Granlund, Erickson, & Ylven, 2004; Simeonsson et al., 1995), these studies were conducted with small samples of convenience. The present study explores using a person-oriented analytic approach in a nationally representative sample of young children with disabilities.

In addition, previous investigations have predominately used cluster analysis and the present study used latent class analysis to generate subgroups of children with shared profiles (Muthen & Muthen, 2007). Magidson and Vermunt (2006) indicated that interest in latent class models has increased with the development of statistical
software programs that can perform this analysis with more than just a few variables. They also noted latent class models have gained popularity over other methods because they use model-based approaches to estimate membership probabilities in order to classify cases into the appropriate subgroup. Following classification into a subgroup, relationships among variables, including subgroup membership, can be explored.

In the present study, the combination of using a functional approach to characterize children’s functional abilities on 15 variables and a person-oriented analytic approach to examine outcomes for subgroups of children with similar functional ability profiles offers a preliminary investigation of a methodological approach that might be particularly useful to examine outcomes for children with disabilities. The present study builds on the complementary nature of a functional approach and a person-oriented analytic approach to explore relationships with social competence for young children with disabilities.

**Summary of Rationale**

A need exists in the current literature base to examine the associations among child functioning, disability/health condition, and contextual factors, in relation to children’s social competence. Given the importance of social competence to children’s school readiness, school achievement, and later-in-life well-being, further examining variables that have been associated with social competence is important to help guide future research and policy and inform interventions and practice.

The present study addressed concerns identified in the literature related to using categorical descriptions of disability to examine relationships in research by exploring the use of a functional approach to characterize children’s abilities and level of
functioning. The use of empirically derived subgroups of children with similar profiles of functioning related to malleable child abilities offered a person-oriented approach to examine the relationship between functional ability profile subgroup membership and key outcomes such as social competence. Exploring the influence of non-malleable child factors and contextual factors was consistent with previous research on social competence and consistent with factors described in the ICF-CY framework.

**Importance of the Study**

The secondary analyses conducted in this study were important for several reasons. First, this study extended secondary analyses conducted with the PEELS data set (i.e., Daley et al., 2009) by exploring the identification of subgroups with similar functional ability profiles to characterize children with disabilities instead of a composite score of functional ability. Second, findings from the present study might inform policy, research, and practice related to characterizing disability and function when examining associations between children with disabilities and socially important outcomes such as social competence. Previous research has suggested that functional ability profiles might account for more variance in criterion variables than disability category. Third, exploring profiles of children’s functional abilities will contribute to understanding relationships between social competence and malleable child factors such as functional abilities. This profile approach might offer additional information beyond children’s static disability category to help inform the provision of targeted supports or services for children whose profile of functional abilities is associated with social competence challenges. Fourth, the exploration of select contextual factors as potential moderators of functional profiles might inform policies related to the provision of family services or additional preschool intervention supports or services for children. Finally, the ICF-CY
framework, which guided this study, offers a holistic system to describe functional abilities that provides information about children beyond disability category while considering contextual factors that influence child functioning. Profiles of children’s functional abilities might be useful for informing the type and intensity of intervention supports to achieve desired child outcomes.

**Definitions of Terms**

Conceptual definitions were presented to provide a definition of terms used in the present study and operational definitions were presented to provide a description of how variables were operationalized for analyses (List of Definitions). Throughout the present study, terms and definitions used to refer to disability categories in previous research studies might not be consistent with recommended anti-bias language in the *Publication Manual of the American Psychological Association* (APA, 2010). These terms and definitions, however, reflect those used by authors at the time the study was conducted and are used to provide an accurate representation of previous research studies.

**Delimitations**

The present study involved secondary analyses of an extant data set; the study did not involve an original research design with primary data collection. The focus of the secondary analyses in this study was children’s social competence; other areas of child development or performance were not examined.

The present study focused on the examination of social competence status when children were 3, 4, or 5 years-of-age. The study did not examine social competence trajectories (i.e., change over time) or prediction of social competence at a later age (i.e., status at an older age). The study employed measures of social competence based on teachers’ judgments of children’s social skills and problem behaviors. Ratings
from parents or peer nominations were not available in the PEELS data set and, therefore, not included in the present study.

Variables used to create subgroups with similar functional ability profiles were variables included in the PEELS data set based on parent interviews. The variables selected represent a sample of functional abilities related to domains that were previously identified in published research. The selection of child and contextual factors were based on a review of the literature and subsequent identification of these variables available in the PEELS data set. These variables are not exhaustive of all child and contextual factors. Moreover, selected variables were based on response formats available in the PEELS data set. For example, some interview items provided respondents with a restricted response format (e.g., 1 = not safe, 2 = safe, 3 = very safe; related to the extent a parent feels the neighborhood is safe for their child to play). Alternatively, some items were summed to create a continuous variable (e.g., number of different activities that a child participates in on a monthly basis). Some of these variables might not be the most robust measure or proxy for the construct of interest. Additional empirical examination of these variables (e.g., the extent to which a participant’s response on an interview or questionnaire item reflects a reliable or valid score related to the construct of interest) was not conducted as part of the present study.

Latent classes in the present study represent subgroups of children with a similar pattern of functioning on 15 functional ability variables included in the PEELS data set. Children were assigned to a profile based on their most likely class membership. It is acknowledged that children within a subgroup will have individual differences related to
their pattern of functioning on the 15 functional ability indicators. Functional ability profile subgroups are intended to represent salient patterns of functioning in the PEELS sample of children with disabilities. Children’s assignment to a functional ability profile subgroup is not intended to replace disability category or individualized information about children that might be used to inform eligibility for special education services or development of IEPs.

Limitations

Several limitations of the present study are noted. First, Odom and colleagues (2008) recommend the use of multiple measures and methods to evaluate children’s social competence from a performance-based perspective. The present study employed only one measure and one method (i.e., teacher ratings) to evaluate children’s social competence. Teacher ratings are likely to reflect teachers’ perspectives of children’s social competence in school environments. The extent to which children’s functional abilities relate to their social competence in other settings could not be determined. Second, the items used to represent children’s functional abilities were derived from a parent interview. Parent’s answers to questions reflect their perspectives of children’s abilities. Direct observations of children’s functional abilities were not conducted nor were judgments about functional abilities obtained from other informants.

As analyses were completed, analytic decisions were made in the conduct of the secondary analyses related to data structure and analytic methods. These decisions and resulting analytic procedures are described in Chapter 4 and should be considered when interpreting findings in the present study.
Summary

Social competence has been identified as an important outcome for young children with disabilities. The examination of factors associated with social competence of young children with disabilities might help guide policy recommendations; inform service provision, including prevention and intervention programs for children with disabilities and their families; and advance future research on examining correlates of social competence.

In the present study, secondary analyses of the PEELS data set were conducted to explore associations between empirically derived subgroups of children with similar functional ability profiles and their social competence. Children’s functional ability profile subgroup membership was examined as a correlate of children’s social competence, beyond the use disability category. In addition, the extent to which non-malleable child factors and contextual factors moderated relationships between functional ability profile subgroup membership and children’s social competence was examined. The ICF-CY conceptual framework informed the selection of variables and research questions examined in the present study.
Table 1-1. Studies related to aspects of present study

<table>
<thead>
<tr>
<th>Citation</th>
<th>National sample</th>
<th>Children with disabilities</th>
<th>Ages 3-5</th>
<th>ICF</th>
<th>Functional characteristics</th>
<th>Person-oriented techniques</th>
<th>Compared to disability categories</th>
<th>Relationship to social competence</th>
<th>Contextual factors considered</th>
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<td>Chambers, Perez, et al., 2004</td>
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<td>Daley, Simeonsson, and Carlson, 2009</td>
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<td>Hair, Halle, Terry-Humen, Lavelle, and Calkins, 2006</td>
<td>X</td>
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<td>0&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>Haapasalo, Tremblay, Boulerice, and Vitaro, 2000</td>
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<td>Janson and Mathiesen, 2008</td>
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<td>Konold and Pianta, 2005</td>
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<td>Stephens, Petras, Fabian, and Walrath, 2009</td>
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<td>0&lt;sup&gt;c&lt;/sup&gt;</td>
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Note. X refers to aspect of present study reflected in the cited study, 0 refers to aspect of present study somewhat reflected in the cited study, and blank cell refers to aspect of present study not reflected in the cited study.

<sup>a</sup> Children ages 3, 4, or 5 years included in larger sample of school-age children.

<sup>b</sup> Referred to as school readiness skills.

<sup>c</sup> All children identified as youth receiving mental health services.
Figure 1-1. International Classification of Functioning, Disability, and Health (WHO 2007). Reprinted with permission from the International Classification of Functioning, Disability and Health: Children and Youth Version (pp. 17), by the World Health Organization, 2007, Geneva, Switzerland: WHO Press.
CHAPTER 2
REVIEW OF THE LITERATURE

In the present chapter, a review of the literature is conducted. The review provides the rationale and background for the conceptual framework for the study, the research questions addressed, the identification of variables of interest from the Pre-Elementary Education Longitudinal Study (PEELS) data set, and the analytic techniques used in the present study. The review of the literature covers five major topics: (a) social competence and contextual factors associated with children’s social competence, (b) concerns about using IDEA-disability categories to characterize young children, (c) the International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY) framework, (d) findings from PEELS studies, and (e) empirical research related to the present study.

The first four topics contribute to the present study in unique and complementary ways. First, social competence has been identified as a desired early childhood outcome (Early Childhood Outcomes Center, 2009; Hebbeler & Kahn, 2008) and has been associated with school readiness and later achievement (Shonkoff & Phillips, 2000). Identifying and understanding factors that promote or impede children’s social competence during the early childhood years, however, requires further examination. Second, concerns with use of IDEA-disability category labels to describe young children for research purposes motivated the decision to examine a functional approach to describe children with disabilities in the present study. Third, the ICF-CY guided the functional approach used in the present study. Fourth, the PEELS data set provided a unique opportunity to describe and examine the experiences of young children with disabilities during the formative years of preschool and early elementary school.
Previous investigations using the PEELS data set offer a rationale for the significance of the present study. Finally, the fifth topic addressed in the present review of the literature is empirical research related to the present study. Empirical studies included in this part of the literature review were those conducted with large samples (i.e., more than 500 participants) that included young children ages 3 through 5 and investigated (a) the contribution of child functioning beyond disability categories related to child outcomes or (b) the use of person-oriented analytic techniques (cf. Magidson & Vermunt, 2006) to identify subgroups of children with similar profiles of abilities and to examine relationships between these subgroups and child outcomes.

**Search Procedures**

Research studies, articles, and reports reviewed in this chapter were identified in a number of ways. First, the following electronic databases were used to identify peer-reviewed articles: Education Full Text and EBSCO Host Platform for Academic Search Premier, CINAHL, Psychology and Behavioral Sciences Collection, PsycINFO, and Teacher Reference Center. For the five topics previously described, searches were conducted using combinations of keywords. For social competence, keywords included social competence, social skills, problem behavior, young children, preschool, children, disability, predictor, and outcome. For disability categories, keywords included disability category, developmental delay, and categorical classification. For the ICF-CY framework, keywords included ICF, ICF-CY, young children, preschool, children, and functional profile. For the PEELS data set, keywords included PEELS, disability, and children. For the empirical research related to the present study, keywords included social competence, behavior, social skills, functional profile, functional ability, functioning, predictor, person-oriented, and children. Second, searches of relevant
websites were conducted to identify national reports and data (e.g., Individuals with Disabilities Education and Improvement Act Section 618 Child Count Data) including: PEELS, Institute of Education Science (IES), Office of Special Education Programs (OSEP), Educational Resource Information Center (ERIC), IDEA data, National Research Council, and World Health Organization (WHO). Third, the reference lists of identified studies, articles, and reports were reviewed.

Articles, reports, and studies obtained through the electronic search procedures were reviewed by title and abstract to determine if the source should be included as part of the literature review. Sources were included in the review of literature related to (a) social competence and contextual factors, (b) concerns about using IDEA-disability categories to characterize young children, and (c) the ICF-CY framework, if the source provided background to the topics or was illustrative of key issues. All articles, reports, and studies that were related to the PEELS data set were included in the review. Empirical studies reviewed in the final section of this chapter were selected based on the following inclusion criteria: the study was conducted with a large sample that included young children ages 3 through 5 that examined (a) the contribution of child functioning beyond disability category related to child outcomes, or (b) the use of person-oriented analytic techniques to identify subgroups of children with similar profiles of abilities and to examine relationships between these subgroups and child outcomes. All sources reviewed in this chapter were available in English.

Social Competence

This section of the present literature review focuses on children’s social competence. Social competence has been identified as critically important in children’s development, school readiness and achievement, and later-in-life well-being (National
The Council on the Developing Child, 2004a; Shonkoff & Phillips, 2000). The relevance of this review for the present study is to describe issues related to examining young children’s social competence, including definitions and measurement, outcomes associated with social competence, and factors that promote or hinder the development of children’s social competence.

**Defining Social Competence**

The present study defined social competence from a performance-based perspective as described by Odom, McConnell, and McEvoy (1992) and Odom, McConnell, and Brown (2008). These authors described social competence by two key dimensions of children’s behaviors: (a) socially effective skills for achieving social goals or influencing a peer’s social behaviors, and (b) the use of social behaviors appropriate for the social context. This view of social competence emphasizes the necessary skills to achieve social goals (i.e., social skills), children’s use of appropriate behaviors for a given social context (i.e., social skills), and the absence of or refraining from inappropriate use of behaviors (i.e., problem behaviors) in a social context (Brown, Odom, McConnell, & Rathel, 2008; Conroy, Brown, & Olive, 2008; Odom et al., 2008).

Using a performance-based approach, social competence is characterized by making evaluative judgments about the social performance of children in social contexts (Odom & McConnell, 1985; Odom et al., 1992; Odom et al., 2008). Table 2-1 shows the four possible evaluative judgments of children’s social competence that might be made. For example, a child might be judged to have good social skills and use socially appropriate behaviors (i.e., no problem behaviors). Alternatively, a child might have good social skills but display socially inappropriate behaviors.
Within this framework, a variety of social behaviors might be observed to evaluate children’s social competence in context. For example, initiating and maintaining interactions, engaging in play, attending and listening to others, maintaining friendships, responding to adult or peer requests, playing or sharing with others, regulating emotions and feelings, or showing empathy for others are all skills that are positively related to social competence. Given the range of social behaviors related to social competence, Odom and colleagues (2008) emphasized the importance of conducting multi-component assessments of social competence to inform a more comprehensive profile of children’s social competence across social settings and social partners.

Challenges Related to the Measurement of Social Competence

Given the complexity of children’s social worlds and the complex processes of development, the measurement of children’s social competence has received attention in the empirical literature. Odom and colleagues (2008) outlined various methods that have been used in the empirical literature to assess children’s performance in social settings and to inform judgments about social competence. These include observational strategies to count the number or rate the effectiveness of social behaviors children display (cf. Brown, Odom, & Holcombe, 1996), parent or teacher ratings of child behavior (cf. Merrell, 2002), social problem-solving tasks (cf. Webster-Stratton & Lindsey, 1999), sociometric approaches using peer ratings or peer nominations (cf. Wu, Hart, Draper, & Olsen, 2001), and measures of friendships (cf. Gifford-Smith & Brownell, 2003). Odom and colleagues noted that each approach, when used separately, provided limited perspectives about children’s social competence. Shonkoff and Phillips (2000) described concerns with each measurement approach. For example, observational methods focus on specific skills in limited
contexts and do not capture enduring interactions. Teacher and parent ratings provide an evaluation of children’s social competence across contexts and time; however, ratings represent adult’s views of social competence, not the views of children. Sociometric approaches using peer ratings or peer nominations provide insight into children’s views of preferred peers. The stability and applicability of these ratings beyond defined peer groups requires further examination.

Raver and Zigler (1997) noted concerns about using individual measures to inform evaluative judgments about children’s social competence. These authors also emphasized the importance of using multiple measures to assess children’s social competence within the complex social demands of diverse environments that children experience with peers and adults. They acknowledged, however, the importance of cost-effectiveness and feasibility when making assessment decisions for research or evaluation purposes. Current recommendations for measuring children’s social competence emphasize the selection of measures that reflect the research or practical questions to be addressed (Odom et al., 2008).

**Outcomes Associated with Social Competence**

Despite measurement challenges, empirical evidence has demonstrated the relationships between the development of children’s social competence in the early years of life and important outcomes such as school readiness, later school success, and overall well-being (Odom et al., 2008; Raver & Zigler, 1997; Shonkoff & Phillips, 2000). These outcomes have been identified from both positive and negative frames. In a positive frame, children with social competence engage in more peer social interactions and maintain more friendships. From a negative frame, children with social
competence challenges experience lower rates of peer acceptance and engage in fewer social interactions.

Research often reflects the negative frame with respect to poor outcomes associated with social competence challenges. For example, children’s lack of social competence might result in conduct problems, which have been linked to peer rejection and isolation, substance abuse, school drop out, juvenile delinquency and incarceration, and depression and other mental health concerns in adult years (Campbell, Breaux, Ewing, & Szumowski, 1986; Campbell et al., 2006). Many researchers have cautioned, however, these later-in-life outcomes are not definitively associated with early conduct problems and have suggested further examinations are needed of the complex processes and associated factors that result in undesirable outcomes (Campbell, Shaw, & Gilliom, 2000; Loeber & Hay, 1997). For example, Campbell and colleagues identified that concerns related to problem behaviors and poor social skills were either (a) time limited to the period of early childhood, (b) were not identified in early childhood but emerged during adolescence, or (c) were present in early childhood and adolescence. These authors noted the latter group of children was identified with problem behaviors that were considered severe and persistent across settings during early childhood. Campbell et al. emphasized that, for some children, identified concerns about social competence might be transient or reflect the process of development.

Although concerns related to social competence might not persist over time, researchers have also identified deleterious outcomes young children with social competence challenges might experience more immediately. These outcomes relate to children’s early development and school readiness, including peer rejection and fewer
social interactions, poor adaptation to school and new environments, lowered teacher expectations and academic opportunities, and, in some cases, preschool or early school suspension or expulsion (Gilliam, 2005; Ladd & Price, 1987, McIntyre, Blacher, & Baker, 2006; Perry, Dunne, McFadden, & Campbell, 2008).

The extent to which these later-in-life and more immediate outcomes affect children with disabilities continues to be examined empirically (Odom et al., 2008). Some research has shown that social competence challenges experienced by young children with disabilities have been associated with peer rejection, fewer friendships and social interaction opportunities, poor adaptation to school, and increases in challenging behaviors (Baker et al., 2003; Guralnick, Hammond, Connor, & Neville, 2006; McIntyre et al., 2006). Increases in challenging behaviors for children with disabilities have been associated with parental stress and exclusion from general education settings (Baker et al., 2003; Lecavalier, Leone, & Witt, 2006). Sigman and Ruskin (1999) noted the extent to which children with intellectual disabilities experience independence in later-in-life settings (e.g., employment, independent living) is as much a function of their social competence as their cognitive competencies.

**Child Factors Associated with Social Competence**

Researchers have conducted investigations to explicate associations between attributes of children and their social competence. Odom et al. (2008) referred to child factors associated with social competence as “inside-out” factors. Inside-out factors referred to children’s personal attributes, skills, and abilities. In the present study, child factors identified in the literature that were related to social competence were characterized as malleable or non-malleable characteristics. *Non-malleable* factors refer to aspects of the child that are not altered or changed by interventions or varying
contexts (IES, 2011). For example, a child’s age, sex, and race/ethnicity are non-malleable child factors. *Malleable factors* refer to child characteristics that are amenable to change due to developmental progression or intervention or that might be altered by different settings and contexts (IES, 2011). For example, children’s cognitive abilities or language and communication skills change over time based on developmental progression or intervention would be considered malleable factors.

Previous research has demonstrated the associations between the non-malleable child factors listed above and children’s social competence (Qi & Kaiser, 2003). For example, some studies have demonstrated that boys are more likely than girls to demonstrate physical aggression or externalizing problem behaviors (Mendez, McDermott, & Fantuzzo, 2002; Olson & Hoza, 1993). Children of different race/ethnicity groups have shown different social competence trajectories and vary in the extent to which certain skills are demonstrated (Raver, Gershoff, & Aber, 2007). Children’s demonstration of social competence becomes more complex and sophisticated as they age (Mendez et al., 2002). Because of the developmental nature of social competence, many researchers highlight the importance of distinguishing between age-expected social skills and behaviors and other indicators that might be perceived as social competence challenges for the child’s age (Campbell et al., 2000). For example, short tantrums, grabbing of toys, and crying are normal expressions of young children learning to navigate a social play setting at certain ages. The persistence of these behaviors at older ages might be indicative of social competence challenges.

Malleable child characteristics and skills have also been shown to be associated with children’s social competence, including children’s cognitive abilities, language and
communication skills, executive functioning, and temperament (Center on the Developing Child at Harvard University, 2011; Herbert-Meyers, Guttentag, Swank, Smith, & Landry, 2006; Qi & Kaiser, 2003). For the purposes of this review, executive function is defined as working memory, inhibitory control, and cognitive flexibility (Center on the Developing Child at Harvard University, 2011); and temperament is defined as children’s level of assertiveness, activity level, ability to sustain attention, and regulation of emotions (Herbert-Meyers et al., 2006; Shonkoff & Phillips, 2000).

Cognitive, language, or communication delays might be evidenced by young children with disabilities. For these children, social interactions and demonstration of social competence in social contexts might be more difficult (Guralnick, 1999, Schneider & Goldstein, 2008; Strain, Schwartz, & Bovey, 2008; Drasgow, Lowery, Turan, Halle, & Meadan, 2008). Odom and colleagues (2008) noted, however, that many children with identified disabilities are socially competent and benefit from strong peer relations and social interactions. The extent to which children with disabilities experience additional difficulties with social competence might be more associated with their functional abilities, as reflected in various malleable factors (e.g., use of arms and legs, cognitive and language abilities, hearing, vision, health status), than their disability status.

**Contextual Factors Associated with Social Competence**

In addition to child factors, researchers have also emphasized the role of contextual factors in relation to young children’s social competence (Blandon, Calkins, & Keane, 2010; Odom et al., 2008; Qi & Kaiser, 2003). Odom et al. (2008) referred to contextual factors associated with social competence as “outside-in” factors. Outside-in factors refer to aspects of children’s home, school, and community contexts that have
been associated with social competence. In the present study, these contextual factors are referred to as *family factors* and *environmental factors*.

Researchers have highlighted associations between children’s social competence and family characteristics, including socio-economic status, parent education, martial status and family size, family stress and disruption, domestic violence, substance abuse, and history of poor mental health or depression (Krishnakumar & Black, 2002; Loeber & Hay, 1997; NICHD Research Network, 2003; Raver et al., 2007; Schmidt, Demulder, & Denham, 2002). Factors related to parental attitudes and behaviors that influence parent-child interactions have also been associated with children’s social competence. Specific parental attitudes and behaviors that have been examined in relation to children’s social competence include parents’ belief that they can affect change in their children’s development, parents’ involvement in their children’s school activities, parents’ facilitation of social opportunities for children, and parent-child interactions (Guralnick, 1999; Oravecz, Koblinsky, & Randolph, 2008; Raver et al., 2007; Schmidt et al., 2002). Researchers have noted the transactional nature of children’s social competence and family factors, specifically the transactional nature of parent-child interactions (Olson & Lunkenheimer, 2009; Rutter, 1979; Sameroff, 2009; Sameroff, Seifer, Baldwin, & Baldwin, 1993).

Factors related to children’s environment in the present study are defined as including select community and school factors. Community factors that have been associated with children’s social competence include the socio-economic status of the community and the safety of children’s neighborhoods (King et al., 2005; Loeber & Hay, 1997; Oravecz et al., 2008; Romano, Kohen, & Findlay, 2010). School factors
associated with children’s social competence include the quality of childcare or school programs and the provision of interventions or supports to promote social competence (e.g., social skills training, positive behavior supports; Domitrovich, Cortes, & Greenberg, 2007; Elias, Gara, Schuyler, Branden-Muller, & Sayette, 1991; Odom et al., 1999). Research has examined the individual contribution of select contextual factors to children’s social competence. The explanatory patterns and consistency of associations between individual family and environmental factors and children’s social competence has varied across studies, population samples, and analytic methods used to examine these relationships (Krishnakumar & Black, 2002; Raver et al., 2007; Sameroff & Seifer, 1983).

Shonkoff and Phillips (2000) noted that individual factors in isolation are unlikely to influence social development. Contemporary perspectives about social competence acknowledge interacting and accumulating influences on children’s social development and their social competence.

Researchers have often examined these factors in terms of risk and have focused on the identification of factors associated with undesirable outcomes. For example, in a series of studies about hard to manage preschool boys, Campbell and colleagues used a cluster analysis technique to examine subgroups based on different patterns of risk factors. Five groups were identified: boys with child and family risk factors, boys with child risk factors only, boys with family risk factors only, and two groups of boys with low or no risk factors (Campbell, 1994; Campbell, March, Peirce, Ewing, & Szumowski, 1991). These studies showed boys in the group with family and child risk factors
consistently displayed lower social skills and more problem behaviors, with high rates of externalizing problem behaviors when compared to other boys in the sample.

Another key aspect of studies on contextual factors has been the identification of factors that protect (or “buffer”) against the negative influence of risk factors (cf. Werner & Smith, 2001). These factors have been referred to as promotive or protective factors. Gutman and colleagues (2003) defined promotive factors as variables positively related to positive outcomes and protective factors as variables positively related to positive outcomes for children in a high-risk group but not for children in a low-risk group. From an analytic perspective, promotive factors address main effects and protective factors address interaction effects.

**Summary Related to Social Competence**

Social competence has emerged as a national priority outcome for young children and young children with disabilities given the role of social competence in many aspects of children's development, school readiness and success, and later-in-life well-being. Non-malleable and malleable child factors and select contextual factors have been examined in relation to children’s social competence. Researchers have noted the interacting and accumulating influences of contextual factors in relation to social competence. Researchers continue to identify a range of risk factors, promotive factors, and protective factors that might be associated with or influence children’s social development and their social competence.

The review of the literature related to children’s social competence informed the present study in several ways. For example, the performance-based view of social competence described by Brown and colleagues (2008) was consistent with the assessment of social competence available in the PEELS data set (i.e., Preschool and
Kindergarten Behavior Rating Scale, Second Edition [PKBS-2]; Merrell, 2002), which defined how social competence was operationalized in the present study. The PKBS-2, however, was the only standardized measure available in the PEELS data set, which limited the use of multiple measures. The child and contextual factors identified in the literature that have been associated with children’s social competence informed the selection of child and contextual variables from the array of variables available in the PEELS data set. Selected variables included potential risk factors or protective factors and were used to examine the moderating role of these factors on the relationship between functional ability profiles and social competence.

**Use of Disability Categories to Characterize Children**

This section of the present literature review focuses on the use of disability categories under the Individuals with Disabilities Education Improvement Act (IDEA, 2004). The relevance of this review to the present study is to illustrate concerns with using disability categories to examine relationships with outcomes for young children, including social competence.

Thirteen disability categories are specified in the IDEA for children age 3 through 21. The categories are autism, deaf-blindness, deafness, emotional disturbance, hearing impairments, mental retardation, multiple disabilities, orthopedic impairments, other health impairments, speech or language impairments, specific learning disability, traumatic brain injury, and visual impairments including blindness. For children ages 3 through 9, the additional disability category of developmental delay is also specified in the law (NICHCY, 2009). To be eligible for services under IDEA, a child must meet the established criteria for a disability category and subsequently receive a primary disability classification or categorical “label.” Many unintended consequences and
concerns about a categorical approach to characterize disability have been described in the literature (e.g., Florian et al., 2006; Hobbs, 1975; Simeonsson & Scarborough, 2001). The following sections review key issues related to the use of disability category and variations in state eligibility systems, particularly with respect to the use of disability category as predictor or explanatory variables in research.

**Concerns with Categorical Approaches**

In 1975, Nicolas Hobbs authored *The Future of Children: Categories, Labels, and Their Consequences* for the federally funded project focused on the classification of exceptional children. In this seminal report, Hobbs described issues associated with using a categorical approach to describe children with disabilities or children with social and economic risk factors. Some of the issues identified by Hobbs, and subsequently by others over the years, include (a) the stigmatizing effects of categorical labels (Smith & Schakel, 1986; Simeonsson & Scarborough, 2001); (b) the poor reliability and validity of diagnostic procedures that lead to classification (Haring, Lovett et al., 1992; McLean, Smith, McCormick, Schakel, & McEvoy, 1991); (c) the imprecision of categorical labels to inform interventions or support services (Florian et al., 2006; Reschly, 1996; Simeonsson & Scarborough, 2001); and (d) the variation of disability categories and eligibility determination criteria across states and agencies (Linehan, 2001; Snyder, Bailey, & Auer, 1994). Others have noted that the categorical approach locates the disability as a fixed characteristic of the child or person (Burke & Ruedel, 2008; Florian et al., 2006) and provides limited or no information about a child’s strengths, weaknesses, support needs, or secondary conditions (Forhan, 2009; Haring, Farron-Davis et al., 1992).
For young children with disabilities, the use of developmental delay was intended to provide a “non-categorical” approach to determine eligibility for IDEA-related services (McLean et al., 1991). The use of this non-categorical option was at the discretion of the state. States could choose to adopt the category, determine the age range in which the category might be applied, and provide discretion to local education agencies (LEAs) about whether to adopt the use of developmental delay within a district (Linehan, 2001). Advocates of the non-categorical option encouraged a broad definition in which developmental delay referred to “a condition which [sic] represents significant delay in the process of development” (McLean et al., 1991, p. 1). Proponents of developmental delay as a “non-categorical” option for young children asserted this approach would remediate some of the problems identified with the categorical approach, such as encourage service individualization and improve continuity of service between Part C and Part B. Despite these potential benefits, researchers cautioned that developmental delay could become “yet another category” and not represent the non-categorical option as intended (Haring, Lovett et al., 1992, p. 155).

In 2000, the National Association of State Directors of Special Education (NASDE) in collaboration with Frank Porter Graham Child Development Center at the University of North Carolina (UNC) convened a meeting of key stakeholders to identify trends in state practices related to the use of developmental delay as an eligibility category (Linehan, 2001). As part of this summit, researchers from UNC reported findings from a survey of state directors of special education. This study revealed that state directors viewed the use of developmental delay option in four different ways. First, some directors considered the category as one that was different than all other Part B
categories (i.e., children not eligible for other categories could be identified for services with developmental delay). Second, some directors considered the developmental delay category to encompass all possible categories represented in Part B for preschool-aged children (i.e., all preschool-aged children with disabilities should be classified as developmental delay). Third, some believed the category was appropriate to use to identify the early manifestation of disabilities that would later be identified by other Part B categories. Finally, some state directors felt the developmental delay category provided an option for a functional approach. The differences in the special education directors’ views of developmental delay as a “non-categorical” option provided insight into the variation of practices across states and the processes by which developmental delay often became another category in some states.

Current Variations in Eligibility Determination Systems

In 2004, the National Association of State Directors of Special Education (NASDE) commissioned a report on state terminology, definitions, and eligibility criteria for disability categories. In this report, Muller and Markowitz (2004) described the vague criteria that the federal regulations provided with regard to determining eligibility across all disability categories. The authors noted that federal regulations only provide specific recommendations for eligibility determination for one disability category (i.e., learning disability). The absence of guidance in the federal regulations allowed states to set their own terms, definitions, and criteria for eligibility determination as long as the state creates a structure that satisfies the requirements for federal reporting (i.e., Section 618 requirements). The report described the extensive variation across the 50 states and 3 non-state U.S. jurisdictions with regards to the use of federal terms, state definitions,
and state criteria for determining eligibility for each of the 13 disability categories and the optional category of development delay.

Their report highlighted that most states adopt the terms used in the federal legislation to describe a disability category. One notable exception is the term mental retardation; only about half the states use the term mental retardation while other states use other comparable terms such as cognitive delay, cognitive impairment, or intellectual disability. Muller and Markowitz also reported that states did not use all categories or some states combined categories. They reported that 15 states included deafness under the category of hearing impairment, seven states did not use the category of multiple disabilities, and three states included autism, other health impairment, or traumatic brain injury under the category of orthopedic impairment.

A major focus of the report was the analysis of eligibility criteria, including specificity of criteria, types of assessments used to determine eligibility categories, use of an outside professional as part of the eligibility determination process, incorporation of qualitative data to inform decision making, and membership requirements for the eligibility determination team specified by each state. Across states, the specificity of the criteria and required assessments was variable by disability category. More than half the states outlined specific criteria for each disability category with the exception of deaf-blindness, deafness, and multiple disabilities. On average, most states did not require the use of an outside professional to contribute to eligibility determinations across disability categories. Very few states required the use of qualitative data or specified requirements for the composition of the eligibility determination team.
In 2005, Muller, Markowitz, and Srivastava conducted follow-up investigations from their previous report to determine whether use of specific terms or the presence or absence of an eligibility criteria resulted in differences in proportions of children served by a specific disability category. The researchers selected five disability categories (i.e., autism, emotional disturbance, mental retardation, specific learning disability, and speech or language impairments) and used data from the 50 states for children age 6 through 21 served under IDEA. Independent t-tests were used to assess differences between groups (i.e., term/criteria used group and term/criteria not used group). On average, from the selection of terms and criteria the authors examined, use of a specific term or criteria did not result in statistically significant differences in the proportion of children served by different disability categories across the 50 states with two notable exceptions. First, the use an outside professional as part of the requirements for the diagnosis of autism was associated with a lower proportion of children being identified for services in the category of autism. Second, the use of the term mental retardation was associated with a lower proportion of students being identified for services in this category compared to states that used other comparable terms (e.g., cognitive delay, cognitive impairment, or intellectual disability).

Danaher (2007) compiled an analysis of eligibility policies and practices for preschool-aged children with disabilities. Danaher’s report echoed the major themes of variability among states over the years in relation to eligibility determination and eligibility categories. The report outlined variation in (a) the use of developmental delay across states, (b) the age range to which developmental delay is applied, (c) the relationship between the use developmental delay and other categories for children, (d)
the eligibility criteria that are applied across states, (e) the polices that support transition from Part C to Part B, and (f) the within-state variation resulting from LEA discretion on the adoption of developmental delay.

**Illustration of Concerns and Implications for Research**

Because of the variation in state eligibility systems, states might use the same disability category to identify children with different disabilities and characteristics (Chambers, Perez, et al., 2004). For example, in State A, the IDEA-eligibility determination system identifies all young children ages 3 through 6 with developmental delay. In this state, a 3-year-old child with significant multiple impairments including intellectual disabilities and physical disabilities is identified for services under the disability category of developmental delay. In the same state, a 4-year-old child with speech articulation difficulties also is identified for services under the disability category of developmental delay. Despite the differences in these children’s functional characteristics, both children would be identified with developmental delay.

To illustrate further the variation related to specific disability categories such as developmental delay, descriptive information about children’s abilities for four children are shown in Appendix A. The IDEA-related disability category for each of the four children was developmental delay and each child’s abilities, related to different functional skills, are shown. In this example, children resided in different states. As shown in the appendix, children’s functional skills differ based on the characteristics of each child. Despite the differences in children’s functional abilities, the primary disability category for each child was developmental delay.

Moreover, children with the same disability and functional ability characteristics might be identified by different disability categories across states because of the
variation in state eligibility systems (Chambers, Perez, et al., 2004; Dunst, Trivette, Appl, & Bagnato, 2004). For example, the children in the above-referenced example move to State B where the eligibility determination system permits use of most IDEA-related categories for preschool children. In this state, the 3-year-old child with significant multiple impairments, including intellectual disabilities and physical disabilities, is identified for services under the disability category of multiple disabilities, while the 4-year-old child with speech articulation difficulties is identified for services under the disability category of speech or language impairments. In this example, each child’s primary disability classification does not change based on their functional characteristics. The child’s disability category changes because of the policies of the state in which they reside.

Differences in the identification of children with disabilities that are a result of variability in eligibility systems across states is further illustrated by comparing state data on children receiving services. Table 2-2 shows data for the number of children, 3 through 5 years-of-age, served under IDEA by disability category for three example states (Minnesota, Washington, Wisconsin). These states were identified for similarities in total number of preschool children served across all disability categories. As shown in Table 2-2, the percentages of children identified by different disability categories are different across the three states. For example, Minnesota and Washington identified approximately 50% to 57% of children with developmental delay, while Wisconsin only identified approximately 19% of children with developmental delay. Wisconsin, however, identified 67% of children with speech or language impairments, but Minnesota and Washington identified 32% and 27% of children with this category,
respectively. Minnesota has a higher percentage of children with autism, but lower percentage of children with other health impairments (an IDEA disability category used in some states when a child does not have a medical diagnosis of autism) compared to Washington or Wisconsin. These data might illustrate patterns of differential prevalence rates in the population of children with disabilities across states or these data might illustrate some of the issues related to comparing state-level data when disability categories result from different state eligibility systems.

As shown in the previous examples and noted by Florian and colleagues (2006), there is as much within-category variation as there is a between-category variation for the IDEA disability categories. This variation potentially introduces several limitations when aggregating data for use in nationally representative data sets and using disability category as a predictor or explanatory variable of child outcomes (MacMillian & Reschly, 1998). Limitations related to the use of IDEA categorical descriptions of disability include (a) comparing children by disability category from different states when disabilities categories, definitions, and criteria differ across states, and (b) distinguishing differences between children within a disability category (Florian et al., 2006; Simeonsson, Simeonsson, & Hollenweger, 2008). Moreover, disability category alone provides limited information about a child’s functional abilities or levels of functioning and subsequent support needs, and provides no information about secondary conditions or contextual factors that might facilitate or inhibit children’s social competence (Florian et al., 2006; Forhan, 2009).

**Summary Related to Categorical Descriptions of Disability**

The variations in state eligibility determination systems have resulted in disability categories that are idiosyncratic to individual states (Danaher, 2007; Muller &
Markowitz, 2004). Given the issues related to variations within and between disability categories, the use of IDEA-disability category to characterize children as a homogenous group in research is not recommended (Florian et al., 2006; Lollar & Simeonsson, 2005). Alternatively, researchers have recommended using a functional approach to describe and characterize children's functional abilities. Based on concerns identified in the present review and recommendations using for a functional approach, the present study examined the use of functional ability profile subgroup membership as an alternative to disability category as a correlate of child outcomes.

**The ICF-CY Framework**

This section of literature review focuses on the International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY). The ICF-CY was the conceptual framework that guided the present study.

The ICF-CY is part of the Family of International Classifications (WHO-FIC) promulgated by the World Health Organization. The classification system is designed to categorize relevant dimensions of health and well-being for the purposes of systematic recording or analysis of data across health and related sectors both internationally and nationally with the aim of improving health, well-being, and related services (Madden, Sykes, & Bedirhan, 2007). Three classifications are part of the primary reference classification system: the International Classification of Disease, 10th edition (ICD-10); International Classification of Functioning, Disability, and Health (ICF); and International Classification of Health Interventions (ICHI). The ICHI is currently under development. The ICF-CY is considered a derived classification system, based on the framework of the ICF, designed specifically for children birth through adolescence. The ICF-CY is the classification of interest in the present study.
The ICF-CY is not used to identify or classify the etiology of health condition, disability, disease, or disorder; this classification has been the domain of the ICD-10 (WHO, 1992). One potential use of the ICF-CY is to be used in conjunction with the ICD-10 to understand functioning in relation to a disability/health condition (Peterson, 2005). For example, the ICD-10 has classification codes can be used to denote if a child has conditions such as Down syndrome (code Q90.9), blindness (code H54.0), asthma (J45.9), or other diagnoses. The ICF-CY can be used to document the level of functioning related to cognitive function (code b117.0), sensory functions (code b156.0), language functions (code b167.0), motor activities such as walking or running (code b770.0) or other domains to enhance the information that is known about a child identified with a condition, such as Down syndrome, through the ICD-10. When used in combination, the two systems (i.e., ICD-10 and ICF-CY) are designed to provide a system to classify and describe children’s functioning in relation to other diagnoses (WHO, 2010).

**History of the ICF-CY**

The ICF framework, which is the basis for the ICF-CY, is a revision of the original International Classification of Impairments, Disability, and Handicaps (ICIDH) framework proposed by the World Health Organization in 1980. At the time it was first disseminated, the ICIDH presented four novel approaches to common conceptualizations of disability (Simeonsson et al., 2003). First, it conceptualized disability as the consequence of an underlying health condition or disorder. Second, it differentiated the consequences of disability across the body, the person, and society. Third, it introduced a multi-dimensional view of disability, in which functioning might be affected by impairment related to the body, disability or limitation related to the person’s
activities, and a handicap or disadvantage related to participation in society. Fourth, it introduced a numeric coding system that could be used to document the impact of disability across the body, the person, and society.

Despite the significant advancements that the ICIDH presented, it was released as an experimental document and it was not widely disseminated or adopted (Florian et al., 2006; Simeonsson et al., 2003; Simeonsson, Lollar, Hollowell, & Adams, 2000). Following its release, the ICIDH was criticized for not acknowledging contextual factors as key aspects related to an individual’s functioning (Florian et al., 2006; Simeonsson et al., 2000) and for its linear approach from health condition to impairment to disability to handicap (Figure 2-1; Florian et al., 2006; Simeonsson et al., 2000). These concerns, in addition to other concerns that were raised about the ICIDH, resulted in revisions to the framework in the 1990s. During this time, two beta versions of the revised ICIDH were released for continued feedback and revisions before the current ICF was released in 2001 (Simeonsson et al., 2000; Simeonsson et al., 2003).

The ICF framework, illustrated in Figure 2-2, incorporates aspects of body functions and structures, activities, and participation to describe disability and functioning, however, the framework also highlights the influence of health conditions and contextual factors (i.e., environmental and personal) on functioning. The ICF framework focuses on components of health instead of disease, emphasizes the importance of health and wellness, and emphasizes the universal nature of functioning and disability, such that health and wellness of all persons are influenced by the components of body functions and structures, activities, participation, and contextual
factors (Lollar & Simeonsson, 2005; Raghavendra, Bornman, Granlund, & Bjorck-Akesson, 2007).

The ICF framework offers descriptors that emphasize positive aspects (e.g., integrity, facilitators) or negative aspects (e.g., limitation, restriction, barriers) of health and functioning. The framework aims to reorient users on the health condition and the consequences of health conditions on functioning instead of a focus on etiology or diagnosis (Carlson, Benson, & Oakland, 2010). A key aspect of the framework is the emphasis on the multi-dimensional and interactive features of functioning and disability, including contextual factors (Raghavendra et al., 2007).

The ICF is designed to provide a broader conceptual framework related to disability as contrasted, for example, with IDEA disability categories. The ICF is considered a classification system for functioning and disability; the ICF is not a specific measurement instrument. The ICF classification system presents chapters and codes for related domains for the framework components. As shown in Table 2-3, the ICF classification system is organized in chapters related to body functions, body structures, activities and participation, and environmental factors. The ICF classification system does not provide domains related to personal factors.

Within each chapter, there are second level and third level codes, for some domains there are also fourth level codes. Table 2-4 shows an example of second, third, and fourth level codes for Chapter 1 of the body functions components. For each ICF code, a generic rating or qualifier can be applied to describe the level of functioning. A rating of 0 is applied to indicate normal function related to the code. Normal function is defined by what is typical of the average, same-aged peer (WHO, 2007). A rating of
1 is applied to indicate mild functional impairment, limitation, or restriction related to the code. A rating of 2, 3, or 4, is applied to indicate moderate, severe, or complete functional impairment, limitation, or restriction, respectively, related to the code. This qualifier system is used to describe the body functions, body structures, and activities and participation codes. For the environmental codes, a (+) is assigned if the code is considered a facilitator and a (−) is assigned if the code is considered a barrier.

Since the release of the ICF, some have offered continued feedback and critique (Dahl, 2002; Imrie, 2003). Others have highlighted its strengths and focused on its contributions to the conceptualization of disability and the potential for a common language that might be used across countries and cultural contexts (Florian et al., 2006; Peterson, 2005; Rosenbaum & Stewart, 2004; Simeonsson, 2003; Simeonsson et al., 2000; Simeonsson et al., 2003). Many authors, however, have noted the ICF was not developmentally appropriate for children and adolescence. Based on concerns about using the ICF with children and youth, a derived classification system was released in 2006, the International Classification of Function for Children and Youth (ICF-CY; WHO, 2007).

The ICF-CY provides a classification system with content appropriate for children and youth from birth through adolescence (Bjorck-Akesson et al., 2010). The ICF-CY accounts for the expected variations and developmental changes during childhood. Moreover, environmental factor domains were expanded to emphasize the role of family and school factors during these years of development. Lollar and Simeonsson (2005) noted the ICF-CY emphasizes the unique nature of child development and provides
codes that can account for the pattern of change in the nature, intensity, and consequence of functional ability or disability during childhood.

**ICF-CY Applications**

The ICF-CY manual indicates the ICF-CY might be used to develop statistical tools, research tools, clinical tools, social policy tools, or educational tools (WHO, 2007; 2010). Simeonsson and colleagues (2006) identified seven specific applications of the ICF-CY. Four of these applications have particular relevance for the present study. First, the ICF-CY provides a framework for interdisciplinary practice. Many authors have referred to this as a “common language” that might be used across medicine, allied health, mental health, nursing, psychology and psychiatry, education and special education, and social and family services. Lollar and Simeonsson (2005) noted, however, “it would be foolhardy to believe that each discipline will change its idiosyncratic terminology” (p. 327). These authors suggested the ICF-CY might provide a second language that could be used to facilitate communication and understanding across disciplines. Second, the ICF-CY can yield profiles of child functioning. The focus on profiles of functioning switches emphasis from classifying the child using an IDEA-related disability category, which might have stigmatizing effects, to describing the variation in child-specific characteristics in the context of related factors that influence functioning. A profile helps identify needs and supports that are unique to the child.

Third, the ICF-CY profiles can help clarify clinical diagnoses and co-morbidities of traditional categorical systems. For example, the diagnosis of autism might be related to impairment in social skills, communication, or atypical behavior, a child’s functional profile provides specific information about the child’s current level of functioning in each area to help clarify a child’s strengths and specific needs. Fourth, the focus of the ICF-
The ICF-CY classification system is on functional characteristics related to difficulties and strengths in meeting the demands of daily life. The description of a child’s functional profile can have practical implications for individualizing interventions in educational and clinical treatment planning. In the context of the present study, information about children’s functional abilities, based on indicators associated with the ICF-CY model, were used to empirically derive subgroups of children with similar functional ability profiles and to examine relationships between subgroup membership and social competence.

**ICF-CY Usability**

The ICF-CY is a classification system to document functioning and disability. Evidence for ICF-CY codes might be gathered from direct measurements, observation, respondent interviews, or professional judgment (WHO, 2007). Because ICF-CY is not a measurement instrument, many have focused their efforts on identifying existing measures or developing new measures that can be used to assess information related to ICF-CY codes. For example, Morris, Kurinczak, and Fitzpatrick (2005) examined the extent to which seven different instruments identified for use with families to complete self-assessment of child functioning provided items related to codes in the activities and participation component. These authors noted that no existing instruments included items related to all domains and four instruments only provided items related three of the domains in the activities and participation component. Ogonowski, Kronk, Rice, and Feldman (2004) examined the extent to which two raters could apply ICF codes to scores from existing measures of child functioning. These authors reported interrater reliability was higher (kappa >.80) for instrument items that corresponded directly with a single ICF code. Kronk, Ogonowski, Rice, and Feldman (2005) further examined the
extent to which two raters could assign ICF codes based on content from an open-ended structured interview with families. These authors reported two raters had high interrater reliability when assigning binary codes (kappa > .85) but lower interrater reliability when assigning a severity rating (Mean kappa .72; range .25-1.0).

The ICF-CY provides over 1,400 alphanumeric codes across the four listed components (Table 2-3). It is neither expected nor feasible to document every code listed on the ICF-CY (WHO, 2007). Instead, researchers have focused efforts on identifying measures and developing practical tools to document ICF-CY codes for different purposes. Researchers have suggested generic tools that provide a brief sample of ICF-CY codes to gain an overall picture related a variety of codes, comprehensive checklists to assess the level two and three codes on specific domains, or core sets of codes identified for specific purposes or specific health conditions (Simeonsson, 2009; Stucki, 2005; Stucki & Cieza, 2004).

ICF-CY in Educational Contexts

The ICF-CY has been used in education and related fields such as special education, related services, and early intervention. Despite its strengths, researchers have not suggested the ICF-CY replace disability categories for educational eligibility, clinical, or other administrative purposes, however, many researchers have noted ICF-CY-based functional profiles provide information useful for practice, research, and policy (Simeonsson, 2009; Simeonsson & Lollar, 2005). For example, Florian and colleagues (2006) suggested ICF-CY-based functional profiles give educators relevant information for providing educational services including planning, individualizing interventions, assessment, and evaluations. These authors proposed the information related to a
child’s functioning addressed many of the concerns previously identified with traditional disability categories.

Simeonsson and Bailey (1991) developed a measure to assess children’s functional abilities. The ABILITIES Index (Simeonsson & Bailey, 1991) is a judgment-based rating scale, based on previous versions of the ICF. It was designed to profile the functional abilities of children across nine developmental and performance domains: audition (hearing), behavior and social skills, Intellectual functioning, use of limbs, intentional communication, tonicity, integrity of health, eyes (vision), and structural status.

Simeonsson, Bailey, Smith, and Buysse (1995) examined the utility of the ABILITIES Index to create functional ability profiles. The authors used a sample of 91 children receiving early childhood intervention services to generate subgroups of children with similar functional ability profiles. The sample of children were eligible for services based on the following disability categories: speech-language impaired (n = 53); mentally handicapped (n = 15); behaviorally-emotionally handicapped (n = 14); multiply handicapped (n = 3); autism (n = 2); orthopedically impaired (n = 2); other health impaired (n = 1); and learning disabled (n = 1). Using a hierarchical cluster analysis, a six-cluster model was identified (i.e., six subgroups with distinct and interpretable functional ability profiles were identified in the sample).

Simeonsson et al. described the differences between groups based on each group’s shared functional ability profile. For example, Cluster 1, which included 42 children, was characterized by mean ratings reflecting normal or suspected disabilities across all nine domains. Cluster 2 (n = 18) was characterized by ratings that reflected...
substantial disability in three domains: social skills and behavior, intelligence, and intentional communication. Cluster 3 \( (n = 9) \) and Cluster 4 \( (n = 14) \) were characterized by ratings that reflected substantial disability related to intentional communication or social skills and behavior, respectively. Both Cluster 5 \( (n = 5) \) and Cluster 6 \( (n = 3) \) were characterized by ratings that reflected substantial disability in use of limbs and tonicity, with substantial disability related to intelligence, health, and vision for cluster 5. The authors reported children identified by different disability categories were distributed across the six subgroups.

Other examples of using the ICF in education contexts include the use of ICF codes in research conducted with large-scale, national data sets. Simeonsson, Scarborough, and Hebbeler (2006) mapped ICF codes to eligibility descriptions provided by early intervention service providers in the National Early Intervention Longitudinal Study (NEILS). The authors used the ICF and ICD codes to describe variations in the population of children receiving services, beyond the three broad Part C eligibility categories (i.e., developmental delay, diagnosed medical condition, or at-risk). The authors reported 71% of the sample had documented eligibility related to ICF body functions, 41% related to ICD health conditions, 10% related to ICF activities or participation, and 5% related to ICF environmental factors. In addition, Chambers, Perez, et al. (2004) and Daley, Simeonsson, and Carlson (2009) have conducted research with nationally representative data sets in which an adapted version of the ABILITIES Index was used. These studies are described in further detail under the ‘Studies that Used Functional Ability Composite Scores’ subheading below.
Summary Related to ICF-CY

The ICF-CY provides a framework to describe and quantify children’s functional abilities. A primary strength of the ICF-CY is the inclusion of contextual factors and their influence on children’s functioning as facilitators or barriers. Proponents of the ICF-CY have noted several possible applications. The utility and feasibility of these applications continues to be tested and examined in research and in practice.

The ICF-CY framework was used in the present study to frame the research questions and inform the selection of variables from the PEELS data set. This framework, therefore, guided the secondary analyses conducted. Constructs identified in the ICF-CY framework are consistent with constructs identified in the extant literature on social competence, although different terms and labels are used. For example, malleable and non-malleable child characteristics described by the Institute of Education Sciences are consistent with aspects of body functions and activities, and personal factors, respectively, in the ICF-CY framework. Risk factors and promotive or protective factors described in relation to children’s social competence are consistent with the use of contextual hindrances or barriers and facilitators in the ICF-CY framework.

PEELS Data Set

In this section of the literature review, information about the Pre-Elementary Educational Longitudinal Study (PEELS) data set and findings from previous studies conducted with the PEELS data set are provided to set the context for the present study. The PEELS study was a prospective, longitudinal study focused on preschool children with disabilities. The PEELS data set provides a nationally representative sample of 3,100 children with disabilities ages 3, 4, and 5 at the start of the study.
Children were followed for four consecutive years from 2003-04 through 2006-07, with a follow-up year completed during 2009-10.

Public Information from the PEELS Reports

This section briefly describes public information about the PEELS sample. Westat researchers who implemented PEELS have published one User’s Guide for the restricted-use data set (Carlson, Posner, & Lee, 2008); three overview reports from the first three waves of data collection (Markowitz et al., 2006; Carlson, Daley, et al., 2008; Carlson et al., 2009); one selected findings report (Carlson, Bitterman, & Daley, 2010); and a variety of two-page briefs on PEELS findings. Information about the PEELS data set and PEELS reports are available on the PEELS website (www.peels.org).

Findings from the first wave of data collection focused on the characteristics of young children with disabilities and their families, the educational services they received, transitions from early intervention settings, and performance on measures of school readiness and social competence (i.e., social and behavioral skills; Markowitz et al., 2006). The following paragraphs highlight findings from Markowitz et al. (2006) wave 1 report.

In the PEELS sample, children identified with disabilities were disproportionately male (70%). Children represented diverse families: White (67%), Hispanic (22%), and Black (11%). Due to small sample sizes, data for other races were not included in reported findings related to race/ethnicity. Twenty-seven percent of all children with disabilities were from households with family incomes of $20,000 or less. Nearly half the children were identified by the IDEA-disability category speech or language impairments (47%), followed by developmental delay (27%). All other disability categories combined made up the remaining 26% of the PEELS sample: autism (7%),
mental retardation (4.5%), other health impairment (3%), learning disability (2.5%), orthopedic impairment (2%), emotional disturbance (1%), and a combined low-incidence category (6%; multiple disabilities, deaf-blindness, deafness, hearing impairment, visual impairment, and traumatic brain injury).

Eighty-six percent of parents indicated they thought their child spent the right amount of time with peers without disabilities. The majority of children with disabilities had a teacher with a graduate degree (55%) or bachelor’s degree (38%). For children with an individualized family service plan before age 3, 31% of these children had a gap in services during the transition from Part C early intervention services to Part B preschool services. Overall, children with disabilities were within one standard deviation of the population mean on ratings of social skills and problem behaviors as measured by the PKBS-2 (Merrell, 2002). Deviations were noted for specific disability categories; for example, mean scores on social skills for children with autism or mental retardation were significantly lower than other disability groups. Overall, females had higher social skills ratings and fewer problem behaviors than boys. Differences by race/ethnicity for social skills and differences by race/ethnicity and income for problem behaviors were also noted.

Findings from the second wave of PEELS data collection focused on changes in eligibility and classification status, changes in educational services, and growth in skills (Carlson, Daley, et al., 2008). The following paragraphs highlight findings from the Carlson, Daley, et al. (2008) wave 2 report.

At the time of recruitment, all children had an active IEP or IFSP, however, during the course of the study, some children no longer required special education services.
and were declassified. Children who were declassified from special education services remained in the PEELS sample. Twenty-one percent of children with disabilities were declassified at some point between recruitment and wave 2 data collection. Of those, 2% were declassified before wave 1 data collection and then re-classified by wave 2 data collection. Declassification differed by primary disability category, for example, 37% of children identified with speech or language impairments were declassified, and 21% of children identified with emotional disturbance were declassified. Children transitioning between settings (22% - 24%) were more likely to be declassified than children who remained in the same setting (6%) between wave 1 and wave 2. Of children who continued to receive special education services, 23% were reclassified with a new primary disability category.

Between wave 1 and wave 2, the number of special education services that children with disabilities received decreased, while the mean number of hours spent in general education settings with children without disabilities increased. Children’s performance on standardized assessments increased for letter-word identification and applied problems, but remained stable for picture word vocabulary. Ratings of children’s social skills increased; changes in problem behaviors ratings were not reported.

Findings from the third wave of data collection focused on children’s transition experiences and social competence (Carlson et al., 2009). Between wave 2 and wave 3 data collection, 82% of children with disabilities made a transition between programs, schools, or grade. Twenty-one percent of children who transitioned were declassified compared to 9% of children who were declassified but did not undergo a transition.
Parents’ positive perspectives of transitions were associated with school and teacher transition practices. Teachers who indicated using more transition strategies were associated with improved transition outcomes. Special educators were more likely to use more transition strategies than general educators. The numbers of transition strategies were also associated with district size and wealth (e.g., medium and small districts used more strategies than large or very large districts).

Correlations between parent and teacher ratings of children’s social skills were low but positive ($r = .12$ for males and $r = .06$ for females); however, correlations for problem behaviors were moderate and negative ($r = -.39$ for males and $r = -.52$ for females). Different measures, however, were used to gather perspectives from parents and teachers. Parent ratings were based on a scale created from 29 parent interview items (Carlson et al., 2009) and the teacher ratings were based on the PKBS-2 (Merrell, 2002). Declassification was significantly related to children’s social skills and problem behaviors. Children with more advanced social skills and fewer problem behaviors were more likely to be declassified.

Carlson, Bitterman, and Daley (2010) created a special report on children’s community and recreational activities and educational services for kindergarten children. To examine children’s community and recreational activities, the authors focused on children ages 5 through 7 (i.e., wave 3 data). Based on parent report, 50% of children with disabilities participated in organized athletic activities, 20% in clubs or recreational programs, 14% in dance lessons, 14% in choirs or children’s theater performances, and 10% in music lessons. Differences in children’s participation varied by disability category (e.g., 55% of children with speech or language impairments
participated in organized athletic activity compared to 28% with mental retardation). Differences in children’s participation across activities were also associated with family income, parent reports of neighborhood safety, and access to transportation.

For children’s educational experiences in kindergarten, the general education classroom was the primary education placement for 73% of kindergarteners receiving special education services. Differences in general education or special education placements were associated with district size, metropolitan status, and district wealth. For kindergarteners receiving special education services, teachers reported 44% accessed grade level materials without modifications, 29% required some modifications, 13% required substantial modifications, and 14% used specialized curriculum or materials. Teachers reported the amount of time spent in different types of activities for kindergarteners receiving special education services. Instructional time was allocated in the following ways: 39% adult-directed whole-class activities, 23% adult-directed small group activities, 16% adult-directed individual activities, 13% child-directed activities, and 9% instructional or therapy services.

**Studies Conducted with the PEELS Data Set**

Search procedures described earlier in this chapter resulted in the identification of six published studies that were conducted using the PEELS data set. These studies include at least one author from the Westat PEELS project team. A brief synopsis of each study, followed by a detailed description of studies related to the present study, is provided.

Li, Lee, Lo, and Norman (2008) conducted a study to investigate bias in teacher questionnaire data that were imputed using the Auto Impute software. Bitterman, Daley, Misra, Carlson, and Markowitz (2008) conducted a study to examine parent
satisfaction and educational services for children identified with autism (i.e., a subsample of 186 children from the larger PEELS sample). In 2009, Daley and Carlson reported information about the correlates of change in eligibility status (i.e., declassification) for preschool children in special education. Daley, Simeonsson, and Carlson (2009) constructed and tested a disability index to measure children’s level of functioning using parent interview information. In 2010, Carlson, Bitterman, and Jenkins examined the role of home literacy environments on children’s achievement. St. Clair, Heinzen, Jenkins, and Carlson (2010) examined children's risk factors and the extent to which these factors were associated with educational performance.

Of the six studies listed above, Daley, Simeonsson, and Carlson (2009) is most closely related to the present study. Daley and colleagues discussed the importance of the ICF-CY for describing and quantifying children's functional abilities and impairments. The authors noted that the ABILITIES Index developed by Simeonsson and Bailey (1991) was a useful tool for describing a range of child abilities across developmental domains. Using the ABILITIES Index, parents or teachers rate the child’s level of functioning (1) normal ability to (6) profound lack of ability on individual items (e.g., vision, hearing, communication). The authors used PEELS parent interview information from wave 1 data collection to create an index to characterize the nature and severity of children’s functioning based on items from the ABILITIES Index. Using 24 parent-interview questions, the authors created 15 items that described children’s abilities on a 4-point scale: (1) normal or typical functioning to (4) severe limitation in functioning. Additional information about scale items is described in Chapter 3.
The 15 items were mapped to relevant codes in the body functions and activities/participation sections of ICF-CY. To examine the utility of the items, the authors conducted multivariate regression analysis using the 15 variables (i.e., all items entered simultaneously) on eight outcome variables (i.e., picture vocabulary, letter-word identification, applied problems, social skills, problem behaviors, and three scales of adaptive functioning—conceptual, practical, and social). Five items from the functional index, cognition, communicating with others, understanding, overall health, and regulation of activity, had statistically significant associations with at least four outcomes. All other items were differentially related to varying outcomes.

Based on these analyses, the authors created five possible disability severity indices composed of 15-items, 6-items, 7-items, 7-items, and 8-items, respectively. To examine each index, the authors calculated Pearson product-moment correlations between a composite score from each index and the eight outcome variables. The authors noted the composite score from the 15-item and 6-item indices had the highest correlations (range .22 through .53) with the outcome variables. The authors compared the correlations between the indices and reported no statistically significant differences were identified. Given the comparability of associations between outcomes using the composite score from 15-item and 6-item indices, the authors selected the 6-item index to create the PEELS Disability Severity Index. This index had items related to: cognition, communication, overall health, activity level, attention, and understanding.

To examine the validity of the Disability Severity Index, the authors used correlations and t-test to compare the 6-item index with additional data reported from parents and teachers. For example, index scores were significantly and positively
related to the number of modifications children needed to access curricula and materials and the number of related services children received at school. Moreover, statistically significant differences in mean index scores were identified for children who took the alternate assessment (i.e., higher mean index score) and those who received regular assessment (i.e., lower mean index score) and children who were declassified from special education services (i.e., lower mean index score) and those who remained in special education (i.e., higher mean index score). The authors also compared whether Disability Severity Index resulted in improved explanation of variance when compared to the use of disability category alone. These analyses are described under the ‘Studies that used Functional Ability Composite Scores’ subheading.

**Summary Related to Peels Data Set**

Findings from the PEELS reports and published studies using the PEELS data set highlight trends and patterns in educational services, transition experiences, and characteristics of young children with disabilities. The findings from these reports and published studies might aid interpretation of analyses and findings for the present study. For example, 21% of all children were declassified between recruitment and wave 2. By wave 1 data collection, some children were no longer receiving special education services based on a primary disability classification and were not assigned a primary disability category. Moreover, the published studies have offered information to inform secondary analyses conducted with the PEELS data set. Given the recent availability of the PEELS data through restricted-use licenses, those associated with the PEELS project have been the primary authors of studies published to date.
Empirical Studies with Direct Relevance for the Present Study

In this section, empirical studies with direct relevance for the present study are described. Studies reviewed in this section were identified as part of the systematic search process previously described. A study was included in this section of the review if the study was conducted with a large sample (i.e., more than 500 participants) that included young children ages 3 through 5 and the study examined (a) the contribution of child functioning over disability category in relation to examining child outcomes, or (b) the use of person-oriented analytic techniques to identify subgroups of children with similar profiles of abilities to examine variations in child outcomes.

A total of eight studies were selected for this review and are shown in Table 2-5. The table shows the extent to which each study included eight key features identified as important for addressing the research questions in the present study. The eight key features were that the study (a) was conducted with a U.S. based nationally-representative sample, (b) was conducted with children with disabilities ages 3 through 5, (c) was based on the ICF-CY framework, (d) examined children’s functional characteristics or other aspects of children’s abilities, (e) used person-oriented analytic techniques to identify subgroups with similar profiles, (f) compared functional ability to disability category, (g) examined relationships between child characteristics and outcome variables, and (e) considered contextual factors as part of the analysis. This type of analysis was conducted because no single study included all eight features that were directly relevant for the present study. Nonetheless, these studies were illustrative of research on key topics related to different aspects of the present study.

To aid in critical analysis of the research, studies were grouped based on similar characteristics. Two studies examined the use of children’s functional ability composite
scores as a correlate to child outcomes and as an alternative to using disability categories (Chambers, Perez, et al., 2004; Daley et al., 2009). Six studies used person-oriented analytic techniques to identify subgroups of children with similar profiles of abilities and examined relationships between these profiles and child outcomes (Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; Haapasalo, Tremblay, Boulerice, & Vitaro, 2000; Janson & Mathiesen, 2008; Konold & Pianta, 2005; Sanson, Letcher, Smart, Prior, Toumbourou, & Oberklaid, 2009; Stephens, Petras, Fabian, & Walrath, 2009). Additional information about the type of variables and analyses used across the eight studies are shown in Table 2-6.

**Studies that Used Functional Ability Composite Scores**

Two studies were identified in this group. Daley and colleagues (2009) developed a Disability Severity Index using the PEELS data set. As previously described, the authors examined the creation of four possible disability indices (i.e., 15-item index, 6-item index, 7-item index, and 8-item index). The authors determined a 6-item composite index was sufficiently representative of children’s overall functional ability (see previous description of this study under the ‘Studies Conducted with the PEELS Data Set’ subheading). The authors compared the contribution of children’s functional ability composite score and disability category to explain variations in children’s pre-academic/cognitive, social, and adaptive functioning skills. Stepwise regression models were used to compare the adjusted R-squared values for each model and the change in R-squared when (a) disability category was used alone, (b) functional ability composite score was used alone, and (c) disability category and functional ability composite score were used simultaneously.
For measures related to pre-academic/cognitive and social skills, the authors reported that children’s functional ability composite score alone accounted for more variance in scores than disability category alone (i.e., between 2% to 6% more variance accounted for across measures). For measures related to adaptive functioning skills, the authors reported that children’s disability category alone accounted for more variance in scores than functional ability composite score alone (i.e., between 1% to 3% more variance accounted for across subscales of an adaptive functioning measure). The authors noted, however, that adaptive functioning skills were assessed as part of the alternate assessment and the authors indicated the reduced sample size for this analysis might have impacted reported findings. When children’s disability category and functional ability composite score were used in combination, the amount of variance accounted for in the outcomes measures was greater than when either indicator was used alone (i.e., between 4% to 13% additional variance accounted for in each outcome measure). The authors noted the increase in variance explained when the two indicators were used together illustrated “that [disability category and functional ability] are different constructs, with less overlap than might be predicted given traditional ideas about certain categories being more ‘mild’ than others” (Daley et al., 2009, p. 548).

The second study was conducted as part of the Special Education Expenditure Project (SEEP; http://csef.air.org/) for the Center for Special Education Finance (CSEF). The SEEP project provides a nationally representative data set about general education and special education expenditures for a sample of over 10,270 students with disabilities served under IDEA Part B. Students were from a sample of 1,770 schools in 450 school districts or 30 affiliated intermediate education units and 20 state-run special
education schools. Students with low-incidence disabilities were oversampled to ensure adequate sample sizes for less common disability categories. Students, schools, and districts completed a series of surveys to gather information about fiscal policy, programs, personnel, and students. For more information about the SEEP study see Chambers, Parrish, Shkolnik, Levine, and Makris (2003).

SEEP reports have indicated that schools spend an average of $12,639 on each student with a disability compared to $6,556 for each student without a disability (Chambers, Parrish, & Harris, 2004). Moreover, schools spend different amounts of money to provide educational services for students from different disability categories (e.g., $10,058 for students with learning disabilities compared to $20,095 for students with multiple disabilities; Chambers, Shkolnik, & Harris, 2003). These reports, however, have noted there has been a tremendous amount of variation in spending within disability categories.

In a SEEP study conducted by Chambers, Perez, et al. (2004), the ABILITIES Index was used to examine the extent to which variation in a composite score of children’s functional ability contributed to the prediction of special education expenditures over and above children’s primary disability category. The researchers used a series of multivariate regression analyses to explore the relationships between expenditure and children’s disability category, functional ability, and other related information. The authors reported adjusted R-squared to indicate the amount of variance accounted for by each variable. The researchers reported 10% of the variance in special education expenditures was accounted for by children’s primary IDEA disability category alone. The researchers then included in the model the number of
secondary disabilities (accounted for 8% of the variance), information about students’ age, gender, and ethnicity (accounted for 2% of the variance), and information about the district size and district fiscal policies (accounted for 15% of the variance). Taken together, these variables and primary disability category accounted for 27% of the variance.

In contrast, when primary disability category was replaced with the student’s functional ability composite score in the previous regression model, 40% of the variance in special education expenditure was accounted for by the six variables. Functional ability resulted in a 15% increase in the R-squared value. The authors noted that when disability category and functional ability were included in the model, 42% of the variance was explained, and the combination of these seven variables resulted in the most variance explained related to expenditure on educational services for students with disabilities.

**Person-Oriented Analytic Approaches to Examine Child Outcomes**

Six studies were identified that used person-oriented analyses to examine child outcomes. None of these studies were exclusively conducted with children with disabilities; however, children with disabilities might have been represented in the study sample.

Hair, Halle, Terry-Humen, Lavelle, and Calkins (2006) identified subgroups of children based on profiles of school readiness in a sample of kindergarten children from the Early Childhood Longitudinal Study – Kindergarten (ECLS-K). They used profile membership to examine the extent to which membership differentially predicted academic and social outcomes in first grade. The ECLS-K data set is a nationally representative data set of 17,220 children who were enrolled in kindergarten and
followed through the eighth grade. The authors identified five dimensions of school readiness for young children: physical health, social/emotional development, approaches to learning, language, and cognitive. The authors noted that previous research examined how different school readiness factors or dimensions predicted later-in-life outcomes, but no previous research had examined their combined influence. The authors used multiple indicators from the ECLS-K data set to construct scales that represented each school readiness dimension. The scales were dichotomized for each indicator dimension using liberal and conservative cut-points. The authors reported there was very little variance in scores related to one indicator dimension (i.e., approaches to learning). Using liberal cut-points, 99% of the children were rated ‗on-track‘ related to approaches to learning; therefore, this indicator was not included in subsequent analysis.

In the first part of the study, the authors examined the creation of subgroups based on similar profiles of school readiness using K-means cluster analysis (MacQueen, 1967) for both the liberal and conservative scales. The authors reported that a four-cluster group model had the best conceptual and statistical fit across both the liberal and conservative cut-points. Cluster 1 was described as comprehensive positive development on the four dimensions: physical health, social/emotional development, language, and cognitive (30% of sample using liberal cut-offs, 16% of the sample using conservative cut-offs). Cluster 2 was described as social/emotional and health strengths (34% of sample using liberal cut-offs, 37% of the sample using conservative cut-offs). Cluster 3 was described as below the mean on all four dimensions with the greatest risk in social/emotional development (13% of sample using liberal cut-offs, 27%
of the sample using conservative cut-offs). Cluster 4 was described as health risks, but was also below the mean on language and cognitive (23% of sample using liberal cut-offs, 20% of the sample using conservative cut-offs). The authors examined the distribution of children across cut-points and determined that the clusters generated from scales with liberal cut-points were most representative of children’s skills in the population.

Using the subgroups based on liberal cut points, the authors examined how school readiness profile membership from kindergarten predicted academic ability and social adjustment outcomes in first grade while controlling for child, family, and classroom variables. Children associated with one of the two “risk” profiles performed the worst across all measures. Children in the comprehensive positive profile performed significantly better than all children on academic measures, but no differences were found on social adjustment measures for these children and children with the social/emotional and health strengths profile.

As part of this study, the authors examined whether child and family variables differed across profiles and used logistic regression models to examine whether child and family variables were associated with profile membership. The authors noted that children from ‘disadvantaged’ backgrounds (e.g., lowest incomes, parents with the least education, single or teen mothers, low birth weight) were more likely to be identified in one of the two risk profiles.

Haapasalo, Tremblay, Boulerice, and Vitaro (2000) used kindergarten teachers’ ratings of children’s behaviors to predict delinquency, social withdrawal, and school placement in preadolescence in a sample of 1,034 boys from Canada. The authors
reported the sample was relatively homogenous with majority of participants reported to be White, low SES, non-immigrant, and French-speaking families living in the same urban environment. In this study, the authors compared two analytic techniques: a variable-oriented approach and person-oriented approach. In the variable-oriented approach, the authors used logistic regression models to examine the relationships between teachers’ ratings of physical aggression, hyperactivity, inattention, anxiety, and pro-social behavior to outcome variables in preadolescence. Outcome variables included self-reported delinquency in preadolescence, peer-rated social withdrawal, and placement in a specialized school setting. Findings from this analysis showed that physical aggression, hyperactivity, and low anxiety in kindergarten were the best predictors of delinquency in preadolescence, high anxiety and low pro-social behavior in kindergarten were the best predictors of social withdrawal in preadolescence, and inattention and low pro-social behavior were best predictors of school placement in preadolescence.

In the person-oriented approach, authors used teachers’ ratings of physical aggression, hyperactivity, inattention, anxiety, and pro-social behavior to create subgroups of children with similar profiles of behavioral dimensions. The authors reported using the QUICK clustering techniques (i.e., K-means clustering in SPSS), which resulted in eight clusters that were replicated in previous samples. Cluster groups were described by the following characteristics. Cluster 1 was identified as competent with low aggression, hyperactivity, inattention, and anxiety, and high pro-social behavior (n = 265). Cluster 2 was described as anxious (n = 63; i.e., high anxiety and low pro-social behavior), Cluster 3 was described as passive (n = 120; i.e., high on
inattention and low pro-social behavior), Cluster 4 was described as inattentive (\(n = 145\); i.e., high inattention and hyperactivity), and Cluster 5 was described as nervous (\(n = 157\); i.e., high inattention and anxiety). Cluster 6, 7, and 8 were all associated with high aggression and high hyperactivity. Cluster 6 was described as bullying and included low pro-social skills (\(n = 46\)), Cluster 7 was described as undercontrolled and included high anxiety and inattention (\(n = 73\)), and Cluster 8 was described as multi-problem and included high anxiety, inattention and low pro-social behaviors (\(n = 74\)).

Using the cluster subgroups, the authors used logistic regression models to examine how cluster membership predicted outcomes in adolescence. Findings from this analysis showed that membership in the inattentive, bully, undercontrolled, or multi-problem groups in kindergarten were the most noteworthy predictors of delinquency in preadolescence. Membership in the multi-problem group in kindergarten was the most noteworthy predictor of social withdrawal in preadolescence. Membership in the passive, inattention, nervous, undercontrolled, or multi-problem groups were the most noteworthy predictors of school placement in preadolescence. The authors noted that results from the cluster analysis revealed that boys with multi-problems were at the greater risk of negative outcomes.

As part of this study, the authors examined the relative predictive accuracy of both variable-oriented and person-oriented analytic approaches. Using a ROC curve to examine the sensitivity and specificity of prediction, the authors reported that these approaches had near similar predictive accuracy (i.e., within 2% points for each outcome variable). The authors noted, however, a key distinction between the approaches was the ability to make conclusions related to prevention and intervention
efforts. For example, from a variable-oriented approach, physical aggression and high anxiety were predictors of delinquency. From a person-oriented approach, subgroups with high physical aggression were predictive of delinquency, but sub-groups associated with inattention and hyperactivity were also predictive of delinquency even though these variables were not identified in the variable-oriented approach. Moreover, subgroups associated with high-anxiety that were not also associated with physical aggression were not predictive of delinquency, even though this variable was predictive in the variable-oriented approach. The authors stated, “the predictive value of [variables] must be interpreted in the light of the whole behavior profile” (Haapasalo, Tremblay, Boulerice, & Vitaro, 2000, p. 163).

In addition to comparisons between the two analytic approaches, the authors noted the importance of examining the contribution of family adversity in kindergarten to the prediction of outcomes in adolescence. The authors combined four variables on family characteristics to create an index of family adversity (Table 2-6). In all models, family adversity in kindergarten was predictive of delinquency and school placement in adolescence, but not social withdrawal. The authors also examined whether subgroups identified from the person-oriented analysis differed by family variables.

Janson and Mathiesen (2008) created subgroups of children based on a profile of children’s temperament, which was defined by mothers’ reports of activity, sociability, emotionality, and shyness. They subsequently examined associations between subgroup membership and children’s internalizing and externalizing behaviors. The authors were also interested in the distributions of subgroup membership and individual stability of profile characteristics over time. The study was conducted with 921 children
and mothers over 9 years. Data were collected on children at 18 months, 30 months, 4 to 5 years, and 8 to 9 years; samples at each time point were 921, 784, 737, and 512, respectively. On each occasion, mothers completed a survey about the child’s temperament related to emotionality, shyness, sociability, and activity, and a rating scale on problem behaviors.

The authors completed an I-States as Object Analysis (ISOA; Bergman, Magnusson, & El-Khoury, 2003), which uses cluster analysis techniques to generate subgroups based on shared profiles over each period of interest. The authors used a two-step cluster analysis, using Ward’s cluster method (Ward, 1963) followed by K-means cluster method. The authors selected a five-cluster model across the time points and subsequently assigned each participant to the nearest cluster for each time point (i.e., total 2,594 profiles across entire sample). Clusters 1, 2, and 3 were described as undercontrolled \( (n = 345) \), confident \( (n = 394) \), and unremarkable \( (n = 378) \), respectively. Clusters 4 and 5 were described as inhibited \( (n = 213) \) and uneasy \( (n = 391) \), respectively. The authors noted that the proportion of children assigned to different clusters changed over time. For example, the confident profile was most common at 18 months (32% of sample), but the uneasy profile was most common when children were 4 to 5 years (32% of sample). The authors reported between 33% and 46% of children stayed in the same profile between adjacent time points.

The authors reported that subgroup membership was consistently associated with children’s internalizing and externalizing behaviors at each time point. For example, membership in the undercontrolled profile was associated with high externalizing
behaviors at each time point, while membership in the inhibited and easy profiles were associated with high internalizing behaviors at each time point.

Konold and Pianta (2005) used a sample of 964 children assessed at 54 months to create subgroups of children based on similar profiles of school readiness related to three measures of social functioning and three measures of cognitive functioning. The sample was identified through a larger study (i.e., National Institute of Child Health and Human Development [NICHD] Early Child Care Research Network [ECCRN], 2002), which recruited families from hospital visits shortly after the birth of a child at 10 locations in the United States. The number of males and females was approximately equal in the sample. The sample included more children classified as Anglo (83%) than any other race (African American 11%, Asian or Pacific Islander 1.5% or other 4.5%). The sample was predominately non-Hispanic (96.5%). The authors reported 25% of the sample was below the poverty line based on 1.85 threshold for an income-to-need ratio.

Using a two-step cluster analysis technique, the authors generated profiles of school readiness based on six standardized measures using Ward’s cluster method followed by K-means cluster method. The authors reported six subgroups for the final cluster model. The groups were distinguished in the following ways: Profile 1—children with attention problems (10% of sample), Profile 2—children with low cognitive ability (7% of sample), Profile 3—children with low/average social and cognitive skills (20% of sample), Profile 4—children with social difficulties (17% of sample), Profile 5—children with high social competence (24% of sample), and Profile 6—children with high cognitive ability and mild externalizing behaviors (22% of sample).
The authors compared children’s subgroup membership with first-grade academic achievement scores (i.e., picture vocabulary, letter-word identification, and applied problems). In general, the high cognitive group outperformed other subgroups on all measures and the low cognitive group had the lowest performance on all achievement measures. The authors cautioned, however, that the subgroups, based on standardized assessment scores at 54 months, accounted for less than 20% of the variance in scores in first-grade outcomes (R-squared .08 for letter-word identification to .18 for applied problems). The authors noted that the multi-dimensional profiles provide useful description of children’s characteristics, but were only moderate predictors of academic ability in first-grade.

Subgroups were compared on child and family variables and the authors reported differences among the groups for mother’s age and education, partner’s education, and income-to-needs ratio. For example, on average, children with younger mothers, less parental education, and lower income-to-needs ratios were more likely to be associated with a risk or below average skills profile.

Sanson, Letcher, Smart, Prior, Toumbourou, and Oberklaid (2009) created subgroups of children based on profiles of temperament during infancy and early childhood and examined the extent to which subgroup membership was associated with differences in problem behaviors, social skills, and academic competence in later childhood and preadolescence. The sample included 2,443 infants and families who were recruited when children were infants between the ages of 4 and 8 months from urban and rural areas in a large state in Australia. Families were surveyed every 1 to 2 years until children were 11 to 12 years of age. In later childhood and preadolescence,
teachers of child participants were also surveyed. At the final stage of data collection 70% of sample remained. Surveys were designed to collect information about children’s temperament and families’ social-economic status between infancy and early childhood (i.e., 3 to 4 years) and children’s behavior problems and families’ social-economic status between later childhood (i.e., 7 to 8 years) and preadolescence. Teachers were surveyed to collect information about children’s behavior problems, social skills, and academic competence. Temperament measures included three dimensions: reactivity, inhibition, and self-regulation. To identify subgroups of children with similar temperament profiles, the authors used a two-step cluster analysis using Ward’s cluster method followed by K-means cluster method.

The authors determined a four-cluster model was the most appropriate representation of the data. Cluster 1 was described as nonreactive/outgoing (25% of sample), Cluster 2 was described as high attention regulation (27% of sample), Cluster 3 was described as poor attention regulation (28% of sample) and Cluster 4 was described a reactive/inhibited (20% of sample). The authors examined differences between clusters by gender and SES. SES was represented as a composite score that accounted for parents occupation and education level. The authors reported that there were more males than females in Cluster 3 (i.e., poor attention regulation) but all other clusters had similar gender proportion. Related to SES, Cluster 1 (i.e., nonreactive/outgoing) contained more children from higher SES and Cluster 4 (i.e., reactive/inhibited) contained more children from lower SES.

The authors reported that subgroup membership in early childhood was differentially associated with outcome variables in later childhood. The patterns of
associations, however, were different across parent and teacher reported measures. For example, high levels of physical aggression were associated with Clusters 3 and 4 when reported by parents, but associated with Clusters 1 and 3 when reported by teachers. SES was found to moderate physical aggression (i.e., low SES resulted in higher levels of physical aggression) when reported by parents, but not when reported by teachers. The authors noted possible conclusions based on the differential patterns between teacher and parent reports of outcomes but also noted that more research was needed to explore this finding further.

Stephens, Petra, Fabian, and Walrath (2009) examined patterns of functional impairment based on subgroups of youth identified for community mental health services. Children were identified for this study as part of the Comprehensive Community Health Services for Children and Their Families National Evaluation. The sample included 9,461 children and youth between the ages of 5 and 18 years whom had complete data across relevant predictors used for this study. The sample for this study included more males than females (i.e., 68% male), over half the sample was identified as White, and just under half the sample reported a family income less than $15,000 a year (i.e., 45% of sample). Trained raters, at intake of services, assessed functional impairment. Raters evaluated child functioning across eight life domains: home role, school role, community role, behavior toward others, mood and emotions self-harmful behavior, substance abuse, and thinking. The authors also created child risk and family risk composite scores based on descriptions of children and families at intake (Table 2-6). Composite scores were created based on the total number of risk factors for each child and family variable. The authors used latent class analysis to
identify subgroups of children based on similar profiles from the eight observed domain scores related to functioning. Models were estimated separately for males and females.

A 3-class model was identified for males and females based on statistical indices and theoretical rationales. Latent class descriptions (i.e., subgroups or profile names) were similar across males and females. Profile 1 was identified as high-impairment externalizing behavior (17% of males and 19% of females). Profile 2 was identified as high-impairment internalizing behavior (50% of males and 51% of females). Profile 3 was identified as low impairment (33% of males and 30% of females). Latent class regressions were used to examine whether child and family composites were related to profile membership. Males with high-risk composites for child and family factors were more likely to be associated with Profile 1 or 2 over Profile 3. Females with high-risk composites for child factors were more likely to be associated with Profile 1 or 2 over Profile 3; however, statistically significant relationships for family factors were not identified.

In this study, the authors did not examine associations between profile membership and other outcome variables. They did examine the stability of profile membership using latent transition analysis. Based on domain scores obtained 6 months after intake, the authors reported that males maintained higher levels of stability across profiles over time (i.e., 74% and 80% remained in same profile for high-impairment profiles), while females displayed lower levels of stability (i.e., 65% and 71% remained in same profile for high-impairment profiles).

**Summary of Empirical Studies Related to Present Study**

The eight studies described in this review provided empirical research to guide the present study. The ways in which these studies informed the present study is grouped
by four topics (a) examination of young children’s social competence, (b) examination of functional ability compared to disability category, (c) use of person-oriented approaches to identify subgroups based on shared profiles, and (d) examination of contextual factors.

**Social competence**

Five of the eight studies examined the relationship between child characteristics and outcomes related to social competence (i.e., social skills, problem behaviors, delinquency, social withdrawal, or social adjustment). Four of these studies were conducted with young children ages 3, 4, or 5. Taken together, the studies suggest that children with lower functional skills, profiles associated with lower school readiness skills, or “difficult/uneasy” temperaments have lower levels of social competence. Four of these studies also suggest that the unique make-up of the child’s profile might result in differences related to social skills and problem behaviors outcomes.

**Functional ability compared to disability category**

Two studies were conducted with nationally representative data sets on children with disabilities receiving special education services under IDEA (Chambers, Perez, et al., 2004; Daley et al., 2009). In these studies, researchers examined the use of disabilities category and functional ability to examine outcomes. In both studies, the functional ability was represented as a composite score guided by measures based on the ICF as a guiding framework. Findings from Daley et al. (2009) and Chamber, Perez, et al. (2004) demonstrated that a functional approach or a combination of functional ability and disability category might explain more variance in outcomes over traditional disability categories alone. The present study extended findings from these previous studies by using person-oriented analytic techniques to identify subgroups of
children based on shared profiles of functional ability and to examine the extent to which subgroup membership explained variance in social competence outcomes over traditional disabilities categories alone.

**Person-oriented approaches to identify subgroups**

Six studies used person-oriented analytic techniques to identify subgroups of children with more homogeneous set of characteristics (i.e., similar profiles) within a large heterogeneous population. Two of these studies illustrated the emerging use of these methods in early childhood research in the United States (Hair et al., 2006; Konold & Pianta, 2005). In addition, the six studies provided information about the types of analytic methods and the decision processes that have been used to generate subgroups based on shared profiles, the numbers of skills/characteristics (i.e., variables) that have been used to create profiles, and the number of subgroups or models that have been identified in previous studies on related topics. Although these studies were not conducted specifically with children with disabilities, the processes and findings were informative for the present study.

Related to the types of methods used to create subgroups, five studies used a type of cluster analysis and only one study used latent class analysis (Table 2-5). Of the studies that used cluster analysis, two studies used K-mean cluster analysis and three studies used a two-step procedure, which combined a hierarchical cluster analysis method such as Ward’s cluster analysis with K-means cluster analysis. The two-step procedure has been favored in the literature to protect against the critiques of each approach used individually (i.e., hierarchical approach restricts movement once assigned to cluster and K-means sensitive to the quality of starting values; Keller, Spieker, & Gilchrist, 2005). Several authors, however, have noted the advantages of
latent class analysis over traditional cluster analysis methods (Magidson & Vermunt, 2006; Vermunt & Magidson, 2002). Latent class analysis is a model-based approach that assigns cases to classes based on estimated probabilities (McCutcheon, 1987). This differs from traditional cluster analysis, which relies on algorithms to identify maximum separation between groups and minimal difference within groups (Everitt, Landau, & Lesse, 2001). With the increase in computer processing abilities and software programs to conduct latent class analysis, the use of latent class analysis has been recommended over cluster analysis methods (Vermunt & Magidson, 2002).

Related to the numbers of variables used to generate profiles of child characteristics, researchers entered between three and eight variables into the analytic method to create profiles (Table 2-6). In Konold and Pianta (2005) the authors used six measures across two domains of school readiness (i.e., social and academic). Hair et al. (2006) used measures from four domains related to school readiness (i.e., physical health, social/emotional development, language, and cognitive) and these authors also reported that one variable had no variance and was therefore removed from analysis. The present study used 15 variables to create profiles and examine relationships to social competence.

Related to the number of subgroups or models identified, previous studies identified between three and eight distinct subgroups (Table 2-5). As noted by many authors of the reviewed studies, models were identified based on statistical indices and theoretical decisions to select a model that was interpretable and defensible. The number of variables used to create profiles did not appear to correspond to the number of subgroups identified. Studies that examined profiles of similar characteristics (e.g.,
school readiness or temperament) did not identify the same number of subgroups. Although no studies examined person-oriented profiles of children’s functional abilities, skills referred to as school readiness in previous studies are related to functional abilities, and these studies suggested between four and six subgroups might be identified in the present study.

**Examination of contextual factors**

As shown in Table 2-6, the extent to which studies examined contextual factors, the contextual variables used in each study, and the types of analyses conducted varied across the six studies that considered contextual factors. Related to the types of contextual factors considered, five studies included child factors, five studies included family factors, one study included district factors, and one study included classroom factors. Across these factors, researchers used a range of variables. Three studies examined relationships based on individual variables only, while three studies examined relationships based on a composite of child or family factors. How composite scores were created was not explicitly described in two of these studies (Haapasalo et al., 2000; Sanson et al., 2009). Related to analyses, two studies controlled contextual variables as part of the analysis, four studies examined relationships between subgroup membership and contextual variables, and one study examined contextual variables as moderators.

In summary, these reviewed studies provide an emerging evidence base to justify the research questions posed and analyses used in the present study. They highlight further the need to examine relationships between functional ability profile subgroup membership and social competence for preschool children with disabilities, while
examining contextual factors that might moderate the relationship between children’s subgroup membership and their social competence.

Summary

This review of the literature outlined key issues related to (a) social competence and contextual factors associated with children’s social competence, (b) concerns about using IDEA-disability category to characterize children, (c) the ICF-CY framework, (d) findings from PEELS studies, and (e) empirical research related to the present study. The existing literature related to these topics suggested that social competence is an important aspect of young children’s development and select child and contextual factors are associated with children’s social competence. To examine further social competence of young children with disabilities, a profile of children’s functional abilities, related to the ICF-CY framework, might provide a correlate that explains more variance in social competence over the use of disability category. To date, no studies have used a person-oriented approach to identify subgroups of young children with disabilities that have similar functional ability profiles to examine associations with social competence. The PEELS data set provides a unique opportunity to examine social competence for children with disabilities related to functional ability profiles, disability categories, and contextual factors.
Table 2-1. Evaluative judgments about children’s social competence

<table>
<thead>
<tr>
<th>Skills used to achieve social goals</th>
<th>Skills not used or skills ineffective for achieving social goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appropriate behaviors for social context</strong></td>
<td><strong>Inappropriate behaviors for social context</strong></td>
</tr>
<tr>
<td>• Good social skills</td>
<td>• Poor social skills</td>
</tr>
<tr>
<td>• Few problem behaviors</td>
<td>• Few problem behaviors</td>
</tr>
<tr>
<td>• Good social skills</td>
<td>• Poor social skills</td>
</tr>
<tr>
<td>• Many problem behaviors</td>
<td>• Many problem behaviors</td>
</tr>
</tbody>
</table>
Table 2-2. Population estimates across disability categories by state: Minnesota, Washington, and Wisconsin

<table>
<thead>
<tr>
<th>Disability category</th>
<th>Minnesota (n = 14,361)</th>
<th>Washington (n = 14,006)</th>
<th>Wisconsin (n = 15,153)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental delay</td>
<td>50</td>
<td>57</td>
<td>19</td>
</tr>
<tr>
<td>Speech or language impairments</td>
<td>32</td>
<td>27</td>
<td>67</td>
</tr>
<tr>
<td>Intellectual disability</td>
<td>1</td>
<td>&gt;1</td>
<td>1</td>
</tr>
<tr>
<td>Autism</td>
<td>11</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Multiple disabilities</td>
<td>&gt;1</td>
<td>&gt;1</td>
<td>n/a</td>
</tr>
<tr>
<td>Orthopedic impairment</td>
<td>1</td>
<td>&gt;1</td>
<td>1</td>
</tr>
<tr>
<td>Other health impairments</td>
<td>&gt;1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Hearing impairments</td>
<td>2</td>
<td>&gt;1</td>
<td>1</td>
</tr>
<tr>
<td>Visual impairments</td>
<td>&gt;1</td>
<td>&gt;1</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Deaf-blindness</td>
<td>&gt;1</td>
<td>n/a</td>
<td>0</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>&gt;1</td>
<td>&gt;1</td>
<td>&gt;1</td>
</tr>
<tr>
<td>Emotional disturbance</td>
<td>2</td>
<td>&gt;1</td>
<td>1</td>
</tr>
<tr>
<td>Specific learning disability</td>
<td>&gt;1</td>
<td>n/a</td>
<td>&gt;1</td>
</tr>
</tbody>
</table>

n/a refers to category not used in state eligibility system for children ages 3 through 5.
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Body function</th>
<th>Body structure</th>
<th>Activity and participation</th>
<th>Environmental factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mental Functions</td>
<td>Structures of the nervous system</td>
<td>Learning and applying knowledge</td>
<td>Products and technology</td>
</tr>
<tr>
<td>2</td>
<td>Sensory functions and pain</td>
<td>Eye, ear and related features</td>
<td>General tasks and demands</td>
<td>Natural environment and human-made changes to environment</td>
</tr>
<tr>
<td>3</td>
<td>Voice and speech functions</td>
<td>Structures involved in voice and speech</td>
<td>Communication</td>
<td>Support and relationships</td>
</tr>
<tr>
<td>4</td>
<td>Functions of the cardiovascular, immunologic and respiratory systems</td>
<td>Structures of the cardiovascular, immunologic and respiratory systems</td>
<td>Mobility</td>
<td>Attitudes</td>
</tr>
<tr>
<td>5</td>
<td>Functions of the digestive, metabolic and endocrine systems</td>
<td>Structures related to the digestive, metabolic and endocrine systems</td>
<td>Self-care</td>
<td>Services, systems and policies</td>
</tr>
<tr>
<td>6</td>
<td>Genitourinary and reproductive systems</td>
<td>Structures related to the genitourinary and reproductive systems</td>
<td>Domestic life</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Neuromusculoskeletal and movement-related functions</td>
<td>Structures related to movement</td>
<td>Interpersonal interactions and relationships</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Functions of the skin and related structures</td>
<td>Skin and related structures</td>
<td>Major life areas</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>Community, social and civic life</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from the International Classification of Functioning, Disability and Health: Children and Youth Version (pp. 31-42), by the World Health Organization, 2007, Geneva, Switzerland: WHO Press.
Table 2-4. Selected codes of ICF classification system: Body functions component

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Level 1 classification</th>
<th>Level 2 classification</th>
<th>Level 3 classification</th>
<th>Level 4 classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mental functions</td>
<td>Global mental functions</td>
<td>Consciousness functions</td>
<td>State of consciousness</td>
<td>Quality of consciousness</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orientation functions</td>
<td>Orientation to time</td>
<td>Orientation to place</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Orientation to person</td>
<td>Orientation to self</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Orientation to others</td>
</tr>
<tr>
<td>Intellectual functions</td>
<td>Dispositions and intra-</td>
<td></td>
<td>Adaptability</td>
<td>Responsively</td>
</tr>
<tr>
<td></td>
<td>personal functions</td>
<td></td>
<td></td>
<td>Activity level</td>
</tr>
<tr>
<td>Specific mental</td>
<td>Attention functions</td>
<td></td>
<td>Sustaining attention</td>
<td></td>
</tr>
<tr>
<td>functions</td>
<td></td>
<td></td>
<td>Shifting attention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Memory functions</td>
<td>Short-term memory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Long-term memory</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Adapted from the International Classification of Functioning, Disability and Health: Children and Youth Version (pp. 46-48), by the World Health Organization, 2007, Geneva, Switzerland: WHO Press.
<table>
<thead>
<tr>
<th>Citation</th>
<th>Sample</th>
<th>CWD</th>
<th>Age at recruitment</th>
<th>ICF</th>
<th>Child characteristics</th>
<th>Person-oriented techniques</th>
<th>CDC</th>
<th>Relationship to outcomes</th>
<th>Contextual factors considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chambers, Perez, et al., 2004</td>
<td>9,000 (SEEP)</td>
<td>YES</td>
<td>School age³</td>
<td>YES</td>
<td>Composite score of functional ability</td>
<td>N/A</td>
<td>YES</td>
<td>Special education expenditure</td>
<td>Child factors District factors</td>
</tr>
<tr>
<td>Daley, Simeonsson, and Carlson, 2009</td>
<td>3,100 (PEELS)</td>
<td>YES</td>
<td>3, 4, 5 yrs</td>
<td>YES</td>
<td>Composite score of functional ability</td>
<td>N/A</td>
<td>YES</td>
<td>Pre-academic skills Social skills Adaptive skills</td>
<td>NO</td>
</tr>
<tr>
<td>Hair, Halle, Terry-Humen, Lavelle, and Calkins, 2006</td>
<td>17,220 (ECLS-K)</td>
<td>NO</td>
<td>5 yrs</td>
<td>NO</td>
<td>Profiles of school readiness</td>
<td>K-means cluster analysis 4-cluster model</td>
<td>N/A</td>
<td>Academic ability Social adjustment</td>
<td>Child factors Classroom factors</td>
</tr>
<tr>
<td>Haapasalo, Tremblay, Boulcerice, and Vitaro, 2000</td>
<td>1,034 (Canada; boys only)</td>
<td>NO</td>
<td>6 yrs⁴⁵</td>
<td>NO</td>
<td>Profiles of behavior dimensions</td>
<td>QUICK cluster analysis 8-cluster model</td>
<td>N/A</td>
<td>Delinquency Social withdrawal School placement</td>
<td>Family factors</td>
</tr>
<tr>
<td>Janson and Mathiesien, 2008</td>
<td>939 (Norway)</td>
<td>NO</td>
<td>18 mo⁶⁷</td>
<td>NO</td>
<td>Profiles of child temperament</td>
<td>Two-step analysis (Ward’s and K-means) 5-cluster model</td>
<td>N/A</td>
<td>Externalizing and internalizing behaviors</td>
<td>NO</td>
</tr>
<tr>
<td>Konold and Pianta, 2005</td>
<td>964 (NICHD)</td>
<td>NO</td>
<td>4.5 yrs</td>
<td>NO</td>
<td>Profiles of school readiness</td>
<td>Two-step cluster analysis (Ward’s and K-means) 6-cluster model</td>
<td>N/A</td>
<td>Academic ability</td>
<td>Child factors Family factors</td>
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</tbody>
</table>
Table 2-5. Continued.

<table>
<thead>
<tr>
<th>Citation</th>
<th>Sample</th>
<th>CWD</th>
<th>Age at recruitment</th>
<th>ICF</th>
<th>Child characteristics</th>
<th>Person-oriented techniques</th>
<th>CDC</th>
<th>Relationship to outcomes</th>
<th>Contextual factors considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanson, Letcher, Smart, Prior, Toumbourou, and Oberklaid, 2009</td>
<td>2,443 (Australia)</td>
<td>NO</td>
<td>4 mo(^{\text{ab}})</td>
<td>NO</td>
<td>Profiles of child temperament</td>
<td>Two-step cluster analysis (Ward’s and K-means) 4-cluster model</td>
<td>N/A</td>
<td>Behavior problems Social skills Academic competence</td>
<td>Child factors Family factors</td>
</tr>
<tr>
<td>Stephens, Petras, Fabian, and Walrath, 2009</td>
<td>4,161 (CMHI)</td>
<td>NO(^{\text{d}})</td>
<td>5-18 yrs</td>
<td>NO</td>
<td>Profiles of functional impairment in life domains(^{\text{e}})</td>
<td>Latent class analysis 3-class model(^{\text{f}})</td>
<td>N/A</td>
<td>NO(^{\text{g}})</td>
<td>Child factors Family factors</td>
</tr>
</tbody>
</table>

Note. CWD refers to sample of children with disabilities. ICF refers to study based on International Classification of Functioning. CDC refers to methods to compare descriptions of children to disability category. PEELS = Pre-Elementary Education Longitudinal Study; SEEP = Special Education Expenditure Project; ECLS-K = Early Childhood Longitudinal Study–Kindergarten; NICHD = National Institute of Health and Human Development Study of Early Child Care; CMHI = Children’s Mental Health Initiative.

\(^{\text{a}}\) Children ages 3, 4, or 5 years included in larger sample of school-age children.

\(^{\text{b}}\) Longitudinal study, children recruited at early age and followed through preadolescence.

\(^{\text{c}}\) Refers to K-means cluster analysis in SPSS

\(^{\text{d}}\) Children and youth receiving mental health services.

\(^{\text{e}}\) Functioning across eight life domains: home role, school role, community role, behavior toward others, mood and emotions self-harmful behavior, substance abuse, and thinking.

\(^{\text{f}}\) Separate models conducted for males and females.

\(^{\text{g}}\) Latent class transition analysis used to examine stability of profile.
<table>
<thead>
<tr>
<th>Citation</th>
<th>Predictor variables (PV)</th>
<th>Criterion variables (CV)</th>
<th>Contextual factors</th>
<th>Contextual variables</th>
<th>Variables or composite</th>
<th>Analysis related to contextual variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chambers, Perez, et al., 2004</td>
<td>19 variables to create composite score of functional ability</td>
<td>Special education expenditure</td>
<td>Child</td>
<td>Child age</td>
<td>Variables</td>
<td>Control child and district variables in multivariate regression analysis of PV to CV</td>
</tr>
<tr>
<td></td>
<td>Measured at various ages</td>
<td>Measured concurrently</td>
<td>District</td>
<td>District size</td>
<td>Variables</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cost-of-education index</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>State indicators (fiscal)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daley, Simeonsson, and Carlson, 2009</td>
<td>6 variables to create composite score of functional ability</td>
<td>Pre-academic skills</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Measured in preschool or kindergarten</td>
<td>Social skills</td>
<td></td>
<td>Adaptive skills</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adaptive skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hair, Halle, Terry-Humen, Lavelle, and Calkins, 2006</td>
<td>4 variables to create profiles of school readiness</td>
<td>Academic ability</td>
<td>Child</td>
<td>Child age</td>
<td>Variables</td>
<td>Control child, family, and classroom variables in OLS regression analysis of PV to CV</td>
</tr>
<tr>
<td></td>
<td>Measured in kindergarten</td>
<td>Social adjustment</td>
<td></td>
<td>Child race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Child gender</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Child disability</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Child birth weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Family</td>
<td>Family type</td>
<td>Variables</td>
<td>Bivariate analysis to examine whether subgroups differed by child and family variables</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Family race/ ethnicity</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>Family education</td>
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<td></td>
<td>Family income</td>
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<td></td>
<td>Family language</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Classroom</td>
<td>Class day (full/half)</td>
<td>Variables</td>
<td>Logistic regression to examine whether child and family variables predicted subgroup membership</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Class size</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Teacher experience</td>
<td></td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>Teacher training</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>School type (public/private)</td>
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Table 2-6. Continued.

<table>
<thead>
<tr>
<th>Citation</th>
<th>Predictor variables (PV)</th>
<th>Criterion variables(^a) (CV)</th>
<th>Contextual factors</th>
<th>Contextual variables</th>
<th>Variables or composite</th>
<th>Analysis related to contextual variables</th>
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</thead>
<tbody>
<tr>
<td>Haapasalo, Tremblay, Boulerice, and Vitaro, 2000(^b)</td>
<td>5 variables to create profiles of behavior dimensions</td>
<td>Delinquency Social withdrawal School placement</td>
<td>Family</td>
<td>Parent occupation Parent education Parent age Family structure</td>
<td>Composite index of family adversity</td>
<td>Bivariate analysis to examine whether subgroups differed by family variables Logistic regression to examine whether family adversity predicted CV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured in kindergarten</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured in preadolescence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Janson and Mathiesen, 2008</td>
<td>4 variables to create profiles of child temperament</td>
<td>Externalizing and internalizing behaviors</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured in infancy through late childhood</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured concurrently</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Konold and Pianta, 2005</td>
<td>6 variables to create profiles of school readiness</td>
<td>Academic ability</td>
<td>Child</td>
<td>Child gender Child race</td>
<td>Variables</td>
<td>Bivariate analysis to examine whether subgroups differed by child and family variables</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured in preschool</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured in first grade</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Variables may include academic achievement, social, emotional, physical, or behavioral outcomes.
Table 2-6. Continued.

<table>
<thead>
<tr>
<th>Citation</th>
<th>Predictor variables (PV)</th>
<th>Criterion variables(^a) (CV)</th>
<th>Contextual factors</th>
<th>Contextual variables</th>
<th>Variables or composite</th>
<th>Analysis related to contextual variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanson, Letcher, Smart, Prior, Toumbourou, and Oberklaid, 2009</td>
<td>3 dimensions(^c) to create profiles of child temperament Measured in infancy and early childhood</td>
<td>Behavior problems Social skills Academic competence</td>
<td>Child</td>
<td>Child gender</td>
<td>Variable</td>
<td>Bivariate analysis to examine whether subgroups differed by gender and SES</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measured late childhood and preadolescence</td>
<td>Family</td>
<td>Parent education Parent occupation</td>
<td>Composite of Socio-economic status (SES)</td>
<td>Child gender and SES composite entered as moderators in MANOVA</td>
</tr>
<tr>
<td>Stephens, Petras, Fabian, and Walrath, 2009</td>
<td>8 variables to create profiles of functional impairment in life domains</td>
<td>N/A(^d)</td>
<td>Child</td>
<td>Child gender Child age Child race/ethnicity</td>
<td>Variables</td>
<td>Separate analysis conducted for boys and girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Family</td>
<td>Family income</td>
<td>Variable</td>
<td>Latent class regression to examine whether child and family variables and composites predicted subgroup membership</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Child</td>
<td>History of physical/sexual abuse Substance abuse Run away history Suicide attempt Sexual assault on others</td>
<td>Composite of child risk factors</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Family</td>
<td>Caregiver felony Caregiver substance abuse Caregiver psychiatric hospitalization Family violence Caregiver mental health Sibling in foster care</td>
<td>Composite of family risk factors</td>
<td></td>
</tr>
</tbody>
</table>

Note.

\(^a\) Criterion variables referred to as outcome variables in narrative.
\(^b\) Study conducted with boys only.
\(^c\) Dimensions measured by age appropriate variables at each measurement occasion.
\(^d\) Latent class transition analysis used to examine stability of profile over 6 month period.
Figure 2-1. International Classification of Impairments, Disability, and Handicaps (ICIDH) framework.
Figure 2-2. International Classification of Functioning, Disability, and Health framework (WHO, 2007). Reprinted with permission from the International Classification of Functioning, Disability and Health: Children and Youth Version (pp. 17), by the World Health Organization, 2007, Geneva, Switzerland: WHO Press.
CHAPTER 3
METHODOLOGY

In the present study, secondary analyses were conducted using the Pre-
Elementary Education Longitudinal Study (PEELS) data set, a large-scale nationally
representative data set involving young children with disabilities. A correlational study
design was used to explore and examine relationships among factors associated with
young children’s social competence. Variables from the PEELS data set were used to
identify subgroups of young children with disabilities with similar functional ability
profiles and to examine relationships between subgroup membership and social
competence. Findings from the body of research reviewed in Chapter 2 suggested that
distinct subgroups based on profiles of children’s abilities have been created previously
for children without disabilities. The present study focused on young children with
disabilities and one purpose of the study was to examine associations between
children’s functional ability profile subgroup membership as well as their disability
category and their social competence.

In addition to information about children’s functional ability profile subgroup
membership or disability category, findings from previous research indicated that
additional non-malleable child factors, and contextual factors are associated with
children’s social competence. In the present study, the moderating influences of non-
malleable child factors as well as contextual factors on children’s functional ability profile
subgroup membership in relation to their social competence were examined.

This chapter presents the research questions, research design, and hypothesized
relationships among variables that were examined in this study. Information about the
PEELS study and data set, the variables examined, the methodological procedures, and analyses employed are described.

**Research Questions**

The following research questions guided the secondary analyses conducted in the present study:

1. What distinct and interpretable functional ability profile subgroups emerge when using person-oriented analytic techniques to examine functional ability variables contained in the PEELS data set for young children with disabilities?

2. What is the strength of the relationship between functional ability profile subgroup membership and social competence?

3. What are the individual and combined contributions of functional ability profile subgroup membership and disability category membership to the explanation of social competence?

4. To what extent do non-malleable child factors and contextual factors moderate the relationship between functional ability profile subgroup membership and social competence?

Each research question was identified to contribute to the growing body of literature focused on examining children’s social competence while considering key aspects of the ICF-CY framework: child functioning, disability/health condition, and contextual factors.

**Research Design**

The present study is a correlational study. The study can be classified as a cross-sectional, non-experimental research design with research questions focused on exploration and explanation of relationships between and among variables (Johnson, 2000). Correlational research has been identified as an appropriate research method to explore associations between malleable child factors and educational outcomes and explore factors or conditions that mediate or moderate these relationships (IES, 2011).
Correlational research contributes to the evidence base in early education and early childhood special education by examining the magnitude of associations; generating hypotheses related to underlying processes; informing theories of change; and identifying variables to inform the design of interventions and experimental research (IES, 2011; Snyder & Kaiser, 2008; Thompson, Diamond, McWilliam, Snyder, & Snyder, 2005). A correlational research design was appropriate to examine the guiding research questions posed.

In the present study, the PEELS data set was used to explore whether subgroups of children with similar functional ability profiles could be identified (Research Question 1). In addition, the study was designed to explicate relationships between young children’s social competence and factors such as functional ability profile membership, disability category membership, and contextual factors that have been associated with children’s social competence (Research Questions 2 through 4). Variables of interest selected from the PEELS data set were examined at one time point during preschool or kindergarten (i.e., wave 1 data for children 3, 4 or 5 years-of-age), thus the study is considered cross-sectional. Associations between and among variables are based on children’s status compared to same-aged peers included in the PEELS data set.

**Hypothesized Relationships**

The ICF framework suggests complex, transactional relationships exist among child functioning, disability/health conditions, and contextual factors. The figures below show the hypothesized relationships between or among key variables for each research question. It was important to specify these relationships a priori. It would not have been feasible to test all possible relationships nor would it have been scientifically justifiable to ‘fish around’ in a large-scale data set looking for statistically significant or
noteworthy relationships (Pedhauzer, 1982). The models, therefore, represent the hypothesized relationships that were empirically examined in this study based on a review of the relevant extant literature. In the figures, squares represent observed variables (i.e., manifest variables) in the data set, circles represent latent variables created from observed variables, and arrows represent the direction of the relationships between variables.

Figure 3-1 illustrates the model examined to investigate the first and second research questions. The left side of the model displays the observed variables in the PEELS data set used to identify subgroups with similar functional ability profiles. The first research question addressed whether subgroups with similar functional ability profiles (i.e., categorical latent classes) would emerge from the observed data. To identify subgroups, exploratory analyses were used to examine the patterns of similarities and differences among children on observed functional ability variables. Using these types of analyses, all children were associated with a subgroup that represented a group of children who shared similar patterns of characteristics but had different patterns of characteristics from other subgroups.

Given the exploratory nature of these analyses, both statistical indices and theoretical rationales were used to determine the appropriate class model (i.e., determine the number of subgroups that were defined for this study). The right side of the model displays the hypothesized relationship between subgroup membership, once identified, and social competence (Research Question 2). The focus of this investigation was to examine the strength of the relationship between subgroups (based on functional ability profiles) and children’s social competence status.
Figure 3-2 illustrates the model used to investigate the individual and combined contributions of children’s functional ability profile subgroup membership and disability category membership to the explanation of children’s social competence status (i.e., Research Question 3). To investigate the individual contribution of disability category, the strength of the relationship between disability category membership and children’s social competence status was examined. The individual contribution of functional ability profile subgroup membership was examined as part of Research Question 2. To investigate the combined contribution of each variable, the strength of the relationships among group memberships (i.e., functional ability profile and disability category) and children’s social competence status were examined.

Functional ability subgroup profile membership and disability category membership were hypothesized to have an association. The purpose of these analyses was to examine whether additional noteworthy information about children’s social competence status was gained by adding children’s functional ability profile subgroup membership to disability category in the model.

Figure 3-3 illustrates the model examined to investigate the fourth research question. The hypothesized relationship shown in the figure focuses on the extent to which contextual factors moderate the relationship between children’s subgroup membership and their social competence. In the present study, moderators were select variables and included non-malleable child factors and contextual factors (i.e., family factors and environmental factors).

The scope and sequence of the research questions presented in this study focused on systematically examining relationships between functional ability profile
subgroup membership and social competence for children with disabilities while considering the influence of disability category and contextual factors that were hypothesized to be related to functional ability profiles and to social competence. The research questions and variables selected from the PEELS data set to address the study research questions were identified based on key aspects of the ICF-CY framework and the literature review.

**PEELS Study and Data Set**

The PEELS study was a longitudinal, prospective investigation to examine characteristics of children receiving early childhood special education, the programs and services they receive, their transitions from preschool to school-age settings, and how children with disabilities function and learn in preschool and school-age settings. The PEELS data set provides a nationally representative sample of 3,100 young children with disabilities. Children in the PEELS sample were 3, 4, or 5 years-of-age and had an active individualized education program (IEP) or individualized family service plan (IFSP) at the time they were recruited into the study. The sample is disproportionately male (70%; Markowitz et al., 2006). Children included in the sample are from diverse racial/ethnic and socioeconomic backgrounds. At the time of enrollment, children attended early childhood education programs or kindergarten and transitioned into elementary school during the course of the longitudinal study. Information in the data set relates to children’s characteristics, educational services, and academic achievement as measured by direct child assessments or gathered from teacher and administrator questionnaires. Information about children’s family members, family context, and local community and information on parent’s perspectives of their child and educational services were obtained from parent interview.
Data for the PEELS study were collected in four waves from the 2003 - 2004 through 2006 - 2007 school years, and follow-up data were collected during the 2009 - 2010 school year (Markowitz et al., 2006). Data for the present study were from the first wave of data collection so analyses are cross-sectional in nature.

The PEELS data set was selected for use in the present study because it offers descriptive information on the characteristics, functioning, and performance of young children with disabilities during early childhood. Moreover, the data set includes information related to family, school, and community environments. This data set is unique from other large-scale data sets that examine young children’s experience during early childhood because only young children with disabilities were included in the study.

**PEELS Sampling Strategy**

The PEELS data set is a stratified sample of young children with disabilities receiving early childhood special education services at the time of enrollment. PEELS data can be weighted to represent national estimates that can be generalized to the entire U.S. population of children with disabilities ages 3 through 5 years-of-age. The present study employed weighting for each analysis. Weight files were applied as appropriate based on the variables of interest in the analysis.

The sample consists of three age cohorts: Cohorts A, B, and C. Children in cohort A were 3 years old (date of birth 3/1/00 through 2/28/01); children in cohort B were 4 years old (date of birth 3/1/99 through 2/28/00); and children in cohort C were 5 years old (date of birth 3/1/98 through 2/28/99) when recruited into the PEELS study. Table 3-1 shows children’s ages during each wave of data collection.
The present study used wave 1 data to investigate the research questions with a sample of young children with disabilities who were 3, 4, and 5 years-of-age. During wave 1, all children were enrolled in early childhood, preschool, or kindergarten settings.

The PEELS study used a two-stage sampling design. In the first stage, a nationally representative sample of local education agencies (LEA) was selected. The LEA sample was stratified by geographic region, preschool special education enrollment size, and district poverty level. A total of 220 local education agencies (LEA) participated in the study. The participating LEAs were recruited through three processes: (a) the main sample recruited in 2001, (b) a non-response sample recruited in 2003 from non-responders in 2001, and (c) a supplemental sample recruited in 2004 to address the representation of a key state originally banned from participation by state regulations (Carlson et al., 2008).

In the second stage, a sample of preschoolers with disabilities, ages 3, 4, or 5 years-of-age, were selected from the participating LEAs. Children were stratified by age cohorts. Children were selected by age; therefore, children may have participated in preschool programs, kindergarten programs, or other early childhood special education programs at the time of recruitment. Children were eligible for recruitment if they were age-eligible (i.e., 3, 4, or 5 years-of-age) and had an IEP or IFSP with the district. PEELS had three additional eligibility criteria: (a) an English or Spanish speaking adult or an adult who used signed communication who could respond to the household interview, (b) the child was the first in the family to be sampled for PEELS, and (c) the sampled child’s family resided in the LEA at the time of enrolment in the PEELS study.
(Markowitz et al., 2006). Children were sampled from district lists of eligible children and families were asked permission for their child’s participation through a family recruitment packet. Families that agreed to participate in the study completed and returned signed consent and enrollment forms. A total of 3,100 children participated in the study.

**PEELS Instrumentation**

Data for PEELS were collected by parent interview, teacher questionnaire, direct child assessments, administrator questionnaire, local education agencies (LEA) questionnaire, and state education agencies (SEA) questionnaire in wave 1. In subsequent waves of data collection, data were collected by parent interview, teacher questionnaire, and direct child assessments. In addition, the PEELS project staff developed a demographic data file that contains information about child participants based on a school records and a triangulation of data sources to identify the child’s primary disability category (Carlson & Lowe, 2009). The present study used data from the parent interview, the teacher questionnaire, the administrator questionnaire, and the demographic file.

Parent or guardian interviews were conducted by phone using computer assisted telephone interview (CATI) technology. Interviews were approximately 1-hour in length; interviews used a protocol with identified skip patterns to ensure parents were not asked to respond to questions that were not applicable (e.g., parent indicates a child has typical vision and does not wear glasses, remaining questions about vision acuity and service history related to vision were skipped; Markowitz et al., 2006). Parents were asked questions about their child’s health, disability, behavior, special education services, related services, transitions between school settings, and out-of-school
activities. In addition, parents were asked about their family, their child’s school, and their local community environments, including family and community resources and family background.

Three versions of the teacher questionnaire were used in PEELS: the Early Childhood Teacher Questionnaire (used in waves 1, 2, 3); the Kindergarten Teacher Questionnaire (used in waves 1, 2, 3, 4); and the Elementary Teacher Questionnaire (used in waves 2, 3, 4; Carlson & Lowe, 2009). All teacher questionnaires were mailed to the child’s teacher. Teachers reported information about classroom environment, child’s experiences in the classroom, interaction with peers, their philosophies of early childhood education, and their transition practices for children entering or leaving their program. The teacher questionnaires also included selected teacher rating scales related to gross motor skills, adaptive behavior, social skills, and problem behaviors. An additional section of the teacher questionnaires addressed the child’s special education programs and related services. Either the classroom teacher or the special education service provider completed questionnaire items.

There were two versions of the administrator questionnaire: the Elementary School Principal Questionnaire or Early Childhood Program Director Questionnaire (Carlson & Lowe, 2009). The appropriate questionnaire was sent to principals or program directors of the children’s schools or programs. Only one administrator questionnaire was sent to each school or program, regardless of the number of PEELS-participating children. The administrator questionnaire asked about children’s school or program including staff, programs, and resources, and community characteristics including parent involvement. The administrator questionnaire was sent during the first
wave of data collection; a new questionnaire was sent if a child moved to a new school or center without a previous administrator questionnaire completed.

**PEELS Response Rates and Imputation for Missing Data**

The PEELS data set was affected by the response rates of parents, teachers, and administrators. Table 3-2 displays the response rates for the parent interviews and teacher questionnaires across waves. Parent interview response rates were at or above 93% for the first two waves of data collection; these rates declined to at or above 80% response rates for the following two wave of data collection. Teacher response rates were generally comparable across the four waves of data collection between 79% and 84%. The response rate for the administrator questionnaire was 72%.

During data preparation for the restricted-use data set, missing data were imputed for selected items on child assessments, administrator questionnaire, teacher questionnaires, and parent interviews. Different methods of imputation were used depending on the nature of the data; methods included hot-deck imputation, regression, external data source, and deterministic or derivation method, based on the internal consistency principle of interrelated variables (Markowitz et al., 2006). More information on the data imputation and data imputation methods is available in the PEELS User’s Manual (Carlson, Posner, & Lee, 2008). On average, less than 10% of data were imputed (Carlson & Lowe, 2009). Imputed data were recorded in the data set with imputation flags.

**PEELS Variables Selected for Analysis in the Present Study**

Multiple sources informed the selection of variables for this study. First, the social competence definition described in Chapter 1 and Chapter 2 influenced the selection of the criterion variables to measure social competence. Second, the Daley, Simeonsson,
and Carlson (2009) study described in Chapter 2 was used to identify variables from the parent interview to create a selection of variables that represent children’s functional abilities; these variables were used to identify subgroups of children with similar functional ability profiles and functional ability profile membership was used as an explanatory variable to examine relationships with social competence. Third, disability categories, used as explanatory variables, were constructed to be consistent with IDEA-based disability categories. Fourth, findings from the literature review described in Chapter 2 influenced the selection of non-malleable child factors and contextual factors (described in the section entitled descriptive variables), which were used to examine relationships among these factors, functional ability profile membership, and social competence.

**Criterion Variables**

Social competence was measured by two domains of the Preschool and Kindergarten Behavior Scale, Second Edition (PKBS-2; Merrell, 2002) and these domains (social skills and problem behavior) were used as the criterion variables in this study. To assess children’s social competence, the PKBS-2 was collected by teacher report in wave 1 and wave 2. Only wave 1 data were used in the present study.

The PKBS-2 is a judgment based, summated rating scale designed to evaluate social skills and problem behaviors in preschool and kindergarten children, age 3 through 6 years. Home-based or school-based raters can complete the rating scale and separate normative information is provided for home and school raters. PEELS used the school-rater form of the measure. The PKBS-2 includes 76 items across the social skills and problem behaviors domain scales. Each domain scale was examined separately in this study. The Social Skills scale includes 34 items ($v=34$) and the
Problem Behaviors scale includes 42 items ($v=42$). The Social Skills scale consists of three subscales: Cooperation, Interaction, and Independence. The Problem Behaviors scale consists of two subscales: Internalizing Behaviors and Externalizing Behaviors. Subscales were derived empirically through exploratory factor analysis (EFA), and verified through confirmatory factor analysis (CFA) procedures (Merrell, 2002).

Directions to the teachers on the PEELS questionnaire indicated rating of items should be based on the teachers’ observations of the child during the past 3 months. Scoring is based on a 0-3 scale: 0=never, 1=rarely, 2=sometimes, and 3=often. Subscale raw scores are converted to standards scores. Standard scores are summed and converted to composite standard score or percentile rank for each domain scale. One score conversion table is used for children ages 3 through 6 years. The test developer reported that score conversion tables for each age were not warranted due to the small difference in means for each age. Standard scores are based on a normal distribution with a mean of 100 and a standard deviation of 15. Interpretation of scores is different for each scale. High scores on social skills scale are desirable and associated with desired behaviors. Low scores on the problem behaviors scale are desirable and associated with the absence of behavior labeled as challenging or problematic.

The PKBS-2 was standardized based on a sample of 3,313 children ages 3, 4, 5, or 6. The sample was constructed to approximate the general U.S. population based on 2000 Census data with respect to geographic region, gender, race/ethnicity, special education status, and socioeconomic status (Merrell, 2002). The test developer reported Cronbach’s alpha internal consistency score reliability coefficients between .88 and .97 for all subscales, a .97 for problem behaviors total score, and a .96 for social
skills total score for the school-rater form. Additionally, test-retest score reliability coefficients between .58 and .87 for all subscales on 3-week retest and between .69 and .78 for all subscales on 3-month retest were reported. Factors loadings for items on each subscale identified through EFA procedures were between .45 and .82 for social skills subscales and between .49 and .80 for problem behavior subscales. PKBS-2 scores have moderate to strong correlations with other measures of young children’s behavior. For example the PKBS-2 scores had a .76 and .83 correlation with scores on the Social Skills Rating Scale (Gresham & Elliot, 1990) for social skills and problem behaviors scales, respectively.

In the PEELS data set, the domain scores (social skills and problem behaviors) and sub-domain scores (cooperation, interaction, independence, internalizing behaviors and externalizing behaviors) were available as standard scores. Raw scores or item-level data were not available for users with the restricted-use license.

Explanatory Variables

ICF-related functional profiles

ICF-related functional ability profiles represented a latent class categorical variable (i.e., subgroup membership) created from 15 variables in the PEELS data set that described a child’s functional ability. The 15 variables used in the present study were derived from observed variables in the PEELS data set that described a child’s functional ability and were based on the 15-item PEELS Disability Severity Index described by Daley, Simeonsson, and Carlson (2009). The PEELS Disability Severity Index was adapted from the ABILITIES Index (Simeonsson & Bailey, 1991). Daley and colleagues used items from the parent interview to generate scores related to the child’s level of functioning or severity of disability across 15 domains related to the ABILITIES
Index. This section presents information about the original ABILITIES Index, the PEELS Disability Severity Index, and the 15 variables used in the present study.

The ABILITIES Index, developed by Simeonsson and Bailey (1991), is used to assess a child’s functioning across nine domains: audition (i.e., hearing left and right ear), behavior and social skills, intellectual function, limbs (i.e., right and left hand, arm, and leg), intentional communication (i.e., understanding and communication with others), tonicity (i.e., tightness and looseness), integrity of physical health, eyes (i.e., vision right and left eye), and structural status. The ABILITIES Index is a judgment-based rating system. The rating scale consists of 19 items related to the nine domains. Each item is scored on a 6-point scale ranging from (1) normal ability to (6) profound lack of ability. Parents, caregivers, or practitioners who are familiar with the child can complete the ABILITIES Index. Ratings should be based on (a) knowledge about the child’s functional abilities as observed during typical activities or routines, (b) assessment findings, or (c) other available sources of information such as documentation or records. The ABILITIES Index can be used to create a profile of child functioning across the nine domains or compute a composite score. The composite score represents the child’s functional ability across the nine domains.

Bailey, Simeonsson, Buysse, and Smith (1993) examined interrater agreement and test-retest score reliability for the ABILITIES Index. The authors compared ratings for 130 parent-teacher pairs, 130 parent-specialist pairs, and 130 teacher-specialist pairs for a sample of young children with disabilities. Exact agreement across the 19 items for parent-teacher pairs was 68.5% (range = 39-85); for parent-specialist pairs was 65.5% (range = 32-84); and for teacher-specialist pairs was 67.8% (range = 42-91).
Interrater exact agreement was lowest for items related to social skills, behavior, and communication skills. The authors reported interrater agreement within one point across the 19 items: for parent-teacher pairs was 85.1% (range = 76-95); for parent-specialist pairs was 84.9% (range = 66-97); and for teacher-specialist pairs was 88.5% (range = 78-98). To examine test-retest score reliability, 40 teachers completed a second ABILITIES Index for young children with disabilities 34 days after the first rating. Exact agreement between ratings was 67.8% while agreement within one point was 90.6%. The mean intraclass correlation coefficient was .70, and mean weighted kappa was .77. As described in Chapter 2, Simeonsson, Bailey, Smith, and Buysse, (1995) conducted a hierarchical cluster analysis that yielded a 6-cluster model of subgroups sharing similar ability profiles. Consumer validation of the ABILITIES Index conducted by Buysse, Smith, Bailey, and Simeonsson (1993) showed that a range of early childhood stakeholders (e.g., parents, other family members, early interventionists, preschool teachers, therapists) indicated the index was a useful assessment tool that was feasible to use and the index produced socially-valid scores of children's functioning related to the nine domains.

The PEELS Disability Severity Index described by Daley, Simeonsson, and Carlson (2009) is based on the original ABILITIES Index (Simeonsson & Bailey, 1991). For the severity index, however, the authors used items from the PEELS parent interview to create scores for variables related to seven of the original nine domains (i.e., tonicity and structural status were not included). Daley and colleagues reported the ABILITIES Index has been expanded since its original publication with an additional area called ‘activities/characteristics’ which includes regulation of attention, regulation of
activity level, regulation of feeling/emotions, academic skills, motivation, and impulse control. From these expanded domains, four domains were selected to be included on the PEELS Disability Severity Index: regulation of attention, regulation of activity level, regulation of feeling/emotions, and motivation.

The PEELS Disability Severity Index has 15 items related to eleven domains selected from the original ABILITIES Index and expanded ABILITIES Index. The 15 items are hearing, vision, overall health, use of hands, use of arms, use of legs, cognition, communicating with others, understanding, regulation of attention, regulation of feelings and emotions, regulation of activity level, motivation, social skills, and inappropriate or unusual behavior.

To generate items for these areas, PEELS researchers used 24 questions from the parent interviews. In some cases, an item was represented by a single question, (e.g. ‘how well does {child} use {his/her} arms and hands for things like throwing, lifting, or carrying?’ to represent item ‘use of arms’). For other items, multiple questions were asked. For example, three separate questions about the child’s ability to see with and without glasses were used to create the item for vision (Daley et al., 2009). Daley and colleagues (2009) reported their procedural decisions to select or combine parent interview variables to derive final items for PEELS Disability Severity Index was based on theoretical information about the skills and domains. Questions from the parent interview and corresponding item coding used to derive final items for the PEELS Disability Severity Index are presented in Appendix B. Overall, nine items were created from a single question; of these, seven required recoding for use as part of the Disability Severity Index. In addition, six items were derived from multiple questions. As shown
in Appendix B, final items are based on a 4-point scale: (1) normal or typical functioning, (2) mild limitation in functioning, (3) moderate limitation in functioning, and (4) severe limitation in functioning.

Daley and colleagues (2009) reported they analyzed the extent to which the PEELS Disability Severity Index items mapped to codes of the ICF-CY. Table 3-3 shows the ICF-CY-related codes identified by Daley and colleagues. The authors reported there were correspondences between index items with seven Body Function codes and six Activities/Participation codes; however, no clear ICF-CY codes were identified for inappropriate or unusual behavior and overall health.

Daley and colleagues examined the relationship between the each of the five possible PEELS Disability Severity Index composite scores (described in Chapter 2) and other variables identified in the PEELS data set by examining Pearson product-moment correlation coefficients between children’s composite scores and child assessment scores. For the 15-item index, the authors reported Pearson product-moment correlation coefficients on the following measures: Peabody Picture Vocabulary Test (PPVT; $r = -.32$); Woodcock Johnson Letter-Word Identification subtest ($r = -.22$); Woodcock Johnson Applied Problems subtest ($r = -.40$); conceptual domain of the ABAS ($r = -.53$); practical domain of the ABAS ($r = -.53$); social domain of the ABAS ($r = -.40$); PKBS-2 social skills composite ($r = -.47$); and PKBS-2 problem behaviors composite ($r = .35$).

For the 6-item index, which was the selected index in the Daley et al. study, the authors reported the following Pearson product-moment correlation coefficients: Peabody Picture Vocabulary Test (PPVT; $r = -.36$); Woodcock Johnson Letter-Word
Identification subtest \((r = -.26)\); Woodcock Johnson Applied Problems subtest \((r = -.45)\); conceptual domain of the ABAS \((r = -.46)\); practical domain of the ABAS \((r = -.43)\); social domain of the ABAS \((r = -.35)\); PKBS-2 social skills composite \((r = -.43)\); and PKBS-2 problem behaviors composite \((r = -.35)\).

In the present study, the 15 items from the PEELS Disability Severity Index created by Daley and colleagues were used to identify subgroups of children with similar functional ability profiles. The items used to create the profiles are aligned with select ICF-CY codes and represent children’s functioning. As noted previously, the subgroups were created with exploratory analyses (i.e., latent class analysis) to examine the patterns of similarities and differences among children on these 15 variables. Children identified with the same profile (i.e., belong to the same subgroup) share similar characteristics of strengths and needs across the 15 functional ability variables. The number of subgroups that were defined for this study was based on both statistical indices and theoretical rationales considered during the exploratory analyses.

**Disability category**

The child’s primary disability category is available in the demographic file provided with the restricted-use PEELS data set. This variable was derived from multiple sources. The PEELS team used the disability reported on the teacher and related service questionnaire, parent interview, and enrollment forms submitted by district personnel to determine a primary disability category for each wave (Carlson & Lowe, 2009). The PEELS demographic data file includes 15 possible disability categories. These categories are consistent with IDEA disability categories (i.e., 14 categories); the additional category in the PEELS data set is due to the inclusion of mild mental retardation and moderate mental retardation (2 categories) to represent the IDEA.
category of mental retardation. For the present study, mild mental retardation and moderate mental retardation were grouped into one disability category (i.e., mental retardation). Sample size in some disability categories were too small for analysis, therefore, a low-incidence disability category was created for the present study. Low incidence included hearing impairment, deaf/blind, deafness, multiple disabilities, orthopedic impairment, other health impairments, traumatic brain injury, and visual impairment. Although sample size was small for emotional-behavioral disturbance, this category was not included in the low-incidence disability category, because of possible strong associations between this disability category and children’s social competence. As a result, seven disability categories were used in this study. The categories in the present study were speech or language impairments, developmental disability, autism, emotional-behavioral disturbance, mental retardation, learning disability, and low incidence disability.

**Descriptive Variables**

Non-malleable child and contextual (i.e., family and environmental) factors were used to explore relationships in two ways in the present study. First, variables were used to describe children within and across functional ability profile subgroups. Second, the relationship between children’s functional ability profile membership and social competence was examined with variables associated with non-malleable child factors as well as with family factors and environmental factors included as moderators in the model. Not all descriptive variables were included as moderators. Child, family, and environmental variables used in the present study are briefly described in this section. Detailed information about PEELS questions used to derive these variables and how these variables were used in the present study are shown in Appendix D.
Child factors

*Child gender* was identified as male or female in the PEELS demographic file and was used in the present study.

*Child age* was identified as age in months at the time of assessment in the PEELS demographic file and was used in the present study.

*Race/ethnicity* was derived from two questions on the parent interview. The first question asked the respondent to indicate if the child was of Hispanic, Latino, or other Spanish-speaking origin. The second question asked the respondent to indicate the category that best described the child’s race. Five possible categories were listed: White, African American or Black, American Indian or Alaska Native, Asian, or Native Hawaiian or other Pacific Islander.

*English as a second language* was derived from one question in the parent interview. Respondents were asked to indicate if the child spoke any language other than English at home.

*IFSP before age 3* was derived from one question in the parent interview. Respondents were asked to identify if the child had an IFSP before the age of 3 years old.

*Birth weight* was derived from one question in the parent interview. Respondents were asked to report the child’s birth weight in ounces. Ounces were converted to grams for the present study.

*Weeks premature* was derived from one question in the parent interview. Respondents were asked to indicate the number of weeks premature the child was born. If children were not born premature, the inapplicable code was applied.
Family factors

Family factors were identified in one of two ways: family characteristics or parent-child interactions. Family characteristic variables were home-living environment, marital status, family income, and parent education. Parent-child interaction variables were parent-school activities, child activities, regular child activities, parent–child activities, child participation in activities regularly, family meals per week, and the extent families read to the child.

*Respondent role* was derived from two questions in the parent interview. First, respondents were asked to identify if they were biological, adoptive, step-parents, foster parents, or guardians. Second, respondents were asked what type of relationship they had to the child (e.g., mother, father, grandmother, sibling, non-relative).

*Home-living environment* was derived from one question in the parent interview. Respondents were asked to identify if the child lived at home or in another setting (e.g., hospital, care facility).

*Marital status* was derived from one question in the parent interview. Respondents were asked indicate if there were married, never married, widowed, separated, or divorced.

*Family income* was derived from one question in the parent interview. Respondents were asked to indicate the total income for all persons in the household.

*Parental education* was derived from one question in the parent interview. Respondents were asked to indicate their level of education.

*Parent-school activities* were derived from multiple questions in the parent interview. Respondents were asked to indicate whether they had participated in
activities at their child’s school or program. Seven possible activities were described. Respondents answered yes or no to each possible activity.

*Child activities* were derived from multiple questions in the parent interview. Respondents were asked to indicate whether their child had ever participated in after-school or community activities. Seven possible activities were described. Respondents answered yes or no to each possible activity.

*Regular child activities* were derived from multiple questions in the parent interview. Respondents were asked to indicate whether their child participated in after-school or community activities on a monthly basis. Seven possible activities were described. Respondents answered yes or no to each possible activity.

*Parent-child activities* were derived from multiple questions in the parent interview. Respondents were asked to indicate whether they participated in community-based activities with their child on a monthly basis. Seven possible activities were described. Respondents answered yes or no to each possible activity.

*Child participation in activities regularly* was derived from one question in the parent interview. Respondents were asked to indicate whether their child participated in any group activities on a monthly basis. Respondents answered yes or no to this question.

*Meals per week* were derived from one question in the parent interview. Respondents were asked to indicate how many times a week the family had a meal together.
Extent family reads to the child was derived from one question in the parent interview. Respondents were asked to indicate how often someone in the family reads to the child.

Environmental factors

Environmental factors included community- and school-related factors.

Neighborhood safety was derived from one question in the parent interview. Respondents were asked to indicate the extent to which they felt their neighborhood was safe for children to play outside during the day.

School/neighborhood income was derived from one question in the administrator questionnaire. Respondents were asked to indicate what percentage of their students or children lived in low-income households.

School/program quality was derived from two questions in the administrator questionnaire. For school principals, respondents were asked to indicate if the school was designated low-performing or in need of improvement under the No Child Left Behind Act. For early-childhood programs, respondents were asked to indicate if the program was licensed or accredited.

Parent satisfaction with special education services was derived from one question in the parent questionnaire. Respondents were asked to rate their level of satisfaction with the child’s special education services.

Number of children with IEPs in class was derived from one question in the teacher questionnaire. Respondents were asked to indicate the number of children with an IEP in the child’s class.
Number of children without IEPs in class was derived from one question in the teacher questionnaire. Respondents were asked to indicate the number of children without an IEP in the child’s class.

Classroom intervention to support social interaction was derived from one question in the teacher questionnaire. Respondents were asked to indicate whether their program facilitated interactions between children with disabilities and children without disabilities.

Focus of child’s IEP goals was derived from multiple questions in the teacher questionnaire. Respondents were asked to indicate the top priorities for a child’s IEP goals. Eight possible priority areas were described. Respondents selected the top three priority areas.

Procedures

This section describes the methodological procedures used in the present study to conduct the secondary analyses of the PEELS data set.

Data File Preparation

PEELS data files are available in cross-sectional formats for each data source (i.e., child assessments, administrator questionnaire, parent interview). For teacher questionnaires, data from questionnaires answered by different teachers (e.g., early childhood or kindergarten teacher) are presented in separate files. Data files for the present study were prepared by selecting variables of interest from each individual wave 1 data file. Each data file contained a variable to indicate the child’s unique identification number in the study. The unique ID was used to merge reduced files from each data source.
To derive variables for the present study that were created from multiple variables in the PEELS data files, variable re-coding and variable merging syntax were used to transform or create final variables. A final data file containing all variables used in the present study was exported into a SAS™ file. Final data files were used in statistical software programs using program specific syntax to conduct analyses. All data files used in the present study were kept on a secure, password-protected computer authorized for use under the restricted-use licensing agreement. Variable coding and re-coding syntax and analytic program syntax are presented in Appendix D.

**Primary Sampling Unit, Stratification, and Sampling Weights**

The PEELS data set is based on complex sampling techniques. First, the sample was identified from a two-stage sampling process. The primary sampling units were school districts, which were selected from lists of eligible districts. Following district selection, children were selected from lists of eligible children within districts. Throughout the recruitment process, historical (i.e., child eligible at the beginning of recruitment) and on-going (i.e., child became eligible during recruitment) lists of children were used. Second, the PEELS sample was stratified. Districts were stratified by geographic region, preschool special education enrollment size, and district poverty level. Children were stratified by age cohort. Third, the PEELS data set can be weighted to represent a nationally representative sample of children.

Analyses reported in the present study were conducted by accounting for the stratification of the sample, cluster sampling (i.e., sampling districts prior to sampling children), and the sampling weights. The Taylor Series linearization method accounts for the effect of cluster sampling and was used to calculate standard errors (Rust, 1985). This was achieved by using appropriate analytic procedures in SAS™ 9.2 or
Mplus 6.1 (e.g., SurveyReg). Taylor weight files in the PEELS data set include parent-child weights and parent-child-teacher-weights. The parent-child weights are appropriate for analyses conducted with data from the parent interview and the child assessments (Carlson, Posner, & Lee, 2008) and include 2,870 available cases. The parent-child-teacher weights are appropriate for analyses conducted with data from the parent interview, the child assessments, and the teacher questionnaire (Carlson, Posner, & Lee, 2008) and include 2,180 available cases. Weight files for the present study were selected to maximize the number of available cases for each analysis using appropriate weight files. Analyses for Research Question 1 were conducted with the cross-sectional wave 1 parent-child weights. Analyses for Research Question 2 and 3 were conducted with the cross-sectional wave 1 parent-child-teacher weights. Based on advice from PEELS staff, the parent-child-teacher weights were also used for analyses conducted with wave 1 parent interview, wave 1 teacher questionnaire, and wave 1 administrator questionnaire (i.e., Research Question 4).

**Missing Data**

Large-scale, longitudinal, prospective data sets have missing data. When data were missing, a missing data indicator was used in the data set so the analysis appropriately takes into account observed and missing data. To address missing data for the analyses conducted as part of the present study, models were analyzed using SAS™ 9.2 or Mplus 6.1 (Muthen & Muthen, 2007) with maximum likelihood estimation. SAS™ and Mplus with maximum likelihood estimation analyses that were conducted in the present study used all available data to generate estimates.
Analyses

Research Question 1

To examine whether distinct subgroups based on similar functional ability profiles emerged in the PEELS data set (Research Question 1), latent class analysis (LCA) in Mplus 6.1 was used. LCA uses observed predictor variable scores (i.e., manifest variables) to create subgroups with similar patterns of scores. These subgroups are referred to as latent classes. In the present study, the 15 variables related to children’s functional abilities (i.e., observed variable scores) were used to create subgroups with similar functional ability profiles (i.e., the latent classes). Appendix D shows Mplus syntax. All models were estimated with 500 random starts and the top 40 log likelihood values were examined to investigate whether local maxima were avoided in the estimation procedure.

The following model fit indices were used to inform selection of the optimal latent class model: log likelihood (LL) value and replication of LL, Bayesian information criterion (BIC), and entropy. Parameter estimates are found that maximize the LL. Demonstrating that the same LL is obtained for different starting values (replication of LL) provides evidence that the estimates are for a global maximum. BIC is a recommended measure of fit for latent class models and lower BIC numbers are desirable (Nylund, Asparouhov, & Muthen, 2007). Entropy refers to the classification uncertainty (Vermunt, & Magidson, 2002). In Mplus, relative entropy is reported and values near one indicate a high certainty in classification. To report information about the functional ability profile subgroups, basic descriptive analyses were conducted in SAS™ 9.2 using most likely class membership.
Research Question 2

To examine the relationships between functional ability profile subgroup membership and social competence, two possible analytic methods were considered. The first method was to use the mixture-modeling feature of Mplus 6.1 to model the relationships between latent class membership (i.e., subgroup with similar functional ability profile) and PKBS-2 standard scores. This method uses posterior probability-based imputation in testing equality of mean PKBS-2 scores for the latent classes. The second method was to use Mplus 6.1 to export the assigned class membership for each case after running the latent class analysis. This method created a data file in which each child was assigned to a most likely class membership based on the posterior probabilities. The assigned latent class membership becomes a categorical variable represented by a number. In the present study, these categorical variables represent subgroups of children with similar functional ability profiles and were referred to by profile number (i.e., Profile 1, 2, 3, 4, or 5). The file was then merged with a data file that included the explanatory variables, descriptive variables, and the criterion variables to estimate a regression model to examine the relationships between functional ability profile subgroup membership and children’s social skills and problem behaviors standard scores using ProcSurveyReg in SAS™ 9.2.

The concern with using the first method was related to the sampling weights. The recommended PEELS sampling weights for an analysis using functional ability items and PKBS-2 scores are different than the recommended PEELS sampling weights for an analysis using functional ability items alone. Therefore, to use posterior probability-based imputation, it would have been necessary to use different sampling weights in the analysis to investigate whether latent class membership was associated with PKBS-2
scores than the weights used in the analysis to determine the latent classes. This variation in weights could have resulted in different latent classes in the two analyses. To avoid this possibility, the second method was selected. This method avoided the problem with the sampling weights and was appropriate given that mean posterior probabilities for class membership were all above .86, with a range of .86 to .92 over the five latent classes.

Regression analyses were completed using assigned functional ability profile subgroup membership (i.e., latent class) as a categorical variable in ProcSurveyReg in SAS™ 9.2 and social skills and problem behaviors standard scores as criterion measures. Analyses were conducted separately for social skills and problem behaviors standard scores.

**Research Question 3**

To examine the relationships between functional ability profile subgroup membership, disability category, and social competence, three regression models were estimated using ProcSurveyReg in SAS™ 9.2. The first model included disability category as an explanatory variable, the second model included profile membership as an explanatory variable (same as Research Question 2), and the third model included both disability category and profile membership as explanatory variables. Analyses were conducted separately using social skills and problem behaviors standard scores as criterion measures. To report information about the relationship between functional ability profile subgroup membership and disability category, basic descriptive analyses were conducted in SAS™ 9.2.
### Research Question 4

To examine the extent to which select contextual factors moderated the relationship between functional ability profile subgroup membership and social competence, ProcSurveyReg in SAS™ 9.2 was used. For this research question, select non-malleable child variables as well as contextual variables were examined through a series of regression models. Each model included an interaction term as a test of moderation. Variables were grouped by child factors, family characteristics, parent-child interactions, and environmental factors. Within each group of factors, the Bonferroni-Holm criterion (Holm, 1979) was applied to account for the multiple inferential tests and control Type 1 error rate. When significant moderation was identified, follow-up analyses included comparisons of all possible profile combinations to identify how the differences in the profiles varied across scores on the moderator variables. Again, the Bonferroni-Holm criterion was applied to control Type 1 error rate. Analyses were conducted separately using social skills and problem behaviors standard scores as criterion measures.

Statistical models for each research question are presented in Appendix E.

### Statistical Software

Data file preparation was conducted with SPSS Version 19.0 or SAS™ Version 9.2. Analyses were conducted with SAS™ Version 9.2 or Mplus Version 6.1. All procedures and analyses were conducted in accordance with the restricted-use data license agreement.

### Summary

Secondary analyses of the Pre-Elementary Education Longitudinal Study (PEELS) data set were conducted in the present study. Research questions and hypothesized...
models guided the analyses. Statistical techniques used included latent class analysis, regression models, and regression models with interaction terms. The primary focus of the present study was to identify subgroups of young children with disabilities with similar profiles of functional ability and to examine the relationship between subgroup membership and children’s social skills and problem behaviors. In addition, the individual and combined contributions of children’s functional ability profile subgroup membership and disability category membership to the explanation of children’s social skills and problem behaviors were examined. Finally, the extent to which non-malleable child factors as well as contextual factors moderated relationships between children’s functional ability profile subgroup membership and their social skills and problem behaviors was examined.
Table 3-1. Children’s age by cohort and wave in the PEELS sample

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Table 3-2. Response rates in the PEELS data set

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<th>Wave 1</th>
<th>Wave 2</th>
<th>Wave 3</th>
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<td>Freq.</td>
<td>%</td>
<td>Freq.</td>
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<tr>
<td>Parent interview</td>
<td>2,800</td>
<td>96</td>
<td>2,890</td>
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<td>Teacher questionnaire</td>
<td>2,290</td>
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<td>Early childhood teacher</td>
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<td>Kindergarten teacher</td>
<td>270</td>
<td>73</td>
<td>960</td>
<td>79</td>
</tr>
<tr>
<td>Elementary teacher</td>
<td>n/a</td>
<td>n/a</td>
<td>310</td>
<td>86</td>
</tr>
</tbody>
</table>

Table 3-3. PEELS Disability Severity Index and related ICF-CY codes

<table>
<thead>
<tr>
<th>Disabilities index variable</th>
<th>ICF-CF code</th>
<th>ICF-CY code name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audition</td>
<td>b230</td>
<td>Hearing function</td>
</tr>
<tr>
<td>Vision</td>
<td>b210</td>
<td>Seeing function</td>
</tr>
<tr>
<td>Overall Health</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Use of Arms</td>
<td>d445</td>
<td>Hand and arm use</td>
</tr>
<tr>
<td>Use of Hands</td>
<td>d440</td>
<td>Fine hand use</td>
</tr>
<tr>
<td>Use of Legs</td>
<td>d435</td>
<td>Moving lower extremities</td>
</tr>
<tr>
<td>Cognition</td>
<td>b117</td>
<td>Intellectual functions</td>
</tr>
<tr>
<td>Communicate with Others</td>
<td>d349</td>
<td>Communicating-producing</td>
</tr>
<tr>
<td>Understanding</td>
<td>d329</td>
<td>Communicating-receiving</td>
</tr>
<tr>
<td>Regulation of Attention</td>
<td>b140</td>
<td>Attention</td>
</tr>
<tr>
<td>Regulation of Feeling and Emotions</td>
<td>b1521</td>
<td>Responsivity</td>
</tr>
<tr>
<td>Regulation of Activity Level</td>
<td>b1252</td>
<td>Activity level</td>
</tr>
<tr>
<td>Motivation</td>
<td>b1301</td>
<td>Motivation</td>
</tr>
<tr>
<td>Social Skills</td>
<td>d710</td>
<td>Basic interpersonal interactions</td>
</tr>
<tr>
<td>Inappropriate or Unusual Behavior</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Figure 3-1. Hypothesized relationship between functional ability variables, functional ability profile membership, and children’s social competence
Figure 3-2. Hypothesized relationships between functional profile membership, disability category membership, and social competence
Figure 3-3. Hypothesized moderator relationships involving functional ability profile subgroup membership and contextual factors in relation to children's social competence.
CHAPTER 4
RESULTS

The present study used a cross-sectional correlational design to explore and examine relationships among factors associated with young children’s social competence through secondary analyses of the Pre-Elementary Education Longitudinal Study (PEELS) data set. The purposes of the study were to (a) determine whether a set of functional ability variables included in the PEELS data set would be useful for empirically deriving distinct and interpretable latent classes that represent subgroups of children who share similar functional ability profiles, (b) explore the relationships between children’s functional ability profile subgroup membership and their social skills and problem behaviors, (c) examine the individual and combined contributions of functional ability profile subgroup membership and children’s IDEA-disability category as correlates of their social skills and problem behaviors, and (d) explore whether select non-malleable child variables and contextual variables moderate the relationships between functional ability profile subgroup membership and children’s social skills and problem behaviors. These secondary analyses were exploratory and analytic decisions were made as part of the conduct of the study. In this chapter, analytic decisions made in order to conduct analyses for each research question and the findings associated with each of research question are described.

Context for Reporting and Interpreting Findings

The PEELS data were collected using a complex sampling design that used stratified cluster sampling and unequal probability of selection. Sampling weights were used to address the unequal probability of selection and Taylor Series linearization was used to calculate standard errors that take into account the cluster sampling (Rust,
As part of exploratory procedures, analyses also were conducted with the unweighted sample and the sample weighted in relation to the primary sampling unit. Similar results were found across estimation methods. All findings reported in this chapter were estimated with the Taylor Series linearization method using either Mplus 6.1 (Muthen & Muthen, 2007) or the ProcSurveyReg procedure in SAS™ 9.2. Findings related to each research question are reported below. Steps taken to prepare the data files, changes made to the structure of data variables, or additional analytic procedures completed to conduct or interpret the analyses to address each research question are described, when appropriate.

All analyses were weighted and thus findings are nationally representative of children ages 3, 4, or 5 years in fall of 2003 who were receiving preschool or early elementary special education services under the Individuals with Disabilities Education Act. To meet IES reporting requirements for restricted-use data sets, all sample estimates reported are rounded to the nearest tens and the (#) symbol is used in table cells to designate findings when less than 3% of the reference sample (e.g., proportion within a profile) is represented. Zero is reported as a finding when sample estimates have no cases represented, except when noted in a table.

**Research Question 1**

The purpose of the secondary analyses conducted to address this research question were to explore whether distinct and interpretable latent classes could be identified and to use both statistical indices and substantive interpretations to select the optimal latent class model (i.e., distinct, interpretable, and defensible). In the present study, latent classes represent an unobserved categorical variable that define
subgroups of children with similar functional ability profiles that were empirically derived from the 15 observed functional ability variables included in the PEELS Disability Severity Index.

Data Analyses to Conduct Latent Class Analyses

Exploratory and descriptive analyses were conducted to evaluate the 15 functional ability variables that would be used to conduct the latent class analyses. These analyses showed the sample of children was not evenly distributed across the 3 or 4 possible ordinal response categories for the 15 observed variables related to functional ability that are included in the PEELS Disability Severity Index (Daley, Simeonsson, & Carlson, 2009). Response categories were (1) normal or typical functioning, (2) mild limitation in functioning, (3) moderate limitation in functioning, and (4) severe limitation in functioning.

Table 4-1 shows the proportion of the weighted sample associated with each variable and response category in PEELS Disability Severity Index. Five variables (hearing, vision, use of arms, use of legs, and use of hands) were identified for which less than .5% of the sample was rated as having a severe limitation in function (fourth response category). During initial exploratory latent class analyses using Mplus, the models would not converge or error messages related to estimating model parameters were identified due to the small sample size in these five cells. Review of the response category criteria for these five variables showed that the fourth response category was identified by descriptors related to no function (e.g., child has no use at all of one or both arms for the use of arms variable) or severe limitations in functional ability even when adaptive equipment or devices were used (e.g., child has a lot of trouble seeing or cannot see at all, even with glasses for the vision variable). The third response
categories for these five variables were associated with a lot of difficulty or difficulty even with the use adaptive equipment or devices. For these five variables, the descriptions for the third response category were more similar to descriptions for the fourth response category than for the other 10 variables. A decision was made to combine the fourth and third response categories for these five variables to represent a moderate/severe limitation in functioning related to the functional ability variable and the combined response category was coded as a 4 to be consistent with coding categories for the other 10 variables.

Following the re-coding of response options for these five functional ability variables, exploratory models for the latent class analyses were rerun. The revised models converged and error messages associated with parameter estimates for these five variables were not identified. Table 4-2 shows the proportion of the weighted sample for each variable and response category after hearing, vision, use of arms, use of legs, and use of hands were recoded for the present study.

Results for the latent class analyses conducted in Mplus were generated as probability scales representing the proportion of cases associated with each response category for each variable within a latent class. These proportions were subsequently transformed into model-implied means and variances in SAS™ 9.2 to aid interpretation of the functional ability profiles associated with each latent class (Appendix D shows the SAS™ syntax used to conduct these transformations). Model-implied means for each variable within each latent class were calculated by multiplying the proportion of each response category by the ordinal value of the response category and summing these values. The model-implied means for each functional ability variable within each latent
class were inspected to describe the latent classes in terms of unique functional ability profiles.

Some of the initial exploratory latent class analyses produced error messages associated with estimation of the threshold values for five variables (use of arms, use of hands, inappropriate or unusual behavior, understanding, and communication) in some of the latent classes. The default in Mplus is to set -15 as the lowest possible threshold and 15 as the highest possible threshold and to issue a warning when thresholds have been estimated to be equal to these default values. When these warning occurred, the defaults were modified to be -45 and 45 in order to determine if estimated values below -15 and above 15 would occur for any thresholds. In general, estimates below -15 and above 15 did not occur and thresholds that had been estimated at the -15 or 15 default values by Mplus were estimated at the -45 and 45 default values by Mplus. Results are based on the model estimated by using the -45 and 45 default values. The choice between -15 and 15 default values and -45 and 45 default values has a trivial effect on the estimation of model-implied means and standard deviations because with either set of values when a threshold is set at the lower default (i.e., -15 or -45) the expected proportion of response in the lowest response category is substantially below .000001 and when a threshold is set at the higher default (i.e., 15 or 45) the expected proportion of response in the highest response category is substantially below .000001 (Algina, personal communication, October 22, 2011).

**Generating and Evaluating Latent Class Models**

As part of exploratory analyses to identify the latent class model that would be interpreted and used to address other research questions in the present study, models
with 2 to 7 latent classes were estimated. Models beyond a 7-class model were not explored because statistical indices of model fit and replication began to decline.

Table 4-3 shows the fit measures for the models that were generated. The log likelihood (LL) value increased and the Bayesian information criterion (BIC) decreased with the addition of latent classes; both of which are desirable. For the 7-class model, however, the BIC began to increase. Entropy stayed above the desirable level of .80 for the 2- through 6-class models. The numbers of replications that yielded the same LL was sufficiently large (37 – 40 replications for the 2- through 4-class models, 11 – 13 replications for the 5- and 6-class models, and 6 replications for the 7-class model) to indicate that a model at a local maximum was not likely to have occurred for any of the models. The 2- through 6-class models were examined to evaluate them with respect to which, if any, were interpretable and logical from a substantive perspective. Based on the statistical indices, however, the 4-, 5-, and 6-class models were considered the statistically defensible models for selection.

Within each model, each latent class represents a subgroup of children with similar functional ability profiles. To aid interpretation, each subgroup (latent class) was labeled with a profile number and a descriptive interpretation of each profile was generated. For the remainder of this chapter, profile numbers refer to specific subgroups and the term profile is used when describing these unique subgroups. The phrases functional ability profile subgroup membership or subgroup membership are used when referring to the subgroups (latent classes) as a categorical variable.

Substantive interpretations focused on examining shared features of functional ability variables within a profile and the distinguishing features of these variables across
profiles. Functional ability profiles could be quantified related to the (a) level or severity of limitations on the functional ability variables (e.g., mild, moderate, or severe limitations), (b) number of functional ability variables with limitations (e.g., a few, many, all), and (c) nature or type of functional ability variables with limitations (e.g., limitations associated with a similar cluster of functional ability variables). Severity or level of limitations was examined by inspecting the model-implied mean score on each functional ability variable that were calculated from the proportion of cases associated with response categories for each variable. To describe the profiles and to interpret the severity of limitations across profiles, model-implied means were grouped into ranges to account for the standard deviations. Moderate to severe limitations were associated with mean scores from 2.5 and above, mild to moderate limitations were mean scores from 1.5 to 2.49, and no to mild limitations were mean scores from 1.49 and below.

As noted previously, to determine the optimal class model, model fit indices were combined with substantive interpretations of the profiles. The 5-class model was selected because (a) the 5-class model had improved model fit indices over the 4-class model; (b) the 5-class model provided a logical and interpretable model that offered distinctions among profiles; and (c) the 6-class model did not provide substantial fit improvement or notably different substantive information over the 5-class model.

In the following section, information about the severity of limitations, number of limitations, and type of functional ability limitations identified in the five distinct profiles are described. In addition, information about the classification probabilities is provided. For reference, similar information about the non-selected class models is provided in Appendix E.
Interpreting the Selected Latent Class Model

The selected 5-class model represented five subgroups of children with similar functional ability profiles on the 15 functional ability variables that were distinct from other subgroups. As noted earlier, each subgroup was labeled with a profile number. Descriptions of each profile are based on the (model-implied) mean functional ability scores for the subgroup of children that the profile represents. Children assigned to a profile have, in general, similar functional abilities in terms of the severity of limitations, number of limitations, and types of limitations across the 15 functional ability variables.

Severity and number of limitations on functional ability variables

Figure 4-1 shows the means for each profile on the 15 functional ability variables. Table 4-4 shows the means and standard deviations on the 15 functional ability variables for each profile. The means in Table 4-4 have been bolded or italicized to indicate the different severity or levels of limitations across the functional ability variables. Means show that Profile 1 and Profile 2 had more moderate to severe limitations across functional ability variables. Profile 1 (5% of the sample) was associated with limitations on 13 of 15 functional ability variables. This included moderate to severe limitations on 11 functional ability variables: use of arms, use of hands, use of legs, communication, understanding, cognition, overall health, social skills, regulation of activity level, regulation of attention, and motivation; and mild to moderate limitations on two functional ability variables: vision and behavior. Profile 2 (15% of the sample) was associated with limitations on 11 of 15 functional ability variables. This included moderate to severe limitations across eight functional ability variables: communication, cognition, use of hands, social skills, behavior, regulation of activity level, regulation of attention, and motivation; and mild to moderate limitations
associated with three functional ability variables: overall health, use of hands, and regulation of emotions.

Means show that Profile 3 and Profile 4 had more mild to moderate limitations across functional ability variables. Profile 3 (7% of sample) was associated with limitations on 10 of 15 functional ability variables. This included moderate to severe limitations on two functional ability variables: cognition and use of hands; and mild to moderate limitations across eight functional ability variables: communication, overall health, use of arms, use of legs, social skills, regulation of activity level, regulation of attention, and motivation. Profile 4 (33% of sample) was associated with limitations on 9 of 15 functional ability variables. This included moderate to severe limitations on five functional ability variables: communication, cognition, regulation of activity level, regulation of attention, and motivation; and mild to moderate limitations across four functional ability variables: understanding, overall health, social skills, and behavior.

Profile 5 (40% of the sample) was associated with limitations on 5 of 15 functional ability variables. This included mild limitations with communication, cognition, regulation of activity level, regulation of attention, and motivation and no limitations on other functional ability variables.

**Types of limitations on functional ability variables**

A further distinction among the profiles was the types of limitations; specifically, there were clusters of variables that might affect similar aspects of functioning that were common within a profile. For example, there were five profiles with limitations related to regulatory functional ability variables but only three profiles with limitations related to physical functional ability variables. Moreover, there were five profiles with limitations
related to communication or cognition variables but only four profiles had limitations related to social competence variables (i.e., social skills and behavior).

Regulatory variables were identified as regulation of activity, regulation of attention, motivation, and regulation of emotions, although the emotions variable did not lead to distinctions between sub-groups. Limitations on these variables might affect self-regulation. Both Profile 1 and Profile 2 had moderate to severe limitations related to these variables. Model-implied means were somewhat higher on these variables, however, for Profile 2 than the means for Profile 1. In addition, Profile 3 and Profile 4 had mild to moderate limitations related to these variables. Model-implied means were somewhat higher on these variables for Profile 4 than the means for Profile 3. Profile 5 had mild limitations related to these variables.

Physical indicators were identified as overall health, use of arms, use of hands, and use of legs. Limitations on these variables might affect motor function. Profile 1 had moderate to severe limitations related to all of these variables and Profile 3 had mild to moderate limitations related to all these variables.

Functional ability variables related to communication, understanding, and cognition were similar to the differences between profiles associated with the severity of limitations. Model-implied means indicated moderate to severe limitations for Profiles 1 and 2, mild to moderate limitations for Profiles 3 and 4, and mild or no limitations for Profile 5 on these variables. Profile 1, however, had slightly higher means (indicating somewhat greater limitations in function) on these variables than Profile 2, while Profile 4 had slightly higher means on these variables than Profile 3.
Social skills and behavior variables that might be associated with social competence also distinguished differences between profiles associated with the severity of the limitations. Limitations on these parent-rated functional abilities associated with social competence might correspond with performance-based teacher-ratings of social skills and problem behaviors. Model-implied means in Table 4-4 show the profiles with limitations related to physical variables (Profiles 1 and 3) had slightly lower means (indicating somewhat fewer limitations in function) than Profiles 2 and 4, respectively.

**Probability of being assigned to a profile**

As noted in Chapter 3, latent class analysis is a model based statistical procedure. As part of the analysis, the probability that each child would be assigned to each latent class (subgroup) is calculated and reported as posterior probabilities. The mean posterior probability estimates for each of the five latent classes was greater than 85%. Table 4-5 shows the mean profile (latent class) probabilities for most likely class membership.

Children in the Profile 1 had a 91%, 6%, 3%, 0%, and 0% probability of being assigned to the first, second, third, fourth, and fifth profile, respectively. Children in Profile 2 had a 2%, 89%, 1%, 8%, and 0% probability of being assigned to the first, second, third, fourth, and fifth profile, respectively, while children in Profile 3 had a 3%, less than 1%, 88%, 7%, and 2% probability of being assigned to the first, second, third, fourth, and fifth profile, respectively. For Profile 4, children had a 4%, 0%, 3%, 86%, and 7% probability of being assigned to the first, second, third, fourth, and fifth profile, respectively. Children in Profile 5 had a 0%, 0%, less than 1%, 7%, and 92% probability of being assigned to the first, second, third, fourth, and fifth profile, respectively.
Functional ability profile summary

The 5-class model resulted in distinct subgroups with similar functional ability profiles that could be meaningfully interpreted with adequate fit indices and good replication. Severity, number, and types of limitations distinguished the five profiles across functional ability variables. The consistent pattern of distinction between children with moderate to severe limitations and children with mild to moderate limitations was substantively meaningful, as was the distinction between limitations related to different aspects of functioning.

Specifically, the 5-class model permitted comparisons of functional ability limitations for subgroups of children with moderate to severe limitations (Profiles 1 and 2), for subgroups of children with mild to moderate limitations (Profiles 3 and 4), and for a subgroup of children associated with no to mild limitations across the 15 functional ability variables (Profile 5). In addition, the 5-class model identified two subgroups of children whose limitations included physical functional ability limitations that might affect motor function (Profiles 1 and 3).

Demographic and Descriptive Information for Members of Each Subgroup

The sample distribution was not evenly allocated across the subgroups. Profiles 1 and 3 were the smallest groups, 5% and 7% of the sample, respectively. Profile 5 was the largest group (40% of the sample). Profiles 2 and 4 were 15% and 33% of the sample, respectively.

Table 4-6 shows demographic and descriptive information about the children in each profile. Children were assigned to a profile based on their most probable latent class membership. There were more boys than girls in each of the profiles, consistent with the gender distribution in the PEELS data set (i.e., 70% males and 30% females;
Profiles 1, 2, and 4 have mid-70 to mid-20 percentage splits (e.g., 74% boys and 26% girls for Profile 1). Profile 5, however, has 67% boys and 33% girls and Profile 3 has 58% boys and 42% girls. Mean age across profiles was between 54 and 56 months ($SD = 8-9$ months). Within and across profiles, the distribution across 3, 4, and 5 years-of-age was generally evenly spread. Children from different racial backgrounds were generally evenly spread across profiles, with slightly less Caucasian children and more Hispanic children in Profiles 2 and 4. Profile 5 also had slightly more Caucasian children and fewer Hispanic children. Children, whose primary home language was not English, referred to as children with English as a second language (ESL), were generally equally distributed across profiles with a slightly smaller proportion of children designated as ESL in Profile 5.

Proportions of children who had an individualized family service plan (IFSP) before the age of 3 years were larger in profiles associated with limitations related to physical functional abilities, 82% of children and 72% of children within Profiles 1 and 3, respectively. In comparison, 50%, 36%, and 26% of children in Profiles 2, 4, and 5, respectively, had an IFSP before the age of 3 years. A similar pattern across profiles was identified related to the mean number of weeks premature or mean birth weight (i.e., greater proportions of children in Profiles 1 and 3 were born premature and had a lower mean birth weight).

Table 4-7 shows demographic and descriptive information about the families of children in each profile. As noted earlier, profiles represent subgroups of children with similar functional abilities on the 15 functional ability variables and children were assigned to a subgroup based on their most probable latent class membership. As
shown in Table 4-7, nearly 100% of the sample lived with the parent or guardian respondent who completed the PEELS data collection phone interview and provided information about the child, the child’s educational services, the family, the family’s satisfaction with the child’s education services, and the child’s and family’s activities and the community in which they resided. Respondents were generally mothers, biological or adoptive, across the profiles (88% to 96%). Other respondent roles included biological fathers (2% to 6%) or other respondents that might have been grandparents or foster parents (2% to 8%). Across profiles, children generally lived in two-parent families, with 17%, 38%, 32%, 32% and 23% of children in Profiles 1, 2, 3, 4, and 5, respectively, living in single-parent families.

Distribution of the interview respondents’ education level was similar across profiles with the exception of a larger proportion of parents with some college or a 2-year degree for children in Profile 1 and a smaller proportion of parents with no high school diploma or equivalent for children in Profile 5. Distribution of reported family income also was similar across profiles with the exception of a larger proportion of families above $50,000 for children in Profile 1 and a smaller proportion of families below $10,000 for children in Profile 5. Overall, the greatest proportion of respondents indicated the neighborhood in which they lived was safe or very safe for their child to play outside across all profiles. Related to parent satisfaction with special education services, parents generally indicated they were satisfied or very satisfied with special education services across all profiles.

Table 4-8 shows descriptive information about child and family participation in a range of activities for each profile. Activity variables were generated from a series of
questions asked as part of the parent interview. Child activities were defined as the number of extra-curricular activities a child had ever participated in, the extent to which the child participated in any group activities on a monthly basis, and which group activities the child participated in on a monthly basis. Family-school activities related to the number of different school activities that the parent attended at the child’s school. Child-family activities related to the number of community-based activities that someone in the family engaged in with the child on a monthly basis, the number of meals the family ate together during the week, and the number of times a family member read to the child during the week.

Distributions of child, family-school, and child-family activities were similar across profiles, with one exception. For the extent to which a child participated in any group activities on a monthly basis, the proportion of children in Profile 1 (36%) was smaller than Profiles 2, 3, and 4 (45% to 47%) and the proportion of children in Profile 5 was the largest (55%).

Table 4-9 shows descriptive information about children’s early childhood programs or schools for each profile. As reported by school administrators, the extent to which children attended schools that served families from low-income households was generally equally distributed across profiles. Children attended preschool programs or elementary schools that had preschool or kindergarten classrooms. For children enrolled in a preschool program, the extent to which the preschool was accredited was similar across Profiles 1, 2, 4, and 5 (42% – 50% accredited), while the proportion of preschools that were accredited for Profile 3 was 62%. The extent to which schools that children attended met No Child Left Behind (NCLB) standards was generally similar
across profiles (83% - 93% met standards). Using information from the teacher interview, the extent to which teachers reported their program supported or facilitated interactions among children with and without disabilities was 69% for Profile 1, 54% for Profile 2, 64% for Profile 3, 60% for Profile 2, and 53% for Profile 5. The mean number of children with an IEP in children’s classrooms was similar across profiles ($M = 6 – 8$, $SD = 3 – 4$ across profiles). The mean number of children without an IEP in children’s classrooms, however, differed across profiles. Children in Profiles 1 and 2 had the fewest number of children without an IEP in their classroom ($M = 4$, $SD = 6$), children in Profiles 3 and 4 had a slightly larger number of children without an IEP in their classroom ($M = 6$, $SD = 6 – 7$), and children in Profile 5 had the largest number of children without an IEP in their classroom ($M = 8$, $SD = 8$).

The extent to which children’s IEP goals focused on a range of curricular content domains was different across profiles (Table 4-9). For Profile 1, 19% of children had a school readiness goal, 6% had a pre-academic goal, 20% had a social goal, 23% had a behavior goal, 31% had an adaptive goal, 66% had a communication goal, 34% had a fine motor goal, and 38% had a gross motor goal. For Profile 2, 48% of children had a school readiness goal, 12% had a pre-academic goal, 36% had a social goal, 32% had a behavior goal, 22% had an adaptive goal, 71% had a communication goal, 21% had a fine motor goal, and 6% had a gross motor goal. For Profile 3, 40% of children had a school readiness goal, 16% had a pre-academic goal, 17% had a social goal, 8% had a behavior goal, 16% had an adaptive goal, 56% had a communication goal, 35% had a fine motor goal, and 38% had a gross motor goal. For Profile 4, 48% of children had a school readiness goal, 9% had a pre-academic goal, 32% had a social goal, 22% had a
behavior goal, 10% had an adaptive goal, 74% had a communication goal, 17% had a fine motor goal, and 4% had a gross motor goal. For Profile 5, 27% of children had a school readiness goal, 5% had a pre-academic goal, 19% had a social goal, 6% had a behavior goal, 3% had an adaptive goal, 83% had a communication goal, 10% had a fine motor goal, and 4% had a gross motor goal. Distribution across curricular content domains within and across profiles corresponded with limitations on related functional ability variables associated with profile descriptions. For example, children in Profile 5 had the highest proportion of goals associated with communication, while children in Profiles 1 or 3 had higher proportions of goals focused on fine motor or gross motor compared to other profiles.

Overall, descriptive analyses of the 24 demographic variables related to children, families, their activities, and their school programs showed similar proportions distributed across the five latent class profiles for 17 of these variables. Noteworthy differences across profiles were found for four child characteristic variables (i.e., gender, IFSP before 3, weeks premature, birth weight), one contextual variable (participation in regular group activities), and two school-related variables (i.e., the number of children without disabilities in the child’s classroom, or the type of IEP goals). These differences are discussed further in Chapter 5.

**Research Question 2**

The purpose of this research question was to examine relationships between children’s functional ability profile subgroup membership and their social skills and problem behaviors. In addition, analyses were conducted to examine whether subgroups of children with different functional ability profiles differed in their social skills and problem behaviors.
Using Most Probable Class Membership to Examine Social Competence

The unique functional ability profile of each subgroup provided an opportunity to compare and contrast how different profiles of functional abilities might or might not relate to differences in children’s social skills and problem behaviors. As described previously, functional ability profile subgroup membership was estimated as a categorical variable (1, 2, 3, 4, 5) based on most probable latent class membership assigned as part of the latent class analysis. This approach addressed the issue with selecting the weight file for LCA with mixture modeling and was appropriate given that mean posterior probabilities for latent class membership were all above .86, with a range of .86 to .92 over the five latent classes. As noted earlier, the term profile refers to specific subgroups while the phrase subgroup membership refers to the categorical variable used in the analyses.

To conduct regression analyses the parent-child-teacher weights were used. The application of parent-child-teacher weights to address the second research question resulted in a reduced number of available cases to conduct analyses. The application of these weights (N = 2,180), in combination with missing PKBS-2 scores, resulted in 2,090 cases available for these analyses.

Descriptive analyses to examine and compare information about basic demographic characteristics of the children in the three different samples were conducted (i.e., full sample for LCA, reduced sample for parent-child-teacher weights, and reduced sample for PKBS-2). Table 4-10 shows the mean age, gender proportions, and race/ethnicity proportions for children in each profile and the total sample across the three different samples. In general, children’s characteristics within a profile were equivalent across the three samples. Two exceptions are shown in Table
In the sample used to conduct analyses with the PKBS-2, children in Profile 1 included proportionally more females than males compared to the other two samples, and children in Profile 2 included proportionally more males than females compared to the other two samples. Differences in gender were not observed when comparing the total sample across each of the three samples.

**Relationships Between Subgroup Membership and Social Skills and Problem Behaviors**

To examine the associations between children’s functional ability profile subgroup membership and social skills and problem behaviors the R squared variance-explained value was examined. Children’s functional ability profile subgroup membership accounted for 20% of the variance in PKBS-2 social skills standard scores and accounted for 11.5% of the variance in problem behaviors standard scores. In addition to the regression model, social skills and problem behaviors standard scores and differences between standard scores for each functional ability profile subgroup were examined.

Table 4-11 shows the means, standard errors, and 95% confidence interval around the standard score mean estimate for social skills and problem behaviors for each functional ability profile subgroup. Figure 4-2 shows the means for each subgroup. The PKBS-2, which was used to measure social skills and problem behaviors, is standardized to a mean of 100 and standard deviation of 15 with higher scores on social skills associated with more social skills (positive outcome) and higher scores on problem behaviors associated with more problem behaviors (negative outcome). As shown in the table, children in Profile 1 had the lowest mean social skills scores ($M = 69.99, \text{SEM} = 3.22$) but not the highest mean problem behaviors scores ($M$...
Children in Profile 2 had the second lowest mean social skills scores ($M = 80.28, SEM = 1.95$) and the highest mean problem behaviors scores ($M = 106.45, SEM = .96$). Children in Profile 4 had lower mean social skills scores ($M = 91.61, SEM = .95$) and higher mean problem behaviors scores ($M = 100.81, SEM = .92$) than children in Profile 3, ($M = 95.28, SEM = 1.94$ for social skills scores and $M = 95.71, SEM = 1.31$ for problem behaviors scores). Children in Profile 5 had the highest mean social skills scores ($M = 102.08, SEM = .89$) and lowest mean problem behaviors scores ($M = 92.43, SEM = .68$).

The relationships between functional ability profile subgroup membership and social skills and problem behaviors were examined further for PKBS-2 subscales related to social cooperation, social interaction, social independence, externalizing behaviors, and internalizing behaviors. Table 4-12 shows the means, standard errors, and 95% confidence interval around the mean estimate for each subscale and profile. Figure 4-2 shows the means for each subscale and profile. Across all profiles, children’s social interaction standard scores were the lowest, mean scores were 64.49, 78.15, 88.98, 91.12, 98.06 for Profiles 1, 2, 4, 3, and 5, respectively. For social cooperation and social independence, respectively, Profile 1 had the lowest mean scores (75.13 and 75.75), Profile 2 had the next lowest mean scores (87.66 and 81.96), followed by Profile 4 (95.77 and 93.07). Profile 3 had the second highest mean scores for social cooperation and social independence (100.43 and 96.09), and Profile 5 had the highest mean scores (105.58 and 101.53).

For externalizing problem behaviors, children in Profile 2 followed by children in Profile 4 had the highest mean externalizing behaviors scores ($M = 104.01$ and $M = 103.96$).
100.9 for Profiles 2 and 4, respectively). Children in Profiles 1, 3, and 5 had a mean score of 98.83, 93.58, and 91.94, respectively. For internalizing behaviors scores, children in Profile 2 followed by children in Profile 1 had the highest mean internalizing behaviors scores, ($M = 107.76$ and $M = 102.35$ for Profiles 2 and 1, respectively). Children in Profiles 3, 4, and 5 had a mean score of 98.84, 100.69, and 94.38, respectively.

The magnitudes of differences between the mean standard scores for social skills and problem behaviors across the five subgroups are shown in Table 4-13. This table provides the standardized mean difference effect sizes for the scores on the PKBS-2 social skills composite and problem behaviors composite. Pooled residual variance was used to estimate the effect sizes for each composite score. Effect sizes show that mean social skills scores for children in Profile 1 were at least one standard deviation below children in Profile 3, 4, and 5 (i.e., 1.35, 1.15, and 1.71, respectively) and .55 standard deviation below children in Profile 2. For Profile 2, effect sizes show children in Profile 2 were .80, .60, and 1.16 standard deviation below children in Profile 3, 4, and 5, respectively. Effect size for Profile 3 was .20 standard deviation above Profile 4 and was 1.16 standard deviation below Profile 5. Profile 4 was .56 standard deviation below Profile 5. These standardized mean differences between profiles were found to be statistically significant at a p-critical value of .01 or smaller except for the difference between mean social skills scores for children in Profile 3 and 4 (ES = .20), which was not statistically significant.

In general, the magnitudes of differences between mean problem behaviors scores across functional ability profile subgroups were not as large as those for social
skills. For problem behaviors, higher scores are associated with more problem behaviors. Effect sizes show that mean problem behaviors scores in Profile 1 was .41 standard deviation below Profile 2 and was .01 standard deviation below Profile 4. Profile 1 was .35 and .58 standard deviation above Profile 3 and 5, respectively. For Profile 2, standardized mean difference effect sizes show children in Profile 2 were .76, .40, and .99 standard deviation above children in Profile 3, 4, and 5, respectively. Effect sizes show that Profile 3 was .36 standard deviation below Profile 4 and was .23 standard deviation above Profile 5. Profile 4 was .59 standard deviation above children Profile 5. Standardized mean differences between profiles were found to be statistically significant at a p-critical value of .05 or smaller except for the difference between mean problem behaviors scores for children in Profile 1 and Profile 3 (ES = .35) or Profile 1 and 4 (ES = .01), which were not statistically significant.

**Research Question 3**

The purpose of this question was to examine whether functional ability profile subgroup membership accounted for more explained variance in social skills and problem behaviors scores than disability category. To explore these relationships, the individual and combined contributions of functional ability profile subgroup membership and children's IDEA-disability category were examined by using these variables as correlates of children's social skills and problem behaviors in a series of regression models. The following explanatory variables were used: IDEA disability category alone, functional ability profile subgroup membership alone, and both variables entered simultaneously in the regression model. The following disability categories were used: autism, developmental delay, emotional-behavioral disturbance, mental retardation, learning disabilities, low incidence, and speech or language impairments.
Associations Between Explanatory Variables

Associations between functional ability profile subgroup membership and disability category were examined before estimating regression models to examine variance accounted for when the variables were entered individually and together. Table 4-14 shows the percentage of the total sample cross-classified by profile and disability category. Table 4-15 shows the distribution of disability categories across the profiles. Of note, 72% of the children in Profile 5 were identified for special education services with the speech or language impairments disability category. This cross-classified group consisted of 29% of the total sample. PEELS staff has reported that a large portion of the sample included children with speech or language impairments who qualified for services due to speech (articulation) issues (Carlson & Lowe, 2009).

As shown in Table 4-14, nearly half the sample was identified with speech or language impairments and one quarter was identified with developmental delay. Speech or language impairments made up 72% of the children in Profile 5, however, it was also represented across all other profiles: 43%, 15%, 25%, and 5% of Profiles 4, 3, 2, and 1, respectively. The distribution of developmental delay (DD) was more similar across profiles; DD represented 26%, 38%, 37%, 32%, and 14% of Profiles 1, 2, 3, 4, and 5, respectively. The distribution of other disability categories varied across profiles. For example, 35% of children in Profile 1 were identified with a low incidence disability, 26% with mental retardation, and 8% with autism. For children in Profile 2, 23% were identified with autism, 6% with a low incidence disability, and 4% with mental retardation. Thirty-seven percent of children in Profile 3 were identified with a low incidence disability and 3% with mental retardation. For children in Profile 4, 8% were identified with a low incidence disability, 6% with autism, 4% with a learning disability,
and 3% with mental retardation. Less than 10% of children in Profile 5 were identified for services with disability categories other than speech or language impairments or developmental delay, nonetheless, most or all disability categories were represented.

As shown in Table 4-14, 9.2% of the total sample were children identified for special education services related to a low incidence disability. Table 4-16 shows the primary IDEA-disability category by profile for children who represented the low-incidence disability category used in the present study. As shown in this table, children with multiple disabilities, orthopedic impairments, or other health impairments were generally represented in all profiles with more representation in Profile 1 or Profile 3 compared to other profiles.

**Estimating Individual and Combined Contributions of Explanatory Variables**

Distribution of disability categories across subgroup membership and within the total sample indicates that there is some relationship or crossover between subgroup membership and disability category, particularly for speech or language impairments and Profile 5. For this reason, the individual and combined contributions of functional ability profile subgroup membership and children’s IDEA-disability category as correlates of their social skills and problem behaviors were examined in two ways. First, the explanatory power of subgroup membership and disability category were examined by estimating three regression models using all five subgroups and all seven disability categories. Model 1 included disability category as an explanatory variable. Model 2 included subgroup membership as an explanatory variable. Model 3 included subgroup membership and disability category entered together as explanatory variables. Second, a holdout analysis was conducted. Children with speech or
language impairments were removed from the sample and the three regression models were reestimated.

**Individual and Combined Contributions of Explanatory Variables**

Table 4-17 shows the R squared variance-explained value for social skills standard scores and problem behaviors standard scores for each explanatory variable and when entered together in the regression model. In general, more variance was explained for social skills scores than problem behaviors scores. In the first regression model, disability category accounted for 16.5% of the variance in social skills scores. In the second regression model (same as Research Question 2), subgroup membership accounted for 20% of the variance in social skills scores. When subgroup membership and disability category were entered simultaneously in the third regression model, they accounted for 25.2% of the variance in social skills scores.

For PKBS-2 problem behaviors standard scores, the explanatory variables accounted for less variance than for social skills. In the first regression model, disability category accounted for 10.8% of the variance in problem behaviors scores. In the second regression model (same as Research Question 2), subgroup membership accounted for 11.5% of the variance in problem behaviors scores. The most variance was accounted for when subgroup membership and disability category were entered simultaneously in the third regression model. This accounted for 15.9% of the variance in problem behavior scores. Again, these data indicate the explanatory variables were not perfectly uncorrelated, as was anticipated.

Table 4-18 shows the R squared variance-explained value for the holdout analyses in which children with speech or language impairments (SLI) were removed from the sample. More variance was explained for social skills scores than problem
behaviors scores. In the first regression model, disability category accounted for 11.4% of the variance in social skills scores. In the second regression model, subgroup membership, however, accounted for 20.1% of the variance in social skills scores. The most variance was accounted for when subgroup membership and disability category were entered simultaneously in the third regression model. This accounted for 23.1% of the variance in social skills scores. Even without SLI in the sample, the explanatory variables were not perfectly uncorrelated.

For problem behaviors, disability category accounted for 7.4% of the variance in problem behaviors standard scores in the first regression model. In the second regression model, subgroup membership accounted for 9% of the variance in problem behaviors scores. In the third regression model when subgroup membership and disability category were entered simultaneously, 10.4% of the variance was accounted for in problem behaviors scores.

**Research Question 4**

The purpose of this question was to explore whether select non-malleable child factors and contextual (i.e., family and environmental) variables moderate relationships between functional ability profile subgroup membership and children’s social skills and problem behaviors. This was examined by inspecting the extent to which non-malleable child factors and contextual factors had an interactive influence on the relationships between functional ability profile subgroup membership and children’s social skills and problem behaviors. Contextual factors were identified as family factors, which included family characteristics and parent-child interaction factors, and other environmental factors, which included school and community variables.
Examination of Non-Malleable Child Factors and Contextual Factors

Sixteen variables related to the four types of factors were selected from the PEELS data set and examined: child factors ($v = 3$), family characteristics ($v = 3$), parent-child interaction factors ($v = 7$), and other environmental factors ($v = 3$). As shown in Appendix C, seven of these variables were continuous, four were dichotomous, and five were categorical. As part of exploratory work for the moderation analyses, frequencies of the categorical variables by subgroup membership were examined. Three variables (child’s race/ethnicity, parent education, number of times a week a family member reads to the child) were identified with no cases or a small proportion of the sample in at least one cross-classified response category (i.e., profile by categorical response). To examine the moderating influence of these categorical variables on the relationships between functional ability profile subgroup membership and social skills and problem behaviors, categories for these variables were recoded to ensure each cross-classified cell had adequate sample sizes to examine moderation.

Table 4-19 shows how the variables were recoded for moderation analyses. Child race ethnicity included six possible response categories: (1) Caucasian/Non-Hispanic; (2) Hispanic; (3) African-American; (4) American Indian or Alaskan Native; (5) Asian, Native Hawaiian, or Pacific Islander; and (6) Multi-racial. Due to the small sample sizes in (1) American Indian or Alaskan Native; (2) Asian, Native Hawaiian, or Pacific Islander; and (3) Multi-racial, these were grouped into an “other” category. This grouping is consistent with other PEELS studies and reports that have reported information about children’s race/ethnicity (e.g., Markowitz et al., 2006). Parent education included seven possible response categories: (1) less than High School with no GED, (2) high school diploma or GED, (3) some college/post secondary vocational
course, (4) 2- or 3-year college degree or vocational school diploma, (5) 4-year college degree, (6) some graduate work/no graduate degree, and (7) graduate degree. Parent education was regrouped into six categories by combining (1) 4-year college degree, (2) some graduate work/no graduate degree, due to the sample size for some graduate work/no graduate degree response category. The number of times a family member reads to the child each week was originally coded as: (1) never, (2) once or twice, (3) 3 to 6 times, and (4) every day. Due to the small sample size for the response category never, this variable was re-coded into 3 response categories: (1) 0 to 2 times, (2) 3 to 6 times, and (3) every day.

Moderation was examined with 13 of the originally coded variables and the three recoded variables. If moderation was identified as statistically significant, follow-up analyses included graphing the slopes by profile for continuous variables or tabling the social skills or problem behavior mean scores for each response category by profile for categorical variables.

**Moderating Influence of Contextual Factors on the Relationship Between Subgroup Membership and Social Skills**

Table 4-20 shows the extent to which variables associated with child factors, family characteristics, parent-child interactions, and other environmental factors predicted children’s social skills scores with and without subgroup membership in the regression model and the extent to which these variables moderated the relationship between subgroup membership and social skills scores.

As shown in the table, child factors of race/ethnicity \( F(12, 61) = 1.29, p = .24 \), age \( F(4, 61) = 1.71, p = .15 \), and gender \( F(4, 61) = .15, p = .96 \) did not have a moderating influence on the relationship between subgroup membership and social skills scores nor
did family factors of parent education \(F(20, 61) = 1.58, p = .08\), marital status \(F(4, 61) = .75, p = .55\), and family income \(F(4, 61) = .74, p = .56\). For parent-child interaction factors, the number of child activities a child had ever participated in, did have a statistically significant moderating influence on the relationship between subgroup membership and social skills scores \(F(4, 61) = 3.93, p = .0066\), while other parent-child interaction variables did not moderate this relationship. Environmental factors, school-community income \(F(12, 61) = 1.50, p = .14\), program support for social interaction \(F(4, 61) = 1.64, p = .17\), and neighborhood safety \(F(8, 61) = 1.07, p = .39\), also did not have a moderating influence on the relationship between subgroup membership and social skills.

To examine further the moderating influence of the number of child activities that a child had ever participated in on the relationship between subgroup membership and social skills scores, the difference between slopes for each profile comparison (i.e., 10 comparisons) was examined. Follow-up analyses revealed that there were statistically significant differences in the slope between Profile 4 and Profile 5 [estimated slope difference = 2.91, \(t(61) = 2.91, p = .0051\)], however this difference in slope was not statistically significant at the Bonferonni-Holm adjusted (Holm, 1979) \(p\)-critical criterion of .005. Nonetheless, the nature of the interaction was of substantive interest and a graph of the interaction was examined and interpreted. Figure 4-3 shows the moderation of differences on children’s social skills between Profile 4 and 5 by the number of extra curricular child activities that a child has participated in. The figure shows that for children who have participated in fewer activities during their life (i.e., 0-1 activities), children in Profile 4 have lower social skills scores than children in Profile 5.
For children who have participated in more activities (i.e., 6 activities), children in Profile 4 have higher social skills scores than children in Profile 5. For children who have participated in 3 or 4 different activities, there is no difference in social skills scores between children in Profile 4 and Profile 5.

**Moderating Influence of Contextual Factors on the Relationship Between Subgroup Membership and Problem Behaviors**

Table 4-21 shows the extent to which variables associated with child factors, family characteristics, parent-child interactions, and other environmental factors predicted children’s problem behaviors scores with and without subgroup membership in the model and the extent to which these variables moderated the relationship between subgroup membership and problem behaviors scores. As shown in the table, the child factor of race/ethnicity \[F(12, 61) = 2.72, p = .005\] was a statistically significant moderator on the relationship between subgroup membership and problem behaviors scores, while, age \[F(4, 61) = 1.63, p = .17\], and gender \[F(4, 61) = .32, p = .86\] did not have a moderating influence on this relationship. Family factors of parent education \[F(20, 61) = 1.97, p = .02\], family income \[F(4, 61) = 2.28, p = .07\], and marital status \[F(4, 61) = 1.19, p = .32\] did not have a moderating influence on the relationship between subgroup membership and problem behavior scores.

For parent-child interaction factors, the number of regular child activities \[F(4, 61) = 5.07, p = .0014\] and the number of parent-child activities \[F(4, 61) = 4.07, p = .0054\], did have a statistically significant moderating influence on the relationship between subgroup membership and problem behaviors scores, while other parent-child interaction variables did not moderate this relationship. For other environmental factors, neighborhood safety \[F(8, 61) = 3.14, p = .0049\], was a statistically significant
moderator on the relationship between subgroup membership and problem behaviors scores, but school-community income \(F(12, 61) = 1.83, p = .06\) and program support for social interaction \(F(4, 61) = .42, p = .79\) were not statistically significant moderators of the relationship between subgroup membership and problem behaviors scores.

To examine further the moderating influence of the continuous variables, follow-up analyses on the number of parent-child activities and number of regular child activities on the relationship between subgroup membership and problem behaviors scores were conducted for each variable. For the number of parent-child activities, follow-up analyses involving comparisons of the differences between the slopes for 10 possible comparisons showed that there were statistically significant differences in the slope between Profile 1 and Profile 3 [estimated slope difference = 4.46, \(t(61) = 3.59, p = .0007\)] and slope between Profile 1 and Profile 5 [estimated slope difference = 4.24, \(t(61) = 3.56, p = .0007\)]. Figure 4-4 shows the moderation of differences on children’s problem behaviors scores between Profile 1 and Profile 3 and between Profile 1 and Profile 5 by the number of parent-child activities. For children who have participated in fewer parent–child activities (i.e., 0-1 activities), the figure shows that the difference between problem behaviors scores for children in Profile 1 compared to children in Profile 3 or 5 is smaller than the difference between problem behaviors scores for children who have participated in more parent-child activities (i.e., 6-7 activities). Visual inspection of the graphed data revealed that outliers in Profile 1 influenced the slope of the line for Profile 1, and thus the moderation effect is likely due to these outliers.

For the number of regular child activities, follow-up analyses showed that there were statistically significant differences in the slope between Profile 1 and Profile 5
[estimated slope difference = 6.83, \( t(61) = 3.09, p = .003 \)]. Figure 4-5 shows the moderation of differences on children’s problem behaviors scores between Profile 1 and Profile 5 by number of regular child activities. The figure shows that the difference in problem behaviors scores between children in Profile 1 and Profile 5 gets larger (higher ratings of problem behaviors for Profile 1) as the number of regular child activities increases.

To examine further the moderating influence of the categorical variables (i.e., child’s race/ethnicity and neighborhood safety) on the relationship between subgroup membership and problem behaviors scores, the problem behaviors standard score means for each profile for every response category of the categorical variable were calculated and tabled. Examination of statistically significant, mean difference comparisons for every possible comparison were not conducted due to the large number of comparisons for each variable (i.e., 30 comparisons for race/ethnicity and 15 comparisons for neighborhood safety).

Table 4-22 shows the mean problem behaviors scores for children in each profile for race/ethnicity. Consistent with means identified for each profile under Research Question 2, children in Profile 2 tend to have the highest mean problem behaviors scores while children in Profile 5 tend to have the lowest mean problem behaviors scores. A few descriptive differences in mean scores are noted to highlight what the moderation is evaluating, but, as previously indicated, comparisons were not examined for statistical significance. For example, the difference between problem behaviors mean scores for Caucasian/ Non-Hispanic children and Hispanic children was 9, 3, 1, 2, and 1 for Profile 1, 2, 3, 4, and 5, respectively. The 9-point difference between
Caucasian/Non-Hispanic children and Hispanic children for Profile 1 was not consistent with the pattern of the relationship across other profiles, suggesting some moderation between these response categories across subgroup profiles.

Table 4-23 shows the mean problem behaviors scores for children in each profile for the neighborhood safety response categories. Descriptively, there was a difference between problem behaviors scores for children who live in a very safe neighborhood compared to children who live in a not safe neighborhood among the profiles, suggesting some moderation between these response categories across profiles. Profiles 1, 3, and 5 had a large difference in scores between children who live in a very safe neighborhood compared a not safe neighborhood (5 to 6 point difference), while there was a small difference between these groups for Profiles 2 and 4 (1 to 2 point difference). In contrast, the differences between problem behaviors scores for children who live in a very safe neighborhood were very similar to children who live in a safe neighborhood across profiles. There was a 3- or 4-point difference between children who live in a very safe neighborhood or a safe neighborhood across all profiles. In this set of mean difference comparisons (safe vs. very safe), the similar mean differences across profiles suggest no moderation between these response categories across profiles.

Summary

Results from the latent class analyses conducted in the present study showed that functional ability variables included in the PEELS data set were useful for empirically deriving distinct and interpretable latent classes. A 5-class model was identified based on statistical and substantive interpretations. The distinctions between profiles were
related to children’s severity of limitations, number of limitations, and type of limitations across functional ability indicators.

Regression analyses to explore the relationships between children’s functional ability profile subgroup membership and their social skills and problem behaviors showed that functional ability profile subgroup membership had a small to moderate relationship with children’s social skills and problem behaviors. Statistically significant and noteworthy differences in social skills and problem behavior scores were identified between subgroups. Examination of the individual and collective contributions of functional ability profile subgroup membership and children’s IDEA-disability category as correlates of their social skills and problem behaviors showed that functional ability profile subgroup membership provided somewhat more explanatory power than the use of disability categories. When disability category and functional ability profile subgroup membership were included together in the regression models, explanatory power was larger than when either variable was used alone.

Regression analyses that included an interaction term were used to explore whether select contextual variables moderated relationships between functional ability profile subgroup membership and children’s social skills and problem behaviors. Moderation analyses revealed that only one variable moderated the relationship between functional ability profile subgroup membership and social skills. This variable was the number of child activities. Three variables moderated the relationship between functional ability profile subgroup membership and problem behaviors. These variables were race/ethnicity, number of regular child activities, and neighborhood safety.
The secondary analyses conducted in the present study were exploratory. Findings generally supported empirically hypothesized relationships shown in Figures 3-1 to 3-3. The present study offers preliminary evidence to suggest there are subgroups of young children with disabilities served under IDEA who share similar functional ability profiles and these profiles might be examined further in future studies. Chapter 5 includes additional discussion of primary findings and implications from the present study.
Table 4-1. Proportion of sample for each response category for PEELS Disability Severity Index

<table>
<thead>
<tr>
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<th>No limitations (1)</th>
<th>Mild limitations (2)</th>
<th>Moderate limitations (3)</th>
<th>Severe limitations (4)</th>
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<td>1.0</td>
<td>4.3</td>
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<td>2.0</td>
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<td>10.8</td>
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<td>32.0</td>
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</tr>
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<td>Inappropriate or Unusual Behavior</td>
<td>60.6</td>
<td>26.0</td>
<td>10.5</td>
<td>3.0</td>
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</table>

Note.  \( N = 2870 \). Estimates weighted using sampling weights. 

n/a indicates that only 3 response categories (1, 2, and 4) were used for the functional ability item in the PEELS Disability Severity Index.
### Table 4-2. Proportion of sample for each response category used in latent class analysis

<table>
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</table>

**Note.** $N = 2870$. Estimates weighted using Taylor method.

n/a indicates that only 3 response categories (1, 2, and 4) were used for the functional ability item in the PEELS Disability Severity Index.

† indicates that cases in the this response category were re-coded to conduct analyses (i.e., response category 3 was re-coded to 4).
<table>
<thead>
<tr>
<th># of classes</th>
<th>LL</th>
<th># of parameters</th>
<th>BIC</th>
<th>Entropy</th>
<th># of replications</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-33955.832</td>
<td>73</td>
<td>68492.920</td>
<td>0.843</td>
<td>40</td>
</tr>
<tr>
<td>3</td>
<td>-33231.445</td>
<td>110</td>
<td>67338.755</td>
<td>0.805</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>-32808.467</td>
<td>147</td>
<td>66787.410</td>
<td>0.842</td>
<td>37</td>
</tr>
<tr>
<td>5</td>
<td>-32577.949</td>
<td>184</td>
<td>66620.983</td>
<td>0.835</td>
<td>13&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>6</td>
<td>-32420.620</td>
<td>221</td>
<td>66600.935</td>
<td>0.828</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>-32275.788</td>
<td>258</td>
<td>66605.880</td>
<td>0.784</td>
<td>6</td>
</tr>
</tbody>
</table>

Note. LL = log likelihood. BIC = Bayesian Information Criterion. Replications based on sets of 500 start values with display set to show top 40 values.

<sup>a</sup> 13 replications -32577.949 and 21 replications -32577.955. Estimates for the models with the two largest log likelihood were quite similar with differences in the third decimal place or smaller.
Table 4-4. Model-implied means (standard deviations) for 5-class models

<table>
<thead>
<tr>
<th></th>
<th>Profile 1 &lt;br&gt; ((n = 140))</th>
<th>Profile 2 &lt;br&gt; ((n = 420))</th>
<th>Profile 3 &lt;br&gt; ((n = 200))</th>
<th>Profile 4 &lt;br&gt; ((n = 950))</th>
<th>Profile 5 &lt;br&gt; ((n = 1150))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>3.53 (0.45)</td>
<td>3.36 (0.47)</td>
<td>2.19 (1.28)</td>
<td>2.51 (0.92)</td>
<td>2.08 (1.11)</td>
</tr>
<tr>
<td>Understanding</td>
<td>2.64 (0.40)</td>
<td>2.56 (0.34)</td>
<td>1.44 (0.33)</td>
<td>1.74 (0.31)</td>
<td>1.11 (0.10)</td>
</tr>
<tr>
<td>Cognition</td>
<td>3.82 (0.17)</td>
<td>3.36 (0.62)</td>
<td>2.50 (0.62)</td>
<td>2.61 (0.47)</td>
<td>1.90 (0.24)</td>
</tr>
<tr>
<td>Overall Health</td>
<td>2.58 (1.12)</td>
<td>1.97 (1.00)</td>
<td>2.12 (1.12)</td>
<td>1.53 (0.62)</td>
<td>1.29 (0.39)</td>
</tr>
<tr>
<td>Use of Arms</td>
<td>2.93 (0.99)</td>
<td>1.27 (0.25)</td>
<td>2.02 (1.01)</td>
<td>1.06 (0.06)</td>
<td>1.00 (0.00)</td>
</tr>
<tr>
<td>Use of Hands</td>
<td>3.68 (0.53)</td>
<td>2.30 (1.10)</td>
<td>2.55 (1.02)</td>
<td>1.41 (0.35)</td>
<td>1.08 (0.08)</td>
</tr>
<tr>
<td>Use of Legs</td>
<td>2.75 (1.03)</td>
<td>1.28 (0.24)</td>
<td>2.30 (1.33)</td>
<td>1.05 (0.05)</td>
<td>1.03 (0.06)</td>
</tr>
<tr>
<td>Social Skills</td>
<td>3.26 (0.87)</td>
<td>3.03 (0.92)</td>
<td>1.76 (0.87)</td>
<td>1.99 (1.08)</td>
<td>1.27 (0.43)</td>
</tr>
<tr>
<td>Behavior</td>
<td>2.29 (1.02)</td>
<td>2.53 (0.69)</td>
<td>1.27 (0.26)</td>
<td>1.64 (0.48)</td>
<td>1.09 (0.11)</td>
</tr>
<tr>
<td>Reg. of Activity Lev.</td>
<td>2.79 (1.49)</td>
<td>3.25 (1.27)</td>
<td>2.09 (1.43)</td>
<td>2.84 (1.45)</td>
<td>1.67 (0.78)</td>
</tr>
<tr>
<td>Reg. of Attention</td>
<td>3.12 (1.27)</td>
<td>3.18 (1.26)</td>
<td>2.17 (1.36)</td>
<td>2.57 (1.15)</td>
<td>1.60 (0.64)</td>
</tr>
<tr>
<td>Motivation</td>
<td>3.27 (1.32)</td>
<td>3.21 (1.20)</td>
<td>2.38 (1.33)</td>
<td>2.67 (1.34)</td>
<td>2.00 (1.03)</td>
</tr>
<tr>
<td>Reg. of Emotions</td>
<td>1.37 (0.58)</td>
<td>1.82 (1.23)</td>
<td>1.39 (0.84)</td>
<td>1.29 (0.50)</td>
<td>1.07 (0.09)</td>
</tr>
<tr>
<td>Hearing</td>
<td>1.26 (0.68)</td>
<td>1.10 (0.27)</td>
<td>1.18 (0.51)</td>
<td>1.18 (0.47)</td>
<td>1.13 (0.37)</td>
</tr>
<tr>
<td>Vision</td>
<td>2.24 (1.66)</td>
<td>1.10 (0.17)</td>
<td>1.42 (0.69)</td>
<td>1.10 (0.17)</td>
<td>1.04 (0.08)</td>
</tr>
</tbody>
</table>

Note. \(N = 2870\), however, subgroup numbers do not sum to total due to rounding error. Estimates weighted using sampling weights. Bolded items range from 2.5 and above to denote ratings associated with moderate to severe limitations. Italicized items range from 1.5 to 2.49 to denote ratings with mild to moderate limitations.
Table 4-5. Average latent class posterior probabilities for most likely class membership

<table>
<thead>
<tr>
<th>Actual assigned profile</th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profile 1</td>
<td>.906</td>
<td>.057</td>
<td>.036</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td>Profile 2</td>
<td>.021</td>
<td>.891</td>
<td>.012</td>
<td>.076</td>
<td>.000</td>
</tr>
<tr>
<td>Profile 3</td>
<td>.026</td>
<td>.009</td>
<td>.881</td>
<td>.066</td>
<td>.019</td>
</tr>
<tr>
<td>Profile 4</td>
<td>.044</td>
<td>.000</td>
<td>.029</td>
<td>.860</td>
<td>.066</td>
</tr>
<tr>
<td>Profile 5</td>
<td>.000</td>
<td>.000</td>
<td>.005</td>
<td>.071</td>
<td>.923</td>
</tr>
</tbody>
</table>

Table 4-6. Demographic and descriptive information for children within each profile

<table>
<thead>
<tr>
<th></th>
<th>Profile 1 (5% of sample)</th>
<th>Profile 2 (15% of sample)</th>
<th>Profile 3 (7% of sample)</th>
<th>Profile 4 (33% of sample)</th>
<th>Profile 5 (40% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child gender (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>74</td>
<td>78</td>
<td>58</td>
<td>74</td>
<td>67</td>
</tr>
<tr>
<td>Female</td>
<td>26</td>
<td>22</td>
<td>42</td>
<td>26</td>
<td>33</td>
</tr>
<tr>
<td>Age distributions (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 years-of-age</td>
<td>19</td>
<td>23</td>
<td>20</td>
<td>25</td>
<td>18</td>
</tr>
<tr>
<td>4 years-of-age</td>
<td>38</td>
<td>43</td>
<td>41</td>
<td>33</td>
<td>40</td>
</tr>
<tr>
<td>5 years-of-age</td>
<td>43</td>
<td>34</td>
<td>39</td>
<td>42</td>
<td>41</td>
</tr>
<tr>
<td>Child race/ethnicity (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian/Non-Hispanic</td>
<td>60</td>
<td>55</td>
<td>68</td>
<td>55</td>
<td>71</td>
</tr>
<tr>
<td>Hispanic</td>
<td>15</td>
<td>24</td>
<td>20</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>African American</td>
<td>14</td>
<td>11</td>
<td>8</td>
<td>13</td>
<td>8</td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>0</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Asian, Native Hawaiian, or Pacific Islander</td>
<td>0</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Multi-racial</td>
<td>11</td>
<td>9</td>
<td>4</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>English as a second language (%)</td>
<td>24</td>
<td>25</td>
<td>21</td>
<td>23</td>
<td>16</td>
</tr>
<tr>
<td>IFSP before 3 (%)</td>
<td>82</td>
<td>50</td>
<td>72</td>
<td>36</td>
<td>26</td>
</tr>
<tr>
<td>Mean age in months (SD)</td>
<td>55 (9)</td>
<td>54 (8)</td>
<td>55 (9)</td>
<td>55 (9)</td>
<td>56 (8)</td>
</tr>
<tr>
<td>Mean no. weeks premature (SD)</td>
<td>3.9 (5.6)</td>
<td>1.6 (3.1)</td>
<td>3.3 (4.7)</td>
<td>1.5 (3.3)</td>
<td>.9 (2.5)</td>
</tr>
<tr>
<td>Mean birth weight in grams (SD)</td>
<td>2665 (1134)</td>
<td>3147 (765)</td>
<td>2722 (1049)</td>
<td>3147 (822)</td>
<td>3289 (709)</td>
</tr>
</tbody>
</table>

Note. $N = 2870$. Estimates weighted using sampling weights. All variables reported by parent or guardian. IFSP = individualized family service plan.
Table 4-7. Demographic and descriptive information for families within each profile

<table>
<thead>
<tr>
<th></th>
<th>Profile 1 (5% of sample)</th>
<th>Profile 2 (15% of sample)</th>
<th>Profile 3 (7% of sample)</th>
<th>Profile 4 (33% of sample)</th>
<th>Profile 5 (40% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children live with respondent (%)</td>
<td>100</td>
<td>&lt;100</td>
<td>100</td>
<td>&lt;100</td>
<td>&lt;100</td>
</tr>
<tr>
<td>Respondent Role (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological mother</td>
<td>88</td>
<td>84</td>
<td>93</td>
<td>84</td>
<td>88</td>
</tr>
<tr>
<td>Adoptive mother</td>
<td>#</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Biological father</td>
<td>3</td>
<td>3</td>
<td>#</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Other role (e.g., grandparent, foster)</td>
<td>7</td>
<td>8</td>
<td>#</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Single parent family (%)</td>
<td>17</td>
<td>38</td>
<td>32</td>
<td>32</td>
<td>23</td>
</tr>
<tr>
<td>Respondent education level (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school or GED</td>
<td>16</td>
<td>19</td>
<td>17</td>
<td>17</td>
<td>9</td>
</tr>
<tr>
<td>High School or GED</td>
<td>22</td>
<td>31</td>
<td>20</td>
<td>36</td>
<td>28</td>
</tr>
<tr>
<td>Some college or 2 year degree</td>
<td>45</td>
<td>29</td>
<td>33</td>
<td>26</td>
<td>33</td>
</tr>
<tr>
<td>Four-year degree or higher</td>
<td>17</td>
<td>21</td>
<td>30</td>
<td>21</td>
<td>29</td>
</tr>
<tr>
<td>Family income bracket (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than $10,000</td>
<td>19</td>
<td>18</td>
<td>12</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td>$10,000 – $20,000</td>
<td>14</td>
<td>17</td>
<td>20</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>$20,000 – $30,000</td>
<td>6</td>
<td>11</td>
<td>13</td>
<td>21</td>
<td>17</td>
</tr>
<tr>
<td>$30,000 – $40,000</td>
<td>8</td>
<td>15</td>
<td>9</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>$40,000 – $50,000</td>
<td>11</td>
<td>12</td>
<td>7</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>$50,000 and above</td>
<td>42</td>
<td>27</td>
<td>39</td>
<td>30</td>
<td>39</td>
</tr>
<tr>
<td>Parent ratings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Avg. rating of neighborhood safety</td>
<td>Safe</td>
<td>Safe</td>
<td>Safe</td>
<td>Safe</td>
<td>Safe</td>
</tr>
<tr>
<td>Avg. rating of satisfaction with special education services</td>
<td>Satisfied</td>
<td>Satisfied</td>
<td>Satisfied</td>
<td>Satisfied</td>
<td>Satisfied</td>
</tr>
</tbody>
</table>

Note. *N* = 2870. Estimates weighted using sampling weights. All variables reported by parent or guardian.
Table 4-8. Descriptive information about child and family activities within each profile

<table>
<thead>
<tr>
<th></th>
<th>Profile 1 (5% of sample)</th>
<th>Profile 2 (15% of sample)</th>
<th>Profile 3 (7% of sample)</th>
<th>Profile 4 (33% of sample)</th>
<th>Profile 5 (40% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children who regularly participate in group activities (%)(^a)</td>
<td>36</td>
<td>47</td>
<td>46</td>
<td>45</td>
<td>55</td>
</tr>
<tr>
<td><strong>Child-Family Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family member reads to child (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 – 2 times a week</td>
<td>26</td>
<td>28</td>
<td>19</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>3 – 6 times a week</td>
<td>26</td>
<td>29</td>
<td>34</td>
<td>35</td>
<td>41</td>
</tr>
<tr>
<td>Everyday</td>
<td>47</td>
<td>43</td>
<td>48</td>
<td>40</td>
<td>43</td>
</tr>
<tr>
<td><strong>Child Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean no. extra-curricular activities children have ever participated in (SD)(^b)</td>
<td>&lt;1 (1)</td>
<td>&lt;1 (1)</td>
<td>1 (1)</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Mean no. of regular group activities (^c)</td>
<td>1.2 (.5)</td>
<td>1.3 (.7)</td>
<td>1.6 (.7)</td>
<td>1.3 (.6)</td>
<td>1.4 (.7)</td>
</tr>
<tr>
<td><strong>Family-School Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean no. activities parents attend at child’s school (SD)(^d)</td>
<td>3 (2)</td>
<td>3 (2)</td>
<td>3 (2)</td>
<td>3 (2)</td>
<td>4 (2)</td>
</tr>
<tr>
<td><strong>Child-Family Activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean no. of different family activities (SD)(^e)</td>
<td>5 (1)</td>
<td>5 (1)</td>
<td>5 (1)</td>
<td>5 (2)</td>
<td>6 (1)</td>
</tr>
<tr>
<td>Mean no. of family meals each week (SD)</td>
<td>5 (2)</td>
<td>5 (2)</td>
<td>5 (2)</td>
<td>5 (2)</td>
<td>5 (2)</td>
</tr>
</tbody>
</table>

Note. \(N = 2870\). Estimates weighted using sampling weights. All variables reported by parent or guardian.

\(^a\) Represents the percentage of parents who indicated the child participates in group activities on a monthly basis.

\(^b\) Represents the sum of responses to whether child has ever participated in 7 possible extra-curricular activities - dance lessons, athletics, clubs, music lessons, drama classes, art classes, or other performance activities.

\(^c\) Represents the sum of responses to whether child participates monthly in 6 possible group activities - playgroup, story hour, religious group lessons, athletic team, or recreational clubs; for those who indicated yes to any group activity.

\(^d\) Represents the sum of responses to whether the parent or guardian attends 7 possible activities at the child’s school – general school meetings, attend class events, volunteer in classroom, field trips, parent-teacher conferences, policy council or similar, or fundraising

\(^e\) Represents the sum of responses to whether someone in the family and child go to 7 possible locations – grocery store, shopping mall, restaurant, public park/playground, place of worship, library, or movie.
Table 4-9. Descriptive information about programs or schools for children and families within each profile

<table>
<thead>
<tr>
<th>Percentage of school population from low-income families (%)</th>
<th>Profile 1 (5% of sample)</th>
<th>Profile 2 (15% of sample)</th>
<th>Profile 3 (7% of sample)</th>
<th>Profile 4 (33% of sample)</th>
<th>Profile 5 (40% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 25%</td>
<td>37</td>
<td>32</td>
<td>32</td>
<td>28</td>
<td>40</td>
</tr>
<tr>
<td>25 – 50%</td>
<td>20</td>
<td>24</td>
<td>36</td>
<td>32</td>
<td>27</td>
</tr>
<tr>
<td>50 – 75%</td>
<td>29</td>
<td>13</td>
<td>8</td>
<td>13</td>
<td>12</td>
</tr>
<tr>
<td>More than 75%</td>
<td>14</td>
<td>31</td>
<td>24</td>
<td>27</td>
<td>21</td>
</tr>
<tr>
<td>Program quality (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preschool accredited ((n = 1030))</td>
<td>42</td>
<td>47</td>
<td>62</td>
<td>48</td>
<td>50</td>
</tr>
<tr>
<td>School met NCLB standards ((n = 1150))</td>
<td>89</td>
<td>92</td>
<td>83</td>
<td>91</td>
<td>93</td>
</tr>
<tr>
<td>Program supports social interactions among children with and without disabilities (%)</td>
<td>69</td>
<td>54</td>
<td>64</td>
<td>60</td>
<td>53</td>
</tr>
<tr>
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<td>With IEP</td>
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<td>8 (4)</td>
<td>7 (3)</td>
<td>8 (4)</td>
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<td>4 (6)</td>
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<td>Children have IEP goal focused on (%)</td>
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Note. \(N = 2870\) for variables completed by parents or guardians, \(N = 2180\) for variables completed by teachers and program administrators or principals. Estimates weighted using sampling weights. NCLB = No Child Left Behind Act; IEP = Individualized Education Program.
Table 4-10. Comparative demographic information for samples used in analyses.

<table>
<thead>
<tr>
<th>Sample with parent-child weights; (N = 2870)</th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
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<tbody>
<tr>
<td>Percent of Sample (%)</td>
<td>5</td>
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<td>Child gender (%)</td>
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<td>22</td>
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<td>29</td>
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<tr>
<td>Child race/ethnicity (%)</td>
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<table>
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<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
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<td>7</td>
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<td>40</td>
<td>100</td>
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<td>Mean age in months</td>
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<td>65</td>
<td>56</td>
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<table>
<thead>
<tr>
<th>Sample with PKBS-2 scores; (N = 2090)</th>
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<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Child gender (%)</td>
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<td>89</td>
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<td>70</td>
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<td>11</td>
<td>48</td>
<td>26</td>
<td>34</td>
<td>30</td>
</tr>
<tr>
<td>Child race/ethnicity (%)</td>
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<td>65</td>
<td>58</td>
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<td>5</td>
<td>13</td>
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</table>

Note. Estimates weighted using sampling weights.
<table>
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<th></th>
<th>M</th>
<th>St. Error</th>
<th>CI</th>
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<td><strong>Social skills composite score</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Profile 1 ($n = 130$)</td>
<td>69.99</td>
<td>3.22</td>
<td>63.55, 76.43</td>
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<tr>
<td>Profile 2 ($n = 290$)</td>
<td>80.28</td>
<td>1.95</td>
<td>76.38, 84.18</td>
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<tr>
<td>Profile 3 ($n = 150$)</td>
<td>95.28</td>
<td>1.94</td>
<td>91.40, 99.16</td>
</tr>
<tr>
<td>Profile 4 ($n = 670$)</td>
<td>91.61</td>
<td>0.95</td>
<td>89.70, 93.51</td>
</tr>
<tr>
<td>Profile 5 ($n = 840$)</td>
<td>102.08</td>
<td>0.89</td>
<td>100.30, 103.86</td>
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<tr>
<td><strong>Problem behaviors composite score</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Profile 1 ($n = 130$)</td>
<td>100.61</td>
<td>2.12</td>
<td>96.37, 104.85</td>
</tr>
<tr>
<td>Profile 2 ($n = 290$)</td>
<td>106.45</td>
<td>0.96</td>
<td>104.53, 108.37</td>
</tr>
<tr>
<td>Profile 3 ($n = 150$)</td>
<td>95.71</td>
<td>1.31</td>
<td>93.09, 98.33</td>
</tr>
<tr>
<td>Profile 4 ($n = 670$)</td>
<td>100.81</td>
<td>0.92</td>
<td>98.97, 102.65</td>
</tr>
<tr>
<td>Profile 5 ($n = 830$)</td>
<td>92.43</td>
<td>0.68</td>
<td>91.07, 93.79</td>
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</tbody>
</table>

Note. $N = 2090$, however, profile numbers do not sum to total due to rounding error. Estimates weighted using sampling weights.
### Table 4-12. PKBS-2 sub-scale scores for each profile

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<th>( \text{St. Error} )</th>
<th>( \text{CI} )</th>
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</thead>
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<tr>
<td><strong>Social cooperation</strong></td>
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<td>Profile 1</td>
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<td>67.33, 82.93</td>
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<tr>
<td>Profile 2</td>
<td>87.66</td>
<td>1.73</td>
<td>84.20, 91.12</td>
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<tr>
<td>Profile 3</td>
<td>100.43</td>
<td>1.85</td>
<td>96.73, 104.13</td>
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<td>93.91, 97.63</td>
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<tr>
<td>Profile 5</td>
<td>105.58</td>
<td>0.79</td>
<td>104.00, 107.16</td>
</tr>
<tr>
<td><strong>Social interaction</strong></td>
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<td>60.05, 72.93</td>
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<td>74.39, 81.91</td>
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<td>91.12</td>
<td>2.14</td>
<td>86.84, 95.40</td>
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<td>87.00, 90.96</td>
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<td>0.95</td>
<td>96.16, 99.96</td>
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<td>69.09, 81.81</td>
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<tr>
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<td>1.85</td>
<td>78.26, 85.66</td>
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<tr>
<td>Profile 3</td>
<td>96.09</td>
<td>1.70</td>
<td>92.69, 99.49</td>
</tr>
<tr>
<td>Profile 4</td>
<td>93.07</td>
<td>0.92</td>
<td>91.23, 94.91</td>
</tr>
<tr>
<td>Profile 5</td>
<td>101.53</td>
<td>0.78</td>
<td>99.97, 103.09</td>
</tr>
<tr>
<td><strong>Externalizing behaviors</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Profile 1</td>
<td>98.83</td>
<td>2.07</td>
<td>94.69, 102.97</td>
</tr>
<tr>
<td>Profile 2</td>
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<td>1.06</td>
<td>101.89, 106.13</td>
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<tr>
<td>Profile 3</td>
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<td>1.25</td>
<td>91.08, 96.08</td>
</tr>
<tr>
<td>Profile 4</td>
<td>100.90</td>
<td>0.99</td>
<td>98.92, 102.88</td>
</tr>
<tr>
<td>Profile 5</td>
<td>91.94</td>
<td>0.62</td>
<td>90.70, 93.18</td>
</tr>
<tr>
<td><strong>Internalizing behaviors</strong></td>
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<tr>
<td>Profile 1</td>
<td>102.35</td>
<td>2.12</td>
<td>98.11, 106.59</td>
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<tr>
<td>Profile 2</td>
<td>107.76</td>
<td>1.07</td>
<td>105.62, 109.9</td>
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<tr>
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<td>1.35</td>
<td>96.14, 101.54</td>
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<tr>
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<td>99.09, 102.29</td>
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<td>Profile 5</td>
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<td>0.71</td>
<td>92.96, 95.80</td>
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*Note. \( N = 2090 \). Estimates weighted using sampling weights.*
Table 4-13. PKBS-2 composite scores standardized mean difference effect sizes

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<tr>
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<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>Profile 1</td>
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<td>-1.35***</td>
<td>-1.15***</td>
<td>-1.71***</td>
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<tr>
<td>Profile 2</td>
<td>--</td>
<td>-.80***</td>
<td>-.60***</td>
<td>-1.16***</td>
</tr>
<tr>
<td>Profile 3</td>
<td>--</td>
<td>--</td>
<td>0.20</td>
<td>-0.36**</td>
</tr>
<tr>
<td>Profile 4</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>-0.56***</td>
</tr>
</tbody>
</table>

| **Problem behaviors composite score** |           |           |           |           |
| Profile 1      | 0.41*     | -0.35     | 0.01      | -0.58***  |
| Profile 2      | --        | -0.76***  | -0.40***  | -0.99***  |
| Profile 3      | --        | --        | 0.36***   | -0.23*    |
| Profile 4      | --        | --        | --        | -0.59***  |

Note. N = 2090. Estimates weighted using sampling weights. Effect sizes estimated for row vs. column. For social skills, a positive effect size is associated with more social skills (positive outcome) and a negative effect is associated with less social skills. For problem behaviors, a positive effect size is associated with more problem behaviors (negative outcome) and a negative effect is associated with less problem behaviors. Effect sizes were estimated by subtracting the means of column group from the row group and dividing the difference by the square root of the residual variance.

***p < .001
** p < .01
* p < .05
Table 4-14. Percentage of total sample by profile and disability category

<table>
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<tr>
<th></th>
<th>SLI</th>
<th>DD</th>
<th>LI</th>
<th>AUT</th>
<th>MR</th>
<th>LD</th>
<th>EBD</th>
<th>Missing</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Profile 1</td>
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</table>

Note. $N = 2870$. Estimates weighted using sampling weights. SLI = speech or language impairments; DD = developmental disability; LI = low incidence disability; AUT = autism; MR = mental retardation; LD = learning disability; EBD = emotional behavioral disturbance; and Missing = disability category not identified.
Table 4-15. Percentage of profile sample by disability category

<table>
<thead>
<tr>
<th></th>
<th>Profile 1 (5% of sample)</th>
<th>Profile 2 (15% of sample)</th>
<th>Profile 3 (7% of sample)</th>
<th>Profile 4 (33% of sample)</th>
<th>Profile 5 (40% of sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SLI</td>
<td>5</td>
<td>25</td>
<td>15</td>
<td>43</td>
<td>72</td>
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</tr>
<tr>
<td>MISSING</td>
<td>#</td>
<td>#</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Note.  N = 2870. Estimates weighted using sampling weights. SLI = speech or language impairments; DD = developmental disability; LI = low incidence disability; AUT = autism; MR = mental retardation; LD = learning disability; EBD = emotional behavioral disturbance; and Missing = disability category not identified. In this table the # symbol is used to indicate cells with less than 3% of the profile sample, including cells with zero cases.
Table 4-16. Percentage of total sample for disability categories within the low incidence disability category by disability category and profile

<table>
<thead>
<tr>
<th>Disability Category</th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hearing impairment</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>6</td>
<td>#</td>
<td>9</td>
</tr>
<tr>
<td>Deaf/blind</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Deafness</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>4</td>
</tr>
<tr>
<td>Multiple disabilities</td>
<td>8</td>
<td>4</td>
<td>6</td>
<td>#</td>
<td>#</td>
<td>19</td>
</tr>
<tr>
<td>Orthopedic</td>
<td>4</td>
<td>#</td>
<td>18</td>
<td>#</td>
<td>4</td>
<td>27</td>
</tr>
<tr>
<td>Other health impairments</td>
<td>7</td>
<td>5</td>
<td>11</td>
<td>6</td>
<td>4</td>
<td>32</td>
</tr>
<tr>
<td>Traumatic brain injury</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>4</td>
</tr>
<tr>
<td>Visual impairment</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>10</td>
<td>37</td>
<td>18</td>
<td>15</td>
<td>100</td>
</tr>
</tbody>
</table>

Note. $N = 160$. Estimates weighted using sampling weights. Low incidence makes up 9.2% of the total sample. In this table the # symbol is used to indicate cells with less than 3% of the profile sample, including cells with zero cases.
Table 4-17. Variance accounted with the addition of explanatory variables: $R^2$

<table>
<thead>
<tr>
<th>Model</th>
<th>Explanatory variable</th>
<th>PKBS-2 composite score $R^2$</th>
<th>Social skills</th>
<th>Problem behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Disability category</td>
<td></td>
<td>.165</td>
<td>.108</td>
</tr>
<tr>
<td>2</td>
<td>Subgroup membership</td>
<td></td>
<td>.200</td>
<td>.115</td>
</tr>
<tr>
<td>3</td>
<td>Subgroup membership and disability category</td>
<td></td>
<td>.252</td>
<td>.159</td>
</tr>
</tbody>
</table>

Table 4-18. Hold-out analyses for $R^2$

<table>
<thead>
<tr>
<th>Model</th>
<th>Explanatory variable</th>
<th>PKBS-2 composite score $R^2$</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Social skills</td>
<td>Problem behaviors</td>
</tr>
<tr>
<td>1</td>
<td>Disability category</td>
<td>.114</td>
<td>.074</td>
</tr>
<tr>
<td>2</td>
<td>Subgroup membership</td>
<td>.201</td>
<td>.090</td>
</tr>
<tr>
<td>3</td>
<td>Subgroup membership and disability category</td>
<td>.231</td>
<td>.104</td>
</tr>
</tbody>
</table>

Note. $N = 1090$. Estimates weighted using sampling weights. These analyses used a subset of the sample to examine the variance explained after excluding cases with speech or language impairments indicated as the disability category.
Table 4-19. Modified categorical coding for moderation analyses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Original coding</th>
<th>Coding for moderation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child race ethnicity</td>
<td>1. Caucasian/Non-Hispanic</td>
<td>1. Caucasian/Non-Hispanic</td>
</tr>
<tr>
<td></td>
<td>2. Hispanic</td>
<td>2. Hispanic</td>
</tr>
<tr>
<td></td>
<td>4. American Indian or Alaskan Native</td>
<td>4. Other</td>
</tr>
<tr>
<td></td>
<td>5. Asian, Native Hawaiian, or Pacific Islander</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Multi-racial</td>
<td></td>
</tr>
<tr>
<td>Parent education</td>
<td>1. Less than High School with no GED</td>
<td>1. Less than High School with no GED</td>
</tr>
<tr>
<td></td>
<td>2. High School diploma or GED</td>
<td>2. High School diploma or GED</td>
</tr>
<tr>
<td></td>
<td>4. 2- or 3-year college degree or vocational school diploma</td>
<td>4. 2- or 3-year college degree or vocational school diploma</td>
</tr>
<tr>
<td></td>
<td>5. 4-year college degree</td>
<td>5. 4-year college degree with or without some graduate work</td>
</tr>
<tr>
<td></td>
<td>6. Some graduate work/no graduate degree</td>
<td>(no graduate degree)</td>
</tr>
<tr>
<td></td>
<td>7. Graduate degree</td>
<td>6. Graduate degree</td>
</tr>
<tr>
<td>Read to child each week</td>
<td>1. Never</td>
<td>1. 0 to 2 times</td>
</tr>
<tr>
<td></td>
<td>2. Once or twice</td>
<td>2. 3 to 6 times</td>
</tr>
<tr>
<td></td>
<td>3. 3 to 6 times</td>
<td>3. Every day</td>
</tr>
<tr>
<td></td>
<td>4. Every day</td>
<td></td>
</tr>
</tbody>
</table>
Table 4-20. Moderation of differences among profiles on social skills by non-malleable child factors and contextual factors

<table>
<thead>
<tr>
<th>Non-Malleable Child Factors</th>
<th>Prediction</th>
<th>Moderation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>df</td>
<td>F-value</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>Yes (.012)</td>
<td>No (.103)</td>
</tr>
<tr>
<td>Age</td>
<td>Yes (&lt;.001)</td>
<td>Yes (&lt;.001)</td>
</tr>
<tr>
<td>Gender</td>
<td>Yes (.021)</td>
<td>No (.096)</td>
</tr>
</tbody>
</table>

Contextual Factors

<table>
<thead>
<tr>
<th>Family Characteristic</th>
<th>Prediction</th>
<th>Moderation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent education</td>
<td>No (.472)</td>
<td>No (.217)</td>
</tr>
<tr>
<td>Marital status</td>
<td>No (.198)</td>
<td>No (.395)</td>
</tr>
<tr>
<td>Family income</td>
<td>No (.367)</td>
<td>No (.432)</td>
</tr>
</tbody>
</table>

Parent-Child Interaction

| Parent-child activities (#) | Yes (.004) | Yes (.006) | 4.61 | 3.93 | .0066 | .007 | Yes |
| Parent-child activities (#) | Yes (.031) | Yes (.008) | 4.61 | 1.76 | .1490 | .008 | No |
| Regular child activities (#) | Yes (.019) | Yes (.011) | 4.61 | 1.66 | .1715 | .01 | No |
| Child participates in activities regularly (yes/no) | Yes (.017) | Yes (.036) | 4.61 | .89 | .4737 | .0125 | No |
| Parent-school activities (#) | No (.137) | No (.128) | 4.61 | 1.02 | .4048 | .017 | No |
| Meals per week             | No (.231) | No (.535) | 4.61 | 1.00 | .4156 | .025 | No |
| Read to child              | No (.467) | No (.928) | 8.61 | .39 | .9240 | .05 | No |

Environmental

| School community income     | No (.339) | No (.292) | 12.61 | 1.50 | .1494 | .017 | No |
| Program supports social interaction | No (.767) | No (.398) | 4.61 | 1.64 | .1761 | .025 | No |
| Neighborhood safety         | Yes (.011) | No (.095) | 8.61 | 1.07 | .3947 | .05 | No |

Note. N = 2090. Estimates weighted using sampling weights. The extent to which each variable was associated with social skills, referred to as prediction, was determined based on an alpha .05. For moderation analyses of interest related to child, family, and contextual factors, the p-value criterion for determining moderation was based on Bonferonni-Holm Criterion within each group of variables.

<sup>a</sup> p-calculated value reflects moderation with four categories of race/ethnicity. Moderation was also examined for 6 categories of race/ethnicity. Moderation for race/ethnicity for 6 categories resulted in a p-calculated value of .0655.
Table 4.21. Moderation of differences among profiles on problem behaviors by non-malleable child factors and contextual factors

<table>
<thead>
<tr>
<th></th>
<th>Prediction</th>
<th></th>
<th>df</th>
<th>F-value</th>
<th>p-value</th>
<th>p-value criterion</th>
<th>Moderation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Non-Malleable Child Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>Yes (&lt;.001)</td>
<td>No (.122)</td>
<td>12,61</td>
<td>2.72</td>
<td>.0053a</td>
<td>.017</td>
<td>Yesa</td>
</tr>
<tr>
<td>Age</td>
<td>No (.361)</td>
<td>No (.561)</td>
<td>4,61</td>
<td>1.63</td>
<td>.1784</td>
<td>.025</td>
<td>No</td>
</tr>
<tr>
<td>Gender</td>
<td>Yes (.012)</td>
<td>Yes (.008)</td>
<td>4,61</td>
<td>.32</td>
<td>.8611</td>
<td>.05</td>
<td>No</td>
</tr>
<tr>
<td><strong>Contextual Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family Characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parent education</td>
<td>No (.112)</td>
<td>Yes (.006)</td>
<td>20,61</td>
<td>1.97</td>
<td>.0227</td>
<td>.017</td>
<td>No</td>
</tr>
<tr>
<td>Family income</td>
<td>Yes (.002)</td>
<td>No (.100)</td>
<td>4,61</td>
<td>2.28</td>
<td>.0706</td>
<td>.025</td>
<td>No</td>
</tr>
<tr>
<td>Marital status</td>
<td>Yes (&lt;.001)</td>
<td>Yes (.054)</td>
<td>4,61</td>
<td>1.19</td>
<td>.3228</td>
<td>.05</td>
<td>No</td>
</tr>
<tr>
<td><strong>Parent-Child Interaction</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regular child activities (#)</td>
<td>No (.259)</td>
<td>No (.164)</td>
<td>4,61</td>
<td>5.07</td>
<td>.0014</td>
<td>.007</td>
<td>Yes</td>
</tr>
<tr>
<td>Parent-child activities (#)</td>
<td>No (.355)</td>
<td>No (.784)</td>
<td>4,61</td>
<td>4.07</td>
<td>.0054</td>
<td>.008</td>
<td>Yes</td>
</tr>
<tr>
<td>Child participates in activities regularly (yes/no)</td>
<td>No (.481)</td>
<td>No (.148)</td>
<td>4,61</td>
<td>2.85</td>
<td>.0313</td>
<td>.01</td>
<td>No</td>
</tr>
<tr>
<td>Child activities (#)</td>
<td>No (.061)</td>
<td>No (.341)</td>
<td>4,61</td>
<td>2.37</td>
<td>.0622</td>
<td>.0125</td>
<td>No</td>
</tr>
<tr>
<td>Read to child</td>
<td>No (.409)</td>
<td>No (.470)</td>
<td>8,61</td>
<td>1.70</td>
<td>.1177</td>
<td>.017</td>
<td>No</td>
</tr>
<tr>
<td>Meals per week</td>
<td>No (.372)</td>
<td>No (.516)</td>
<td>4,61</td>
<td>1.27</td>
<td>.2910</td>
<td>.025</td>
<td>No</td>
</tr>
<tr>
<td>Parent-school activities (#)</td>
<td>No (.193)</td>
<td>No (.107)</td>
<td>4,61</td>
<td>.77</td>
<td>.5492</td>
<td>.05</td>
<td>No</td>
</tr>
<tr>
<td><strong>Environmental Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhood safety</td>
<td>No (.139)</td>
<td>No (.062)</td>
<td>8,61</td>
<td>3.14</td>
<td>.0049</td>
<td>.017</td>
<td>Yes</td>
</tr>
<tr>
<td>School community income</td>
<td>No (.097)</td>
<td>Yes (.040)</td>
<td>12,61</td>
<td>1.83</td>
<td>.0636</td>
<td>.025</td>
<td>No</td>
</tr>
<tr>
<td>Program supports social interaction</td>
<td>No (.162)</td>
<td>No (.289)</td>
<td>4,61</td>
<td>.42</td>
<td>.7954</td>
<td>.05</td>
<td>No</td>
</tr>
</tbody>
</table>

Note. \( N = 2090 \). Estimates weighted using sampling weights. The extent to which each variable was associated with social skills, referred to as prediction, was determined based on an alpha .05. For moderation analyses of interest related to child, family, and contextual factors, the p-value criterion for determining moderation was based on Bonferonni-Holm Criterion within each group of variables.

\( a \) p-calculated value reflects moderation with 4 categories of race/ethnicity. Moderation was also examined for 6 categories of race/ethnicity. Moderation for race/ethnicity for 6 categories resulted in a p-calculated value of .0002.
Table 4-22. Mean problem behaviors standard scores by race/ethnicity and profile

<table>
<thead>
<tr>
<th></th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian/Non-Hispanic</td>
<td>97</td>
<td>107</td>
<td>96</td>
<td>101</td>
<td>92</td>
</tr>
<tr>
<td>Hispanic</td>
<td>106</td>
<td>104</td>
<td>95</td>
<td>99</td>
<td>91</td>
</tr>
<tr>
<td>African American</td>
<td>107</td>
<td>106</td>
<td>96</td>
<td>107</td>
<td>96</td>
</tr>
<tr>
<td>Other(^a)</td>
<td>102</td>
<td>106</td>
<td>99</td>
<td>97</td>
<td>93</td>
</tr>
</tbody>
</table>

Note. \(N = 2090\). Estimates weighted using sampling weights. Significant moderation interaction between subgroup membership and problem behaviors by race/ethnicity identified. Differences between individual race/ethnicity categories across profiles not examined for significance due to the large number of comparisons.

\(^a\) Other = American Indian or Alaskan Native, Asian, Native Hawaiian, or Pacific Islander, and Multi-racial.
### Table 4-23. Mean problem behaviors standard scores by parent rating of neighborhood safety and profile

<table>
<thead>
<tr>
<th></th>
<th>Profile 1</th>
<th>Profile 2</th>
<th>Profile 3</th>
<th>Profile 4</th>
<th>Profile 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not safe</td>
<td>107</td>
<td>107</td>
<td>99</td>
<td>99</td>
<td>97</td>
</tr>
<tr>
<td>Safe</td>
<td>97</td>
<td>108</td>
<td>98</td>
<td>103</td>
<td>91</td>
</tr>
<tr>
<td>Very safe</td>
<td>101</td>
<td>105</td>
<td>94</td>
<td>100</td>
<td>92</td>
</tr>
</tbody>
</table>

**Note.** $N=2090$. Estimates weighted using sampling weights. Significant moderation interaction between subgroup membership and problem behaviors by neighborhood safety identified. Differences between individual neighborhood safety categories across profiles not examined for significance due to the large number of comparisons.
Figure 4-1. Profile means across functional ability variables. Functional ability score: (1) no limitation, (2) mild limitation, (3) moderate limitation, and (4) severe limitation.
Figure 4-2. Mean PKBS-2 score for each profile. PKBS-2 standardized to $M = 100$, $SD = 15$. 
Figure 4-3. Moderation of differences on social skills standard scores between profiles 4 and 5 by child activities.
Figure 4-4. Moderation of differences on problem behaviors standard scores between profiles 1 and 3 and between profiles 1 and 5 by parent-child activities. Visual inspection of the graphed data revealed that outliers in profile 1 influenced the slope of the line for profile 1, and thus the moderation effect is likely due to these outliers. Outliers were a small cluster of cases in Profile 1 with 0 parent-child activities and problem behavior scores at or near 80.
Figure 4-5. Moderation of differences on problem behaviors standard scores between profiles 1 and 5 by regular child activities.
CHAPTER 5
DISCUSSION

The purpose of the present study was to explore relationships between empirically
derived subgroups of children with similar functional ability profiles and their social
competence outcomes. Study research questions were addressed by conducting
secondary analyses using cross-sectional data from the Pre-Elementary Education
Longitudinal Study (PEELS) data set. The PEELS data set includes information about
young children with disabilities who were receiving early childhood special education
services and supports under the Individuals with Disabilities Education Improvement Act
(IDEA). All secondary analyses were conducted using appropriate weights so reported
findings are nationally representative of young children with disabilities receiving early
childhood special education services and supports in the fall of 2003.

Latent class analyses were conducted to determine whether a set of 15 functional
ability variables included in the PEELS data set would be useful for empirically deriving
distinct and interpretable subgroups of children who share similar functional ability
profiles. Following the selection of the 5-class model, regression analyses were used to
explore relationships between children’s functional ability profile subgroup membership
and their social skills and problem behaviors. Additional regression analyses were
conducted to examine the explanatory power of functional ability profile subgroup
membership and IDEA-disability category, with the variables used individually and
together, as correlates of children’s social skills and problem behaviors. Regression
analyses that included an interaction term were used to examine whether select non-
malleable child factors and contextual factors moderated relationships between
functional ability profile subgroup membership and children’s social skills and problem behaviors.

The purpose of this chapter is to interpret findings, discuss implications of the findings, and provide recommendations for future research. Findings associated with each study research question are integrated within each section.

Interpretation of Study Findings

An underlying assumption of the present study was that 15 functional ability variables included in the PEELS data set could be used to create distinct and interpretable latent classes that represent subgroups of children with similar functional ability profiles. This assumption was supported by theory and previous research on the functional abilities of young children (e.g., Simeonsson, 2009; Simeonsson, Bailey, Smith, & Buysse, 1995; WHO, 2007) but had not been examined using a large-scale data set focused on young children with disabilities.

Overall, the hypotheses and relationships modeled as part of each research question were empirically supported, including the identification of distinct and interpretable latent classes. The sequence of research questions helped unpack the relationships among child functioning, disability category, non-malleable child factors, and contextual factors and their associations with children’s social competence using the International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY; WHO, 2007) as a guiding framework.

Characteristics of Latent Class Subgroups Based on Functional Ability Profiles

Given the exploratory nature of the latent class analyses, it was not known a priori which dimensions of function would lead to distinctions between subgroups (latent classes). The 5-class model was selected for interpretation because it was supported
by model fit indices and it provided logical and interpretable distinctions between subgroups that highlighted salient patterns of functioning within and across subgroups. Each subgroup represents a group of children with a similar functional ability profile and the functional ability profile for each subgroup is different than the profiles for other subgroups. Across the 15 functional ability variables, the dimensions of function that were identified in the profiles related to the (a) severity of the limitations (e.g., mild, moderate, or severe limitations), (b) number of limitations, and (c) type of limitations (e.g., limitations associated with common clusters of variables).

Substantive interpretations of the profiles focused on examining patterns of functioning, including shared features of functional ability variables within a subgroup and the distinguishing features of these variables across subgroups. To aid interpretation, each subgroup was labeled with a profile number and limitations across functional ability variables were examined. Profile numbers refer to specific subgroups and the term profile is used when describing the functional abilities for these subgroups. The terms functional ability profile subgroup membership or subgroup membership are used when referring to the subgroups (latent classes) as a categorical variable.

Severity of limitations for each subgroup was examined by inspecting the model-implied mean score for each functional ability variable. Model-implied means were calculated from the proportion of cases associated with the ordinal response categories for each functional ability variable. The PEELS Disability Severity Index used a 4-point scale and response categories were (1) normal or typical functioning, (2) mild limitation in functioning, (3) moderate limitation in functioning, and (4) severe limitation in functioning. To interpret the severity of limitations, model-implied means were grouped
into ranges to account for variation among children in a subgroup when describing the profiles. In the present study, moderate to severe limitations were associated with mean scores from 2.5 and above, mild to moderate limitations were mean scores from 1.5 to 2.49, and no to mild limitations were mean scores from 1.49 and below.

Findings from the latent class analyses suggest that five distinct and interpretable subgroups with similar functional ability profiles can be used to characterize the nationally representative sample of young children with disabilities included in the PEELS data set. Profiles were interpreted in terms of patterns of functional ability limitations across the 15 functional ability variables. The patterns of functioning and distinctions between subgroups were logical in relation to what is known about variations in the functional abilities of young children with disabilities (Simeonsson, 2009; Simeonsson, Bailey, Smith, & Buysse, 1995). The profiles provide information about how various aspects of function co-occur in children with disabilities. Profiles were examined individually and relative to other profiles.

Profile 1 was comprised of 5% of children in the PEELS data set and the functional ability profile indicated that these children had limitations on 13 of 15 functional ability variables including moderate to severe limitations related to communication/cognition, motor function, social competence, self-regulation and vision. Profile 2 was comprised of 15% of children in the PEELS data set and the functional ability profile indicated that these children had limitations on 11 of 15 functional ability variables including moderate to severe limitations related to communication/cognition, social competence, and self-regulation. Profile 3 was comprised of 7% of children in the PEELS data set and the functional ability profile indicated that these children had limitations on 10 of 15
functional ability variables with mild to moderate limitations that related to
communication/cognition, motor function, social competence, and self-regulation.
Profile 4 was comprised of 33% of children in the PEELS data set and the functional
ability profile indicated that these children had limitations on 9 of 15 functional ability
variables including mild to moderate limitations that related to communication/cognition,
social competence, and self-regulation. Profile 5 was comprised of 40% of children in
the PEELS data set and the functional ability profile indicated that these children had
limitations on 5 of 15 functional ability variables including mild limitations that related to
communication/cognition and self-regulation.

Profile patterns in relation to functional ability variables

In this section, patterns in the functional ability profiles are discussed in relation to
severity of limitations as well as individual and clusters of functional ability variables
associated with each profile. As shown in Table 4-4, the severity of limitations was
related to the mean ratings for each functional ability variable. Several variables had
the same or similar severity of limitation ratings across profiles. For example, the
severity of limitations for communication and cognition were consistent with the overall
severity of limitations identified for each profile such that these ratings were not notably
different between Profile 1 and Profile 2 (children with moderate to severe limitations) or
between Profile 3 and Profile 4 (children with mild to moderate limitations).

The functional ability variable for children’s understanding, however, was
consistently 1-mean rating point lower (indicating fewer limitations or more ability) than
the communication and cognition variables across profiles. This finding was
unexpected, given that communication and understanding or cognition and
understanding are typically considered related skills. One explanation for this finding is
that key words used to define these variables might encompass multiple functional skills or define functional skills in ways that alter how parents rated these variables. For example, the variable for communication was defined by how the child communicates (i.e., expresses their needs) and the extent to which others understand the child’s message. This definition emphasizes expressive communication and clarity of speech or expression. The variable for cognition was defined by how the child learns, thinks, and solves problems. The variable for understanding was defined by how well a child understands verbal messages from others, which emphasizes receptive communication. The consistently higher ratings (i.e., more limitations) for cognition and communication, when compared to the ratings for understanding, might be explained by the former two variables including several functional skills within one functional ability item. Alternatively, lower ratings (i.e., more ability) for understanding, in comparison to ratings for variables such as cognition and communication, might relate to parents’ perceptions that children “understand” more than might be expected given their functional abilities in communication and cognition. For example, a parent might say, “he understands most of what I say to him, he just cannot communicate using words.”

Identifying distinct patterns across functional ability profiles or identifying how functional ability variables cluster together within a profile was part of the rationale for using person-oriented techniques instead of variable-oriented techniques. The complex associations between various dimensions of children’s abilities might be more relevant to understanding relationships between children’s functioning and desired outcomes than using individual functional ability variables in a heterogeneous group of children (Haapasalo, Tremblay, Boulerice, & Vitaro, 2000).
Some of the distinct patterns between profiles were based on clusters of variables associated with similar functional ability limitations, but manifested at different levels of severity. One cluster of variables was limitations related to overall health, use of arms, use of hands, and use of legs. Profiles 1 and 3 were associated with limitations on all of these variables. This cluster of variables was viewed as functional abilities related to physical aspects of the body that might affect motor function in the context of activities and social participation. Another cluster of variables was limitations related to regulation of attention, regulation of activity, and motivation. Profiles 1, 2, 3, 4 and 5 were associated with limitations on these variables, however, Profiles 2 and 4 had higher mean ratings (i.e., more limitations) on these variables compared to Profiles 1 and 3, respectively. This cluster of variables was viewed as functional abilities that might affect self-regulation in the context of activities and social participation. By focusing on clusters of variables with limitations it was easier to interpret the ways in which these variables might affect children’s participation in ongoing activities (e.g., motor function, self-regulation) compared to a focus on individual variables.

Despite the clustering of some variables that lead to interpretable and logical distinctions between groups, other variables did not contribute to the distinctions between profiles. For example, the variable for regulation of emotions did not generally distinguish differences between profiles, nor was it related to other variables associated with regulatory processes. One possible explanation for this finding is that the regulation of emotions variable was defined by the extent to which children were frequently anxious or depressed. It is possible that limitation with this aspect of functioning is less prevalent among young children with disabilities (i.e., 82% were
identified with no limitation). This functional variable might provide more distinction between subgroups of children who have known mental health concerns or challenging behaviors. Alternatively, it is possible that concerns related to mental health of young children and young children with disabilities are underreported by primary caregivers (Knitzer, 2002; Woods, Smith, & Cooper, 2010).

Hearing and vision variables generally did not distinguish differences between profiles (with the exception of Profile 1 and the vision variable). The hearing and vision variables were defined by children who have difficulty hearing or seeing, even with the assistance of adaptive equipment (e.g., hearing aids or glasses). The inclusion of adaptive equipment as part of these variables (e.g., child can see with glasses or child can hear with a hearing aid) might be related to why ratings were consistently lower (indicating more ability and fewer limitations) across profiles. With the use of adaptive equipment, fewer children experience severe limitations and children with complete vision or hearing loss (i.e., blindness or deafness) might represent a small number of children with disabilities. Although these variables did not lead to distinctions between subgroups, the ICF-CY framework highlights that these variables might affect children’s overall functioning and these variables should be interpreted in the context of each profile, and in the context of personal and environmental factors (Lollar & Simeonsson, 2005; Simeonsson, 2003).

In this section, salient patterns of functioning for the latent class functional ability profile subgroups in relation to the functional ability variables in the PEELS data set were summarized. The functional ability profile patterns provide information about the functional abilities within a profile and the differences in functional ability across profiles.
A few of the functional ability variables did not lead to distinctions among profiles and plausible explanations were offered to describe why these functional ability variables might not have contributed to distinctions among profiles. Nonetheless, one strength of person-oriented profile approaches is the information gained about the multi-dimensional and interactive features of functioning reflected in each profile (Raghavendra et al., 2007).

Based on statistical fit indices and substantive interpretations of the profile patterns, the five latent class subgroups identified in the present study were defensible and interpretable. The profile patterns were examined with respect to how the functional ability variables were expressed in each profile, how the functional ability variables relate to each other within and across profiles, and how operational definitions associated with each of the functional ability variables might have affected obtained profile patterns.

Profile patterns in relation to child, family, and school variables

As noted in Chapter 4, descriptive analyses showed child factors, family factors, and school factors differed across profiles in ways that were logical and interpretable given the patterns of functioning represented in each profile. For child factors, proportions of children who had an IFSP before the age of 3 were higher, mean number of weeks premature was larger, and mean birth weight was smaller for children whose functional ability profile included limitations related to all the physical functional abilities. The subgroup associated with moderate to severe limitations (Profile 1) had only slightly larger scores on these variables compared to the subgroup associated with mild to moderate limitations (Profile 3). This finding indicates the profiles distinguished children with limitations related to physical function who are often identified for services earlier...
and are likely born premature or with low birth weight (Saigal, Stoskopf, Streiner, & Burrows, 2001; Vohr et al., 2000).

Child gender was represented in different proportions across profiles. In Profiles 1, 2, 4, and 5, 68% to 78% of the children were boys and 22% to 33% were girls. These within-profile percentages generally approximated the percentage of boys and girls in the PEELS data set (i.e., 70% male and 30% female). In Profile 3, however, 58% of the children who shared a similar functional ability profile (characterized as mild to moderate limitations in most areas of function including physical limitations) were boys and 42% of these children were girls. Why a smaller percentage of boys and a larger percentage of girls were associated with this profile when compared to gender percentages in other profiles and in the entire PEELS data set is unclear, but might warrant additional investigation in future studies.

Related to family factors, larger proportions of children participated in regular group activities in profiles that had fewer limitations associated with the functional ability variables. For example, 55% of children in Profile 5 participated in regular group activities compared to 36% of children in Profile 1. Between 45% and 47% of children in Profile 2, 3, 4 participated in regular group activities. These findings are consistent with expectations that children with less severe functional limitations have more access to and participation in family- and community-based activities (Brown & Gordon, 1987; King et al., 2003; Spiker, Boyce, & Boyce, 2002).

Patterns of functional ability were also examined in relation to school factors. First, the mean number of children without IEPs in the child’s classroom was greater for children associated with profiles with fewer and milder functional limitations (Profiles 3,
4, and 5), suggesting that children with more moderate to severe functional limitations (Profiles 1 and 2) attended programs that have fewer peers without disabilities (i.e., more restricted or specialized settings). This finding is consistent with previous research on placement for children with disabilities (e.g., Buysse, Bailey, Smith, & Simeonsson, 1994; Etscheidt, 2006). Second, the type of IEP goals that teachers reported for children within a profile corresponded with specific limitations on functional ability variables for that profile. For example, children in Profiles 1 and 3, which included children with more physical limitations, had a larger percentage of motor goals compared to other profiles and other curricular domains.

This section summarized how profiles differed across child factors, family factors, and school factors in ways that were not unexpected given the patterns of functioning represented in each profile and previous research related to these factors. Differences across profiles with respect to child, family, and school factors highlight how children’s functional abilities might relate to their access to and participation in family- and community-based activities, as well as classroom settings with same-aged peers without disabilities. Additional variables available in the PEELS data set might be used to examine further these differences among profiles (e.g., teacher reported activities, classroom placement, and amount of time spent with peers at school).

**Comparison of the selected latent class model with existing studies**

Another way to interpret findings from the present study is to examine the number and type of latent classes (subgroups) as well as functional ability profile patterns within and across each subgroup in relation to findings from other studies that used similar person-oriented analytic techniques to derive subgroups with shared characteristics. As
noted in Chapter 2, no other studies involving a nationally representative sample of young children with disabilities have used this technique.

Nonetheless, eight studies reviewed in Chapter 2 were used to inform analyses conducted in the present study. Specifically, six studies shown in Table 2-5 used a person-oriented approach and shared similar features with the present study (Haapasalo et al., 2000; Hair, Halle, Terry-Humen, Lavelle, & Calkins, 2006; Janson & Mathiesen, 2008; Konold & Pianta, 2006; Sanson et al., 2009; Stephens, Petra, Fabian, & Walrath, 2009). These studies are compared to findings from the present study related to the number and type of subgroups obtained.

The number of subgroups identified in the present study was similar to the number of subgroups identified in the six studies with different samples of children (i.e., 4 to 8 subgroups in previous studies). Several of these studies also identified severity of limitations or level of impairment as a distinguishing feature among subgroups. For example, Stephens, Petra, Fabian, and Walrath (2009) examined patterns of functional impairment based on subgroups of youth identified for community mental health services and identified two high-impairment groups and one low impairment group.

Several of the studies shown in Table 2-5 also distinguished subgroups based on clusters of similar skills. Konold and Pianta (2006) examined school readiness in relation to three measures of social function and three measures of cognitive function. Subgroups were associated with different patterns of abilities representing relative strength and weakness on social and cognitive variables. Hair, Halle, Terry-Humen, Lavelle, and Calkins (2006) included physical health as a variable to examine school readiness in young children, along with social/emotional development, approaches to
learning, language, and cognition. This study distinguished subgroups based on differences in physical health, similar to the present study in which a cluster of physical variables, including overall health distinguished several subgroups.

These comparisons illustrate that the number of subgroups identified in the present study is generally consistent with those identified in the six studies. In addition, profile patterns that distinguished subgroups in these studies were somewhat similar to profile patterns that distinguished subgroups in the present study with respect to severity of limitations, to clusters of variables associated with profile patterns, and by the use of physical health variables.

Although comparisons across large-scale studies focused on children with disabilities were not possible, Simeonsson, Bailey, Smith, and Buysse (1995) conducted a small-scale comparative study, which is described in detail in Chapter 2. Although this study was not one of the eight large-scale studies reviewed as part of Table 2-5, it is particularly relevant to the present study. Simeonsson et al. used functional ability variables from the ABILITIES Index (Simeonsson & Bailey, 1991) and conducted a hierarchical cluster analysis to identify subgroups of children with similar functional ability profiles. The study sample was small (i.e., 91 children receiving early childhood intervention services) but this study permits comparison of the number and type of functional ability profiles obtained in the present study with those obtained by Simeonsson et al. using similar functional ability variables.

A few caveats are noted before comparing the profiles identified in the present study with those from the Simeonsson et al. study. First, the Simeonsson et al. study used the original nine variables from the ABILITIES Index; in the present study 15
variables derived from parent interview data in the PEELS data set were used. Many of these variables were similar to those from the ABILITIES Index. Second, the present study included the additional ABILITIES Index variables reported by Daley, Simeonsson, and Carlson (2009; i.e., regulation variables and motivation); these variables were not used in the Simeonsson et al. study. Third, respondents in the present study rated functional ability using a 4-point scale, while respondents in the Simeonsson et al. study used a 6-point scale for the functional ability variables so severity of limitation is quantified differently across the studies and might not be directly comparable.

Simeonsson et al. identified six subgroups with distinct and interpretable functional ability profiles. The authors noted distinctions among subgroups based on the severity of limitations and the types of limitations. The largest group (46%) in the Simeonsson et al. study was associated with mild limitations similar to Profile 5 in the present study. Two subgroups had functional ability profiles that showed limitations related to variables associated with interaction skills (e.g., communication, social skills) and two subgroups had profiles that showed limitations related to variables associated physical skills (e.g., use of limbs) similar to Profiles 2 and 4 and Profiles 1 and 3, respectively, in the present study. Subgroups in the Simeonsson et al. study whose functional ability profiles showed limitations in physical skills were the smallest proportion of the sample, which was consistent with findings in the present study related to the proportion of the PEELS sample in Profiles 1 and 3. A sixth subgroup was identified in the Simeonsson et al. study that was not identified in the present study. The authors described this subgroup
as having mild limitations across most functional abilities with moderate limitations related to communication; this group was most similar to Profile 5 in the present study.

The comparisons between these two studies show that the distinctions between characteristics of children with disabilities identified in the present study are similar to those identified in the Simeonsson et al. study. For example, the severity and types of limitations resulted in somewhat similar profile patterns across these studies. In addition, the prevalence of different profile patterns was similar across these studies. Children with fewer limitations were the largest proportion of children and children with limitations related to physical/health aspects of functioning were the smallest proportion of children.

A unique feature of the present study was the use of 15 functional ability variables. Previous large-scale studies, shown in Table 2-5, used between three to eight variables to create profiles, while the Simeonsson et al. study used nine variables to create profiles. The selection of variables for person-oriented approaches will depend on the purpose of the examination (e.g., different skills related to one domain of functioning or range of skills representing different domains of functioning). The present study and the Simeonsson et al. study both focused on a range of skills representing different domains of functioning. Additional regulation variables (i.e., regulation of activity level, regulation of attention, regulation of emotion, and motivation) that were included in the present study were not included in the Simeonsson et al. study. It is possible that these variables helped to provide a more nuanced analysis of profile patterns in the present study. For example, if the regulatory variables had not been included patterns of
functioning for Profiles 2 and 4 might have been interpreted differently (e.g., focus on cognition and communication).

The present study demonstrated that the 15 functional abilities variables in the PEELS data set could be used to create distinct and interpretable subgroups of children with similar functional ability profiles in a large-scale data set focused on young children with disabilities. The 15 variables represent a range of functional abilities that might be important for identifying patterns of functioning. Findings from the present study suggest variables that include information about children’s level of ability or functioning and variables related to range of functional skills including physical/health aspects of functioning and self-regulation might be important for identifying distinct subgroups and interpretable profile patterns in other samples of nationally representative children with and without disabilities.

**Association Between Functional Ability Profile Subgroup and Children’s Social Skills and Problem Behaviors**

Social competence of young children with disabilities receiving early intervention and early childhood special education services and supports under the Individuals with Disabilities Education Improvement Act (IDEA) has been identified as a desired outcome. Children with social competence have the necessary skills to achieve social goals, know when to use appropriate behaviors for a given social context (i.e., social skills), and refrain from inappropriate behavior (i.e., problem behavior) in a social context (Odom, McConnell, & Brown, 2008). The importance of children’s social skills and problem behaviors in overall development and school success has been emphasized in the literature (Shonkoff & Phillips, 2000; National Council on the Developing Child, 2004a) and in policy (Early Childhood Outcome Center, 2009). Given
previous research on children’s social skills and problem behaviors, it was hypothesized that functional ability profile subgroup membership would be associated with children’s social skills and problem behaviors.

Findings from the present study showed that functional ability profile subgroup membership was somewhat associated with children’s social skills and problem behaviors (R-squared = .20 for social skills and .115 for problem behaviors). The variance accounted for in social skills and problem behaviors by subgroup membership was similar to findings reported in previous research that had used functional ability or composite scores or school readiness profiles to examine relationships with pre-academic and social competence outcomes (cf. Daley et al., 2009; Konold & Pianta, 2006). For example, Daley et al., (2009) explained between 7% and 20% of the variance in pre-academic/cognitive outcomes and between 13% and 19% of the variance in adaptive functioning outcomes when they examined relationships with a functional ability composite score. Konold and Pianta (2006) explained between 12% and 19% of the variance in pre-academic/cognitive outcomes when they examined relationships with school readiness profiles. Konold and Pianta noted that even though their school-readiness profiles of young children were only moderate predictors of educationally relevant outcomes, the profiles provided useful descriptions of children’s characteristics for other purposes such as understanding the multi-dimensional features of children’s abilities and making decisions about instructional interventions.

Because functional ability profile subgroup membership in the present study was estimated as a categorical variable (1, 2, 3, 4, 5) based on most-probable latent class membership, the restricted range of the categorical variable might have limited the
explanatory power of this variable with respect to social competence outcomes. In future studies, examination of associations between functional ability profiles and desired outcomes might be conducted using the posterior probability scores rather than a categorical subgroup membership variable.

Differences Between Functional Ability Profile Subgroup on Children's Social Skills and Problem Behaviors

Although the number of subgroups and functional ability profile patterns across subgroups was not known a priori, examining differences in social skills and problem behaviors across the subgroups of children who shared similar functional ability profiles was also of interest in the present study. Notable differences were found across subgroups related to their social skills and problem behaviors as measured by standard scores on the PKBS-2 (PKBS-2 normative sample \( M = 100, \ SD = 15 \)). Children associated with Profile 1 had social skills that were more than two standard deviations below the normative mean \( (M = 70) \), although they evidenced problem behavior scores very near the normative mean \( (M = 101) \). Children in Profile 2 had the highest ratings on problem behaviors \( (M = 106) \) and their social skills were more than one standard deviation below the normative mean \( (M = 80) \). Children in Profiles 3 and 4 had mean social skills and problem behavior scores that were at or within half of a standard deviation unit of the normative mean. In contrast, children in Profile 5 had the highest social skills ratings \( (M = 102; \ near \ the \ normative \ mean) \) and the lowest ratings on problem behaviors \( (M = 92; \ below \ the \ normative \ mean) \).

Differences between subgroups in relation to social skills and problem behavior standard scores were generally statistically significant and effect sizes (i.e., standardized difference effect sizes) were typically .40 or greater. Children in
subgroups associated with more moderate to severe limitations (Profile 1 and 2) had lower ratings of social skills, particularly social interactions, in comparison to children in subgroups associated with less severe limitations (Profiles 3, 4, and 5). Social skills scores for children in Profile 1 were 1.35, 1.15, and 1.71 standard deviation units below children in Profiles 3, 4, and 5, respectively. For children in Profile 2, social skills scores were .80, .60, and 1.16 standard deviation units below social skills scores for children in Profiles 3, 4, and 5, respectively.

Children in subgroups associated with more limitations related to self-regulation (Profiles 2 and 4) had higher ratings of problem behaviors, particularly externalizing behaviors, in comparison to children in profiles associated with physical limitations (Profiles 1 and 3) or children with the fewest limitations (Profile 5). Problem behaviors scores for children in Profile 2 were .41, .76, and .99 standard deviations units above children in Profiles 1, 3, and 5 respectively. Problem behaviors scores for children in Profile 4 were .36 and .59 standard deviation units above problem behaviors scores for children in Profile 3, and 5, respectively.

Although differences in social skills and problem behaviors among subgroups were identified, standard score means for Profiles 3, 4, and 5 were generally at or within half a standard deviation from the PKBS-2 normative sample. This finding suggests that social skills and problem behaviors for children with disabilities in these subgroups are generally within an expected range of skills and behaviors for their peer group (Merrell, 2002). Given this information, ongoing monitoring of social competence, using prevention practices, and implementing targeted interventions when needed, are likely
appropriate for children with these functional ability profiles (Fox, Dunlap, Hemmeter, Joseph, & Strain, 2003; Merrell, 2002).

Standard score means for social skills and problem behaviors for Profiles 1 and 2, however, fall outside the normative range of social skills. The mean social skills score for Profile 2 was 1.33 standard deviation units from the PKBS-2 normative sample mean and the mean social skills score for Profile 1 was 2 standard deviation units from the PKBS-2 normative sample mean, suggesting the need for regular assessment and intensive and individualized interventions to promote the development of social skills for children with these functional ability profiles (Fox et al., 2003; Merrell, 2002).

Literature that describes the characteristics of children with significant disabilities might be helpful for explaining the notably lower social skills for children in Profiles 1 and 2. For example, Profile 2 represents children with moderate to severe limitations including limitations with communication/cognition, social competence, and self-regulation. This profile likely includes children who have been clinically diagnosed with autism or other intellectual disabilities as described by Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-4) or the American Association on Intellectual and Developmental Disabilities (AAIDD, 2010). Disabilities identified in this way might not correspond with IDEA disability classifications. Nonetheless, it is well documented in the research literature that children who have been clinically diagnosed with autism or intellectual disability have difficulty with a range of social skills, including social initiation and reciprocity, spontaneous social exchanges, interpreting social cues, sustaining proximity to peers, and participating in novel play sequences (Dawson et al., 2004; Matson & Shoemaker, 2009; McConnell, 2002; Wetherby & Prizant, 2000). For this
subgroup, concerns with social skills likely relate to the severity of limitations and the types of limitations that might affect social communication and self-regulation identified in their profile.

In contrast, Profile 1 represents children with moderate to severe limitations including limitations with communication/cognition, motor function, social competence, self-regulation, and vision. This profile likely includes children who are considered to have the most significant disabilities, multiple disabilities, or the most extensive support needs (Snell & Brown 2006; Westling & Fox, 2004). Research supports that children with significant and multiple disabilities who require extensive supports often (a) have less access to peer groups (King et al., 1997; King et al., 2009), (b) lack mobility to access peers without assistance (Harper & McCluskey, 2002), (c) lack communication skills to initiate and respond to social interactions (Reichle, 1997; Snell, Chen, & Hoover, 2006), (d) lack motors skills to participate in play activities (King et al., 2009), and (e) are more likely to be excluded by peers without disabilities (Buysse, Goldman, & Skinner, 2002; Diamond, Hong, & Tu, 2008). For this subgroup, concerns with social skills likely relate to the overall severity of limitations and the multiplicity of limitations that might affect social communication and motor function identified in their profile.

Given existing research about relationships between children’s functional characteristics and social skills, it was not surprising that children in Profiles 1 and 2 had significantly and notably fewer social skills than children in other profiles. The size of the gap might be somewhat unexpected, however, especially for children in Profile 1. Although research that describes the characteristics of children with significant disabilities suggests that children in Profiles 1 and 2 were likely to have limitations
related to their social skills, an unexpected finding from the present study was that fewer children in these profiles had IEP goals targeting social skills compared to other curricular domains. For example, 20% of the children in Profile 1 had a social skills goal compared to 60% of children who had a communication goal or 34% or 38% who had a fine or gross motor goal, respectively. For Profile 2, 36% of children had a social skills goal compared to 71% of children who had a communication goal or 48% who had a school readiness goal. Profiles 2 and 4 had the highest percentage of social skills goals on their IEPS compared to other profiles (36% and 32%, respectively), although these percentages are smaller than the percentage of school readiness or communication goals for these children. The present study suggests a need to consider social skills goals and related instructional interventions for children with characteristics similar to children associated with Profiles 1 and 2.

**Disability Category Compared to Subgroup Membership**

Concerns with the use of IDEA-disability categories to describe and classify children have been discussed in the special education literature since the passage of IDEA (cf. Hobbs, 1975). To address concerns identified with IDEA-disability categories, a functional approach has been proposed to complement information that can be obtained from disability category (Florian & McLaughlin, 2008; Simeonsson et al., 2008). Previous studies have used nationally representative data sets to examine the use of disability category in the prediction or explanation of educational services and child outcomes compared to the use of children's functional ability skills (e.g., Chambers, Perez, et al., 2004; Daley, Simeonsson, & Carlson, 2009). Both of these studies used functional ability variables from the ABILITIES Index to create a composite score that represented overall severity of limitations in functioning. Findings from these
studies showed that the functional ability composite scores accounted for more variance in the criterion variable than disability category alone. These studies also showed that when the functional ability composite and disability category were used together, the most variance was accounted for in the criterion variable. The present study extends these findings by using a categorical variable that represents subgroups of children who have similar functional ability profiles instead of an overall composite score of functional ability to examine similar associations.

An important aspect of using a functional approach, whether focused on subgroups that have similar profiles or a composite score of functional ability, is the extent to which distinctions among the severity of limitations can be identified. As noted by Daley and colleagues, distinctions among the severity of limitations are something that might not be well specified within disability categories. For example, low incidence disabilities are often associated with more “significant” or “severe” disabilities. Descriptive information from the present study, however, shows that only 30% of children identified by disability categories typically referred to as low incidence were also assigned to a profile associated with moderate to severe limitations in functioning (Profiles 1 and 2), while 55% of these children were assigned to a profile associated with mild to moderate limitations in functioning (Profiles 3 and 4).

In relation to the prediction or explanation of child outcomes, the present study showed that children’s functional ability profile subgroup membership ($R^2 = .20$ for social skills; $R^2 = .115$ for problem behaviors) accounted for more variance in the criterion variable than disability category ($R^2 = .165$ for social skills; $R^2 = .108$ for problem behaviors). This resulted in a 3.5% difference for social skills and .7%
difference for problem behaviors in variance explained by the two categorical variables. Similar to the previous studies, the present study also showed that when these variables were used together, they accounted for the most variance in the criterion variables and accounted for more variance in social skills than in problem behaviors.

Direct comparisons to the Daley et al. study, which was conducted with the PEELS data set using similar variables of functional ability to create a 6-item disability severity composite score, show the functional ability profile subgroup membership variable in the present study accounted for slightly more variance in the criterion variables (e.g., 19% of variance in social skills explained by the disability severity composite, 20% of variance in social skills explained by the functional ability profile). The increase in variance explained between the two studies was small (1% difference).

The decision to use a functional ability composite score (similar to the Daly et al. study) or to use a subgroup membership variable based on similar functional ability profiles (similar to the present study) as a predictor or explanatory variable in relation to child outcomes, such as social skills and problem behaviors, might be based on the substantive questions of interest. For example, for questions related to the cumulative influence of functional limitations a composite score might be appropriate. For questions related to the patterns of functioning across ability areas a profile approach might be appropriate.

Daley and colleagues noted that they compared the explanatory power of IDEA-disability category and a composite score of functional ability limitations to illustrate that these variables reflect distinct constructs “with less overlap than might be predicted given traditional ideas about certain categories being more ‘mild’ than others” (p. 548).
Results from the present study showed that there was some overlap between profiles and disability categories. This overlap, however, is not likely sufficient to predict a child’s functional ability profile subgroup membership if the child’s disability category is known or vice versa, with the possible exception of speech or language impairments and Profile 5. Findings showed there were a large proportion of children identified with speech or language impairments (SLI) who were assigned to the profile with the fewest limitations (i.e., Profile 5), this made up 29% of the total PEELS sample and 72% of Profile 5. All other overlap between disability category and profile subgroup membership were less than 14% of the total PEELS sample.

To examine further the effect of this overlap on the explanation of variance in social skills and problem behaviors, holdout analyses were conducted with children with SLI excluded from the analyses. Findings from these analyses suggest that when children with SLI were not included in the model, disability category had less explanatory power for social skills ($R^2 = .114$) and problem behavior ($R^2 = .074$). Functional ability profiles, however, maintained explanatory power for social skills ($R^2 = .201$), and had less explanatory power for problem behavior ($R^2 = .090$).

Overall, these and previous findings suggest that to characterize childhood disability, functional ability profiles or functional ability composite scores should be used in place of or together with IDEA-disability category when examining relationships to important outcome variables for young children with disabilities. Variables related to children’s functional ability accounted for more variance in outcomes, provided descriptive information about children’s abilities and limitations, and created relatively
homogenous groups of children compared to IDEA-disability categories that result in heterogeneous groups of children.

**Non-Malleable Child Factors and Contextual Factors**

In the present study, children’s functional abilities were viewed as malleable child factors and a primary purpose of the study was to examine the extent to which subgroups, based on similar profiles of malleable functional ability variables, were related to children’s social skills and problem behaviors. Given research on factors associated with children’s social competence and hypothesized relationships in ICF-CY framework, the extent to which select non-malleable child factors and contextual factors moderated relationships between functional ability profile subgroup membership and children’s social skills and problem behaviors was examined in the present study. The interaction between functional ability profile subgroup membership and non-malleable child factors and contextual factors were examined through a series of regression-based moderation analyses.

Contextual factors included family factors and environmental factors. Family factors consisted of family characteristics and parent-child interactions; environmental factors included both school and community variables. The inclusion of parent-child interactions and school variables was an important part of the present study because these variables have not been routinely examined in other large-scale studies and the ICF-CY specifically emphasizes the role of family and school factors during childhood (Bjorck-Akesson et al., 2010).

Moderation analyses were used to examine whether there were differences in children’s social skills and problem behaviors among profiles as a function of moderator variables. An unexpected finding from the present study was the extent to which non-
malleable child factors and contextual factors generally did not moderate relationships between functional ability profile subgroup membership and children’s social skills and problem behaviors. Of the 16 select moderator variables, only one variable (child activities) moderated the relationship between subgroup membership and social skills, and only three variables (regular child activities, race/ethnicity, safety of neighborhood) moderated the relationship between subgroup membership and problem behaviors.

Comparisons between findings from the moderator analyses in the present study with previous research is somewhat limited, as only one large-scale study has used a person-oriented profile approach and included non-malleable child factors as well as contextual factors as moderators. Sanson et al. (2009) used child gender and a composite score of socio-economic status (SES) to examine moderation of the relationship between temperament profiles and problem behaviors, social skills, and school adjustment. The authors found SES was a significant moderator of the relationship between temperament profiles and problem behaviors, but other interaction effects were not identified. The authors also noted that identifying reasons why SES was a moderator of temperament profiles in relation to problem behaviors were difficult to pinpoint.

In the present study, the number of child activities was a significant moderator of the relationship between subgroup membership and children’s social skills. Follow-up analyses suggested that the number of activities a child had ever participated in was more related to children’s social skills for children in Profile 4 (children with mild to moderate limitations) than for children in Profile 5 (children with fewer limitations) who had participated in the same number of activities. This finding suggests that
participation in a range of extracurricular activities might support social skills
development for children with functional ability limitations similar to Profile 4 compared
to children with functional ability limitations similar to Profile 5. Alternatively, this finding
might suggest that children who have functional ability limitations similar to Profile 4 and
who have better social skills have participated in more activities. Both explanations are
plausible based on the correlational analyses conducted in the present study.

The regular child activities variable was a significant moderator of the relationship
between subgroup membership and problem behaviors. Follow-up analyses showed
that the more activities that children regularly participated in, the more children’s
problem behaviors scores increased for children in Profile 1 (children with the most
functional ability limitations) compared to children in Profile 5 (children with the fewest
limitations) who participated in the same number of activities. This finding suggests that
regular participation in extracurricular activities might not prevent problem behavior for
children with the most functional ability limitations (Profile 1) compared to children with
the fewest functional ability limitations (Profile 5). Alternatively, this finding might
suggest that children who have the most functional ability limitations and who have
more problem behaviors are provided with more regular extracurricular activities. Both
explanations are plausible based on the correlational analyses conducted in the present
study.

Two categorical variables, race/ethnicity and neighborhood safety, were significant
moderators of the relationship between subgroup membership and problem behaviors.
Follow-up analyses for these categorical variables were examined by comparing the
mean problem behaviors scores for each profile for every response category of the
categorical variable. Due to the large number of comparisons, follow-up comparisons were not examined for statistical significance. For race/ethnicity, comparisons showed that mean differences in problem behaviors scores for children in some race/ethnicity categories were not consistent when comparing profiles. For example, in Profile 1, Caucasian/Non-Hispanic children had lower mean problem behaviors scores than children in other race/ethnicity categories compared to differences for children in Profile 2 who were Caucasian/Non-Hispanic. For Profile 4, African American children had higher mean problem behaviors scores than children in other race/ethnicity categories when compared to differences for children in Profile 3 who were African American. For neighborhood safety, children in Profile 1 who were from a not safe neighborhood had higher mean problem behaviors scores than children in other neighborhood safety categories when compared to children in Profile 2 who were from a not safe neighborhood.

These moderation findings suggest that there are some interactions among children’s race/ethnicity, functional ability profile subgroup membership, and problem behaviors, and some interactions among children’s neighborhood safety, functional ability profile subgroup membership, and problem behaviors. It is possible that these differences are related to actual levels of problem behaviors reported by teachers or it is possible that these differences are related to teacher’s perspectives about problem behaviors in relation to these variables (Konold, & Pianta, 2007; Reid et al., 1998).

Given the limited research that has examined non-malleable child factors and contextual factors as moderators of the relationships between functional ability profile subgroup membership and social skills and problem behaviors, the explanations for why
these variables might operate differently on social skills or problem behaviors across the functional ability profile subgroups are preliminary. In addition, the patterns and consistency of associations between non-malleable and contextual factors and children’s social competence has varied across studies, population samples, and analytic methods used to examine these relationships (Krishnakumar & Black, 2002; Raver et al., 2007; Sameroff & Seifer, 1983), therefore findings related to moderator analyses might not replicate in future studies. Analyses conducted in the present study did not account for potential correlations between or among moderator variables. Nonetheless, the present study provides preliminary evidence about the potential role of select non-malleable child factors and contextual factors in relation to children’s functional ability profiles and their social skills and problem behaviors.

**Implications of the Present Study**

The present study highlights the need to characterize and quantify children’s functional abilities to examine relationships to desired outcomes, such as children’s social skills and problem behaviors. In addition, examining profiles of functional abilities or limitations within and across person-oriented latent class subgroups provides important information about functional characteristics shared by young children with disabilities. Profiles provide information about multi-dimensional and interactive patterns in children’s functional abilities that might be informative for research and practice. Profiles and profile patterns provide descriptions of children’s characteristics that might be used for educational planning, informing decisions about services and supports, or designing specific interventions.

Findings from the present study support existing research and theory that suggest the relationships between children’s functional abilities and their social skills and
problem behaviors might have different manifestations or be enacted in different ways in
the context of a profile of children’s abilities (cf. Hair et al., 2006; Haapasalo et al., 2000; Janson & Mathiesen, 2008; Sanson et al., 2009). The present study extends previous research to young children with disabilities through the conduct of secondary analyses using a large-scale, nationally representative data set. Five subgroups of children with distinct and interpretable functional ability profiles were derived empirically. The study offers information about the patterns of children’s functional abilities and prevalence of the five different functional ability profiles for young children ages 3 through 5 years who were receiving special education services in the fall of 2003.

Conceptual Implications of the Findings

The present study used the International Classification of Functioning, Disability, and Health for Children and Youth (ICF-CY) framework described by the World Health Organization (WHO, 2007) to guide the conceptualization of the study research questions, the creation of the functional ability profiles, and the identification of contextual factors. This framework offers a way to conceptualize and describe a child’s developing characteristics within his or her surrounding environment, while noting the influence of the child’s abilities on the child’s functioning and adaptation (Snyder, 2006). The ICF-CY highlights the unique nature of child development and suggests that patterns of a child’s functional ability or limitations will change in nature, intensity, and consequence over time (Lollar & Simeonsson, 2005).

This study supports the use of the ICF-CY framework in future research with children with disabilities. For example, the complex relationships that were identified within and between functional ability profiles provide the opportunity to examine the co-occurrence of functional limitations or salient patterns of abilities that affect children’s
functioning and development. Specifically, the profiles provided information related to the (a) level or severity of limitations (b) number of limitations and (c) nature or type of limitations across the 15 functional ability variables.

Of particular importance for research, constructs identified in the ICF-CY framework are consistent with constructs identified in the extant literature, particularly related to key priorities in educational research. For example, malleable and non-malleable characteristics described by the Institute of Education Sciences are consistent with aspects of body functions and activities, and personal factors, respectively, in the ICF-CY framework. The ICF-CY framework provides a common language for researchers across disciplines to begin to identify, define, and examine these variables in future studies (Bjorck-Akesson et al., 2010; Simeonsson, 2009). Using the ICF-CY as a framework, researchers might create measures that reflect key functional ability variables (cf. Simeonsson & Bailey, 1991) or map existing measures to functional ability variables (cf. Morris, Kurinczuk, & Fitzpatrick, 2005; Simeonsson, Scarborough, & Hebbeler, 2006) that allows for comparison of findings across studies and measures.

Methodological Implications of the Findings

Researchers have begun using advanced analytic methods to create profiles of children’s abilities or skills and to group children with similar or shared characteristics into descriptive profiles. These analytic methods are characterized as person-oriented techniques (Campbell, Shaw, & Gilliom, 2000; Konold & Pianta, 2005).

An important aspect of the present study was the use of latent class analysis (Muthen & Muthen, 2007) to conduct person-oriented analyses and to identify plausible latent classes based on the functional ability profiles of young children with disabilities.
Previous investigations have predominately used cluster analysis to identify subgroups of children with shared profiles. Latent class models have gained popularity over other methods because they use model-based approaches to estimate membership probabilities in order to classify cases into the appropriate subgroup (Magidson & Vermunt, 2006). The present study, however, was not able to use all the features of the model-based approach. Specifically, children’s subgroup membership was based on most probable latent class membership and examined as a categorical variable (i.e., Profile 1, 2, 3, 4 or 5). The decision to use most probable latent class membership was appropriate given that mean posterior probabilities for latent class membership were all above .86 and analyses were designed to use PEELS weight files that used all available cases to examine each research question. The study did not analyze relationships between functional ability and children’s social skills and problem behaviors using latent class analysis with mixture modeling. This approach would have used posterior probability scores rather than most probable latent class membership categories.

A potential methodological contribution of the present study, however, is the ability to generate the posterior probabilities (cf. Collins & Lanza, 2010) for children not included in the PEELS sample. Using posterior probabilities, other children with disabilities could be assigned to their most probable functional ability profile subgroup based on the five profiles identified in the present study. Collins and Lanza (2010) introduced an equation that, conceptually, can be generated from the latent class analysis to calculate posterior probabilities. This equation requires information about the item response probabilities and the prevalence of the five latent classes generated in the present study along with scores for the 15 functional ability variables used in the
present study for a new sample of children with disabilities. This potential contribution is conceptual because additional exploration of Mplus is needed to generate the required information. Nonetheless, posterior probabilities might be used in future research or in practice-based applications to classify children into the appropriate functional ability profile subgroup and examine further the relationships between their functional ability profile subgroup membership and educationally relevant outcomes.

**Practical Implications of the Findings**

The present study identified five functional ability profiles for a nationally representative sample of young children with disabilities who were receiving early childhood special education services in 2003. Profiles provided information about the severity, number, and nature of children’s limitations in relation to 15 functional ability variables. As hypothesized, children’s functional ability profile was related to social skills and problem behaviors and differences in social skills and problem behaviors were identified between profiles. In general, mean scores on social skills and problem behaviors standard scores on the PKBS-2 reflected a typical range of expected skills and behaviors for young children associated with Profiles 3, 4, and 5. From a practical standpoint, this finding suggests that children whose functional skills are similar to these profiles likely require general curricular interventions that focus on promotion of social skills and prevention of problem behaviors. Often associated with the primary and secondary level of tiered frameworks (cf. Simeonsson, 1991; Snyder, McLaughlin, & Denney, 2011), these interventions might include monitoring of social skills and problem behaviors, universal promotion and prevention practices provided to all children, and targeted interventions and prevention practices when needed (e.g., Brown, Odom, &
Findings also showed that two profiles (Profiles 1 and 2) were associated with extremely low or low social skills and that these children were not likely to have an instructional goal to improve social skills compared to other curricular areas. For children whose functional abilities are similar to these two profiles, teachers, parents, and other care providers might consider regular assessment of social skills and individualized interventions to promote the development of social skills as needed. These types of interventions often are associated with the tertiary or individualized level of tiered curricular frameworks (Simeonsson, 1991; Snyder et al., 2011).

For children who are identified to have a need for targeted or individualized intervention, the functional ability profile offers a useful description of children’s characteristics that might provide practical information to inform the design and delivery of interventions (Konold & Pianta, 2005). As noted by Simeonsson and colleagues (2006), the description of a child’s functional ability profile can guide practitioners in individualizing interventions in educational and clinical treatment planning. For example, a child in Profile 1 might experience difficulties with social skills because the child has limitations in mobility that restrict the child from running, playing, and moving around with his or her peer group in a way that limits the child’s ability to develop or exhibit social skills. In contrast, a child in Profile 2 might experience difficulties with social skills because the child does not sit still or remain engaged with a play activity or peer for sufficient periods of time to develop or exhibit social skills. In this example, both children have difficulties with gaining or maintaining access to peers to develop or
exhibit social skills. The distinction in what leads to this difficulty has important implications for the design and delivery of prevention supports such as environmental arrangements or targeted or individualized interventions, such as peer buddies (English, Goldstein, Shafer, & Kaczmarek, 1997) or social skills training (Brown & Conroy, 2001). In this example, each child will need supports or instruction to help gain or maintain access to peers, but the nature of the supports or instruction will likely be very different based on the knowledge of the child gained through the description of the functional ability profile.

**Policy and Research Implications of the Findings**

Findings from the present study might help inform policy recommendations related to characterizing disability and function for young children with disabilities when examining correlates of socially valid outcomes such as social competence. The increase in variance explained in social skills and problem behaviors measures when functional ability profile subgroup membership was used compared to when disability category was used supports the use of functional ability variables or functional variables in combination with disability category to examine variations in outcomes. National efforts to collect and report information about educational services and outcomes for young children with disabilities (i.e., IES national studies, accountability requirements under IDEA Part B Section 618) might include information about children’s functional abilities as part of required data collection. Using this information, outcome and performance data might be reported in relation to a composite score of children’s functional ability or children’s functional ability profile subgroup.

The use of functional ability profiles might also have important implications for intervention research that helps inform policy and service provision. National efforts to
identify empirical evidence for the use of different educational interventions often focus on “what works for whom and under what conditions” (e.g., What Works Clearinghouse). As noted by King et al. (1997), policy makers, researchers, and practitioners cannot assume that interventions that work for children with one set of abilities will work for other children. Given the range of functional characteristics across young children with disabilities, the use of a profile to describe the functional abilities of children for whom the intervention was effective might help advance the development of interventions, funding allocations for supports and services, and related policies.

Moreover, profiles of children’s functional abilities offer a way to organize a range of malleable explanatory or predictor variables in ways that account for the complex and transactional relationships among these variables. Characterizing children in relation to malleable factors to examine relationships that are associated with, moderate, or mediate children’s educational outcomes have been identified as a top priority in educational research (IES, 2011). The functional ability profile approach might be helpful to identify children who are not achieving desired outcomes and to use information from their profile to inform the types of supports these children might need. By using a profile of malleable child factors, interventions can be designed to target areas of identified need and to interpret intervention outcomes in relation to functional profile characteristics.

**Recommendations for Future Research**

The present study examined relationships among child functioning, IDEA-disability category, non-malleable child and contextual factors, and young children's social competence. Findings from the present study suggest that additional examination of
these relationships is warranted. This section highlights a few of the potential next steps for future research.

Person-oriented analytic techniques, including latent class analysis, will likely be used increasingly in future research. As noted earlier, children’s profile assignment was based on most likely latent class membership instead of the posterior probability scores. Researchers might compare and contrast findings that use posterior probability scores to findings that use most likely latent class membership.

Researchers might examine the extent to which the profiles obtained in the present study are replicated using (a) other samples of young children with and without disabilities, (b) other populations of individuals with disabilities (e.g., school age, adults), (c) different functional ability variables, or (d) other domains of child functioning indicated on the ICF-CY. These types of comparative analyses might further enhance understandings of relationships between functional abilities and desired early learning or educational outcomes.

As noted by Lollar and Simeonsson (2005), patterns of a child’s functional ability or disability will change in nature, intensity, and consequence over time. The present study used cross-sectional data gathered at one wave (i.e., wave 1) from the PEELS data set to examine relationships between children’s functional ability profiles and their social skills and problem behaviors. Latent transition analysis (cf. Collins & Lanza, 2011; Stephens, Petras, Fabian, & Walrath, 2009) or a series of latent class analyses might be used to examine how the nature and prevalence of functional ability profiles change over time and how these changes might affect relationships with outcome variables. In addition, latent transition analysis might be used to examine the stability of
children’s functional ability profile subgroup membership over time or how profiles change in relation to implemented interventions.

The present study examined whether non-malleable child factors and contextual factors moderated relationships between children’s functional ability profile subgroup membership and social competence outcomes. Although a few noteworthy moderator relationships were identified, interpretations related to these relationships were preliminary given the limited research that has examined these variables as moderators, particularly as moderators of relationships between functional ability profile subgroup membership and social skills and problem behaviors (cf. Sanson et al., 2009). Additional research is needed to better understand these relationships, to explore whether these relationships replicate in future studies, and to examine relationships among moderator variables (e.g., create latent variables that represent clusters of moderators rather than using one variable at a time to examine moderation).

**Summary**

Given the identified importance of social competence in young children’s development and school success, it is critical to unpack how malleable child factors, such as functional abilities, are related to children’s social skills and problem behaviors. Information gained from a person-oriented functional approach can inform the design and delivery of interventions and policies to provide efficient and effective supports and services for children and their families. The present study used a cross-sectional correlational design to explore and examine relationships among young children’s social skills and problem behaviors and their functional abilities, IDEA-disability category, and non-malleable child and contextual factors through secondary analyses of the Pre-Elementary Education Longitudinal Study (PEELS) data set. Fifteen functional ability
variables, based on the ICF-CY framework, were used in latent class analyses and these analyses identified five subgroups of children with distinct and interpretable functional ability profiles.

Functional ability profiles were described in relation to the severity, number, and type of functional ability limitations. Profiles 1 and 2 were associated with moderate to severe limitations, Profiles 3 and 4 were associated with mild to moderate limitations, and Profile 5 was associated with no to mild limitations across the 15 functional ability variables. Profiles 1 and 3 were different from other profiles because they included limitations related to all the physical/health variables. Profile patterns identified in the present study were similar to profile patterns identified in existing research that has used person-oriented methods to create subgroups of children with similar profiles of abilities. Descriptive differences for select child, family, and school factors across the profiles were noted. These differences were logical in relation to the patterns of functioning within and across the profiles. Findings from the person-oriented functional approach provide important information about the characteristics of young children with disabilities in relation to their functional ability profile patterns.

Functional ability profile subgroup membership was moderately related to children’s social skills and the relationship to problem behaviors was small. Although differences between subgroups were identified on social skills and problem behaviors, mean standard scores indicated that children associated with profiles with no to mild limitations or mild to moderate limitations were generally within the normative range with respect to expected social skills and problem behaviors for their peer group. Children with moderate to severe limitations, however, were identified to have social skills
notably lower than same-aged peers, suggesting the need for targeted or individualized intervention supports.

The explanatory power of functional ability profile subgroup membership was greater than the explanatory power of children’s IDEA-disability category as a correlate of their social skills and problem behaviors. When the two variables were used together, functional ability profile subgroup membership and IDEA-disability category accounted for the most variance in social skills and problem behaviors standard scores on the PKBS-2. These findings suggest a measure of children’s functioning might be important when examining correlates of child outcomes in future research.

One of the 16 non-malleable child or contextual variables moderated the relationship between children’s functional ability profile subgroup membership and their social skills (i.e., number of child activities). Three of these 16 variables moderated the relationship between children’s functional ability profile subgroup membership and their problem behaviors (i.e., race/ethnicity, number of regular child activities, and neighborhood safety). Findings related to moderation identified in the present study are preliminary but suggest relevant directions for further research.

The present study highlights the importance of considering the diversity of young children’s abilities within and across disability categories for young children who receive special education and related services under the Individuals with Disabilities Education Improvement Act. Findings support that the ICF-CY framework is useful to guide how children’s functional abilities, their personal characteristics, and their environments are defined and measured in educational research. The present study demonstrates how a functional approach can be combined with person-oriented analytic methods to examine
associations between subgroups of children with similar functional ability profiles and desired outcomes, including social competence. Using functional ability profiles to describe and quantify children’s abilities provides information, beyond disability category, that can be used to design interventions and supports so children develop the skills they need to be socially competent.

More than 35 years ago, Nicholas Hobbs (1975) authored *The Future of Children: Categories, Labels, and Their Consequences*. In this seminal report, Hobbs described an alternative to traditional disability classification systems used in education. He suggested that “the information needed for good program planning is to construct a profile of assets and liabilities of the child in a particular setting at a particular time … The profile should be the basis for specification of [educational planning]” (p. 25). At the time, Hobbs was heartened that

Computer technology provides the means of organizing information … In a perfected system, data from all states could be aggregated to provide the federal government with information to plan legislation, not in terms of gross categories of exceptionality but in terms of specific requirements for services. Such a system should be developed. (p. 25)

Thirty-five years later, Hobbs’s recommendations are still relevant today. The present study highlights how frameworks such as the ICF-CY can be used to move closer to the type of system Hobbs envisioned to help guide educational planning and service delivery for young children with disabilities.
APPENDIX A
PROFILES OF CHILDREN’S FUNCTIONAL ABILITY
Table A-1. Functional profile: Child A

<table>
<thead>
<tr>
<th>Child A</th>
<th>Primary Disability: Developmental Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hearing</td>
</tr>
<tr>
<td>1 Typical Function</td>
<td>X</td>
</tr>
<tr>
<td>2 Mild Impairment</td>
<td>X</td>
</tr>
<tr>
<td>3 Moderate Impairment</td>
<td></td>
</tr>
<tr>
<td>4 Severe Impairment</td>
<td></td>
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</tbody>
</table>

Table A-2. Functional profile: Child B

<table>
<thead>
<tr>
<th>Child B</th>
<th>Primary Disability: Developmental Delay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hearing</td>
</tr>
<tr>
<td>1 Typical Function</td>
<td>X</td>
</tr>
<tr>
<td>2 Mild Impairment</td>
<td></td>
</tr>
<tr>
<td>3 Moderate Impairment</td>
<td>X</td>
</tr>
<tr>
<td>4 Severe Impairment</td>
<td></td>
</tr>
</tbody>
</table>
Table A-3. Functional profile: Child C

<table>
<thead>
<tr>
<th></th>
<th>Hearing</th>
<th>Visions</th>
<th>Use of Arm</th>
<th>Use of hands</th>
<th>Use of Legs</th>
<th>Overall Health</th>
<th>Cognition</th>
<th>Com. with Others</th>
<th>Understand Others</th>
<th>Social Skills</th>
<th>Behavior</th>
<th>Motivation</th>
<th>Activity Level</th>
<th>Attention</th>
<th>Regulate Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Typical Function</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>2: Mild Impairment</td>
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<tr>
<td>3: Moderate Impairment</td>
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<td>4: Severe Impairment</td>
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</tbody>
</table>

Primary Disability: **Developmental Delay**

Table A-4. Functional profile: Child D

<table>
<thead>
<tr>
<th></th>
<th>Hearing</th>
<th>Visions</th>
<th>Use of Arm</th>
<th>Use of hands</th>
<th>Use of Legs</th>
<th>Overall Health</th>
<th>Cognition</th>
<th>Com. with Others</th>
<th>Understand Others</th>
<th>Social Skills</th>
<th>Behavior</th>
<th>Motivation</th>
<th>Activity Level</th>
<th>Attention</th>
<th>Regulate Emotion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Typical Function</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: Mild Impairment</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>X</td>
<td>X</td>
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<tr>
<td>3: Moderate Impairment</td>
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<tr>
<td>4: Severe Impairment</td>
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</tbody>
</table>

Primary Disability: **Developmental Delay**
### APPENDIX B

#### PEELS DISABILITY SEVERITY INDEX VARIABLES

Table B-1. PEELS Disability Severity Index variables

<table>
<thead>
<tr>
<th>Item</th>
<th>PEELS Parent Interview Questions</th>
<th>Derived Items</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hearing</strong></td>
<td><strong>HEARCMP</strong>: Compared with children about same the same age, would you say {CHILD} 1: Hears normally 2: Might have a hearing problem 3: Does have a hearing problem</td>
<td><strong>DP1PROBHEAR</strong> 1: No hearing loss and hears normally 2: Hears normally or has only a little trouble hearing regardless of level of hearing loss 3: Has a little or lot of trouble hearing with a range of hearing loss 4: Does not hear at all or severe/profound loss and has a lot of trouble hearing</td>
</tr>
<tr>
<td></td>
<td><strong>WELHRDV</strong>: How well does {CHILD} seem to hear with the currently used hearing device(s) 1: Hears normally 2: Has a little trouble hearing 3: Has a lot of trouble hearing 4: Does not hear at all</td>
<td></td>
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<tr>
<td></td>
<td><strong>HRNGLSS</strong>: Is {CHILD}'s unaided hearing loss 1: Mild, (&lt;TO 40 Dba hearing level) 2: Moderate, (41–70 Dba hearing level) 3: Severe, or (71–90 Dba hearing level) 4: Profound (&gt; 90 Dba hearing level)</td>
<td></td>
</tr>
<tr>
<td><strong>Vision</strong></td>
<td><strong>CHDEYEST</strong>: How is {CHILD}'s eyesight? Would you say {he/she} 1: Sees normally without glasses 2: Might have a vision problem 3: Does have a vision problem</td>
<td><strong>DP1PROBVISION</strong> 1: Sees normally without glasses 2: Sees normally with glasses 3: Has a little trouble seeing, even with glasses 4: Has a lot of trouble seeing or can’t see at all, even with glasses</td>
</tr>
<tr>
<td></td>
<td><strong>VSWTHGLS</strong>: How well can {CHILD} see with glasses? Would you say {he/she} 1: Sees normally 2: Has a little trouble seeing 3: Has a lot of trouble seeing 4: Does not see at all</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>VSWOGLS</strong>: How well can {CHILD} see without glasses? Would you say {he/she} 1: Sees normally 2: Has a little trouble seeing 3: Has a lot of trouble seeing 4: Does not see at all</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>PEELS Parent Interview Questions</td>
<td>Derived Items</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Overall Health</td>
<td>BHLTHCMP: Compared with other children about the same age, would you say (CHILD)’s general health is: 1: Excellent  2: Very good  3: Good  4: Fair  5: Poor  ACTLMTD: Are (CHILD)’s activities limited in any way because of a health problem? 1: Yes  2: No</td>
<td>DP1PROBHEALTH  1: Excellent or very good health with no limitation in activities  2: Good health with no limitation in activities or excellent/very good health with limitation in activities  3: Good health with limitation in activities or poor health with no limitation in activities  4: Fair or poor health with limitations in activities or poor health with no limitations in activities</td>
</tr>
<tr>
<td>Use of Arms</td>
<td>BARMSGMS: How well does (CHILD) use {his/her} arms for things like throwing, lifting, or carrying? 1: Uses {his/her} hands and fingers normally  2: Has a little trouble using them  3: Has a lot of trouble using them  4: Has no use at all of {his/her} hands and fingers  5: missing one or both hands</td>
<td>DP1BARMSGMS  1: Uses {his/her} hands and fingers normally  2: Has a little trouble using them  3: Has a lot of trouble using them  4: Has no use at all of {his/her} hands and fingers</td>
</tr>
<tr>
<td>Use of Hands</td>
<td>BARMSFMS: How well does (CHILD) use {his/her} hands and fingers for things like buttoning a shirt or using a spoon, pencil or scissors? 1: Uses {his/her} arms and hands normally  2: Has a little trouble using one or both  3: Has a lot of trouble using one or both  4: Has no use at all of one or both arms or hands  5: Missing one or both arms</td>
<td>DP1BARMSFMS  1: Uses {his/her} arms and hands normally  2: Has a little trouble using one or both  3: Has a lot of trouble using one or both  4: Has no use at all of one or both arms or hands</td>
</tr>
<tr>
<td>Use of Legs</td>
<td>BLEGSWEL: How well does (CHILD) use {his/her} feet?  1: Uses both legs and feet normally  2: Has a little trouble using one or both  3: Has a lot of trouble using one or both  4: Has no use at all of one or both legs or feet  5: Missing one or both legs</td>
<td>DP1BLEGSWEL  1: Uses both legs and feet normally  2: Has a little trouble using one or both  3: Has a lot of trouble using one or both  4: Has no use at all of one or both legs or feet</td>
</tr>
<tr>
<td>Cognition</td>
<td>CBLEARN: Compared with other children about the same age, does (CHILD), learn, think and solve problems 1: Better than other children {his/her} age  2: As well as other children  3: Slightly less well than other children  4: Much less well than other children</td>
<td>DP1CBLEARN  1: Better than other children {his/her} age  2: As well as other children  3: Slightly less well than other children  4: Much less well than other children</td>
</tr>
<tr>
<td>Item</td>
<td>PEELS Parent Interview Questions</td>
<td>Derived Items</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Communicate with others</td>
<td>NDSKNWN: Compared with other children about the same age, how well does (CHILD) make (his/her) needs known to you and others? Communication can be any form, for example crying, pointing, or talking. Would you say (he/she)? 1: Communicates just as well as other children 2: Has a little trouble communicating 3: Has a lot of trouble communicating 4: Does not communicate at all?</td>
<td>DP1PROBCOMC 1: Communicates just as well as other children and very easy to understand 2: Some difficulties communicating or being understood 3: Moderate difficulties communicating or being understood 4: Does not communicate at all or very</td>
</tr>
<tr>
<td>Understanding</td>
<td>EASYUNDR: When (CHILD) talks to people (he/she) doesn't know well, is (he/she) 1: Very easy to understand 2: Fairly easy to understand 3: Somewhat hard to understand 4: Very hard to understand 5: Does not or will not talk at all</td>
<td></td>
</tr>
<tr>
<td>Regulation of Attention</td>
<td>VERBCOMM: Compared with other children about the same age, how would you describe (CHILD)'s understanding of verbal or nonverbal communication (signs, gestures, symbol systems)? Would you say (he/she)? 1: Understands just as well as other children 2: Has a little trouble understanding 3: Has a lot of trouble understanding 4: Does not understand at all</td>
<td>DP1VERBCOMM 1: Understands just as well as other children 2: Has a little trouble understanding 3: Has a lot of trouble understanding 4: Does not understand at all</td>
</tr>
<tr>
<td></td>
<td>CBPYATTN: Some children are good at paying attention to things and staying focused on what they are doing. Does this sound 1: Very much like (CHILD) 2: A little like (him/her) 3: Not like (him/her)</td>
<td>DP1CBPYATTNR4 1: Very much like (CHILD) 2: A little like (him/her) 4: Not like (him/her)</td>
</tr>
<tr>
<td>Regulation of Feeling and Emotions</td>
<td>CBDEPRSD: Some children are frequently anxious or depressed. Does this sound 1: Very much like (CHILD) 2: A little like (him/her) 3: Not like (him/her)</td>
<td>DP1CBDEPRSDR4 1: Not like (him/her) 2: A little like (him/her) 4: Very much like (CHILD)</td>
</tr>
<tr>
<td>Regulation of Activity Level</td>
<td>CBRSTLSS: Some children are restless, fidget a lot, and have trouble sitting still. Does this sound 1: Very much like (CHILD) 2: A little like (him/her) 3: Not like (him/her)</td>
<td>DP1CBRSTLSSR4 1: Not like (him/her) 2: A little like (him/her) 4: Very much like (CHILD)</td>
</tr>
<tr>
<td>Item</td>
<td>PEELS Parent Interview Questions</td>
<td>Derived Items</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Motivation</td>
<td>CBFINISH: Some children try to finish things, even if it takes a long time. Does this sound</td>
<td>DP1CBFINISHR4</td>
</tr>
<tr>
<td></td>
<td>1: Very much like {CHILD}</td>
<td>1: Very much like {CHILD},</td>
</tr>
<tr>
<td></td>
<td>2: A little like {him/her}</td>
<td>2: A little like {him/her},</td>
</tr>
<tr>
<td></td>
<td>3: Not like {him/her}</td>
<td>4: Not like {him/her}</td>
</tr>
<tr>
<td>Social Skills</td>
<td>CBPLAYNG: Would you say that {CHILD}</td>
<td>DP1PROBSOC</td>
</tr>
<tr>
<td></td>
<td>1: Has no trouble playing with</td>
<td>1: No trouble playing with,</td>
</tr>
<tr>
<td></td>
<td>2: Has some trouble playing</td>
<td>making friends, taking turns with other children</td>
</tr>
<tr>
<td></td>
<td>3: Has a lot of trouble playing</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4: not around other children</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CBFRIEND: Some children have a lot of trouble making or keeping friends. Does this sound</td>
<td>3: Moderate trouble playing with children, making</td>
</tr>
<tr>
<td></td>
<td>1: Not like {CHILD}</td>
<td>friends, taking turns with other children</td>
</tr>
<tr>
<td></td>
<td>2: A little like {him/her}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: Very much like {him/her}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CBTKTURN: When some children are with other children their same age, they take turns and</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Very much like {CHILD}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: A little like {him/her}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: Not like {him/her}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4: child never interacts with peers</td>
<td></td>
</tr>
<tr>
<td>Inappropriate or unusual behavior</td>
<td>CBMANAGE: Would you say {CHILD} is</td>
<td>DP1PROBBEH</td>
</tr>
<tr>
<td></td>
<td>1: Easy to manage</td>
<td>1: Child is easy to manage and</td>
</tr>
<tr>
<td></td>
<td>2: Sometimes hard to manage</td>
<td>behavior is appropriate for age</td>
</tr>
<tr>
<td></td>
<td>3: Often hard to manage</td>
<td>2: Some difficulty with managing</td>
</tr>
<tr>
<td></td>
<td>CBBEHAVR Would you say {CHILD}’s behavior is</td>
<td>behavior or inappropriate behavior for age</td>
</tr>
<tr>
<td></td>
<td>1: Is typical and appropriate for {his/her} age</td>
<td>3: Moderate difficulty with managing</td>
</tr>
<tr>
<td></td>
<td>2: Is mildly inappropriate</td>
<td>behavior or inappropriate behavior for age</td>
</tr>
<tr>
<td></td>
<td>3: Is moderately inappropriate</td>
<td>4: Child is difficult to manage and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>behavior is moderately or severely</td>
</tr>
<tr>
<td></td>
<td></td>
<td>inappropriate for age</td>
</tr>
</tbody>
</table>

## APPENDIX C

### CHILD, FAMILY, AND ENVIRONMENTAL VARIABLES

Table C-1. Child factor variables from PEELS data set

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Factors</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Child sex<sup>a</sup> | CHDSEX | 1: Male  
2: Female |
| Child age<sup>a</sup> | ASSESSAGMW1  
(Age at Assessment for Wave 1) | Valid Responses: 37-76  
(Months) |
| Race/ethnicity<sup>b</sup> | I'm going to read a list of categories. Please choose one or more categories that best describe (CHILD)'s race. Is (he/she)…. | 1: Caucasian/Non-Hispanic  
2: Hispanic  
3: African American or Black  
4: American Indian or Alaska Native  
5: Asian, or Native Hawaiian or other Pacific Islander  
6: Multi-racial/ethnicity |
| | 1: White (CHRACEWH)  
2: African American or Black (CHRACEBL)  
3: American Indian or Alaska Native (CHRACEAI)  
4: Asian (CHRACEAS)  
5: Native Hawaiian or other Pacific Islander (CHRACEPI) | |
| | CHDETHN: Is (CHILD) of Hispanic, Latino, or other Spanish origin? | 1 YES  
2 NO |
| English as a second language<sup>b</sup> | CHDLANG | 1: Yes  
2: No |
| | Any language other than English regularly spoken in child's home | |
| | 1: YES  
2: NO | |
| Child had IFSP<sup>b</sup> | IFSPLAN | 1: Yes  
2: No |
| | Child had an IFSP before age 3 | |
| | 1: YES  
2: NO | |
| Birth weight<sup>b</sup> | PBRTHOZ | Transformed to grams |
| | Birth weight in ounces | Valid Responses: 16 - 229 |
| | Number of weeks early child was born | Valid Responses: 0-20  
(weeks) |
| | Valid Responses: 3 - 20  
-1 inapplicable | |

**Notes.** Alpha-numeric codes represent variable ID in the PEELS data set. Coding associated with PEELS questions does not show response codes for refused, don't know, not ascertained, or inapplicable; these responses will be coded as missing data or no based on response options for variable.  
<sup>a</sup> refers to variables identified in demographic file.  
<sup>b</sup> refers to variables identified in parent interview file.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respondent role</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td>RESPRT</td>
<td>1: Biological mother</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2: Adoptive mother</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3: Biological father</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4: Other role</td>
</tr>
<tr>
<td></td>
<td>Respondent type of parent/guardian</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Biological</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: Adoptive</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: Step</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4: Foster</td>
<td></td>
</tr>
<tr>
<td><strong>RESTYPE</strong></td>
<td>Respondent's relationship to child</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: Mother</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: Father</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: Brother</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4: Sister</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5: Grandmother</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6: Grandfather</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7: Aunt</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8: Uncle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9: Cousin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10: Partner of child's parent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11: Other relative</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12: Non-relative</td>
<td></td>
</tr>
<tr>
<td><strong>CHDLVNOW</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Child currently lives with respondent?</td>
<td>Same as indicated</td>
</tr>
<tr>
<td></td>
<td>1: Yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: No</td>
<td></td>
</tr>
<tr>
<td><strong>MARSTATS</strong></td>
<td>Respondent's legal marital status:</td>
<td>1: Married</td>
</tr>
<tr>
<td>*moderator variable&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
<td>2: Not married</td>
</tr>
<tr>
<td></td>
<td>1: Never married</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: Married</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: Separated</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4: Divorced</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5: Widowed</td>
<td></td>
</tr>
<tr>
<td><strong>INCOME</strong></td>
<td>Please tell me which group best describes the total income of all persons in your household over the past year, including salaries or other earnings, money from public assistance, child support, retirement, and so on, for all household members. Was your household income in the past year…</td>
<td></td>
</tr>
<tr>
<td>*moderator variable&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1: $25,000 or less, or</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: More than $25,000?</td>
<td></td>
</tr>
</tbody>
</table>
### Table C-2. Continued.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family Factors: Family Characteristics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HOWMCH</td>
<td>Was it...</td>
<td></td>
</tr>
<tr>
<td>1: $5,000 or less, or</td>
<td>1: less than 5,000</td>
<td></td>
</tr>
<tr>
<td>2: $5,001 to $10,000,</td>
<td>2: 5,001 – 10,000</td>
<td></td>
</tr>
<tr>
<td>3: $10,001 to $15,000,</td>
<td>3: 10,001 – 15,000</td>
<td></td>
</tr>
<tr>
<td>4: $15,001 to $20,000, or</td>
<td>4: 15,001 – 20,000</td>
<td></td>
</tr>
<tr>
<td>5: $20,001 to $25,000?</td>
<td>5: 20,001 – 25,000</td>
<td></td>
</tr>
<tr>
<td>INC25_50</td>
<td>Was it...</td>
<td></td>
</tr>
<tr>
<td>1: $25,001 to $30,000,</td>
<td>1: less than 25,000</td>
<td></td>
</tr>
<tr>
<td>2: $30,001 to $35,000,</td>
<td>2: 25,001 – 30,000</td>
<td></td>
</tr>
<tr>
<td>3: $35,001 to $40,000,</td>
<td>3: 30,001 – 35,000</td>
<td></td>
</tr>
<tr>
<td>4: $40,001 to $45,000,</td>
<td>4: 35,001 – 40,000</td>
<td></td>
</tr>
<tr>
<td>5: $45,001 to $50,000, or</td>
<td>5: 40,001 – 45,000</td>
<td></td>
</tr>
<tr>
<td>6: More than $50,000?</td>
<td>6: more than 50,000</td>
<td></td>
</tr>
<tr>
<td><strong>Parent education</strong>&lt;sup&gt;b&lt;/sup&gt;</td>
<td><strong>GRADE:</strong> What is the highest year or grade you finished in school?</td>
<td>Same as indicated</td>
</tr>
<tr>
<td><em>moderator variable</em></td>
<td>1: Less than High School with no GED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: High School diploma or GED</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3: Some college/post secondary vocational course</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4: 2- or 3-year college degree (AA degree) or vocational school diploma</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5: 4-year college degree (BA, BS degree)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6: Some graduate work/no graduate degree</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7: Graduate degree (MA, MBA, Ph.D., JD, MD)</td>
<td></td>
</tr>
</tbody>
</table>

**Notes.** Alpha-numeric codes represent variable ID in the PEELS data set. Coding associated with PEELS questions does not show response codes for refused, don’t know, not ascertained, or inapplicable; these responses will be coded as missing data or no based on response options for variable.

<sup>a</sup> refers to variables identified in demographic file.
<sup>b</sup> refers to variables identified in parent interview file.
<sup>c</sup> refers to variables identified in administrator questionnaire file.
<sup>d</sup> refers to variables identified in teacher questionnaire file.
### Table C-3. Parent child interaction variables from PEELS data set

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family Factors: Parent Child Interaction</strong></td>
<td></td>
<td><strong>Sum of yes responses for each activity type; scored 0-7</strong></td>
</tr>
<tr>
<td>Parent-school activities&lt;sup&gt;b&lt;/sup&gt;&lt;sup,#moderator variable&lt;/sup&gt;</td>
<td><strong>Preschool Questions</strong>&lt;br&gt;Since the beginning of the school year, have you or another adult in the household done the following at {CHILD}’s program(s)? [1=YES, 2= NO]</td>
<td></td>
</tr>
<tr>
<td>PATNDMT: a.</td>
<td>Attended a general school or program meeting, for example, back to school night, or a meeting of a parent-teacher organization?</td>
<td></td>
</tr>
<tr>
<td>PATNDSE: b.</td>
<td>Attended a school or class event, such as a play, sports event, or science fair?</td>
<td></td>
</tr>
<tr>
<td>PATNDVL: c.</td>
<td>Volunteered in {CHILD}’s classroom for at least 30 minutes?</td>
<td></td>
</tr>
<tr>
<td>PATNDTRP: d.</td>
<td>Helped with field trips or other special events?</td>
<td></td>
</tr>
<tr>
<td>PATNPTC: e.</td>
<td>Attended parent-teacher conferences?</td>
<td></td>
</tr>
<tr>
<td>PATNPOL: f.</td>
<td>Participated in Policy Council, monitoring-related activities, or other school or program planning groups?</td>
<td></td>
</tr>
<tr>
<td>PATNFND: g.</td>
<td>Participated in fundraising activities?</td>
<td></td>
</tr>
<tr>
<td><strong>Kindergarten Questions</strong>&lt;br&gt;Since the beginning of the school year, have you or another adult in the household done any of the following at {CHILD}’s school? [1=YES, 2= NO]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KATNDMT: a.</td>
<td>Attended a general school meeting, for example, back to school night, or a meeting of a parent-teacher organization?</td>
<td></td>
</tr>
<tr>
<td>KATNDSE: b.</td>
<td>Attended a school or class event, such as a play, sports event, or science fair?</td>
<td></td>
</tr>
<tr>
<td>KATNDVL: c.</td>
<td>Volunteered in {CHILD}’s classroom for at least 30 minutes?</td>
<td></td>
</tr>
</tbody>
</table>
Table C-3. Continued.  

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family Factors: Parent Child Interaction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KATNDFP:</td>
<td>d. Helped with field trips or other special events?</td>
<td></td>
</tr>
<tr>
<td>KATNPTC:</td>
<td>e. Attended parent-teacher conferences?</td>
<td></td>
</tr>
<tr>
<td>KATNPOL:</td>
<td>f. Participated in Policy Council, monitoring-related activities, or other school planning groups?</td>
<td></td>
</tr>
<tr>
<td>KATNFND:</td>
<td>g. Participated in fundraising activities?</td>
<td></td>
</tr>
<tr>
<td><strong>Child extra-curricular activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDANCE:</td>
<td>{Outside of school hours,} has {CHILD} ever participated in dance lessons?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
<tr>
<td>GATHLETE:</td>
<td>{Outside of school hours,} has {he/she} ever participated in organized athletic activities, like gymnastics, soccer, baseball, or basketball?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
<tr>
<td>GCLUBS:</td>
<td>{Outside of school hours,} has {CHILD} ever participated in organized clubs or recreational programs, like scouts?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
<tr>
<td>GMUSIC:</td>
<td>{Outside of school hours,} has {he/she} ever participated in music lessons, such as piano, instrumental music, or singing lessons?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
<tr>
<td>GDRAMA:</td>
<td>{Outside of school hours,} has {CHILD} ever participated in drama classes?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
<tr>
<td>GARTCLSS:</td>
<td>{Outside of school hours,} has {he/she} ever participated in art or crafts classes or lessons, such as painting, drawing, or sculpturing?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
</tbody>
</table>

Sum of yes responses for each activity type; scored 0-7

---

285
<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Family Factors: Parent Child Interaction</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPERFORM:</td>
<td>Outside of school hours,) has {CHILD} ever participated in organized performing arts programs, such as children’s choirs, dance programs, or theater performances?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
<tr>
<td>GGRPACTV:</td>
<td>Are there any children’s group activities, such as story hours, play groups, lessons, Sunday schools, gym programs, or other programs that {CHILD} goes to at least once a month?</td>
<td>Same as indicated</td>
</tr>
<tr>
<td></td>
<td>1: YES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: NO</td>
<td></td>
</tr>
<tr>
<td><strong>Child participation in group activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPLAYGRP:</td>
<td>What group activities does (he/she) go to at least monthly?</td>
<td>Sum of yes responses for each activity type; scored 0-7</td>
</tr>
<tr>
<td></td>
<td>a. Play group (at someone’s home or at a program, babysitting with other children)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Story hour (at library)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. Sunday School/Church childcare</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. Lessons (swimming, art, Gymboree)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e. Athletic teams (soccer t-ball)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>f. Children’s’ organizations (scouts, brownies)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>g. Other</td>
<td></td>
</tr>
<tr>
<td><strong>Regular child group activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPSTGRCY:</td>
<td>In the past month, has anyone in your family done the following things with (CHILD)? [1 = YES, 2 = NO, 9 = DOES NOT APPLY]</td>
<td>Sum of yes responses for each activity type; scored 0-7</td>
</tr>
<tr>
<td></td>
<td>a. Gone to a grocery store?</td>
<td></td>
</tr>
</tbody>
</table>
### Table C-3. Continued.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Factors: Parent Child Interaction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GPSTMALL:</td>
<td>b. Gone to a shopping mall, department store, or discount store?</td>
<td></td>
</tr>
<tr>
<td>GPSTREST:</td>
<td>c. Gone to a restaurant or fast food place?</td>
<td></td>
</tr>
<tr>
<td>GPSTPARK:</td>
<td>d. Gone to a public park or playground?</td>
<td></td>
</tr>
<tr>
<td>GPSTCHRH:</td>
<td>e. Gone to a church, synagogue, or place of worship?</td>
<td></td>
</tr>
<tr>
<td>GPSTLBRY:</td>
<td>f. Gone to the library?</td>
<td></td>
</tr>
<tr>
<td>GPSTMVIE:</td>
<td>g. Gone to a movie?</td>
<td></td>
</tr>
<tr>
<td>Family meals</td>
<td></td>
<td>Number indicated 0-7</td>
</tr>
<tr>
<td>b</td>
<td>GEATMEAL: How many days out of a typical week does your family eat the evening meal together?</td>
<td></td>
</tr>
<tr>
<td><em>moderator variable</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read to</td>
<td></td>
<td>Same as indicated</td>
</tr>
<tr>
<td>b</td>
<td>GREADTO: How many times have you or someone in your family read to {CHILD} in the past week? Would you say...</td>
<td></td>
</tr>
<tr>
<td><em>moderator variable</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes.** Alpha-numeric codes represent variable ID in the PEELS data set. Coding associated with PEELS questions does not show response codes for refused, don't know, not ascertained, or inapplicable; these responses will be coded as missing data or no based on response options for variable.

a refers to variables identified in demographic file.
b refers to variables identified in parent interview file.
c refers to variables identified in administrator questionnaire file.
d refers to variables identified in teacher questionnaire file.
### Table C-4. Environmental factor variables from the PEELS data set

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Environmental Factors (Community and School)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhood Safety*</td>
<td>GPLYSAFE: How safe is it for children to play outside during the day in your neighborhood? Would you say it’s… 1: Not at all safe 2: Somewhat safe 3: Very safe</td>
<td>Same as indicated</td>
</tr>
<tr>
<td>School/Neighborhood Income*</td>
<td>Kindergarten-Elementary School Questions S1LB3M1: About what percentage of your school’s students are from low-income families (e.g., have a child in the free or reduced-price lunch program)? 1: Less than 25% 2: 25%-50% 3: 51-75% 4: More than 75%</td>
<td>Same as indicated</td>
</tr>
<tr>
<td><strong>Preschool Questions</strong> S1EB3M1: What percentage of the children ages 3 through 5 whom you serve live in low-income households (e.g., receive income assistance or food stamps)? 1: Less than 25% 2: 25%-50% 3: 51-75% 4: More than 75%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>School/program quality*</td>
<td>Kindergarten-Elementary School Questions Has your school been designated as a school in need of improvement or a low-performing school under the No Child Left Behind Act? Is this a… S1LA7_1: School in need of improvement? 1: YES 2: NO S1LA7_2: Low-performing school? 1: YES 2: NO</td>
<td>For Kindergarten-Elementary 1: Meet NCLB standard 2: Low performing or in need of improvement For Preschool Same as indicated</td>
</tr>
<tr>
<td><strong>Preschool Questions</strong> S1EA8AM1: Is your program licensed or accredited? 1: YES 2: NO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

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<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent satisfaction with services</strong></td>
<td>ESATISFD Overall respondent satisfaction with special education services</td>
<td>Same as indicated</td>
</tr>
<tr>
<td><strong>Classroom intervention to support social competence</strong></td>
<td>T1KA47 or T1EA29 Does your program support social interaction between this child and children without disabilities?</td>
<td>1: Yes 2: No</td>
</tr>
<tr>
<td><strong>Number of child with IEP in classroom</strong></td>
<td>T1EA2_1 or T1KA7A Number of children with IEP in class</td>
<td>Same as indicated</td>
</tr>
<tr>
<td><strong>Number of child without IEP in classroom</strong></td>
<td>T1EA2_2 or T1KA7B Number of children without IEP in class</td>
<td>Same as indicated</td>
</tr>
<tr>
<td><strong>Focus of IEP goals</strong></td>
<td>For this school year, what are the three most important IEP goals for this child? Please check up to three.</td>
<td>For each goal type 1: Yes 0: No</td>
</tr>
<tr>
<td></td>
<td>T1ED5A or T1KB3B a: Improve overall school readiness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1ED5B or T1KB3C b: Improve pre-academic performance in a specific area</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1ED5C or T1KB3D c: Improve social skills</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1ED5D or T1KB3E D: Improve appropriateness of general behavior</td>
<td></td>
</tr>
<tr>
<td></td>
<td>T1ED5E or T1KB3F e: Improve adaptive behavior or self-help skills</td>
<td></td>
</tr>
</tbody>
</table>
### Table C-4. Continued.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related PEELS Question(s)</th>
<th>Coding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Factors (Community and School)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1ED5F or T1KB3G</td>
<td>f: Improve speech/communication skills</td>
<td></td>
</tr>
<tr>
<td>T1ED5G or T1KB3H</td>
<td>g: Improve fine motor skills</td>
<td></td>
</tr>
<tr>
<td>T1ED5H or T1KB3I</td>
<td>h: Improve gross motor skills</td>
<td></td>
</tr>
<tr>
<td>T1ED5I or T1KB3J</td>
<td>i: Other</td>
<td></td>
</tr>
</tbody>
</table>

**Notes.** Alpha-numeric codes represent variable ID in the PEELS data set. Coding associated with PEELS questions does not show response codes for refused, don't know, not ascertained, or inapplicable; these responses will be coded as missing data or no based on response options for variable.

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- \( ^b \) refers to variables identified in parent interview file.
- \( ^c \) refers to variables identified in administrator questionnaire file.
- \( ^d \) refers to variables identified in teacher questionnaire file.
APPENDIX D
VARIABLE CODING AND ANALYTIC SYNTAX

Variable Coding Syntax

SAS™ Coding for Disability Index
(Provided by Daley, Carlson, & Simeonsson, 2009)

LIBNAME DATA 'C:\DATA';
DATA DATA.W1_PARENT;
SET WORK.W1parent;
RUN;
DATA data.W1_dis_indx_15VAR;
set data.W1_PARENT;
DP1PROBCOMC=0;
DP1PROBHEALTH=0;
DP1CBRSTLSSR4= 0;
DP1CBPYATTNR4=0;
DP1PROBHEAR=0;
DP1PROBSOC=0;
DP1PROBBEH=0;
DP1BARMSGMS=0;
DP1BARMSFMS=0;
DP1BLEGSWEL=0;
DP1BLEGSWEL=0;
DP1PROBVISION=0;
DP1CBDEPRSDR4=0;
DP1CBFINISHR4=0;
DP1SEVERINDX15VAR=0;

/*Create DP1PROBCOMC by combining P1NDSDKWN and P1EASYUNKR*/
If P1NDSDKWN=1 and P1EASYUNKR=1 then DP1PROBCOMC=1;
Else If P1NDSDKWN=1 and P1EASYUNKR=2 then DP1PROBCOMC=1;
Else If P1NDSDKWN=2 and P1EASYUNKR=1 then DP1PROBCOMC=2;
Else If P1NDSDKWN=2 and P1EASYUNKR=2 then DP1PROBCOMC=2;
Else If P1NDSDKWN=3 and P1EASYUNKR=1 then DP1PROBCOMC=2;
Else If P1NDSDKWN=1 and P1EASYUNKR=3 then DP1PROBCOMC=3;
Else If P1NDSDKWN=1 and P1EASYUNKR=4 then DP1PROBCOMC=3;
Else If P1NDSDKWN=3 and P1EASYUNKR=2 then DP1PROBCOMC=3;
Else If P1NDSDKWN=2 and P1EASYUNKR=3 then DP1PROBCOMC=3;
Else If P1NDSDKWN=3 and P1EASYUNKR=3 then DP1PROBCOMC=3;
Else If P1NDSDKWN=4 and P1EASYUNKR=1 then DP1PROBCOMC=4;
Else If P1NDSDKWN=4 and P1EASYUNKR=2 then DP1PROBCOMC=4;
Else If P1NDSDKWN=4 and P1EASYUNKR=3 then DP1PROBCOMC=4;
Else If P1NDSDKWN=4 and P1EASYUNKR=4 then DP1PROBCOMC=4;
Else If P1NDSDKWN=1 and P1EASYUNKR=5 then DP1PROBCOMC=4;
Else If P1NDSDKWN=2 and P1EASYUNKR=5 then DP1PROBCOMC=4;
Else If P1NDSDKWN=3 and P1EASYUNKR=5 then DP1PROBCOMC=4;

Else If P1NDSKWN=4 and P1EASYUNDR=5 then DP1PROBCOMC=4;
Else If P1NDSKWN=3 and P1EASYUNDR=4 then DP1PROBCOMC=4;
Else If P1NDSKWN=2 and P1EASYUNDR=4 then DP1PROBCOMC=4;
label DP1PROBCOMC = INDEX child communication with others Wave 1;

/*Create D1PROBHEALTH by combining P1BHLTHCMP and P1ACTLMTD*/
If P1BHLTHCMP=1 and P1ACTLMTD=2 then D1PROBHEALTH=1;
Else If P1BHLTHCMP=2 and P1ACTLMTD=2 then D1PROBHEALTH=1;
Else If P1BHLTHCMP=3 and P1ACTLMTD=2 then D1PROBHEALTH=2;
Else If P1BHLTHCMP=1 and P1ACTLMTD=1 then D1PROBHEALTH=2;
Else If P1BHLTHCMP=2 and P1ACTLMTD=1 then D1PROBHEALTH=2;
Else If P1BHLTHCMP=3 and P1ACTLMTD=1 then D1PROBHEALTH=3;
Else If P1BHLTHCMP=4 and P1ACTLMTD=2 then D1PROBHEALTH=3;
Else If P1BHLTHCMP=4 and P1ACTLMTD=1 then D1PROBHEALTH=4;
label D1PROBHEALTH = INDEX Child overall health Wave 1;

/*create new variable DP1CBRSTLSSR4 reverse coding*/
If P1CBRSTLSS=1 then DP1CBRSTLSSR4 = 4;
Else if P1CBRSTLSS=2 then DP1CBRSTLSSR4 = 2;
Else if P1CBRSTLSS=3 then DP1CBRSTLSSR4 = 1;
label DP1CBRSTLSSR4 = INDEX Child regulation of activity level Wave 1;

/*create new variable DP1CBPYATTNR4 shift 3 value to 4*/
If P1CBPYATTN = 1 then DP1CBPYATTNR4 = 1;
Else if P1CBPYATTN = 2 then DP1CBPYATTNR4 = 2;
Else if P1CBPYATTN = 3 then DP1CBPYATTNR4 = 4;
label DP1CBPYATTNR4 = INDEX Child regulation of attention Wave 1;

/*Rename cognition*/
DP1CBLEARN=P1CBLEARN;
LABEL DP1CBLEARN = INDEX Child cognition Wave 1;

/*Rename understanding*/
DP1VERBCOMM=P1VERBCOMM;
label DP1VERBCOMM = INDEX Child understanding communication Wave 1;

/*Create DP1PROBHEAR by combining P1HEARCMP, P1WELHRDV and P1HRNGLSS*/
If P1HEARCMP=1 Then DP1PROBHEAR=1;
Else If P1HEARCMP=2 and P1HEARTSTD=2 Then DP1PROBHEAR=2;
Else If P1HEARCMP=2 and P1HEARTSTD=3 Then DP1PROBHEAR=2;
Else If P1HEARCMP=2 and P1HEARTSTD=8 Then DP1PROBHEAR=2;
Else If P1HEARCMP=2 and P1HEARTSTD=9 Then DP1PROBHEAR=2;
Else If P1HEARCMP=2 and P1DIAGPROF=1 Then DP1PROBHEAR=3;
Else If P1HRNGLSS=1 and P1WELHRDV=1 Then DP1PROBHEAR=3;
Else If P1HRNGLSS=1 and P1WELHRDV=2 Then DP1PROBHEAR=3;
Else If P1HRNGLSS=2 and P1WELHRDV=1 Then DP1PROBHEAR=3;
Else If P1HRNGLSS=2 and P1WELHRDV=2 Then DP1PROBHEAR=3;
Else If P1HRNGLSS=3 and P1WELHRDV=1 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=4 and P1WELHRDV=1 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=1 and P1WELHRDV=3 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=2 and P1WELHRDV=3 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=3 and P1WELHRDV=2 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=4 and P1WELHRDV=2 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=1 and P1WELHRDV=4 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=2 and P1WELHRDV=4 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=3 and P1WELHRDV=4 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=4 and P1WELHRDV=4 Then DP1PROBHEAR=4;
Else If P1HRNGLSS=4 and P1WELHRDV=3 Then DP1PROBHEAR=4;

/* Problems with social skills: Create DP1PROBSOC */
If P1CBPLAYNG = -1 then P1CBPLAYNG = .;
If P1CBPLAYNG = -7 then P1CBPLAYNG = .;
If P1CBPLAYNG = -8 then P1CBPLAYNG = .;
If P1CBPLAYNG = -9 then P1CBPLAYNG = .;
If P1CBPLAYNG = 4 then P1CBPLAYNG = .;
If P1CBPLAYNG = -2 then P1CBPLAYNG = .;
If P1CBTKTURN = -1 then P1CBTKTURN = .;
If P1CBTKTURN = -7 then P1CBTKTURN = .;
If P1CBTKTURN = -8 then P1CBTKTURN = .;
If P1CBTKTURN = -9 then P1CBTKTURN = .;
If P1CBTKTURN = 4 then P1CBTKTURN = .;
If P1CBTKTURN = -2 then P1CBTKTURN = .;
If P1CBFRIEND=1 then DP1CBFRIENDR=3;
If P1CBFRIEND=2 then DP1CBFRIENDR=2;
If P1CBFRIEND=3 then DP1CBFRIENDR=2;
If P1CBPLAYNG=1 and DP1CBFRIENDR=1 and P1CBTKTURN=1 Then
DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=2 and P1CBTKTURN=1 Then
DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=1 and P1CBTKTURN=2 Then
DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=1 and P1CBTKTURN=3 Then
DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=2 and P1CBTKTURN=2 Then
DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=2 and P1CBTKTURN=3 Then DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=3 and P1CBTKTURN=2 Then DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=3 and P1CBTKTURN=3 Then DP1PROBSOC=1;
Else If P1CBPLAYNG=1 and DP1CBFRIENDR=3 and P1CBTKTURN=1 Then DP1PROBSOC=1;
Else If P1CBPLAYNG=2 and DP1CBFRIENDR=1 and P1CBTKTURN=1 Then DP1PROBSOC=2;
Else If P1CBPLAYNG=2 and DP1CBFRIENDR=1 and P1CBTKTURN=2 Then DP1PROBSOC=2;
Else If P1CBPLAYNG=2 and DP1CBFRIENDR=2 and P1CBTKTURN=1 Then DP1PROBSOC=2;
Else If P1CBPLAYNG=2 and DP1CBFRIENDR=1 and P1CBTKTURN=3 Then DP1PROBSOC=2;
Else If P1CBPLAYNG=2 and DP1CBFRIENDR=3 and P1CBTKTURN=1 Then DP1PROBSOC=2;
Else If P1CBPLAYNG=2 and DP1CBFRIENDR=3 and P1CBTKTURN=2 Then DP1PROBSOC=3;
Else If P1CBPLAYNG=2 and DP1CBFRIENDR=3 and P1CBTKTURN=3 Then DP1PROBSOC=3;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=1 and P1CBTKTURN=1 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=1 and P1CBTKTURN=2 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=1 and P1CBTKTURN=3 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=2 and P1CBTKTURN=1 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=2 and P1CBTKTURN=2 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=2 and P1CBTKTURN=3 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=3 and P1CBTKTURN=1 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=3 and P1CBTKTURN=2 Then DP1PROBSOC=4;
Else If P1CBPLAYNG=3 and DP1CBFRIENDR=3 and P1CBTKTURN=3 Then DP1PROBSOC=4;
label DP1PROBSOC = INDEX Child Social Skills Wave 1;
/*Create DP1PROBBEH by combining P1CBMANAGE and P1CBBEHAVR*/
If P1CBMANAGE=1 and P1CBBEHAVR=1 Then DP1PROBBEH=1;
Else If P1CBMANAGE=1 and P1CBBEHAVR=2 Then DP1PROBBEH=1;
Else If P1CBMANAGE=2 and P1CBBEHAVR=1 Then DP1PROBBEH=1;
Else If P1CBMANAGE=2 and P1CBBEHAVR=2 Then DP1PROBBEH=2;
Else If P1CBMANAGE=2 and P1CBBEHAVR=3 Then DP1PROBBEH=2;
Else If P1CBMANAGE=3 and P1CBBEHAVR=2 Then DP1PROBBEH=2;
Else If P1CBMANAGE=1 and P1CBBEHAVR=3 Then DP1PROBBEH=3;
Else If P1CBMANAGE=3 and P1CBBEHAVR=1 Then DP1PROBBEH=3;
Else If P1CBMANAGE=1 and P1CBBEHAVR=4 Then DP1PROBBEH=3;
Else If P1CBMANAGE=2 and P1CBBEHAVR=4 Then DP1PROBBEH=3;
Else If P1CBMANAGE=3 and P1CBBEHAVR=3 Then DP1PROBBEH=3;
Else If P1CBMANAGE=3 and P1CBBEHAVR=4 Then DP1PROBBEH=4;
lable DP1PROBBEH = INDEX Child Inappropriate behavior Wave 2;

/* Create new variable:  DP1BARMSGMS shift 5 value to 4*/
If P1BARMSGMS = 1 then DP1BARMSGMS = 1;
Else if P1BARMSGMS = 2 then DP1BARMSGMS = 2;
Else if P1BARMSGMS = 3 then DP1BARMSGMS = 3;
Else if P1BARMSGMS = 4 then DP1BARMSGMS = 4;
Else if P1BARMSGMS = 5 then DP1BARMSGMS = 4;
lable DP1BARMSGMS = INDEX Child use of arms Wave 1;

/* Create new variable:  DP2BARMSFMSL shift 5 value to 4*/
If P1BARMSFMS = 1 then DP1BARMSFMS = 1;
Else if P1BARMSFMS = 2 then DP1BARMSFMS = 2;
Else if P1BARMSFMS = 3 then DP1BARMSFMS = 3;
Else if P1BARMSFMS = 4 then DP1BARMSFMS = 4;
Else if P1BARMSFMS = 5 then DP1BARMSFMS = 4;
lable DP1BARMSFMS = INDEX Child use of hands Wave 1;

/* Create new variable:  DP1BLEGSWEL shift 5 value to 4*/
If P1BLEGSWEL = 1 then DP1BLEGSWEL = 1;
Else if P1BLEGSWEL = 2 then DP1BLEGSWEL = 2;
Else if P1BLEGSWEL = 3 then DP1BLEGSWEL = 3;
Else if P1BLEGSWEL = 4 then DP1BLEGSWEL = 4;
Else if P1BLEGSWEL = 5 then DP1BLEGSWEL = 4;
lable DP1BLEGSWEL = INDEX Child use of legs Wave 1;

/* Create new variable: DP1PROBVISION from P1CHDEYEST, P1VSWOGLS, and P1VSWGLS*/
If P1CHDEYEST=1 Then DP1PROBVISION=1;
Else If P1VSWOGLS=1 Then DP1PROBVISION =1;
Else If P1VSWTHGLS=1 Then DP1PROBVISION=2;
Else If P1VSWTHGLS=2 Then DP1PROBVISION=3;
Else If P1VSWTHGLS=3 Then DP1PROBVISION=4;
Else If P1VSWTHGLS=4 Then DP1PROBVISION=4;
lable DP1PROBVISION = INDEX Child vision Wave 1;

/*create new variable DP1CBDEPRSDR reverse coding*/
If P1CBDEPRSD = 1 then DP1CBDEPRSDR = 3;
Else if P1CBDEPRSD = 2 then DP1CBDEPRSDR = 2;
Else if P1CBDEPRSD = 3 then DP1CBDEPRSDR = 1;
If P1CBDEPRSDR = 3 then DP1CBDEPRSDR4=4;
Else DP1CBDEPRSDR4 = DP1CBDEPRSDR;
lable DP1CBDEPRSDR4 = INDEX Child regulation of feelings emotions Wave 1;

/*create new variable DP1CBFINISHR4 replace 3 with 4*/
If P1CBFINISH = 1 then DP1CBFINISH4 = 1;
Else if P1CBFINISH = 2 then DP1CBFINISH4 = 2;
Else if P1CBFINISH = 3 then DP1CBFINISH4 = 4;
lable DP1CBFINISH4 = INDEX Child motivation Wave 1;

/*alternate code for 3 to 4 shifts;
If P1CBFINISH = 3 then DP1CBFINISH4=4;
Else DP1CBFINISH4 = P1CBFINISH;*/

TMP1=DP1CBLEARN+DP1VERBCOMM+DP1PROBCOMC+D1PROBHEALTH+DP1CBRSTLSSR4+DP1CBPYATTNR4;
TMP2=DP1PROBHEAR+DP1PROBSOC+DP1PROBBEH+DP1BARMSGMS+DP1BARMSFMS+DP1BLEGSWEL;
TMP3=DP1PROBVISION+DP1CBDEPRSDR4+DP1CBFINISHR4;

DP1SEVERINDX15VAR = TMP1+TMP2+TMP3;
lable DP1SEVERINDX15VAR = Var 15 Severity of disability index temp(unweighted)W1;

keep DP1PROBHEAR DP1PROBSOC DP1PROBBEH DP1BARMSGMS DP1BARMSFMS DP1BLEGSWEL DP1PROBVISION DP1CBDEPRSDR4 DP1CBFINISH4;
keep DP1CBLEARN DP1VERBCOMM DP1PROBCOMC D1PROBHEALTH DP1CBRSTLSSR4 DP1CBPYATTNR4;
keep DP1SEVERINDX15VAR CHILDID P1CURMMS P1CHCURGRD;
run;

DATA data.index_mplus;
set data.W1_dis_indx_15VAR;
comunicate=DP1PROBCOMC;
health=D1PROBHEALTH;
activty=DP1CBRSTLSSR4;
attention=DP1CBPYATTNR4;
hear=DP1PROBHEAR;
DATA work.parent_var_all;
SET tmp2.w1parent;
ID = CHILDID + 0;
keep id p1marstats P1INCOME P1HOWMCH P1INC25_50 P1GRADE P1CHDLANG
p1resprint p1restype DP1PBRTHOZ;
keep p1chdlvnow p1ifsplan p1erlynum;
keep p1chracewh p1chracebl p1chraceai p1chraceas p1chracepi p1chdethn; /*RACE
ETHNICITY*/
KEEP P1ESATISFD; /*SATISFACTION WITH SERVICE*/
KEEP P1PATNDMT P1PATNDSE P1PATNDVL P1PATNDRP P1PATNPTC
P1PATNPOL P1PATNFND; /*PARENT PARTICIPATION PRESCHOOL*/
KEEP P1KATNDMT P1KATNDSE P1KATNDVL P1KATNDRP P1KATNPTC
P1KATNPOL P1KATNFND; /*PARENT PARTICIPATION KINDERGARDEN*/
KEEP P1GDANCE P1GATHLETE P1GCLUBS P1GMUSIC P1GDRAMA
P1GARTCLSS P1GPERFORM ; /*CHILD PARTICIPATION COMMUNITY ACTIVITIES*/
keep P1GGRPACTV P1GPLAYGRP P1GSTORYHR P1GSUNSCHL P1GLESSONS
P1GTEAMS P1GSCOUTS P1GACTOTHR; /*CHILD PARTICIPATION OTHER GROUP
ACTIVITIES*/
KEEP P1GPSTGRCRY P1GPSTMALL P1GPSTREST P1GPSTPARK P1GPSTCHRH
P1GPSTLBRY P1GPSTMVIE; /*ACTIVITIES FAMILIES DO TOGETHER*/
keep P1GREATMEAL P1GREADTO; /*# OF TIMES FAMILY MEAL AND READ TO
CHILD IN WEEK*/
KEEP P1GPLYSAFE; /*NEIGHBORHOOD SAFE*/
RUN;

DATA work.principal_var;
SET tmp2.w1principal;
ID = CHILDID + 0;
KEEP ID S1LA7_1 S1LA7_2 S1LB3M1;
RUN;

DATA work.progdir_var;
SET tmp2.w1progdir;
ID = CHILDID + 0;
KEEP ID S1EA8AM1 S1EB3M1;
RUN;

DATA work.ECTEACHER_var;
SET tmp2.w1ecteacher;
ID = CHILDID + 0;
KEEP ID t1ea29 t1ea2_1 t1ea2_2;
Keep t1ed5a t1ed5b t1ed5c t1ed5d t1ed5e t1ed5f t1ed5g t1ed5h t1ed5i;
RUN;

DATA work.kteacher_var;
SET tmp2.w1kteacher;
ID = CHILDID + 0;
KEEP ID t1ka47 t1ka7A t1ka7B;
keep t1kb3b t1kb3c t1kb3d t1kb3e t1kb3f t1kb3g t1kb3h t1kb3i t1kb3j;
RUN;

DATA WORK.MOD_VAR_ALL;
MERGE work.kteacher_var work.ECTEACHER_var work.progdir_var work.principal_var
work.parent_var_all;
BY ID;
RUN;

DATA WORK.MOD_VAR_ALL_REVISE;
SET WORK.MOD_VAR_ALL;
birth_wt = DP1PBRTHOZ;
esl = P1CHDLANG;
live_w_res = p1chdlvnow;
sat_ses = P1ESATISFD;
wk_prem = p1erlynum;
if p1erlynum = -1 then wk_prem = 0;
ifsp_pre3 = p1ifsplan;
if p1ifsplan = -1 then ifsp_pre3 =2;
/*IEP goals*/
g_sch_red = .;
if t1ed5a = 0 then g_sch_red = 0;
if t1ed5a = 1 then g_sch_red = 1;
if t1kb3b = 0 then g_sch_red = 0;
if t1kb3b = 1 then g_sch_red = 1;
g_pre_ac = .;
if t1ed5b = 0 then g_pre_ac = 0;
if t1ed5b = 1 then g_pre_ac = 1;
if t1kb3c = 0 then g_pre_ac = 0;
if t1kb3c = 1 then g_pre_ac = 1;
g_soc_sk_1 = .;
if t1ed5c = 0 then g_soc_sk = 0;
if t1ed5c = 1 then g_soc_sk = 1;
if t1kb3d = 0 then g_soc_sk = 0;
if t1kb3d = 1 then g_soc_sk = 1;
g_beh_1 = .;
if t1ed5d = 0 then g_beh = 0;
if t1ed5d = 1 then g_beh = 1;
if t1kb3e = 0 then g_beh = 0;
if t1kb3e = 1 then g_beh = 1;
g_adapt_1 = .;
if t1ed5e = 0 then g_adapt = 0;
if t1ed5e = 1 then g_adapt = 1;
if t1kb3f = 0 then g_adapt = 0;
if t1kb3f = 1 then g_adapt = 1;
g_com_1 = .;
if t1ed5f = 0 then g_com = 0;
if t1ed5f = 1 then g_com = 1;
if t1kb3g = 0 then g_com = 0;
if t1kb3g = 1 then g_com = 1;
g_Fmotor_1 = .;
if t1ed5g = 0 then g_Fmotor = 0;
if t1ed5g = 1 then g_Fmotor = 1;
if t1kb3h = 0 then g_Fmotor = 0;
if t1kb3h = 1 then g_Fmotor = 1;
g_Gmotor_1 = .;
if t1ed5h = 0 then g_Gmotor = 0;
if t1ed5h = 1 then g_Gmotor = 1;
if t1kb3i = 0 then g_Gmotor = 0;
if t1kb3i = 1 then g_Gmotor = 1;
g_other_1 = .;
if t1ed5i = 0 then g_other = 0;
if t1ed5i = 1 then g_other = 1;
if t1kb3j = 0 then g_other = 0;
if t1kb3j = 1 then g_other = 1;
Res_role =.;
if p1resprnt = 1 and p1restype = 1 then res_role = 1; /* biological mother */
if p1resprnt = 1 and p1restype = 2 then res_role = 2; /* biological father */
if p1resprnt = 2 and p1restype = 1 then res_role = 3; /* adoptive mother */
if p1resprnt = 2 and p1restype = 2 then res_role = 4; /* adoptive father */
if p1resprnt = 1 and p1restype= 5 then res_role =5; /*biological grandmother*/
if p1resprnt = 3 then res_role =6; /*other respondent*/
if p1resprnt = 4 then res_role =6; /*other respondent*/
if p1resprnt = -1 then res_role =6; /*other respondent*/
MAR_STATS =.;
IF p1marstats = 1 THEN MAR_STATS = 2; /*NOT MARRIED*/
IF p1marstats = 2 THEN MAR_STATS = 1; /*MARRIED*/
IF p1marstats = 3 THEN MAR_STATS = 2; /*NOT MARRIED*/
IF p1marstats = 4 THEN MAR_STATS = 2; /*NOT MARRIED*/
IF p1marstats = 5 THEN MAR_STATS = 2; /*NOT MARRIED*/
MRACE = 6;
if p1chracewh =1 and p1chdethn =2 AND p1chracebl =2 AND p1chraceai=2 AND
p1chraceas =2 AND p1chracepi =2 then MRACE = 1; /*WHITE NON-HISPANIC*/
if p1chdethn =1 and p1chracewh =1 AND p1chracebl =2 AND p1chraceai=2 AND
p1chraceas =2 AND p1chracepi =2 then MRACE = 2; /*HISPANIC*/
if p1chracebl = 1 and p1chracewh =2 AND p1chdethn =2 AND p1chraceai=2 AND
p1chraceas =2 AND p1chracepi =2 then MRACE = 3; /*BLACK*/
if p1chraceai = 1 and p1chracewh=2 AND p1chracebl =2 AND p1chdethn =2 AND
p1chraceas =2 AND p1chracepi =2 then MRACE = 4; /* ALASKAN OR AMERICAN
INDIAN*/
if p1chraceas = 1 and p1chracewh=2 AND p1chracebl =2 AND p1chraceai=2 AND
p1chdethn =2 AND p1chracepi =2 then MRACE = 5; /*ASIAN */
if p1chracepi = 1 and p1chracewh=2 AND p1chracebl =2 AND p1chdethn =2 AND
p1chraceas =2 AND p1chracepi =2 then MRACE = 6; /* PACIFIC ISLAND*/
IF p1chracepi = . THEN MRACE=.;
Mpar_edu = .; /*parent education for moderation*/
if P1GRADE = 1 then Mpar_edu = 1; /*no HS*/
if P1GRADE = 2 then Mpar_edu = 2; /* HS*/
if P1GRADE = 3 then Mpar_edu = 3; /*SOME COLLEGE*/
if P1GRADE = 4 then Mpar_edu = 4; /*2 OR 3 YR DEGREE*/
if P1GRADE = 5 then Mpar_edu = 5; /*4-YEAR DEGREE */
if P1GRADE = 6 then Mpar_edu = 6; /*SOME GRADUATE */
if P1GRADE = 7 then Mpar_edu = 7; /*GRADUATE DEGREE */
if P1GRADE = -1 then Mpar_edu = .;
if P1GRADE = -9 then Mpar_edu =;
Dpar_edu = .; /*parent education for descriptive*/
if P1GRADE = 1 then Dpar_edu = 1; /*no HS*/
if P1GRADE = 2 then Dpar_edu = 2; /* HS*/
if P1GRADE = 3 then Dpar_edu = 3; /*SOME COLLEGE OR 2 OR 3 YR DEGREE*/
if P1GRADE = 4 then Dpar_edu = 3; /* SOM COLLEGE OR 2 OR 3 YR DEGREE*/
if P1GRADE = 5 then Dpar_edu = 4; /*4-YEAR DEGREE OR MORE */
if P1GRADE = 6 then Dpar_edu = 4; /*4-YEAR DEGREE OR MORE */
if P1GRADE = 7 then Dpar_edu = 4; /*4-YEAR DEGREE OR MORE */
if P1GRADE = -1 then Dpar_edu = .;
if P1GRADE = -9 then Dpar_edu =;
Mincome = .; /*income for moderation*/
if P1HOWMCH = 1 then Mincome = 1; /*LESS THEN 5,000*/
if P1HOWMCH = 2 then Mincome = 2; /* 5,000 - 10,000*/
if P1HOWMCH = 3 then Mincome = 3; /* 10,000 - 15,000*/
if P1HOWMCH = 4 then Mincome = 4; /* 15,000 - 20,000*/
if P1HOWMCH = 5 then Mincome = 5; /* 20,000 - 25,000*/
if P1INC25_50 = 1 then Mincome = 6; /* 25,000 - 30,000*/
if P1INC25_50 = 2 then Mincome = 7; /* 30,000 - 35,000*/
if P1INC25_50 = 3 then Mincome = 8; /* 35,000 - 40,000*/
if P1INC25_50 = 4 then Mincome = 9; /* 40,000 - 45,000*/
if P1INC25_50 = 5 then Mincome = 10; /* 45,000 - 50,000*/
if P1INC25_50 = 6 then Mincome = 11; /* 50,000 AND ABOVE*/
dincome = .; /*income for descriptive*/
if P1HOWMCH = 1 then dincome = 1; /*LESS THEN 10,000*/
if P1HOWMCH = 2 then dincome = 1; /*LESS THEN 10,000*/
if P1HOWMCH = 3 then dincome = 2; /* 10,000 - 20,000*/
if P1HOWMCH = 4 then dincome = 2; /* 10,000 - 20,000*/
if P1HOWMCH = 5 then dincome = 3; /* 20,000 - 30,000*/
if P1INC25_50 = 1 then dincome = 3; /* 20,000 - 30,000*/
if P1INC25_50 = 2 then dincome = 4; /* 30,000 - 40,000*/
if P1INC25_50 = 3 then dincome = 4; /* 30,000 - 40,000*/
if P1INC25_50 = 4 then dincome = 5; /* 40,000 - 50,000*/
if P1INC25_50 = 5 then dincome = 5; /* 40,000 - 50,000*/
if P1INC25_50 = 6 then dincome = 6; /* 50,000 AND ABOVE*/

MSAFE_NEIG = .;
iF P1GPLYSAFE = 1 THEN MSAFE_NEIG = 1; /* NOT SAFE*/
iF P1GPLYSAFE = 2 THEN MSAFE_NEIG = 2; /* SOMEWHAT SAFE*/
iF P1GPLYSAFE = 3 THEN MSAFE_NEIG = 3; /* VERY SAFE*/

/*set up for summing activities*/
PPT1 =0; PPT2 =0; PPT3 =0; PPT4 =0; PPT5 =0; PPT6 =0; PPT7 =0; PPT8 =0;
PPT9 =0; PPT10 =0; PPT11 =0; PPT12 =0; PPT13 =0; PPT14 =0;
CA1 =0; CA2 =0; CA3 =0; CA4 =0; CA5 =0; CA6 =0; CA7 =0; CA8 =0;
OT1 =0; OT2 =0; OT3 =0; OT4 =0; OT5 =0; OT6 =0; OT7 =0;
FA1 =0; FA2 =0; FA3 =0; FA4 =0; FA5 =0; FA6 =0; FA7 =0;
IF P1PATNDMT = 1 THEN PPT1=1;
IF P1PATNDSE = 1 THEN PPT2=1;
IF P1PATNDVL = 1 THEN PPT3=1;
IF P1PATNDTRP = 1 THEN PPT4=1;
IF P1PATNPTC = 1 THEN PPT5=1;
IF P1PATNPOL = 1 THEN PPT6=1;
IF P1PATNFND = 1 THEN PPT7=1;
IF P1KATNDMT = 1 THEN PPT8=1;
IF P1KATNDSE = 1 THEN PPT9=1;
IF P1KATNDVL = 1 THEN PPT10=1;
IF P1KATNDTRP = 1 THEN PPT11=1;
IF P1KATNPTC = 1 THEN PPT12=1;
IF P1KATNPOL = 1 THEN PPT13=1;
IF P1KATNFND = 1 THEN PPT14 = 1;
P_PART_SCH = PPT1 + PPT2 + PPT3 + PPT4 + PPT5 + PPT6 + PPT7 + PPT8 +
PPT9 + PPT10 + PPT11 + PPT12 + PPT13 + PPT14; /*parent participation in school*/
IF P1GDANCE = 1 THEN CA1 = 1;
IF P1GATHLETE = 1 THEN CA3 = 1;
IF P1GCLUBS = 1 THEN CA4 = 1;
IF P1GMUSIC = 1 THEN CA5 = 1;
IF P1GDRAMA = 1 THEN CA6 = 1;
IF P1GARTCLSS = 1 THEN CA7 = 1;
IF P1GPERFORM = 1 THEN CA8 = 1;
C_PART_ACT = CA1 + CA3 + CA4 + CA5 + CA6 + CA7 + CA8; /*CHILD ACTIVITIES
EVER*/
IF P1GGRPACTV = 1 THEN GEN_ACT_PART = 1; /*other activities yes/no*/
if P1GPLAYGRP = 1 then OT1 = 1;
IF P1GSTORYHR = 1 then OT2 = 1;
IF P1GSUNSCHL = 1 then OT3 = 1;
IF P1GLESSONS = 1 then OT4 = 1;
if P1GTEAMS = 1 then OT5 = 1;
if P1GSCOUTS = 1 then OT6 = 1;
if P1GACTOTHR = 1 then OT7 = 1;
C_OTH_ACT = OT1 + OT2 + OT3 + OT4 + OT5 + OT6 + OT7; /*REGULAR CHILD
ACTIVITIES*/
IF P1GPSTGRCY = 1 THEN FA1 = 1;
IF P1GPSTMALL = 1 THEN FA2 = 1;
IF P1GPSTREST = 1 THEN FA3 = 1;
IF P1GPSTPARK = 1 THEN FA4 = 1;
IF P1GPSTCHR = 1 THEN FA5 = 1;
IF P1GPSTLBRY = 1 THEN FA6 = 1;
IF P1GPSTMVIE = 1 THEN FA7 = 1;
FAM_ACT = FA1 + FA2 + FA3 + FA4 + FA5 + FA6 + FA7; /*parent-child activities*/
read_to = .;
if P1GREADTO = 1 then read_to = 1; /*never*/
if P1GREADTO = 2 then read_to = 2; /*1-2 times a week*/
if P1GREADTO = 3 then read_to = 3; /*3-6 times a week*/
if P1GREADTO = 4 then read_to = 4; /*everyday*/
if P1GREADTO = -8 then read_to = .;
if P1GREADTO = -9 then read_to = .;
eat_meal = P1GEATMEAL;
if P1GEATMEAL = -8 then eat_meal = .;
if P1GEATMEAL = -9 then eat_meal = .;
NEIG_INC = .;
IF s1lb3m1 = 1 then NEIG_INC = 1; /*less than 25% free reduced lunch*/
IF s1lb3m1 = 2 then NEIG_INC = 2; /*25% -50% free reduced lunch*/
IF s1lb3m1 = 3 then NEIG_INC = 3; /*50-75% free reduced lunch*/
IF s1lb3m1 = 4 then NEIG_INC = 4; /*more than 75% free reduced lunch*/
IF s1eb3m1 = 1 then NEIG_INC = 1; /*less than 25% free reduced lunch*/
IF s1eb3m1 = 2 then NEIG_INC =2; /* 25% - 50% free reduced lunch*/
IF s1eb3m1 = 3 then NEIG_INC =3; /* 50-75% free reduced lunch*/
IF s1eb3m1 = 4 then NEIG_INC =4; /* more than 75% free reduced lunch*/
NCLB = 3;
IF S1LA7_1 = 1 THEN NCLB =2; /* IN NEED OF IMPROVEMENT*/
IF S1LA7_2 = 1 THEN NCLB =1; /* LOW PERFORMING*/
IF S1LA7_1 = . THEN NCLB =.;
IF S1LA7_2 = . THEN NCLB =.;
PRE_ACRD = S1EA8AM1;
if S1EA8AM1 = 3 then PRE_ACRD = 2;
SSUP_SS = .;
IF t1ea29 = 1 then SSUP_SS = 1;
IF t1ea29 = 2 then SSUP_SS = 2;
IF t1ea29 = 3 then SSUP_SS = 2;
IF t1ea29 = 4 then SSUP_SS = 2;
IF t1ea29 = 5 then SSUP_SS = 2;
IF t1ka47 = 1 then SSUP_SS = 1;
IF t1ka47 = 2 then SSUP_SS = 2;
IF t1ka47 = 3 then SSUP_SS = 2;
IF t1ka47 = 4 then SSUP_SS = 2;
IF t1ka47 = 5 then SSUP_SS = 2;
DROP PPT1 PPT2 PPT3 PPT4 PPT5 PPT6 PPT7 PPT8 PPT9 PPT10 PPT11 PPT12
PPT13 PPT14;
drop CA1 CA2 CA3 CA4 CA5 CA6 CA7 CA8;
Drop OT1 OT2 OT3 OT4 OT5 OT6 OT7;
Drop FA1 FA2 FA3 FA4 FA5 FA6 FA7;
RUN;

/* test all revised variable frequencies*/
proc freq data = work.MOD_VAR_ALL_REVISE;
table birth_wt ;
table esl ;
table live_w_res ;
table sat_ses ;
table wk_prem ;
table ifsp_pre3 PRE_ACRD ;
run;
proc freq data = work.MOD_VAR_ALL_REVISE;
table g_sch_red g_pre_ac g_soc_sk g_beh;
table g_adapt g_com g_Fmotor g_Gmotor g_other;
table Res_role;
table mar_stats;
table mrace;
table mpar_edu ;
run;
proc freq data = work.MOD_VAR_ALL_REVISE;
/*get number of children with and without IEP previous CM file*/
DATA TMP1.temp_iep;
SET tmp1.Cm_descriptive_combine;
n_ch_IEP = n_iep_class ;
IF n_iep_class = -1 THEN n_ch_IEP = .;
IF n_iep_class = -9 THEN n_ch_IEP = .;
n_ch_nIEP = n_nep_class ;
IF n_nep_class = -1 THEN n_ch_nIEP = .;
IF n_nep_class = -9 THEN n_ch_nIEP = .;
KEEP ID n_ch_IEP n_ch_nIEP;
RUN;

LIBNAME DATA 'C:\DATA';
proc sort data=tmp1.Model_cm_sc_remove;
by ID;
RUN;
proc sort data=work.MOD_VAR_ALL_REVISE;
by ID;
RUN;
proc sort data=TMP1.temp_iep;
by ID;
RUN;

Data data.MODERATOR_FILE;
merge work.MOD_VAR_ALL_REVISE data.Model_cm_sc_remove TMP1.temp_iep;
by id;
run;

LIBNAME DATA 'C:\DATA';
data DATA.moderator_file ;
set DATA.Moderator_file;
drop g_soc_sk_1 g.beh_1 g_adapt_1 g_com_1 g_Fmotor_1 g_Gmotor_1 g_OTHER_1;
run;
Analytic Coding Syntax

Mplus Latent Class Analyses 2- through 7-Class Models - Research Question 1

Title:
LCA SYNTAX 2-CLASS
DATA:
FILE IS "C:/data/Wt_use_lca.txt" ;
VARIABLE:
NAMES ARE hear id com heal act att soc beh arm leg hand
vis emo mot cog und SOC_COOP SOC_INT SOC_IND BEH_EXT
BEH_INT PROB_BEH autism dd ebd ld mr sl li age CHDSEX SOC_SKL
Varstrat Varunit PCT1CW0 PC1CW0 ;
USEVARIABLES ARE hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
CLASSES = c (2) ;
CATEGORICAL = hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
missing are all (0);
STRATIFICATION IS Varstrat;
CLUSTER IS Varunit;
WEIGHT IS PC1CW0;
define:
if arm==3 then arm=4;
if hand==3 then hand=4;
if leg==3 then leg=4;
if vis==3 then vis=4;
if hear==3 then hear=4;
ANALYSIS:
Type = MIXTURE COMPLEX;
STARTS = 500 40 ;
loghigh = 45;
loglow = -45;
OUTPUT:
TECH1 ;
!sampstat;

Title:
LCA SYNTAX 3-CLASS
DATA:
FILE IS "C:/data/Wt_use_lca.txt" ;
VARIABLE:
NAMES ARE hear id com heal act att soc beh arm leg hand
vis emo mot cog und SOC_COOP SOC_INT SOC_IND BEH_EXT
BEH_INT PROB_BEH autism dd ebd ld mr sl li age CHDSEX SOC_SKL
Varstrat Varunit PCT1CW0 PC1CW0 ;
USEVARIABLES ARE hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
CLASSES = c (3) ;
CATEGORICAL = hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
missing are all (0);
STRATIFICATION IS Varstrat;
CLUSTER IS Varunit;
WEIGHT IS PC1CW0;
define:
if arm==3 then arm=4;
if hand==3 then hand=4;
if leg==3 then leg=4;
if vis==3 then vis=4;
if hear==3 then hear=4;
ANALYSIS:
Type = MIXTURE COMPLEX;
STARTS = 500 40 ;
loghigh = 45;
loglow = -45;
OUTPUT:
TECH1 ;
!sampstat;

Title:
LCA SYNTAX 4-CLASS
DATA:
FILE IS "C:/data/Wt_use_lca.txt" ;
VARIABLE:
NAMES ARE hear id com heal act att soc beh arm leg hand
vis emo mot cog und SOC_COOP SOC_INT SOC_IND BEH_EXT
BEH_INT PROB_BEH autism dd ebd ld mr sl li age CHDSEX SOC_SKL
Varstrat Varunit PCT1CW0 PC1CW0 ;
USEVARIABLES ARE hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
CLASSES = c (4) ;
CATEGORICAL = hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
missing are all (0);
STRATIFICATION IS Varstrat;
CLUSTER IS Varunit;
WEIGHT IS PC1CW0;
define:
if arm==3 then arm=4;
if hand==3 then hand=4;
if leg==3 then leg=4;
if vis==3 then vis=4;
if hear==3 then hear=4;
ANALYSIS:
Type = MIXTURE COMPLEX;
STARTS = 500 40;
loghigh = 45;
loglow = -45;
OUTPUT:
TECH1;
!sampstat;

Title:
LCA SYNTAX 5-CLASS
DATA:
FILE IS "C:/data/Wt_use_lca.txt";
VARIABLE:
NAMES ARE hear id com heal act att soc beh arm leg hand
vis emo mot cog und SOC_COOP SOC_INT SOC_IND BEH_EXT
BEH_INT PROB_BEH autism dd ebd ld mr sl li age CHDSEX SOC_SKL
Varstrat Varunit PCT1CW0 PC1CW0;
USEVARIABLES ARE hear com heal act att soc beh arm leg hand
vis emo mot cog und;
CLASSES = c (5);
CATEGORICAL = hear com heal act att soc beh arm leg hand
vis emo mot cog und;
missing are all (0);
STRATIFICATION IS Varstrat;
CLUSTER IS Varunit;
WEIGHT IS PC1CW0;
define:
if arm==3 then arm=4;
if hand==3 then hand=4;
if leg==3 then leg=4;
if vis==3 then vis=4;
if hear==3 then hear=4;
ANALYSIS:
Type = MIXTURE COMPLEX;
STARTS = 500 40;
loghigh = 45;
loglow = -45;
OUTPUT:
TECH1;
SAVEDATA:
FILE = fiveclassout.dat;
SAVE = CPROB;
Title:
LCA SYNTAX 6-CLASS
DATA:
FILE IS "C:/data/Wt_use_lca.txt" ;
VARIABLE:
  NAMES ARE hear id com heal act att soc beh arm leg hand
  vis emo mot cog und SOC_COOP SOC_INT SOC_IND BEH_EXT
  BEH_INT PROB_BEH autism dd ebd ld mr sl li age CHDSEX SOC_SKL
  Varstrat Varunit PC1CW0 PC1CW0 ;
USEVARIABLES ARE hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
CLASSES = c (6) ;
CATEGORICAL = hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
missing are all (0);
STRATIFICATION IS Varstrat;
CLUSTER IS Varunit;
WEIGHT IS PC1CW0;
define:
if arm==3 then arm=4;
if hand==3 then hand=4;
if leg==3 then leg=4;
if vis==3 then vis=4;
if hear==3 then hear=4;
ANALYSIS:
Type = MIXTURE COMPLEX;
STARTS = 500 40 ;
loghigh = 45;
loglow = -45;
OUTPUT:
TECH1 ;
!sampstat;

Title:
LCA SYNTAX 7-CLASS
DATA:
FILE IS "C:/data/Wt_use_lca.txt" ;
VARIABLE:
  NAMES ARE hear id com heal act att soc beh arm leg hand
  vis emo mot cog und SOC_COOP SOC_INT SOC_IND BEH_EXT
  BEH_INT PROB_BEH autism dd ebd ld mr sl li age CHDSEX SOC_SKL
  Varstrat Varunit PC1CW0 PC1CW0 ;
USEVARIABLES ARE hear com heal act att soc beh arm leg hand
vis emo mot cog und ;
CLASSES = c (7) ;
CATEGORICAL = hear com heal act att soc beh arm leg hand
vis emo mot cog und;
missing are all (0);
STRATIFICATION IS Varstrat;
CLUSTER IS Varunit;
WEIGHT IS PC1CW0;
define:
if arm==3 then arm=4;
if hand==3 then hand=4;
if leg==3 then leg=4;
if vis==3 then vis=4;
if hear==3 then hear=4;
ANALYSIS:
Type = MIXTURE COMPLEX;
STARTS = 500 40 ;
loghigh = 45;
loglow = -45;
OUTPUT:
TECH1 ;
!sampstat;

SAS™ to Calculate Model Implied Means 5-class model - Research Question 1
(Calculations provided by Algina)

DATA ;
INPUT VAR $CLASS SOLUT PROP1 PROP2 PROP4 ;
MEAN=1*PROP1+2*PROP2+4*PROP4;
VARIANCE=PROP1*(1-MEAN)**2+PROP2*(2-MEAN)**2+PROP4*(4-MEAN)**2;
DATALINES;
HEAR 1 5 0.955 0.016 0.029
ARM 1 5 0.743 0.249 0.008
HAND 1 5 0.195 0.557 0.248
LEG 1 5 0.739 0.254 0.007
VIS 1 5 0.924 0.064 0.013
HEAR 2 5 0.909 0.010 0.082
ARM 2 5 0.000 0.537 0.463
HAND 2 5 0.000 0.159 0.841
LEG 2 5 0.032 0.581 0.388
VIS 2 5 0.412 0.263 0.325
HEAR 3 5 0.940 0.000 0.060
ARM 3 5 0.327 0.501 0.172
HAND 3 5 0.072 0.613 0.314
LEG 3 5 0.271 0.442 0.287
DATA;
INPUT VAR $CLASS SOLUT PROP1 PROP2 PROP4;
MEAN=1*PROP1+2*PROP2+4*PROP4;
VARIANCE={PROP1*(1-MEAN)**2+PROP2*(2-MEAN)**2+PROP4*(4-MEAN)**2;
DATALINES;
ACT 1 5 0.112 0.208 0.680
ATT 1 5 0.098 0.262 0.640
EMO 1 5 0.540 0.280 0.180
MOT 1 5 0.080 0.274 0.646
ACT 2 5 0.178 0.338 0.484
ATT 2 5 0.096 0.295 0.609
EMO 2 5 0.744 0.198 0.058
MOT 2 5 0.132 0.168 0.700
ACT 3 5 0.419 0.326 0.255
ATT 3 5 0.348 0.392 0.260
EMO 3 5 0.811 0.087 0.101
MOT 3 5 0.236 0.455 0.309
ACT 4 5 0.159 0.343 0.498
ATT 4 5 0.111 0.549 0.340
EMO 4 5 0.809 0.141 0.049
MOT 4 5 0.149 0.441 0.409
ACT 5 5 0.520 0.387 0.093
ATT 5 5 0.530 0.404 0.066
EMO 5 5 0.936 0.059 0.004
MOT 5 5 0.345 0.483 0.172
PROC PRINT;
RUN;

DATA;
INPUT VAR $CLASS SOLUT PROP1 PROP2 PROP3 PROP4;
MEAN=1*PROP1+2*PROP2+3*PROP3+4*PROP4;
VARIANCE=PROP1*(1-MEAN)**2+PROP2*(2-MEAN)**2+PROP3*(3-MEAN)**2+PROP4*(4-MEAN)**2;

DATALINES;
COM 1 5 0.014 0.077 0.441 0.467
HEAL 1 5 0.414 0.313 0.170 0.104
SOC 1 5 0.141 0.023 0.497 0.339
BEH 1 5 0.082 0.449 0.329 0.140
COG 1 5 0.052 0.038 0.405 0.505
UND 1 5 0.024 0.416 0.535 0.025
COM 2 5 0.000 0.099 0.276 0.625
HEAL 2 5 0.184 0.304 0.259 0.253
SOC 2 5 0.101 0.036 0.367 0.496
BEH 2 5 0.272 0.295 0.301 0.132
COG 2 5 0.005 0.000 0.159 0.835
UND 2 5 0.018 0.392 0.521 0.069
COM 3 5 0.434 0.069 0.368 0.129
HEAL 3 5 0.356 0.317 0.175 0.152
SOC 3 5 0.563 0.144 0.270 0.024
BEH 3 5 0.759 0.215 0.026 0.001
COG 3 5 0.109 0.358 0.457 0.077
UND 3 5 0.606 0.351 0.043 0.000
COM 4 5 0.230 0.133 0.530 0.107
HEAL 4 5 0.633 0.227 0.118 0.022
SOC 4 5 0.492 0.073 0.381 0.053
BEH 4 5 0.479 0.411 0.103 0.007
COG 4 5 0.064 0.313 0.573 0.050
UND 4 5 0.321 0.622 0.058 0.000
COM 5 5 0.455 0.066 0.417 0.061
HEAL 5 5 0.788 0.153 0.045 0.015
SOC 5 5 0.832 0.075 0.084 0.010
BEH 5 5 0.921 0.066 0.013 0.000
COG 5 5 0.173 0.756 0.069 0.002
UND 5 5 0.895 0.102 0.003 0.000
PROC PRINT;
RUN;

LIBNAME DATA 'C:\DATA';
DATA DATA.class5solfinal;
SET WORK.data20 work.data21 work.data22 ;
RUN;
Quit;
SAS™ Descriptive Analyses - Research Question 1

/* OPEN LIBRARY TO ACCESS FILE*/
LIBNAME DATA 'C:\DATA';
DATA DATA.Moderator_file;
SET tmp1.Moderator_file;
RUN;

/*CM = latent class membership
Results were interpreted using the following key
CM 1 = Profile 2
CM 2 = Profile 1
CM 3 = Profile 3
CM 4 = Profile 4
CM 5 = Profile 5
*/

/*GENERAL DESCRIPTIVES*/
Proc sort data=DATA.Moderator_file;
by cm;
run;

PROC SURVEYMEANS data=DATA.Moderator_file VARMETHOD=Taylor MEAN VAR clm;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PC1CW0;
VAR AGE;
BY CM;
RUN;

/* CODE EXAMPLE FOR DESCRIPTIVES use to get SD for weighted analyses -
vardef=wdf*/
proc MEANS vardef=wdf data=DATA.Moderator_file ;
WEIGHT T_PC1CW0;
VAR age;
BY CM;
RUN;

/* CROSS-CLASSIFICATION FOR CM AND DIS--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PC1CW0;
table cm*AUTISM;
table cm*DD;
DATA WORK.Moderator_file_TEMP;
SET DATA.Moderator_file;
IF DIS = . THEN DIS =8;
RUN;

/* CROSS-CLASSIFICATION FOR CM AND DIS--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=WORK.Moderator_file_temp VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _PC1CW0;
table cm*DIS; /*1=aut, 2=dd, 3= li, 4= ebd, 5=mr, 6=ld, 7=sl, 8=missing*/
TABLE DIS*CM;
run;

/* CROSS-CLASSIFICATION FOR CM AND Gender--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _PC1CW0;
table cm*chdsex;
run;

/* CROSS-CLASSIFICATION FOR CM AND AGE COHORT--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _PC1CW0;
table cm*COHORT;
run;

/* CROSS-CLASSIFICATION FOR CM AND race ethnicity--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _PC1CW0;
table cm*MRACE;
run;
/* CROSS-CLASSIFICATION FOR CM AND ESL--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT   T_PC1CW0;
   table cm*esl;
   run;
   
/* CROSS-CLASSIFICATION FOR CM AND ifsp pre 3--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT   T_PC1CW0;
   table cm*ifsp_pre3;
   run;
   
/* CM AND weeks premature, birthweight--PARENT CHILD WEIGHTS*/
PROC SURVEYMEANS data=DATA.Moderator_file VARMETHOD=Taylor MEAN VAR
   clm;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT   T_PC1CW0;
   VAR wk_prem birth_wt;
   BY CM;
   RUN;
   
/* use to get STD for weighted analyses -vardef=wdf*/
proc MEANS vardef=wdf data=DATA.Moderator_file ;
   WEIGHT   T_PC1CW0;
   VAR wk_prem birth_wt;
   BY CM;
   RUN;
   
/* CROSS-CLASSIFICATION FOR CM AND home live environment--PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT   T_PC1CW0;
   table cm*live_w_res;
   run;
   
/* average child activities--PARENT CHILD WEIGHTS*/
PROC SURVEYMEANS data=DATA.Moderator_file VARMETHOD=Taylor MEAN VAR
   clm;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT   T_PC1CW0;
VAR  C_PART_ACT ;
BY CM;
RUN;

/* use to get SD for weighted analyses -vardef=wdf*/
proc MEANS vardef=wdf data=DATA.Moderator_file ;
WEIGHT   T_PC1CW0;
VAR  C_PART_ACT ;
BY CM;
RUN;

/* CROSS-CLASSIFICATION FOR CM AND activity information-PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT   T_PC1CW0;
table cm*GEN_ACT_PART;
table cm*read_to;
run;

data work.moderator_activty_temp ;
set DATA.Moderator_file;
if GEN_AC\nT_PART = . then C_OTH_ACT = .;
run;

/* average child activities for children who participate--PARENT CHILD WEIGHTS*/
PROC SURVEYMEANS data=work.moderator_activty_temp VARMETHOD=Taylor MEAN VAR clm;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT   T_PC1CW0;
VAR  C_OTH_ACT ;
BY CM;
RUN;

/* use to get SD for weighted analyses -vardef=wdf*/
proc MEANS vardef=wdf data=work.moderator_activty_temp ;
WEIGHT   T_PC1CW0;
VAR  C_OTH_ACT ;
BY CM;
RUN;
/* average family activities -PARENT CHILD WEIGHTS*/
PROC SURVEYMEANS data=work.moderator_activty_temp VARMETHOD=Taylor
MEAN VAR clm;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PC1CW0;
VAR fam_act eat_meal ;
BY CM;
RUN;

/* use to get SD for weighted analyses -vardef=wdf*/
proc MEANS vardef=wdf data=work.moderator_activty_temp ;
WEIGHT T_PC1CW0;
VAR fam_act eat_meal ;
BY CM;
RUN;

/* CROSS-CLASSIFICATION FOR CM AND martial status-PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PC1CW0;
table cm*mar_stats;
run;

/* CROSS-CLASSIFICATION FOR CM AND respondent role-PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PC1CW0;
table cm*res_role;
run;

/* CROSS-CLASSIFICATION FOR CM AND dincome-PARENT CHILD WEIGHTS*/
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PC1CW0;
table cm*dincome;
run;

/* average parent satisfication -PARENT CHILD WEIGHTS*/
PROC SURVEYMEANS data=work.moderator_FILE VARMETHOD=Taylor MEAN VAR clm;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT T_PC1CW0;
VAR sat_ses;
BY CM;
RUN;

/* use to get SD for weighted analyses - vardef=wdf */
proc MEANS vardef=wdf data=work.moderator_FILE;
WEIGHT T_PC1CW0;
VAR sat_ses;
BY CM;
RUN;

/* CROSS-CLASSIFICATION FOR CM AND school income area-PARENT CHILD Teacher WEIGHTS */
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT T_PC1CW0;
table cm*neig_inc;
r;

/* CROSS-CLASSIFICATION FOR CM AND school quality-PARENT CHILD Teacher WEIGHTS */
proc SURVEYfreq data=DATA.Moderator_file VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT T_PC1CW0;
table cm*PRE_ACRD;
table cm*nclb;
r;

data work.moderator_GOAL_temp;
set DATA.Moderator_file;
if g_sch_red = . then g_sch_red = 0;
if g_pre_ac = . then g_pre_ac = 0;
if g_soc_sk = . then g_soc_sk = 0;
if g_beh = . then g_beh = 0;
if g_adapt = . then g_adapt = 0;
if g_com = . then g_com = 0;
if g_Fmotor = . then g_Fmotor = 0;
if g_Gmotor = . then g_Gmotor = 0;
if g_other = . then g_other = 0;
IF SSUP_SS = . THEN SSUP_SS = 2;
r;
/* CROSS-CLASSIFICATION FOR CM AND goal type-PARENT CHILD Teacher WEIGHTS*/
proc SURVEYfreq data=WORK.Moderator_GOAL_TEMP VARMETHOD=Taylor;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT  T_PCT1CW0;
  table cm* g_sch_red;
  table cm* g_pre_ac;
  table cm* g_soc_sk;
  table cm* g_beh;
  table cm* g_adapt;
  table cm* g_com;
  table cm* g_Fmotor;
  table cm* g_Gmotor;
  table cm* g_other;
run;

/* CROSS-CLASSIFICATION FOR CM AND support participation-PARENT CHILD Teacher WEIGHTS*/
proc SURVEYfreq data=work.moderator_GOAL_temp  VARMETHOD=Taylor;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT  T_PCT1CW0;
  table cm*SSUP_SS;
run;

/* CROSS-CLASSIFICATION FOR CM AND support participation-PARENT CHILD Teacher WEIGHTS*/
PROC SURVEYMEANS data=work.moderator_activty_temp VARMETHOD=Taylor
  MEAN VAR clm;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT  T_PCT1CW0;
  VAR n_ch_IEP n_ch_nIEP ;
  BY CM;
  RUN;

/* use to get SD for weighted analyses -vardef=wdf*/
proc MEANS vardef=wdf data=work.moderator_activty_temp ;
  WEIGHT  T_PCT1CW0;
  VAR n_ch_IEP n_ch_nIEP ;
  BY CM;
  RUN;
LIBNAME DATA 'C:\DATA';
DATA DATA.Model_cm_sc_remove;
SET WORK.Model_cm_sc_remove ;
RUN;

/*MODEL TO REPORT ESTIMATES AND COMPARISONS;CM CENTERED ON AGE;
NEED TO CALCULATE ES and CI*/
proc SURVEYREG data=data.Model_cm_sc_remove VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM;
MODEL SOC_SKL = CM /ANOVA SOLUTION;
ESTIMATE 'CLASS 1' INTERCEPT 1 CM 1 0 0 0 0;
ESTIMATE 'CLASS 2' INTERCEPT 1 CM 0 1 0 0 0;
ESTIMATE 'CLASS 3' INTERCEPT 1 CM 0 0 1 0 0;
ESTIMATE 'CLASS 4' INTERCEPT 1 CM 0 0 0 1 0;
ESTIMATE 'CLASS 5' INTERCEPT 1 CM 0 0 0 0 1;
ESTIMATE '1 VS 2' CM 1 -1 0 0 0;
ESTIMATE '1 VS 3' CM 1 0 -1 0 0;
ESTIMATE '1 VS 4' CM 1 0 0 -1 0;
ESTIMATE '1 VS 5' CM 1 0 0 0 -1;
ESTIMATE '2 VS 3' CM 0 1 -1 0 0;
ESTIMATE '2 VS 4' CM 0 1 0 -1 0;
ESTIMATE '2 VS 5' CM 0 1 0 0 -1;
ESTIMATE '3 VS 4' CM 0 0 1 -1 0;
ESTIMATE '3 VS 5' CM 0 0 1 0 -1;
ESTIMATE '4 VS 5' CM 0 0 0 1 -1;
RUN;

/* MODEL DIS ONLY FOR R2 */
proc SURVEYREG data=data.Model_cm_sc_remove VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS DIS;
MODEL SOC_SKL = DIS /ANOVA SOLUTION;
RUN;
/* MODEL CM ONLY FOR R2 */
proc SURVEYREG data=data.Model_cm_sc_remove VARMETHOD=Taylor;
   STRATA Taylor_VARSTRAT;
   CLUSTER Taylor_VARUNIT;
   WEIGHT T_PCT1CW0;
   CLASS CM;
   MODEL SOC_SKL = CM /ANOVA SOLUTION;
RUN;

/* MODEL CM AND DIS FOR R2 */
proc SURVEYREG data=data.Model_cm_sc_remove VARMETHOD=Taylor;
   STRATA Taylor_VARSTRAT;
   CLUSTER Taylor_VARUNIT;
   WEIGHT T_PCT1CW0;
   CLASS CM DIS;
   MODEL SOC_SKL = CM DIS /ANOVA SOLUTION;
RUN;

/* HOLD OUT ANALYSES FOR r2 */
DATA WORK.Model_cm_sc_remove_HOLD_OUT;
   SET DATA.Model_cm_sc_remove ;
   if dis = 7 then delete;
RUN;

/* MODEL DIS ONLY FOR R2 */
proc SURVEYREG data=WORK.Model_cm_sc_remove_HOLD_OUT VARMETHOD=Taylor;
   STRATA Taylor_VARSTRAT;
   CLUSTER Taylor_VARUNIT;
   WEIGHT T_PCT1CW0;
   CLASS DIS;
   MODEL SOC_SKL = DIS /ANOVA SOLUTION;
RUN;

/* MODEL CM ONLY FOR R2 */
proc SURVEYREG data=WORK.Model_cm_sc_remove_HOLD_OUT VARMETHOD=Taylor;
   STRATA Taylor_VARSTRAT;
   CLUSTER Taylor_VARUNIT;
   WEIGHT T_PCT1CW0;
   CLASS CM;
   MODEL SOC_SKL = CM /ANOVA SOLUTION;
RUN;

/* MODEL CM AND DIS FOR R2 */
proc SURVEYREG data=WORK.Model_cm_sc_remove_HOLD_OUT
   VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT  T_PCT1CW0;
CLASS CM DIS;
MODEL SOC_SKL = CM DIS /ANOVA SOLUTION;
RUN;

/* CROSS-CLASSIFICATION FOR CM AND DIS--PARENT CHILD TEACHER WEIGHTS*/
DATA WORK.Moderator_file_TEMP;
SET DATA.Moderator_file;
IF DIS = . THEN DIS =8;
RUN;

proc SURVEYfreq data=WORK.Moderator_file_temp VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT  T_PCT1CW0;
table cm*DIS; /*1=aut, 2=dd, 3= li, 4= ebd, 5=mr, 6=ld, 7=sl, 8=missing*/
run;

SAS™ Moderation Analyses - Research Question 4
(Example for Social Skills Analyses)

/*get mean to center continuous variables*/
PROC MEANS vardef=wdf  DATA= data.Moderator_file;
WEIGHT  T_PCT1CW0;
VAR age MINCOME EAT_MEAL P_PART_SCH C_PART_ACT C_OTH_ACT
FAM_ACT ; /*ALL CONTINUOUS SHOULD BE CONETERED*/
RUN;

/*create new centered continuous variables*/
data data.Moderator_file_CENTERED;
SET data.Moderator_file;
AGE_CEN=AGE  -55.77;*55.77 CALCULATED AS A WEIGHTED MEAN;
Mincome_CEN=MINCOME- 7.3144104; * 7.3144104 CALCULATED AS A WEIGHTED MEAN;
EAT_MEAL_CEN = EAT_MEAL - 5.4065115;
P_PART_SCH_CEN = P_PART_SCH- 3.3415803;
C_PART_ACT_CEN = C_PART_ACT - 0.6884862;
C_OTH_ACT_CEN = C_OTH_ACT - 0.6741080;
FAM_ACT_CEN = FAM_ACT - 5.1572612;
run;

/* MODERATION CODE CHILD FACTORS */

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT   T_PC1CW0;
  CLASS CM;
  MODEL SOC_SKL = CM AGE_CEN /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT   T_PC1CW0;
  CLASS CM;
  MODEL SOC_SKL = CM AGE_CEN CM*AGE_CEN/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file CENTERED VARMETHOD=Taylor;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT   T_PCT1CW0;
  CLASS CM CHDSEX;
  MODEL SOC_SKL = CM CHDSEX /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT   T_PCT1CW0;
  CLASS CM CHDSEX;
  MODEL SOC_SKL = CM CHDSEX CM*CHDSEX/ANOVA SOLUTION;
RUN;

/* moderation with 4 groups for race/ethnicity*/
data work.moderator_file_race_temp;
Set data.Moderator_file;
  mrace_new = .;
  if mrace = 1 then mrace_new = 1 ;
  if mrace = 2 then mrace_new = 2 ;
  if mrace = 3 then mrace_new = 3 ;
if mrace = 4 then mrace_new = 4 ;
if mrace = 5 then mrace_new = 4 ;
if mrace = 6 then mrace_new = 4 ;
run;

proc SURVEYREG data=work.Moderator_file_race_temp VARMETHOD=Taylor;
  STRATA Taylor_VARSTRAT;
  CLUSTER Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM MRACE_new;
  MODEL SOC_SKL = CM MRACE_new /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=work.Moderator_file_race_temp VARMETHOD=Taylor;
  STRATA Taylor_VARSTRAT;
  CLUSTER Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM MRACE_new;
  MODEL SOC_SKL = CM MRACE_new CM*MRACE_new/ANOVA SOLUTION;
RUN;

/* MODERATION CODE FAMILY fACTORS */

/* moderation with 6 groups for PARENT EDUCATION*/
data work.moderator_file_PARENT_temp;
Set data.Moderator_file;
MPAR_EDU_new = .;
if MPAR_EDU = 1 then MPAR_EDU_new = 1 ;
if MPAR_EDU = 2 then MPAR_EDU_new = 2 ;
if MPAR_EDU = 3 then MPAR_EDU_new = 3 ;
if MPAR_EDU = 4 then MPAR_EDU_new = 4 ;
if MPAR_EDU = 5 then MPAR_EDU_new = 5 ;
if MPAR_EDU = 6 then MPAR_EDU_new = 5 ;
if MPAR_EDU = 7 then MPAR_EDU_new = 6 ;
run;

proc SURVEYREG data=WORK.Moderator_file_PARENT_temp VARMETHOD=Taylor;
  STRATA Taylor_VARSTRAT;
  CLUSTER Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM MPAR_EDU_new;
  MODEL soc_skl = CM MPAR_EDU_new /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=WORK.Moderator_file_PARENT_temp VARMETHOD=Taylor;
  STRATA Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT  T_PCT1CW0;
CLASS CM MPAR_EDU_new;
MODEL soc_skl = CM MPAR_EDU_new CM*MPAR_EDU_new/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT  T_PCT1CW0;
CLASS CM mar_stats;
MODEL SOC_SKL = CM mar_stats /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file CENTERED VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT  T_PCT1CW0;
CLASS CM;
MODEL SOC_SKL = CM Mincome_Cen /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file CENTERED VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT  T_PCT1CW0;
CLASS CM;
MODEL SOC_SKL = CM Mincome_Cen CM*Mincome_Cen /ANOVA SOLUTION;
RUN;

/* MODERATION CODE FAMILY-INTERACTION FACTORS */
proc SURVEYREG data=data.Moderator_file CENTERED VARMETHOD=Taylor;
STRATA  Taylor_VARSTRAT;
CLUSTER  Taylor_VARUNIT;
WEIGHT  T_PCT1CW0;
CLASS CM; /*PARENT PARTICIPATION IN SCHOOL */
MODEL SOC_SKL = CM P_PART_SCH_CEN /ANOVA SOLUTION;
RUN;
proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _T_PCT1CW0;
CLASS CM ; /*PARENT PARTICIPATION IN SCHOOL */
MODEL SOC_SKL = CM P_PART_SCH_CEN CM*P_PART_SCH_CEN/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _T_PCT1CW0;
CLASS CM ; /*child PARTICIPATION IN community activities EVER */
MODEL SOC_SKL = CM C_PART_ACT_cen/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _T_PCT1CW0;
CLASS CM ; /*child PARTICIPATION IN community activities EVER */
MODEL SOC_SKL = CM C_PART_ACT_cen CM*C_PART_ACT_cen/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _T_PCT1CW0;
CLASS CM ; /*child PARTICIPATION IN other activities REGULARLY */
MODEL SOC_SKL = CM C_OTH_ACT_cen/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT _T_PCT1CW0;
CLASS CM ; /*child PARTICIPATION IN other activities REGULARLY */
MODEL SOC_SKL = CM C_OTH_ACT_cen CM*C_OTH_ACT_cen/ANOVA SOLUTION;
RUN;

data work.moderator_file_activity_temp;
Set data.Moderator_file;
if GEN_ACT_PART = . then GEN_ACT_PART = 0;
run;

proc SURVEYREG data=work.moderator_file_activity_temp VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT  T_PCT1CW0;
   CLASS CM GEN_ACT_PART; /*child PARTICIPATION IN other activities REGULARLY
                           YES/NO */
   MODEL SOC_SKL = CM GEN_ACT_PART /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=work.moderator_file_activity_temp VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT  T_PCT1CW0;
   CLASS CM GEN_ACT_PART; /*child PARTICIPATION IN other activities REGULARLY
                           YES/NO */
   MODEL SOC_SKL = CM GEN_ACT_PART CM*GEN_ACT_PART/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT  T_PCT1CW0;
   CLASS CM ; /*family and child activities */
   MODEL SOC_SKL = CM FAM_ACT_cen /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT  T_PCT1CW0;
   CLASS CM ; /*family and child activities */
   MODEL SOC_SKL = CM FAM_ACT_cen CM*FAM_ACT_cen/ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
   STRATA  Taylor_VARSTRAT;
   CLUSTER  Taylor_VARUNIT;
   WEIGHT  T_PCT1CW0;
   CLASS CM ; /*meals per week */
   MODEL SOC_SKL = CM EAT_MEAL_cen /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
PROC SURVEYREG DATA=DATA.MODERATOR_FILE VARMETHOD=TAYLOR;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM; /*meals per week */
  MODEL SOC_SKL = CM EAT_MEAL_cen CM*EAT_MEAL_cen/ANOVA SOLUTION;
RUN;

PROC SURVEYREG DATA=DATA.MODERATOR_FILE VARMETHOD=TAYLOR;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM READ_TO; /*READ TO CHILD */
  MODEL SOC_SKL = CM READ_TO /ANOVA SOLUTION;
RUN;

PROC SURVEYREG DATA=DATA.MODERATOR_FILE VARMETHOD=TAYLOR;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM READ_TO; /*READ TO CHILD */
  MODEL SOC_SKL = CM READ_TO CM*READ_TO/ANOVA SOLUTION;
RUN;

DATA WORK.MODERATOR_FILE_READ_TEMP;
  SET DATA.MODERATOR_FILE;
  READ_TO_new = .;
  IF READ_TO = 1 THEN READ_TO_new = 1 ;
  IF READ_TO = 2 THEN READ_TO_new = 1 ;
  IF READ_TO = 3 THEN READ_TO_new = 2 ;
  IF READ_TO = 4 THEN READ_TO_new = 3 ;
RUN;

PROC SURVEYREG DATA=WORK.MODERATOR_FILE_READ_TEMP VARMETHOD=TAYLOR;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM READ_TO_new; /*READ TO CHILD */
  MODEL SOC_SKL = CM READ_TO_new /ANOVA SOLUTION;
RUN;

PROC SURVEYREG DATA=WORK.MODERATOR_FILE_READ_TEMP VARMETHOD=TAYLOR;
  STRATA  Taylor_VARSTRAT;
  CLUSTER  Taylor_VARUNIT;
  WEIGHT T_PCT1CW0;
  CLASS CM READ_TO_new; /*READ TO CHILD */
  MODEL SOC_SKL = CM READ_TO_new CM*READ_TO_new/ANOVA SOLUTION;
RUN;

/* MODERATION CODE ENVIRONMENTAL FACTORS */
proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM MSAFE_NEIG; /*NEIGHBORHOOD SAFE */
MODEL SOC_SKL = CM MSAFE_NEIG /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM MSAFE_NEIG; /*NEIGHBORHOOD SAFE */
MODEL SOC_SKL = CM MSAFE_NEIG CM*MSAFE_NEIG /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM SSUP_SS; /*SUPPORT SOCIAL INTERACTION */
MODEL SOC_SKL = CM SSUP_SS /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM SSUP_SS; /*SUPPORT SOCIAL INTERACTION */
MODEL SOC_SKL = CM SSUP_SS CM*SSUP_SS /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM NEIG_INC; /*NEIGHBORHOOD INCOME */
MODEL SOC_SKL = CM NEIG_INC /ANOVA SOLUTION;
RUN;

proc SURVEYREG data=data.Moderator_file VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM NEIG_INC; /*NEIGHBORHOOD INCOME */
MODEL SOC_SKL = CM NEIG_INC CM*NEIG_INC/ANOVA SOLUTION;
RUN;
/*explore significant moderator*/
proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM ; /*child PARTICIPATION IN community activities EVER */
MODEL SOC_SKL = CM C_PART_ACT_cen CM*C_PART_ACT_cen/ANOVA SOLUTION;
RUN;

/* INTERCEPTS AND SLOPES MODEL. USED IF A QUANTITATIVE INDEPENDENT VARIABLE HAS A SIGNIFICANT INTERACTION WITH PROFILE*/
proc SURVEYREG data=data.Moderator_file_CENTERED VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS CM;
MODEL SOC_SKL = CM C_PART_ACT_cen(cm)/ANOVA SOLUTION NOINT;
ESTIMATE 'SLOPES FOR P1 VS P2' C_PART_ACT_cen(cm) 1 -1 0 0 0;
ESTIMATE 'SLOPES FOR P1 VS P3' C_PART_ACT_cen(cm) 1 0 -1 0 0;
ESTIMATE 'SLOPES FOR P1 VS P4' C_PART_ACT_cen(cm) 1 0 0 -1 0;
ESTIMATE 'SLOPES FOR P1 VS P5' C_PART_ACT_cen(cm) 1 0 0 0 -1;
ESTIMATE 'SLOPES FOR P2 VS P3' C_PART_ACT_cen(cm) 0 1 -1 0 0;
ESTIMATE 'SLOPES FOR P2 VS P4' C_PART_ACT_cen(cm) 0 1 0 -1 0;
ESTIMATE 'SLOPES FOR P2 VS P5' C_PART_ACT_cen(cm) 0 1 0 0 -1;
ESTIMATE 'SLOPES FOR P3 VS P4' C_PART_ACT_cen(cm) 0 0 1 -1 0;
ESTIMATE 'SLOPES FOR P3 VS P5' C_PART_ACT_cen(cm) 0 0 1 0 -1;
ESTIMATE 'SLOPES FOR P4 VS P5' C_PART_ACT_cen(cm) 0 0 0 1 -1;
run;

/*plot moderation and examine for outliers*/
/*plot moderation*/
data;
do cm = 4 to 5 by 1;
do c_part_act_cen=0 to 7;
if cm = 4 then
Yhat=91.846744+ 3.231931* c_part_act_cen;
if cm = 5 then
Yhat= 102.011277+ ( 0.313673)* c_part_act_cen;
OUTPUT;
END;
PROC PRINT;
RUN;
PROC PLOT;
PLOT YHAT*c_part_act_cen;
RUN;
/*outliers*/
DATA NEW;
SET data.Moderator_file_CENTERED;
IF CM=5;
PROC PLOT;
PLOT soc_skl*c_part_act;
RUN;

DATA NEW;
SET data.Moderator_file_CENTERED;
IF CM=4;
PROC PLOT;
PLOT soc_skl*c_part_act;
RUN;

proc SURVEYFREQ data=data.Moderator_file_CENTERED;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
TABLE CM*c_part_act;
RUN;

(Moderation Example for Problem Behavior When Categorical Variable Significant)

/*create new variable to run all possible comparisons for race --4 categories White, 
Hispan, Black, Other*/
DATA work.Race_PROFILE;
SET data.Moderator_file;
temp_race = .;
if mrace = 1 then temp_race = 1;
if mrace = 2 then temp_race = 2;
if mrace = 3 then temp_race = 3;
if mrace = 4 then temp_race = 4;
if mrace = 5 then temp_race = 4;
if mrace = 6 then temp_race = 4;
NEWCLASS=(10*temp_race)+ CM;
run;

/*FOLLOWING TO ESTIMATE CELL MEANS WHEN MODERATION IS SIGNIFICANT AND TO COMPARE CELL
MEANS for categorical;*/
proc SURVEYREG data=race_PROFILE VARMETHOD=Taylor;
STRATA Taylor_VARSTRAT;
CLUSTER Taylor_VARUNIT;
WEIGHT T_PCT1CW0;
CLASS NEWCLASS;
MODEL PROB_BEH = NEWCLASS/SOLUTION NOINT;
/* 20 new class variables*/
ESTIMATE 'P1white VS P1hisp' NEWCLASS 1 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 0 0;
ESTIMATE 'P1white VS P1black' NEWCLASS 1 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 0;
ESTIMATE 'P1white VS P1other' NEWCLASS 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 ;
ESTIMATE 'P1hisp VS P1black' NEWCLASS 0 0 0 0 0 1 0 0 0 0 -1 0 0 0 0 0 0 0 0 0;
ESTIMATE 'P1hisp VS P1other' NEWCLASS 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 -1 0 0 0 0;
ESTIMATE 'P1black VS P1other' NEWCLASS 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 -1 0 0 0 0;
ESTIMATE 'P2white VS P2hisp' NEWCLASS 0 1 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 0 ;
ESTIMATE 'P2white VS P2black' NEWCLASS 0 1 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 0 ;
ESTIMATE 'P2white VS P2other' NEWCLASS 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 0 ;
ESTIMATE 'P2hisp VS P2black' NEWCLASS 0 0 0 0 0 0 1 0 0 0 0 -1 0 0 0 0 0 0 0 0 ;
ESTIMATE 'P2hisp VS P2other' NEWCLASS 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 -1 0 0 0 ;
ESTIMATE 'P2black VS P2other' NEWCLASS 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 -1 0 0 0 ;
ESTIMATE 'P3white VS P3hisp' NEWCLASS 0 0 1 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 0 ;
ESTIMATE 'P3white VS P3black' NEWCLASS 0 0 1 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 0 ;
ESTIMATE 'P3white VS P3other' NEWCLASS 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 0 ;
ESTIMATE 'P3hisp VS P3black' NEWCLASS 0 0 0 0 0 0 0 1 0 0 0 0 -1 0 0 0 0 0 0 0 ;
ESTIMATE 'P3hisp VS P3other' NEWCLASS 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 -1 0 0 ;
ESTIMATE 'P3black VS P3other' NEWCLASS 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 -1 0 0 ;
ESTIMATE 'P4white VS P4hisp' NEWCLASS 0 0 0 1 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 0 ;
ESTIMATE 'P4white VS P4black' NEWCLASS 0 0 0 1 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 0 ;
ESTIMATE 'P4white VS P4other' NEWCLASS 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 0 ;
ESTIMATE 'P4hisp VS P4black' NEWCLASS 0 0 0 0 0 0 0 0 1 0 0 0 0 -1 0 0 0 0 0 0 ;
ESTIMATE 'P4hisp VS P4other' NEWCLASS 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 -1 0 ;
ESTIMATE 'P4black VS P4other' NEWCLASS 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 -1 0 ;
ESTIMATE 'P5white VS P5hisp' NEWCLASS 0 0 0 0 1 0 0 0 0 -1 0 0 0 0 0 0 0 0 0 0 ;
ESTIMATE 'P5white VS P5black' NEWCLASS 0 0 0 0 1 0 0 0 0 0 0 0 0 0 -1 0 0 0 0 0 ;
ESTIMATE 'P5white VS P5other' NEWCLASS 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 -1 ;
ESTIMATE 'P5hisp VS P5black' NEWCLASS 0 0 0 0 0 0 0 0 0 1 0 0 0 0 -1 0 0 0 0 0 ;
ESTIMATE 'P5hisp VS P5other' NEWCLASS 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 -1 ;
ESTIMATE 'P5black VS P5other' NEWCLASS 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 -1 ;
RUN;

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APPENDIX E
STATISTICAL MODELS

Question 1: What distinct and interpretable functional ability profile subgroups emerge when using person-oriented analytic techniques to examine functional ability variables contained in the PEELS data set for young children with disabilities?

\[ f(Y_i \mid \theta) = \sum_{k=1}^{K} \pi_k f_k(Y_i \mid \theta_k) \]

Notes:
\( Y_i \) denotes \( P \) observed indicators of \( K \) latent classes.
\( \pi_k \) denotes the probability of belonging to latent class \( k \), \( k = 1, \ldots, K \).
\( f(Y_i \mid \theta) \) denotes the distribution of the indicators conditional on the parameters of the distributions.
\( f_k(Y_i \mid \theta_k) \) denotes the distribution of the indicators conditional on the parameters of the distributions in the \( k^{th} \) latent class.

Question 2: What is the strength of the relationship between functional ability profile subgroup membership and social competence?

\[ Y_i = \alpha + \delta_1(FP_1) + \cdots + \delta_{K-1}(FP_{K-1}) + r_i \]

Notes:
\( Y_i \) denotes the PKBS standard score for the problem behavior or social skills scale
\( FP_k, k = 1, \ldots, K - 1 \) denotes a dummy variable with the \( K^{th} \) latent class used as the reference group.

Subgroup membership will be determined by using the most likely class membership calculated based on the model in Question 1.

The actual statistical method was to test equality of means across latent classes using ProcSurveyReg in which functional ability profile subgroup membership was indicated as a class variable.
Question 3: What are the individual and combined contributions of functional ability profile subgroup membership and disability category membership to the explanation of social competence?

Examine individual contribution of disability category

\[ Y_i = \alpha + \delta_1 (DC_1) + \ldots + \delta_6 (DC_6) + r_i \]

Notes:
\( y \) denotes the PKBS standard score for the problem behavior or social skills scale. \( DC_j, j = 1 \ldots 6 \) denotes a dummy variable with the Speech or language impairments category used as the reference group and the \( j^{th} \) disability category coded 1.

Examine combined contribution of disability category and functional ability profile subgroup membership

\[ Y_i = \alpha + \delta_1 (DC_1) + \ldots + \delta_6 (DC_6) + \delta_1 (FP_1) + \ldots + \delta_{k-1} (FP_{k-1}) + r_i \]

Notes:
\( y \) denotes the PKBS standard score for the problem behavior or social skills scale. \( DC_j, j = 1 \ldots 6 \) denotes a dummy variable with the Speech or language impairments category used as the reference group and the \( j^{th} \) disability category coded 1. \( FP_k, k = 1 \ldots K-1 \) denotes a dummy variable with the \( K^{th} \) latent class used as the reference group.

Subgroup membership will be determined by using the most likely class membership calculated based on the model in Question 1.

The actual statistical method was to test equality of means across latent classes or disability category using ProcSurveyReg in which functional ability profile subgroup membership and disability category were indicated as class variables.
**Question 4:** To what extent do non-malleable child factors and contextual factors moderate the relationship between functional ability profile subgroup membership and social competence?

Examine moderation

\[ Y_i = \alpha + \delta_1(FP_1) + \ldots + \delta_{K-1}(FP_{K-1}) + \beta(C) + \beta_1(C \times FP_1) + \ldots + \beta_{K-1}(C \times FP_{K-1}) + r_i \]

Notes:

\( Y_i \) denotes the PKBS standard score for the problem behavior or social skills scale.

\( FP_{i,k} \), \( k = 1, \ldots, K-1 \) denotes a dummy variable with the \( K^{th} \) latent class used as the reference group.

Subgroup membership will be determined by using the most likely class membership calculated based on the model in Question 1.

The actual statistical method was to test the interaction term using ProcSurveyReg in which functional ability profile subgroup membership and any categorical contextual variables were indicated as class variables.

\( C \) denotes the variable of interest for non-malleable child factors or contextual factors.

Non-malleable child factors: gender, age, race/ethnicity,

Contextual variables include family income, parent education, single parent household, child activities, parent-child activities, regular child activities, child participation in activities regularly, family meals, extent child is read to, SES neighborhood, neighborhood safety, and program support for social interaction.
APPENDIX F
LATENT CLASS MODELS NOT SELECTED

Interpreting Non-selected Latent Class Models

The following models were not selected for the present study because they were not supported by model fit statistics or were not as optimal as the selected 5-class model. Information about the non-selected class models, including, substantive interpretations and classification probabilities, are provided for comparative purposes.

As noted in Chapter 4, substantive interpretations of models focused on examining shared features of functional ability variables within a profile and the distinguishing features of these variables across profiles. Functional ability profiles could be quantified related to the (a) severity or level of the limitations across functional ability variables (e.g., mild, moderate, or severe limitations), (b) number of functional ability variables with limitations (e.g., a few, many, all), and (c) nature or type of functional ability variables with limitations (e.g., limitations associated with a similar cluster of functional ability variables). Severity or level of limitations was examined by inspecting the mean score on each functional ability variable (4-point scale). To describe the profiles, the ratings for severity of limitations were grouped to account for the standard deviations. Moderate to severe limitations were associated with mean scores from 2.5 and above, mild to moderate limitations were mean scores from 1.5 to 2.49, and no to mild limitations were mean scores from 1.49 and below.

Two-Class Model

Table F-1 shows the model-implied means and standard deviations for each variable in each profile (i.e., subgroup) in the model. Profile 1 consisted of 40% of the sample and Profile 2 consisted of 60% of the sample. Profile 1 was associated with
moderate to severe limitations on six functional ability variables: communication, cognition, social skills, regulation of activity level, regulation of attention, and motivation. Profile 1 also had mild to moderate limitations on seven functional ability variables: understanding, overall health, use of arms, use of hands, use of legs, behavior, and regulation of emotion. Profile 2 was associated with mild to moderate limitations on five functional ability variables that included communication, cognition, regulation of activity level, regulation of attention, and motivation, and no limitations on other functional ability variables. Overall, the 2-class model seemed to distinguish between a subgroup of children whose functional ability profile was associated with more moderate to severe limitations on functional ability variables (Profile 1) and a subgroup of children whose functional ability profile was associated with mild limitations on functional ability variables (Profile 2).

Profile probability estimates were high for the 2-class model. Children in Profile 1 had a 94% probability of being assigned to the first profile. Children in Profile 2 had a 96% probability of being assigned to the second profile. Based on the substantive and statistical examination of the 2-class model, it appeared that this model provided distinct classes, that could be meaningfully interpreted, however, other class models were identified that provided a better fit with data and more substantive aspects to examine associations with social competence. For these reasons, the 2-class model was not selected.

Three-Class Model

The 3-class model improved in model fit statistics over the 2-class model (i.e., increased log likelihood and decreased BIC). Table F-2 shows the model-implied
means and standard deviations for the 15 functional ability variables for each profile. Profile 1 consisted of 19% of the sample, Profile 2 consisted of 37% of the sample, and Profile 3 consisted of 44% of the sample. Profile 1 was a subgroup of children with moderate to severe limitations on eight functional ability variables. These included communication, understanding, cognition, use of hands, social skills, regulation of activity level, regulation of attention, and motivation. This profile also was associated with mild to moderate limitations on five functional ability variables: overall health, use of arms, use of legs, behavior, and regulation of emotions. Profile 2 was associated with moderate to severe limitations on five functional ability variables: communication, cognition, regulation of activity level, regulation of attention, and motivation. This profile was also associated with mild to moderate limitations on five variables: understanding, overall health, use of hands, social skills, and behavior. Profile 3 was associated with mild to moderate limitations on five functional ability variables: communication, cognition, regulation of activity level, regulation of attention, and motivation.

Profile probability estimates also were high for the 3-class model. Children in Profile 1 had a 93% probability of being assigned to the first profile, 6% probability of being assigned to the second profile, and less than 1% probability of being assigned to the third profile. Children in Profile 2 had a 88% probability of being assigned to the second profile, 5% probability of being assigned to the first profile, and 7% probability of being assigned to the third profile. Children in Profile 3 had less than 1%, 7%, and 93% probability of being assigned to the first, second, and third profile, respectively. The 3-class model provided distinct classes that could be meaningfully interpreted, but again,
other class models were identified that provided a better fit with the data and more substantive aspects to examine in relation to social competence.

Four-Class Model

The 4-class model had a larger log likelihood and a smaller BIC than the 3-class model. Table F-3 shows the model-implied means and standard deviations for the 15 variables for each profile in the model. Profile 1 (14% of the sample) was associated with moderate to severe limitations on nine functional ability variables including communication, understanding, cognition, use of hands, social skills, behavior, regulation of activity level, regulation of attention, and motivation, and with mild to moderate limitations on four functional ability variables: overall health, use of arms, use of legs, and regulation of emotions. Profile 2 (8% of sample) was associated with moderate to severe limitations on five functional ability variables: communication, cognition, use of hands, use of legs, and motivation. This profile also was associated with mild to moderate limitations on seven functional ability variables: understanding overall health, use of arms, social skills, regulation of activity level, regulation of attention and vision. Profile 3 (35% of sample) was associated with moderate to severe disabilities on five functional ability variables: communication, cognition, regulation of activity level, regulation of attention, and motivation. In addition, this profile was associated with mild to moderate disabilities on four functional ability variables understanding, overall health, social skills, and behavior. Profile 4 (43% of the sample) was associated with mild to moderate limitations on five functional ability variables: communication, cognition, regulation of activity level, regulation of attention, and motivation.
The 4-class also had good profile probability estimates. Children in the Profile 1 had a 92%, 3%, 5%, and 0% probability of being assigned to the first, second, third, and fourth profile, respectively. Children in Profile 2 had a 4%, 90%, 5.0% and 1% probability of being assigned to the first, second, third, and fourth profile, respectively, while children in Profile 3 had a 2%, 1%, 89% and 7% probability of being assigned to the first, second, third, and fourth profile, respectively. Children in Profile 4 had a 0% probability of being assigned to Profile 1, less than 1% probability of being assigned to Profile 2, 7% probability of being assigned to Profile 3, and a 94% probability of being assigned to Profile 4. The 4-class model provided distinct classes that could be meaningfully interpreted with adequate fit indices, but the continued decrease in the BIC for the 5- and 6-class models warranted the examination of these models, therefore, the 4-class model was not selected.

Six-Class Model

The 6-class model had good fit statistics (increased LL and reduced BIC over previous models) with 11 replications. The reduction in BIC, however, was not significant compared to previous reductions between models (e.g., BIC dropped 500 points between 3- and 4-class models, BIC dropped 170 points between 4- and 5-class models, but only dropped 5 points between the 5- and 6-class models). Table F-4 shows the model-implied means and standard deviations for the 15 variable for each profile in the model.

The 6-class model was similar to the 5-class model. Profile 1 (4% of the sample) was associated with the same severity and type of limitations in functional abilities as Profile 1 in the 5-class model. Profile 2 (10% of the sample) was associated with the
same severity and type of limitations in functional abilities as Profile 2 in the 5-class model. Profile 3 (7% of sample) was associated with the same severity and type of limitations in functional abilities as Profile 3 in the 5-class model. Profile 6 (38% of the sample) associated with the same severity and type of limitations in functional abilities as Profile 5 in the 5-class model.

The distinction in the 6-class model was the splitting of the subgroup identified in the 5-class model that was identified as Profile 4. The addition of a sixth profile appeared to break this subgroup into two groups (Profile 4 and Profile 5 in the 6-class model). Both profiles were associated with limitations in communication, understanding, overall health, social skills, behaviors, regulation of activity level, regulation of attention, and motivation. As shown in Table F-4, Profile 4 (29% of the sample) was associated with lower means on these variables except for regulation of activity level which had a slightly higher mean score than Profile 5. Profile 5 (12% of the sample) was associated with higher means on these variables compared to Profile 4, with the highest mean scores on cognition and motivation variables.

The 6-class model probability estimates dropped below 85% for Profiles 4 and 5. Children in Profile 1 had a 95%, 3%, 1%, 0%, 1%, and 0% probability of being assigned to first, second, third, fourth, fifth, and sixth profile, respectively. Children in Profile 2 had a 2%, 90%, less than 1%, 2%, 5% and 0% probability of being assigned to the first, second, third, fourth, fifth, and sixth profile, respectively. For children in Profile 3, there was a less than 1%, less than 1%, 88%, 5%, 3%, and 3% probability of being assigned to the first, second, third, fourth, fifth, and sixth profile, respectively. For Profile 4, children had a 0%, less than 1%, 1%, 84%, 6% and 8% probability of being assigned to
the first, second, third, fourth, fifth, and sixth profile, respectively. Children in Profile 5 had a 1%, 5%, 2%, 12%, 79% and less than 1% probability of being assigned to the first, second, third fourth, fifth and sixth profile, respectively. Children in class 6 had a 0%, 0%, less than 1%, 7%, 0% and 92% probability of being assigned to the first, second, third fourth, fifth and sixth profile, respectively.

The 6-class model presented an interesting distinction between subgroups of children with and without moderate to severe limitations in cognition among children with mild to moderate limitations in functional ability. Although cognition is likely associated with teacher ratings of social competence, the use of this single variable to distinguish between subgroups was not justified, particularly given the BIC was not notably smaller and than the 5-class model and the decrease in the probability of membership (i.e., dropped below 80%) for assignment between Profiles 4 and 5; therefore, the 6-class model was not selected.
Table F-1. Model-implied means (standard deviations) for 2-class models

<table>
<thead>
<tr>
<th>Variable</th>
<th>Profile 1 (n = 1150)</th>
<th>Profile 2 (n = 1720)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>2.98 (0.90)</td>
<td>2.17 (1.09)</td>
</tr>
<tr>
<td>Understanding</td>
<td>2.20 (0.47)</td>
<td>1.25 (0.21)</td>
</tr>
<tr>
<td>Cognition</td>
<td>3.16 (0.58)</td>
<td>2.05 (0.35)</td>
</tr>
<tr>
<td>Overall Health</td>
<td>1.92 (1.02)</td>
<td>1.37 (0.48)</td>
</tr>
<tr>
<td>Use of Arms</td>
<td>1.50 (0.74)</td>
<td>1.06 (0.09)</td>
</tr>
<tr>
<td>Use of Hands</td>
<td>2.25 (1.22)</td>
<td>1.19 (0.21)</td>
</tr>
<tr>
<td>Use of Legs</td>
<td>1.52 (0.76)</td>
<td>1.09 (0.18)</td>
</tr>
<tr>
<td>Social Skills</td>
<td>2.63 (1.21)</td>
<td>1.42 (0.61)</td>
</tr>
<tr>
<td>Behavior</td>
<td>2.10 (0.77)</td>
<td>1.20 (0.22)</td>
</tr>
<tr>
<td>Reg. of Activity Lev.</td>
<td>3.05 (1.41)</td>
<td>1.93 (1.15)</td>
</tr>
<tr>
<td>Reg. of Attention</td>
<td>2.96 (1.31)</td>
<td>1.81 (0.85)</td>
</tr>
<tr>
<td>Motivation</td>
<td>3.01 (1.34)</td>
<td>2.15 (1.16)</td>
</tr>
<tr>
<td>Reg. of Emotions</td>
<td>1.55 (0.92)</td>
<td>1.12 (0.21)</td>
</tr>
<tr>
<td>Hearing</td>
<td>1.19 (0.50)</td>
<td>1.13 (0.36)</td>
</tr>
<tr>
<td>Vision</td>
<td>1.27 (0.53)</td>
<td>1.07 (0.12)</td>
</tr>
</tbody>
</table>
Table F-2. Model-implied means (standard deviations) for 3-class models

<table>
<thead>
<tr>
<th></th>
<th>Profile 1 (n = 560)</th>
<th>Profile 2 (n = 1170)</th>
<th>Profile 3 (n = 1250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>3.32 (0.70)</td>
<td>2.56 (0.92)</td>
<td>2.07 (1.11)</td>
</tr>
<tr>
<td>Understanding</td>
<td>2.51 (0.46)</td>
<td>1.77 (0.32)</td>
<td>1.12 (0.11)</td>
</tr>
<tr>
<td>Cognition</td>
<td>3.46 (0.56)</td>
<td>2.66 (0.47)</td>
<td>1.90 (0.25)</td>
</tr>
<tr>
<td>Overall Health</td>
<td>2.22 (1.14)</td>
<td>1.57 (0.68)</td>
<td>1.33 (0.44)</td>
</tr>
<tr>
<td>Use of Arms</td>
<td>1.85 (1.09)</td>
<td>1.11 (0.11)</td>
<td>1.06 (0.11)</td>
</tr>
<tr>
<td>Use of Hands</td>
<td>2.83 (1.31)</td>
<td>1.50 (0.40)</td>
<td>1.15 (0.21)</td>
</tr>
<tr>
<td>Use of Legs</td>
<td>1.82 (1.04)</td>
<td>1.15 (0.22)</td>
<td>1.09 (0.21)</td>
</tr>
<tr>
<td>Social Skills</td>
<td>3.00 (1.04)</td>
<td>2.05 (1.09)</td>
<td>1.28 (0.43)</td>
</tr>
<tr>
<td>Behavior</td>
<td>2.35 (0.90)</td>
<td>1.67 (0.50)</td>
<td>1.10 (0.11)</td>
</tr>
<tr>
<td>Reg. of Activity Lev.</td>
<td>3.01 (1.48)</td>
<td>2.84 (1.49)</td>
<td>1.69 (0.81)</td>
</tr>
<tr>
<td>Reg. of Attention</td>
<td>3.14 (1.28)</td>
<td>2.57 (1.19)</td>
<td>1.62 (0.673)</td>
</tr>
<tr>
<td>Motivation</td>
<td>3.20 (1.28)</td>
<td>2.67 (1.33)</td>
<td>2.02 (1.06)</td>
</tr>
<tr>
<td>Reg. of Emotions</td>
<td>1.68 (1.10)</td>
<td>1.33 (0.58)</td>
<td>1.09 (0.14)</td>
</tr>
<tr>
<td>Hearing</td>
<td>1.17 (0.45)</td>
<td>1.18 (0.47)</td>
<td>1.13 (0.35)</td>
</tr>
<tr>
<td>Vision</td>
<td>1.42 (0.83)</td>
<td>1.12 (0.20)</td>
<td>1.06 (0.12)</td>
</tr>
<tr>
<td></td>
<td>Profile 1 ((n = 390))</td>
<td>Profile 2 ((n = 240))</td>
<td>Profile 3 ((n = 1010))</td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Communication</td>
<td>3.50 (0.39)</td>
<td>2.54 (1.28)</td>
<td>2.58 (0.91)</td>
</tr>
<tr>
<td>Understanding</td>
<td>2.71 (0.29)</td>
<td>1.75 (0.53)</td>
<td>1.81 (0.34)</td>
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<tr>
<td>Cognition</td>
<td>3.52 (0.57)</td>
<td>2.91 (0.80)</td>
<td>2.69 (0.49)</td>
</tr>
<tr>
<td>Overall Health</td>
<td>2.18 (1.11)</td>
<td>2.21 (1.15)</td>
<td>1.56 (0.65)</td>
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<tr>
<td>Use of Arms</td>
<td>1.63 (0.80)</td>
<td>2.32 (1.22)</td>
<td>1.08 (0.07)</td>
</tr>
<tr>
<td>Use of Hands</td>
<td>2.68 (1.31)</td>
<td>2.94 (1.08)</td>
<td>1.48 (0.40)</td>
</tr>
<tr>
<td>Use of Legs</td>
<td>1.55 (0.64)</td>
<td>2.62 (1.26)</td>
<td>1.07 (0.06)</td>
</tr>
<tr>
<td>Social Skills</td>
<td>3.30 (0.67)</td>
<td>2.08 (1.15)</td>
<td>2.07 (1.12)</td>
</tr>
<tr>
<td>Behavior</td>
<td>2.72 (0.64)</td>
<td>1.37 (0.35)</td>
<td>1.71 (0.52)</td>
</tr>
<tr>
<td>Reg. of Activity Lev.</td>
<td>3.31 (1.19)</td>
<td>2.12 (1.43)</td>
<td>2.90 (1.44)</td>
</tr>
<tr>
<td>Reg. of Attention</td>
<td>3.32 (1.11)</td>
<td>2.38 (1.45)</td>
<td>2.62 (1.19)</td>
</tr>
<tr>
<td>Motivation</td>
<td>3.34 (1.07)</td>
<td>2.57 (1.47)</td>
<td>2.71 (1.35)</td>
</tr>
<tr>
<td>Reg. of Emotions</td>
<td>1.84 (1.20)</td>
<td>1.28 (0.60)</td>
<td>1.33 (0.58)</td>
</tr>
<tr>
<td>Hearing</td>
<td>1.16 (0.44)</td>
<td>1.17 (0.48)</td>
<td>1.17 (0.45)</td>
</tr>
<tr>
<td>Vision</td>
<td>1.25 (0.50)</td>
<td>1.72 (1.17)</td>
<td>1.10 (0.18)</td>
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Table F-4. Model-implied means (standard deviations) for 6-class models

<table>
<thead>
<tr>
<th></th>
<th>Profile 1 (n = 100)</th>
<th>Profile 2 (n = 290)</th>
<th>Profile 3 (n = 200)</th>
<th>Profile 4 (n = 830)</th>
<th>Profile 5 (n = 350)</th>
<th>Profile 6 (n = 1090)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>3.49 (0.54)</td>
<td>3.51 (0.35)</td>
<td>1.98 (1.20)</td>
<td>2.49 (0.98)</td>
<td>2.94 (0.65)</td>
<td>2.08 (1.11)</td>
</tr>
<tr>
<td>Understanding</td>
<td>2.53 (0.47)</td>
<td>2.77 (0.26)</td>
<td>1.26 (0.23)</td>
<td>1.68 (0.34)</td>
<td>2.15 (0.23)</td>
<td>1.11 (0.10)</td>
</tr>
<tr>
<td>Cognition</td>
<td>3.81 (0.19)</td>
<td>3.44 (0.70)</td>
<td>2.28 (0.54)</td>
<td>2.49 (0.51)</td>
<td>3.26 (0.22)</td>
<td>1.91 (0.24)</td>
</tr>
<tr>
<td>Overall Health</td>
<td>2.47 (0.97)</td>
<td>2.16 (1.13)</td>
<td>2.16 (1.13)</td>
<td>1.53 (0.61)</td>
<td>1.67 (0.81)</td>
<td>1.28 (0.37)</td>
</tr>
<tr>
<td>Use of Arms</td>
<td>3.18 (1.00)</td>
<td>1.42 (0.39)</td>
<td>2.01 (1.09)</td>
<td>1.01 (0.01)</td>
<td>1.29 (0.21)</td>
<td>1.01 (0.00)</td>
</tr>
<tr>
<td>Use of Hands</td>
<td>3.74 (0.45)</td>
<td>2.48 (1.30)</td>
<td>2.43 (1.01)</td>
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<td>2.23 (0.73)</td>
<td>1.09 (0.09)</td>
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<tr>
<td>Use of Legs</td>
<td>3.05 (1.05)</td>
<td>1.35 (0.32)</td>
<td>2.30 (1.41)</td>
<td>1.02 (0.02)</td>
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<td>1.03 (0.06)</td>
</tr>
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<td>Social Skills</td>
<td>3.13 (1.04)</td>
<td>3.40 (0.58)</td>
<td>1.78 (0.90)</td>
<td>2.03 (1.11)</td>
<td>2.15 (1.07)</td>
<td>1.24 (0.38)</td>
</tr>
<tr>
<td>Behavior</td>
<td>1.93 (0.67)</td>
<td>2.90 (0.62)</td>
<td>1.31 (0.33)</td>
<td>1.67 (0.52)</td>
<td>1.73 (0.45)</td>
<td>1.07 (0.08)</td>
</tr>
<tr>
<td>Reg. of Activity Lev.</td>
<td>2.44 (1.43)</td>
<td>3.48 (1.01)</td>
<td>2.15 (1.54)</td>
<td>2.87 (1.48)</td>
<td>2.71 (1.40)</td>
<td>1.63 (0.71)</td>
</tr>
<tr>
<td>Reg. of Attention</td>
<td>2.98 (1.30)</td>
<td>3.36 (1.07)</td>
<td>2.13 (1.35)</td>
<td>2.55 (1.17)</td>
<td>2.73 (1.32)</td>
<td>1.59 (0.61)</td>
</tr>
<tr>
<td>Motivation</td>
<td>3.15 (1.51)</td>
<td>3.27 (1.10)</td>
<td>2.30 (1.24)</td>
<td>2.58 (1.34)</td>
<td>3.09 (1.29)</td>
<td>2.00 (1.03)</td>
</tr>
<tr>
<td>Reg. of Emotions</td>
<td>1.21 (0.30)</td>
<td>2.00 (1.29)</td>
<td>1.50 (1.05)</td>
<td>1.32 (0.55)</td>
<td>1.31 (0.58)</td>
<td>1.06 (0.06)</td>
</tr>
<tr>
<td>Hearing</td>
<td>1.19 (0.51)</td>
<td>1.17 (0.43)</td>
<td>1.21 (0.59)</td>
<td>1.20 (0.53)</td>
<td>1.05 (0.15)</td>
<td>1.13 (0.36)</td>
</tr>
<tr>
<td>Vision</td>
<td>2.50 (1.68)</td>
<td>1.16 (0.32)</td>
<td>1.44 (0.73)</td>
<td>1.10 (0.18)</td>
<td>1.08 (0.11)</td>
<td>1.04 (0.08)</td>
</tr>
</tbody>
</table>
REFERENCES


Hemmeter, M. L., Fox, L., & Snyder, P. (2010). Evaluating the potential efficacy of a classroom-wide model for promoting social-emotional development and addressing challenging behavior in preschool. [Data file and codebook]. Vanderbilt University, TN.


BIOGRAPHICAL SKETCH

Tara McLaughlin earned her doctorate at the University of Florida. During her doctoral program she received a grant from the American Educational Research Association funded by the National Science Foundation to conduct secondary analyses in the PEELS data set to examine relationships among children’s functional abilities, disability classification, and contextual factors and children’s social competence. Tara’s other research interests include (a) instructional and behavioral supports for children with disabilities in inclusive settings, (b) professional development for teachers supporting children with disabilities in inclusive settings, and (c) cross-sector research and policy focused on supports and services for children with disabilities and their families. In 2010, Tara received the J. David Sexton Doctoral Student Award from the Division for Early Childhood (DEC). The award is given to a DEC member and doctoral level student who has made contributions to young children with special needs and their families through their efforts in research, higher education, publications, and policy.

Prior to enrolling in the doctoral program in 2006, Tara was an early primary special education teacher (new entrant through year 3) in New Zealand. She completed her master’s degree in special education at the University of Florida in 2003 and her bachelor’s degree of arts in psychology and education at Hobart and William Smith Colleges in 2000.

Following the completion of her degree, Tara has worked as a researcher for the Center for Excellence in Early Childhood Studies at the University of Florida. The Center is a campus-wide, interdisciplinary center focused on the science of early learning and development. The Center includes two model training, demonstration, and research sites located at Baby Gator Child Development and Research Center.