Copyright 2004

by

Laura Anne Curry
ACKNOWLEDGMENTS

My experience as a graduate student at the University of Florida has been an opportunity for me to grow both personally and professionally. I attribute this, in large part, to the many talented and supportive people I have had the privilege of working with and learning from while here.

First and foremost, I could not have succeeded in accomplishing this project without the guidance, patience and support of my advisor and cochair, Dr. Lise Youngblade. A tireless mentor, advocate and friend, Dr. Youngblade’s prompt and insightful feedback kept me focused on my objectives. Her exceptional skill at organization and presentation was invaluable to me in helping me keep my plans and ideas in an integrated form. She is a gifted academic, and I look forward to working with her in the future.

My cochair, Dr. Scott Miller, and my committee members, Dr. Julia Graber, Dr. Patricia Ashton, and Dr. Mark Fondacaro, provided thoughtful suggestions and guidance throughout the qualifying and dissertation processes. I would also like to thank the faculty, staff, and my peers in the psychology department for creating a supportive and stimulating academic environment, and to thank Dr. Manfred Diehl who patiently and generously offered his time and expertise in statistical analysis.

Words can not express the heartfelt gratitude I offer my parents. It is because of their continued unconditional support, love and encouragement that I have succeeded in
this endeavor. My parents believed in me when I did not believe in myself, and provided me with strength and perspective when my own failed.

Finally, I would like to thank my husband and best friend, Henry Lee Morgenstern. Throughout this tumultuous journey he has been a constant source of strength and respite. He has inspired me and has given me the courage to be at my best.

This work was supported in part by grant R03 HS13261, *Predictors and Costs of Adolescent Risky Behavior*, from the Agency for Health Care Research and Quality (Lise M. Youngblade, Principal Investigator).
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>ACKNOWLEDGMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>vii</td>
<td>LIST OF TABLES</td>
<td></td>
</tr>
<tr>
<td>ix</td>
<td>LIST OF FIGURES</td>
<td></td>
</tr>
<tr>
<td>x</td>
<td>ABSTRACT</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>INTRODUCTION AND LITERATURE REVIEW</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Adolescent Risk Behavior</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Adolescent Decision-Making</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Adolescent Risk Perception</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Influences of ARCs on Cognition</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Research Questions and Hypotheses</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>METHOD</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Participants</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Procedure</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Measures</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>RESULTS</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Self-Reported Risk Behavior</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Decision-Making Bases</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Bivariate Correlations</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>Test of Research Questions</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Links Among ARCs, Decision-Making Bases, and Risk Behavior</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Links Among ARCs, Risk Perception, and Risk Behavior</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Links Among Risk Perception, Decision Making, and Risk Behavior</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>Summary of Results Related to RQ1 through RQ3</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Test of Complete Model</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td>Developmental Differences</td>
<td>64</td>
</tr>
</tbody>
</table>
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1</td>
<td>Descriptive statistics for affect-related characteristics (ARCs), risk perception, decision-making processes, and adolescent risk behavior composite variables . . .</td>
</tr>
<tr>
<td>3-1</td>
<td>Bivariate correlations among age, gender, grades, risk behavior at Time 1, affect-related characteristics, risk perception, decision-making bases (DMB), and risk behavior at Time 2 variables</td>
</tr>
<tr>
<td>3-2</td>
<td>Affective predictors of adolescent risk behavior at Time 2 with and without mediation of affective influences of decision making: Parameter estimates (standard errors)</td>
</tr>
<tr>
<td>3-3</td>
<td>Affective predictors of influences on decisions to engage in or refrain from adolescent risk behavior (H2): Coefficient estimates (standard errors), and model test statistics</td>
</tr>
<tr>
<td>3-4</td>
<td>Affective predictors of risk perception (H4, H5, H6)</td>
</tr>
<tr>
<td>3-5</td>
<td>Affective predictors of adolescent risk behavior at Time 2 with and without mediation of risk perception: Parameter estimates (standard errors)</td>
</tr>
<tr>
<td>3-6</td>
<td>Risk perception as a predictor of adolescent risk behavior at Time 2 with and without mediation of affective influences of decision making: Parameter estimates (standard errors)</td>
</tr>
<tr>
<td>3-7</td>
<td>Risk perception predictors of influences on decisions to engage in or refrain from adolescent risk behavior (H9): Coefficient estimates (standard errors)</td>
</tr>
<tr>
<td>3-8</td>
<td>Direct and indirect effects of ARCs, decision making, and risk perception on adolescent risk behavior</td>
</tr>
<tr>
<td>D-1</td>
<td>Bivariate correlations among age, gender, grades, risk behavior at time 1(RBT1), and affect-related characteristics (ARCs)</td>
</tr>
<tr>
<td>D-2</td>
<td>Bivariate correlations among age, gender, grades, risk behavior at time 1(RBT1), affect-related characteristics (ARCs), risk perception (RP), and decision-making bases composite variables</td>
</tr>
</tbody>
</table>
D-3  Bivariate correlations among risk perception (RP) and decision-making bases composite variables .............................................................. 110

D-4  Bivariate correlations among self-reported rates of risk behavior by type ...... 111
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Proposed model of the relationships among affective factors, risk perception, decision making, and adolescent risk behavior</td>
</tr>
<tr>
<td>3-1</td>
<td>Percent of adolescents engaging in risk behavior by type and gender</td>
</tr>
<tr>
<td>3-2</td>
<td>Percent of adolescents engaging in risk behavior by type and age</td>
</tr>
<tr>
<td>3-3</td>
<td>Initial complete model: Affect-related characteristics, risk perception, decision-making bases, and adolescent risk behavior</td>
</tr>
<tr>
<td>3-4</td>
<td>Final reduced standardized model: Affect-related characteristics, risk perception, decision-making bases, and adolescent risk behavior</td>
</tr>
<tr>
<td>3-5</td>
<td>Younger versus older adolescents: Affect-related characteristics, risk perception, decision-making bases, and adolescent risk behavior</td>
</tr>
</tbody>
</table>
Abstract of Dissertation Presented to the Graduate School of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

AFFECT, DECISION MAKING, AND ADOLESCENT RISK BEHAVIOR

By

Laura Anne Curry

December 2004

Chair: Scott A. Miller
Cochair: Lise M. Youngblade
Major Department: Psychology

This study offers a new approach to analyzing and understanding the reasons why adolescents engage in risk behavior such as substance use, crime, and sex. Historically, risk behavior has been viewed as a result of cognitive decisions or choices. Therefore, to understand the behavior, researchers have examined the decision-making processes associated with those choices. An integrated model is proposed that incorporates decision making and also the affect-related characteristics (ARCs) and risk perceptions that influence that decision-making process.

Telephone surveys were conducted with 290 14- to 20-year-olds who provided reports of positive (joy and interest) and negative (anger and fear) affect, impulsivity, and sensation seeking (ARCs); risk perception (appreciation and comparative value of costs to benefits); and risk behavior (tobacco, alcohol, and drug use, school-related risk behavior, crime and violence, and sexual activity). Participants were also asked to
identify the decision-making bases (DMBs) that influenced their decisions to engage in
or refrain from risk behavior.

A majority of adolescents indicated that expectations of enhanced positive affect
and/or reduced negative affect, and anticipated regret influenced their decisions to
engage in or refrain from risk behavior. Older adolescents were more likely to report that
their decisions were influenced by expectations that these activities would result in
reduced negative affect than were younger adolescents.

Regression results showed that impulsivity and sensation seeking (ARCs)
influenced risk perception, decision making, and risk behavior; and that risk perception
influenced decision making and risk behavior. Decision making mediated the
relationships between ARCs and risk behavior, and between risk perception and risk
behavior. Structural equation modeling showed that the proposed model adequately fit
the data. Age-related differences emerged, as anger significantly predicted decision
making for younger but not older adolescents.

The detrimental effects of adolescent risk behavior are broad and far-reaching,
from victims of juvenile crimes to health care providers to schools, to the adolescent's
own family, health, and future. The results of this study, depicting the effects of ARCs on
adolescents' decisions to engage in or refrain from risk behavior, add to the growing
corpus of knowledge about the context and process of adolescent risk behavior.
CHAPTER 1
INTRODUCTION AND LITERATURE REVIEW

The prevalence with which adolescents engage in and disproportionately suffer the consequences of risk behavior has precipitated substantial research during the last few decades. Much has been learned with respect to the predictive value that various contextual factors, such as family, peer, and community connectedness have on adolescent risk behavior (Byrnes, 2002; Jessor, 1992). Researchers have also examined the ways in which cognitive development affects decision-making abilities (Flavell, 1992; Furby & Beyth-Marom, 1992; Grisso, 1980; Keating, 1990; Mann, Harmoni, & Power, 1989). However, less is known about the influence that affect has on the decisions to engage in or refrain from risk behavior, especially during adolescence.

Moreover, few if any studies have examined the differential influence that affect has on the decision-making process from early to late adolescence and adulthood. Extensive research has described the reasoning competence of adolescents and how that competence compares to that of adults, but most researchers have examined this reasoning process as a predominantly cognitive process. Although studies have demonstrated that in adults (usually university students) emotion affects cognition (Ellis & Ashbrook, 1988; Eysenck & Calvo, 1992), the role that affect plays in the reasoning process of adolescents has received limited attention.

Decision making is not merely a cognitive process but rather is influenced by cognitive capacities and the individual’s affect-related characteristics (Byrnes, 2002;
Cauffman & Steinberg, 2000; Scott, Reppucci, & Woolard, 1995). Various affect-related characteristics include those referred to in the literature as emotionality, emotion regulation, emotional temperance, affective state, affective trait, or simply as affect. For clarity and consistency, this class of characteristics is referred to here as affect-related characteristics (ARCs). ARCs include positive and negative affect, emotion-regulation competencies, and sensation-seeking tendencies. Research has revealed evidence of the influence that positive and negative ARCs have on decision making in adults (Hockey, Maule, Clough, & Bdzola, 2000; Lerner & Keltner, 2000). However, none have examined how these influences may affect decision making in adolescence, or whether these influences change during adolescence.

The purpose of this study is to begin to fill that void. Grisso (1996) suggested that the developmental effects that ARCs such as impulsivity have on decision making will be most apparent in highly emotional, unstructured contexts. That is, although adolescents may have decision-making abilities comparable to those of adults, differences in impulsivity over the course of the psychosocial maturation process result in age-related decision-making processing differences that are especially pronounced in stressful and uncertain situations. Similarly, Forgas (2002) purported that positive and/or negative ARCs are particularly influential during decision making when the task requires a high degree of open, constructive processing.

Since it is arguable that (a) the contexts within which adolescents make decisions related to risk behavior are often unstructured, (b) adolescent decision making often occurs in stressful and uncertain situations, (c) these decisions often require constructive processing, and (d) adolescent development results in changes in decision making, the primary hypothesis of this study is that there is a significant relation between ARCs and
decision making with regard to risk behavior in adolescents, and that this association will be moderated by age.

To address this general hypothesis, this chapter is organized as follows. First, a discussion of adolescent risk behavior is provided. This is followed by a review of key findings from research on adolescent decision-making competence. Next, research on the effects of ARCs on cognition and decision making is reviewed, followed by a discussion of the model on which this study was based. The chapter concludes with a description of the study questions and principal hypotheses.

Adolescent Risk Behavior

Many psychologists believe that a major goal of adolescence is to develop a sense of personal identity that is separate from one’s parents (Keating, 1990). One of the ways in which adolescents attempt to achieve this goal is by engaging in behaviors that are inconsistent with the norms and values of their parents and other authority figures of conventional society. Jessor (1992) suggested that these behaviors are often “functional, purposive, instrumental, and goal-oriented” (p. 22), in that they help adolescents separate from their parents and become more closely affiliated with their peers. Although some of these behaviors are quite innocuous (such as unconventional hairstyles and fashions), others lead to an increased likelihood of undesirable outcomes, including some that may be seriously detrimental and life altering.

These behaviors are often referred to as risk behavior and include illegal drug use, gambling, tobacco and alcohol use, delinquency, inappropriate aggressiveness and violence, school failure, and unsafe sexual activity. Different studies define risk behavior differently. Jessor (1992), for instance, included poor diet, lack of exercise, and refusal to use car safety devices; but did not include gambling or aggressiveness and violence.
Lerner and Simi (2000) included drug and alcohol use/abuse, sex-related risk behavior, crime and violence, and scholastic under-achievement. For the current study, participants were asked about the following risk behaviors: tobacco, alcohol, and drug use; sexual activity; crime and violence; and school-related risk behavior (e.g., getting suspended from school). Although this is not an exhaustive list of risk behaviors, it is a sample representative of the key areas assessed in national and health-related surveys (e.g., Youth Risk Survey®, YAHCs; Communities that Care Youth Survey® [Developmental Research and Programs, 1999]), and the sample can be used to examine the relations among adolescent affect-related characteristics, decision making, and risk behavior. As used in the following discussion and conclusions, the term “risk behavior” refers to the class of behavior represented by this sample.

Recognizing the significance of the detrimental consequences of adolescent risk behavior, researchers have attempted to reveal the possible determinants thereof. Evidence indicates that contextual factors such as peer connectedness and perceived peer (risky) activity, parental connectedness and parental control, and community connectedness and deviance, are likely to influence adolescent decisions to engage in or refrain from risk behavior (Byrnes, 2002; Jessor, 1992; Lerner & Simi, 2000). However, the dynamics of the relationship between individual cognitive factors and risk behavior itself are less clear (Furby & Beyth-Marom, 1992).

**Adolescent Decision-Making**

Many theories of cognitive development posit that adolescence is the time during which most people attain a level of cognitive processing comparable to that of adults (Flavell, 1992; Inhelder & Piaget, 1958; Keating, 1990). When researchers have examined differences between adolescent and adult cognitive processing, relatively
minor differences in cognitive capacity have been found (Grisso, 1980; Lewis, 1981; Manis, Keating, & Morrison, 1980; Weithorn & Campbell, 1982). Although many theorists would agree that cognitive structures might reach a mature level during adolescence, fewer would say that the quality of cognitive processing, in general, or of decision making, in particular, remains constant from adolescence through adulthood.

Early theories of adolescent decision making (Furby & Beyth-Marom, 1992; Goldberg, 1968; Janis & Mann, 1977; Shaklee, 1979) were grounded in utility theory models borrowed from economic theory. Under these early theories, the decision-making process was idealized as a conscious, rational process in which a person carefully considers all options and corresponding outcomes. Utility theory assumes that people can and do associate appropriate probabilities with each outcome and then add personal utility or preference indices to each. Proponents of this theory suggest that after considering all relevant information, people make rational selections in order to maximize their personal utility or to minimize personal risk. The models developed from these theories still serve as a basis for “normative” decision making.

Thus, normative decision making models generally include the following processes: (a) identification of all possible choices, (b) the gathering of all relevant information pertaining to those options, including the likelihood of various consequences of selecting or not selecting each action, (c) identification of relevant goals of the decision, (d) evaluation of each possible outcome based on personal beliefs and values, (e) a method of selection among all options, and (f) review of decision before implementation (Furby & Beyth-Marom, 1992; Ormond, Luszcz, Mann, & Beswick, 1991). These are idealized decision-making practices, and researchers today acknowledge that most decisions do not involve this sophisticated level of analysis. In
assessing whether a decision-making process is mature or competent, researchers currently use behavioral models that focus more on the evaluative process than on the outcome. Mann and colleagues proposed that evaluation could be based on the “nine C’s of competence” (Mann et al., 1989, p. 271), which include choice, comprehension, creativity, compromise, consequentiality, correctness, credibility, consistency, and commitment. On the basis of these criteria, they asserted that comparisons could be made between adult and adolescent competence in decision-making practices.

In what ways are decision-making practices of adolescents different from those of adults? Guided by their “nine C’s of competency,” Mann and colleagues (1989) conducted an intensive review of research through 1988 and determined that although adolescents who are older than 14 demonstrate decision-making competence comparable to that of adults, younger adolescents “are less able to create options, identify a wide range of risks and benefits, foresee the consequences of alternatives, and gauge the credibility of information from sources with vested interests” (p. 265). Generally, they found that although most adolescents are capable of making a rational selection among presented options, older adolescents generate more alternatives, have more sophisticated metacognitive understanding of their own decision making processes, and can envision more possible consequences than younger adolescents. Further, Lewis (1981) found that younger adolescents (7th and 8th graders as compared to 12th graders) seem to overlook negative consequences of alternatives, and Furby and Beyth-Marom (1992) suggested that younger adolescents may emphasize individual cases more than adults do when estimating outcome probabilities.

Findings that suggest other possible developmental differences in decision making have been less robust. Historically, it was thought that adolescents are more
influenced by peer pressure than adults are (Mann et al., 1989). However, more current research has generated evidence that peer influence is often overestimated, largely due to confounds with adolescent perceptions of peers’ behavior as opposed to actual peer behavior, and with adolescent-friend-selection bias (Kandel, 1996).

Results regarding temporal aspects or future orientation of solution generation and predictions of consequences of behavior have also been mixed (Gouze, Strauss, & Keating, 1986; Nurmi, 1991). For example, Nurmi’s review of research on the development of future orientation and planning revealed a complex relationship between future orientation and age. Some evidence suggested a U-shaped relationship between age and future extension, with younger and older adolescents being oriented farther into the future than were middle adolescents. Interestingly, however, the intensity of planning and salience given to future events generally increased with age during adolescence.

Some of the seemingly mixed implications of these findings, however, may be due to research design differences. For example, the age categories set for comparisons and measures used have been inconsistent. Some studies compare adolescents (11- to 18-year-olds) as a group, to adults; while others separate the age groups into younger, middle, and older adolescents. Furthermore, the adults who are compared to the adolescent group(s) vary considerably. Adult groups can consist of 18-year-olds, college students, or parents of adolescents. Clearly, there is potential for differential outcomes depending on the way the adult comparison group is composed. Generally, although decision-making practices may improve from early to late adolescence, evidently cognitive capacities related to decision making remain qualitatively similar from mid-adolescence through adulthood (Cauffman & Steinberg, 2000; Keating, 1990).
Adolescent decision making and risk behavior. If adolescents have decision-making skills (i.e., cognitive skills), comparable to those of adults, then why do adolescents seem to often make decisions that adults consider to be less-than-optimal, or “risky”? Many factors need to be examined in order to answer this question. First of all, for the purpose of this paper, it is assumed that behaviors such as adolescent smoking, drug and alcohol use, and sexual activity are less-than-optimal when judged according to “adult values” of long-term health and physical and emotional well-being in life. However, these values are not the only values by which a decision can be judged.

For example, although adolescents are able to generate a list of multiple options when presented with a particular problem, each option may not be given the level of viability assumed by an adult. Next, the assessed outcomes associated with each of these options may be very different from those generated by adults. That is, the valence and/or salience of each outcome can vary considerably (Furby & Beyth-Marom, 1992). In such a case, a decision that is considered to be less-than-optimal to an adult may be the result of an adolescent’s logical consideration. For example, the potential loss of a boyfriend as a result of not engaging in sexual activity may be rated as catastrophic by an adolescent girl although it might seem trivial to an adult.

Even if the adolescent recognizes the same positive and negative values and appreciates the likelihood of the various potential outcomes, there is evidence that adolescents often weigh the expected positive consequences of engaging in risk behavior more heavily than the potential costs (Goldberg, Halpern-Felsher, & Millstein, 2002). In addition, there is evidence that, in general, short-term consequences are more salient to adolescents than are long-term consequences (Halpern-Felsher & Cauffman, 2001; Scott et al., 1995). Finally, others have found significant correlations between decision making
Adolescent Risk Perception

In addition to evaluative differences vis-à-vis expectancies and salience of outcomes of risk behavior, it is also arguable that younger adolescents perceive the notion of risk differently than do older adolescents and adults. Thus, perhaps adolescent engagement in risk behavior results from biases in their perception of risks associated with these activities. Adults frequently opine that adolescents often act as if they perceive themselves to be invulnerable to the potential risks of certain behaviors. However, the evidence that supports this premise is weak and the results from research on adolescent abilities in assessing risk, in general, have been mixed (Furby & Beyth-Marom, 1992; Millstein & Halpern-Felsher, 2002).

For example, Lewis (1981) conducted a study in which 7th and 8th, 10th, and 12th graders were asked to offer advice to a peer with regard to a medical procedure (medical domain), participation in a research study for acne medication (informed consent domain), and in deciding which parent to live with after a divorce (family domain). She found that (a) 12th graders were more likely than both younger groups to spontaneously mention risks; (b) 12th graders were more likely to mention future consequences of decisions than were 10th graders, and 10th graders were more likely to
mention them than were 7th and 8th graders; and (c) 12th graders were more likely than both younger groups to consider the vested interests of others involved in the hypotheticals. Halpern-Felsher and Cauffman (2001) replicated this study with 6th through 12th graders and young adults (mean age 23), and found similar results. In the medical domain dilemma, adults generated more options and long-term consequences than did adolescents in all age groups; and 6th, 8th, and 10th graders mentioned fewer risks than did adults and 12th graders. In the informed consent domain, adults (and 12th and 10th graders) generated more options than did 6th and 8th graders, and each of the older participant groups generated more risks than did 6th graders. Finally, in the family domain, participants in each of the older groups generated more risks than did 6th graders. Interestingly, in the medical and family domains, 8th graders generated the fewest number of benefits associated with various options.

Others, however, have compared the risk assessment abilities of adolescents and adults and have found few, or contradictory differences. Beyth-Marom and colleagues (Beyth-Marom, Austin, Fischoff, Palmgren, & Jacobs-Quadrel 1993) concluded that the capacity to identify possible consequences of risk behavior was similar for adolescents between 12 and 18 (combined, and compared as one group) and parents (mean age 42). Perhaps more surprisingly, Millstein and Halpern-Felsher (2002) found a negative correlation between age and perceived vulnerability to the negative consequences of alcohol use and sexual activity in a study that included adolescents from grades 5, 7, and 9, and young adults. That is, 5th- and 7th-grade adolescents felt more vulnerable to the risks of alcohol use than did adults and 9th graders, and all adolescents perceived greater vulnerability to sexually transmitted diseases than did the young adults.
How can these disparate findings be reconciled? First, it is critically important to acknowledge that the concept of risk perception is more complex than estimating the likelihood or probability of certain outcomes. There are many factors to consider when assessing risk, including the likelihood of short-term and long-term consequences, the potential severity of these consequences, and the cumulative risks of certain behaviors over time (Slovic, 2000). The appropriate consideration of these factors together demonstrates a true appreciation of risk. However, it is still unclear whether the appreciation that adolescents have for risk is significantly different than that of adults. When these factors are included in research, individuals (regardless of age) tend to overestimate short-term risks and underestimate cumulative risks (Shaklee & Fischhoff, 1990).

Second, some of the contradictory findings from risk perception research may be attributed to differences in study design. For example, some of the adults included in studies are college students, while others are parents of adolescents. There also seems to be lack of control for low-risk versus at-risk adolescents and for gender, when making these comparisons. Unless variables such as these are controlled for, research results are inconclusive.

For example, Beyth-Marom and Fischhoff (1997) noted that high-risk adolescents were worse than low-risk adolescents at assessing the risks associated with various behaviors, and that they were less aware of their own risk-assessment abilities. Furby and Beyth-Marom (1992) suggested a reason why high-risk adolescents often underestimated risk. They posited that since high-risk adolescents know that it is inevitable that they will engage in risk behavior, they are more likely to focus on the positive consequences of these activities rather than the potential negative outcomes. Similarly, differences in risk
preferences and risk-taking proclivity between males and females may also affect research results. Byrnes and colleagues (Byrnes, Miller, & Schafer, 1999)—using a broad definition of risk behavior including social, intellectual, and physical risks—conducted a meta-analysis of gender differences in risk-taking tendencies and found that boys consistently outscored girls, and that this disparity tended to decrease from early to late adolescence. Clearly, it is important for researchers to be aware of these potential confounds when conducting risk-perception research.

Finally, different risk-perception measures may also lead to disparate results. Beyth-Marom and Fischhoff (1997) discussed the differences in results between studies that use open-ended measures of risk perception and those that used more structured measures. They cautioned that when items have defined response options, participants may have different interpretations of the situation, leading to very different responses. When items are more open-ended, researchers are better able to identify the assumptions made by participants. Differences have also been attributed to the use of hypothetical vignettes versus more real-life situations for risk perception assessment. Hypothetical situations may lack personal relevance and/or salience and therefore may elicit fewer or less elaborate participant responses. Finally, Millstein and Halpern-Felsher (2002) emphasized the importance of examining perceived benefits as well as perceived risk. They suggest that perhaps the main differences in younger and older adolescent risk perception is actually in the comparison of benefits to costs of these behaviors, rather than the absolute assessment of risk probabilities.

In summary, then, given the inconsistencies in operationalizations, study designs, and measurement issues, the question of whether and how adolescents differ from adults and among age groups needs to be addressed further. In addition, and perhaps even more
critically, the relationship between risk perception and decision making needs to be clarified, especially in terms of the moderating effects of age. An analysis of this literature suggests that the critical variables related to risk perception are cost-benefit analysis, appreciation, and assessment of likelihood of risk. Thus, these variables were included in the current study.

**Adolescent risk perception and risk behavior.** The relationship between risk perception and risk behavior has yet to be fully explored. Although it is logical to assume that risk behavior is causally related to risk perception, the direction of this relationship is unclear, since most of the research that has examined this relationship is cross-sectional in design. Nevertheless, some interesting findings have been revealed. Studies that have compared adolescents who engage in risk behavior to those who do not, have consistently demonstrated that engagers judge themselves to be at higher risk of negative consequences than do nonengagers (Johnson, McCaul, & Klein, 2002; Millstein & Halpern-Felsher, 2002). These findings seem to suggest that adolescents who engage in risk behavior are aware of the risks involved, at least to some extent. However, when measures included conditioned items (i.e., nonengagers are asked to estimate the risk they would be vulnerable to if they were to engage in the stated activity), then engagers’ judgments of risk were lower than those of nonengagers (Millstein & Halpern-Felsher, 2002).

Furthermore, Goldberg and colleagues (2002), comparing risk perception of 5th, 7th, and 9th graders, found that the 9th graders were more likely than 7th graders, and 7th graders more likely than 5th graders, to focus on perceived benefits of risk behavior than on perceived risks. She also found that perceptions of expected risks were higher for the 5th and 7th graders than for the 9th graders. In general, perceived benefits of risk behavior
increased with age, and perceived costs decreased with age. These changes with age were also true when experience rather than age was the variable factor.

Clearly, further study is needed to fully understand the relationship between adolescent risk perception and risk behavior. Adolescents often demonstrate a level of ability to assess risk that is comparable to that of adults; however, it remains to be determined whether and how this ability is used in real-life decision-making situations. It also seems evident from research that while perceived risk may have effects on adolescent decision-making performance and behavior, other concomitant factors are likely in play as well. Research on the influence that affective factors have on cognitive processing provides some insight into what some of these other factors may be.

**Influences of ARCs on Cognition**

The relationship between cognition and ARCs has been studied extensively over the past several decades. Indeed, studies relating cognition and emotion have provided evidence that affect does influence decision-making processes. For example, Bower (1981) found that individuals are better able to recall information from memory when that information is congruent with their current mood than if it is incongruent with current mood. Others have found that ARCs also affect cognitive performance in other various ways (Cauffman & Steinberg, 2000; Derakshan & Eysenck, 1998; Forgas, 2002; Isen, 2000). Following is a brief summary of some of these findings.

Forgas (2002) found, in several studies with adults, that negative affect leads to more diligent, careful processing and consideration of more complete information during decision making, and that positive affect often leads to more top-down, schema-based processing. Johnson and Tversky (1983) found that university students with higher positive affect scores were often less systematic in decision-making situations. That is,
they were less likely to consider detailed information and were more likely to use simple
heuristics and to rely on preexisting biases when making decisions. In addition, Schwarz
and Clore (1996) found that individuals with higher negative affect scores were more
likely to use systematically rigorous decision-making strategies. However, others have
found that positive affect leads to more thorough, creative, and flexible problem solving
(e.g., Isen, 2000). These contradictory conclusions underscore the need for further
research.

ARCs have also been found to affect cognitive performance. For example,
Schweizer (2002) investigated the effects of impulsivity on reasoning and found that
young adults who scored higher on impulsivity scales displayed lower performance on
reasoning tasks. Furthermore, perhaps sensation-seeking tendencies and risk orientation
influence goals and motivational factors related to the decision-making process. These
goals may result in the generation and construction of responses most likely to lead to
sensation-satisfying outcomes.

**Influence of ARCS on Adolescent Decision Making**

Extant research suggests that adolescents are as capable as adults of making
rational decisions, and that they do make rational decisions based on their own
assessments of options and outcomes. However, although adolescents may have the
capacity to make rational decisions, it is likely that ARCs often prevent them from fully
using these abilities in real-life situations. The developmental influences of ARCs on
decision making throughout adolescence have yet to be systematically explored.

For example, are the effects of ARCs on decision making the same for younger
adolescents versus older adolescents and adults? There is reason to hypothesize that they
are not. It is known that cognitive load or working memory capacity increases during
adolescence (Flavell, 1992; Keating, 1990) and that heightened levels of positive and/or negative affect detract from this capacity by using up attentional resources (Ellis & Ashbrook, 1988; Derakshan & Eysenck, 1998; Sorg & Whitney, 1992). An important implication of these findings is that the relationship between cognition and emotion likely changes developmentally throughout adolescence. That is, because younger adolescents may be more limited in cognitive capacity, the detrimental effects of ARCs may be more extreme for these individuals than for adults. As Grisso (1996) suggested, developmental differences in decision making are likely to be more apparent in highly emotional conditions.

Emotion-regulation competence, impulsivity, and suppression of aggression are ARCs that may directly influence risk perception and decision-making processes. Although there is not a great deal of research to address this question, Cauffman and Steinberg (2000) investigated the potential effects of ARCs such as impulsivity on decision making. Their research revealed developmental differences in responsibility, emotional-regulation competence, and temporal perspective between adolescents (again, especially younger adolescents) and adults. Adolescents scored worse than adults on each of these measures; however there were much greater individual differences among groups of younger adolescents (8th- and 10th-grade students). Cauffman and Steinberg viewed the adolescent’s level of responsibility, emotion regulation competence (including impulsivity and suppression of aggression), and temporal perspective as elements of what they termed psychosocial maturity. Upon closer inspection, Cauffman and Steinberg found that psychosocial maturity, and not age, was the defining predictor of decision-making competence. For example, adolescents who scored high on scales of
impulsivity demonstrated lower levels of decision-making competence than those who scored low on scales of impulsivity, regardless of age.

In addition to the evidence of psychosocial maturation during adolescence presented by Cauffman and Steinberg (2000), neurological research has revealed that brain development during adolescence may lead to greater sensation seeking and impulsivity (Spear, 2000). According to Spear, adolescent engagement in risk behavior such as alcohol and drug experimentation may be attributed, in part, to brain development that typically occurs throughout adolescence. Spear explained that reorganization in the adolescent prefrontal cortex, a shift in activation of the amygdala, and increased dopamine levels that are coincident with a decrease in glutamate and gamma-aminobutyric acid, likely contribute to increased sensation seeking and changes in behavior motivated by affective expectations. As a result, adolescents are more likely to reveal higher levels on impulsivity and sensation-seeking scales, and lower emotion-regulation competence, than are younger children and adults. Given these developmental changes, it is reasonable to suppose that ARCs play a significant role in adolescent decision-making processes.

Therefore, the relationships between impulsivity and decision making, and sensation seeking and decision making, are particularly relevant for adolescent decision-making research. That is, although adolescents may have the capacity to make rational decisions under ideal circumstances, external factors may interact with internal (affective and cognitive) factors to produce differences in decision-making processes between younger and older adolescents. Cauffman and Steinberg’s (2000) research provides evidence of a relationship between impulsivity and decision making, and underscores the importance of further research in this area.
Affective Determinants of Adolescent Risk Behavior

One unfortunate consequence of increased impulsivity and sensation-seeking tendencies during adolescence is the frequency with which teens participate in risk behavior. As Arnett (1992) noted, adolescents are overrepresented in all categories of risk behavior. Teens also disproportionately suffer the negative effects of these behaviors. These effects can include premature death, addiction, criminal incarceration, sexually transmitted diseases, and underachievement, and they carry considerable societal costs in addition to the devastating effects suffered by the adolescent. According to data from the 2001 Youth Risk Behavior Surveillance Study (Grunbaum et al., 2002), approximately 75% of all deaths among 10- to 24-year-olds result from risky behavior. Clearly, it is important to investigate the determinants of this behavior.

Colder and Chassin (1993) found that rebelliousness and dispositional negative affect (using a composite score of internalizing symptomatology of anxiety, depression, and social withdrawal) directly predicted alcohol use, and that negative affect also partially mediated the relationship between stress and alcohol use. Others have provided evidence that adolescents who tend toward avoidance-coping strategies in order to regulate negative emotional states were also more likely to engage in risk behavior (Cooper, Wood, Orcutt, & Albino, 2003). There is also evidence that reveals robust relationships between impulsivity and adolescent risk behavior (Askenazy et al. 2003; Cooper et al.; Miller, Flory, Lynam, & Leukefeld, 2003; Poikolainen, 2002; Shoal & Giancola, 2003) and a somewhat less robust relationship between sensation-seeking tendencies and adolescent risk behavior (Miller et al.; Poikolainen).

In addition to the direct effects that ARCs have on engaging in risk behavior, they may also influence adolescents’ decision-making processes, thereby influencing risk
behavior indirectly, as well. For example, individuals’ goals and motivations in risk behavior are often driven by how they feel about the affective outcomes they expect to result from engaging in or refraining from the risk behavior. Some researchers have referred to these motivational factors as affective expectancies.

Caffray and Schneider (2000) conducted an interesting study in which they examined the factors motivating both the engagement in and avoidance of risk behavior for high- and low-experience adolescents (mean age 16). For this study, they used a measure that identified different outcome expectancies that teens had with respect to risk behavior such as smoking, drinking alcohol, drug use, and sexual activity. Their methods extended work by Cooper and colleagues (Cooper, Frone, Russell, & Mudar, 1995) and focused on affective motivators related to risk behavior. Caffray and Schneider found that adolescents with high experience tended to be motivated by expectations that outcomes would include enhanced positive affective states and/or reduced negative affective states. In contrast, the low-experience group was motivated (to not engage in risk behavior) by the salience of anticipated regret associated with these behaviors. Clearly, the influence that ARCs have on adolescent risk behavior, both directly and indirectly, is significant.

Affect and Risk Perception

ARCs have also been found to influence risk perception. For example, Johnson and Tversky (1983) discovered that university students with higher scores on positive affect measures often overestimate the likelihood of positive (versus negative) consequences, while the opposite was true for individuals with higher negative affect scores. Closer inspection of relevant literature reveals that differences in risk perception may not just be related to the affective valence, but to the specific type of affect within a
given affective valence. For example, Lerner and Keltner (2000) investigated the effects of more specific negative emotions on young adults’ judgment and choice; they found differential effects of anger and fear. Their results indicated that individuals who scored higher on a scale of anger made more optimistic judgments of risk, whereas those who scored higher on a scale of fear made more pessimistic judgments. Therefore, affect (at least negative affect) can have a moderating effect on decision making via risk perception. Further research in this area is likely to provide additional insights on the relationship between cognition and emotion, perhaps also revealing similar differences in terms of positive affect.

Summary

Adolescent risk behavior is a serious concern because adolescents engage in risk behavior more frequently than any other age group (Arnett, 1992) and disproportionately suffer the negative consequences of these behaviors (Grunbaum et al., 2002). Efforts to understand adolescent risk behavior have included a wide variety of predictors, many of them contextual, but also have included some beginning forays into affective and cognitive predictors. The research to date has revealed that the relationships among adolescent risk behavior, decision making, risk perception, and affect-related characteristics (ARCs) are exceedingly complex. Although research has provided some insight into this relationship, much remains to be learned about adolescent risk behavior and decision making, especially with respect to the role of ARCs in this relationship.

Evidence indicates that although the cognitive capacity of most middle-adolescents is similar to that of adults, some significant differences in performance have been revealed (Keating, 1990). For example, the ability to consider multiple alternatives, goals, outcomes, and perspectives typically continues to develop throughout adolescence
(Byrnes, 2002). Others have found that psychosocial development with respect to responsibility, temperance, and temporal perspective is especially significant from early to mid-adolescence Cauffman and Steinberg (2000). Cauffman and Steinberg (2000) assert that psychosocial maturity, which broadly includes ARCs and risk-perspective-taking ability, is an important determinant of decision-making competence. Still, as Furby and Beyth-Marom (1992) suggest, adolescent decisions to engage in risk behavior are often the result of rational processes based on values that reflect adolescent rather than adult standards.

Research on the influence of ARCs on cognition has been inconclusive. Whereas Forgas’ (2002) research suggests that negative affect leads to more careful, systematic problem solving, Isen (2000) produced evidence that positive affect induced more thorough, effective problem solving. Isen also reported mixed evidence with regard to the relationship between affect and risk perception. In general, these effects seem to be dependent on the measures used in the research. Other research linking ARCs and cognition indicates a negative correlation between impulsivity and cognitive processing (Schweizer, 2002). Similary, Cauffmann and Steinberg’s (2000) work revealed a positive relationship between psychosocial maturity and competent decision making.

Affect also influences engagement in risk behavior indirectly through affective expectancies of the consequences of these behaviors. Caffray and Schneider (2000) demonstrated that adolescents often engage in risk behavior because they expect these behaviors to result in enhanced positive affective states and/or an avoidance of negative affective states. They also found that adolescents who do not engage in risk behavior often refrain from them because they expect that engagement will lead to feelings of anticipated regret.
Finally, research clearly reveals a correlation between ARCs and risk behavior. Colder and Chassin (1993) found that rebelliousness and dispositional negative affect predicted alcohol use. Others have found that adolescents who tend toward avoidance coping strategies in order to alleviate negative emotional states were more likely to engage in risk behavior (Cooper et al., 2003). Similarly, evidence demonstrates a positive correlation between impulsivity and risk behavior (Askenazy et al., 2003) and between sensation-seeking tendencies and risk behavior (Miller et al., 2003).

Taken together, then, findings from the research reviewed above suggest a number of direct and indirect pathways linking ARCs, risk perception, decision making, and risk behavior. The model in Figure 1-1 summarizes these relationships.

Figure 1-1. Proposed model of the relationships among affective factors, risk perception, decision making, and adolescent risk behavior

Specifically, the model postulates that decisions to engage in or refrain from risk behavior are significantly impacted by the interdependent influences of ARCs and the risk perceptions of the decision maker. The research base to date also leads to the proposition that ARCs and risk perception will each directly influence decision making and risk behavior, and that the influence that ARCs and risk perception have on risk behavior will be partially mediated by the decision-making process. It is also predicted
that ARCs will indirectly influence decision making and risk behavior via the influence that they have on risk perception.

**Research Questions and Hypotheses**

The model in Figure 1-1 suggests several specific research questions. These questions follow, along with the hypotheses that were tested for each question.

**RQ1**: Do ARCs directly influence adolescents’ risk behavior and their decisions to engage in or refrain from these behaviors? If so, do affective influences on decisions to engage in or refrain from risk behavior mediate the relationship between ARCs and adolescents’ risk behavior?

It was expected that the current study would replicate some of the findings of prior research on the relationship between ARCs and risk behavior. The following hypotheses are consistent with these findings:

**H1**: Impulsivity, sensation seeking, and negative affect will be significant determinants of risk behavior.

Consistent with Colder and Chassin (1993), it was expected that adolescents who measured high on a scale of negative affect will report more frequent engagement in risk behavior and adolescents who measured high on a scale of positive affect will report less risk behavior (Johnson & Tversky, 1983). Further, evidence of the relationships between ARCs such as impulsivity (Askenazy et al., 2003) and sensation seeking (Miller et al., 2003), and risk behavior was expected to be revealed. Impulsivity was expected to be the strongest predictor of risk behavior (Miller et al., 2003).

**H2**: High scores of impulsivity (Cauffman & Steinberg, 2000), sensation seeking, and negative affect, and low suppression of aggression scores will directly predict high scores of affective influence on decision making.

The rationale for this hypothesis was that if emotion regulation competence is underdeveloped then cognitive decision-making processes would be interrupted and ARCs would have greater influence over decision making outcomes.
H3: Affect manifests an indirect effect on risk behavior through its influence on decision making and therefore, decision making will mediate the relationship between ARCs and risk behavior.

As suggested by Caffray and Schneider’s (2000) results, adolescents who report expectancies that risk behavior would lead to enhanced positive affect or to decreased negative affect would engage in more risk behavior. Conversely, adolescents who report “anticipated regret” as an influential factor in their decisions to refrain from these activities would be expected to report less frequent engagement in risk behavior.

RQ2: Do ARCs influence adolescent risk behavior indirectly via the effects that these factors have on risk perception?

Hypotheses concerning the relationship between ARCs and risk perceptions were also based on evidence from prior research. The following predictions were proposed:

H4: Anger and fear will be significant predictors of risk perception.

As Lerner and Keltner (2000) found, adolescents with higher scores on a measure of fear, reveal higher perceptions of risk. On the other hand, adolescents with high anger scores tend to perceive less risk given the same hypothetical situations.

H5: Sensation seeking tendencies will predict risk perception.

As Goldberg et al. (2002) suggested, it was expected that adolescents with greater sensation-seeking tendencies will focus more on the benefits and less on the potential costs of risk behavior.

H6: Higher levels of emotion-regulation competence such as suppression of aggression and premeditation, and lower levels of impulsivity will predict greater perceived risks.

H7: Adolescents who perceive less likelihood of risk and/or greater comparative value (benefits versus costs) of risk behavior will be more likely to engage in these activities.

H8: Risk perception will partially mediate the relationship between ARCs and adolescent risk behavior.
RQ3: Do perceptions of risk influence decisions to engage in or refrain from risk behavior? Further, is the association between risk perception and risk behavior mediated by affective influences on the decisions to engage in or refrain from risk behavior?

H9: Adolescents who perceive less likelihood of risk and/or greater comparative value (benefits versus costs) of risk behavior will be more likely to base their decisions to engage in these behaviors on expectations that these activities would lead to enhancement of positive affect and/or avoidance or attenuation of negative affect.

On the other hand, it was expected that adolescents who perceive greater likelihood of risk and/or lesser comparative value (benefits versus costs) of risk behavior will be more likely to base their decisions to engage in these behavior on expectations that these activities would lead to increased negative affect or anticipated regret (Caffray & Schneider, 2000).

H10: Risk perception manifests an indirect effect on risk behavior through its influence on decision making and therefore, decision making will partially mediate the relationship between risk perception and risk behavior.

RQ4: Are there developmental differences with regard to these relationships?

Although it is likely that frequency of risk behavior will increase during adolescence with age due, in large part, to the increase in opportunities to engage in these activities, other predictions about age-related effects on the relationships among ARCs, risk perception, decision making, and risk behavior are less obvious. The following predictions were proposed:

H11: The influence that ARCs have on adolescent risk behavior and the decisions to engage in or refrain from these behaviors will be greater for younger adolescents than for older adolescents.

It is reasonable to expect to find a larger effect of ARCs on risk behavior for younger adolescents than for older ones. The logic behind this hypothesis is that, because younger adolescents have more environmental and situational impediments to engaging in risk behavior (e.g., more supervision by parents and other adults, lack of jobs and
therefore of money, driving restrictions), it takes more personal motivation to seek out
topportunities. On the other hand, most middle and older adolescents have abundant
opportunity to engage in risk behavior. Therefore, their decisions to engage in these
activities are more likely to vary across situational as well as individual factors.
CHAPTER 2
METHOD

Participants

The participants in this study were adolescents who took part in a study related to adolescent health and risk behavior in spring, 2003. These adolescents were all recruited from the Florida Healthy Kids Program, which provides health care to children and adolescents in low-income families. This program serves “working poor” families whose incomes are between 100 and 200 percent of the federal poverty level. As such, these youth are low-income but not at the poverty level.

At Time 1 (Spring, 2003), 576 adolescents (316 females, 54.9%) between the ages of 13 and 19 ($M = 15.4$, $SD = 1.68$) were surveyed. The age-range distribution was as follows: 217 (37.9%) participants were between the ages of 13 and 14, 214 (37.4%) were 15 to 16, and 141 (24.7%) were between 17 and 19. The ethnic diversity of this group approximately represents the diversity of Healthy Kids enrollees: 163 (28.5%) Hispanic, 85 (14.8%) African American, 299 (52.3%) Non-Hispanic White, and 25 (4.4%) Other.

At Time 2 (Spring, 2004), 290 adolescents (173 females, 59.7%) between the ages of 14 and 20 ($M = 15.98$, $SD = 1.56$) were surveyed. The age-range distribution was as follows: 126 (43.5%) participants were between 14 and 15 years old, 108 (37.2%) were between 16 and 17, and 56 (19.3%) were between 18 and 20. The ethnic breakdown of the group at Time 2 was: 77 (26.6%) Hispanic, 44 (15.2%) African American, 161 (55.4%) Non-Hispanic White, and 8 (2.8%) Other.
As noted, 290 participants from the Time 1 survey also participated in the Time 2 survey. Of the 286 remaining participants from Time 1, 190 adolescents were not reached due to changes in telephone numbers with no forwarding information, disconnected phones, phone numbers that were no longer valid for the target adolescent, and attempts that never resulted in contact with anyone at the number dialed. (Up to 27 attempts were made for each participant from Time 1.) In addition, 10 parents refused to give permission to have their son or daughter interviewed, and 86 adolescents declined.

Analyses of sample attrition revealed a slight selection bias at Time 2, as a disproportionate number of males and older adolescents did not participate in the follow-up survey. The mean ages for the group of participants from Time 1 who also participated at Time 2 compared to those who did not were 15.98 (SD = 1.56) and 16.47 (SD = 1.65), respectively; this difference was significant, $t(574) = 3.68, p < .001$. A chi-squared test also revealed a significant gender difference between the two groups: $\chi^2(1) = 5.42; p < .05$. The participant group that completed the follow-up at Time 2 consisted of 59.7% females and the group that did not participate at Time 2 consisted of 50.0% females. T-tests were also performed to examine any differences in grades and total reported risk behavior, however no significant differences were found. Similarly, a chi-squared test of the ethnic composition of the two groups revealed no significant difference.

**Procedure**

Data were collected as part of a larger telephone survey that included additional measures of potential determinants of adolescent risk behavior (e.g., community and family connectedness, and peer relations). First, letters were mailed to parents of potential participants describing the study and advising them to expect a call from a
researcher at the University of Florida. A professional survey center at the University of Florida was contracted to conduct the interviews for this study.

The Survey Research Center at the Bureau for Economic and Business Research (BEBR) at the University of Florida is a professional survey center, and, in fact, is one of the top 10 university survey centers in the U.S. Students are employees of BEBR, and as such they undergo rigorous training in professional conduct during interviews. The training includes extensive general training and ongoing monitoring in issues of confidentiality, as well as training specific to the survey being fielded. Employees sign an honor code as a condition of their employment, and any violation of the honor code is grounds for dismissal. Not only will employees lose their jobs, but BEBR will pursue violations with the University Honor Court. Thus, employees are trained in confidentiality procedures, and understand (and sign) a code that documents the dire consequences of violation.

For any survey that is fielded, including this one, a series of specific steps occur. First, the researcher meets with BEBR senior staff, including the director, and the survey center supervisor to discuss the survey, the population, and the research design. Second, several iterations of survey development occur that include programming the survey, testing the survey and item sequences, and finally pilot testing the survey among the interviewers. Third, when the programming is complete, a series of training sessions are held between the survey center supervisor and surveyors, to go over issues related to the survey and the population, including issues of sensitivity and confidentiality, and to practice the survey itself. Finally, when the survey is officially launched, the survey center supervisor observes and randomly listens in to surveys to monitor that the protocol is adhered to. In addition, staff members from the research project are welcome to
observe the interviewers at any point. During the early stages of the current study, an investigator made a staff visit in order to ensure that the interviewers were presenting the survey items as intended, and to be certain that the participants were able to understand and respond to the items as intended.

Approximately one week after the introductory letter was mailed to parents of potential participants a BEBR interviewer called each parent, explained the study, and asked for consent for their child’s participation. If the parent agreed, the interviewer asked to speak with the adolescent, explained the study to them, and asked for his or her assent. If consent and assent were both given, the interviewer scheduled a time for the survey (either immediately or another time, as requested by the adolescent).

To satisfy confidentiality requirements and to assure the maximum possible comfort level for the participant, the interviewer who conducted the survey was different from the interviewer who made the initial contact with the family. As a result, the interviewer had no personal knowledge of the interviewee, except for a first name. Because of the sensitive nature of some of the questions asked, all interviewers were female. The survey took approximately 45 minutes to complete. Participants were advised that they could choose to not answer any item, or to stop at any time after the survey commenced. A $15 WalMart giftcard was mailed to all participants after the survey. The measures included in the survey are described next.

**Measures**

Table 2-1 cross references the constructs in the model in Figure 1-1 to the measures used to assess each respective construct and to the corresponding variables that were used in the analyses. Measures, and their corresponding variables, are described below. Data were checked for coding errors and missing data. For each variable, missing data were imputed only if responses for 75% of the items were valid and nonmissing.
Table 2-1. Descriptive statistics for affect-related characteristics (ARCs), risk perception, decision-making processes, and adolescent risk behavior composite variables

<table>
<thead>
<tr>
<th>Construct</th>
<th>Variable</th>
<th>Number of items</th>
<th>Range</th>
<th>Mean (SD)</th>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Variables</td>
<td>Age</td>
<td>1</td>
<td>14-20</td>
<td>15.98</td>
<td>n/a</td>
</tr>
<tr>
<td>ARCs</td>
<td>Gender</td>
<td>1</td>
<td>M, F</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Grades</td>
<td></td>
<td>1</td>
<td>1-9</td>
<td>6.96</td>
<td>n/a</td>
</tr>
<tr>
<td>Anger</td>
<td></td>
<td>5</td>
<td>0-20</td>
<td>5.53 (4.81)</td>
<td>0.85</td>
</tr>
<tr>
<td>Fear</td>
<td></td>
<td>5</td>
<td>0-20</td>
<td>1.91 (2.67)</td>
<td>0.82</td>
</tr>
<tr>
<td>Positive Affect</td>
<td></td>
<td>10</td>
<td>0-40</td>
<td>17.86 (8.49)</td>
<td>0.89</td>
</tr>
<tr>
<td>Restraint</td>
<td></td>
<td>15</td>
<td>0-60</td>
<td>27.16 (7.14)</td>
<td>0.86</td>
</tr>
<tr>
<td>Impulsivity</td>
<td></td>
<td>11</td>
<td>0-44</td>
<td>12.27 (4.54)</td>
<td>0.85</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td></td>
<td>12</td>
<td>0-48</td>
<td>15.54 (4.95)</td>
<td>0.78</td>
</tr>
<tr>
<td>Risk Likelihood</td>
<td></td>
<td>6</td>
<td>0-18</td>
<td>13.40 (5.12)</td>
<td>0.88</td>
</tr>
<tr>
<td>Risk Perception</td>
<td>Appreciation</td>
<td>6</td>
<td>0-18</td>
<td>15.51 (2.82)</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td>Comparative value</td>
<td>6</td>
<td>0-18</td>
<td>16.03 (2.53)</td>
<td>0.8</td>
</tr>
<tr>
<td>Decision-making bases (rescaled)</td>
<td>Expectancies –reduce negative affect/cope</td>
<td>9</td>
<td>0-2</td>
<td>0.22 (0.38)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Expectancies –enhance positive affect</td>
<td>11</td>
<td>0-2</td>
<td>0.23 (0.37)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Impulsiveness</td>
<td>4</td>
<td>0-2</td>
<td>0.27 (0.67)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Expectancies – anticipated regret</td>
<td>12</td>
<td>0-2</td>
<td>1.41 (0.51)</td>
<td>n/a</td>
</tr>
<tr>
<td>Risk Behavior</td>
<td>Drug Use (Frequency T2)</td>
<td>9</td>
<td>0-45</td>
<td>1.02 (2.23)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Crime/violence (Frequency T2)</td>
<td>6</td>
<td>0-30</td>
<td>0.38 (1.03)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>School-related (Frequency T2)</td>
<td>2</td>
<td>0-10</td>
<td>0.64 (1.27)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Sex* (T2)</td>
<td>2</td>
<td>0-2</td>
<td>0.39 (0.65)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>Total (Frequency T2)</td>
<td>22</td>
<td>0-102</td>
<td>6.18 (8.65)</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Note: *The sex-related risk behavior variable was scored as: 0 if respondent reported no sexual intercourse over the past 12 months, 1 if respondent reported sexual intercourse, and that he or she used a condom during the most recent episode, and 2 if respondent reported sexual intercourse and that he or she did not use a condom during the most recent episode.*
Composite variables were created, as described below, for affect-related characteristics, risk-perception, decision-making bases, and risk-behavior constructs. Descriptive information and Cronbach alphas (to test for internal consistency among items within each measure) are also presented in Table 2-1.

Control Variables

First, individual level information such as age, gender, and school grades were collected so that these data could be controlled in all subsequent analyses of adolescent risk behaviors and decision making with respect to these behaviors. At Time 1 adolescents were asked to report age, in completed years, and gender. It was expected that reports of risk behavior would increase with age, and data on gender allowed us to account for potential gender differences in risk behavior patterns. School grades as self-reported by the participants were used as a proxy measure of cognitive ability. Although not an ideal measure of cognitive ability, it is one of few that could be used within the time and methodological constraints of a telephone survey. In addition, since it is actually a measure that captures both cognitive ability and commitment to education, it is likely to have a more significant association with risk behavior than cognitive ability alone. The response categories to this measure were mostly As, As and Bs, mostly Bs, Bs and Cs, mostly Cs, Cs and Ds, mostly Ds, Ds and Fs, and mostly Fs. These responses were scored ordinally from 1 (mostly Fs) to 9 (mostly As).

Self-Reported Risk Behavior

Various studies have used a variety of instruments to measure adolescent engagement in risk behavior. The items used in this survey were modified from items included in the Youth Risk Behavior Survey (2002) and the Communities That Care® Youth Survey (1999). Six categories of risk behavior were included in this measure:
tobacco use, alcohol use, illegal drug use, school-related risk behavior, sexual activity, and crime and violence. For each category there were multiple items referring to specific types of behavior. For example, the alcohol use category included items referring to beer and wine, hard liquor, and binge drinking. Participants were asked whether they had ever engaged in each activity, and then the frequency of engagement over the 6 months prior to the spring, 2003 survey. During the follow-up survey, participants were asked about the frequency of engagement in the same activities, over the past 12 months. Frequency scores were assigned values representing never or rarely, moderately, or frequently.

Then, composite variables were created. First, a composite for each risk behavior category was created by adding frequency scores of items within that category. Next, a composite across all behavior was created by adding all frequency scores.

**Positive and Negative Affect**

The measure of positive and negative affect was created for this study (Appendix A). It includes five items for each of the following emotions or affective states: anger, fear, interest, and joy. Several items were adopted from a child version of the Positive and Negative Affect Schedule (PANAS-C), developed by Laurent et al. (1999). Additional items were developed so that each of the four affective states was represented by five individual items. For each item, the participant was asked to indicate how often they experienced these feelings over the past two weeks. A 5-point Likert scale was used with frequency scores of 0 (Never) to 4 (More than once a day). The PANAS-C has demonstrated adequate convergent and discriminant validity with other measures of childhood anxiety and depression and is appropriate to use with adolescents. A pilot test of this newly developed measure revealed adequate validity and reliability.
From this instrument, several affect-related variables were created. First, four variables were formed to represent anger, fear, joy, and interest. The value of each variable was set to equal the sum of the frequency scores for each of the five items within each affective state (0-20). The results from these measures were checked to verify the reliability for each and also for the existence of four separate affect-related constructs. A high significant correlation emerged between joy and interest ($r = .72$). Because of this and potential problems with multicollinearity, a decision was made to combine these two measures into one composite score representing positive affect. The reliability coefficient for each of the final three measures was found to be greater than .80 (Table 2-1.)

**Restraint and Sensation Seeking**

The Impulsivity (Premeditation) and Suppression of Aggression subscales of Weinberger’s Adjustment Inventory (Weinberger & Schwartz, 1990) were used. These subscales have been used with children as young as 6th grade ($\alpha = .69$ for the premeditation subscale and $\alpha = .80$ for the suppression of aggression subscale when tested separately). For the participants in this study the reliability coefficients (Cronbach $\alpha$’s) were .73 and .84 for the premeditation and suppression of aggression subscales, respectively. Further, upon examining the association between these subscales, a significant correlation ($r = .60$) between them was revealed. Therefore, the two subscales were summed to create a measure of restraint. The reliability coefficient for this resulting measure is .86.

Since the internal consistency of the Weinberger impulsivity subscale is (historically) modest ($\alpha = .69$), an additional measure of impulsivity was included in the survey. Therefore, the sensation-seeking ($\alpha = .90$) and impulsivity ($\alpha = .91$) subscales of Whiteside and Lynam’s (2001) UPPS Impulsive Behavior scale were used. Miller and
colleagues (2002) found strong correlations between these subscales and risk behavior such as alcohol and drug use, and risk sexual activity. Because these measures were developed for use with adult populations some of the items were adapted for the verbal abilities of young adolescents. When tested with the data used for the current study, the reliability coefficients for these measures were .78 and .85 for the sensation seeking and impulsivity subscales, respectively.

**Risk Perception**

A risk perception instrument developed by Benthin, Slovic, and Severson (1993) and revised by the MacArthur Foundation Research Network on Adolescent Development and Juvenile Justice (2002) was used to measure participants’ assessment of the likelihood of risk, the potential seriousness of undesired outcomes of certain risk behaviors, and the assessment of costs to benefits of these behaviors. This measure has been developed specifically for use with adolescents and has four subscales (affective, likelihood, appreciation or salience, and comparative value). When used in its entirety for the MacArthur Study, the internal consistency was $\alpha = .86$. For this study, three of the subscales were utilized, representing perceptions of risk likelihood, appreciation, and the comparative value of costs to benefits of risk taking.

The behaviors included in this risk perception instrument are smoking cigarettes, riding in a car with a drunk driver, having unprotected sex, stealing from a store, vandalizing property, and drinking alcohol. Respondents are asked to answer three questions addressing the perceived likelihood, seriousness of consequences (appreciation), and comparative value of each of these six behaviors. Each item is measured on a 4-point Likert scale. The likelihood of risk is measured on a scale from not at all likely to very likely, and the potential seriousness responses are on a scale from

not at all serious to very serious. The comparative value of risk behavior responses are (1) a lot more good things than bad things, (2) somewhat more good things than bad things, (3) somewhat more bad things than good things, and (4) a lot more bad things than good things. To create scale scores, item responses across the six behaviors were summed to represent perceived likelihood of risk ($\alpha = .88$), appreciation of risk ($\alpha = .75$), and comparative value of costs to benefits ($\alpha = .80$). For each scale a higher score represents greater perceived risk.

**Decision-Making Bases**

A measure was specifically developed for this study, and pilot tested to identify reasons why adolescents decide to engage in risk behavior (Appendix B). Because “real-time” information with respect to these decisions was not available, the items of this measure served to obtain insight into the bases upon which adolescents make these decisions. The pilot test was conducted in person, over the telephone, and via written surveys. Adolescents (11 to 20 years old) were asked to offer as many reasons as they could think of to explain why adolescents decide to engage in or refrain from risk behaviors such as tobacco, alcohol, and drug use and sexual activity.

The responses to these surveys were assembled and organized to create the decision-making measure used for this study (Appendix C). This measure consists of eight subsections. The items are grouped according to the category of risk behavior specified (tobacco use, alcohol use, drug use, and sexual activity), and again subdivided into two sections: influences of decisions to engage in risk behavior, and influences of decisions to refrain from risk behavior. The instrument was first programmed according to each adolescent’s responses to the self-report of risk behavior measure. For each category of behavior, a variable was set to “yes” if the adolescents indicated that they had
engaged in any of the behavior within that category, or to “no” if they indicated that they had not engaged in any of the items within that category.

If the variable was set to “yes” the interviewer reminded the participant that they had discussed some of their experience with the specified behavior and asked whether each subsequent item influenced their decision to engage in that behavior. For example, if the participant indicated that he or she had used tobacco, the interviewer read a list of possible influential factors such as “I thought it would be fun,” “It helps me to relax,” or “I didn’t think about it. It just happened.” The participants were then asked to indicate the level of influence each factor had on their own decision to use tobacco on a 3-point scale from a lot of influence to no influence at all.

Alternatively, if the variable was set to “no,” the interviewer reminded the participant that he or she indicated that they did not engage in the specified behavior and then asked whether each subsequent item influenced their decision to refrain from that behavior. For example, if the participant indicated that they had never used tobacco, the interviewer read a list of possible influential factors such as “It’s dangerous,” “It’s bad for your health,” or “It could ruin my future.” The participant was then asked to indicate the level of influence each factor had on their own decision to not use tobacco on a 3-point scale from a lot of influence to no influence at all.

To create subscales, items were grouped into the following: (a) expected reduction of negative affect/coping support, (b) expected enhancement of positive affect/sensation seeking, (c) lack of emotion regulation/impulsiveness, (d) anticipated regret, (e) peer relationship maintenance, (f) parental relationship maintenance, (g) identity maintenance, (h) conflict with morals/values, and (i) instrumental reasons. Because the focus of the current study was on affect-related characteristics and decision
making, only the first four categories were utilized in the analyses presented herein; a subsequent study will evaluate the additional categories of decision-making bases. Thus, composite variables were developed to represent scores for each of the first four categories (a through d) identified above. Responses to all of the items within each category were summed to create these four decision-making bases composite variables.

One major concern regarding the decision-making bases was that distributions were dependent, in part, on the survey design. Specifically, participants were prompted with items depending on whether they indicated engagement in the targeted risk behavior (tobacco, alcohol, or drug use, or sexual activity). A consequence of this design was that groups of participants answered different sets of questions. In order to adjust for these differences, summed composites were rescaled such that each composite reflected the average response for each decision-making bases category (i.e., expectations of reduced negative affect, expectations of enhanced positive affect, impulsiveness, and anticipated regret). Although the resulting variables were still somewhat skewed due to the groups of adolescents who either indicated that they engaged in or refrained from all four categories of risk behavior, these rescaled composites more closely approximated normal distributions.

Thus, to summarize, the following variables were used in the subsequent analyses. Age, gender, grades, and risky behavior at Time 1, were included as control variables. ARCs included anger, fear, positive affect, restraint, sensation seeking, and impulsivity. Risk perception measures included perceived likelihood, appreciation, and comparative value of costs to benefits. Decision-making bases were expected reduction of negative affect/coping, enhanced positive affect, impulsiveness, and anticipated regret. Finally, the primary outcome was the total risk behavior composite score at Time 2.
CHAPTER 3
RESULTS

Results are presented in four main sections. In the first, descriptive information about the primary dependent variables representing adolescent engagement in risk behavior, and about the variables representing the bases upon which decisions to engage in or refrain from these activities were made, is provided. In addition, bivariate correlations among study variables are presented. In the second, the results from a series of multiple regressions, which were used to test the specific hypotheses that guided this study are discussed. These results led to the development of a “best-fit” model tested by structural equation modeling, which is discussed in the third section. Finally, a group comparison of this model is used to examine differences between younger and older adolescents in the fit of the model.

Self-Reported Risk Behavior

Data related to adolescents’ self-reported engagement of risk behavior at Time 2 are presented in Figures 3-1 and 3-2. As illustrated in both figures, approximately 70% of all participants reported engagement in at least one risk behavior during the 12 months immediately preceding the survey. Of the six categories of risk behavior included, adolescents were most likely to use alcohol and least likely to engage in criminal activity, with prevalence rates of 51% and 19%, respectively (Figure 3-1). Engagement in each of the other categories of risk behavior (tobacco use, drug use, sexual activity, school related) was roughly 30%.
Interestingly, the rates of risky behavior for males and females were similar with two exceptions. A set of chi-squared tests confirmed that none of the differences in rates of risk behavior by type, or in total, for males versus females were significant at $p < .05$, except for criminal behavior and school-related risk behavior. A chi-squared test revealed that the difference in rates of criminal behavior for males versus females (29.92% and
was significant, $\chi^2 (1) = 8.50, p < .01$. Similarly, a chi-squared test also confirmed that the rate of school-related risk behavior was greater for males (37.61%) than for females (24.86%), $\chi^2 (1) = 5.40, p < .05$.

Risk behavior rates by age are shown in Figure 3-2. As expected, these rates consistently increased with age, with two exceptions. First, school-related risk behavior (getting suspended from school and/or going to school drunk or high) was less prevalent for 15-year-olds than for either 14- or 16-year-olds, however a chi-squared test confirmed that there was no main effect of age for rate of school-related risk behavior, at the .05 significance level. Second, adolescents who were 18 and older were less likely to report drug use than were 17-year-olds. A chi-squared test revealed a significant main effect of age on rate of drug use ($\chi^2 (4) = 28.26, p < .0001$), however a follow-up chi-squared comparison confirmed that this decrease in rate of drug use from age 17 to age 18 was, in fact, not significant at $p < .05$.

**Decision-Making Bases**

The measure of influences on adolescents’ decisions to engage in or refrain from risk behavior (DMBs) provided valuable insight into the bases upon which adolescents made these decisions. A majority of the participants endorsed decision-making bases that are affect-related. Specifically, almost all (97.90%) of the adolescents who reported that they did not engage in at least one of the four categories of risk behavior for which the DMBs were solicited (tobacco use, alcohol use, drug use, and sexual activity) indicated that their decisions were influenced by the anticipated regret that would result from engagement in risk behavior. Of the adolescents who engaged in risk behavior, 65.93% reported that expectations of enhanced positive affect (e.g., it seemed like it would be fun, I just wanted to see what it would be like, or I was bored) influenced their decisions
to engage in these activities; 51.10% reported that expectations of reduced negative affect (e.g., it helps me to relax, it makes me feel better, I was angry) influenced these decisions; and, 43.41% indicated that impulsiveness led to engagement in risk behavior (i.e., I didn’t think about it—it just happened).

Patterns of the reported influences of expectations of enhanced positive affect and reduced negative affect (DMBs) for younger and older adolescents who engage in risk behavior were similar. However, one age-related difference was notable. Older adolescents (16- to 20-year-olds) were more likely to endorse the expectations of reduced negative affect DMB, than were younger adolescents (58% versus 36% endorsements, respectively). This difference was significant with $\chi^2(1) = 7.55, p < .01$.

**Bivariate Correlations**

Table 3-1 presents simple bivariate correlations between the predictors and outcomes (i.e., risk behavior) of this study. (Appendix D contains tables of correlations among all predictor variables and among risk behaviors by type.) These correlations give some insight into the relations among background characteristics such as age, gender, and grades; affect-related characteristics (ARCs); risk perception; and decisions regarding and adolescents’ engagement in risk behavior. Significant correlations were revealed between age and risk behavior (positive) and grades and risk behavior (negative), although none was found between gender and risk behavior. As expected, significant correlations among ARCs, risk perception, affective influences of decision making, and risk behavior were revealed. Among the ARCs, restraint, impulsivity, sensation seeking, and anger were significantly associated with the outcome variable; however, fear and positive affect were not. The correlation between each of the four DMBs (expectations of reduced negative affect, enhanced positive affect, impulsiveness,
Table 3-1. Bivariate correlations among age, gender, grades, risk behavior at Time 1, affect-related characteristics, risk perception, decision-making bases (DMB), and risk behavior at Time 2 variables

<table>
<thead>
<tr>
<th>Risk behavior (T2)</th>
<th>Tobacco use</th>
<th>Alcohol use</th>
<th>Drug use</th>
<th>School-related</th>
<th>Crime</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.31***</td>
<td>.33***</td>
<td>.34***</td>
<td>.17**</td>
<td>.02</td>
<td>0.04</td>
</tr>
<tr>
<td>Gender (1=M, 2=F)</td>
<td>.02</td>
<td>.11#</td>
<td>.02</td>
<td>.05</td>
<td>-11#</td>
<td>-0.09</td>
</tr>
<tr>
<td>Grades</td>
<td>-.24***</td>
<td>-.22***</td>
<td>-.20***</td>
<td>-.13*</td>
<td>-.32***</td>
<td>-.15**</td>
</tr>
<tr>
<td>Risk behavior (Time 1)</td>
<td>.80***</td>
<td>.76***</td>
<td>.61***</td>
<td>.70***</td>
<td>.59***</td>
<td>.53***</td>
</tr>
<tr>
<td>Anger</td>
<td>.24***</td>
<td>.13*</td>
<td>.18**</td>
<td>.15**</td>
<td>.31***</td>
<td>.25***</td>
</tr>
<tr>
<td>Fear</td>
<td>.22</td>
<td>.03</td>
<td>.00</td>
<td>.03</td>
<td>.04</td>
<td>.02</td>
</tr>
<tr>
<td>Positive affect</td>
<td>-.05</td>
<td>.00</td>
<td>.01</td>
<td>-.07</td>
<td>.12*</td>
<td>-.09</td>
</tr>
<tr>
<td>Restraint</td>
<td>-.37***</td>
<td>-.28***</td>
<td>-.28***</td>
<td>-.27***</td>
<td>.37***</td>
<td>.37***</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>.23***</td>
<td>.15**</td>
<td>.25***</td>
<td>.15**</td>
<td>.13*</td>
<td>.06</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>.20***</td>
<td>.14*</td>
<td>.21***</td>
<td>.14**</td>
<td>.10#</td>
<td>.09</td>
</tr>
<tr>
<td>Risk perception–likelihood</td>
<td>-.12*</td>
<td>-.08</td>
<td>-.11#</td>
<td>-.07</td>
<td>-.09</td>
<td>-.08</td>
</tr>
<tr>
<td>Risk perception–appreciation</td>
<td>-.36***</td>
<td>-.30***</td>
<td>-.32***</td>
<td>-.25***</td>
<td>-.24***</td>
<td>-.36***</td>
</tr>
<tr>
<td>Risk perception–comparative value</td>
<td>-.26***</td>
<td>-.22***</td>
<td>-.23***</td>
<td>-.19***</td>
<td>-.20***</td>
<td>-.19***</td>
</tr>
<tr>
<td>DMB reduced negative affect</td>
<td>.69***</td>
<td>.61***</td>
<td>.61***</td>
<td>.59***</td>
<td>.44***</td>
<td>.34***</td>
</tr>
<tr>
<td>DMB enhanced positive affect</td>
<td>.50***</td>
<td>.37***</td>
<td>.56***</td>
<td>.39***</td>
<td>.21***</td>
<td>.15***</td>
</tr>
<tr>
<td>DMB impulsiveness</td>
<td>.35***</td>
<td>.25***</td>
<td>.37***</td>
<td>.22***</td>
<td>.21***</td>
<td>.16***</td>
</tr>
<tr>
<td>DMB anticipated regret</td>
<td>-.66***</td>
<td>-.57***</td>
<td>-.57***</td>
<td>-.45***</td>
<td>-.45***</td>
<td>-.30***</td>
</tr>
</tbody>
</table>

Note: *** reflects p-value <.001; ** reflects p-value <.01; * reflects p-value <.05; # reflects p-value <.10.
and anticipated regret) and risk behavior were also significant. And, finally, negative correlations between the risk perception variables and risk behavior were found as expected. These correlations are consistent with the proposed hypotheses.

Correlations between the predictors and specific types of risk behavior (i.e., tobacco use, drug use, criminal behavior, etc.) also were calculated. As seen in Table 3-1, the pattern of correlations between ARCs, risk perception, decision making, and risk behavior by type are similar across the various categories of risk behavior. Owing to this empirical consistency, as well as conceptual reasons based on Moffitt (1993) and others (Jessor, 1992) who argue that specific risk behaviors tend to co-occur and are indicative of broader latent factors, the decision was made to retain the composite risk behavior variable for all further analyses. Therefore, no further analyses by risk behavior type were performed and all subsequent analyses utilized the composite variable.

**Test of Research Questions**

As recalled, the model in Figure 1-1 represents multiple research questions. To address these questions, a multi-step process was used. First, a series of regression analyses, organized by the dependent variable in the model, were performed to address each research question individually. These regression analyses tested the direct effects indicated by each path included in the model and led to the identification of significant variables within each major construct (e.g., restraint, sensation seeking, impulsivity etc.) that were used in later complete model analyses. Next, regression analyses were performed with the addition of mediating variables (e.g., risk perception, decision-making bases) to test for mediating effects, where applicable. Then, structural equation modeling, based on a reduced set of variables deduced from the previous analyses, was
used to test the complete model. Finally, this reduced model was analyzed by age group (i.e., younger versus older adolescents) to examine potential moderating effects of age.

**Links Among ARCs, Decision-Making Bases, and Risk Behavior**

As seen in Figure 1-1, a set of relationships between ARCs, decision-making bases, and risk behavior is postulated. The first research question addresses these direct and mediated associations.

**RQ1:** Do affective factors directly influence adolescents’ risk behavior and their decisions to engage in or refrain from these behaviors? If so, do affective influences on decisions to engage in or refrain from risk behavior mediate the relationship between ARCs and adolescents’ risk behavior?

Based on the evidence reviewed in the literature, three hypotheses were tested:

**H1:** Impulsivity, sensation seeking, and negative affect will all be significant determinants of risk behavior (e.g., Colder & Chassin, 1992; Cooper et al., 2003; Miller et al., 2003). Impulsivity is expected to be the strongest predictor of risk behavior (Miller et al.).

**H2:** High scores of impulsivity (Cauffman & Steinberg, 2000), sensation seeking, and negative affect, and low suppression of aggression scores will directly predict high scores of affective influence on decision making.

**H3:** Affect manifests an indirect effect on risk behavior, through its association with decision making and, therefore, decision making partially mediates the relationship between affect and risk behavior.

The first two hypotheses were tested via regression analysis. For H1, age, gender, school grades, and previous risk behavior experience (from Time 1) were controlled. Next, the ARCs were introduced to the model. The resulting model was found to be significant, $F(10,288) = 61.42$, $p < .0001$, $R^2 = .69$. Coefficient estimates, standard errors, and $p$-values for each predictor are in Table 3-2, column (H1). As expected, better grades predicted lower levels of self-reported risk behavior at Time 2, and higher levels of risk behavior at Time 1 predicted higher levels of risk behavior at Time 2; however, age and gender were not found to be significant predictors of risk behavior at Time 2. As
further illustrated in Table 3-2, higher levels of sensation seeking and impulsivity predicted more risk behavior at Time 2; however, other ARCs were not found to be significant predictors of risk behavior at Time 2. Thus, hypothesis 1 was partially supported as sensation seeking and impulsivity did predict risk behavior at Time 1, after controlling for age, gender, grades, and risk behavior at Time 1.

Because four of the decision making bases composites reflected affective influences on adolescents’ decision to engage in or refrain from risk behavior, four respective sets of regressions were performed to test the relationship between affect-related characteristics and affective influences of decision making (H2). First, age, gender, and grades were entered as independent variables to be controlled. Next, anger, fear, positive affect, restraint, sensation seeking, and impulsivity were entered as independent variables. The affect-related decision-making bases composites (reduced negative affect, enhanced positive affect, impulsiveness, and anticipated regret) served as the dependent variables, respectively.

The results of these analyses are presented in Table 3-3. Each of these tests revealed significant models with age a significant predictor of affective influence on decision making. Specifically, as age increased, the influence that expectations of reduced negative affect and impulsiveness had on decision making increased, and the influence that anticipated regret had on decision making decreased. Conversely, reports of better school grades predicted less influence of impulsiveness, and greater influence of anticipated regret on decision making. And, gender had a significant effect on affective influences of decision making, as females reported a greater influence that expectations of reduced negative affect and enhanced positive affect had on decision making.
Table 3-2. Affective predictors of adolescent risk behavior at Time 2 with and without mediation of affective influences of decision making: Parameter estimates (standard errors)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Direct effect of affective predictors (H1)</th>
<th>Addition of mediating variables (H3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.19 (.20)</td>
<td>.02 (.15)</td>
</tr>
<tr>
<td>Gender</td>
<td>.50 (.66)</td>
<td>.10 (.48)</td>
</tr>
<tr>
<td>Grades</td>
<td>-.41 (.19)*</td>
<td>-.22 (.14)</td>
</tr>
<tr>
<td>Risky behavior (Time 1)</td>
<td>1.08 (.06)***</td>
<td>.77 (.05)***</td>
</tr>
<tr>
<td>Anger</td>
<td>.14 (.08)#</td>
<td>n/a</td>
</tr>
<tr>
<td>Fear</td>
<td>-.04 (.13)</td>
<td>n/a</td>
</tr>
<tr>
<td>Positive affect</td>
<td>-.01 (.04)</td>
<td>n/a</td>
</tr>
<tr>
<td>Restraint</td>
<td>-.01 (.06)</td>
<td>n/a</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>.15 (.06)*</td>
<td>.03 (.05)</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>.19 (.08)*</td>
<td>.06 (.05)</td>
</tr>
</tbody>
</table>

Note: *** reflects p-value <.001; ** reflects p-value <.01; * reflects p-value <.05; # reflects p-value <.10. a Because these variables do not manifest a significant relationship with the outcome, they were not included in the analysis that included the mediating factors.

Table 3-3. Affective predictors of influences on decisions to engage in or refrain from adolescent risk behavior (H2): Coefficient estimates (standard errors), and model test statistics

<table>
<thead>
<tr>
<th>Decision-making bases (outcomes)</th>
<th>Reduced negative affect</th>
<th>Enhanced positive affect</th>
<th>Impulsiveness</th>
<th>Anticipated regret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.05 (.01)***</td>
<td>.02 (.01) #</td>
<td>.05 (.02)**</td>
<td>-.07 (.02)**</td>
</tr>
<tr>
<td>Gender</td>
<td>.12 (.05) **</td>
<td>.11 (.05) **</td>
<td>.08 (.06)</td>
<td>-.00 (.08)</td>
</tr>
<tr>
<td>Grades</td>
<td>-.02 (.01) #</td>
<td>-.01 (.01)</td>
<td>-.04 (.02)*</td>
<td>.07 (.02)**</td>
</tr>
<tr>
<td>Anger</td>
<td>.00 (.01)</td>
<td>.00 (.01)</td>
<td>.01 (.01)</td>
<td>-.01 (.01)</td>
</tr>
<tr>
<td>Fear</td>
<td>.00 (.01)</td>
<td>.00 (.01)</td>
<td>-.01 (.01)</td>
<td>.02 (.02)</td>
</tr>
<tr>
<td>Positive affect</td>
<td>-.00 (.03)</td>
<td>.00 (.00)</td>
<td>.00 (.00)</td>
<td>-.00 (.00)</td>
</tr>
<tr>
<td>Restraint</td>
<td>-.01 (.04)**</td>
<td>-.01 (.00)**</td>
<td>-.02 (.01)**</td>
<td>.02 (.01)*</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>.02 (.05)**</td>
<td>.02 (.00)**</td>
<td>.01 (.01)</td>
<td>.00 (.01)</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>-.00 (.06)</td>
<td>.01 (.01)</td>
<td>-.01 (.01)</td>
<td>-.03 (.01)***</td>
</tr>
</tbody>
</table>

Note: *** reflects p-value <.001; ** reflects p-value <.01; * reflects p-value <.05; # reflects p-value <.10.
Furthermore, as illustrated in Table 3-3, affect-related characteristics did, in fact, predict affective influences on decision making, however, these effects varied by the particular decision-making basis. Specifically, restraint (suppression of aggression and premeditation) predicted the influence that expectations of reduced negative affect, enhanced positive affect, impulsiveness, and anticipated regret had on decisions to engage in or refrain from risk behavior; higher sensation seeking predicted greater expected reduced negative affect and enhanced positive affect influences on decision making; and high scores on impulsivity predicted less influence of anticipated regret on decision making. Anger, fear, and positive affect did not significantly affect decision making.

The third hypothesis, H3, was tested according to the criteria specified by Baron and Kenny (1986), for demonstrating mediation. The criteria included demonstrating a path between the predictor and criterion (H1); demonstrating a path between the predictor and mediator(s) (H2); and demonstrating a reduction in the path between the predictor(s) and criterion that occurs with the introduction of the mediator(s) into the equation, along with maintaining a significant relationship between the mediator(s) and criterion. In this case, the third condition was demonstrated with hierarchical regression to predict risk behavior: After controlling for age, gender, grades, and previous risk behavior experience, and adding the ARCs that were found to be significant predictors of risk behavior (sensation seeking, and impulsivity), as independent variables, the decision-making variables were entered into the model (Table 3-2, column H3).

This model was found to be significant, $F(10, 289) = 133.17, p < .0001, R^2 = .83$. The results show that mediation occurred, as there was a reduction in the magnitude of the relationships between affect and risk behavior (from H1), when the decision-making
variables were also entered into the equation. Specifically, as illustrated in Table 3-2, the effects of sensation seeking and impulsivity on risk behavior were completed mediated by the introduction of the decision-making variables because they become nonsignificant predictors when the decision-making-bases variables were added to the model. In addition, the mediators (i.e., expectations of reduced negative affect, enhanced positive affect, and anticipated regret influences on decision making) were significant predictors of adolescent risk behavior at Time 2.

A potential problem in interpreting these findings emanates from the multicollinearity of the DMB variables. Specifically, the four DMB variables were significantly correlated with one another (.21 to .64). Thus, it is possible that this degree of correlation may have led to model instability, with the significant DMB variables emerging more or less at random, depending on order of entry into the model and correlation with the other predictors.

One strategy to deal with this problem might have been to composite these variables. However, for theoretical reasons, this was not a desirable strategy. This is because, conceptually, each of the four DMBs represented a unique variable that was retained so that results could be interpreted and compared to previous research. However, to check for undesirable multicollinearity effects, the regression model used to test H3 was modified and reanalyzed. Specifically, four individual regressions were run, each of which included only one of the DMB variables. The results of these regressions were compared to the one that included all four DMB variables. These findings showed that, although the coefficient estimates for each of the DMB variables differed somewhat across analyses, the relative size and direction of these estimates were consistent. For example, of the four DMBs, the influence that expectations of reduced negative affect
had on decision making was the strongest predictor of risk behavior, and the influence that impulsiveness had on decision making was the weakest predictor of risk behavior in both cases. Thus, it was decided that each of the four DMB variables would be retained for subsequent regression analyses.

Thus, to summarize, the findings provide general support for the hypotheses related to RQ1. Specifically, after controlling for age, gender, grades, and risk behavior at Time 1, sensation seeking and impulsivity (ARCs) were significant predictors of adolescent risk behavior at Time 2 (criterion), and restraint, sensation seeking, and impulsivity (ARCs) were significant predictors of affective influences of decision making (mediator). Moreover, the association between ARCs and risk behavior at Time 2 was significantly accounted for by affective influences on decisions to engage in or refrain from risk behavior.

**Links Among ARCs, Risk Perception, and Risk Behavior**

As seen in Figure 1-1, in addition to the relations between ARCs, decision making, and risk behavior, there is also a presumed set of associations between risk perception and these factors. The next research question addresses these relationships.

**RQ2:** Do affect-related characteristics (ARCs) influence risk behavior indirectly via the effects that these factors have on risk perception?

Recall that the results presented earlier related to H1 demonstrated that ARCs, specifically sensation seeking and impulsivity, were related to risk behavior at Time 2. It was also hypothesized that there would be links between ARCs and risk perception, and that, in fact, risk perception would mediate the links between ARCs and risk behavior. Hypotheses four through six address the link between ARCs and risk perception. Following, H7 and H8 address the issue of mediation.
**H4:** Levels of anger and fear are significant predictors of risk perception (Lerner and Keltner, 2000). Specifically, higher anger scores and lower scores on a measure of fear will predict lesser perceived risk.

**H5:** Higher sensation seeking scores will predict lesser perceived risk (Goldberg, 2002).

**H6:** Adolescents with lower scores on restraint and higher scores on impulsivity will perceive less risk inherent in risk behavior.

Because there were three measures of risk perception, three respective regression analyses were performed to test the relationship between affect-related characteristics and risk perception (H4, H5, and H6), using the risk perception scores (likelihood, appreciation, and comparative value) as dependent variables, respectively. Age, gender, and grades were entered first as control variables; anger, fear, positive affect, restraint, sensation seeking, and impulsivity were entered as predictors.

The results of these analyses are presented in Table 3-4. Each of these regressions was statistically significant, with $R^2$ ranging from .07 to .14. As to the effects of ARCs on risk perception, restraint and impulsivity were found to be predictive of risk perception, but sensation seeking, anger, and fear were not. As illustrated in Table 3-4, adolescents with greater restraint perceived greater likelihood and appreciation of risk. On the other hand, adolescents who were more impulsive reported less appreciation of the risks of these behaviors. Neither restraint nor impulsivity predicted perceptions of comparative value of risk behavior.

Having demonstrated an association between ARCs and risk perception, the next step was to address mediation and the link between risk perception and risk behavior. Thus the following hypotheses were tested:

**H7:** Risk perception partially mediates the relationship between ARCs and adolescents’ risk behavior.
**H8:** Adolescents who perceive less likelihood of risk and/or greater comparative value (benefits versus costs) of risk behavior will be more likely to engage in these activities.

The regression equation used to test hypotheses 7 and 8 included age, gender, grades, and risk behavior at Time 1 (controls), and ARCs and risk perception measures (likelihood, appreciation, and comparative value), as predictors of risk behavior at Time 2. Here, only those ARC variables that were previously established as significant predictors (Table 3-2, column H1) were included in the model (i.e., sensation seeking and impulsivity).

**Table 3-4. Affective predictors of risk perception (H4, H5, H6)**

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Likelihood estimate</th>
<th>Appreciation</th>
<th>Comparative value of risk to benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.24 (.19)</td>
<td>-.21 (.10)*</td>
<td>-.12 (.09)</td>
</tr>
<tr>
<td>Gender</td>
<td>-.55 (.67)</td>
<td>.82 (.35)*</td>
<td>.21 (.32)</td>
</tr>
<tr>
<td>Grades</td>
<td>.30 (.19)</td>
<td>.12 (.10)</td>
<td>.26 (.09)**</td>
</tr>
<tr>
<td>Anger</td>
<td>.14 (.08)#</td>
<td>.01 (.04)</td>
<td>-.05 (.04)</td>
</tr>
<tr>
<td>Fear</td>
<td>.02 (.13)</td>
<td>-.01 (.07)</td>
<td>-.00 (.06)</td>
</tr>
<tr>
<td>Positive affect</td>
<td>.02 (.04)</td>
<td>.01 (.02)</td>
<td>.01 (.02)</td>
</tr>
<tr>
<td>Restraint</td>
<td>.11 (.06)*</td>
<td>.06 (.03)*</td>
<td>.05 (.03)#</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>.07 (.06)</td>
<td>.04 (.03)</td>
<td>.02 (.03)</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>-.11 (.08)</td>
<td>-.13 (.04)***</td>
<td>-.06 (.04)#</td>
</tr>
</tbody>
</table>

*Note:*** reflects p-value <.001; ** reflects p-value <.01; * reflects p-value <.05; # reflects p-value <.10.*

Again, the criteria specified by Baron and Kenny (1986) for demonstrating mediation were followed. The first requirement of mediation is the demonstration of a path between the predictor(s) and criterion (H1); the second is a demonstration of a path between the predictor(s) and mediator(s) (H4, H5, and H6); and the third is the demonstration of a reduction in the path between the predictor(s) and criterion that occurs...
with the introduction of the mediator(s) into the equation (H7); along with a significant relationship between the mediator and outcome (H8).

In this case, it was demonstrated, first, that greater sensation seeking and impulsivity predicted more risk behavior (Table 3-5, column H1). Second, as restraint increased and impulsivity decreased, risk perception increased (Table 3-4). Third, the regression of ARCs and risk perception on risk behavior at Time 2 was statistically significant, $F (10, 287) = 64.27, p < .0001, R^2 = .70$ (Table 3-5, column H7, H8).

Consistent with Hypothesis 7, there was a reduction in the magnitude of the relationships between affect and risk behavior (from H1) when the risk-perception variables were entered into the equation. The regression shows that mediation occurred; however, the degree of mediation varied across the affect-related characteristics tested. As depicted in Table 3-5, although the effect of impulsivity was completely mediated by risk perception, the effect of sensation seeking was not.

Table 3-5. Affective predictors of adolescent risk behavior at Time 2 with and without mediation of risk perception: Parameter estimates (standard errors)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Direct effect of affective predictors from Table 3-2 (H1)</th>
<th>Addition of mediating variables (H7, H8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.19 (.20)</td>
<td>.13 (.20)</td>
</tr>
<tr>
<td>Gender</td>
<td>.56 (.66)</td>
<td>1.21 (.64)#</td>
</tr>
<tr>
<td>Grades</td>
<td>-.44 (.19)*</td>
<td>-.39 (.19)*</td>
</tr>
<tr>
<td>Risky behavior (Time 1)</td>
<td>1.08 (.06)***</td>
<td>1.04 (.06)***</td>
</tr>
<tr>
<td>Anger</td>
<td>.13 (.08)</td>
<td>n/a^a</td>
</tr>
<tr>
<td>Fear</td>
<td>-.03 (.13)</td>
<td>n/a^a</td>
</tr>
<tr>
<td>Positive affect</td>
<td>-.01 (.04)</td>
<td>n/a^a</td>
</tr>
<tr>
<td>Restraint</td>
<td>-.01 (.06)</td>
<td>n/a^a</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>.15 (.06)*</td>
<td>.17 (.06)**</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>.19 (.08)*</td>
<td>.13 (.08)#</td>
</tr>
<tr>
<td>Risk likelihood</td>
<td>n/a</td>
<td>.05 (.06)</td>
</tr>
<tr>
<td>Risk appreciation</td>
<td>n/a</td>
<td>-.32 (.12)**</td>
</tr>
<tr>
<td>Risk comparative value</td>
<td>n/a</td>
<td>-.27 (.13)*</td>
</tr>
</tbody>
</table>

Note: *** reflects $p$-value <.001; ** reflects $p$-value <.01; * reflects $p$-value <.05; # reflects $p$-value <.10. *Because these variables do not manifest a significant relationship with the outcome, they were not included in the analysis that included the mediating factors.
Consistent with Hypothesis 8, adolescents who perceived greater comparative value of benefits to costs of risk behavior were more likely to engage in these behaviors. Similarly, greater appreciation of these risks predicted fewer reports of risk behavior. Perceived likelihood of risk was not found to be predictive of risk behavior at Time 2 (Table 3-5, column H7, H8).

In summary, the hypotheses related to RQ2 were generally supported by the analyses. First, recall that the findings from Hypothesis 1 revealed that ARCs (specifically, sensation seeking and impulsivity) were significant predictors of risk behavior at Time 2 (criterion). Next, after controlling for age, gender, and grades, restraint (suppression of aggression and premeditation) and impulsivity were also significant predictors of risk perception (mediator). Moreover, the effect of impulsivity on risk behavior at Time 2 was significantly accounted for by risk perception, although the effect of sensation seeking on risk behavior was not. And, lastly, risk perception (specifically, appreciation and comparative value of risk) significantly predicted risk behavior at Time 2.

**Links Among Risk Perception, Decision Making, and Risk Behavior**

The last set of relationships depicted in Figure 1-1 concerned predictive associations between risk perception and risk behavior, and the mediating effect of decision making. The third research question addresses these relationships.

**RQ3:** Do perceptions of risk influence decisions to engage in or refrain from risk behavior? Further, is the association between risk perception and risk behavior mediated by affective influences on the decisions to engage in or refrain from risk behavior?

Recall that Hypothesis 8 in the previous section addressed the relation between risk perception and risk behavior, and that the results showed a significant connection between risk perception and risk behavior. However in the previous analysis, because the
hypothesis was part of a mediational analysis, and risk perception was the mediator, the regression analysis also included the ARC variables. ARCs, however, are not relevant to this research question. Therefore, a direct test of Hypothesis 8, not including the ARC variables, was conducted. To reiterate the predicted relationship, Hypothesis 8 is listed again below.

**H8:** Adolescents who perceive less likelihood of risk and/or greater comparative value (benefits versus costs) of risk behavior will be more likely to engage in these activities.

Hypothesis 8 was tested using regression analysis. After controlling for age, grades, gender, and previous risk behavior experience, the risk perception variables were introduced to predict risk behavior. The results demonstrated that a significant relationship existed between the predictor, risk perception, and criterion, adolescent risk behavior at Time 2 (Table 3-6, column H8). Specifically, adolescents who demonstrated greater risk appreciation and who perceived a greater value of risks to benefits of risk behavior were less likely to engage in risk behaviors.

The results from H8 show an association between risk perception and risk behavior. To fully test RQ3, two additional hypotheses were specified showing connections between risk perception and decision making (H9) and the mediating effect of DMBs on the relation between risk perception and risk behavior. The hypotheses are as follows:

**H9:** Adolescents who perceive less likelihood of risk and/or greater comparative value (benefits versus costs) of risk behavior are more likely to base their decisions to engage in these behaviors on expectations that these activities will lead to enhancement of positive affect and/or avoidance or attenuation of negative affect. On the other hand, adolescents who perceive greater likelihood of risk and/or lesser comparative value (benefits versus costs) of risk behavior are more likely to base their decisions to engage in these behaviors on expectations that these activities will lead to increased negative affect or anticipated regret (Caffray & Schneider, 2000).
Table 3-6. Risk perception as a predictor of adolescent risk behavior at Time 2 with and without mediation of affective influences of decision making: Parameter estimates (standard errors)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Direct effect of risk perception (H8)</th>
<th>Addition of mediating variables (H10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.11 (.20)</td>
<td>.02 (.15)</td>
</tr>
<tr>
<td>Gender</td>
<td>.74 (.62)</td>
<td>.13 (.46)</td>
</tr>
<tr>
<td>Grades</td>
<td>-.41 (.19)*</td>
<td>-.21 (.14)</td>
</tr>
<tr>
<td>Risky behavior (Time 1)</td>
<td>1.07 (.06)***</td>
<td>.76 (.05)***</td>
</tr>
<tr>
<td>Risk likelihood</td>
<td>.05 (.06)</td>
<td>n/a</td>
</tr>
<tr>
<td>Risk appreciation</td>
<td>-.36 (.12)**</td>
<td>-.08 (.09)</td>
</tr>
<tr>
<td>Risk comparative value</td>
<td>-.33 (.13)**</td>
<td>-.04 (.10)</td>
</tr>
<tr>
<td>Decision-making basis—expectations of reduced negative affect</td>
<td>n/a</td>
<td>6.08 (.82)***</td>
</tr>
<tr>
<td>Decision-making basis—impulsiveness</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Decision-making basis—expectations of enhanced positive affect</td>
<td>n/a</td>
<td>2.36 (.76)**</td>
</tr>
<tr>
<td>Decision-making basis—anticipated regret</td>
<td>n/a</td>
<td>-2.81 (.42)***</td>
</tr>
</tbody>
</table>

Note: *** reflects p-value <.001; ** reflects p-value <.01; * reflects p-value <.05; # reflects p-value <.10. *Because these variables do not manifest a significant relationship with the outcome, they were not included in the analysis that included the mediating factors.

H10: Risk perception manifests an indirect effect on risk behavior through its influence on decision making and therefore, decision making will partially mediate the relationship between risk perception and risk behavior.

In regard to the links between the predictors (risk perception) and the presumed mediator (decision-making bases), regression analysis was used to test the ninth hypothesis with decision-making bases serving as the dependent variables. In these models gender, age, grades, and risk behavior at Time 1 were controlled, and risk perception variables (estimated risk likelihood, appreciation, and comparative value) were entered.

Each of the four resulting models used to test Hypothesis 9 were found to be significant with \( p < .0001 \). Test statistics for each model, and coefficient estimates, standard errors, and \( p \)-values for each predictor are illustrated in Table 3-7. As expected,
risk perception predicted affective influences on decisions to engage in or refrain from risk behavior, however, this effect varied across risk perception measures. As illustrated in Table 3-7, adolescents with greater appreciation of risk were influenced more by anticipated regret and less by expectations of reduced negative affect, enhanced positive affect, and impulsiveness. Furthermore, those who perceived greater benefits and fewer costs of risk behavior were more influenced by expectations of enhanced positive affect. And, adolescents who perceived greater costs and fewer benefits of risk behavior were more influenced by anticipated regret when deciding whether or not to engage in such behavior. Contrary to Hypothesis 9, however, perceptions of likelihood of risk were not found to be predictive of affective influences on these decisions.

Table 3-7. Risk perception predictors of influences on decisions to engage in or refrain from adolescent risk behavior (H9): Coefficient estimates (standard errors)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Reduced negative affect</th>
<th>Enhanced positive affect</th>
<th>Impulsiveness</th>
<th>Anticipated regret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>.05 (.01)***</td>
<td>.02 (.01)</td>
<td>.05 (.02)**</td>
<td>-.06 (.02)*</td>
</tr>
<tr>
<td>Gender</td>
<td>.10 (.04)*</td>
<td>.08 (.05)#</td>
<td>.05 (.06)</td>
<td>-.06 (.07)</td>
</tr>
<tr>
<td>Grades</td>
<td>-.02 (.01)#</td>
<td>-.02 (.01)</td>
<td>-.04 (.02)*</td>
<td>.06 (.02)**</td>
</tr>
<tr>
<td>Risk likelihood</td>
<td>.00 (.00)</td>
<td>.01 (.00)</td>
<td>-.01 (.01)#</td>
<td>-.00 (.01)</td>
</tr>
<tr>
<td>Risk appreciation</td>
<td>-.03 (.01)***</td>
<td>-.02 (.01)*</td>
<td>-.03 (.01)**</td>
<td>.06 (.01)***</td>
</tr>
<tr>
<td>Risk comparative value</td>
<td>-.02 (.01)*</td>
<td>-.02 (.01)*</td>
<td>.00 (.01)</td>
<td>.05 (.02)**</td>
</tr>
<tr>
<td>(F(6, 289))</td>
<td>8.95***</td>
<td>3.80***</td>
<td>5.99***</td>
<td>13.33***</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.16</td>
<td>0.07</td>
<td>0.11</td>
<td>0.22</td>
</tr>
</tbody>
</table>

Note: *** reflects \(p\)-value <.001; ** reflects \(p\)-value <.01; * reflects \(p\)-value <.05; # reflects \(p\)-value <.10.

To test the tenth hypothesis, the criteria specified by Baron and Kenny (1986) were once again followed. Recall that the previous analyses demonstrated a path between the predictor(s), risk perception, and the outcome, risk behavior (Table 3-6, column H8), as well as between the predictors and mediator(s), affective influences on decision making (Table 3-7). The third step in this procedure was to demonstrate a
reduction in the path between the predictor(s) and criterion with the introduction of the mediator(s) into the equation and a significant association between the mediator and outcome. Therefore, to test this condition, hierarchical regression was used: After controlling for age, gender, and previous risk behavior experience, the risk perception variables were introduced, and then decision-making variables were introduced. Here, only those variables that were established as significant predictors were included in the model (i.e., risk appreciation and comparative value of risk). Overall, the equation was significant, $F(9, 289) = 148.28, p < .0001, R^2 = .83$ (Table 3-6, column H10).

Consistent with Hypothesis 10, there was a reduction in the magnitude of the relationship between risk perception and risk behavior (Table 3-6, column H8) when the decision-making variables were entered into the equation, which shows that mediation occurred. As shown in Table 3-6, column H10, the effects of risk appreciation and comparative value of risk were completely mediated by the addition of the decision-making variables.

Thus, in summary, the results of these analyses generally support the hypotheses related to RQ3. First, risk perception, specifically, appreciation of risk and perceived value of risks compared to benefits of risk behavior, were significant predictors of risk behavior at Time 2. Next, after controlling for age, gender, and grades, measures of risk perception were also significant predictors of affective influences on decisions to engage in or refrain from risk behavior. Last, the effect of risk perception on risk behavior at Time 2 was significantly accounted for by affective influences on decisions to engage in or refrain from these behaviors.

**Summary of Results Related to RQ1 through RQ3**

Taken together, the analyses thus far support the relationships represented by Figure 1-1. Specifically, after controlling for age, gender, grades, and risk behavior at
Time 1, the data supported the following hypotheses related to RQ1: (a) higher levels of sensation seeking and impulsivity (ARCs) predicted greater risk behavior at Time 2, (b) restraint, sensation seeking, and impulsivity predicted the influence that expectations of reduced negative affect, enhanced positive affect, impulsiveness, and anticipated regret have on decisions to engage in or refrain from adolescents’ risk behaviors, and (c) these affective influences on decision making mediated the relationship between affect and risk behavior.

Furthermore, the findings from the analyses supported the following hypotheses related to RQ2 and RQ3, specifically, it was found that (a) higher levels of restraint predicted greater perceived likelihood and appreciation of risk; (b) higher levels of impulsivity predicted lower appreciation of risk; (c) risk perception was found to be a significant predictor of the influence that expectations of reduced negative affect, enhanced positive affect, impulsiveness, and anticipated regret have on decisions to engage in or refrain from adolescents’ risk behaviors; (d) greater appreciation of risk and greater perceived value of costs to benefits of risk behavior predicted lower levels of risk behavior at Time 2; (e) risk perception did, in fact, partially mediate the relationship between ARCs and risk behavior; and (f) affective influences on decision making mediated the relationship between risk perception and risk behavior.

**Test of Complete Model**

The analyses performed thus far examined each proposed hypothesis individually. To synthesize the results from these analyses and to develop a final best-fitting model that represents the relationships that were revealed, exploratory structural equation modeling was used. First, a full model was specified that included those variables and paths that had been identified as significant at the $p < .10$ level or better in the previous
analyses. The fit of this final model was tested using LISREL’s (LISREL 8.5) maximum likelihood estimation methods.

Recommendations by Hu and Bentler (1999) were used to determine whether the proposed model fit the data. The cutoff values associated with these criteria are that the standardized root mean squared residual (SRMR) is close to .08; the root mean square error of approximation (RMSEA) is close to .06; a comparative fit index (CFI) of at least .95 is indicated; and a chi-squared test statistic emerges that is close in value to the model’s degrees of freedom (p > .05).

The data were checked for violations of the assumption of multivariate normality. This analysis revealed significantly skewed distributions for risk behavior (Time 1 and Time 2), each of the two risk perception measures, anger, and fear. Thus, these variables were transformed (log transformations), resulting in distributions that more closely approximated normal distributions.

Although each of the DMB variables were rescaled to minimize the bias due to survey design, the distributions were not sufficiently normal for this analysis. To address this limitation, a composite DMB was created by summing the four individual DMBs (the anticipated regret basis variable was reverse scored). In addition, this variable was transformed (z-score transformation) and the final DMB variable was normally distributed with $\mu = -.69$, $SD = 1.42$. This composite DMB represents the influence of affect-related impetuses (expectation of reduced negative or enhanced positive affect, and impulsiveness) compared to the influence that anticipated regret has, on decisions to engage in or refrain from risk behavior.

Model testing proceeded in several stages. As noted by Hox and Bechger (1999), iterative modifications are commonly used to arrive at a model with adequate fit. First, an
initial model was specified that included variables and paths that had emerged as significant in the regression analyses performed to test H1 through H10. This initial model is illustrated in Figure 3-3. Notably, there are no direct paths from any of the ARCs, or from risk perception, to risk behavior at Time 2. This is due to the fact that decision making was found in the earlier analyses to completely mediate these effects.

Figure 3-3. Initial complete model: Affect-related characteristics, risk perception, decision-making bases, and adolescent risk behavior

Second, because initial model specifications failed to result in converging estimates, several significant modifications to the model were necessary. Specifically, to compensate for problems due to multicollinearity, the data were reduced further. The correlation between risk behavior at Time 1 (RBT1) and risk behavior at Time 2 (RBT2) was .80. Although RBT1 was found to be a significant predictor of RBT2, this high degree of correlation caused significant instability in the model estimation. Thus, the
decision was made to eliminate RBT1 from the model. Next, since impulsivity and restraint were found to be highly correlated (-.52), it was necessary to eliminate one from the analysis. The psychological construct presumed to be measured by impulsivity is straightforward. However, the restraint variable consists of two subscales; impulsivity (reverse-scored) and suppression of aggression. Impulsivity was selected for the model so that clearer interpretation of results could be made.

Following these modifications that were necessary for the program to converge, the analysis revealed that the model fit the data, $SRMR = .02$, $RMSEA = .04$, $CFI = .99$, $\chi^2 (12) = 16.38$, $p > .05$. However, examination of $t$-values for each of the path coefficients suggested that improvements could be made. Specifically, the paths from grades (Grades) to risk perception (RPP) and decision making (DMB), and from impulsivity (Impulsivity) to decision making (DMB), were not found to be significant. Thus, they were eliminated and the further-reduced model was tested. The final results are illustrated in Figure 3-4, which indicates an improvement in the model fit. Overall model fit indices were similar to the original model ($SRMR = .03$, $RMSEA = .00$, $CFI = 1.00$, $\chi^2 (12) = 11.87$, $p > .05$), and all resulting paths were found to be significant at $p < .05$.

Table 3-8 presents the direct and indirect effects that each of the predictors (anger, fear, impulsivity, sensation seeking, risk perception, and decision making) had on adolescent risk behavior. As shown, decision making had a significant ($p < .05$) direct effect on risk behavior. Adolescents who were influenced more by affect-related impetuses to engage in risk behavior (expectation of reduced negative or enhanced positive affect, and impulsiveness) than by anticipated regret, which would motivate the adolescent to refrain from risk behavior, engaged in more risk behavior. The other
predictors had significant ($p < .05$) indirect effects on risk behavior through their associations with risk perception and decision making. Specifically, adolescents with higher scores on anger, impulsivity, and/or sensation seeking, engaged in more risk behavior. In contrast, those with higher scores on fear and/or who perceived greater risk of risk behavior were more likely to refrain from risk activities.

Figure 3-4. Final reduced standardized model: Affect-related characteristics, risk perception, decision-making bases, and adolescent risk behavior

\[ \chi^2 (12) = 11.87; p = .46; RMSEA = .00; SRMR = .03; CFI = 1.00; * p < .05; \# p < .10 \]

Table 3-8. Direct and indirect effects of ARCs, decision making, and risk perception on adolescent risk behavior

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Direct effect ($\beta$)</th>
<th>Indirect effect ($\beta$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anger</td>
<td>0.00</td>
<td>0.24*</td>
</tr>
<tr>
<td>Fear</td>
<td>0.00</td>
<td>-0.12*</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>0.00</td>
<td>0.19*</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>0.00</td>
<td>0.16*</td>
</tr>
<tr>
<td>Risk perception</td>
<td>0.00</td>
<td>-0.52*</td>
</tr>
<tr>
<td>Decision making</td>
<td>0.82*</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Notes. * $p < .05$; # $p < .10$. 

The final model illustrated in Figure 3-4 supports the hypotheses that were tested in the previous sections. Specifically, higher levels of anger and higher levels of impulsivity predicted reduced risk perception. Adolescents with higher scores on anger were also more influenced by affect-related impetuses to engage in risk behavior (expectations of reduced negative affect, enhanced positive affect, and/or impulsiveness) than by anticipated regret, which would motivate them to refrain from risk behavior. Greater sensation seeking tendencies were also associated with greater influence of affect-related impetuses compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior. This final model also revealed that greater levels of fear predicted lesser influence of affect-related impetuses compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior.

In addition, the results suggest relationships between risk perception and decision making and between decision making and risk behavior. First, greater risk perception was associated with lesser influence of affect-related impetuses compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior. Lastly, as expected, greater influence of affect-related impetuses compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior, predicted increased engagement in risk behavior.

**Developmental Differences**

Having defined a reduced model that fits the data, the final concern was whether the model fit equally well for younger and older adolescents. Thus, the last research question guiding this study addressed the issue of developmental differences.

**RQ4:** Are there developmental differences with regard to the relationships between affect-related characteristics, risk perception, decision making, and adolescent risk behavior?
**H11**: The influence that affective-related characteristics (ARCs) have on risk behavior and the decisions to engage in or refrain from these behaviors is greater for younger adolescents than for older adolescents.

In order to test for age-related differences in the relationships among ARCs, risk perception, decision making, and risk behavior, the final omnibus model that was derived using structural equation modeling in the previous section, was fitted separately for younger (14- and 15-years old) versus older (16- to 20-years old) adolescents. The results are illustrated in Figure 3-5, with standardized beta coefficients for the older group above those for the younger group. Indices of fit were found to be satisfactory for both groups (Older: \( SRMR = .03, RMSEA = .03, CFI = 1.00, \chi^2 (12) = 13.40, p > .05 \); Younger: \( SRMR = .04, RMSEA = .05, CFI = .99, \chi^2 (12) = 15.73, p > .05 \)).

As is evident from the standardized coefficients, there were a number of similarities between the two groups, but also a significant age-related difference. First, with regard to age-group similarities, the model revealed that (a) higher levels of impulsivity predicted lower perceived risk, (b) greater sensation seeking predicted greater influence of affect-related impetuses (expectation of reduced negative or enhanced positive affect, and impulsiveness) compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior, (c) greater perceived risk predicted lesser influence of affect-related impetuses (expectation of reduced negative or enhanced positive affect, and impulsiveness) compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior, and (d) greater influence of affect-related impetuses (expectation of reduced negative or enhanced positive affect, and impulsiveness) compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior, predicted greater engagement in risk behavior.
Second, with regard to age-group differences, for the younger group of adolescents, an additional significant path was revealed that was not evident for the older adolescents. That is, greater scores on anger predicted greater influence of affect-related impetuses (expectation of reduced negative or enhanced positive affect, and impulsiveness) compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior.

In summary, the results of individual age-group analyses testing the final model that was initially derived with the total sample, did not support the hypothesis that ARCs would generally have greater influence on risk behavior for younger than for older adolescents. However, the analyses do suggest that there may be age-related differences in the extent to which anger influences risk behavior. Specifically, anger predicted decision-making bases for younger but not older adolescents.
CHAPTER 4
DISCUSSION

The prevalence of adolescent risk behavior and the detrimental consequences of risk activities are topics of increasing concern. A significant amount of research in this area has been conducted over the past three decades and much has been learned about the influences that contextual, cognitive, and personality traits have on adolescent engagement in risk behavior (e.g., Byrnes, 2002; Cooper et al., 2003; Flavell, 1992; Furby & Beyth-Marom, 1992; Jessor, 1992; Miller et al., 2003). Others have examined the ways in which expectations motivate or deter adolescent engagement in risk behavior (Caffray & Schneider, 2000). And researchers have provided valuable insight into the strengths and limitations of adolescent risk perception (e.g., Millstein & Halpern-Felsher, 2002; Slovic, 2000).

Researchers have also provided valuable insight into the effects that emotions have on adult cognition (Forgas, 2002; Isen, 2000; Johnson & Tversky, 1983). However, less is known about the influence that affect has on the decisions to engage in or refrain from risk behavior, especially during adolescence. And, few if any studies have examined the differential influence that affect has on the decision-making process from early to late adolescence and adulthood.

Research reviewed earlier on the relationships among cognition, affect-related characteristics (ARCs), risk perception, and adolescent risk behavior provides valuable insight, but leaves several important theoretical and methodological gaps. Thus, the goal
of the current study was to fill some of these gaps. To date, few studies have simultaneously included all of these domains, and none has provided data that reveal the effect that age has on this integration. Thus, the relationships between ARCs, risk perception, and risk behavior were examined in the current study, both within and among various adolescent age groups. In addition, the influence of various types of ARCs on decision making and risk behavior were explored, including positive and negative affect (anger, fear, joy, and interest), emotion-regulation competencies (impulsivity and suppression of aggression), and sensation-seeking tendencies. The relationship between these factors and the bases upon which decisions to engage in risk behavior are made (DMBs) were also investigated. Thus, this study contributes to the literature that explains adolescent risk behavior by integrating affect, cognition, risk perception, and adolescent risk behavior in one interconnected model.

In addition to these theoretical improvements, several methodological factors were addressed that also contributed to the usefulness of the findings of this study. These included the fact that in-depth self-reports of risk behavior were utilized rather than responses to hypothetical scenarios, thus providing a closer approximation to real life. In addition, adolescents were asked to reflect on their actual real-life decisions to engage in or refrain from risk behavior. Moreover, three distinct measures of risk perception were used, and the effects of each of six different ARCs were examined and analyzed individually. Finally, a relatively large, diverse, low-income sample of adolescents aged 14 through 20 participated in the study.

The discussion of the findings from this study is organized as follows. First, the principal findings that emerged from examination of the main research questions that guided this study are summarized. Second, these findings are discussed with respect to
extant research, organized by the research questions guiding this study. Third, a
discussion of the strengths and limitations of the current study follow. And, finally,
conclusions and directions for future research are offered.

**Summary of Principal Findings**

In this section, the major findings related to the major research questions that
guided this study are summarized and reviewed in relation to previous relevant research.
The organization of the sections that follow corresponds to the parts of the model
illustrated in Figure 1-1. Each specific part of the model, addressed via the research
questions guiding the study, is discussed in more depth.

Preliminary analyses suggested that the prevalence of risk behaviors reported in
this study was similar to those reported by participants of comparable surveys
(Monitoring the Future Study [Johnston, O’Malley, & Bachman, 2001]; Youth Risk
Behavior Surveillance Study [Grunbaum et al., 2003]). At Time 2, approximately 70% of
all participating adolescents reported engagement in at least one risk behavior during the
12 months immediately preceding the survey. Of the six categories of risk behavior
included, adolescents were most likely to use alcohol and least likely to engage in
criminal activity, with prevalence rates of 51% and 19%, respectively. Engagement in
each of the other categories of risk behavior (tobacco use, drug use, sexual activity,
school related) was approximately 30%.

Moreover, correlational analyses showed that the relationships among ARCs, risk
perception, decision making, and risk behavior were consistent across the various
categories of risk behavior included in the study (tobacco, alcohol, and drug use, school-
related risk activities, crime and violence, and sexual activity). This lent support for the
use of a risk behavior composite throughout the analyses performed. The consistency of
these relationships was also in line with findings of prior research. For example, Miller and colleagues (2003) found impulsivity (or lack of premeditation) to be a strong predictor of tobacco, alcohol, and drug use, crime and delinquency, and risky sexual activity. Similarly, Caspi and others (1997) found that 18-year-olds who scored low on a measure of control and/or high on a measure of aggression were more likely to report health-risk behavior such as unsafe sex, violence, and alcohol abuse at age 21. Furthermore, Cooper et al. (2003) also concluded that impulsivity and tendencies toward avoidance coping were linked to participation in risk behavior.

The major analyses were conducted with respect to Figure 1-1. Overall, regression results generally supported the specific relationships represented by Figure 1-1. First, several links between affect-related characteristics (ARCs), decision making, and adolescent risk behavior were revealed. Specifically, the results show that (a) higher levels of sensation seeking and impulsivity (ARCs) predicted greater risk behavior; (b) restraint, sensation seeking, and impulsivity (ARCs) predicted the amount of influence that the decision-making bases (DMBs, i.e., expectations of reduced negative affect, enhanced positive affect, impulsiveness, and anticipated regret) had on adolescents’ decisions to engage in or refrain from risk behavior; and (c) affective influences on decision making (DMBs) mediated the relationship between ARCs and risk behavior.

The findings also supported the hypothesized role that risk perception plays in the relationships among ARCs, decision making, and risk behavior. First, it was demonstrated that higher levels of restraint (ARC) predicted greater perceived likelihood and appreciation of risk, and that higher levels of impulsivity (ARC) predicted lower appreciation of risk. Next, the data showed that risk perception was a significant predictor of the amount of influence that the DMBs had on decisions to engage in or
refrain from risk behaviors. Also, as expected, greater appreciation of risk and greater perceived value of costs to benefits of risk behavior predicted lower levels of risk behavior. Finally, risk perception was found to partially mediate the relationship between ARCs and risk behavior, and the decision-making bases mediated the relationship between risk perception and risk behavior.

Results from the analysis of the complete model illustrated in Figure 3-4, with the use of structural equation modeling, were also generally consistent with the hypotheses. This final reduced model was determined by the results of the preceding regression analyses and was found to adequately fit the data. The specific findings of this analysis evidenced direct associations between ARCs and risk perception, and ARCs and decision making. First, it was shown that higher anger scores and higher levels of impulsivity predicted lesser appreciation of risk and greater perceived value of the benefits versus costs of risk behavior. Also as expected, adolescents who scored higher on anger reported that expectations of reduced negative affect, enhanced positive affect, and/or impulsiveness had more influence on their decisions to engage in or refrain from risk behavior than did the potential anticipated regret associated with these decisions. Further, greater sensation seeking tendencies predicted greater influence of affect-related impetuses compared to the influence of anticipated regret on decisions to engage in or refrain from risk behavior. Lastly, adolescents with higher scores on fear reported that the potential experience of anticipated regret influenced their decisions to refrain from or engage in risk behavior more than the expectations of reduced negative affect and/or enhanced positive affect, or impulsiveness did.

The analysis of the complete model also demonstrated direct links between risk perception and decision making and between decision making and risk behavior.
Specifically, greater perceived risk predicted lesser influence of affect-related impetuses compared to the influence of anticipated regret on decisions to engage in or refrain from risk behavior. Also, as expected, greater influence of affect-related impetuses compared to the influence of anticipated regret on decisions to engage in or refrain from risk behavior predicted increased engagement in risk behavior.

Age-related differences with regard to the relationships among ARCs, risk perception, decision making, and adolescent risk behavior, were also revealed. Although most of the segments of the final complete model were similar for younger and older adolescents, one significant difference emerged. Specifically, anger was found to predict decision making for the younger group of adolescents, but not for the older group. That is, greater scores on anger were associated with greater influence of affect-related impetuses (expectation of reduced negative or enhanced positive affect, and impulsiveness) compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior. Thus, as summarized, the hypotheses guiding this study were generally supported. Next, specific findings are discussed with respect to previous literature.

**Links Between ARCs and Adolescent Risk Behavior**

Significant relations were revealed between affect-related characteristics and adolescent risk behavior. Specifically, adolescents with high scores on sensation seeking and/or impulsivity were more likely to engage in risk behavior than those with lower sensation seeking and impulsivity scores. These findings are consistent with prior research that has shown that impulsivity (Askenazy et al. 2003; Cooper et al., 2003; Miller, et al., 2003; Poikolainen, 2002; Shoal & Giancola, 2003) and sensation seeking (Miller et al.; Poikolainen) predict risk behavior.
As to positive and negative ARCs, unexpectedly, none of the positive and negative ARCs was predictive of risk behavior in the current study. This is inconsistent with Colder and Chassin’s (1993) work, which showed that negative affect, operationalized with a composite score of symptoms of anxiety, depression, and social withdrawal, predicted alcohol use. It is notable that anger was correlated with risk behavior however fear, which is also a negative ARC, was not. A significant negative correlation was also found between anger and restraint, and a significant positive correlation was found between anger and impulsivity.

There are several possible explanations for these unexpected results. First, scores for fear were significantly skewed, with almost half of the participants reporting no experienced fear during the two weeks prior to the survey. This would certainly lessen the possibility of finding significant effects of fear on risk perception or risk behavior. Perhaps a measure that solicited reports of fearfulness over an extended duration or as a response to hypothetical situations would be more appropriate. Second, the fact that anger was found to be highly correlated with several other ARCs that were included in the analyses could explain why anger was not found to predict risk perception or risk behavior. In this case, it is possible that although anger may have been a significant predictor without the inclusion of restraint and/or impulsivity, it may not be the best predictor among these ARCs.

It is more difficult to explain the lack of effect that positive affect had on risk perception, decision making, and risk behavior. Although researchers have examined the influence of positive affect on cognition with adults (e.g., Forgas, 2002; Isen, 2000), previous results have been notably mixed. Several explanations for the current findings are suggested. First, it may be that the influences of positive affect are more complex
than expected, such that simple analyses based on average scores are not sufficiently
sensitive. It is also entirely possible that the null hypothesis is true (i.e., that there is no
relationship between positive affect and cognition or risk behavior) and the effects found
in prior studies were actually those of other factors; or, perhaps, this relationship does not
exist for adolescents. A third possibility suggests that the effects are apparent at extreme
positive states of elation, but are not linear. Finally, it may also be the case that effects
are found only when affective state is measured at the time of decision making.
Certainly, future research is warranted in order to determine which, if any, of these
potential explanations hold.

In general, these results suggest that it is preferable to examine each affect-related
characteristic independently rather than to combine them into composites such as
“negative affect.” By doing so, the results of the current study allow us to distinguish the
differing effects among the ARCs tested. First, impulsivity and sensation seeking had the
greatest predictive value. Second, anger was significantly correlated with risk behavior,
but not after other variables were controlled. Third, fear and positive affect were not
associated with risk behavior.

**Links Between Adolescents’ Decision-Making Bases (DMBs) and Risk Behavior**

The measure of bases of adolescents’ decisions to engage in or refrain from risk
behavior (DMBs) provided interesting results. As expected, significant correlations were
revealed between risk behavior and the DMBs (the influences of perceived enhanced
positive affect, reduced negative affect, impulsiveness, and anticipated regret).
Endorsements were common as two-thirds of adolescents who engaged in risk behavior
reported that expectations of enhanced positive affect (e.g., it seemed like it would be
fun, I just wanted to see what it would be like, or I was bored) influenced their decisions
to engage in these activities; half reported that expectations of reduced negative affect (e.g., it helps me to relax, it makes me feel better, I was angry) influenced these decisions; and a significant number indicated that impulsiveness led to engagement in these activities (i.e., I didn’t think about it—it just happened).

These results were consistent with prior research. Cooper and colleagues (2003) found that adolescents who tended towards avoidance coping strategies to reduce negative affect were more likely to engage in substance use and abuse. Similarly, Caffray and Schneider (2000) showed that adolescents who engaged in risk behavior tended to focus more on the potential enhancement of positive affective states and on the expectations of reductions in negative affect that would result from these activities. Furby and Beyth-Marom (1992) reviewed several similar studies and concluded that findings consistently demonstrate that adolescents and adults tend to be motivated to engage in these risk activities by the perception that the consequences will bring immediate psychological and/or physical satisfaction.

Patterns of the reported influences of expectations of enhanced positive affect and reduced negative affect (DMBs) for younger and older adolescents who engage in risk behavior were similar. However, one age-related difference was notable. Older adolescents were more likely to report that their decisions were influenced by the expectations that these activities would result in reduced negative affect (58% versus 36% endorsements, respectively). Various factors could contribute to this result. First, older adolescents may experience more complicated and/or difficult situations that could lead to negative feelings. Another possibility is that older adolescents have more experience with these behaviors, or have had more exposure to the claims of peers who have engaged in them, and are therefore are more aware of their affective consequences.
Alternatively, perhaps older adolescents are more sensitive to social sanctions than are younger adolescents, and consider this rationale to be a socially acceptable justification for engagement in risk behavior.

Although the decision-making bases results provided valuable correlational information, causal attributions can not be made. That is, it is possible that adolescents who are more influenced by expectations of enhanced positive affect, reduced negative affect, and impulsiveness (DMBs) are therefore more likely to engage in risk behavior, and that those who are more concerned with avoiding feelings of anticipated regret (DMB) are less likely to engage in risk behavior. However, an equally likely possibility is that adolescents who engage in risk behavior make concerted efforts to justify their behavior, and therefore are more likely to report that their decisions are based on expectations of enhanced positive and reduced negative affect (Caffray & Schneider, 2000). Or, similarly, adolescents without experience in risk behavior are more compelled to focus on expectations of anticipated regret. Thus, an important next step would be to disentangle the direction of effects, perhaps by examining the relationship between DMB and first risk behavior experience.

**Links Between Affect-Related Characteristics (ARCs) and Adolescents’ Decision-Making Bases (DMBs)**

Several aspects of the relationship between affect-related characteristics (ARCs) and the affective influences of decisions to engage in or refrain from risk behavior (DMBs) were also revealed. First, adolescents who measured high on sensation seeking and/or low on restraint reported that the expectation that negative affect would be reduced as a result of risk behavior influenced their decisions to engage in these activities. Similarly, those who either measured high on sensation seeking, high on
impulsivity, or low on restraint reported a greater influence of expectations of enhanced positive affect on their decisions to engage in risk behavior. Those who measured high on restraint were less likely to say that impulsiveness led them to engage in risk behavior. And, as expected, adolescents who measured either high on restraint, low on sensation seeking, or low on impulsivity reported that the expectations of the anticipated regret that would result from risk behavior strongly influenced their decisions to refrain. These findings are consistent with Cauffman and Steinberg’s (2000) conclusion that psychosocial maturity as measured by one’s level of responsibility, emotion regulation competence, and temporal perspective, is an important predictor of decision-making competence.

The relationship between affect-related characteristics (ARCs) and decision-making bases (DMBs) was found to be strong, albeit complicated. The ARCs themselves were found to be significantly correlated with one another. Therefore, it is likely that the results of statistical analyses that include these constructs will vary depending on the specific models tested. For example, a particular ARC may be a significant predictor of DMBs when tested individually, but not when tested as one of a set of ARCs included in the model tested. In the current study, anger, fear, positive affect, sensation seeking, impulsivity, and restraint (ARCs) were all included, and only sensation seeking, impulsivity, and restraint were found to be significant predictors of the affective influences on decisions to engage in or refrain from risk behavior (DMBs), despite the significant bivariate correlations between individual ARCs. Although this seems to be inconsistent with others who found that positive and negative affect influences decision making (e.g., Isen, 2000; Johnson & Tversky, 1983; Schwarz & Clore, 1996), this is not necessarily the case. As Appendix D shows, anger, fear, and positive affect were all
significantly correlated with impulsivity and restraint, and anger was significantly
correlated with each of the DMBs.

Another possible explanation for findings that are seemingly inconsistent with
previous research findings is based on the fact that grades were included in the analyses
for this study. Again, as shown in Appendix D, grades were significantly correlated with
anger and positive affect and were significant predictors of each of the decision-making
bases. Therefore, it is possible that the correlation between grades and decision making
suppressed any apparent relationship between anger and/or positive affect and decision
making. Clearly, conclusions must be drawn with caution, and this once again
demonstrates the advisability of examining ARCs individually rather than as a
composite, whenever possible.

**Mediating Effect of DMBs on the Relationship Between ARCs and
Risk Behavior**

As illustrated in Figure 1-1, it was hypothesized that decision-making bases
(DMBs) such as expectations of enhanced positive or reduced negative affect,
impulsiveness, and anticipated regret, would mediate the relationship between affect-
related characteristics (ARCs) and adolescent risk behavior. The results supported this
hypothesis. Recall that sensation seeking and impulsivity (ARCs) were significant
predictors of risk behavior when DMBs were not included in the model tested. However,
when DMBs were included, three of the four bases was a significant predictor of risk
behavior, and the predictive value of sensation seeking and impulsivity were completely
mediated. This finding provides a clearer sense of how these factors interrelate, and
suggests that ARCs may have immediate influence on decision-making bases, which in
turn affect risk behavior.
A strict interpretation of this finding would suggest that ARCs do not directly influence behavior, but only indirectly through their association with decision making. More specifically, ARCs influence the extent to which one engages in cognitive processing as well as the salience of each of the various factors that are associated with the decision to engage in or refrain from risk behavior (expectations of reduced positive affect, enhanced negative affect, and anticipated regret). Then, the resulting decision-making process has a direct effect on risk behavior. This finding suggests several interesting possibilities.

First, it suggests that it is not necessarily the level of decision making skill that an adolescent has that determines whether he or she will make a decision to refrain from risk behavior. Rather, it is the way in which ARCs determine the salience of factors under consideration, or the level of rigor with which these decisions are made. This relationship is analogous to conclusions drawn from risk perception research. For example, an adolescent can understand the costs and benefits associated with risk behavior, but make seemingly poor choices based on the subjective value of potential outcomes. Similarly, an adolescent can have excellent cognitive skills, but be driven toward certain decisions by ARCs such as impulsivity and sensation seeking.

Interestingly, this relationship is complicated by other factors. Although two of the studied decision-making bases seem to be closely related to a specific ARC (i.e., impulsiveness (DMB) and impulsivity (ARC), and expectations of enhanced positive affect (DMB) and sensation seeking (ARC), respectively), these correlations were only moderate (both less than .30). This suggests that although these tendencies may lead to greater salience of outcomes that will bring affective satisfaction, it is likely that other factors can, and do, successfully compete with these impetuses.
An alternative explanation for the apparent mediating effect that decision making has on the relationship between ARCs and risk behavior is that risk behavior often influences decision making rather than the reverse. Because the data for this study were not collected before any of the participants engaged in risk behavior, it can not be determined which is more accurate. However, it is most likely that the relationship between decision making and risk behavior is bidirectional. In addition, affect was not measured at the time that decisions to engage in or refrain from risk behavior were made. Perhaps it is the immediate affective state that affects decision making. Without real-time data, it is difficult to know for certain how and why these decisions are made.

Finally, social desirability can not be ruled out. That is, when presented with possible reasons for engaging in or refraining from risk behavior, participants are apt to select one(s) that seem most acceptable or reasonable, but are not necessarily the bases for previous decisions. Again, further research is needed to disentangle the causal routes of the relationships among ARCs, decision making, and risk behavior.

Links Among ARCs, Risk Perception, and Adolescent Risk Behavior

Risk perception is an important link between ARCs and risk behavior. When the relationship between ARCs and risk behavior was analyzed, sensation seeking and impulsivity were predictive of risk behavior. Risk perception mediated the relationship between impulsivity and risk behavior, but not between sensation seeking and risk behavior. Also, as expected, greater appreciation of risk and greater comparative value of costs to benefits of risk predicted lower reports of risk behavior. Importantly, results varied depending on the risk perception measure that was used.
Risk Perception

As suggested by the disparate results of research on adolescent risk perception, not all measures of risk perception represent the same construct. Therefore, three distinct measures of risk perception were included in this study: perceived likelihood of risk, appreciation of risk, and comparative value of costs to benefit of risk. Results varied according to which measure was used. For example, age and gender were significant predictors of risk appreciation, but not of the other two measures of risk. Consistent with Millstein and Halpern-Felsher’s (2002) findings, appreciation, or perceived seriousness of the potential consequences of risk behavior, decreased with age. In their study, Millstein and Halpern-Felsher found that younger adolescents (5th and 7th graders) perceived themselves to be more vulnerable to the risks of alcohol and sexual activity than did older adolescents (9th graders) and adults.

Gender also predicted risk appreciation with females predicting more severe consequences from risk behavior than males. Similarly, Byrnes and colleagues (1999) found that adolescent boys outscored girls in risk-taking tendencies, with this disparity decreasing from early to late adolescence. Moreover, in the current study, reported grades, which were used as an approximate measure of cognitive ability, predicted perceived comparative value of costs to benefits of risk behavior. Adolescents with better grades tended to perceive greater costs compared to the benefits of risks. As Furby and Beyth-Marom (1992) suggested, it is likely that the belief that one is invested in something that may be lost (e.g., a promising future) as a consequence of risk behavior serves as motivation to protect oneself against such loss.
Risk Perception and Affect-Related Characteristics (ARCs)

As expected, restraint and impulsivity predicted risk perception. Adolescents who scored higher on restraint tended to perceive greater likelihood and appreciation of risk. Conversely, those who scored higher on impulsivity tended to have lesser appreciation of risk. In contrast to Goldberg’s (Goldberg, et al., 2002) suggestion, sensation seeking tendencies did not predict perceptions of greater comparative value of benefits to costs of risk behavior.

Anger, fear, and positive affect were not found to be significant predictors of risk perception. These results are inconsistent with Lerner and Keltner’s (2000) findings, which suggested that individuals who scored high on anger made more optimistic judgments of risk, and those who scored high on fear made more pessimistic judgments. These findings were also contrary to Johnson and Tversky’s (1983) results which suggested that individuals with high positive affect tended to overestimate the likelihood of positive (versus negative) consequences of risk. Perhaps the inclusion of impulsivity and/or age suppressed the effects of anger and/or positive affect on risk perception. Alternatively, perhaps these relationships are not significant for adolescents.

Mediation of Risk Perception on the Relationship Between ARCs and Risk Behavior

As hypothesized, risk perception partially mediated the relationship between ARCs and risk behavior. When risk perception was added to the model that had previously demonstrated that sensation seeking and impulsivity predicted risk behavior, the effect of impulsivity was completely mediated, although the effect of sensation seeking was not. Furthermore, greater appreciation of risk and greater perceived comparable value of benefits to costs of risk behavior predicted risk behavior. Perceptions of likelihood of risk did not affect risk behavior. As it was previously shown
that greater impulsivity predicted lesser appreciation of risk, these findings demonstrate
that impulsivity has a direct effect on risk perception, and risk perception and sensation
seeking have direct effects on risk behavior.

These findings suggest that educating adolescents about the potential risks of risk
behavior is not the only way to address this issue. Clearly, various motivational factors
and goals associated with individual ARCs such as sensation and impulsivity necessitate
various approaches to address risk behavior. For example, an effective approach for
adolescents with high sensation seeking tendencies may be to suggest and provide safer
alternative ways in which these adolescents can fulfill sensation seeking goals. On the
other hand, to address the effect of impulsivity on risk perception, training aimed at
behavioral and/or emotion regulation may prove to be a more effective approach towards
reducing risk behavior.

**Risk Perception and Decision-Making Bases**

Significant relations were found between risk perception and the decision-making
bases. However, once again, these relationships were dependent on the specific risk
perception measure used. Adolescents with greater appreciation of risk were influenced
more by anticipated regret and less by expectations of reduced negative affect or
enhanced positive affect, and were less likely to indicate that impulsiveness led to their
engagement in risk behavior (DMBs). Furthermore, those who perceived greater benefits
and fewer costs of risk behavior were more influenced by expectations of enhanced
positive affect. Conversely, adolescents who perceived greater costs and fewer benefits
of risk behavior were more influenced by anticipated regret when deciding whether or
not to engage in such behavior. Perceptions of likelihood of risk were not found to be
predictive of decision-making bases.
Once again, these findings underscore the importance of understanding and acknowledging the various facets of risk perception including likelihood estimation, appreciation, and perceived comparative value of costs to benefits of risk. Clearly, educating youth about the risks and dangers of risk behavior is not enough. Rather, the salience of potential consequences (both positive and negative) and the access to healthier alternative options must be addressed in order to affect the relationship between risk perception and decision making.

**Risk Perception and Risk Behavior**

Risk appreciation and perceived comparative value of costs versus benefits of risk predicted risk behavior, but perceived likelihood of risk did not. These results are consistent with previous findings that showed that, although adolescents may have the cognitive capacity to assess risk, they still engage in many risk behaviors. As Furby and Beyth-Marom (1992) suggested, these activities may be the result of a difference in the values that adolescents assign to various consequences when compared to the values assigned by adults.

Furthermore, although it is tempting to make causal attributions, it should not necessarily be concluded that lesser appreciation of risk, or lower comparative value of costs to benefits of risk, results in more frequent risk behavior. As Goldberg and colleagues (2002) found, perceived benefits of risk increased, and perceived costs of risk decreased, with age and experience. Thus, it may be the changes in age and experience of the adolescent and his or her peers that lead to changes in risk perception, rather than the reverse.
Mediation of DMBs on the Relationship Between Risk Perception and Risk Behavior

The decision-making bases completely mediated the relationship between risk perception and risk behavior. These findings suggest that a more accurate description of the relations among risk perception, decision making, and risk behavior is that first, risk perception influences decision making which, in turn, directly influences adolescent risk behavior. Perhaps a means to affecting adolescents’ decisions to engage in or refrain from risk behavior is to focus on risk appreciation and comparative value of the costs to benefits of risk. Once again, however, conclusions should be drawn with caution. This mediational description depicts a largely cognitive rationale to adolescent risk behavior. Although this may be the case, it is important to acknowledge that these findings may also be an artifact of the survey design. That is, adolescents were asked to think about what influenced their decisions to engage in or refrain from risk behavior. Their subsequent responses may not have actually reflected the influences of their decisions at the time they were made.

Thus, to summarize, many of the principal findings were consistent with prior research, including the following: (a) higher levels of impulsivity and sensation seeking predicted greater risk behavior (Cooper et al., 2003; Miller et al., 2003); (b) adolescents who reported that expectations of enhanced positive affect and/or reduced negative affect influenced their decisions to engage in risk behavior, engaged in more risk behavior (Caffray & Schneider, 2000; Cooper et al., 2003); (c) restraint, impulsivity, and sensation seeking predicted the bases upon which decisions to engage in or refrain from risk behavior were made (Cauffman & Steinberg, 2000); and (d) risk appreciation and
perceived comparative value of costs versus benefits of risk predicted risk behavior, but perceived likelihood of risk did not (Furby & Beyth-Marom, 1992).

In contrast, several findings associated with the influence that specific ARCs have on risk behavior, risk perception, and decision making, were inconsistent with results from previous research. Specifically, the current study demonstrated that (a) negative affect (anger, fear) did not predict risk behavior (Colder & Chasin, 1993); (b) neither positive nor negative affect predicted bases upon which decisions to engage in or refrain from risk behavior were made (Isen, 2000; Johnson & Tversky, 1983; Schwarz & Clore, 1996); (c) although impulsivity and restraint did predict risk perception, sensation seeking did not (Goldberg, et al., 2002); (d) neither anger nor fear influenced risk perception (Lerner & Keltner, 2000); and (e) positive affect did not influence risk perception (Johnson & Tversky, 1983).

The current study also provided original information about the relationship between ARCs, risk perception, decision making, and risk behavior. It was shown that decision making mediated the relationship between ARCs (impulsivity and sensation seeking) and risk behavior. In addition, risk perception was found to mediate the relationship between impulsivity and risk behavior; however, it did not affect the influence that sensation seeking has on risk behavior. These findings suggest that the relationships between the factors that were examined are complex and interrelated. Thus, an examination of the complete model, which takes these complexities into account, was also included.

**Complete Model**

Based on the theoretical model illustrated in Figure 1-1, and the data collected for the current study, a structural equation model was specified and tested. The purpose of
this exploratory exercise was to develop a “best-fit” parsimonious model that simultaneously included the many relationships that had been examined independently. A secondary purpose was to provide a foundation for examining these relationships separately by age group. The resultant model did generally support the hypotheses that guided this study and that have been previously discussed.

Although the model fit the data well, conclusions from these findings must be made with caution. First, causal attributions can not be made. Additional longitudinal studies that follow adolescents (or preadolescents) before they engage in risk behavior, through late adolescence are necessary. In addition, because this model was developed based on the results of the regression analyses performed using the same data these findings are exploratory rather than confirmatory. Thus, the model must be tested with additional independent samples to obtain further support for its validity. Third, a significant amount of data manipulation was necessary to get the model to mathematically converge. Although this is acceptable for exploratory purposes, replication is necessary before fully embracing this model. Nevertheless, given the state of the extant literature, this work provides an important initial step toward the development of an integrated model.

The complete model analyses were based on results from the preceding multiple regressions. However, risk behavior at Time 1 was included in the regression analyses used to predict risk behavior at Time 2, but not in the complete model analyses due to difficulties related to multicollinearity. Thus, interpretations of the respective results must be made with this difference in mind. Specifically, the multiple regression analyses model changes in rates of risk behavior from Time 1 to Time 2, whereas the complete model analyses reflect correlates of engagement on risk behavior throughout the year
preceding the survey. Given this methodological difference, it should be noted that results were similar for both sets of analyses.

**Developmental Differences**

The final reduced model was analyzed to determine whether the model fit equally well for younger versus older adolescents. This analysis revealed only one difference. Because of the exploratory nature of the model, this finding should be replicated before conclusions can be drawn from it. However, in the interest of stimulating future research it will be discussed speculatively.

Specifically, for the younger group of adolescents, greater scores on anger predicted greater influence of affect-related impetuses (expectation of reduced negative or enhanced positive affect, and impulsiveness) compared to the influence of anticipated regret, on decisions to engage in or refrain from risk behavior. This finding is consistent with the premise that some engagement in risk behavior is more normative for older adolescents, and thus does not require factors beyond *normal* adolescent experiences. On the other hand, it suggests that engagement in risk behavior by younger adolescents may be the result of extenuating factors such as frequent or intense feelings of anger. It is also possible that older adolescents are more skilled at managing their anger in more constructive ways. It would be interesting to further investigate this possible link between anger and risk behavior.

As was shown from the individual regression analyses used to test the specific hypotheses, discussed previously, impulsivity and sensation seeking tendencies, and risk perception had indirect effects, and decision making had a direct effect on risk behavior for both younger and older adolescents. If these relationships are, in fact, stable throughout adolescence, prevention programs that address these links and target younger adolescents may prove to be effective.
Limitations

Although the current study extended prior research in many important ways, it had several limitations. First, because data were collected over the telephone, the types of items that could be included in the survey were somewhat restricted. This survey method also limited the length of the survey because it was a challenge to keep teens engaged over the phone for longer than 45 minutes or so. However, this method did allow us to reach a diverse sample of adolescents throughout the state of Florida.

Another implication of conducting the survey over the telephone was that a measure of cognitive capacity could not be included. This is not likely to have had serious implications since there is no evidence in the literature to suggest a significant relationship between cognitive ability and risk behavior. It is possible that this relationship may be important for adolescents below the normal range of cognitive functioning; however, it is unlikely that such individuals were included in the survey. An adolescent with limited cognitive skills would most likely not have been able to remain engaged throughout the length of the telephone survey. Even so, because of the theoretical possibility that cognitive capacity might influence responses, the survey included a measure of students’ self-reported grades at Time 2, which was used as a proxy for aptitude. Although grades did predict risk behavior, this relationship was mediated by decision making. Perhaps the most significant effect of grades was the association between grades and the influence that anticipated regret has on decisions to refrain from risk behavior.

Second, although a decision making measure was included in the survey this measure could not capture the decision-making process at the time that the adolescent was actually deciding whether or not to engage in risk behavior. Adolescents were asked
to recall and report on the factors that influenced these decisions, which may not exactly reflect the actual decision-making process.

Third, the participants of the study reflected significant ethnic diversity; however, neither race nor ethnicity was included in the analyses. Conceptually, none of the hypotheses that guided the analyses herein, and indeed none of the literature reviewed that formed the basis of these hypotheses, specified differences in affect, risk perception, or decision making across ethnicity, nor in the associations between these variables and risk behavior. Furthermore, there were no differences based on race and ethnicity in the total risk behavior, with one exception. Rates of tobacco use were significantly different across ethnicity with non-Hispanic Whites reporting more frequent use than Hispanics and non-Hispanic Blacks. Given this specific finding, future examination of the relation between race and ethnicity and tobacco use may provide interesting insight into these differences.

Finally, the method of recruitment for this study left it vulnerable to self-selection bias. As a result, it is possible that adolescents who frequently engage in risk behavior may have declined to participate in this survey. Older adolescents, males, and ethnic minority adolescents were also less likely to agree to participate. The group of adolescents who were unreachable by telephone is also an important omission. Still, approximately 50% of the participants from Time 1 were retained, and included a broad range of adolescents of various ages, ethnicities, and geographic areas across Florida.

Strengths

Despite these limitations, the current study addressed some of the important omissions of earlier work. Theoretically, this study is among the first to test a model that integrates affect, risk perception, decision making, and risk behavior. Although several of
these relationships have been examined individually, the integration of these factors resulted in valuable insights into why adolescents engage in risk behavior.

Several methodological enhancements were also included in the current study. First, much of the risk behavior and decision-making research had been based on the use of hypothetical vignettes. Responses to hypotheticals do not have the veracity of reports on actual experiences. Self-reports of risk behavior were utilized rather than responses to hypothetical scenarios, thus providing a closer approximation to real life. In addition, adolescents were asked to reflect on their actual decisions to engage in or refrain from risk behavior and to disclose the possible sources of influence on these decisions. The measure of decision-making bases provided important knowledge of the relationship between the decision-making process and in-depth self-reports of risk behavior. Other researchers have examined developmental differences in this relationship by recording adolescents’ responses to a series of hypothetical decision-making dilemmas (Cauffman & Steinberg, 2000) or to video segments depicting a group of adolescents involved in a prank with unexpected dire results (Fried & Reppucci, 2001). However, few, if any, have studied the relationship between the decision-making process and actual risk behavior.

In addition, findings from previous research of risk perception have been inconsistent, arguably due in large part to the various risk perception measures used. Three distinct measures of risk perception (likelihood estimation, appreciation, and comparative value of costs to benefits of risk) were used in this study. Findings from the current study indicate that results are dependent upon the risk perception measure that is used.

Similarly, research on affect-related characteristics often involved measures that did not clearly reflect distinct affective constructs. The effects of each of six different
ARCs (sensation seeking, impulsivity, restraint, positive affect, anger, and fear) were examined and analyzed individually in the current study. The examination of ARCs individually rather than merely as a part of a cumulative construct such as “affect” gave new specificity to an understanding of how ARCs affect risk behavior.

Most research examining the relationship between cognition and affect has been conducted with university students. Virtually none have examined the relationship between decision making and positive and negative affect during adolescence. Interestingly, the results from this study were not consistent with previous research with adults (e.g., Forgas, 2002; Isen, 2000; Schwarz & Clore, 1996). Further research is necessary to determine whether these results were caused by differences in the ages of participants or by other design differences.

A final strength of this study was the diversity of the adolescents who took part in this survey. This sample represented a population that is often underrepresented in similar research. The adolescents were from low-income “working poor” families, and the distribution of ethnic diversity, gender, and age was similar to other studies in this area of research (e.g., Shenkman, Youngblade, & Nackashi, 2003; Youngblade, Col, & Shenkman, 2001). Because of this representative sample, the conclusions drawn from this study are broadly generalizable to a population that is vulnerable to the detrimental effects of adolescent risk behavior.

**Conclusions and Implications for Future Research**

Adolescents disproportionately engage in risk behavior that is harmful or dangerous to the adolescent and to society. The more that is learned about the root causes of these risk behaviors, and the mechanisms by which they are engaged in, the better equipped society will be to prevent them or minimize their negative effects. Figure 1-1
shows a theoretical model of the psychological process by which adolescents may arrive at the decision to embark on risk behavior. According to the model affect-related characteristics (ARCs) and risk perception serve as significant driving forces behind the adolescent’s decision to engage in or refrain from risk behavior.

The primary theoretical implication of this study is to propose Figure 1-1 as an improved model to represent this process. Researchers have examined many parts of the process. Their findings have been reviewed and discussed in this dissertation. However, this is the first time that the relations among ARCs, risk perceptions, DMBs, and risk behavior, have been unified into one coherent diagrammatic scheme and analyzed as such.

Some specific gaps in extant research have been filled. No previous data were found examining the link between risk perception and decision making; this study provides such data. In addition, although various ARCs have been linked to DMBs and risk behavior, the ARCs studied have generally been examined as composite variables (e.g., negative affect such as anger, fear, and anxiety). The current study is the first to simultaneously examine the individual effects of sensation seeking, impulsivity, anger, fear, and positive affect on decision-making. This is significant because the results of this study, as well as others before, have suggested that distinct ARCs have distinct effects, which may be masked when treated as a unified construct. In addition, risk perception has here been identified with three different measures, giving valuable specificity to the resulting findings. Finally, this study expands past research into the developmental aspects of adolescent risk behavior by examining the ways in which the various elements of the model change over the years from early to late adolescence.
The findings of the current study also have practical applications for coping with juvenile crime and delinquency, and other forms of risk behavior. When looking at the model as a whole, it becomes evident that emotional needs and forces perhaps play a role that is primary to logical thinking and cognitive perception in driving adolescents to risk behavior. Addressing these needs and forces should be a major emphasis of any effective prevention or intervention program.

Rather than focusing on the development of cognitive skills that would allegedly engender adolescents to refrain from risk behavior, effective programs need to address the direct and indirect influences of ARCs on risk perception, decision making, and risk behavior. First, if the desire to enhance positive and/or reduce negative affect motivates adolescents to engage in risk activities, then constructive strategies should include programs that adolescents can use to achieve these ends. For example, Coping Power, a SAMHSA (Substance Abuse and Mental Health Services) model program, targets self-regulation and social competence skills and has proven to be an effective prevention program for moderate to high-risk adolescents (Lochman & Wells, 2002). As a first step, individuals can be taught strategies to identify the influences that ARCs have on their own behavior. Perhaps strategies analogous to those used to improve metacognitive awareness and cognitive processing can be used to improve awareness of affect-related influences and emotion regulation processes.

Next, children and adolescents need to be offered alternative, productive ways in which their emotional needs may be satisfied. For example, since sensation seeking is predictive of risk behavior, activities that provide a satisfying level of adventure, while retaining an acceptable level of safety should be widely available to youth. Because the empirical evidence suggests that adolescents lack constructive ways in which to satisfy
their psychological and physical needs, a strong case may be made for the importance of accessible and stimulating after-school activities for middle- and high-school students.

Finally, adolescents must be given a greater opportunity to feel that they have something to lose by engaging in risk behavior. The results from this study demonstrated that adolescents who earned better grades focused more on expectations of anticipated regret associated with risk behavior, and perceived that the costs of risk activities outweighed the benefits. This finding is likely due to the fact that an adolescent with good grades feels that he or she has a promising future to look forward to and is thus motivated to protect that opportunity. On the other hand, individuals who feel that they have little to lose (and a potential for significant gain from risk behavior) may be more likely to engage in risk activities. Several programs that emphasize positive youth development have proven to effectively reduce adolescent risk behavior, including Raising Healthy Children (Catalano et al., 2003) and the Seattle Social Development Project (Hawkins, Catalano, Kosterman, Abbott, & Hill, 1999).

The results of this study reveal several areas for future research that are likely to provide further insight into the relations among ARCs, risk perception, decision making, and adolescent risk behavior. First, it is clear that additional longitudinal studies that begin with children before adolescence and that follow them through to adulthood are imperative. Data on ARCs and risk perception need to be collected before the adolescent has engaged in risk behavior, so that evidence of causal effects may be examined. Next, if the desire to reduce negative affect is a significant reason for adolescent engagement in risk behavior, then youth who do not engage in risk behavior should be included in studies to examine the ways in which they cope with negative affect.
This study also revealed that further examination of the measures often used in this type of research is warranted. As demonstrated, results vary depending on the specific measures of affect-related characteristics and risk perception that are used. These measures should be tested with diverse samples, and across a wide range of ages to identify exactly what constructs are represented by each.

The data from the decision-making bases that were analyzed in the current study provided significant insight into adolescents’ decisions to engage in or refrain from risk behavior. Examination of the DMBs (i.e., identity-based, maintenance of relationship with peer or parents, instrumental/logistical reasons, image-related, beliefs/morals) that were not included in these analyses might also prove to be valuable. If these bases are actually used by the adolescent as heuristics when making decisions (e.g., “I’m not going to smoke because I’m a jock”), then perhaps prevention and intervention programs should focus on the development of similarly protective heuristics.

In addition, to better understand the influence that positive and negative affect have on decision making and risk perception, continued research is necessary. Studies with adolescents are particularly needed in this area. First, studies need to be conducted to determine how real-time affect influences decision making and risk perception, and to determine whether these influences change with age. Second, research is needed to examine the differences between real-time measures of affect and recall measures. The developmental differences in the effects of mood manipulation on decision making and risk perception would provide valuable insight that could guide prevention and intervention programs.

Finally, the findings from the current study could be used to develop pilot prevention and/or intervention programs aimed at adolescents. Applied research should
continue to develop program components that target younger adolescents who score high on measures of anger and help them to develop anger management skills and/or help them to find ways to diminish their anger. Programs that involve working with youth to increase the salience of opportunities that are incompatible with risk behavior (Benson, 2001; Hawkins, Arthur, & Catalano, 1995) are similarly encouraged.

The detrimental effects of adolescent risk behavior are broad and far-reaching, from victims of juvenile crimes to health care providers to school systems, to the adolescent’s own family, health, and future. As this dissertation shows, the causes of risk behavior and means for prevention remain dramatically underexplored and misunderstood. This study attempts to take a small but significant step toward enhancing that understanding and to identify directions for future research that may be fruitful in continuing that effort.
APPENDIX A
POSITIVE AND NEGATIVE AFFECT

Participant #________
For each item, please think about how you’ve felt over the past 2 weeks. Then, tell me how often you’ve felt the way described.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Once or Twice</th>
<th>A Few Days</th>
<th>Almost Every Day</th>
<th>More than once a day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I was angry</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>I was attentive</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>I was worried</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>I was happy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>I was scared</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>I was calm</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>I was frustrated</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>I was bored</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>I was mad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>I was cheerful</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11.</td>
<td>I was terrified</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12.</td>
<td>I was interested</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13.</td>
<td>I was annoyed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14.</td>
<td>I was relaxed</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15.</td>
<td>I was excited</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16.</td>
<td>I was glad</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17.</td>
<td>I was curious</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18.</td>
<td>I was really into what I was doing</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19.</td>
<td>I was nervous</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20.</td>
<td>I was joyful</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>21.</td>
<td>I was enthusiastic</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>22.</td>
<td>I was frightened</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>23.</td>
<td>I had trouble sleeping</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Never</td>
<td>Once or Twice</td>
<td>A Few Days</td>
<td>Almost Every Day</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>-------</td>
<td>---------------</td>
<td>------------</td>
<td>------------------</td>
</tr>
<tr>
<td>24.</td>
<td>I felt like I was in danger</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>25.</td>
<td>I was paying close attention</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>26.</td>
<td>I felt like hitting something or someone</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>27.</td>
<td>I had a lot of energy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>28.</td>
<td>I was troubled about something</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>29.</td>
<td>I felt like I was going to explode</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>30.</td>
<td>I was jittery</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>31.</td>
<td>I was determined to do something</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>32.</td>
<td>I was afraid</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>33.</td>
<td>I had no energy</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
APPENDIX B
DECISION-MAKING BASES: PILOT MEASURE

Participant #________

For each of three categories of risk behavior (tobacco use, drug use, and alcohol use):
If adolescent said yes to any item within category (i.e., that he or she engaged in this type of risk behavior), then ask the following:

*You told me a little about your experience with __________. Now I’m going to read to you some reasons why some teens have had similar experiences with __________. For each item, please tell me whether it had a lot of influence on your decision to engage in this behavior, a little influence, or no influence at all.*

<table>
<thead>
<tr>
<th>Level of influence</th>
<th>A lot</th>
<th>A little</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Everyone else is doing it</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s just part of who I am</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It seemed like it would be fun</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Other people would think I was cool</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It would help me relax</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I’d feel better</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I wanted to see what it would be like</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I didn’t think about it – it just happened</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Someone else wanted me to</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I was bored</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

If adolescent said no to every item within category, then ask the following:

*You told me that you’ve never __________. Now I’m going to read to you some reasons why some teens have also decided not to __________. For each item, please tell me whether it had a lot of influence on your decision to not engage in this behavior, a little influence, or no influence at all.*
### Decision-Making Bases: Pilot Measure

#### Participant #________

<table>
<thead>
<tr>
<th><strong>Level of influence</strong></th>
<th>A lot</th>
<th>A little</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s just not me.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s against my beliefs/values.</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I don’t want to disappoint my parent(s)</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s dangerous</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s bad for your health</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I’d get in trouble</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>My parent(s) would get angry</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>If I got caught it would ruin my future</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I don’t know anyone else who does it</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s not available to me</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>My friends aren’t into doing that</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s too expensive</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>I’d feel terrible</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s wrong</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>It’s gross</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
APPENDIX C
DECISION-MAKING BASES MEASURE

Bases for Decisions to Engage in or Refrain from Risk Behavior

If adolescent’s response to any of the risk behavior (tobacco use, alcohol use, drug use, sexual activity) items was “yes”, then continue, otherwise skip to item number 13.

You told me a little about your experience with (tobacco, alcohol, drugs, sexual activity). Now I’m going to read to you some reasons why some teens have also decided to (use tobacco products, drink alcohol, use drugs, engage in sexual activity). Please tell me whether these factors influenced your decision to (use tobacco products, drink alcohol, use drugs, engage in sexual activity).

1. Everyone else does it.
   - Strongly influenced my decision ........................................ 0
   - Somewhat influenced my decision ........................................ 1
   - Did not influence my decision at all .................................... 2
   - Don’t Know ........................................................................ -8
   - Refused ............................................................................... -9

2. It’s just part of who I am.
   - Strongly influenced my decision ........................................ 0
   - Somewhat influenced my decision ........................................ 1
   - Did not influence my decision at all .................................... 2
   - Don’t Know ........................................................................ -8
   - Refused ............................................................................... -9

3. It seemed like it would be fun.
   - Strongly influenced my decision ........................................ 0
   - Somewhat influenced my decision ........................................ 1
   - Did not influence my decision at all .................................... 2
   - Don’t Know ........................................................................ -8
   - Refused ............................................................................... -9

4. I thought that other people would think I was cool.
   - Strongly influenced my decision ........................................ 0
   - Somewhat influenced my decision ........................................ 1
   - Did not influence my decision at all .................................... 2
   - Don’t Know ........................................................................ -8
   - Refused ............................................................................... -9
5. It helps me to relax.

- Strongly influenced my decision .......................... 0
- Somewhat influenced my decision ........................ 1
- Did not influence my decision at all ....................... 2
- Don’t Know .................................................. -8
- Refused ....................................................... -9

6. It makes me feel better.

- Strongly influenced my decision .......................... 0
- Somewhat influenced my decision ........................ 1
- Did not influence my decision at all ....................... 2
- Don’t Know .................................................. -8
- Refused ....................................................... -9

7. I just wanted to see what it would be like.

- Strongly influenced my decision .......................... 0
- Somewhat influenced my decision ........................ 1
- Did not influence my decision at all ....................... 2
- Don’t Know .................................................. -8
- Refused ....................................................... -9

8. I didn’t think about—it just happened.

- Strongly influenced my decision .......................... 0
- Somewhat influenced my decision ........................ 1
- Did not influence my decision at all ....................... 2
- Don’t Know .................................................. -8
- Refused ....................................................... -9

9. Someone else wanted me to.

- Strongly influenced my decision .......................... 0
- Somewhat influenced my decision ........................ 1
- Did not influence my decision at all ....................... 2
- Don’t Know .................................................. -8
- Refused ....................................................... -9

10. I was angry.

- Strongly influenced my decision .......................... 0
- Somewhat influenced my decision ........................ 1
- Did not influence my decision at all ....................... 2
- Don’t Know .................................................. -8
- Refused ....................................................... -9
11. I think it’s cool.

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly influenced my decision</td>
<td>0</td>
</tr>
<tr>
<td>Somewhat influenced my decision</td>
<td>1</td>
</tr>
<tr>
<td>Did not influence my decision at all</td>
<td>2</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>-8</td>
</tr>
<tr>
<td>Refused</td>
<td>-9</td>
</tr>
</tbody>
</table>

12. I was bored.

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly influenced my decision</td>
<td>0</td>
</tr>
<tr>
<td>Somewhat influenced my decision</td>
<td>1</td>
</tr>
<tr>
<td>Did not influence my decision at all</td>
<td>2</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>-8</td>
</tr>
<tr>
<td>Refused</td>
<td>-9</td>
</tr>
</tbody>
</table>

If adolescent’s response to all of the risk behavior items (tobacco use, alcohol use, drug use, sexual activity) was “no,” then continue, otherwise continue onto next section.

You told me that you do not (use tobacco, drink alcohol, use drugs, engage in sexual activity). Now I’m going to read to you some reasons why some teens have also decided not to (use tobacco products, drink alcohol, use drugs, engage in sexual activity). Please tell me whether these factors influenced your decision to not (use tobacco products, drink alcohol, use drugs, engage in sexual activity).

13. It’s just not me.

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly influenced my decision</td>
<td>0</td>
</tr>
<tr>
<td>Somewhat influenced my decision</td>
<td>1</td>
</tr>
<tr>
<td>Did not influence my decision at all</td>
<td>2</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>-8</td>
</tr>
<tr>
<td>Refused</td>
<td>-9</td>
</tr>
</tbody>
</table>

14. It’s against my beliefs/values.

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly influenced my decision</td>
<td>0</td>
</tr>
<tr>
<td>Somewhat influenced my decision</td>
<td>1</td>
</tr>
<tr>
<td>Did not influence my decision at all</td>
<td>2</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>-8</td>
</tr>
<tr>
<td>Refused</td>
<td>-9</td>
</tr>
</tbody>
</table>

15. I don’t want to disappoint my parents.

<table>
<thead>
<tr>
<th>Response</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly influenced my decision</td>
<td>0</td>
</tr>
<tr>
<td>Somewhat influenced my decision</td>
<td>1</td>
</tr>
<tr>
<td>Did not influence my decision at all</td>
<td>2</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>-8</td>
</tr>
<tr>
<td>Refused</td>
<td>-9</td>
</tr>
<tr>
<td></td>
<td>Question</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>16.</td>
<td>It’s dangerous.</td>
</tr>
<tr>
<td>17.</td>
<td>It’s bad for your health.</td>
</tr>
<tr>
<td>18.</td>
<td>I’d get in trouble.</td>
</tr>
<tr>
<td>19.</td>
<td>My parent(s) would get angry.</td>
</tr>
<tr>
<td>20.</td>
<td>It could ruin my future.</td>
</tr>
<tr>
<td>21.</td>
<td>My friends aren’t into doing that.</td>
</tr>
</tbody>
</table>
22. It’s not available to me.

Strongly influenced my decision .......................... 0
Somewhat influenced my decision .......................... 1
Did not influence my decision at all ....................... 2
Don’t Know ......................................... -8
Refused ............................................ -9

23. It’s too expensive.

Strongly influenced my decision .......................... 0
Somewhat influenced my decision .......................... 1
Did not influence my decision at all ....................... 2
Don’t Know ......................................... -8
Refused ............................................ -9

24. It’s wrong.

Strongly influenced my decision .......................... 0
Somewhat influenced my decision .......................... 1
Did not influence my decision at all ....................... 2
Don’t Know ......................................... -8
Refused ............................................ -9

25. It’s gross.

Strongly influenced my decision .......................... 0
Somewhat influenced my decision .......................... 1
Did not influence my decision at all ....................... 2
Don’t Know ......................................... -8
Refused ............................................ -9

Coding Instructions

Sum responses by category:

<table>
<thead>
<tr>
<th>Category</th>
<th>Corresponding Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectations of reduced negative affect</td>
<td>5, 6, 10</td>
</tr>
<tr>
<td>Expectations of enhanced positive affect</td>
<td>3, 7, 12</td>
</tr>
<tr>
<td>Impulsiveness</td>
<td>8</td>
</tr>
<tr>
<td>Expectations of anticipated regret</td>
<td>16, 17, 20</td>
</tr>
<tr>
<td>Maintain relationship with parents</td>
<td>15, 19</td>
</tr>
<tr>
<td>Maintain relationship with peers</td>
<td>1, 4, 9, 21</td>
</tr>
<tr>
<td>Identity/image related</td>
<td>2, 11, 13</td>
</tr>
<tr>
<td>Instrumental reasons</td>
<td>18, 22, 23, 25</td>
</tr>
<tr>
<td>Morals/Beliefs</td>
<td>14, 24</td>
</tr>
</tbody>
</table>
APPENDIX D
BIVARIATE CORRELATIONS AMONG AGE, GENDER, GRADES, RISK BEHAVIOR AT TIME 1 (RBT1), AFFECT-RELATED CHARACTERISTICS (ARCS), DECISION-MAKING BASES, AND RISK BEHAVIOR AT TIME 2
Table D-1. Bivariate correlations among age, gender, grades, risk behavior at time 1 (RBT1), and affect-related characteristics (ARCs)

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Gender</th>
<th>Grades</th>
<th>RBT1</th>
<th>Anger</th>
<th>Fear</th>
<th>Positive affect</th>
<th>Restraint</th>
<th>Impulsivity</th>
<th>Sensation seeking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>0.04</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades</td>
<td>0.01</td>
<td>0.24***</td>
<td>-0.18**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBT1</td>
<td>0.36***</td>
<td>0.03</td>
<td>-0.18**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anger</td>
<td>0</td>
<td>0.13*</td>
<td>-0.12*</td>
<td>0.15**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fear</td>
<td>-0.08</td>
<td>0.10#</td>
<td>-0.04</td>
<td>0.54***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive affect</td>
<td>0.07</td>
<td>-0.01</td>
<td>0.15**</td>
<td>0.04</td>
<td>-0.11#</td>
<td>-0.03</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restraint</td>
<td>-0.02</td>
<td>0.16**</td>
<td>0.27***</td>
<td>-0.31***</td>
<td>-0.48***</td>
<td>-0.18**</td>
<td>0.22**</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impulsivity</td>
<td>0.03</td>
<td>0.03</td>
<td>-0.14*</td>
<td>0.10#</td>
<td>0.29***</td>
<td>0.17**</td>
<td>-0.28***</td>
<td>-0.52***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>0.04</td>
<td>-0.26***</td>
<td>-0.12*</td>
<td>0.12*</td>
<td>0.10#</td>
<td>0.02</td>
<td>0.11#</td>
<td>-0.27***</td>
<td>0.04*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note:* *** reflects p-value <.0001; ** reflects p-value <.001; * reflects p-value <.01; # reflects p-value <.10.
<table>
<thead>
<tr>
<th></th>
<th>RP likelihood</th>
<th>RP appreciation</th>
<th>RP comparative value</th>
<th>DMB-coping</th>
<th>DMB–enhanced positive affect</th>
<th>DM–impulsiveness</th>
<th>DMB–anticipated regret</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.07</td>
<td>-0.11*</td>
<td>-0.07</td>
<td>0.23**</td>
<td>0.12**</td>
<td>0.18**</td>
<td>-0.18***</td>
</tr>
<tr>
<td>Gender</td>
<td>0</td>
<td>0.16**</td>
<td>0.08</td>
<td>0.06</td>
<td>0.06</td>
<td>0</td>
<td>0.05</td>
</tr>
<tr>
<td>Grades</td>
<td>0.12*</td>
<td>0.17**</td>
<td>0.25***</td>
<td>-0.14**</td>
<td>-0.09**</td>
<td>-0.18**</td>
<td>0.24***</td>
</tr>
<tr>
<td>RBT1</td>
<td>-0.10#</td>
<td>-0.30***</td>
<td>-0.16**</td>
<td>0.46***</td>
<td>0.27***</td>
<td>0.31***</td>
<td>-0.51***</td>
</tr>
<tr>
<td>Anger</td>
<td>0.02</td>
<td>-0.10#</td>
<td>-0.22**</td>
<td>0.19***</td>
<td>0.22***</td>
<td>0.17**</td>
<td>-0.21***</td>
</tr>
<tr>
<td>Fear</td>
<td>0.02</td>
<td>-0.04</td>
<td>-0.09</td>
<td>0.07</td>
<td>0.10#</td>
<td>0.01</td>
<td>-0.02</td>
</tr>
<tr>
<td>Positive affect</td>
<td>0.11#</td>
<td>0.13*</td>
<td>0.13*</td>
<td>-0.05</td>
<td>0</td>
<td>-0.04</td>
<td>0.09</td>
</tr>
<tr>
<td>Restraint</td>
<td>0.15**</td>
<td>0.29***</td>
<td>0.30***</td>
<td>-0.27***</td>
<td>-0.31***</td>
<td>-0.28***</td>
<td>0.35***</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>-0.16**</td>
<td>-0.30***</td>
<td>-0.25***</td>
<td>0.15**</td>
<td>0.22***</td>
<td>0.12*</td>
<td>-0.34***</td>
</tr>
<tr>
<td>Sensation seeking</td>
<td>0.04</td>
<td>-0.04</td>
<td>-0.05</td>
<td>0.23***</td>
<td>0.27***</td>
<td>0.13***</td>
<td>-0.10***</td>
</tr>
</tbody>
</table>

Note: *** reflects $p$-value <.0001; ** reflects $p$-value <.001; * reflects $p$-value <.01; # reflects $p$-value <.10.
Table D-3. Bivariate correlations among risk perception (RP) and decision-making bases composite variables

<table>
<thead>
<tr>
<th></th>
<th>RP (likelihood)</th>
<th>RP (appreciation)</th>
<th>RP (comparative value)</th>
<th>DMB (coping)</th>
<th>DMB (enhanced positive affect)</th>
<th>DMB (impulsiveness)</th>
<th>DMB (anticipated regret)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP likelihood</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RP appreciation</td>
<td>.33***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RP comparative value</td>
<td>.30***</td>
<td>.36***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMB–coping</td>
<td>-.08</td>
<td>-.29***</td>
<td>-.23***</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMB–enhanced positive affect</td>
<td>-.01</td>
<td>-.17***</td>
<td>-.19***</td>
<td>.64***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DMB–impulsiveness</td>
<td>-.17**</td>
<td>-.24***</td>
<td>-.14***</td>
<td>.34***</td>
<td>.44***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>DMB–anticipated regret</td>
<td>.14*</td>
<td>.37***</td>
<td>.33***</td>
<td>-.46***</td>
<td>-.34***</td>
<td>-.21***</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: *** reflects $p$-value <.001; ** reflects $p$-value <.01; * reflects $p$-value <.05; # reflects $p$-value <.10.
Table D-4. Bivariate correlations among self-reported rates of risk behavior by type

<table>
<thead>
<tr>
<th></th>
<th>Tobacco use</th>
<th>Alcohol use</th>
<th>Drug use</th>
<th>School-related</th>
<th>Crime and violence</th>
<th>Sexual activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco use</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol use</td>
<td>.62*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug use</td>
<td>.65*</td>
<td>.54*</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>School-related</td>
<td>.51*</td>
<td>.44*</td>
<td>.63*</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crime and violence</td>
<td>.40*</td>
<td>.39*</td>
<td>.40*</td>
<td>.56*</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Sexual activity</td>
<td>.64*</td>
<td>.44*</td>
<td>.47*</td>
<td>.38*</td>
<td>.25*</td>
<td>1</td>
</tr>
</tbody>
</table>

*Note:* * reflects $p$-value <.0001
REFERENCES


BIOGRAPHICAL SKETCH

Laura A. Curry was born on March 28, 1964, in West Islip, New York. She went to Sachem High School on Long Island and went on to receive a Bachelor of Arts in Economics from Bucknell University in 1986. After college, Laura embarked on a career in actuarial science. She attained designations of Enrolled Actuary and Fellow of the Society of Pension Actuaries, and established herself as a pension consultant. Although this career was suitably challenging and afforded Laura the opportunity to capitalize on her mathematical strengths, she desired a career that was more personally fulfilling. In 1998, she entered the graduate program in developmental psychology at the University of Florida. Here, she has been able to use her interests in statistical analysis toward the study of adolescent development. Laura’s research interests include the development and use of problem-solving and decision-making skills during adolescence, correlates and predictors of adolescent risk behavior, and the evaluation of statistical methods used in social science research.