SPORT AS A PROMISING FACTOR IN REDUCING THE RISK OF SUICIDE AMONG YOUNG PEOPLE

By

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To my Mom – without her support, this accomplishment would not have been possible
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SPORT AS A PROMISING FACTOR IN REDUCING THE RISK OF SUICIDE AMONG YOUNG PEOPLE

By

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August 2009

Chair: Barbara A. Rienzo
Major: Health and Human Performance

Suicide affects everyone. Suicide and the need for suicide prevention represent significant public health concerns. The present work focuses on the relationship between sport participation and reduced risk of suicide among young people. The investigations extend the current literature and address limitations in previous research. Chapters 2 through 4 provide a foundation for the research presented in Chapters 5 and 6. The research described in the latter chapters address three methodological weaknesses in the extant literature. First, the studies test an original theoretical model depicting potential mechanisms that account for the relationship between sport participation and reduced risk of suicidal ideation among young people. Second, the research includes improved assessments of independent and/or dependent variables. Third, the studies compare effects of sport participation to involvement in other extracurricular activities on psychosocial outcomes.

Findings show direct effects of sport participation on suicide risk. Tests of a theoretical model suggest that vigorous activity, social support, and school connectedness at least partially account for the relationship between sport participation and reduced risk of suicidal ideation. This research also found that participating in sports provides increased protection against suicidal ideation more effectively than does participating in other extracurricular activities.
This line of inquiry provides a foundation for research to examine pathways through which sport participation relates to reduced risk of suicidal behavior. The association between sport participation and reduced risk of suicide suggests opportunities for health professionals, school officials, and public health planners. Eventually, practitioners may incorporate findings from this line of research into intervention efforts to prevent suicide among young people. Recommendations for future research are provided.
“For all children aged 1 to 19 years, a significant increase (in cause of death) was registered only for suicide (18.2%).”


“Public health researchers and suicide prevention practitioners need to learn more about both the risk factors for suicide…and effective strategies for suicide prevention.”

Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report, September 7, 2007

**General Introduction**

Suicide among young people in the United States represents a national tragedy and grave public health concern. Suicide ranks as the third leading cause of death for American youth [1]. Yet, most professionals view the number of reported youth suicides as an underestimate of the amount of adolescents who purposefully take their own lives each year [2]. Though myriad interrelated socio-psychological factors affect adolescent suicide, researchers uniformly highlight several correlates including depression, hopelessness, loneliness, and low self-esteem. Conversely, social support and social integration or connectedness may constitute important factors that protect adolescents against suicidal tendencies.

Substantial research suggests that physical activity provides mental health benefits. However, researchers have only recently examined possible protective associations between physical activity and sport participation, and suicide risk. Research examining general physical activity and risk of suicide has yielded equivocal findings. Yet, research focused on sport participation has produced consistent evidence that indicates young people involved in sports show significantly lower odds of emotional distress [3-9], and demonstrate significantly lower risk of suicidal behavior, compared to non-participants [4-7, 10-13]. Thus, involvement in sports may create a distinct form of protection against risk factors associated with adolescent suicide.
The present work seeks to investigate in-depth the unique psychosocial benefits afforded to young people involved in organized sports. The research focuses on the association between sport participation and suicide risk among youth. Chapter 1 presents a review of the relevant literature. This chapter details the prevalence of suicidality (suicidal thoughts or behavior) among young people, describes risk factors and protective factors associated with adolescent suicide, and discusses the extant literature focused on physical activity, sport participation, and suicide risk. Chapters 2 through 6 describe investigations that report findings from a literature review, analyses of secondary data, and original research studies. This research was developed into manuscripts and submitted for publication in scholarly journals. The investigation in Chapter 2 sought to document evidence that supports involvement in sports as a vehicle to enhance resilience in youth. The research in Chapter 3 examined relationships between physical activity and rates of hopelessness, depression, and suicidal behavior among a national sample of college students. In Chapter 4, associations between physical activity and hopelessness, suicidal thoughts, suicide plans, and suicide attempts were examined among U.S. high school students. This research in this chapter also examined associations between sport participation and hopelessness and suicidality. Chapters 5 and 6 describe studies that investigated whether or not participating in sports provides young people with greater protection against suicidal ideation than participating in other extracurricular activities. Moreover, these studies represented the first effort to test theoretical models that incorporated potential mechanisms through which sport participation may protect young people against risk factors associated with suicide. Chapter 7 presents a synthesized discussion of major findings across the studies, and proposes recommendations for future research.
Prevalence of Suicidal Ideation and Behavior Among Adolescents and Young Adults

Suicide ranks as the third leading cause of death for youth aged 15 to 24 [1], and the second leading cause of death for college students [14, 15]. Suicides account for 12.9% of all deaths among persons aged 15 to 24 [1]. During 1990-2003, the combined suicide rate for young people aged 10 to 24 declined 28.5%, from 9.48 to 6.78 per 100,000 persons [16]. However, from 2003 to 2004, the rate increased by 8.0%, from 6.78 to 7.32 [16]. This represented the largest single-year increase during 1990-2004 [16]. Furthermore, during this same time period, the suicide rate for persons under age 20 increased 18%, and suicide constituted the only cause of death that increased among adolescents [17]. In 2004, youth aged 15 to 24 represented 14.2% of the U.S. population and comprised 13.3% of the deaths by suicide [1]. Data from the Centers for Disease Control and Prevention’s 2007 Youth Risk Behavior Survey (YRBS) [18] indicated that, during the 12 months preceding the survey, 14.5% of high school students seriously considered attempting suicide, 11.3% planned to attempt suicide, and 6.9% actually attempted suicide. An estimated 1 in 12 college students has made a suicide plan, and approximately 1,000 students die by suicide on college campuses each year [1]. In 2007, 9.8% of college students seriously considered attempting suicide, and 1.5% actually attempted suicide at least once during the previous school year [19].

Females attempt suicide more often than males, but males aged 15 to 19 are 3.6 times more likely than females to complete suicide [1]. However, from 2003-2004, females aged 10 to 14 and 15 to 19 demonstrated the largest and second largest, respectively, percentage increase in suicide rates (75.9% and 32.3%, respectively) among persons 10 to 24 years [16]. Furthermore, for each completed suicide, an estimated 100 to 200 young people attempted to take their own lives [1]. Thus, Healthy People 2010, a set of health objectives for the nation, specifically targets reducing the rate of completed suicide (Objective 18-1) and the rate of attempted suicide.
among adolescents (Objective 18-2) [20]. The National Institute of Mental Health urges researchers to focus on decreasing the adolescent suicide rate by studying risk and protective factors [21].

**Risk Factors for Suicide**

Suicidal behavior is considered multicausal in origin because researchers consistently distinguish several correlates associated with adolescent suicide that occur with regularity [22, 23]. The myriad interrelated socio-psychological factors associated with adolescent suicide makes pinpointing distinct factors as “causes” impossible [22]. Rather, research suggests that the development of suicidal behavior results from a convergence of multiple predisposing and concurrent risk factors [24, 25]. Risk factors associated with suicidality among young people include depression, hopelessness, low self-esteem, and loneliness/isolation. Frequently, suicide occurs as the end-point of adverse life sequences that involve cumulative exposure to multiple risk factors [24, 25]. Therefore, efforts to prevent suicidal behavior should target points along the pathways that link childhood and adolescent adversity to suicidal behavior [23].

**Depression**

Depression represents the strongest and most consistent predictor of adolescent suicidality [26]. Psychological autopsies show that 3 out of 4 adolescents who died by suicide were depressed [22]. Depressive disorders pose the greatest proximal risk for suicidal behavior among young people [26], and they represent the most prevalent disorders among adolescent suicide victims, ranging from 49% to 64% [27]. About 90% of adolescent suicide completers had a diagnosable psychiatric disorder at the time of their deaths [28]. Young people with psychiatric disorders possess a 9-fold increased risk of suicide [29].

Significant relationships exist between depression and both suicidal thoughts and suicide behavior. According to findings from the 2004 National Survey on Drug Use and Health [30],
during their worst or most recent major depressive episode, about 9% (2.3 million) of youth thought they would prefer to be dead, 7% (1.8 million) thought about killing themselves, 3.6% (900,000) made a plan to kill themselves, and 2.9% (712,000) actually tried to kill themselves. Prinstein et al. [31] assessed psychiatric inpatients demonstrating suicidal tendencies and found both direct and indirect effects of depressive symptoms on suicidal ideation. Kandel et al. [32] found similar results among high school students. In their study, Kandel et al. [32] identified depressive symptoms as the strongest correlates and predictors of suicidal ideation. Field et al. [33] assessed a relatively small sample of high school seniors, but found a very high rate (37%) of students who scored above the clinical cutoff for depressed mood. These researchers also found that depressed adolescents experienced more frequent suicidal thoughts than non-depressed youth [33]. Konick and Gutierrez [34] tested a path model to predict suicidal ideation in college students. Results from this study showed that depressive symptoms exerted a stronger effect than other risk factors in predicting suicidal thoughts [34].

Two recent review papers found that depressed mood consistently emerged as the condition most frequently and strongly associated with adolescent suicidal behavior [24, 35]. Using a community sample of adolescents, findings from Fotti et al. [36] support this position. These researchers found that depression represented the most significant factor in suicidal behavior [36]. Using a longitudinal design, Fergusson et al. [25] examined several predictors associated with suicidal ideation and suicide attempt among young people. These researchers also identified depression as the strongest predictor of suicidal behavior [25].

**Hopelessness**

Relatively few research studies have addressed the association between hopelessness and adolescent suicidal behavior [37]. Furthermore, most studies to date yielded mixed findings [37]. Thompson et al. [37] concluded: “Whether depression or hopelessness or both factors
simultaneously predict suicidal behaviors differs for adolescents compared to adults, for males versus females, and with the outcome variable measured” [p.16].

Though studies have established a relationship between hopelessness and adolescent suicidality, hopelessness does not consistently predict suicidal behavior once researchers control for depression [27, 29, 35, 38]. For example, Konick and Gutierrez [34] confirmed depressive symptoms and hopelessness as predictors of suicidal ideation in college students. However, in this study, depressive symptoms exerted a stronger influence on suicidal ideation than did hopelessness [34]. Yet, Thompson et al. [37] found direct effects of depression and hopelessness on suicidal behaviors for males, but only a direct effect of hopelessness – not depression – for females. Similarly, Kumar and Steer [39] found that hopelessness explained slightly more than depression explained about suicidal ideation among adolescents. Swedo et al. [40] concluded that only hopelessness discriminated between adolescents with a history of a suicide attempt and adolescents at-risk for suicide, despite the large number of variables that differentiated these adolescents from a control group of healthy volunteers. Spirito and Esposito-Smythers [35] suggested that hopelessness may place adolescents at risk for suicidal behavior for only a limited period of time during a depressive episode. Thus, the time-limited nature of hopelessness may explain the contradictory results found in many studies [35].

**Loneliness/Isolation**

Adolescents who lack social support and experience isolation may engage in self-injurious behavior [41]. Adolescents who attempt suicide often become isolated from important people in their lives, and they experience intense feelings of isolation shortly before their attempt [22]. Compared to community controls, adolescents hospitalized after a suicide attempt reported more problems such as loneliness and depressive affect [42]. Adolescents at risk for suicidal behavior engage in more solitary activities than their non-suicidal risk peers [43]. High school
youth involved in the Florida Suicide Prevention Study [44] identified social isolation as a primary factor that contributes to youth suicide.

Prinstein et al. [31] found that lower levels of close friendship support and greater levels of perceived peer rejection each directly related to suicidal ideation among adolescents. In addition, perceived peer rejection indirectly related to suicidal ideation via symptoms of depression [31]. Examining the structural model generated by Prinstein et al. [31] suggested that family functioning represented a weaker correlate of suicidal ideation than did peer functioning. In contrast, Field et al. [33] found that parental relationships represented a more important contributing factor to adolescents’ psychological health than peer relations. However, findings from this study also showed that peer relations, number of friends, and popularity were less optimal for depressed adolescents, compared to their non-depressed peers [33]. Allberg and Chu [22] suggested that suicide risk increases for isolated adolescents, who lack support from either family or peers.

Young females, especially, may demonstrate increased vulnerability to relational strains that contribute to suicidal behavior. Females’ social support systems include parents, other significant adults, and friends [45]. Only family relations represent significant factors associated with suicidality for males [45]. Fotti et al. [36] found that poor parental relationships were positively associated with suicidal ideation and suicide attempts in both males and females. However, findings from Fotti et al. [36] and Watt and Sharp [45] suggested that the effects of family strains on suicide risk remained larger for females than for males.

Poor peer relationships also may contribute to increased suicide risk for females compared to males. Bearman and Moody [46] found that females isolated from the adolescent community demonstrated greater risk for suicidal thoughts than females embedded in cohesive
friendship groups. Conversely, adolescent males appeared more impervious to social context [46]. Results from Fotti et al. [36] support these findings. For females in Fotti et al.’s [36] study, poor peer relationships remained significantly associated with suicidal behavior, even after researchers controlled for depression and parental relationships. Overall, empirical evidence suggests that dysfunctional relationships demonstrate a differential impact on male and female adolescents [36, 45].

**Low Self-Esteem**

Research has established a relationship between low self-esteem and both current and future suicidal behavior among youth [29]. Using a case-control design, Groholt et al. [42] found suicidal adolescents possessed lower self-esteem than non-suicidal adolescents across seven domains (physical appearance, close friends, social competence, romantic appeal, scholastic competence, athletic competence, and global self-worth). Similarly, Wild et al. [47] found associations between low self-esteem in six different domains (peer, school, family, body image, sports/athletics, and global self-worth) and increased suicide risk. McGee and Williams [48] discovered that self-esteem in preadolescence significantly predicted linear trends in adolescent reports of multiple health-compromising behaviors, including suicidal ideation. A study by McGee et al. [49] identified a weak, but direct pathway from low self-esteem in childhood to later suicidal ideation among females. Overholser et al. [50] found that, even after controlling for levels of depression and hopelessness, self-esteem demonstrated a direct impact on suicidal ideation. In this study, low self-esteem in high school students contributed to a substantial increase in rates of suicidal ideation and previous suicide attempts [50]. Among adolescents with low self-esteem, 33% had previously attempted suicide at least once [50].
Protective Factors Against Suicide

Prevention programs that attempt to decrease the incidence and prevalence of high-risk behaviors among adolescents require an understanding of factors affecting the occurrence of these behaviors [7]. This strategy focuses on factors that both increase and decrease the chance of engaging in high-risk behavior [7]. Most studies addressing adolescent suicide focus on risk factors [51]. Protective factors constitute a less well-understood area [51]. Yet, protective factors constitute dimensions that moderate the effects of individual vulnerabilities or environmental hazards so that a given developmental trajectory reflects more adaptation in a given domain than would occur if these processes were not operating [52, 53]. Resiliency research suggests that the presence of protective factors can reduce the impact of risk factors on youth violence [54]. Thus, promoting protective factors offers an effective approach to prevent adolescent suicide [55].

Significant protective factors associated with reduced suicide risk among young people include social support and social integration (also termed “connectedness”). Social support and integration represent two factors associated with enhanced resilience in youth. Resilient youth demonstrate reduced suicide risk [56].

Social Support

Social support promotes healthy adolescent functioning [41]. Adolescents who report strong social support exhibit higher levels of resilience and lower levels of suicide risk [41]. Adolescents demonstrate less suicide risk if they perceive their family, friends, and peers as more accepting, and if they have more positive friendships [41]. Randell et al. [57] found that, among potential high school drop-outs, general satisfaction with support, higher levels of support for school, and support when feeling depressed or thinking about suicide predicted lower levels of suicidal behavior.
Social support may mitigate the effect of two variables highly correlated with youth suicide risk – isolation and hopelessness [58]. Kaslow et al. [59] found that social support represented a significant independent predictor of suicide attempts. Thompson et al. [37] found that family support influenced adolescent suicidal behavior through its direct effects on three mediating factors – depression, hopelessness, and anxiety. High school youth involved in the *Florida Suicide Prevention Study* [44] identified the presence of a trustworthy adult, friends to talk with, and a sense of belonging as protective factors against youth suicide.

**Social Integration or Connectedness**

According to Rink and Tricker [60], resiliency research has embraced the concept of “connectedness” as a means to promote resilience in youth. Doan et al. [56] support this view. These researchers explain that the following protective factors enhance resilience and help to prevent adolescent suicide: parent/family support and connectedness, good relationships with peers, support from relevant adults, social integration/opportunities to participate, and perceived connectedness to school [59]. A widely cited study, Resnick et al. [61], found that parent/family connectedness and perceived school connectedness protected against multiple health risk behaviors among youth, including adolescent suicidality.

Youth strongly integrated into their families show reduced risk of suicidal behavior [62]. Family cohesion, positive parent-child connection, spending time together, parental supervision, and high parental academic and behavioral expectations all represent protective factors [29]. Borowsky et al. [55] found that parent/family connectedness represented a protective factor for attempting suicide that cross-cut sex and racial/ethnic groups of adolescents. In a recent review, Gould et al. [27] identified family cohesion as a protective factor against suicidal behavior among middle school, high school, and college students. Furthermore, students who described their family life in terms of mutual involvement, shared interests, and emotional support were 3.5
to 5.5 times less likely to demonstrate suicidal behavior than were adolescents from less cohesive families who reported the same levels of depression or life stress [27].

Youth disconnected from major support systems (school, work, and family) show very high risk for suicide [29]. Conversely, positive connection to school represents a protective factor against suicidal behavior [29, 55, 61, 63]. Two longitudinal studies support the protective influence of school connectedness on mental health and risk behaviors. Bond et al. [64] found that students with good school and social connectedness were less likely to experience subsequent mental health problems or engage in health risk behavior. Ozer [65] showed that adolescents who felt more connected to school demonstrated reductions from grades 7 to 8 in self-reported depressive symptoms, teacher-rated anxiety and depressive symptoms, and self-reported perpetration of violence. To counter negative peer influences associated with suicidal behavior, high school youth suggested that schools help young people build healthy peer relationships by promoting their involvement in positive youth groups and structured after school activities [44]. Research supports the ability of extracurricular activities, particularly sport participation, to promote increased school connection [66-69]. Overall, these findings support a twofold role for schools, to nurture both academic proficiency as well as a sense of connectedness among students [55].

Research Investigating Associations Among Physical Activity, Sport Participation, and Suicide Risk

Researchers have only recently examined potential positive effects of physical activity and sport participation on suicidal behavior. The few studies published to date yielded equivocal findings. The results become more complex when examined by sex. The extant literature can be summarized in three categories based on method used to determine the independent variable: 1) physical activity and sport examined in combination as one variable, 2) physical activity and
sport examined separately as two variables, and 3) participation in organized sports examined independently.

Physical Activity and Sport Examined in Combination

Simon et al. [70] used a case-control design to investigate the relationship between involvement in physical activity and suicide risk. Researchers asked four questions to assess level of physical activity. First, participants provided information regarding whether or not they participated in “any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise” in the past month. Participants then reported the type of activity they spent “the most time doing,” amount of time they spent engaged in the activity, and frequency of this activity. Findings suggested a strong protective association between physical activity and nearly-lethal suicide attempts (NLSAs). “Even after adjusting for the full set of potential confounders [sociodemographic characteristics, depression, hopelessness, a serious medical condition, alcoholism, BMI, and social support], risk for NLSAs was five times higher among those who had not been physically active in the past month ” [70, p.312]. Regardless of intensity, frequency, or duration of a primary activity, participants who reported engaging in physical exercise demonstrated lower suicide risk.

Though Paffenbarger et al. [71] used the term “sportsplay,” their definition of the variable more closely depicted general physical activity (i.e., golf, walking, gardening, carpentry, swimming, tennis, jogging, or running). These researchers investigated the incidence of depression and suicide among Harvard male alumni aged 35-74 during a 23-27 year follow-up period. Findings indicated that physically active individuals demonstrated lower rates of depression. However, suicide rates remained unrelated to antecedent physical activity.

Two international studies combined physical activity and sports to create a composite independent variable. Tomori and Zalar [51] asked respondents how often they engaged in
sports or physical activity and defined physical activity as “a leisure time recreational activity…as well as club and/or school team sport” [p.408]. Comparing female suicide attempters to female non-attempters, researchers found that females who never attempted suicide more frequently turned to sports as a coping behavior in distress. Among males, non-attempters reported a significantly higher frequency of sport participation and physical activity.

Ferron et al. [4] incorporated a similar method of assessment that included two physical activity questions. The first question focused on frequency of sport activity, and the second question focused on belonging to a sports club. “Athletic adolescents” included youth who participated in sports 2-3 times per week and belonged to a sports club, or who participated in sports daily whether or not they belonged to a sports club. “Non-athletic adolescents” included individuals who engaged in sports once a week or never. Findings from this study determined that youth with the highest frequency of sport activity experienced superior psychological well-being. The most athletic adolescents felt sad, depressed, or desperate less often, and a lower proportion reported past suicidal thoughts or suicide attempts.

**Physical Activity and Sport Examined Separately**

Brosnahan et al. [72] examined varying levels of physical activity, as well as participation in physical education and team sports. They created a total physical activity variable to differentiate students who engaged in physical activity at least 6 days per week versus less active students. Though sport participants showed lower risk of sadness and suicidal behavior, results failed to reach statistical significance. However, youth who participated in a greater number of total physical activity sessions showed significantly less risk of considering suicide. In addition, higher levels of vigorous physical activity, strength and toning activity, and total physical activity all were associated with a decreased risk of planning suicide.
Brown and Blanton [10] also compared young people demonstrating varying levels of physical activity, as well as athletes versus non-athletes, with regard to suicide risk. Brown and Blanton [10] classified college students into 5 activity levels based on their responses to two physical activity questions. One question assessed participation in vigorous activity, and one other provided an estimate of participation in moderate-intensity activity. Sport participation was dichotomized (yes/no) by participants’ responses to the question: “During this school year, on how many college sports teams (intramural or extramural) did you participate?” Compared to inactive males, males who reported participating in low-intensity activity demonstrated reduced risk of suicidal behavior. However, neither moderately nor vigorously active males showed reduced suicide risk in this study. Furthermore, moderately or vigorously active females demonstrated increased risk of suicidal behavior compared to less active females. Yet, for both males and females, sport participation related to decreased suicidal behavior. Compared to sport participants, male non-participants had 2.5 times the odds of reporting suicidal behavior, and female non-participants were 1.67 times more likely to report suicidal behavior.

Unger [9] found similarly complex relationships. This study determined the relative risk of suicidality associated with 6 physical activity/team sport combinations compared to a no physical activity group. Findings indicated that physical activity, especially when combined with team sports, related to lower rates of suicidal behavior for males. Yet, high levels of physical activity, especially without team sports, related to higher rates of suicidal behavior for females.

In contrast, a recent study by Brown et al. [13] found that high school females who participated in regular, vigorous-intensity physical activity or on a sports team were less likely to attempt suicide, than were their inactive or sports team non-participant peers. In addition, among
males, frequent, vigorous-intensity physical activity and sport participation were associated with a lower likelihood of suicidal ideation and suicide attempts.

**Sport Participation Examined Independently**

Several studies examined the association between suicidality and involvement in sports without considering physical activity as an additional independent variable. Focusing on adolescent males, Sabo et al. [73] found that athletes were less likely than non-athletes to consider suicide, make a suicide plan, or attempt suicide. For both males and females, Sabo and colleagues [12] found a significant association between athletic participation and reduced risk of seriously considering suicide. In particular, highly involved athletes (those participating on 3 or more sport teams) of both sexes showed significantly less risk of considering suicide than non-athletes. Furthermore, female athletes were significantly less likely than their non-athlete counterparts to make a suicide plan.

Miller et al. [6] also identified sport participation as a protective factor militating against suicidal tendencies among youth. These researchers found lower rates of suicidal ideation, suicide planning, and suicide attempts among male and female athletes. Similar to Sabo and colleagues [12], highly involved athletes reported the lowest rates of suicidal behavior. Male athletes were significantly less likely than male non-athletes to consider, plan, or attempt suicide. Compared to their non-athlete counterparts, female athletes exhibited significantly less risk of considering or planning suicide.

Page et al. [11] found that male and female students who participated on one or two sport teams were significantly less likely to have attempted suicide in the past 12 months. Compared to non-athletes, Baumert et al. [3] found athletes reported less frequent feelings of hopelessness, and Oler et al. [7] and Steiner et al. [8] found athletes showed significantly less risk of depression and suicidal ideation. However, similar to Page et al. [11], and contrary to Sabo and
colleagues [12] and Miller et al. [6], Oler et al. [7] identified female athletes as less likely than non-athletic females to have attempted suicide.

Harrison and Narayan [5] examined relationships among sport participation, involvement in other extracurricular activities, psychological factors, and suicidal behavior. Findings indicated that “those involved in team sports at school (alone or combined with other activities)…were most likely to report high self-esteem and were least likely to report sadness, anxiety, and suicidal behavior” [5, p.118]. These researchers concluded that while engaging in any organized activity imparted some benefit, participation in sports afforded unique positive advantages.

Limitations in Research Investigating Associations Among Physical Activity, Sport Participation, and Suicide Risk

Research Design

Cross-sectional survey research dominates the literature examining associations among physical activity, sport participation, and suicide risk. Of the reviewed studies, only one, Simon et al. [70], included a case-control design. No study to date incorporated a longitudinal design to prospectively examine the effect of sport participation on subsequent suicidal behavior. However, since sport participation is defined by self-selection [67, 74], researchers may be seeing a selective aggregation of individuals who a priori bring fewer problems across a wide range of domains of functioning [8]. Conversely, involvement in sports may provide psychosocial benefits to participants [8]. In a single wave of data collection, researchers cannot determine whether sport participation represents “cause” or “effect,” nor can they separate true causal effects from preexisting differences [67, 74]. Cross-sectional research designs limit researchers’ ability to disentangle effects of selection versus the true impact of sport participation [8]. Thus, cross-sectional data collection and analysis preclude establishing a causal
relationship, or temporality of sequence, between sport participation and psychosocial variables or health-risk behaviors [4, 5, 8, 67, 69, 74, 75].

The goal of most research involves inferring the consequences of sport participation, so many researchers decry the predominant single-wave designs [67, 74]. Longitudinal designs would serve two purposes: 1) to help establish causal directionality in the relationship between sport participation and suicidality, and 2) to identify the mechanisms through which sport participation reduces suicide risk. In general and, in particular, within research investigating the relationship between sport participation and suicide risk, researchers have not tested the processes or variables hypothesized to mediate between the effects of sport participation and other variables [67, 74].

In summary, according to Marsh [74], a better design for inferring effects of sport participation involves large-scale, longitudinal studies in which researchers relate changes in the same variables assessed on multiple occasions to involvement in sports. Investigators should conduct multi-wave studies that relate the effects of sport participation to a set of outcomes, controlling for preexisting differences in a parallel set of outcomes and background variables [74]. Ideally, researchers would collect data from participants in at least three waves: 1) before they become involved in sports, to establish their baseline self-concept and involvement in health risk behaviors; 2) during their period of participation, to assess the immediate impact of sport participation on intervening and criterion variables; and 3) after the period of sport participation has ended, to assess the longevity of effects [76]. This design would yield longitudinal data that come closer to illuminating causal links between sport participation, proposed intervening variables, and suicidal behavior. In addition, this design would help unravel the physiological
and psychosocial mechanisms through which sport participation contributes to a lower risk of suicide [73].

**Precision of Measurement**

Researchers routinely identify self-report measures as a methodological limitation [9, 10, 23, 28, 36, 57, 77]. Self-report data do not allow for actual observation or measurement of behavior and, thus, may be subject to inherent biases compared to external measures [77]. However, adolescents remain the most reliable source of information on their internal states such as depression and suicidal thoughts, as well as perceptions of their personal experience and risk behaviors [47, 57]. Furthermore, parents typically remain unaware of their child’s suicidality [26, 57], which limits the usefulness of their data as an additional source of valid information.

A more worrisome problem involves the measurement of adolescent suicidality. Reynolds and Mazza [2] caution that suicidal ideation, as a component of suicidal behavior, must be viewed as a multifaceted construct that requires much more than a single item regarding whether or not adolescents have thought about killing themselves. According to these investigators, “research on suicidal ideation or group assignment predicated on one or two questions regarding having thoughts of suicide lacks sufficient specificity for defining this domain of suicidality and obscures the relative importance of suicidal ideation as a component of suicide risk in youth” [2, p.533]. However, many researchers investigating adolescent suicide have incorporated only a few items, or even a single item, to measure suicidality. For example, Fergusson et al. [25] asked participants if they had “thought about taking their lives by suicide during the past year.” McGee et al. [49] asked: “Have you felt so low you thought about committing suicide?” Rueter and Kwon [78] asked if, during the past week, adolescents were “distressed or bothered by thoughts of ending their lives.” Items such as these represent far from
optimal measures of suicidal ideation, and they likely miss many young people who have thought about killing themselves.

A large void exists in the literature investing physical activity, sport participation, and suicide risk regarding precise measurement of adolescent suicidality. To date, only one study assessed suicidality using more than the standard three YRBS [79] items: seriously considered attempting suicide, planned to commit suicide, and actually attempted suicide. Oler et al. [7] used five items to measure suicidal ideation and its relationship with sport participation. Multiple indicators of a construct produce a more precise and robust measurement, which increases reliability. Future investigations should address this methodological flaw by conducting studies that incorporate instruments with sufficient specificity to answer definitive questions regarding the association between participation in organized sports and risk of suicide.

Exploratory Models

Progress in suicide research requires both analyzing existing data sets and implementing new, theoretically informed studies [28]. An important aspect of future research involves developing and testing multiple pathways to suicidal behavior [35]. Exploratory research using causal models to examine direct effects and buffering effects of different types of daily activities will help guide development of suicide prevention and intervention programs [35, 43]. Researchers can theoretically identify precursors of suicidal behavior, and use models to develop interventions that attenuate suicide risk [29].

Most research addressing physical activity, sport participation, and adolescent suicidality originated from larger studies that examined a number of adolescent health issues using existing data sets [3-6, 8-13, 72, 73]. Few researchers have designed studies focused on investigating the relationship between sport participation and risk of suicide. Still, research examining sport participation and suicidality regularly found inverse relationships. Researchers have proposed
hypothetical mechanisms to explain the association between sport participation and reduced odds of suicidal behavior [80]. However, no study specifically tested these mechanisms. Thus, researchers have not conducted a study to test a model depicting potential pathways that explain the relationship between sport participation and reduced suicidal tendencies among young people.

**Comparison of Sport Participation versus Involvement in Other Extracurricular Activities**

One of the most important factors for predicting positive youth development involves how adolescents spend their out-of-school time [81]. Adolescents glean many benefits from their involvement in extracurricular activities. According to a review in Marsh and Kleitman [67], researchers associate participation in extracurricular activities, particularly involvement in sports, with reduced rates of high school dropout; higher attendance records; fewer discipline referrals; fewer mental and general health problems; fewer eating and dietary problems; greater subsequent wages, occupational status, and educational attainment; higher grades in school; more encouragement by significant others; and greater general self-concept, educational aspirations, and subsequent college attendance. Participation in extracurricular activities relates to higher levels of perceived strengths and self-esteem, improvement in academic performance, reduction in risk behaviors, and an orientation toward the future [82-84].

Extracurricular activities facilitate adolescents’ developmental need for social relatedness by expanding peer networks and facilitating the cultivation of peer bonds [82, 85]. Youth activities help young people develop communication skills, and provide youth with an opportunity to experience loyalty and intimacy with their peers [85]. Involvement in school programs links adolescents to a set of similar peers, provides shared experiences and goals, reinforces friendships between peers, and may strengthen the relationship between the individual and family [82, 84].
In contrast with other activities, sport participation may represent a particularly valuable source of learning outside the classroom [86]. Athletes may experience greater social support when they become integrated into a network that includes teammates, coaches, health professionals, family, and community [12]. Increased integration into these protective social networks may buffer adolescents against the effects of life stress [9, 12]. In addition, Marsh’s [74] Identification/Commitment Model argues that sport participation may enhance school identification, involvement, and commitment. This connection to school positively affects more narrowly defined academic outcomes, as well as nonacademic outcomes such as self-concept [67, 74]. Abundant evidence supports the positive effects of sport participation on a variety of broadly defined academic, social, and psychological outcomes [67, 74]. Furthermore, little or no evidence suggests that sport participation produces negative effects [67, 74].

Despite research that supports the positive role sport participation plays in the lives of youth, only Harrison and Narayan [5] compared effects of sport participation to involvement in other extracurricular activities on suicide risk. Yet, to identify sport as a distinct protective factor against suicide, research must demonstrate that sport participation provides unique benefits compared to involvement in other extracurricular activities.

**Rationale and Organization of the Present Studies**

Involvement in organized sports may provide distinct protection against adolescent suicide through multiple mechanisms. Sport participants benefit from the psychological advantages of physical activity including improvements in overall emotional well-being [87-89], depressed mood [88, 90, 91], anxiety and stress [88, 92-94], and self-esteem [90, 95, 96]. Youth athletes also experience greater social integration and support when they become members of an extended social network [12]. In addition, sport participation may cultivate an increased commitment to, involvement in, or identification with school and school values [67-69]. Thus,
the synergy of multiple mechanisms may account for the distinct protection sport participation affords against risk factors associated with suicide.

The present work served three purposes: 1) to highlight potential ways sport participation may enhance resilience in youth and, thus, reduce the risk of suicide; 2) to further explore associations among physical activity, sport participation, and suicide risk; and 3) to address key methodological limitations in the extant literature.

The investigation in Chapter 2 presents a systematic literature review that detailed benefits of youth participation in organized sports. Specifically, this study explored potential mechanisms through which sport participation may enhance resilience in youth.

Chapters 3 and 4 describe studies that sought to substantiate and extend the extant research investigating physical activity, sport participation, and suicide risk. The research presented in Chapter 3 explored associations between physical activity and risk factors associated with suicide among young people. Data for this study derived from the 2005 American College Health Association - National College Health Assessment (ACHA-NCHA) [97]. This investigation examined the relationship between different types of physical activity and rates of hopelessness, depression, and suicidal behavior among college students. The research presented in Chapter 3 provided a foundation for the next investigation. The study described in Chapter 4 built on findings from the first study by including sport participation as an additional independent variable. This study examined associations among physical activity, sport participation, and suicide risk among adolescents using data from CDC’s 2005 YRBS [79]. The assumption that involvement in organized sports affords distinct protection against suicide risk guided the analysis.
Chapters 5 and 6 present studies based on original data that extended the foundational research detailed in Chapters 2 through 4. These studies sought to test the hypothesis that sport participation protects against risk factors associated with suicide through multiple mechanisms. This research addressed three limitations in the extant literature. First, both studies improved on the precision of measurement of suicidality by assessing thoughts about suicide using a valid and reliable measure that provided sufficient specificity to answer definitive questions regarding the association between sport participation and suicidal ideation. Second, both investigations tested theoretical models that included potential mechanisms through which sport participation may protect against risk factors associated with suicide among young people. Third, both studies compared the psychosocial benefits afforded to students involved in sports to those afforded to individuals involved in other extracurricular activities.

Chapter 5 describes a study conducted with students enrolled in undergraduate classes at the University of Florida, Gainesville, Florida. This study tested an original model that highlighted the mediating effects of physical activity and social support on relationships between collegiate sport participation (intramural, club, and varsity sport teams), risk factors associated with suicide (depression, hopelessness, loneliness, and low self-esteem), and suicidal ideation. Analyses also compared effects of sport participation to involvement in other university organizations on psychosocial variables.

Based on findings generated from the investigation presented in Chapter 5, the study described in Chapter 6 tested an enhanced model that included a construct that assessed perceived connection to school. This study also tested the model using involvement in high school sports as the antecedent variable. Furthermore, more comprehensive assessments of sport participation and involvement in other extracurricular activities allowed for a detailed analysis.
regarding types of activities that afford the greatest benefit. Participants in this study included freshman students, aged 18 or 19, attending the University of Florida, Gainesville, Florida.
CHAPTER 2
SPORT PARTICIPATION: A VEHICLE FOR PROMOTING RESILIENCE IN YOUTH

Introduction

Researchers examining resilience in youth ask: What protects them? How can we enhance adolescents’ ability to resist stressful life events, and promote positive adaptation and competence? [98]. The study of resilience focuses on assets within individuals, communities, schools, and families that buffer young people against adopting negative health behaviors, and that foster health-promoting behaviors [60]. Researchers frame the ability to rebound from adversity in the context of protective factors that enhance resilience [52]. Protective factors constitute “individual or environmental safeguards that enhance an individual’s ability to resist stressful life events while adapting to the situation and developing competency in dealing with it” [98, p.296]. Protective factors affect adolescent health behavior in two ways: 1) they buffer adolescents from harm by decreasing the likelihood that youth will engage in high-risk health behavior; and 2) they serve as moderators of risk by modifying the relationship between risk and problem behavior [60]. The Association of Maternal and Child Health Programs suggested that health educators more closely examine protective factors in youth, families, schools, and communities [99]. This approach provides a basis for developing adolescent health policies and programs that emphasize preventive and positive interventions designed to cultivate assets and competencies in adolescents [60]. Such developmental assets help inoculate youth from engaging in high-risk behavior [100].

A recent study found that participation in team sports positively correlated with resilience scores among adolescents [101]. Few other empirical investigations have examined the
association between sport participation and resilience in youth. Yet, sport may represent an intervention activity that increases protective factors associated with enhanced resilience [102]. Rink and Tricker [60] identified six groups of common protective factor themes that promote resilience in youth: 1) Developing interpersonal and intrapersonal skills among youth; 2) Promoting youth participation in the environment in which they live; 3) Emphasizing intergenerational relationships between youth and adults; 4) Establishing clear norms and expectations for youth; 5) Providing access to information and services for youth in their community; and 6) Involving youth in policy changes that support positive development. The purpose of this investigation involved exploring potential mechanisms through which sport participation may enhance resilience in youth. One research question drove this inquiry: Does sport represent a vehicle for enhancing protective factors comprising Rink and Tricker’s [60] first four themes? The last two themes were excluded because they did not pertain to sport participation.

Methods

A literature search was conducted through PsycINFO, PubMed, ERIC, Social Sciences Index, and SPORTdiscus over the time period 1990 to 2007. Initially, the search terms “resilience,” “sport,” and “extracurricular activities” were applied. In subsequent searches, “sport” and specific protective factors comprising each theme such as “self-esteem,” “self-efficacy,” or “locus of control” were applied. The reference lists of all retrieved publications were scanned for other relevant documents and then these works were obtained. The 31 publications found using these search criteria, including empirical, review, and theoretical articles, papers, and reports, comprise the review of the literature summarized in this paper.
Promoting Resilience Through Sport

Developing Interpersonal and Intrapersonal Skills Among Youth

Resilient youth demonstrate resourcefulness and good problem-solving skills [52, 60]. Resilient adolescents possess goals, hopes, and plans for the future, and they have the persistence and ambition to bring them to fruition [52]. Furthermore, strong positive correlations exist between resilience in youth and social competence, self-esteem, self-efficacy, internal locus of control, and cognitive functioning [52, 60].

Social competence/communication skills

According to research presented in Marsh and Kleitman [74], sport participation involves many robust positive effects, and the largest effects relate to social self-concept. A report from the President’s Council on Physical Fitness and Sports promoted sport as a means to develop important social skills [103]. Through their involvement in sports, young people form new acquaintances, and they learn how to cooperate, negotiate, work together as a team, and respect others [84, 85, 104]. Sport participants learn about leadership, responsibility, tolerance, selflessness, and legitimate expression of talent [84, 85, 104]. Youth activities help young people develop communication skills, empathy, and an understanding for others’ viewpoints [85]. School activities also provide youth with an opportunity to experience loyalty and intimacy with their peers [85].

Problem-solving skills/resourcefulness

Sport can teach young people many beneficial lessons including problem-solving skills [103]. Sport participation may represent a mechanism that demands athletes respond to any given situation or problem, and facilitates athletes’ ability to marshal their resources to meet a variety of challenges [105]. Participation in extracurricular activities also provides adolescents with an opportunity to learn emotional self-regulation Dworkin et al. [85]. Youth activities,
especially team sports, involve goal-directed behavior, and require participants to develop competencies for limiting the disruptive effect of emotions on attention and performance [85]. However, compared to participation in other activities, sport participation relates to increased self-knowledge and improved emotional self-management [106]. Youth highly involved in sports describe themselves as more “psychologically resilient,” or able to bounce back after experiencing problems [107].

Sport participants gain critical knowledge regarding how to achieve a goal including autonomous decision-making, and action and time management [85]. Furthermore, youth athletes learn how to interpret and negotiate competitive losses [105]. Following a losing game, coaches and players review the overall game strategy, identify problem areas, and devise a plan of action for future practices designed to improve performance in problem areas [105]. This strategy significantly reduces the likelihood of negative chain reactions following game losses, and promotes constructive analysis of strengths and weaknesses with an eye toward improvement [105].

**Self-esteem/self-concept**

Participation in extracurricular activities relates to higher levels of perceived strengths and self-esteem [84]. However, in contrast with other activities, sport participation may represent a particularly valuable source of learning outside the classroom [86]. Pedersen and Seidman [108] described the team sport environment as a fertile ground for adolescent self-esteem development, and Kaufmann [86] highlighted enhanced self-esteem as a benefit gained from sport participation. Self-esteem and self-efficacy derive largely from an individual’s successful accomplishment of tasks the individual perceives as important [105]. Sport represents an important activity to many young people who devote considerable time, energy, and other resources to its pursuit [105]. Furthermore, unlike many other activities, sport participation
usually results from a young person’s personal decision rather than the decision of parents and teachers [105].

Donaldson and Roman [104] found that sport positively impacted specific self-concept domains (i.e., athletic, social, and physical), as well as overall self-concept. Findings from Marsh and Kleitman [67], Pedersen and Seidman [108], and Tiggemann [109] support the association between participation in organized sports and increased self-esteem. Mastery experiences and successes in sport contribute to improved self-esteem. However, even losses within the sport arena may convey a sense of accomplishment [105]. A well-played game generates respect between teams, players, and the wider student population [105]. Such positive experiences not only reduce the impact of loss, but also contribute to players’ self-esteem and self-efficacy [105].

Resilient youth demonstrate areas of competence and perceived efficacy valued by self or society [60]. American society values athleticism and sport skills [12]. Therefore, experiences in sport may influence the development of healthy self-esteem through feedback youth receive from others regarding their competence in a valued domain. In addition, participation in sport generates a sense of physical well-being. Investigators identified an association between a positive view of one’s body and increased self-esteem [69]. Research also supports a positive relationship between sport participation and enhanced body image among adolescents [68, 103, 109]. Richman and Schaffer [76] suggested that sport may promote self-worth by fostering such contributors to self-esteem as physical competence, a favorable body image, and more flexible sex attitudes.

**Self-efficacy/positive sense of one’s capabilities**

Improved personal competency may constitute the most significant benefit derived from sport participation. In a recent review, Bailey [110] stated that one of the especially relevant
findings concerning sport relates to the development of perceived physical competence. Hjemdal et al. [101] also found an association between sport participation and the personal competence factor of the Resilience Scale for Adolescents. According to Bell and Suggs [111], four conditions promote self-esteem: 1) a sense of connectedness, 2) a sense of uniqueness, 3) a sense of power, and 4) a sense of models or dynamics used to understand experiences. Involvement in organized sport encourages all of these conditions, and can especially encourage a sense of power [111]. Through supportive interactions with coaches, youth athletes learn to call on their “reserve of heart” to go the extra mile without external motivation [111]. The ability to call upon this reserve provides youth with a sense of power, or a feeling of competence or “learned self-helpfulness” [111].

Competency-enhancing activities are highly organized and adult-supervised, promote increased involvement with prosocial peers, provide opportunities for achievement, and facilitate the development of autonomous decision-making skills [108]. Compared to individual sports or informal physical activity, team sports typically include all of the characteristics of competency-enhancing activities [108]. Participation in most organized sports encourages the development of initiative, as well as a strong sense of individual accomplishment or mastery [108]. Sport participation builds confidence, helps youth gain feelings of personal control, and creates expectations of success [103]. Tiggemann [109] suggested that playing sports may confer a sense of body competence, whereby bodies can run fast or jump high, and generally have a function other than merely objects to examine. Findings from Marsh [112] and Stein, Fisher, Berkey, and Colditz [113] support this view. In Marsh’s [112] study, elite high school athletes demonstrated systematically higher physical self-concept than non-athletes. Stein et al. [113]
found that increased physical activity in youth was positively associated with improved athletic self-perception, and decreased physical activity related to reduced athletic self-perception.

**Internal locus of control**

Findings from Snyder and Spreitzer [75] showed a positive relationship between high school athletic commitment and internal control over life events. Yin and Moore [114] also found that participation in interscholastic sports positively related to scores for locus of control among adolescents. Similarly, Marsh and Kleitman [67] discovered that involvement in high school extramural/team sports benefited internal locus of control.

**Persistence and ambition**

Youth activities, especially sports, represent a context in which young people learn to set achievable goals, and learn about effort and perseverance [85]. Involvement in sports helps youth develop personal resources for achieving socially approved goals [12]. Athletic training requires consistent investment in the form of practice and conditioning [105]. Athletes learn to push themselves, work hard, demonstrate discipline, and remain focused [85]. Unlike unstructured and unorganized activities, sport requires discipline and continuity of effort [115]. Research suggests that organized sports influence behaviors such as perseverance and risk-taking to a greater extent than do informal physical activities [104]. Team sport participants usually establish goals they strive to obtain throughout the season. In pursuit of their goals, athletes experience physical, emotional, and mental challenges [102]. Sport serves as the ideal context for individuals to experience adversity and use challenges for self-enhancement [116]. Athletes learn to persist in the face of losses, and to analyze constructively and compensate for competitive weaknesses [105]. To thrive within sports, athletes must cultivate perseverance and resilience [102].
Cognitive functioning/academic achievement/goals, hopes, and plans

Participation in extracurricular activities during high school improves academic performance, reduces involvement in risk behavior, and relates to an orientation toward the future [82, 84]. Participation in sport favorably affects academic self-concept, academic pursuits and achievements, time spent on homework, commitment to school, and college attendance and completion rates [66-68, 82, 86, 105]. Physical activity and learning go hand-in-hand [103]. Sport can elevate academic performance by increasing blood flow to the brain, enhancing mood, increasing mental alertness, and improving self-esteem [110]. In short, sport participation enhances time, energy, and commitment to academic pursuits [67].

Promoting Youth Participation in the Environment in Which They Live

Students who feel engaged at school, and feel connected to an adult in their school, show increased likelihood of graduating [117]. Through affiliation and identification with close friends, adolescents benefit from companionship, emotional and motivational support, role modeling, and a sense of belonging [52]. Engaging youth in real opportunities for involvement and leadership provides young people with experiences that increase their sociability within their peer group [60].

Participation in extracurricular activities may play an important part in the socialization process by linking adolescents to larger social forces within the community [84]. The availability of bonding opportunities in the school environment enhances students’ social bonding and reduces risk-taking behavior [11]. Involvement in school programs links adolescents to a set of similar peers, provides shared experiences and goals, reinforces friendships between peers, and may strengthen the relationship between the individual and family [82, 84]. Extracurricular activities facilitate adolescents’ developmental need for social relatedness, and may contribute to young people’s identities as important and valued members of
the school community [82]. Participation in school activities expands peer networks, and represents an important context for developing valuable peer bonds [85].

Sport creates important opportunities for students to excel and meaningfully contribute to the school community [105]. The team sport environment encourages increased involvement with peers in a prosocial context [108]. The personal and social behavior associated with sport participation also may increase students' leadership potential [118]. Athletes become more socially involved than non-athletes, and they demonstrate increased participation in other school and community activities [75, 102, 103]. Involvement in sports relates to better attendance records, and to reduced likelihood of dropping out [67, 103, 114, 119]. Sport participation may cultivate an increased commitment to, involvement in, or identification with school and school values [67-69]. School sports may enhance bonding by increasing opportunities for students to feel a sense of belonging, attachment, and participation in their social environment [11].

**Emphasizing Intergenerational Relationships Between Youth and Adults**

Access to caring adults and positive adult role models reduces the likelihood that adolescents will engage in negative health behaviors [60]. Programs that provide adolescents with access to adults enable adults and youth to view each other in a positive light, and allow adults to model prosocial behavior [60].

Participation in most organized sport programs provides youth with regular opportunities to interact with caring adult role models [103, 108]. Since adults typically run organized sports, youth athletes become exposed to the care of adults beyond their immediate family [84]. The “therapeutic” support base for athletes extends beyond the head coach, and may include athletic trainers, strength coaches, academic counselors, and other team members [10]. Hawkins and Mulkey [105] suggested that close relationships between coaches and athletes provide youth with a rationale and resource for sustained academic effort even in the face of difficulties. McHale et
al. [115] found that free-time spent with parents and non-parental adults related to positive adjustment among high school youth. Furthermore, time spent in sports positively related to time spent with parents, peers, and, in particular, non-parental adults [115]. The relationships sport participants form with their coaches and teammates represent one of the building blocks for developing resilience [102].

**Establishing Clear Norms and Expectations for Youth**

Young people need adults to establish clear norms and expectations to successfully navigate through adolescence [60]. Establishing norms and expectations for youth provides them with an understanding of rules acceptable to the environment in which they live [60]. School activity participation may moderate antisocial behavior for some students [120]. Organized activities may expose youth to particular sets of values including acceptance of authority and rule-governed behavior [84].

Most researchers found inverse relationships between organized sport participation and social misconduct problems, delinquent behavior, illicit drug use and drug abuse, discipline problems, aggression, peer-related problems, and involvement with police [68, 104, 105]. Sport participation may affect moral development through opportunities to engage in prosocial, or ethical, behavior [103]. Organized sports involve longer duration and greater intensity, frequency, and discipline than do informal activities [104]. In addition, coaches usually expect athletes’ behavior to reach a standard that will allow for team cohesion without many disruptions [104]. Youth athletes also must adhere to rules of fair competition [105]. Thus, in organized sports, youth must behave better than in informal sports where rules may not play an important role [104].
Implications for Practice

Findings from a literature review revealed empirical evidence suggesting that, for youth interested in sports, participation may promote numerous protective factors that enhance resilience. However, practitioners should know that negative sport experiences increase both physical and psychological health risks among youth [121]. Some youth involved in sport report engaging in more problem behaviors such as lying and substance use, and high-risk health behaviors such as speeding or not using a bicycle or motorcycle helmet, and report higher rates of negative experiences such as negative peer interactions and inappropriate adult behavior [122]. Yet, many studies that found negative effects of sport participation did not examine the nature and quality of the experience for youth [122]. The downsides of participation are not intrinsic to sports. Factors that likely influence a young person’s experience in sport include coaches’ training; support the young person receives from coaches, family members, and peers; and the type and competitive level of a sport [122]. For example, perceived parental pressure decreases enjoyment of sport activity, and increases anxiety and risk of injury [121].

Involvement in sports can represent a productive out-of-school experience if adults make an effort to conduct activities, establish environments, and develop sustained peer-peer and youth-adult relationships that intentionally focus on building capacity in youth [122].

Health educators may use findings from the present investigation to advocate for increased opportunities to involve interested youth in sports. Findings would support efforts to assess the impact that the erosion of funds and social support for school and community sport programs have on young people’s health. Furthermore, the empirical research presented in this paper provides guidance for coaches and health educators in establishing youth sport programs. Since few youth possess the talent to play competitive sports at the highest level, the primary goals of youth sport programs should involve developing general physical competence, and
promoting physical activity, fun, socioemotional development, life skills, sportsmanship, and 
good health [122]. Coaches should nourish a sense of independence, self-reliance, courage, 
positive expectancy, and self-confidence in youth athletes [111]. Sport programs that enhance 
these skills and attributes will help cultivate resilience in youth.

Recommendations for Future Research

A paucity of research has examined the association between sport participation and 
resilience in youth. To advance the science in this area, researchers should explore the broad 
relationship between sport and resilience, as well as variables presumed to intervene in the 
relationship between sport participation and the development of resilience. For example, 
protective factors addressed in this investigation may represent mediating variables between 
sport participation and global measures of resilience. In addition, different types of sports may 
enhance resilience in different ways. For example, Marsh and Kleitman [67] found that 
extramural and team sports produced more positive effects than intramural and individual sports. 
Future research should evaluate potential differential effects across various forms of sport, and 
whether effects vary by sex.

Opportunities to participate in and contribute to sport programs focused on positive youth 
development provide young people with a sense of belonging, mastery, generosity, and mattering 
[122]. Involvement in sports may represent an optimal activity to promote mechanisms that 
enhance resilience in youth. More research in this area is needed.
CHAPTER 3
ASSOCIATIONS BETWEEN PHYSICAL ACTIVITY AND REDUCED RATES OF HOPELESSNESS, DEPRESSION, AND SUICIDAL BEHAVIOR AMONG COLLEGE STUDENTS

Introduction

Suicide is the third leading cause of death among Americans aged 10 to 24 years [16]. Suicides account for 12.9% of all deaths among young people aged 15 to 24 years [1]. An estimated 1 in 12 college students has made a suicide plan, and approximately 1,000 students die by suicide on college campuses each year [1]. According to recent data from the Centers for Disease Control and Prevention, during 1990-2003, the combined suicide rate for persons aged 10 to 24 years declined 28.5% [16]. However, from 2003 to 2004, the rate increased by 8.0%. This represented the largest single-year increase during 1990-2004 [16]. In 2005, 10.2% of college students seriously considered attempting suicide, and 1.5% actually attempted suicide at least once during the previous school year [123].

In this study, we examined the association between physical activity and suicidality in a national sample of 43,499 college students. Physical activity was defined as frequency of vigorous or moderate exercise and strength or toning exercises. We performed analyses using data from the 2005 National College Health Assessment (NCHA) conducted by the American College Health Association (ACHA) [97]. We specifically explored associations between levels of aerobic and toning or strength activities and risk of hopelessness, depression, and suicidal behavior.

Depression and Hopelessness as Risk Factors for Suicidal Behavior

The myriad of interrelated socio-psychological factors associated with suicide among young people makes pinpointing specific factors as causes impossible [124]. Therefore, prevention researchers focus on correlates of suicide, particularly hopelessness and depression [1]. Depressive disorders represent the most consistent disorders among young suicide victims [125]. About two-thirds of individuals who died by suicide experienced depressive symptoms at the time of their deaths [1]. Therefore, researchers recognize depression as a fundamental risk factor for suicidality among young people [32-34, 36, 37, 124, 126-128]. In 2005, approximately 38% of college students reported feeling that things were hopeless, and more than a quarter (28%) attributed trouble functioning during the academic year to depressive symptoms [123].

The association between hopelessness and suicidal behavior among young people has only recently received attention, with disparate findings [37]. Thompson et al. [37] concluded, “Whether depression or hopelessness or both factors simultaneously predict suicidal behaviors differs for adolescents compared to adults, for males versus females, and with the outcome variable measured” [p.16]. In their studies of college students, Stephenson et al. [128] and Konick and Gutierrez [34] confirmed depressive symptoms and hopelessness as predictors of suicidal ideation among males and females. However, in Konick and Gutierrez’s [34] study, depressive symptoms exerted a stronger influence on suicidal ideation than did hopelessness. Conversely, Thompson et al. [37] found direct effects of depression and hopelessness on suicidal behavior for males, but only a direct effect of hopelessness – not depression – for females. Kumar and Steer [39], also found hopelessness was more strongly related to suicidal ideation among adolescents than was depression.
**Physical Activity as a Protective Factor Against Suicidal Behavior**

Research clearly indicates a positive association between exercise and psychological health. Physical activity promotes positive emotional well-being [87-89] including improvements in depressed mood [88, 90, 91], anxiety and stress [88, 92-94], and self-esteem [90, 95, 96]. Evidence suggests that exercise promotes a positive self-image, especially among young people with low self-esteem [95]. Physical activity may protect against suicidality through its effect on psychological well-being.

Researchers have only recently examined potential positive effects of physical activity on suicidal behavior. The few studies published to date yielded equivocal findings. The results become more complex when examined by sex. In addition, the existent literature focuses on the association between physical activity and adolescent suicidality. Only 3 studies included young adults of typical college age [4, 10, 70], and only one study specifically addressed suicidal behavior among college students [10]. Furthermore, only Brosnahan et al. [72] examined the effect of strength or toning activities on suicidal behavior.

Simon et al. [70] used a case-control design to investigate the relationship between involvement in physical activity and suicide risk among individuals aged 13 to 34 years. Researchers asked 4 questions to assess level of physical activity. First, participants provided information regarding past-month participation in “any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise” [p.312]. Participants then reported the type of activity they spent the most time doing, amount of time they spent engaged in the activity, and frequency of this activity. Findings suggested a strong protective association between physical activity and nearly-lethal suicide attempts (NLSAs). “Even after adjusting for the full set of potential confounders [sociodemographic characteristics, depression, hopelessness, a serious medical condition, alcoholism, BMI, and social support], risk for
NLSAs was five times higher among those who had not been physically active in the past month” [70, p.312]. Regardless of intensity, frequency, or duration of a primary activity, participants who reported engaging in physical exercise demonstrated lower suicide risk.

Ferron et al. [4] surveyed young people aged 15 to 20 years. They incorporated 2 questions to assess physical activity. The first question focused on frequency of sport activity, and the second question focused on belonging to a sports club. **Athletic adolescents** were young people who participated in sports 2 to 3 times per week and belonged to a sports club, or who participated in sports daily whether or not they belonged to a sports club. **Non-athletic adolescents** were individuals who engaged in sports once a week or never. Findings from this study determined that young people with the highest frequency of physical activity experienced superior psychological well-being. The most athletic adolescents felt sad, depressed, or desperate less often, and a lower proportion reported past suicidal thoughts or suicide attempts.

Brosnahan et al. [72] examined the associations among varying levels of different physical activities and suicidal behavior among high school students. To our knowledge, these investigators were the only ones to examine the effect of strength or toning activities on suicidal behavior. Findings indicated that young people who participated in a greater number of total physical activity sessions showed significantly less risk of considering suicide. In addition, higher levels of vigorous physical activity, strength and toning activity, and total physical activity all were associated with decreased risk of planning suicide.

Brown and Blanton [10] published the only investigation we are aware of that addresses the effect of physical activity on suicide risk among college students. They divided the college student sample into 5 activity level groups on the bases of responses to 2 physical activity questions. One question assessed participation in vigorous activity, and one other provided an
estimate of participation in moderate-intensity activity. Compared with inactive men, males who reported participating in low-intensity activity demonstrated reduced risk of suicidal behavior. However, neither moderately nor vigorously active males showed reduced suicide risk in this study. Furthermore, moderately or vigorously active females demonstrated increased risk of suicidal behavior compared to less active females. Unger [9] found similarly complex relationships among high school students. Findings from this study indicated that increased physical activity was related to lower rates of suicidal behavior for males. Yet, high levels of physical activity related to higher rates of suicidal behavior for females.

Though definitive reasons for these disparate results by sex remain unclear, researchers recognize that, in young females, exercise behavior affects mental health in complex ways. Thome and Espelage [129] found that increased physical activity related to positive psychological health in college females, but only when exercise was not associated with an eating disorder. Tiggeman and Williamson [130] observed significant negative relationships between increased exercise, and body dissatisfaction and self-esteem among young females. Strelan et al. [131] found that females who endorsed appearance-related reasons for exercise (i.e., weight control, body tone, attractiveness) also experienced increased levels of body dissatisfaction and reduced self-esteem. These findings support the role of body appearance as an important determinant of physical and global self-esteem, especially among females [132]. Thus, factors related to poor body image may contribute to low self-esteem, depression, and suicidal feelings that likely influence the relationship between physical activity and suicidal behavior [9, 10].

Conversely, depressed or suicidal individuals may choose not to engage in physical activity. Symptoms associated with depressive disorders – including diminished pleasure in
daily activities, preference for time alone, fatigue, and psychomotor agitation or retardation [133] – may prevent young people from exercising. Tomori and Zalar [51] found that adolescent females demonstrated reduced suicide risk if they perceived physical activity as an important determinant of health and a beneficial coping behavior during times of distress. For males in this study, reduced suicidality related to the attitude that exercise represents a healthy activity and to higher frequency of involvement [51].

Methods

Procedures and Participants

The NCHA addresses student health habits, behaviors, and perceptions related to substance use; sexual health; weight, nutrition, and exercise; mental health; and personal safety and violence. ACHA conducts the survey twice a year, using national samples of college students from numerous colleges and universities across the United States, with institutional data sets ranging from 8 to 117 schools. We obtained data related to the study questions by submitting a research proposal to the ACHA-NCHA Program Office (for instructions visit: http://www.acha-ncha.org/research.html). Participants in the spring 2005 administration of the NCHA included 43,499 college students. The students ranged in age from 18 to 25 years (mean = 20.4 years, SD = 1.8 years). The sample included more females (n = 28,090, 64.5%) than males (n = 15,409, 35.5%). Participants reported their race/ethnicity as 76.3% white, 9.9% Asian, 5.2% Hispanic, 3.8% African American, 0.9% American Indian, and 3.9% Other. We collapsed responses from participants in the last 2 groups into a single category of other.
Measures

Hopelessness

ACHA researchers assessed hopelessness with 1 item: “Within the last school year, how many times have you felt things were hopeless.” We categorized participants as feeling hopeless if they answered 1 or more times.

Depression

Researchers assessed depression with an item that asked how many times within the last school year students felt so depressed that it was difficult to function. We categorized participants as feeling depressed if they answered 1 or more times.

Suicidal behavior

Two ACHA-NCHA items assessed suicide thoughts and attempts. We characterized participants as suicidal if they reported seriously considering attempting suicide or had actually attempted suicide 1 or more times in the past school year. We collapsed these data into a single variable because only about 1% of students reported a previous suicide attempt.

Physical activity

Researchers assessed frequency of aerobic activity with 1 item: “On how many of the past 7 days did you participate in vigorous exercise for at least 20 minutes or moderate exercise for at least 30 minutes?” They assessed frequency of strength or toning activity – termed toning activities – with 1 other item: “On how many of the past 7 days did you do exercises to strengthen or tone your muscles, such as push-ups, sit-ups, or weight lifting?” On the basis of their responses to each item, we grouped participants into 4 categories: 0 times/week, 1 to 2 times/week, 3 to 5 times/week, and 6 to 7 times/week. Thus, the categories were not mutually exclusive.
Data Analysis

We used descriptive statistics to compare rates of hopelessness, depression, and suicidal behavior for 2 groups: males who engaged in aerobic or toning activities at least once per week (n = 12,797) with males who were inactive (n = 2,609), and females who engaged in aerobic or toning activities at least once per week (n = 22,296) with females who were inactive (n = 5,792). We conducted logistic regression analyses by sex to determine the independent effects of aerobic and toning activities on the risk of hopelessness, depression, and suicidal behavior. We performed subsequent analyses, controlling for participation in the alternate activity. This analysis helped clarify the association between type of activity and mental health. We included age and race as covariates in all models. The analyses determined the relative risk of hopelessness, depression, and suicidal behavior associated with different levels of aerobic and toning activities.

Results

Of 43,499 college students, 65.4% reported feelings of hopelessness, and 46.1% stated they felt so depressed it was difficult to function, 1 or more times during the past school year. Approximately 11% had seriously considered suicide or actually attempted suicide. Three quarters of these students engaged in aerobic activity, and 64.2% engaged in strength or toning exercises, at least once per week. Table 3-1 shows the distribution of physical activity, hopelessness, depression, and suicidal behavior by sex. Males were more likely than females to participate in aerobic activity (78.3% vs. 74.7%, respectively, $\chi^2 [N = 43,499, 1] = 70.01, p < .001$) and toning exercises (67.1% vs. 62.6%, respectively, $\chi^2 [N = 43,371, 1] = 87.98, p < .001$) at least once per week. Compared with males, females demonstrated increased rates of hopelessness (57.7% vs. 69.7%, respectively, $\chi^2 [N = 43,509, 1] = 636.52, p < .001$), depression (40.0% vs. 49.6%, respectively, $\chi^2 [N = 43,461, 1] = 364.28, p < .001$), and suicidal behavior
(9.4% vs. 11.2%, respectively, $\chi^2 \ [N = 43,593, 1] = 34.56, p < .001$). For males and females, the prevalence of hopelessness decreased with age (Table 3-2). However, only younger female students reported significantly lower rates of depression and suicidal behavior. Participants in the categories of Asian, Hispanic, and other reported higher levels of hopelessness, depression, and suicidal behavior for both sexes (Table 3-3).

Our findings demonstrated that physically active males experienced lower rates of hopelessness, depression, and suicidal behavior than did their inactive counterparts. More than half (57%) of physically active males experienced hopelessness, compared with 61% of inactive males ($\chi^2 \ [N = 15,329, 1] = 13.5, p < .001$). About 39% of active males and 45% of inactive males reported feeling so depressed they had difficulty functioning ($\chi^2 \ [N = 15,306, 1] = 29.9, p < .001$). Almost 9% of physically active males and 12% of inactive males had thought about suicide or attempted suicide ($\chi^2 \ [N = 15,357, 1] = 20.6, p < .001$).

We found similar patterns among females. More than half (69%) of active females experienced feelings of hopelessness, compared with 72% of inactive females ($\chi^2 \ [N = 27,985, 1] = 17.3, p < .001$). About 49% of physically active females reported feeling so depressed they had difficulty functioning, compared with 54% of inactive females ($\chi^2 \ [N = 27,964, 1] = 46.8, p < .001$). Only 11% of females who engaged in physical activity reported suicidal behavior, whereas about 14% of inactive females reported suicidal thoughts or attempts ($\chi^2 \ [N = 28,042, 1] = 52.9, p < .001$).

Tables 3-4 and 3-5 present the relative risk of hopelessness, depression, and suicidal behavior for males and females who engaged in various levels of both aerobic and toning activities. Males and females who engaged in some aerobic or toning activity each week showed reduced risk of feeling hopeless or depressed compared with their counterparts who did not
engage in each activity. Males who performed aerobic activity also demonstrated reduced suicide risk: 1 to 2 times/week (odds ratio [OR] = .74, \( p < .001 \)), 3 to 5 times/week (OR = .64, \( p < .001 \)), 6 to 7 times/week (OR = .65, \( p < .001 \)). Likewise, females who engaged in aerobic exercise each week showed reduced risk of suicidal behavior: 1 to 2 times/week (OR = .82, \( p < .001 \)), 3 to 5 times/week (OR = .73, \( p < .001 \)), 6 to 7 times/week (OR = .70, \( p < .001 \)). Compared with the effects of aerobic activity, the effects of toning activities exhibited a dose response for both sexes. For males, engaging in moderate levels of toning activities produced optimal results. Males who performed toning activities 3 to 5 times/week were significantly less likely to demonstrate suicidal behavior (OR = .76, \( p < .001 \)) than were males who did not engage in these activities. However, females demonstrated reduced suicide risk if they engaged in toning activities at low (1 to 2 times/week) and moderate (3 to 5 times/week) levels (OR = .84, \( p < .001 \) and OR = .79, \( p < .001 \), respectively), compared with females who did not perform toning activities.

We found no interaction between aerobic activities and toning activities in any of our logistic regression models for either sex. However, the two activities were strongly correlated: males (\( r = .68, p < .001 \)) and females (\( r = .67, p < .001 \)). Therefore, we examined the effect of each activity on levels of hopelessness, depression, and suicidal behavior while controlling for the effect of the alternate activity. For males, toning showed no significant effects on hopelessness, depression, or suicidal behavior after we accounted for participation in aerobic activity. For females, frequent toning activity (6 to 7 times/week) related to increased risk of hopelessness (OR = 1.17, \( p < .05 \)) after we controlled for aerobic activity. In contrast, females who engaged in low (1 to 2 times/week) or moderate (3 to 5 times/week) levels of toning activities were less likely to feel depressed (OR = .93, \( p < .05 \) and OR = .90, \( p < .01 \),
respectively) than were their inactive counterparts, even after we controlled for aerobic activity. We found no significant effects of strength or toning activities on suicidal behavior for females after controlling for aerobic activity. However, for both sexes, aerobic activity remained significantly associated with reduced risk of hopelessness, depression, and suicidal behavior after controlling for participation in toning activities.

To more fully capture the complex relationship between exercise behavior and mental health, we examined the interaction effects between physical activity and both exercising to lose weight and dieting to lose weight. Males who performed toning activities 3 or more times/week with the intent to lose weight were more likely to feel hopeless and depressed (OR = 1.17, \( p < .05 \) and OR = 1.31, \( p < .001 \), respectively). In addition, males who engaged in aerobic or toning activities 3 or more times/week to lose weight demonstrated increased suicide risk (OR = 1.43, \( p < .05 \) and OR = 1.64, \( p < .001 \), respectively). Females who engaged in aerobic or toning exercises 3 or more times/week to lose weight showed an increased risk of hopelessness (OR = 1.25, \( p < .01 \) and OR = 1.41, \( p < .001 \), respectively) and depression (OR = 1.24, \( p < .01 \) and OR = 1.42, \( p < .001 \), respectively). Females who performed some toning activities each week with the intent to lose weight also showed increased risk of suicidal behavior (OR = 1.29, \( p < .01 \)). Furthermore, females who performed aerobic or toning activities 3 or more times/week and dieted to lose weight demonstrated increased risk of suicide (OR = 1.22, \( p < .05 \) and OR = 1.26, \( p < .01 \), respectively).

**Discussion**

In a recent national survey, counseling center directors identified the increase in reports of student self-injury (54.9% in 2004 vs. 68.7% in 2005) as a big concern [134]. The publication *Healthy Campus 2010*, which outlines U.S. public health priorities, sets goals to reduce the rate
of completed suicide (Objective 18-1) and the rate of attempted suicide among college students (Objective 18-2) [135].

To our knowledge, we are the first to examine the association between strength or toning activity and suicide risk among college students, and this is one of only two studies to examine the effects of aerobic activity on suicide risk among college students. Findings provide empirical evidence that establishes the association between physical activity and reduced suicidality among young adults. Our findings also document that certain levels of physical activity relate to reduced risk of hopelessness and depression, two major risk factors associated with suicidal behavior. This study adds to the extant literature by describing the effects of different types of physical activity on suicide risk. Though strength or toning activities demonstrated a significant positive effect on suicidal behavior for both sexes, the association became non-significant after we controlled for participation in aerobic activity. Thus, our findings suggest that aerobic activity – compared with strength or toning activities – affords distinct protection against suicide risk among college students.

Our findings also support previous researchers who examined the association between physical activity and suicide risk. For example, similar to findings by Brosnahan et al. [72], Ferron et al. [4], and Simon et al. [70], we found that students who participated in frequent aerobic activity showed significantly less risk of suicidality. Our results for males also support the findings of Unger [9] and Brown and Blanton [10]. In contrast, our results for females did not support relationships found by Unger [9] or Brown and Blanton [10]. These researchers found that female exercisers, especially those who performed high-intensity activity, demonstrated increased suicide risk. Our findings showed that female college students benefited from the psychological advantages of physical exercise. Females who reported engaging in
some physical activity each week demonstrated reduced risk of hopelessness, depression, and suicidal behavior.

This study also adds to the literature regarding who receives psychological health benefits from physical activity and whose mental health may suffer as a result of frequent exercise [129]. Though our study confirmed the association between physical activity and enhanced mental health, we also found that motivation underlying exercise behavior must be considered. We observed significant associations between engaging in frequent exercise with the intent to lose weight and increased risk of hopelessness, depression, and suicidal behavior. Furthermore, our findings indicated that females who attempted to lose weight by combining frequent physical activity and deleterious dieting behavior also demonstrated greater suicide risk. Our results support theories that propose a complex relationship between body image and mental health, especially among females [9, 10, 129]. Strelan et al. [131] found that reasons for exercise behavior among young females mediated the relationships between self-objectification and body dissatisfaction, and self-esteem. In Strelan et al.’s [131] study, females who exercised for weight control, body tone, or attractiveness experienced increased body dissatisfaction and reduced self-esteem, compared with females who valued functional reasons for exercise (e.g., health, fitness, mood, enjoyment) [131]. Wild et al. [47] found that young females with low body image self-esteem, and those who reported low athletic self-esteem, were at increased risk of exhibiting suicidal behavior. Research addressing abnormal eating behaviors among females also supports positive associations between frequent exercise and disordered eating symptomatology [136], as well as between eating disorders and suicide risk [29].

Limitations

These data originated from a cross-sectional survey, so we were unable to determine causal relationships through the analyses. For instance, physical activity may mediate the lower
risk of suicidality or, conversely, suicidal young people may choose not to engage in physical exercise. Several symptoms associated with depressive disorders may prevent individuals from exercising [133]. Longitudinal and case-control studies can help identify potential cause-and-effect relationships between physical activity and suicidal behavior. Future investigations should explore reasons why young people participate in physical activity to determine if differences in involvement and non-involvement exist based on suicide status.

Our sample included young people currently attending college, which, by default, excluded individuals who did not attend college due to emotional or behavioral problems and those who succeeded in their suicide attempts. Participants who failed in their suicide attempts may possess different characteristics than do individuals who died by suicide. In addition, these data were obtained through self-report rather than objective measures and, because of procedures followed for the survey, we could not validate the self-reports. Participants completed a confidential survey, but they may have altered their responses to avoid embarrassment. Physical activity assessments based on use of movement devices, as well as medical record information documenting attempted suicides, can produce greater precision of measurement.

Conclusions

These findings highlight the prevalence of hopelessness, depression, and suicidal behavior among college students. They also indicate that younger students, females, and some racial minority groups experience increased prevalence of suicidality. Research suggests sex and race differences in the experience of and response to social strains associated with suicidal behavior [45, 137]. Thus, researchers need to account for sex and race differences when investigating suicidal behavior among young people.

Our findings showed significantly lower rates of hopelessness, depression, and suicidal behavior among college students who engaged in physical activity, compared with their inactive
counterparts. We also found significant relationships between physical activity, especially aerobic activity, and reduced risk of hopelessness, depression, and suicidal behavior among male and female college students. Our findings may support the use of physical activity as an adjunct modality in the treatment of depression [138]. However, practitioners working with young adults should assess their reasons for exercising to determine whether their motivation relates to appearance or health and enjoyment. Helping young people change their motivations for physical activity – from a means to look good to an opportunity to feel good – may improve their body satisfaction and self-esteem [131], as well as reduce their suicide risk. Furthermore, individuals in positions to detect disordered eating patterns and unfavorable perceptions of body appearance should become knowledgeable about the links to suicide risk and make referrals as necessary [103]. Future investigations should identify the mediating factors between physical activity and decreased suicide risk. Exploring the intricate connection between reduced levels of suicidality and participation in physical activity holds promise for improving our understanding of unique protective factors. Understanding the mechanisms that confer protection against suicidality will benefit suicidal individuals, parents, university personnel, practitioners working in community organizations, and mental health clinicians working with young adults. Findings from methodologically sound research may provide a foundation for intervention research in the prevention of suicide.
Table 3-1. Physical activity, hopelessness, depression, and suicidal behavior among college students

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td><strong>Aerobic activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No aerobic activity</td>
<td>3,350</td>
<td>21.7</td>
<td>7,114</td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>4,826</td>
<td>31.3</td>
<td>8,691</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>5,643</td>
<td>36.6</td>
<td>9,931</td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>1,590</td>
<td>10.3</td>
<td>2,354</td>
</tr>
<tr>
<td><strong>Strength or toning activity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No strength or toning activity</td>
<td>5,051</td>
<td>32.9</td>
<td>10,491</td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>4,043</td>
<td>26.3</td>
<td>8,413</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>5,168</td>
<td>33.7</td>
<td>7,810</td>
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<tr>
<td>6 to 7 times/week</td>
<td>1,083</td>
<td>7.1</td>
<td>1,312</td>
</tr>
<tr>
<td><strong>Hopelessness, depression, and suicidal behavior</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt hopeless</td>
<td>8,891</td>
<td>57.7</td>
<td>19,603</td>
</tr>
<tr>
<td>Felt depressed</td>
<td>6,153</td>
<td>40.0</td>
<td>13,917</td>
</tr>
<tr>
<td>Thought about suicide or attempted suicide</td>
<td>1,450</td>
<td>9.4</td>
<td>3,156</td>
</tr>
</tbody>
</table>

*** p < 0.001.
Table 3-2. Hopelessness, depression, and suicidal behavior among college students of various ages

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Felt hopeless</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-19 years old</td>
<td>3,105</td>
<td>58.0</td>
</tr>
<tr>
<td>20-22 years old</td>
<td>4,558</td>
<td>58.8</td>
</tr>
<tr>
<td>23-25 years old</td>
<td>1,228</td>
<td>53.5</td>
</tr>
<tr>
<td><strong>Felt depressed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-19 years old</td>
<td>2,104</td>
<td>39.4</td>
</tr>
<tr>
<td>20-22 years old</td>
<td>3,137</td>
<td>40.5</td>
</tr>
<tr>
<td>23-25 years old</td>
<td>912</td>
<td>39.7</td>
</tr>
<tr>
<td><strong>Thought about suicide or attempted suicide</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-19 years old</td>
<td>531</td>
<td>9.9</td>
</tr>
<tr>
<td>20-22 years old</td>
<td>729</td>
<td>9.4</td>
</tr>
<tr>
<td>23-25 years old</td>
<td>190</td>
<td>8.2</td>
</tr>
</tbody>
</table>

* *p < 0.05, ** *p < 0.01, *** *p < 0.001.
Table 3-3. Hopelessness, depression, and suicidal behavior among college students of various races and ethnicities

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th></th>
<th></th>
<th>Females</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>Chi-square</td>
<td>n</td>
<td>%</td>
<td>Chi-square</td>
</tr>
<tr>
<td>Felt hopeless</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>6,708</td>
<td>56.5</td>
<td>37.38***</td>
<td>14,422</td>
<td>68.6</td>
<td>73.09***</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>926</td>
<td>61.9</td>
<td>2,110</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>471</td>
<td>63.6</td>
<td>1,089</td>
<td>71.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>278</td>
<td>59.4</td>
<td>781</td>
<td>68.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>438</td>
<td>63.0</td>
<td>1,021</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt depressed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>4,595</td>
<td>38.8</td>
<td>49.57***</td>
<td>10,152</td>
<td>48.3</td>
<td>86.97***</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>684</td>
<td>45.9</td>
<td>1,535</td>
<td>54.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>338</td>
<td>45.7</td>
<td>799</td>
<td>52.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>177</td>
<td>37.9</td>
<td>539</td>
<td>46.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>317</td>
<td>45.7</td>
<td>774</td>
<td>56.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thought about suicide or attempted suicide</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1,047</td>
<td>8.8</td>
<td>30.79***</td>
<td>2,201</td>
<td>10.4</td>
<td>53.80***</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>179</td>
<td>12.0</td>
<td>400</td>
<td>14.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>92</td>
<td>12.4</td>
<td>185</td>
<td>12.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>39</td>
<td>8.3</td>
<td>140</td>
<td>12.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>84</td>
<td>12.1</td>
<td>195</td>
<td>14.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*** p < 0.001.
Table 3-4. Relative risk of hopelessness, depression, and suicidal behavior for college students engaging in various levels of aerobic activity compared to those not reporting any aerobic activity

<table>
<thead>
<tr>
<th>Level of aerobic activity</th>
<th>Felt hopeless</th>
<th>Felt depressed</th>
<th>Thought about suicide or attempted suicide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
<td>OR</td>
</tr>
<tr>
<td><strong>Males</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>0.88**</td>
<td>(0.81, 0.97)</td>
<td>0.82***</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>0.78***</td>
<td>(0.72, 0.86)</td>
<td>0.74***</td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>0.75***</td>
<td>(0.66, 0.84)</td>
<td>0.72***</td>
</tr>
<tr>
<td><strong>Females</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>0.94</td>
<td>(0.88, 1.01)</td>
<td>0.91**</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>0.83***</td>
<td>(0.77, 0.89)</td>
<td>0.80***</td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>0.81***</td>
<td>(0.73, 0.89)</td>
<td>0.76***</td>
</tr>
</tbody>
</table>

*Note.* <sup>a</sup>Though both are included in the same table, the data for males and females represent separate analyses. <sup>b</sup>Odds ratios were adjusted for age and race/ethnicity. ** p < 0.01, *** p < 0.001.
Table 3-5. Relative risk of hopelessness, depression, and suicidal behavior for college students engaging in various levels of strength or toning activity compared to those not reporting any toning activity

<table>
<thead>
<tr>
<th>Level of strength or toning activity</th>
<th>Felt hopeless</th>
<th>Felt depressed</th>
<th>Thought about suicide or attempted suicide</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OR</td>
<td>95% CI</td>
<td>OR</td>
</tr>
<tr>
<td><strong>Males</strong>a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>1.01</td>
<td>(0.93, 1.01)</td>
<td>0.98</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>0.89**</td>
<td>(0.82, 0.96)</td>
<td>0.84***</td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>0.83**</td>
<td>(0.73, 0.95)</td>
<td>0.85*</td>
</tr>
<tr>
<td><strong>Females</strong>a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>0.92**</td>
<td>(0.86, 0.98)</td>
<td>0.89***</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>0.89***</td>
<td>(0.84, 0.95)</td>
<td>0.81***</td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>0.96</td>
<td>(0.84, 1.09)</td>
<td>0.85**</td>
</tr>
</tbody>
</table>

*Note. aThough both are included in the same table, the data for males and females represent separate analyses. bOdds ratios were adjusted for age and race/ethnicity. * p < 0.05, ** p < 0.01, *** p < 0.001.
CHAPTER 4
HIGH SCHOOL YOUTH AND SUICIDE RISK: EXPLORING PROTECTION AFFORDED THROUGH PHYSICAL ACTIVITY AND SPORT PARTICIPATION

Introduction

Suicide represents the third leading cause of death for youth 15 to 24 years, accounting for 12.9% of all deaths in this age range [1]. According to the Centers for Disease Control and Prevention (CDC), between 2003 and 2004, the suicide rate increased 18% for youth under age 20, and suicides constituted the only cause of death that increased among adolescents [17]. In 2004, youth 15 to 24 years represented 14.2% of the U.S. population and comprised 13.3% of the suicides [1]. Though females attempt suicide more often than males, young males aged 15 to 19 are 3.6 times more likely than females to complete suicide [1]. Furthermore, for each completed suicide, an estimated 100 to 200 adolescents attempted to take their own lives [1]. Thus, Healthy People 2010 specifically targets reducing the rate of completed suicide (Objective 18-1) and the rate of attempted suicide among adolescents (Objective 18-2) [20]. The National Institute of Mental Health urges researchers to focus on decreasing the adolescent suicide rate by studying risk and protective factors [21].

Research indicates that physical activity affords the same psychological benefits to adolescents as to adults. Physical activity promotes positive emotional well-being [89] including improvements in depressed mood [88, 91, 139], anxiety and stress [88, 94], and self-esteem [89, 91, 140]. Therefore, through its effect on psychological well-being, physical activity may protect against suicidality. Physical activity in the context of team sports may afford additional protection by facilitating social support and integration [12]. Conversely, youth involved in
sports may benefit from psychosocial advantages that increase the likelihood of participation [141].

Researchers have only recently examined the possible protective association between physical activity, sport participation, and suicide risk. However, the few studies completed yielded equivocal findings. The results become more complicated when examined by sex. For example, Brosnahan et al. [72] found adolescents significantly less likely to plan suicide if they engaged in frequent, vigorous activity. Yet, they did not find a significant association between sport participation and suicidal behavior. Conversely, Brown and Blanton [10] found that, compared to inactive males, college students who reported low activity levels demonstrated reduced risk of suicidal behavior. However, neither moderately nor vigorously active males showed reduced suicide risk. Furthermore, moderately and vigorously active females actually showed increased levels of suicidal behavior, compared to inactive females. Notably, this study revealed that sport participation protected against suicidal behavior in both males and females. Compared to sport participants, male non-participants had 2.5 times the odds of reporting suicidal behavior, and female non-participants were 1.67 times more likely to report suicidal behavior.

Unger [9] found similarly complex relationships. Physical activity, especially when combined with team sports, related to lower rates of suicidal behavior for males. Yet, frequent, vigorous aerobic activity, especially without team sports, related to higher rates of suicidal behavior for females.

Though definitive reasons for these disparate results by sex remain unclear, researchers recognize that in young females, exercise behavior impacts mental health in complex ways. Thome and Espelage [129] found that exercise related to positive psychological health in college
females, but only when exercise remained unassociated with an eating disorder. Hayes et al. [132] highlighted body appearance as an important determinant of physical and global self-esteem, especially among females. Therefore, factors related to poor body image may contribute to low self-esteem, depression, and suicidal feelings that could influence the relationship between physical activity and suicidal behavior [9, 10].

Conversely, depressed or suicidal youth may choose not to engage in physical activity. Symptoms associated with depressive disorders may prevent individuals from exercising including diminished pleasure in daily activities, preference for time alone, fatigue, and psychomotor agitation or retardation [133]. Tomori and Zalar [51] found that adolescent females demonstrated reduced suicide risk if they perceived physical activity as an important determinant of health, and as a beneficial coping behavior during times of distress. For males in this study, reduced suicidality related to the attitude that exercise represents a healthy activity, as well as to higher frequency of involvement.

Methods

Procedures and Participants

This study investigated the relationships between physical activity, sport participation, and adolescent suicidal behavior based on data from the 2005 Youth Risk Behavior Survey (YRBS) [79]. This epidemiologic surveillance system, established by the CDC, monitors six categories of priority health-risk behaviors among youth, including behaviors that contribute to unintentional injuries and violence, tobacco use, alcohol and other drug use, sexual behaviors, unhealthy dietary behaviors, and physical inactivity. The YRBS constitutes a cross-sectional survey conducted every 2 years among representative samples of 9th- to 12th-grade students from schools across the United States.
Based on the preceding findings, this study posed 4 research questions: 1) Do adolescent males who engage in physical activity demonstrate reduced risk of hopelessness and suicidal behavior compared to inactive males?; 2) Do adolescent females who engage in vigorous physical activity demonstrate increased risk of hopelessness and suicidal behavior compared to inactive females?; 3) Do athletes of both sexes demonstrate reduced risk of hopelessness and suicidal behavior compared to non-athletes?; and 4) Do a subset of highly involved athletes of both sexes demonstrate reduced risk of hopelessness and suicidal behavior compared to non-athletes?

Participants included 13,857 students in grades 9 to 12 who completed the 2005 YRBS. Students ranged in age from 12 to 18 years (mean = 16.2 years, SD = 1.2 years). The sample included slightly more females (51.9%) than males (48.1%). Respondents reported their race/ethnicity as 44.7% white, 24.5% African American, 15.1% Hispanic, 8.4% multiple Hispanic, 2.9% multiple non-Hispanic, 2.7% Asian, 1.1% American Indian, and 0.7% Native Hawaiian.

Measures

Suicidal behavior

To assess suicidal ideation and behavior, participants responded to 3 questions regarding their thoughts and actions during the previous 12 months. Students indicated whether or not (yes or no) they had ever felt sad or hopeless almost everyday for two weeks in a row, seriously considered attempting suicide, or made a suicide plan, and how many times they actually attempted suicide. This assessment was found to have a good internal reliability (Cronbach’s alpha = .81). Few youth reported attempting suicide more than 2 or 3 times (1.5%), so we created 2 dichotomous measures – one indicating whether or not a participant had ever attempted suicide, and one indicating whether or not a participant had attempted suicide more than once.
**Physical activity**

Frequency of physical activity was assessed with 1 item: “On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as basketball, soccer, running, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?” Based on their responses, we grouped students into 4 categories: zero times/week, 1 to 2 times/week, 3 to 5 times/week, and 6 to 7 times/week.

**Sport participation**

Sport participation was assessed by 1 item: “During the past 12 months, on how many sports teams did you play? (Include any teams run by your school or community groups.).” First, we divided participants into 2 groups: those who participated in any number of sports, and those who did not participate. We subsequently grouped participants based on level of sport involvement: non-athletes (participated on no teams), moderately involved athletes (participated on 1 or 2 teams), and highly involved athletes (participated on 3 or more teams).

**Data Analysis**

Descriptive statistics were calculated to compare rates of hopelessness and suicidal behavior for male athletes (n = 3818) with male non-athletes (n = 2444), and for female athletes (n = 3281) with female non-athletes (n = 3609). Logistic regression analyses by sex were conducted to determine if physical activity and sport participation decreased the risk of feeling hopeless, suicidal thoughts, suicide plans, suicide attempts, or multiple suicide attempts. Age and race were included as covariates in all models. We also controlled for sport participation during the physical activity analyses and for physical activity during the sport analyses. Our analysis determined the relative risk of hopelessness and suicidality associated with different levels of physical activity as well as sport participation.
Results

Of 13,857 adolescents, 16.9% had seriously considered attempting suicide, 13.3% had made a suicide plan, 9.0% had attempted suicide, and 4.2% had attempted suicide multiple times. Most (81.8%) had engaged in physical activity at least once per week, and 54.0% participated in sports. Table 4-1 shows the distribution of physical activity, team sports, and suicidal behavior by sex. Males were more likely than females to participate in physical activity at least once per week (87.1% vs. 77.0%, respectively, $\chi^2 = 229.7$, $p < .001$). Males also showed higher rates of sport participation than did females (61.0% vs. 47.6%, respectively, $\chi^2 = 235.4$, $p < .001$). Females demonstrated increased prevalence of suicidality, with 21.8% reporting thoughts or behavior, compared with 11.7% of males ($\chi^2 = 250.6$, $p < .001$).

For females, but not males, the risk of hopelessness and suicidality decreased with age (Table 4-2). Table 4-3 presents the relative risk of hopelessness and suicidality for students reporting different races, compared to their white counterparts. Among both sexes, American Indian, multiple Hispanic, and multiple non-Hispanic students showed greater suicide risk. Among females only, Hispanic and Hawaiian students also demonstrated increased risk. However, American Indian and Hawaiian students were not oversampled, so these groups contain the smallest samples and the widest confidence intervals. Among both sexes, African American students demonstrated less suicide risk.

Our findings revealed that male athletes experienced lower rates of hopelessness and suicidality. Hopelessness was experienced by 18% of athletes, compared to 25% of non-athletes ($\chi^2 = 39.8$, $p < .001$). About 9% of male athletes had seriously considered suicide, compared to 14% of male non-athletes ($\chi^2 = 29.9$, $p < .001$). Only 8% of athletes had a suicide plan, while over 11% of non-athletes had a suicide plan ($\chi^2 = 20.5$, $p < .001$). Relatively few males actually
attempted suicide: 4% of athletes and 7% of non-athletes had attempted suicide ($\chi^2 = 16.9, p < .001$).

We found similar patterns among females. Hopelessness was experienced by 34% of athletes, compared to 41% of non-athletes ($\chi^2 = 30.8, p < .001$). About 20% of female athletes and 23% of female non-athletes had seriously considered suicide ($\chi^2 = 6.9, p < .05$). Similarly, 15% of athletes and 18% of non-athletes had created a suicide plan ($\chi^2 = 8.4, p < .01$). No significant difference was found for attempting suicide. Approximately 9% of female athletes had attempted suicide, compared to about 10% of female non-athletes.

Table 4-4 presents the relative risk of suicidality for male and female adolescents who engaged in various levels of physical activity. After controlling for sport participation, we found no relationship between low or moderate levels of physical activity and suicidality among male adolescents. However, males who exercised 6 to 7 times/week showed reduced risk of planning suicide (odds ratio [OR] = 0.67, $p < .01$), attempting suicide (OR = 0.65, $p < .05$), and attempting suicide multiple times (OR = 0.49, $p < .01$). Conversely, females who exercised 1 to 2 times/week were more likely to feel hopeless (OR = 1.22, $p < .01$), compared to inactive females. Though we did not find a significant difference in the rates of physical activity between females who reported suicidal behavior and those who did not, our findings revealed a link between suicidality and intention motivating exercise behavior. Specifically, females who exercised 1 to 2 or 6 to 7 times/week to lose weight demonstrated increased suicide risk (OR = 1.5, $p < .05$ and OR = 1.7, $p < .05$, respectively). Furthermore, females who engaged in some physical activity each week were more likely to consume fewer calories or foods low in fat (OR = 1.6, $p < .001$) and to take diet supplements (OR = 1.4, $p < .05$) to lose weight. These 2
behaviors significantly increased suicide risk (OR = 1.71, \( p < .001 \) and OR = 3.13, \( p < .001 \), respectively).

Sport participation was significantly associated with reduced the odds of hopelessness and suicidal behavior among both sexes (Table 4-5). Male athletes were less likely to feel hopeless (OR = 0.71, \( p < .001 \)), and consider (OR = 0.71, \( p < .001 \)), plan (OR = 0.76, \( p < .01 \)), or attempt (OR = 0.70, \( p < .01 \)) suicide. Highly involved male athletes had reduced odds of feeling hopeless (OR = 0.63, \( p < .001 \)) and of considering (OR = 0.66, \( p < .01 \)) or planning (OR = 0.68, \( p < .01 \)) suicide than non-athletes. Female athletes demonstrated reduced risk of hopelessness (OR = 0.76, \( p < .001 \)), considering suicide (OR = 0.80, \( p < .001 \)), planning suicide (OR = 0.79, \( p < .001 \)), and attempting suicide multiple times (OR = 0.76, \( p < .05 \)). Compared to non-athletes, highly involved female athletes were less likely to feel hopeless (OR = 0.63, \( p < .001 \)) or consider suicide (OR = 0.79, \( p < .05 \)).

**Discussion**

These data originated from a cross-sectional survey, so one limitation involves the inability to determine causal relationships. For instance, sport participation may mediate the lower risk of suicidality or, conversely, suicidal youth may choose not to become involved in sports. High school athletes enjoy elevated popularity [141] and self-esteem [5]. Youth at risk for suicide often feel socially isolated and rejected by their peers [142]. Therefore, possessing confidence and feeling socially accepted may represent factors that prompt youth to participate in sports, rather than outcomes of participation. Longitudinal and case-control studies would help clarify the direction of causality. Also, our sample included youth currently attending high school, which excluded adolescents who do not attend school because of emotional or behavioral problems, and youth who succeeded in their suicide attempts. The youth in our sample who failed in their suicide attempts may possess different characteristics than suicide completers.
These data also reflect self-report rather than objective measures, and we did not validate self-reports. Though respondents completed a confidential survey, they may have altered their responses to avoid embarrassment. Physical activity assessments based on movement devices, and medical record information documenting attempted suicides, would produce greater precision of measurement.

Psychometric tests indicated our assessment of suicidality was reliable; however, the 3-question format could represent a limitation. Reynolds and Mazza [2] caution that “research on suicidal ideation or group assignment predicated on one or two questions regarding having thoughts of suicide lacks sufficient specificity for defining this domain of suicidality and obscures the relative importance of suicidal ideation as a component of suicide risk in youth” [2, p.533]. Despite these limitations, our findings contribute to understanding physical activity and sport as protective factors against adolescent suicide.

Though our analyses did not focus on age and race, noteworthy patterns emerged among these variables. Consistent with previous research, suicide risk decreased with age for females, but not for males [12]. Our findings regarding race also support previous research [143, 144]. Compared to white students, American Indian, multiple Hispanic, and multiple non-Hispanic students demonstrated increased suicide risk. Hispanic and Hawaiian females also showed increased risk, compared to white females. However, among both sexes, African American students were less likely to consider and plan suicide than their white counterparts.

**Physical Activity**

Our first research question tested whether or not engaging in physical activity decreased the risk of suicidality among males. After controlling for sport, we found that only frequent exercise significantly reduced suicide risk. Also tested was whether or not vigorous activity
increased suicide risk among females. We found only one statistically significant relationship between low levels of activity and increased risk of hopelessness.

Only 3 studies published to date have investigated the separate effects of physical activity and sport [9, 10, 72]. Other investigations either combined physical activity and sport into a composite variable [4, 51, 70, 71] or examined sport independently [5-8, 11, 12, 145]. Though Brosnahan et al. [72] found that youth who participated in higher levels of vigorous activity showed less suicide risk, the researchers did not perform sex-specific analyses. Therefore, our results regarding males, but not females, support the findings of Brosnahan et al. [72]

Our findings also support relationships found by Unger [9] and by Brown and Blanton [10]. Unger [9], who determined the relative risk of suicidality associated with 6 physical activity/team sports combinations, found consistently lower rates of suicidal behavior among males who engaged in various levels of physical activity. However, female exercisers, especially those who performed high-intensity activity, demonstrated increased suicide risk. Though our study did not find as many statistically significant relationships between physical activity and suicidal behavior, our results for males and females generally support Unger’s [9] findings.

Similar to methods by Brown and Blanton [10], we controlled for sport participation in our physical activity analysis. Their study found that male college students who participated in low-intensity activity demonstrated reduced suicide risk. However, neither moderately nor vigorously active men showed decreased risk in Brown and Blanton’s [10] study. Similar to findings by Unger [9], Brown and Blanton [10] found that physically active females demonstrated increased risk compared to less active females.

One possible explanation for inconsistency between our findings and findings by Brown and Blanton [10] involves methods used to determine physical activity and suicide behavior.
Brown and Blanton [10] categorized students into 5 activity levels based on their responses to 2 questions: one assessed vigorous activity, and one other estimated moderate-intensity activity. In contrast, we categorized our participants into 4 physical activity groups based on their response to 1 question assessing high-intensity activity. Brown and Blanton [10] also collapsed 3 items that assessed suicide thoughts, plans, and attempts into a single variable. Our analysis examined these behaviors separately. Another explanation involves disparate samples. Whereas Brown and Blanton [10] addressed behavior among college students, we examined high school youth behavior.

Consistent with previous research [51], we did not find a significant difference in the rates of physical activity behavior between females who reported suicidal tendencies and those who did not. However, for females, exercising to lose weight, as well as restricting calories or taking diet supplements to attain the same goal, significantly increased suicide risk. Therefore, among females in our sample, findings regarding suicide risk and physical activity appear to support theories that suggest a complex relationship between body image and suicidal behavior [9, 10, 129].

Our findings indicate that physical activity alone may not protect against adolescent suicidality, especially among young females. Positive relationships between physical activity and reduced suicidality found in past research that used a composite independent variable may reflect the effects of sport rather than the benefits provided by physical activity.

**Sport Participation**

Findings regarding sport participation support previous investigations that compared the relative risk of suicidal behavior between athletes and non-athletes [6, 9, 11, 12]. After controlling for physical activity, sport participation remained a significant factor in reducing suicidality among both sexes. Compared to non-athletes, male athletes showed reduced risk of
feeling hopeless and considering, planning, or attempting suicide. Young males involved in multiple sports attained even greater protection against hopelessness and suicidality than non-athletes. Compared to non-athletes, female athletes demonstrated reduced risk of hopelessness, considering suicide, planning suicide, and attempting suicide multiple times. Highly involved female athletes were less likely to feel hopeless or consider suicide than non-athletes. These findings support Brown and Blanton’s [10] investigation of sport’s effect on suicidal behavior among college students.

Research suggests that physical activity provides significant mental health benefits. Our findings indicate that, in addition to physical activity, sport may protect against suicidality through other mechanisms. We hypothesize that sport offers unique protection against adolescent suicidality by providing social support and integration. Youth who report strong social support exhibit higher levels of resilience, less hopelessness, and reduced suicide risk [41, 58]. Adolescents demonstrate less suicide risk if they perceive family, friends, and peers as accepting; possess more positive friendships; and feel connected to school [146]. Bearman and Moody [46] found that the friendship environment affected suicidality for both males and females. However, for females, social network effects played an especially prominent role. Females who were socially isolated from the adolescent community demonstrated significantly greater suicide risk than females embedded in cohesive friendship groups [46].

Extracurricular activities provide adolescents an opportunity to establish positive social relationships and networks [147]. Harrison and Narayan [5] examined relationships among sport, other extracurricular activities, psychological factors, and suicidal behavior. Findings indicated that “those involved in team sports at school (alone or combined with other activities)…were most likely to report high self-esteem and were least likely to report sadness,
anxiety, and suicidal behavior” [5, p.118]. These authors concluded that engaging in any organized activity imparted some benefit, but sport participation afforded unique positive advantages [5].

Athletes may experience greater social integration when they become members of a social network that includes teammates, coaches, health professionals, family, and community [12]. The team sport environment represents a fertile ground for adolescent self-esteem development because teams provide opportunities for youth to engage with adults and peers to achieve collective goals [108]. Through its capacity to foster feelings of social support and integration, sport participation may create a distinct form of protection against risk factors associated with adolescent suicide. Females, especially, may benefit from physical activity performed in the context of team sports. In addition to athletic competition, females also participate in sports to improve their fitness levels, improve their athletic skills, and enjoy group interaction [103]. A report from The President’s Council on Physical Fitness and Sports [103] noted that “sport participation can enhance mental health by offering adolescent females positive feelings about body image, improved self-esteem, tangible experiences of competency and success, and increased self-confidence” [p.15]. Research supports the positive association between sport participation and improved self-concept among young females. For example, Pedersen and Seidman [108] found that females’ team sport achievement experiences in early adolescence related to increased self-esteem in middle adolescence. Similarly, Richman and Shaffer [76] found that high school sport participation contributed to higher self-esteem among female college students.

**Conclusions**

This study confirmed findings from previous research on the high prevalence of hopelessness and suicidal behavior among adolescents. Our findings also reinforced past
research indicating that younger students, females, and some racial minorities experience increased suicide risk. Research suggests sex and race differences in the experience of and response to social strains associated with suicidal behavior [45, 137]. Thus, researchers need to account for sex and race differences when investigating adolescent suicide.

Our findings showed significantly lower rates of hopelessness and suicidality among male and female athletes, compared to their non-athlete counterparts. We also found a significant relationship between frequent, vigorous activity and reduced risk of hopelessness and suicidality among male adolescents. However, low levels of activity were actually associated with increased risk of feeling hopeless among females. Furthermore, among females, exercising and engaging in deleterious dieting behavior to lose weight were associated with increased suicide risk. Individuals in a primary position to recognize disordered eating patterns and unfavorable perceptions of body appearance must become knowledgeable about these links and make referrals as necessary.

For both sexes, we found that sport participation related to reduced risk of hopelessness and suicidal behavior. By controlling for physical activity, while examining the effect of sport, our study makes a unique contribution to the literature regarding adolescent suicidality and sport participation. Our findings suggest that mechanisms other than physical activity contribute to the protective association between sport and reduced suicidality. Future investigations should identify the mediating factors between sport involvement and decreased suicide risk. Researchers should examine the effect of social connectedness within sport involvement and how this effect specifically relates to suicidal behavior. Researchers also should conduct case-control studies to identify potential cause-and-effect relationships between physical activity, sport participation, and adolescent suicidality. In addition, future investigations should explore
reasons why adolescents participate in physical activity to determine if differences in involvement and non-involvement exist based on suicidal status.

Findings that indicate athletes of both sexes display less suicide risk compared to their non-athlete counterparts suggest opportunities for prevention and merit serious consideration in public health policy and planning [12]. Exploration of the intricate connection between reduced suicidality and adolescent participation in sports holds promise for improving our understanding of unique protective factors. Understanding the mechanisms that confer protection against adolescent suicidality will benefit suicidal youth, parents, school personnel, community youth organizations, and mental health clinicians working with youth. Findings from methodologically sound research may provide a foundation for intervention research in the prevention of adolescent suicide.
Table 4-1. Physical activity, team sports participation, feelings of hopelessness, and suicidality in adolescent males and females

<table>
<thead>
<tr>
<th>Variable</th>
<th>Males</th>
<th></th>
<th>Females</th>
<th></th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physical activity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No physical activity</td>
<td>810</td>
<td>12.9</td>
<td>1590</td>
<td>23.0</td>
<td>229.7***</td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>1024</td>
<td>16.2</td>
<td>1603</td>
<td>23.2</td>
<td></td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>2149</td>
<td>34.1</td>
<td>2396</td>
<td>34.7</td>
<td></td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>2319</td>
<td>36.8</td>
<td>1313</td>
<td>19.0</td>
<td></td>
</tr>
<tr>
<td><strong>Sport participation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No sport</td>
<td>2444</td>
<td>39.0</td>
<td>3609</td>
<td>52.4</td>
<td>235.4***</td>
</tr>
<tr>
<td>Sport participant</td>
<td>3818</td>
<td>61.0</td>
<td>3281</td>
<td>47.6</td>
<td></td>
</tr>
<tr>
<td><strong>Level of sport involvement</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Sport</td>
<td>2444</td>
<td>39.0</td>
<td>3609</td>
<td>52.4</td>
<td>319.7***</td>
</tr>
<tr>
<td>Moderately involved (1-2 teams)</td>
<td>2744</td>
<td>43.8</td>
<td>2664</td>
<td>38.7</td>
<td></td>
</tr>
<tr>
<td>Highly involved (3 + teams)</td>
<td>1074</td>
<td>17.2</td>
<td>617</td>
<td>9.0</td>
<td></td>
</tr>
<tr>
<td><strong>Hopelessness and suicidal behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Felt sad or hopeless</td>
<td>1417</td>
<td>21.5</td>
<td>2719</td>
<td>38.1</td>
<td>447.7***</td>
</tr>
<tr>
<td>Thought about suicide</td>
<td>772</td>
<td>11.7</td>
<td>1558</td>
<td>21.8</td>
<td>250.6***</td>
</tr>
<tr>
<td>Planned suicide</td>
<td>641</td>
<td>9.7</td>
<td>1187</td>
<td>16.6</td>
<td>141.9***</td>
</tr>
<tr>
<td>Attempted suicide</td>
<td>371</td>
<td>6.3</td>
<td>745</td>
<td>11.5</td>
<td>101.8***</td>
</tr>
<tr>
<td>Multiple suicide attempts</td>
<td>174</td>
<td>3.0</td>
<td>349</td>
<td>5.4</td>
<td>44.9***</td>
</tr>
</tbody>
</table>

*** p < 0.001.
Table 4-2. Physical activity, team sports participation, feelings of hopelessness, and suicidality in adolescent males and females

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Felt sad or hopeless</th>
<th>OR 95% (Confidence Interval)</th>
<th>Thought about suicide</th>
<th>Planned suicide</th>
<th>Attempted suicide</th>
<th>Multiple suicide attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤12-14 years old</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
</tr>
<tr>
<td>15-16 years old</td>
<td>1.05 (0.82, 1.35)</td>
<td>1.16 (0.84, 1.61)</td>
<td>1.13 (0.80, 1.59)</td>
<td>1.32 (0.82, 2.11)</td>
<td>1.30 (0.66, 2.55)</td>
<td></td>
</tr>
<tr>
<td>17 years or older</td>
<td>1.15 (0.89, 1.47)</td>
<td>1.18 (0.85, 1.64)</td>
<td>1.00 (0.70, 1.41)</td>
<td>1.00 (0.62, 1.61)</td>
<td>1.24 (0.63, 2.45)</td>
<td></td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤12-14 years old</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
</tr>
<tr>
<td>15-16 years old</td>
<td>1.03 (0.86, 1.23)</td>
<td>1.01 (0.82, 1.23)</td>
<td>0.95 (0.77, 1.19)</td>
<td>0.97 (0.75, 1.27)</td>
<td>0.91 (0.63, 1.32)</td>
<td></td>
</tr>
<tr>
<td>17 years or older</td>
<td>0.94 (0.78, 1.12)</td>
<td>0.76** (0.61, 0.93)</td>
<td>0.71** (0.57, 0.90)</td>
<td>0.66** (0.50, 0.87)</td>
<td>0.65* (0.44, 0.96)</td>
<td></td>
</tr>
</tbody>
</table>

**Note.** Though these analyses are presented in a separate table, the variables were included as covariates in the physical activity and sport analyses. *p < 0.05, **p < 0.01.
Table 4-3. Relative risk of hopelessness and suicidality for adolescents of different races/ethnicities compared to white adolescents

<table>
<thead>
<tr>
<th>Race/ethnic group</th>
<th>OR 95% (Confidence Interval)</th>
<th>Felt sad or hopeless</th>
<th>Thought about suicide</th>
<th>Planned suicide</th>
<th>Attempted suicide</th>
<th>Multiple suicide attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td>1.74* (1.06, 2.86)</td>
<td>1.90* (1.10, 3.30)</td>
<td>1.83* (0.99, 3.38)</td>
<td>3.99*** (2.08, 7.65)</td>
<td>4.01** (1.66, 9.68)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1.35 (0.94, 1.93)</td>
<td>1.04 (0.66, 1.64)</td>
<td>1.13 (0.69, 1.84)</td>
<td>1.34 (0.71, 2.55)</td>
<td>1.59 (0.67, 3.77)</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>1.04 (0.88, 1.22)</td>
<td>0.53*** (0.42, 0.67)</td>
<td>0.53*** (0.41, 0.69)</td>
<td>1.09 (0.79, 1.49)</td>
<td>1.14 (0.73, 1.80)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.45*** (1.21, 1.74)</td>
<td>0.81 (0.63, 1.04)</td>
<td>0.86 (0.66, 1.13)</td>
<td>1.20 (0.84, 1.71)</td>
<td>1.53 (0.95, 2.47)</td>
<td></td>
</tr>
<tr>
<td>Hawaiian</td>
<td>2.17* (1.10, 4.28)</td>
<td>1.90 (0.86, 4.19)</td>
<td>2.06 (0.89, 4.75)</td>
<td>1.18 (0.28, 5.02)</td>
<td>1.29 (0.17, 9.64)</td>
<td></td>
</tr>
<tr>
<td>Multiple Hispanic</td>
<td>1.59*** (1.28, 1.97)</td>
<td>1.26 (0.97, 1.64)</td>
<td>1.42** (1.07, 1.88)</td>
<td>1.87*** (1.29, 2.70)</td>
<td>2.72*** (1.70, 4.35)</td>
<td></td>
</tr>
<tr>
<td>Male Hispanic</td>
<td>1.47* (1.02, 2.13)</td>
<td>1.77*** (1.18, 2.65)</td>
<td>2.13*** (1.40, 3.24)</td>
<td>1.45 (0.74, 2.83)</td>
<td>0.96 (0.29, 3.13)</td>
<td></td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td>1.00 (referent)</td>
<td></td>
</tr>
<tr>
<td>American Indian</td>
<td>0.78 (0.44, 1.40)</td>
<td>1.73* (0.99, 3.04)</td>
<td>0.98 (0.47, 2.02)</td>
<td>2.09* (1.00, 4.38)</td>
<td>2.25 (0.87, 5.79)</td>
<td></td>
</tr>
<tr>
<td>Asian</td>
<td>1.09 (0.79, 1.51)</td>
<td>0.84 (0.57, 1.25)</td>
<td>1.01 (0.67, 1.55)</td>
<td>0.85 (0.47, 1.52)</td>
<td>0.79 (0.34, 1.84)</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>1.14* (1.00, 1.29)</td>
<td>0.73*** (0.62, 0.85)</td>
<td>0.84* (0.70, 1.00)</td>
<td>0.96 (0.77, 1.20)</td>
<td>0.77 (0.55, 1.08)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.47*** (1.28, 1.70)</td>
<td>1.09 (0.92, 1.29)</td>
<td>1.25** (1.04, 1.50)</td>
<td>1.74*** (1.40, 2.16)</td>
<td>1.65*** (1.22, 2.23)</td>
<td></td>
</tr>
<tr>
<td>Hawaiian</td>
<td>1.46 (0.80, 2.67)</td>
<td>1.73 (0.91, 3.31)</td>
<td>2.07* (1.05, 4.08)</td>
<td>2.56* (1.16, 5.66)</td>
<td>2.46 (0.86, 7.07)</td>
<td></td>
</tr>
<tr>
<td>Multiple Hispanic</td>
<td>1.69*** (1.41, 2.02)</td>
<td>1.30** (1.06, 1.59)</td>
<td>1.26* (1.00, 1.59)</td>
<td>1.91*** (1.47, 2.48)</td>
<td>1.77** (1.23, 2.55)</td>
<td></td>
</tr>
<tr>
<td>Female Hispanic</td>
<td>1.46* (1.09, 1.96)</td>
<td>1.69*** (1.24, 2.32)</td>
<td>1.93*** (1.39, 2.69)</td>
<td>1.75** (1.15, 2.66)</td>
<td>1.93* (1.12, 3.33)</td>
<td></td>
</tr>
</tbody>
</table>

Note. *Though these analyses are presented in a separate table, the variables were included as covariates in the physical activity and sport analyses. *p < 0.05, **p < 0.01, ***p < 0.001.
Table 4-4. Relative risk of hopelessness and suicidality for adolescents with various levels of physical activity compared to those not reporting any physical activity

<table>
<thead>
<tr>
<th>Level of physical activity</th>
<th>Felt sad or hopeless</th>
<th>Thought about suicide</th>
<th>Planned suicide</th>
<th>Attempted suicide</th>
<th>Multiple suicide attempts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>1.08 (0.86, 1.35)</td>
<td>0.93 (0.70, 1.23)</td>
<td>1.12 (0.83, 1.50)</td>
<td>1.00 (0.68, 1.48)</td>
<td>0.79 (0.47, 1.33)</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>0.91 (0.74, 1.11)</td>
<td>0.79 (0.61, 1.02)</td>
<td>0.76 (0.58, 1.00)</td>
<td>0.75 (0.52, 1.07)</td>
<td>0.63 (0.39, 1.01)</td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>0.84 (0.68, 1.03)</td>
<td>0.77 (0.60, 1.00)</td>
<td>0.67** (0.50, 0.89)</td>
<td>0.65* (0.45, 0.95)</td>
<td>0.49** (0.29, 0.81)</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 2 times/week</td>
<td>1.22** (1.06, 1.42)</td>
<td>1.10 (0.92, 1.31)</td>
<td>1.02 (0.85, 1.24)</td>
<td>1.08 (0.85, 1.37)</td>
<td>0.93 (0.67, 1.29)</td>
</tr>
<tr>
<td>3 to 5 times/week</td>
<td>1.04 (0.90, 1.19)</td>
<td>1.01 (0.85, 1.19)</td>
<td>0.84 (0.70, 1.00)</td>
<td>0.94 (0.76, 1.19)</td>
<td>0.88 (0.64, 1.20)</td>
</tr>
<tr>
<td>6 to 7 times/week</td>
<td>0.99 (0.84, 1.17)</td>
<td>1.06 (0.88, 1.29)</td>
<td>1.09 (0.88, 1.34)</td>
<td>1.02 (0.78, 1.32)</td>
<td>0.89 (0.61, 1.29)</td>
</tr>
</tbody>
</table>

*Note:* Though both are included in the same table, the data for males and females represent separate analyses. *Odds ratios were adjusted for age, race/ethnicity, and sport participation.* *p < 0.05, **p < 0.01.
### Table 4-5. Relative risk of hopelessness and suicidality for athletes compared to non-athletes

<table>
<thead>
<tr>
<th></th>
<th>OR 95% (Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Felt sad or hopeless</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
</tr>
<tr>
<td>Sport participation b</td>
<td>0.71*** (0.62, 0.81)</td>
</tr>
<tr>
<td><strong>Level of sport involvement b</strong></td>
<td></td>
</tr>
<tr>
<td>Moderately involved</td>
<td>0.74*** (0.64, 0.85)</td>
</tr>
<tr>
<td>Highly involved</td>
<td>0.63*** (0.51, 0.77)</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
</tr>
<tr>
<td>Sport participation b</td>
<td>0.76*** (0.69, 0.85)</td>
</tr>
<tr>
<td><strong>Level of sport involvement b</strong></td>
<td></td>
</tr>
<tr>
<td>Moderately involved</td>
<td>0.79** (0.71, 0.88)</td>
</tr>
<tr>
<td>Highly involved</td>
<td>0.63*** (0.52, 0.77)</td>
</tr>
</tbody>
</table>

**Note.** aThough both are included in the same table, the data for males and females represent separate analyses. bThough both are included in the same table, the data for the sport participation variable and the level of sport involvement variable represent two separate analyses. cOdds ratios were adjusted for age, race/ethnicity, and physical activity. *p < 0.05, **p < 0.01, ***p < 0.001.
CHAPTER 5
EXPLORING POTENTIAL MEDIATING PATHWAYS THROUGH WHICH PARTICIPATION IN SPORTS RELATES TO REDUCED RISK OF SUICIDAL IDEATION

Introduction

Suicide is the thirteenth leading cause of death worldwide [148], and the eleventh leading cause of death in the United States [18]. According to the World Health Organization (WHO), suicide rates among young people have increased so dramatically that now youth represent the group at highest risk in a third of countries – developed and developing countries [149]. Suicide ranks as the third leading cause of death for American youth 15 to 24 years [1], and the second leading cause of death among U.S. college students [14, 15]. Prevalence data suggest that approximately 1,100 suicides occur annually among U.S. college students aged 18 to 24 [15]. Suicidal ideation and attempts remain even more prevalent [14]. An estimated 1 in 12 college students has made a suicide plan [1], and approximately 24,000 suicide attempts occur annually among U.S. college students [15]. In 2007, 9.8% of college students seriously considered suicide, and 1.5% actually attempted suicide during the previous school year [150]. Healthy Campus 2010, based on public health priorities for the U.S., sets goals to reduce the rate of completed suicide (Objective 18-1) and the rate of attempted suicide (Objective 18-2) among college students [135].

Involvement in sports may provide distinct protection against suicide through multiple mechanisms. Sport participants benefit from the psychological advantages of physical activity including improvements in overall emotional well-being, depressed mood, anxiety and stress, and self-esteem [88, 89, 92, 93, 151]. Sport participants also experience greater social integration and support when they become members of an extended social network [12]. Brown [80] reviewed the literature regarding physical activity, sport participation, and suicidal behavior. Most research found inverse relationships between sport participation and suicidality (i.e.,
suicidal thoughts or behavior) among adolescents and young adults. Compared to non-
participants, sport participants report less frequent feelings of hopelessness [3], and less risk of
sadness, depression, and suicidal behavior [5-13, 73].

However, this field remains in its infancy and, thus, suffers from methodological
weaknesses that often accompany emerging areas of study [80]. Many studies incorporated
limited assessments and definitions of dependent and independent variables [80]. Most research
that investigated sport participation and suicidal behavior included only one question to assess
suicidal ideation: seriously considered attempting suicide in the past 12 months. In fact, only [7]
used items from a standardized suicide questionnaire and index. Yet, Reynolds and Mazza [2]
caution that suicidal ideation, as a component of suicidal behavior, must be viewed as a
multifaceted construct that requires much more than a single item regarding whether or not
young people have thought about killing themselves. According to these investigators, “research
on suicidal ideation or group assignment predicated on one or two questions regarding having
thoughts of suicide lacks sufficient specificity for defining this domain of suicidality and
obscures the relative importance of suicidal ideation as a component of suicide risk in youth” [2,
p.533]. Thus, to advance the science in this area, future research should include efforts to
achieve greater precision of measurement and, in turn, confidence in study outcomes [80].

In addition, most research addressing sport participation and suicide risk has remained
atheoretical, and originated from secondary data analysis of existing data sets that contained
survey information about a number of health issues [80]. However, as Brown [80] explains,
“relying on existing data sets to evaluate this topic relegates researchers to using variables that
may lack the precision necessary to identify associations of interest” [p.496]. Thus, researchers
have not conducted original research focused on investigating the relationship between sport
participation and suicidal behavior, systematically evaluated hypothetical mechanisms to explain
the association between sport participation and reduced suicidality, or placed research questions
into a theoretical framework, especially among college students. Research evaluating
relationships between sport participation and suicidal behavior must account for primary factors
that mediate between a study’s dependent and independent variables [80]. Finally, Harrison and
Narayan [5] were the only investigators to examine relationships among sport, other
extracurricular activities, and suicidal behavior. Yet, to identify sport as a distinct protective
factor against suicidality, research must demonstrate that sport participation provides unique
benefits compared to involvement in other extracurricular activities.

The present investigation further explored the effect of sport participation on suicidal
ideation, and addressed key methodological limitations in previous research. This study
addressed the limitation in measurement of suicidality by incorporating a standardized 25-item
measure of suicidal ideation that demonstrated good reliability. The authors also filled a void by
designing a study with the purpose to test a model that incorporated potential mechanisms
through which collegiate sport participation relates to reduced risk of suicidal ideation among
college students (Figure 5-1). Risk factors for suicide include depression [34, 128], hopelessness
[41, 128], low self-esteem [42, 48], and loneliness [46, 58]. The theoretical framework
underlying the model suggests sport participation produces mental health benefits that protect
against these risk factors through both physiological and social support mechanisms. Physical
activity enhances self-esteem and ameliorates depressive symptoms [89, 151]. Social support
positively impacts depression, hopelessness, and loneliness [58, 152]. A study hypothesis
posited that the synergistic effect of these mechanisms protects sport participants against suicidal
ideation. Finally, in addition to sport participation, measures assessed involvement in other
university-sponsored activities. Thus, analyses also tested the hypothesis that participating in sports provides college students increased protection against suicidal ideation more effectively than does participating in other activities.

**Methods**

**Procedures and Participants**

The protocol was approved by the university Institutional Review Board. Questionnaires were completed as a voluntary, in class activity. The principal investigator surveyed a convenience sample of students enrolled in undergraduate lecture courses: four from the Department of Health Education and Behavior, three from the Department of Psychology, and two from the Department of Sociology. Each instructor determined whether or not his/her students received extra credit for participating in this study. Participants received the survey from the principal investigator in a large catalog envelope. Each participant also received a consent form that stated consent for participation was implied upon completion of the anonymous survey. Participants were not required to sign the consent form. Students were instructed to use the informed consent form as a cover sheet, to place their completed questionnaires into the envelope prior to submitting the survey, and to take their consent form with them after completing the survey. Participants were assured non-participation would not adversely affect their course grade. To guarantee anonymity, no names were included on questionnaires. Participants were informed that the study measures may elicit distressing feelings, and the informed consent form included information regarding mental health services. Participants required approximately 20 minutes to complete the study measures.

The sample included 522 students enrolled in undergraduate courses at a large southeastern university in the United States. After eliminating invalid or incomplete
questionnaires, 450 participants remained in the study. Students whose data were eliminated from the analyses did not differ significantly from participants who returned valid and complete questionnaires regarding sex, age, or race/ethnicity. Most participants were female (n = 333, 74%). Participants ranged in age from 18 to 24 years (M = 19 years, SD = 1.49). Approximately 61% reported their class standing as freshman or sophomore. Participants reported their race/ethnicity as 61% white/non-Hispanic, 14% Hispanic, 13% African American, 8% Asian, and 5% American Indian, Native Hawaiian, or Other (categorized as “Other”).

Measures

Involvement in other extracurricular activities

Involvement in other extracurricular activities was assessed with 1 item created for this research: “During the past 12 months, how many [university]-sponsored clubs or organizations (not including sport teams) have you been a member of?” Among the students who provided information regarding the types of non-sport activities in which they participated, most reported participating in academic or career clubs; or religious, social, or service organizations. Participants were divided into 2 groups: those who participated in other university activities, and those who did not participate.

Antecedent variable

Sport participation: Sport participation during the previous 12 months was determined by 2 items developed for this research: “During the past 12 months, on how many varsity or club sports teams run by [the university] did you play?” (extramural sports); and “During the past 12 months, on how many intramural sports teams run by [the university] did you play?” First participants were grouped into 3 categories: those who participated in intramural sports, those who participated in extramural sports, and those who did not participate in university sports. Participants were subsequently divided into 2 groups: those who participated in sports,
and those who did not participate. The latter dichotomy corresponded to the assessment of sport participation as measured by the Centers for Disease Control and Prevention’s (CDC) National College Health Risk Behavior Survey (NCHRBS) (i.e., involvement in intramural or extramural college sports) [153]. The specific rationale for collapsing the data for intramural and extramural sport participants is provided in the results section.

**Intervening variables**

**Physical activity:** Participants were asked two physical activity questions drawn from CDC’s Youth Risk Behavior Survey [79]: 1) “On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as jogging, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?” (*vigorous exercise*); and 2) “On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?” (*moderate exercise*).

**Social support:** The 25-item Personal Resource Questionnaire (PRQ85) - Part II measures relational provisions in Weiss’s [152] definition of social support (attachment, social integration, opportunity for nurturing behavior, reassurance of worth, a sense of reliable alliance, and obtaining information and guidance in stressful situations) [154]. Respondents rate statements on a 4-point Likert scale (strongly agree to strongly disagree). Scores range from 25 to 100, with higher scores indicating higher perceived social support. The scale produced an internally consistent measure of perceived social support (α = .93). The data distribution was also normal (skewness = -.72; kurtosis = .09).

**Self-esteem:** The Rosenberg Self-Esteem Scale (RSES) includes 10 general statements that assess global aspects of self-worth, confidence, and self-approval [155]. Respondents rate statements on a 4-point Likert scale (strongly agree to strongly disagree). Scores range from 10
to 40, with higher scores indicating higher self-esteem. This measure demonstrated an acceptable level of internal consistency ($\alpha = .92$), and the skewness (-.63) and kurtosis (-.09) values were in the acceptable range.

**Depression:** The 20-item Center for Epidemiological Studies Depression Scale (CES-D) measures depressive symptomatology [156]. Scores range from 0 to 60, with higher scores indicating greater frequency and number of depressive symptoms. Internal consistency of the measure in the current study was $\alpha = .91$. The skewness value was 1.17, and the kurtosis value was 1.04.

**Hopelessness:** The 20-item Beck Hopelessness Scale (BHS) measures negative expectations about the future [157]. Each item elicits a true/false response. Total scores range from 0 to 20, with higher scores indicating a greater degree of hopelessness. In this study, internal consistency for this scale was acceptable ($\alpha = .79$). However, the skewness (2.40) and kurtosis (7.62) values were slightly out of range. Therefore, as suggested by Tabachnick and Fidell [158] and Howell [159], the Logarithmic (Log 10) transformation method was applied to correct for the substantially positively skewed distribution [NEWX = LG10(X + C), where C = 1.5 so the minimum value was greater than zero (min. = .18)]. The transformation procedure produced acceptable skewness (.61) and kurtosis (.13) values.

**Loneliness:** The Revised UCLA Loneliness Scale (UCLA-LS), a measure of subjective experience of loneliness, consists of 20 items on a 4-point summated rating scale [160]. Scores range from 20 to 80, with higher scores indicating higher levels of loneliness. Reliability analysis indicated that this measure demonstrated good internal consistency in this study ($\alpha = .93$). The skewness (1.08) and kurtosis (.90) values also were acceptable.
**Criterion variable**

**Suicidal Ideation:** The 25-item Adult Suicidal Ideation Questionnaire (ASIQ) measures adults’ thoughts about suicide within the past month. Respondents rate each item on a 7-point scale ranging from 0 (*I never had this thought*) to 6 (*I have this thought almost every day*) [161]. Scale content ranges from wishes of being dead or never being born, to thoughts of how and when to kill oneself. Summing item values produces a maximum score of 150. Research validated the scale for use with college students [34, 162]. Internal consistency for the scale was high in this sample (α = .97). Yet, the distribution indicated substantial positive skewness (skewness = 3.88; kurtosis = 21.06). Therefore, again, the Logarithmic (Log 10) transformation method was applied to correct for the failure of normality [NEWX = LG10(X + C), where C = 1.5 so the minimum value was greater than zero (min. = .18)]. After the transformation, the skewness and kurtosis values were .41 and -.81, respectively.

**Data Analysis**

Internal consistency reliability values, skewness values, and kurtosis values were calculated for the study measures. Data transformations were then applied as appropriate. Cook’s Distance values also were generated for regression analyses performed with the total sample. The mean Cook’s Distance value for all tests was less than 1, indicating the data did not contain significant outliers. Descriptive statistics also were calculated for the overall study sample.

In preliminary analyses, the effects of demographic variables on the study measures were evaluated. The primary data analysis was performed in four stages. First, independent samples t-tests and simple correlations tested hypothesized bivariate associations among the study variables. Second, standard path analysis evaluated the proposed model. Third, as stipulated by Baron and Kenny [163], formal tests for mediating effects of the intervening variables were
performed. Fourth, independent samples t-tests and regression analyses compared effects of sport participation to involvement in other extracurricular activities on the intervening and criterion variables.

Results

Sample Characteristics

About 23% (n = 103) of participants reported involvement in intramural sports, 6% (n = 29) reported involvement in extramural sports, and 2% (n = 9) reported involvement in both intramural and extramural sports. Even after accounting for inequality of variances on some variables, only one significant difference emerged between intramural and extramural sport participants regarding vigorous activity $F(3, 446) = 25.57, p < .001$. Participants only involved in extramural sports reported higher levels of vigorous activity ($M = 4.8, SD = 2.09$) than students only involved in intramural sports ($M = 3.4, SD = 1.80$). Since the sample size for extramural sport participants was small, and only one significant difference emerged, the groups were combined in subsequent analyses. Thus, analyses explore differences between students involved in university-run intramural, club, or varsity sports (n = 141, 31%), and those not involved in university sports.

Fifteen percent of participants (n = 68) reported involvement in both university-run sports and other organizations. Slightly more students reported only involvement in university sports (n = 73, 16%). Most students indicated they were either not involved in university-run sports or other organizations (n = 153, 34%), or they were only involved in other university organizations (n = 156, 35%). On average, participants reported engaging in vigorous exercise 2.8 days/week (range = 0-7 days), and moderate exercise 3.5 days/week (range = 0-7 days). Scores for the total sample on the risk measures indicated participants exhibited relatively low levels of depression, hopelessness, loneliness, and suicidal ideation (CES-D: $M = 12.11, SD = 9.29$; BHS: $M = 2.04$)
UCLA-LS: $M = 33.63$, SD = 9.92; ASIQ: $M = 7.41$

Mean level of suicidal ideation fell below normative college samples ($M = 10.91$, SD = 13.89) [161]. These students also demonstrated high levels of social support ($M = 84.84$, SD = 10.38) and self-esteem ($M = 33.37$, SD = 5.37).

**Preliminary Analyses**

Prior to examining relationships among the primary study variables, the effects of three demographic variables, sex, age, and race/ethnicity, were evaluated. A few differences emerged between males and females. Males demonstrated higher levels of vigorous activity $t(448) = 3.95$, $p < .001$ (males: $M = 3.4$, SD = 2.11; females: $M = 2.6$, SD = 1.97) and sport participation ($\chi^2 = 22.21$, $p < .001$; males: n = 57, 49%; females: n = 84, 25%). Conversely, females reported higher levels of social support $t(448) = 2.04$, $p < .05$ (males: $M = 83.16$, SD = 11.27; females: $M = 85.43$, SD = 9.99). No significant interactions emerged regarding sex, and sex was not significant in any of the models that predicted suicidal ideation. All preliminary findings remained consistently in the same direction for females as findings for males and females combined.

Older age related to higher levels of hopelessness ($r = .12$, $p < .01$) and suicidal ideation ($r = .15$, $p < .01$), and to lower levels of vigorous activity ($r = -.10$, $p < .05$). One significant difference emerged among participants reporting different races/ethnicities. Findings indicated a significant main effect for vigorous activity $F(4, 445) = 4.00$, $p < .01$. Subsequent post hoc analyses revealed African American females as significantly less likely to engage in vigorous activity than females of all other race/ethnicity categories $F(4, 328) = 7.06$, $p < .001$: African American ($M = 1.24$, SD = 1.2), white ($M = 2.90$, SD = 2.0), Hispanic ($M = 2.50$, SD = 2.0), Asian ($M = 2.29$, SD = 1.7), and Other ($M = 2.92$, SD = 2.2).
Based on preliminary analyses, different covariates were included in each model depending on the dependent variable under investigation. When the relationship between sport participation and vigorous activity was examined, sex, age, and race/ethnicity were controlled. In models that predicted social support or hopelessness, sex or age, respectively, were controlled. When suicidal ideation represented the outcome variable models included age.

**Bivariate Analyses**

Bivariate correlations among the intervening and criterion variables were calculated to determine the degree to which they were interrelated, and to establish a foundation for further analyses. Moderate exercise only related to vigorous activity ($r = .34, p < .001$).

Intercorrelations among the remaining continuous variables appear in Table 5-1. All the intervening variables related to each other and correlated with suicidal ideation. Thus, the proposed intervening variables were reliably associated with the criterion variable. Table 5-2 presents bivariate associations between sport participation and the intervening and criterion variables. Since the model presents two sets of intervening variables (i.e., 2 protective factors and 4 risk factors) the relationship between sport participation and each set of variables were examined separately. Findings demonstrated that the antecedent variable in the model, sport participation, was related to the criterion variable, and to all the variables, except depression, presumed to intervene in the relationship between sport participation and suicidal ideation.

**Confirmation of the Path Analysis**

Regression analyses evaluated the effect of sport participation on suicidal ideation, and explored the extent to which the proposed intervening variables influenced this relationship. In separate equations, each of the intervening variables and the criterion variable were regressed on sport participation (Figure 5-2). Next, suicidal ideation represented the outcome variable, and the intervening variables were treated as predictors (Figure 5-3). As Figure 5-2 demonstrates,
sport participation predicted both sets of intervening variables and the criterion variable. Furthermore, all the intervening variables represented significant predictors of suicidal ideation (Figure 5-3).

Tests of Mediation

A primary hypothesis of this study posited that physical activity and social support would mediate relationships between sport participation and risk factors associated with suicidal ideation. Therefore, these variables were formally evaluated as mediators in the path model for the total sample. Baron and Kenny [34, 163] outline a series of regression analyses to test for mediation. First, regress the mediator on the independent variable. Next, regress the dependent variable on the independent variable. Finally, regress the dependent variable on both the independent variable and the mediator. The following conditions are required for mediation to occur. First, the independent variable must influence the mediator in the first analysis. Second, the independent variable must influence the dependent variable in the second analysis. Third, the mediator must influence the dependent variable in the third analysis. For partial mediation, the effect of the independent variable on the dependent variable decreases in the third analysis compared to the second analysis. For full mediation, the independent variable has no effect after the mediator is controlled.

Analyses revealed that all conditions for establishing mediation were satisfied. Adjusted R square [AR²] values for each mediation model, and regression coefficients [β = Beta] for the mediating variables are presented. When vigorous physical activity was tested as a mediator, the variable fully mediated relationships between sport participation and self-esteem (AR² = .04) $F(2, 447) = 10.93, p < .001$ ($β_{vig \ activity} = .17, p < .001$) and depression (AR² = .03) $F(2, 447) = 7.08, p < .001$ ($β_{vig \ activity} = -.14, p < .01$). Social support also fully mediated relationships between sport participation and depression (AR² = .33) $F(2, 447) = 111.53, p < .001$ ($β_{social \ support}$
=.57, \ p<.001), \text{hopelessness} (AR^2 = .29) F(3, 445) = 61.52, \ p<.001 \ (\beta_{\text{social support}} = -.52, \ p<.001), \text{and} \text{loneliness} (AR^2 = .64) F(2, 447) = 398.76, \ p<.001 \ (\beta_{\text{social support}} = -.79, \ p<.001). \text{In separate analyses, self-esteem and depression fully mediated the relationship between vigorous activity and suicidal ideation} (AR^2 = .27) F(3, 445) = 57.09, \ p<.001 \ (\beta_{\text{self-esteem}} = -.50, \ p<.001); \text{(AR^2 = .28) } F(3, 445) = 59.07, \ p<.001 \ (\beta_{\text{depression}} = .51, \ p<.001), \text{respectively. Depression, hopelessness, and loneliness each partially mediated the relationship between social support and suicidal ideation} (AR^2 = .30) F(3, 445) = 64.76, \ p<.001 \ (\beta_{\text{depression}} = .41, \ p<.001); \text{(AR^2 = .23) } F(3, 445) = 44.40, \ p<.001 \ (\beta_{\text{hopelessness}} = .24, \ p<.001); \text{(AR^2 = .22) } F(3, 445) = 42.41, \ p<.001 \ (\beta_{\text{loneliness}} = .30, \ p<.001), \text{respectively.}

The path model, including demographic characteristics, accounted for a significant portion of the variance in students’ suicidal ideation (AR^2 = .34, \ p<.001). However, the only variables that remained significant in the final model were age (\beta = .10, \ p<.05), self-esteem (\beta = -.23, \ p<.001), depression (\beta = .29, \ p<.001), and, surprisingly, sport participation (\beta = -.09, \ p<.05). When the mediating effects of the intervening variables were examined separately, sport participation actually mediated the relationship between vigorous activity and suicidal ideation (AR^2 = .05) F(3, 445) = 8.15, \ p<.001 \ (\beta_{\text{sport}} = -.13, \ p<.01). Conversely, social support, self-esteem, depression, hopelessness, and loneliness each partially mediated the relationship between sport participation and suicidal ideation (AR^2 = .20) F(3, 445) = 37.61, \ p<.001 \ (\beta_{\text{social support}} = -.40, \ p<.001); \text{(AR^2 = .28) } F(3, 445) = 59.06, \ p<.001 \ (\beta_{\text{self-esteem}} = -.50, \ p<.001); \text{(AR^2 = .29) } F(3, 445) = 61.52, \ p<.001 \ (\beta_{\text{depression}} = .50, \ p<.001); \text{(AR^2 = .18) } F(3, 445) = 33.37, \ p<.001 \ (\beta_{\text{hopelessness}} = .38, \ p<.001); \text{(AR^2 = .22) } F(3, 445) = 41.97, \ p<.001 \ (\beta_{\text{loneliness}} = .42, \ p<.001), \text{respectively.}
Sport Participation versus Involvement in Other Extracurricular Activities

To determine if sport provides distinct psychosocial benefits, analyses compared effects of sport participation to involvement in other activities. Independent samples t-tests showed no significant mean differences on any study variable between students who participated in other extracurricular activities and students who did not participate in university organizations. Regression analyses confirmed the unique positive effects of sport participation on psychosocial variables. Even after controlling for participation in other university activities, effects of sport participation on the intervening and criterion variables remained significant. Only one significant interaction occurred between sport participation and involvement in other activities. Sport participants reported significantly higher levels of vigorous activity ($M = 4.25, SD = 1.95$) than students who did not participate in any university organizations ($M = 2.25, SD = 1.91$), students only involved in other university organizations ($M = 2.45, SD = 1.87$), and students involved in both university-run sports and other organizations ($M = 3.40, SD = 1.91$).

Discussion

Findings

Research investigating associations between sport participation and suicide risk has not tested variables hypothesized to mediate the relationship. However, exploratory research using models to examine direct effects and buffering effects of different types of daily activities will help guide development of suicide prevention and intervention programs [43]. Therefore, this study tested a model to explain how sport participation may provide distinct protection against suicidal ideation.

A primary hypothesis posited that physical activity and social support would mediate relationships between sport participation and significant risk factors associated with suicidality. Consistent with this hypothesis, vigorous physical activity mediated relationships between sport
participation and self-esteem and depression. Social support mediated relationships between sport participation and depression, hopelessness, and loneliness. Furthermore, self-esteem and depression each fully mediated the relationship between vigorous activity and suicidal ideation; and depression, hopelessness, and loneliness each partially mediated the relationship between social support and suicidal ideation. However, an unexpected finding revealed that none of the variables fully mediated the relationship between sport participation and suicidal ideation.

This study also compared effects of sport participation to involvement in other extracurricular activities. In general, study participants scored low on measures of risk and high on measures of protective factors. Still, participation in non-sport university activities did not provide students with the same psychosocial benefits as did sport participation. Furthermore, effects of sport participation on suicidal ideation and related risk and protective factors proved robust. Even after accounting for students’ involvement in other university activities, the effects of sport participation remained significant. These results support findings from Harrison and Narayan [5] who examined similar relationships among adolescents. These investigators examined relationships among sport participation, involvement in other extracurricular activities, psychological factors, and suicidal behavior. Findings indicated that “those involved in team sports at school (alone or combined with other activities)…were most likely to report high self-esteem and were least likely to report sadness, anxiety, and suicidal behavior” [5, p.118].

**Contribution to the Literature**

This investigation contributes to the extant literature in three ways. First, the study represents the first effort to test a theoretically based model depicting potential mechanisms through which sport participation relates to reduced risk of suicidality. Brown et al. [13] discovered that the relationship between sport participation and suicidal behavior became non-significant among high school students after they controlled for feeling sad or hopeless (1 item)
and other non-psychosocial variables. According to these researchers, this finding suggested that distress/depressed mood may mediate “activity-suicide associations,” and reinforced the importance of accounting for mood disturbance in studies on this topic [13, p.2254].

The present investigation built on these findings by formally testing depression as a mediator between sport participation and suicidal ideation, and by exploring two protective factors – vigorous activity and social support – that account for the relationship between sport participation and depressed mood. This study also tested mediating effects of other risk factors on the relationship between sport participation and suicidal ideation, and the influence of sport participation and associated protective factors on these measures of risk.

Second, this study incorporated thoroughly validated, highly reliable instruments that provided sufficient specificity to answer definitive questions regarding the association between sport participation and suicidal ideation. To date, Oler et al. [7] were the only other investigators to administer a standardized questionnaire to explore the relationship between sport participation and suicidal ideation. Furthermore, no other study included several multi-item measures assessing psychosocial variables to explore mediating effects of risk and protective factors.

Third, to our knowledge, this study represented only the second investigation to compare effects of sport participation to involvement in other activities on suicidal ideation. Our findings support conclusions offered by Harrison and Narayan [5] who explored similar relationships among high school students. These investigators concluded that engaging in any organized activity imparted some benefit, but sport participation afforded unique positive advantages.

Progress in suicide research requires both analyzing existing data sets and implementing new, theoretically informed studies [28]. Furthermore, an important aspect of future research involves developing and detecting multiple pathways to suicidal behavior [35]. Consistent with
previous research [6, 7, 10-13], findings from this study confirmed direct effects of sport participation on suicidality for males and females. This research also accounted for several psychosocial factors responsible for the relationship between sport participation and suicidal ideation. Therefore, though effect sizes remained small, this study provides a foundation for research to examine pathways through which sport participation relates to reduced risk of suicidal behavior.

**Limitations**

Five study limitations should be noted. First, these data originated from a cross-sectional survey, so analyses could not determine causal relationships. For instance, sport participation may confer protection against suicidal ideation or, conversely, suicidal young people may choose not to participate in sports. Longitudinal and case-control studies can help identify potential cause-and-effect relationships between sport participation and risk of suicidal behavior.

Second, the sample primarily comprised female college students (74%) enrolled in health education, psychology, and sociology courses, which represent a limited cross-section of the student population. Students who choose to take these courses, especially the health education classes, may engage in more health-promoting behaviors that positively impact mental health and reduce the risk of suicidal ideation than do students enrolled in other courses.

Third, these data were obtained through self-report rather than objective measures, and no mechanisms existed to validate the self-reports. Though the survey remained anonymous, some participants may have provided socially desirable answers to study questionnaires.

Fourth, the assessment of physical activity may have provided an incomplete picture of participants’ activity levels. For example, items only asked about physical activity during the previous 7 days. Participants’ activity during the preceding week may have been atypical for many reasons. Furthermore, some participants may have intentionally reported engaging in more
physical activity than they actually performed. Thus, longitudinal data on students’ activity levels and physical activity assessments based on movement devices would produce greater precision of measurement.

Fifth, the questions used to assess involvement in sports and other extracurricular activities were developed specifically for this research. Therefore, no validity data exist for these items. This research attempted to obtain more precise measurements of sport participation and involvement in other activities than did two national surveys of U.S. college students: the NCHRBS [153] and the National Survey of Student Engagement (NSSE) [164]. This research could not include an item from the NSSE to assess involvement in other activities because the NSSE item groups intercollegiate and intramural sports among all other co-curricular activities.

Also, researchers in this area have consistently applied a global definition of sport participation (e.g., “During the past 12 months, on how many sports teams did you play?”) [80]. In this investigation, we sought to improve the assessment of sport participation by including separate items to assess involvement in intramural sports and extramural sports. However, lack of participants involved in extramural sports, information regarding type of sport in which participants were involved, or data regarding participants’ duration or frequency of sport involvement, limited the evaluation of potential differential effects across various forms of sport or participants’ intensity of involvement. One significant difference emerged between intercollegiate athletes and intramural sport participants, but considerable differences may exist between these groups.

**Future Research**

In the future, investigations should include a larger cross-section of the college student population; incorporate enhanced assessments of sport participation, physical activity, and suicidal behavior (e.g., history of suicide attempts); test the proposed model using longitudinal
designs; and validate the model with adolescents and with a larger sample of males. The relationship and mediating pathways between sport participation and suicidal ideation (or other measures of suicidal behavior) may differ by sex. If differences exist, this study may have lacked sufficient power to detect such differences. Furthermore, though findings from this research did not show a significant relationship between moderate physical activity and suicidal ideation, other investigators have found associations between low or moderate levels of activity and reduced risk of suicidal behavior [10, 70]. Given public health priorities to encourage moderate-intensity activity, future research should continue exploring the mental health benefits afforded by different types and levels of physical activity.

Investigators should explore additional mediating pathways as well. For example, increased school connectedness may represent another intervening variable. Positive school connection protects against suicide [56, 61]. Especially among younger students, sport participation may cultivate increased commitment to, involvement in, or identification with school and school values [67]. School sport participation enhances connectedness by increasing opportunities for students to feel a sense of belonging, attachment, and participation in their social environment [11]. These feelings may operate as protective factors by buffering stress, enhancing social integration and, in turn, decreasing risk-taking behavior [11].

Future research also should examine ways through which sport participation enhances resilience in young people, thus helping to reduce the risk of suicide. Measures that enhance resilience help to prevent suicide [56]. Participation in sports may represent an intervention activity that increases protective factors associated with enhanced resilience [102]. Cohu [102] found that intercollegiate athletes demonstrated significantly higher resilience scores, compared
to non-athletes. However, little empirical research specifically examines the association between sport and resilience.

**Conclusions**

The growing body of research investigating the relationship between sport participation and suicidal behavior suggests that involvement does not cause harm, and may actually relate to beneficial psychosocial outcomes. However, this study and related research in the area involved individuals with predominantly good mental health. Future research should explore the association between sport participation and suicidality among young people with a broader range of mood disturbances and mental health problems to determine whether or not research with a more distressed population yields similar findings. Then, if the inverse relationship remains, practitioners may consider incorporating this line of research into intervention efforts to prevent suicide among young people. Multi-compartmental approaches to prevent suicide may include opportunities for young people to engage in physical activity, as well as to become involved in sports. For example, Brown [80] describes the Sports Challenge Intervention program used successfully in Australia and Singapore to improve self-concept and self-esteem, reduce destructive behaviors, and promote mental health among “at-risk” youth.

Researchers and practitioners should not oversimplify or overstate the associations between sport participation and suicide risk, but findings from this line of research suggest opportunities for prevention and merit consideration in public health policy and planning [12]. Health professionals may use findings from the present study to advocate for increased opportunities to involve young people in sports and vigorous activity. Findings would support efforts to assess the impact that the erosion of funds and social support for school and community sport programs have on young people’s mental health. Practitioners working specifically with young females also should consider the finding that African American females
demonstrated significantly lower levels of physical activity, compared to their female counterparts. Investigators suggest that racial disparities in females’ exercise behavior originate during early adolescence [165, 166] and continue through adulthood [167, 168]. These findings highlight an intervention opportunity for practitioners to target exercise behavior among young African American females. Program planners should identify perceived barriers to exercise among African American females, and tailor programs to increase levels of physical activity among this subgroup of young people.

Exploring the intricate connections between reduced suicidality and sport participation holds promise for improving understanding of unique protective factors. Findings from methodologically sound research can provide a foundation for intervention research in preventing suicide. Eventually, “physical activity and sport program interventions that possess potential to enhance positive mood and self-esteem, or to promote positive behaviors that compete with negative or self-destructive behaviors, may [become] adjuncts to acceptable behavioral or pharmacological suicide treatment strategies” [80, p.498].
Figure 5-1. Model presenting proposed mechanisms through which sport participation influences the risk of suicidal ideation
Table 5-1. Intercorrelations among the intervening and criterion variables

<table>
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<tr>
<th>Variable</th>
<th>1</th>
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<th>7</th>
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<tr>
<td><strong>Protective factors</strong></td>
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<tr>
<td>1. Vigorous physical activity</td>
<td>-</td>
<td>.19***</td>
<td>-.17***</td>
<td>-.10*</td>
<td>-.21***</td>
<td>-.14**</td>
<td></td>
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<tr>
<td>2. Social support</td>
<td>-</td>
<td>.69***</td>
<td>-.58***</td>
<td>-.53***</td>
<td>-.80***</td>
<td>-.42***</td>
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<tr>
<td><strong>Risk factors</strong></td>
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</tr>
<tr>
<td>3. Self-esteem</td>
<td>-</td>
<td>-.68***</td>
<td>-.56***</td>
<td>-.68***</td>
<td>-.52***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Depression</td>
<td>-</td>
<td>.53***</td>
<td>.67***</td>
<td>.52***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Hopelessness</td>
<td>-</td>
<td></td>
<td>.54***</td>
<td>.40***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Loneliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.45***</td>
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<tr>
<td><strong>Criterion variable</strong></td>
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<tr>
<td>7. Suicidal ideation</td>
<td>-</td>
<td></td>
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</tbody>
</table>

*Note. Correlations performed on transformed data for hopelessness and suicidal ideation. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. 
Table 5-2. Means and independent samples t-test values comparing students involved in university-run sports and students not involved in university-run sports

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sport participants (n = 141)</th>
<th>Non-participants (n = 309)</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Protective factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vigorous physical activity (days/week)</td>
<td>3.84 (1.97)</td>
<td>2.35 (1.89)</td>
<td>7.64</td>
<td>448</td>
<td>.000</td>
</tr>
<tr>
<td>Social support</td>
<td>86.71 (9.95)</td>
<td>83.98 (10.47)</td>
<td>2.60</td>
<td>448</td>
<td>.010</td>
</tr>
<tr>
<td><strong>Risk factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-esteem</td>
<td>34.50 (5.22)</td>
<td>32.86 (5.37)</td>
<td>3.03</td>
<td>448</td>
<td>.003</td>
</tr>
<tr>
<td>Depression</td>
<td>10.57 (9.12)</td>
<td>12.82 (9.30)</td>
<td>-2.39</td>
<td>448</td>
<td>.017</td>
</tr>
<tr>
<td>Hopelessness</td>
<td>1.60 (2.65)</td>
<td>2.24 (3.08)</td>
<td>-2.70</td>
<td>304</td>
<td>.007</td>
</tr>
<tr>
<td>Loneliness</td>
<td>31.55 (8.66)</td>
<td>34.58 (10.32)</td>
<td>-3.24</td>
<td>319</td>
<td>.001</td>
</tr>
<tr>
<td><strong>Criterion Variable</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Suicidal ideation</td>
<td>5.33 (3.95)</td>
<td>8.36 (5.63)</td>
<td>-3.54</td>
<td>298</td>
<td>.000</td>
</tr>
</tbody>
</table>

*Note.* Statistical tests were run on transformed data for hopelessness and suicidal ideation. However, the unconverted (original) standard deviations are presented for these variables. T-test statistics for equal variances not assumed are presented for hopelessness, loneliness, and suicidal ideation because Levene’s Test for Equality of Variances was significant.
Note. * $p < 0.05$, ** $p < .01$, *** $p < 0.001$

a = sex controlled; b = age controlled; c = race/ethnicity controlled

Figure 5-2. Standardized regression coefficients demonstrating the direct effects of sport participation on the intervening and criterion variables
Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

a = sex controlled; b = age controlled; c = race/ethnicity controlled

Figure 5-3. Path model with standardized regression coefficients
CHAPTER 6
EXPLORING PROTECTIVE RELATIONSHIPS BETWEEN PARTICIPATION IN SPORTS AND RISK FACTORS ASSOCIATED WITH ADOLESCENT SUICIDE

Introduction

Research supports positive associations between participation in certain extracurricular activities and favorable academic, psychological, and behavioral outcomes [82, 169, 170]. Extracurricular activities facilitate adolescents’ developmental need for social relatedness by expanding peer networks and facilitating peer bonds [85]. Involvement in school programs links adolescents to a set of similar peers, provides shared experiences and goals, reinforces friendships between peers, and may strengthen relationships between individuals and family [82, 84].

Compared to other activities, sports may represent a particularly valuable source of learning outside the classroom [86]. Athletes may experience greater social support when they become integrated into a network that includes teammates, coaches, health professionals, family, and community [12]. Integration into protective social networks may buffer adolescents against effects of life stress [12]. Sport participation also may enhance school identification, involvement, and commitment [74]. This connection to school positively affects more narrowly defined academic outcomes, as well as nonacademic outcomes such as self-concept [67].

Despite research supporting the positive role of sports for adolescents, investigators only recently explored associations between sport participation and suicide risk. Suicide is the third leading cause of death for American youth aged 15 to 24, and suicides account for 12.9% of all deaths among persons in this age range [1]. Research regarding sport participation and suicidality (suicidal thoughts or behavior) regularly found inverse relationships [5-13, 73]. However, this field suffers from methodological weaknesses that often accompany emerging areas of study [80].
Most research in this area included only one question to assess suicidal ideation: seriously considered attempting suicide in the past 12 months. Researchers also regularly applied a global definition of sport participation (e.g., “During the past 12 months, on how many sports teams did you play?”) [80]. In addition, most research addressing sport participation and suicide risk has remained atheoretical, and originated from secondary data analysis of existing data sets that contained survey information about a number of health issues [80]. Finally, few researchers compared effects of sport participation to involvement in other extracurricular activities on suicide risk.

In one recent study, the authors addressed key methodological limitations in previous research [171]. The study addressed limitations in measurement of suicidality by incorporating a standardized 25-item suicidal ideation measure. The authors also designed a study to explore mechanisms through which collegiate sport participation (varsity, club, or intramural sports) related to reduced risk of suicidal ideation among college students. Finally, analyses compared effects of sport participation to involvement in other college organizations.

Participants included undergraduate students aged 18 to 24. Regression analyses confirmed a path model and tested for mediation effects. Vigorous activity mediated relationships between sport participation and self-esteem and depression; and self-esteem and depression mediated the relationship between vigorous activity and suicidal ideation. Social support mediated relationships between sport participation and depression, hopelessness, and loneliness. Each of these risk factors partially mediated the relationship between social support and suicidal ideation. However, no variable fully mediated the relationship between sport participation and suicidal ideation. Notably, participation in non-sport university activities did not provide students with the same psychosocial benefits as did sport participation.
The present investigation built on previous research by examining effects of sport participation during high school. Improved assessment of sport participation enabled exploration of differential effects across participants’ involvement in intramural, extramural, and community sports. This study included enhanced assessments of involvement in non-sport school and community extracurricular activities as well. Therefore, analyses tested the hypothesis that participating in sports provides young people increased protection against suicidal ideation more effectively than does participating in other extracurricular activities.

This study also tested an enhanced model that incorporated potential mechanisms through which high school sport participation relates to reduced risk of suicidal ideation (Figure 6-1). Risk factors for suicide include depression [34, 128], hopelessness [41, 128], low self-esteem [42, 48], and loneliness [46, 58]. The theoretical framework underlying the model suggests sport participation produces mental health benefits that protect against these risk factors through physiological, social support, and school connectedness mechanisms. Physical activity enhances self-esteem and ameliorates depressive symptoms [89, 151]. Social support and school connectedness positively impact depression, hopelessness, and loneliness [58, 61, 152]. A study hypothesis posited that the synergistic effect of these mechanisms protects sport participants against suicidal ideation.

**Methods**

**Procedures and Participants**

The university Institutional Review Board approved the protocol. Students completed questionnaires as a voluntary, in class activity. The principal investigator surveyed a convenience sample of students in college classes: 7 from “Enhancing the Freshman Experience” program, and 10 from the College of Health and Human Performance. Each instructor determined whether his/her students received extra credit for participating in this
study. Participants received the survey in a large catalog envelope, and they placed their completed questionnaires into the envelope before submitting the survey. Participants received a consent form that implied consent by completing the survey. To guarantee anonymity, no names were included on questionnaires. Participants were informed that the study measures may elicit distressing feelings, and they were provided information regarding mental health services. Participants required approximately 20 minutes to complete the study measures.

The sample included 1029 students enrolled in courses at a large southeastern university in the U.S. Data for the present study was gleaned from 282 freshman students included in the total sample. After eliminating invalid freshman questionnaires, 269 participants remained in the study. Students whose data were eliminated did not differ significantly from participants who returned valid questionnaires regarding sex, age, or race/ethnicity. Most participants were female (n = 197, 73.2%). Participants were aged 18 or 19, (M = 18.9 years, SD = 0.40), but most were aged 18 (n = 217, 80.7%). Participants reported their race/ethnicity as 54.1% white/non-Hispanic; 17.5% Hispanic; 16.4% African American; 9.0% Asian; and 3.0% American Indian, Native Hawaiian, some other race, or multi-racial (“Other”).

Measures

Involvement in other extracurricular activities

Involvement in other activities during high school was assessed through items from the National Education Longitudinal Study (NELS) [172]. Participants were provided 2 lists that excluded sport activities: school-sponsored activities and community activities (see Table 6-1). For each activity, participants indicated whether: 1) they participated, 2) they did not participate, or 3) their high school or community did not have the activity. Scores for each activity on the respective lists were summed to indicate the total number of school and community activities (2 separate scores) in which students participated. Activity groups then were created based on level
of involvement in school and community activities. In addition, a total extracurricular activity participation (TEAP) score was created by summing the total number of sports, school activities, and community activities in which students participated. Again, activity groups were created based on involvement in extracurricular activities.

School and community activities were subsequently categorized to focus on actual content or domain of activity. School activities were clustered into 6 categories: performance activities (music group and/or drama); school involvement (student government and/or yearbook or newspaper); academic activities (honor societies and/or academic clubs); prosocial activities (religious groups and/or service clubs); vocational activities (vocational education or professional clubs); and hobby clubs (photography, chess, etc.). Community activities also were clustered into 6 categories: outdoor activities (scouting and/or 4-H); religious groups; hobby clubs; neighborhood clubs (neighborhood programs, Boys’/Girls’ Clubs, YMCA); summer programs; and other.

One NELS item estimated time participants’ spent in school-sponsored extracurricular activities: “During the past 12 months, how much total time did you spend on all extracurricular activities sponsored by your high school in a typical week?” Response options: none, < 1 hr/wk, 1-4 hrs/wk, 5-9 hrs/wk, 10-19 hrs/wk, and ≥ 20 hrs/wk. Involvement in other extracurricular activities in college was assessed with 1 item: “During the past 12 months, were you a member of any other college organizations (not including sport teams)?”

Antecedent variable

Sport participation: Sport participation during high school was assessed through items from NELS [172]. Participants were provided a list of sports (see Table 6-2). For each activity, participants marked all that applied: 1) their high school did not have the sport, 2) they did not participate, 3) they participated in intramural sports, 4) they participated on a junior varsity or
freshman team, 6) they participated on a varsity team, and/or 6) they participated on a community team. Response option “participated as a captain/co-captain” included in NELS was changed to “participated on a community team.”

Total scores were generated for sport participation, intramural sports, extramural (interscholastic) sports, and community sports. Participants then were divided into 2 groups for each variable: those who participated, and those who did not participate. Finally, for total sport participation and extramural sport participation, students were grouped based on involvement: not involved, moderately involved (1-2 teams), and highly involved (≥ 3 teams). An insufficient number of students involved in intramural and community sports precluded examination based on level of involvement.

Sport participation during college was assessed with 1 item: “During the past 12 months, were you a member of any college intramural, club, or varsity sport teams?”

**Intervening variables**

**Physical activity:** Participants responded to 2 slightly modified physical activity questions drawn from CDC’s YRBS [79]: 1) “During your last year in high school, on how many days during a typical week did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors?” (*moderate activity*); and 2) “During your last year in high school, on how many days during a typical week did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as jogging, swimming laps, fast bicycling, fast dancing, or similar aerobic activities?” (*vigorous activity*).

**Social support:** The 25-item Personal Resource Questionnaire85 - Part II measures relational provisions in Weiss’s [152] definition of social support (attachment, social integration, opportunity for nurturing behavior, reassurance of worth, a sense of reliable alliance, and
obtaining information and guidance in stressful situations) [154]. Respondents rate statements on a 4-point Likert scale (strongly agree to strongly disagree). Scores range from 25 to 100, with higher scores indicating higher perceived social support. The scale produced an internally consistent measure of perceived social support ($\alpha = .92$). Data distribution was normal (skewness = -.74; kurtosis = .22).

**School connectedness:** School connectedness was constructed from responses to 6 items from the National Longitudinal Study of Adolescent Health [173] phrased in the past tense: 1) “I felt close to people at my high school,” 2) “I felt like I was part of my high school,” 3) “I was happy to be at my high school,” 4) “The teachers at my high school treated students fairly,” 5) “I felt socially accepted at my high school,” and 6) “I felt safe at my high school.” Response options used a 4-point Likert scale (strongly agree to strongly disagree). Responses to the 6 statements were summed; scores range from 6 to 24. The measure showed good internal consistency ($\alpha = .88$). The skewness (-.87) and kurtosis (.61) values were acceptable.

**Self-esteem:** The Rosenberg Self-Esteem Scale includes 10 general statements that assess global aspects of self-worth, confidence, and self-approval [155]. Respondents rate statements on a 4-point Likert scale (strongly agree to strongly disagree). Scores range from 10 to 40, with higher scores indicating higher self-esteem. The measure demonstrated good internal consistency ($\alpha = .91$), and the skewness (-.53) and kurtosis (-.63) values were in the acceptable range.

**Depression:** The 20-item Center for Epidemiological Studies Depression Scale (CES-D) measures depressive symptomatology [156]. Scores range from 0 to 60, with higher scores indicating greater frequency and number of depressive symptoms. Internal consistency of the
measure in the current study was $\alpha = .85$. The skewness value was 1.10, and the kurtosis value was .99.

**Hopelessness:** The 20-item Beck Hopelessness Scale (BHS) measures negative expectations about the future [157]. Items elicit true/false responses. Total scores range from 0 to 20, with higher scores indicating a greater degree of hopelessness. In this study, internal consistency for this scale was fair ($\alpha = .68$), and the skewness (1.64) and kurtosis (2.49) values were within the acceptable range.

**Loneliness:** The Revised UCLA Loneliness Scale (UCLA-LS), a measure of subjective experience of loneliness, consists of 20 items on a 4-point summed rating scale [160]. Scores range from 20 to 80, with higher scores indicating higher levels of loneliness. Reliability analysis indicated that this measure demonstrated good internal consistency in this study ($\alpha = .90$). Skewness (.98) and kurtosis (.65) values were acceptable.

**Criterion variable**

**Suicidal ideation:** The 25-item Adult Suicidal Ideation Questionnaire (ASIQ) measures adults’ thoughts about suicide within the past month. Respondents rate each item on a 7-point scale ranging from 0 (I never had this thought) to 6 (I have this thought almost every day) [161]. Scale content ranges from wishes of being dead or never being born, to thoughts of how and when to kill oneself. Summing item values produces a maximum score of 150. Research validated the scale for use with college students [162]. Internal consistency was $\alpha = .97$.

Distribution indicated substantial positive skewness (skewness = 4.22; kurtosis = 34.74). Therefore, as suggested by Tabachnick and Fidell [158] and Howell [159], the Logarithmic (Log 10) transformation method corrected for the substantially positively skewed distribution [NEWX = LG10(X + C), where C = 1.5 so the minimum value was greater than zero (min. = .18)]. The procedure produced acceptable skewness (.99) and kurtosis (-.18) values.
Data Analysis

Internal consistency reliability, skewness, and kurtosis values were calculated, then data transformations were applied as appropriate. Descriptive statistics were calculated, and preliminary analyses determined effects of demographic variables on the study measures. Regression analyses evaluated effects of types of sport participation on the outcome variables. Standard path analysis evaluated the proposed model, and formal tests for mediating effects of the intervening variables were performed. Finally, regression analyses compared effects of sport participation to involvement in other activities on the outcome variables.

Results

Sample Characteristics

Tables 6-1 and 6-2 describe patterns of students’ involvement in sports and other activities during high school. Relatively few students participated in intramural sports (n = 50, 18.6%; $M = 0.34$, $SD = 0.84$; range: 0-5 sports) or community sports (n = 89, 33.1%; $M = 0.42$, $SD = 0.69$; range: 0-5 sports). Conversely, most students participated in extramural sports (n = 193; 71.7%; $M = 1.33$, $SD = 1.22$; range: 0-5 sports). Overall, 79.9% (n = 215) of students participated on some type of sports team ($M = 2.09$, $SD = 1.73$; range: 0-8 sports).

Almost all students participated in non-sport school activities (n = 266, 98.9%; $M = 4.07$, $SD = 1.74$; range: 0-9 activities). In fact, many students participated in 5 or more school activities (n = 113, 42.0%). Most students were involved in academic (n = 253, 94.1%) and/or prosocial activities (n = 208, 77.3%). Many students participated in non-sport community activities (n = 212, 78.8%; $M = 1.74$, $SD = 1.41$; range: 0-7 activities). Over half participated in 1 to 2 community activities (n = 146, 54%), particularly religious groups (n = 110, 40.9%). All participants were involved in at least one extracurricular activity during high school ($M = 7.90$, $SD = 3.38$; range: 1-19 activities). Almost half (n = 122, 45.4%) reported spending
10 or more hours each week in school-sponsored extracurricular activities (range: 0 to ≥ 20 hrs/wk). On average, during high school, participants reported engaging in vigorous activity 4.29 days/wk (SD = 2.08; range: 0-7 days) and moderate activity 3.76 days/wk (SD = 2.24; range: 0-7 days). Just over thirty percent of students (n = 90) participated in college sports, and over half were involved in other university organizations (n = 141, 52.6%).

Scores on the risk measures indicated participants exhibited relatively low levels of depression, hopelessness, loneliness, and suicidal ideation (CES-D: M = 10.79, SD = 7.20; BHS: M = 1.55, SD = 1.90; UCLA-LS: M = 31.74, SD = 8.57; ASIQ: M = 4.87 (original)/3.34 (transformed), SD = 10.10). Mean level of suicidal ideation fell below normative college samples (M = 10.91, SD = 13.89) [161]. These students also demonstrated high levels of social support (M = 87.17, SD = 9.31), self-esteem (M = 34.10, SD = 4.95), and school connectedness (M = 20.13, SD = 3.53).

Preliminary Analyses

Prior to examining relationships among the primary study variables, effects of two demographic variables, sex and race/ethnicity, were evaluated. Several differences emerged. For example, males were more likely than females to participate in intramural sports during high school (χ² = 7.27, p < .01). Yet, females were more likely to participate in school involvement activities than males (χ² = 15.94, p < .001). Some interactions emerged regarding sex. Significant race/ethnicity differences appeared, especially among females. For instance, Asian females were less likely to participate in extramural sports (χ² = 24.72, p < .001), and females categorized as other reported higher levels of loneliness F(4, 178) = 3.21, p < .05. Thus, sex and race/ethnicity were controlled in all models. College sport participation and involvement in other college organizations also were controlled in models that examined effects of participation in sports or other activities during high school.
Confirmation of the Path Analysis

Table 6-3 presents results from regression analyses evaluating effects of high school sport participation on variables in the path model (Figure 6-1). Findings showed few statistically significant relationships between participation in intramural or community sports and psychosocial variables. However, extramural sport participation related to higher levels of physical activity, social support, school connectedness, and self-esteem, and to lower levels of depression, hopelessness, loneliness, and suicidal ideation. Extramural sport participation (dummy coded yes/no) was tested as the antecedent variable in the model. Regression analyses confirmed engagement in vigorous activity as the most appropriate physical activity variable to include in the path model – moderate activity was not related to any psychosocial variables.

Thus, in separate equations, each intervening variable (vigorous activity, social support, school connectedness, self-esteem, depression, hopelessness, and loneliness) and the criterion variable (suicidal ideation) were regressed on extramural sport participation (Table 6-3). Next, suicidal ideation represented the outcome variable, and the intervening variables were treated as predictors (Figure 6-2). The path model, including demographic characteristics and participation in sports or other organizations during college, accounted for a significant portion of the variance in students’ suicidal ideation (adjusted R square \([AR^2] = .33, p < .001\)). As Table 6-3 demonstrates, extramural sport participation predicted all the intervening variables and the criterion variable. Furthermore, all the intervening variables represented significant predictors of suicidal ideation (Figure 6-2).

Tests of Mediation

A primary hypothesis posited that physical activity, social support, and school connectedness would mediate relationships between sport participation and risk factors associated with suicidal ideation. However, vigorous activity was not associated with self-
esteem or depression. Analyses could not evaluate vigorous activity as a mediator between extramural sport participation and these variables. Still, using a series of regression analyses outlined by Baron and Kenny [163], all the protective factors were formally evaluated as mediators between extramural sport participation and suicidal ideation. Yet, only social support and school connectedness were evaluated as mediators between extramural sport participation and certain risk factors associated with suicidal ideation.

When vigorous physical activity was tested as a mediator between extramural sport participation and suicidal ideation, the variable fully mediated the relationship ($\beta_{\text{vig activity}} = -.16$, $p < .05$), but the overall model was not significant ($AR^2 = .03$) $F(9, 253) = 1.74$, $p = .08$. Social support partially mediated relationships between extramural sport participation, and depression ($AR^2 = .24$) $F(9, 231) = 9.37$, $p < .001$ and hopelessness ($AR^2 = .24$) $F(10, 234) = 8.83$, $p < .001$. Yet, social support fully mediated relationships between extramural sport participation, and loneliness ($AR^2 = .63$) $F(9, 239) = 45.30$, $p < .001$ and suicidal ideation ($AR^2 = .17$) $F(9, 240) = 6.75$, $p < .001$. Similarly, school connectedness partially mediated the relationship between extramural sport participation and hopelessness ($AR^2 = .18$) $F(10, 239) = 6.33$, $p < .001$, but fully mediated relationships between extramural sport participation and depression ($AR^2 = .16$) $F(9, 234) = 6.24$, $p < .001$, loneliness ($AR^2 = .25$) $F(9, 233) = 10.18$, $p < .001$, and suicidal ideation ($AR^2 = .09$) $F(9, 245) = 3.66$, $p < .001$.

In separate analyses, loneliness fully mediated the relationship between social support and suicidal ideation ($AR^2 = .27$) $F(7, 230) = 13.70$, $p < .001$, but depression and hopelessness each partially mediated this relationship ($AR^2 = .27$) $F(7, 232) = 13.65$, $p < .001$ and ($AR^2 = .24$) $F(7, 236) = 12.19$, $p < .001$, respectively. Similarly, depression and hopelessness each partially mediated the relationship between school connectedness and suicidal ideation ($AR^2 = .26$) $F(7,
236) = 12.92, \( p < .001 \) and (AR\(^2 \) = .22) \( F(7, 242) = 10.92, \ p < .001 \), respectively. However, loneliness fully mediated this relationship (AR\(^2 \) = .28) \( F(7, 235) = 14.09, \ p < .001 \). Vigorous activity was not related to self-esteem or depression, so analyses could not evaluate these variables as mediators between vigorous activity and suicidal ideation.

**Sport Participation versus Involvement in Other Extracurricular Activities**

To determine if sports provide distinct psychosocial benefits, analyses compared effects of sport participation to involvement in other activities. Table 6-4 presents results from regression analyses that evaluated effects of involvement in non-sport school and community activities on the outcome variables. Few significant relationships emerged between participation in other extracurricular activities and psychosocial measures. Findings remained consistent regardless of students’ level of involvement in school or community activities (results not shown), or type of activity in which students participated. However, sport participation, particularly extramural sports, related to positive psychosocial outcomes. Beneficial effects of extramural sport participation remained among students who reported high involvement (≥ 3 teams) (Table 6-3). Even after controlling for involvement in other activities, effects of extramural sport participation (yes/no) on the outcome variables remained significant.

Number of extracurricular activities did not relate to most psychosocial variables. Yet, time spent in all school-sponsored activities during participants’ last year in high school did relate to the outcome variables (Table 6-5). Specifically, participants who spent 10 or more hours per week during the previous 12 months in extracurricular activities sponsored by their high schools reported higher levels of physical activity, social support, self-esteem, and school connectedness, and lower levels of depression, hopelessness, loneliness, and suicidal ideation. Furthermore, a greater percentage of students who participated in extramural sports reported spending 10 or more hours per week in extracurricular activities (\( \chi^2 = 54.96, \ p < .001; \ n = 111, \))
57.5%), compared to students who participated in school activities ($\chi^2 = 12.36, p < .01; n = 122, 45.9\%$) or in community activities ($\chi^2 = 8.34, p < .05; n = 103, 48.6\%$).

**Discussion**

Contrary to the authors’ previous investigation, this study did not show significant relationships between vigorous activity and self-esteem or depression. Vigorous activity mediated the relationship between extramural sport participation and suicidal ideation, yet when vigorous activity was tested as a mediator in the initial model, the variable became non-significant. Sport participation actually mediated the relationship between vigorous activity and suicidal ideation. Vigorous activity related to behavior performed in high school. Conversely, in the earlier study, vigorous activity related to behavior performed during the previous 7 days. Some participants may have reported engaging in more vigorous activity during high school than they actually performed.

Both studies documented that social support either partially or fully mediated relationships between sport participation and depression, hopelessness, loneliness, and suicidal ideation. School connectedness, measured in this study, mediated (partially or fully) relationships between sport participation and these outcome variables. Depression, hopelessness, and loneliness each mediated (fully or partially) relationships between social support and school connectedness, and suicidal ideation.

Participation in non-sport extracurricular activities did not yield the same psychosocial benefits as sport participation, particularly extramural sports. After accounting for students’ involvement in other activities, effects of extramural sport participation remained significant. These results support findings from research that examined similar relationships among high school students. Harrison and Narayan [5] found that “those involved in team sports at school (alone or combined with other activities)…were most likely to report high self-esteem and were
least likely to report sadness, anxiety, and suicidal behavior" [p.118]. Fredricks and Eccles [170] found that involvement in school clubs did not relate to either self-esteem or depression, but sport participation predicted positive psychological adjustment.

This investigation also addressed key limitations in previous research. First, the study tested an enhanced model depicting potential mechanisms through which high school sport participation related to reduced risk of suicidal ideation. Consistent with previous research [6, 7, 10-13], findings confirmed direct effects of sport participation on suicidality. Taken together, findings from the authors’ tests of a theoretical model suggest that vigorous activity, social support, and school connectedness at least partially account for the relationship between sport participation and suicidal ideation. This study adds to the foundation of research examining pathways through which sport participation relates to reduced risk of suicidality.

Second, this study incorporated validated, highly reliable instruments with specificity to answer questions regarding the association between sport participation and suicidal ideation. This research represented only the third study to include a standardized measure of suicidal ideation to examine effects of sport participation [7, 171]. Measuring variables more precisely may produce greater confidence in study outcomes [80].

Third, this study assessed differential effects across various types of sports and other activities on suicidal ideation and related risk and protective factors. No related research included such detailed assessments of sport participation or involvement in other activities. This study determined that sport participation, particularly extramural sports, affords students enhanced psychosocial benefits, compared to involvement in other activities. Furthermore, greater time spent in school-sponsored activities during a typical week students’ last year in high school yielded stronger results than total number of activities throughout high school. Fredricks
and Eccles [170] found that breadth of participation in extracurricular activities positively related to concurrent indicators of psychological adjustment. However, findings from this study suggest that time spent in school-sponsored activities each week produces stronger effects than number of activity contexts.

Four study limitations warrant recognition. First, the cross-sectional survey could not determine causal relationships. Second, data were obtained through self-report. Participants remained anonymous, but some may have provided socially desirable answers. Third, some data relied on recall. Participants graduated less than 12 months before completing the survey. However, some participants may have exaggerated or forgotten involvement in activities. Fourth, the sample included college students who may differ from those not attending college regarding emotional health or activity involvement.

Investigators should test the proposed model using longitudinal designs, and validate the model with high school students and with larger samples of males. The relationship and mediating pathways between sport participation and suicidal ideation may differ by sex, and this study may have lacked sufficient power to detect differences. Investigators also should continue exploring relationships between involvement in different activities and psychosocial variables. Limited research examines effects of involvement in extracurricular activities on mental health outcomes, compared to effects on health risk behaviors or academic outcomes. In addition, future research should explore the association between sport participation and suicidality among young people with a broader range of mood disturbances and mental health problems to determine whether or not research with a more distressed population yields similar findings.

**Conclusions**

Educators and policymakers must decide whether or not to allocate limited funds to sport programs. This paper provides critical information to help inform these decisions. Researchers
and practitioners should not oversimplify or overstate associations between sport participation and suicide risk, but findings from this line of research suggest opportunities for prevention and merit consideration in public health policy and planning [12]. Despite benefits of sport participation, current state and district budget constraints likely result in decreasing opportunities for some students to participate in school-sponsored sports [174-176]. Thus, school officials and public health planners can use these findings as a tool to evaluate health costs associated with eliminating sport activities, especially as programs face cuts during economic difficulties [177].

Practitioners also may incorporate these findings into intervention efforts to prevent suicide among young people. Multi-compartmental approaches to suicide prevention may include opportunities for young people to engage in physical activity, as well as to become involved in organized sports. Eventually, “physical activity and sport program interventions that possess potential to enhance positive mood and self-esteem, or to promote positive behaviors that compete with negative or self-destructive behaviors, may [become] adjuncts to acceptable behavioral or pharmacological suicide treatment strategies” [80, p.498].
Table 6-1. Percentage of students who participated in different school and community activities during high school

<table>
<thead>
<tr>
<th>Activity</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High school-sponsored activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Band, choir, orchestra, or other music group</td>
<td>16.7</td>
<td>23.9</td>
</tr>
<tr>
<td>School play or musical, or drama club</td>
<td>15.3</td>
<td>17.3</td>
</tr>
<tr>
<td><strong>School involvement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student government</td>
<td>19.4</td>
<td>40.6</td>
</tr>
<tr>
<td>School yearbook, newspaper, or other literary magazine</td>
<td>13.9</td>
<td>27.9</td>
</tr>
<tr>
<td><strong>Academic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>National Honor Society or other academic honor society</td>
<td>84.7</td>
<td>87.8</td>
</tr>
<tr>
<td>Academic clubs (Art, Computer, Debate, Foreign languages, Science, Psychology, Math, Philosophy, etc.)</td>
<td>59.7</td>
<td>70.1</td>
</tr>
<tr>
<td><strong>Prosocial</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service clubs (AFS, Key club, etc.)</td>
<td>58.3</td>
<td>72.6</td>
</tr>
<tr>
<td>Religious organization or group</td>
<td>29.2</td>
<td>37.0</td>
</tr>
<tr>
<td><strong>Vocational</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocational education or professional clubs</td>
<td>25.0</td>
<td>24.9</td>
</tr>
<tr>
<td><strong>Hobby</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hobby clubs (photography, chess, etc.)</td>
<td>45.8</td>
<td>22.3</td>
</tr>
<tr>
<td><strong>Community activities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outdoor</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scouting</td>
<td>8.3</td>
<td>2.5</td>
</tr>
<tr>
<td>4-H</td>
<td>2.8</td>
<td>2.5</td>
</tr>
<tr>
<td><strong>Religious</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious youth groups</td>
<td>37.5</td>
<td>42.1</td>
</tr>
<tr>
<td><strong>Hobby</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hobby clubs</td>
<td>33.3</td>
<td>22.3</td>
</tr>
<tr>
<td><strong>Neighborhood club</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neighborhood clubs or programs</td>
<td>20.8</td>
<td>12.7</td>
</tr>
<tr>
<td>Boys’ clubs or Girls’ clubs</td>
<td>5.6</td>
<td>1.5</td>
</tr>
<tr>
<td>YMCA or other youth groups</td>
<td>8.3</td>
<td>14.2</td>
</tr>
<tr>
<td><strong>Summer program</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer programs such as workshops or institutes in science, drama, language, etc.</td>
<td>29.2</td>
<td>36.5</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>33.3</td>
<td>37.1</td>
</tr>
</tbody>
</table>
Table 6-2. Percentage of students who participated in different sport activities during high school

<table>
<thead>
<tr>
<th>Activity</th>
<th>Males</th>
<th>Females</th>
<th>Activity</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intramural</td>
<td>Extramural</td>
<td>Intramural</td>
<td>Extramural</td>
<td>Activity</td>
</tr>
<tr>
<td>Baseball/softball</td>
<td>9.7</td>
<td>15.3</td>
<td>9.7</td>
<td>0.0</td>
<td>9.6</td>
</tr>
<tr>
<td>Football</td>
<td>12.5</td>
<td>19.4</td>
<td>2.8</td>
<td>3.0</td>
<td>3.6</td>
</tr>
<tr>
<td>Basketball</td>
<td>15.3</td>
<td>11.1</td>
<td>8.3</td>
<td>1.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Soccer</td>
<td>4.2</td>
<td>12.5</td>
<td>8.3</td>
<td>4.1</td>
<td>18.3</td>
</tr>
<tr>
<td>Swim team</td>
<td>1.4</td>
<td>12.5</td>
<td>4.2</td>
<td>0.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Cheerleading</td>
<td>0.0</td>
<td>0.0</td>
<td>1.4</td>
<td>1.5</td>
<td>13.7</td>
</tr>
<tr>
<td>Dance/drill team</td>
<td>0.0</td>
<td>1.4</td>
<td>0.0</td>
<td>2.5</td>
<td>7.6</td>
</tr>
<tr>
<td>Other team sport (hockey, volleyball, etc)</td>
<td>13.9</td>
<td>23.6</td>
<td>5.6</td>
<td>6.1</td>
<td>23.9</td>
</tr>
<tr>
<td>Other individual sport (cross-country, track, golf, gymnastics, wrestling, tennis, etc)</td>
<td>5.6</td>
<td>40.3</td>
<td>6.9</td>
<td>5.1</td>
<td>31.5</td>
</tr>
</tbody>
</table>

*Note.* Intramural sports means the sport teams competed within students’ own schools (not including PE classes). Extramural sports means the sport teams competed with other school teams (freshman, junior varsity, and/or varsity sports). Community sports means the sport teams were run by community organizations.
Table 6-3: Standardized regression coefficients for physical activity and psychosocial variables predicted from participation in sports during high school

<table>
<thead>
<tr>
<th>Activity</th>
<th>High school moderate activity</th>
<th>High school vigorous activity</th>
<th>Social support</th>
<th>School connectedness</th>
<th>Self-esteem</th>
<th>Depression</th>
<th>Hopelessness</th>
<th>Loneliness</th>
<th>Suicidal ideation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sport participation (yes/no)</td>
<td>.12</td>
<td>.52/.20*</td>
<td>.18**</td>
<td>.22**</td>
<td>.17*</td>
<td>-.19**</td>
<td>-.19**</td>
<td>-.16*</td>
<td>-.14*</td>
</tr>
<tr>
<td>Level of involvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately involved (1-2 teams)</td>
<td>.05</td>
<td>.58/.28**</td>
<td>.21*</td>
<td>.21*</td>
<td>.20*</td>
<td>-.25**</td>
<td>-.22*</td>
<td>-.18*</td>
<td>-.20*</td>
</tr>
<tr>
<td>Highly involved (≥ 3 teams)</td>
<td>.27**</td>
<td>.72***</td>
<td>.24**</td>
<td>.35***</td>
<td>.23*</td>
<td>-.23*</td>
<td>-.25**</td>
<td>-.22*</td>
<td>-.13</td>
</tr>
<tr>
<td>Extramural sports (yes/no)</td>
<td>.14*</td>
<td>.47***</td>
<td>.19**</td>
<td>.27***</td>
<td>.14*</td>
<td>-.22**</td>
<td>-.17/.46*</td>
<td>-.14*</td>
<td>-.16*</td>
</tr>
<tr>
<td>Level of involvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately involved (1-2 teams)</td>
<td>.15</td>
<td>.47***</td>
<td>.21**</td>
<td>.27**</td>
<td>.13</td>
<td>-.23**</td>
<td>-.20*</td>
<td>-.14</td>
<td>-.17*</td>
</tr>
<tr>
<td>Highly involved (≥ 3 teams)</td>
<td>.16*</td>
<td>.51***</td>
<td>.16*</td>
<td>.31***</td>
<td>.19*</td>
<td>-.20**</td>
<td>-.11/.29*</td>
<td>-.09/.18*</td>
<td>-.15*</td>
</tr>
<tr>
<td>Intramural sports (yes/no)</td>
<td>.10</td>
<td>.10</td>
<td>.02</td>
<td>.03</td>
<td>-.01</td>
<td>-.07</td>
<td>-.07</td>
<td>.01</td>
<td>.04</td>
</tr>
<tr>
<td>Community sports (yes/no)</td>
<td>.17**</td>
<td>.19**</td>
<td>.09</td>
<td>.10</td>
<td>.07</td>
<td>.04</td>
<td>-.09</td>
<td>-.08</td>
<td>-.02</td>
</tr>
</tbody>
</table>

*Note.* Though both are included in the same table, the data for the sport participation variables and the level of sport involvement variables represent separate analyses. Also, data for each sport activity represents a separate analysis. Two coefficients indicate female and male relationships, respectively, that resulted from a significant interaction effect. The p-value presented for these models represents the significance level for the interaction. Single coefficients indicate the sex interaction was not significant in the model. Sex, race/ethnicity, college sport participation, and involvement in other college organizations were controlled in all models.

* *p < .05, ** *p < .01, *** *p < .001.
Table 6-4. Standardized regression coefficients for physical activity and psychosocial variables predicted from participation in different school and community activities during high school

<table>
<thead>
<tr>
<th>Activity</th>
<th>High school moderate activity</th>
<th>High school vigorous activity</th>
<th>Social support</th>
<th>School connectedness</th>
<th>Self-esteem</th>
<th>Depression</th>
<th>Hopelessness</th>
<th>Loneliness</th>
<th>Suicidal ideation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>School activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>.13*</td>
<td>-11/.06*</td>
<td>.01</td>
<td>-.04</td>
<td>-.02</td>
<td>.09</td>
<td>.04/.21**</td>
<td>.04</td>
<td>.06</td>
</tr>
<tr>
<td>School involvement</td>
<td>.10</td>
<td>.08</td>
<td>.10</td>
<td>.10</td>
<td>.06</td>
<td>.02</td>
<td>-.13*</td>
<td>-.02</td>
<td>-.04</td>
</tr>
<tr>
<td>Academic</td>
<td>-.06</td>
<td>-.02</td>
<td>-.08</td>
<td>.21/.38*</td>
<td>.04</td>
<td>.05</td>
<td>.04</td>
<td>.05</td>
<td>-.03</td>
</tr>
<tr>
<td>Prosocial</td>
<td>.15*</td>
<td>.19**</td>
<td>.12</td>
<td>.07</td>
<td>-.03</td>
<td>.01</td>
<td>-.07</td>
<td>-.10</td>
<td>-.05</td>
</tr>
<tr>
<td>Vocational</td>
<td>.02</td>
<td>-.07</td>
<td>.05</td>
<td>-.06</td>
<td>-.06</td>
<td>.01</td>
<td>.04</td>
<td>.02</td>
<td>.04</td>
</tr>
<tr>
<td>Hobby</td>
<td>.14*</td>
<td>.13*</td>
<td>.02</td>
<td>.04</td>
<td>-.05</td>
<td>.06/.21**</td>
<td>.13</td>
<td>.04</td>
<td>-.00/.21*</td>
</tr>
<tr>
<td><strong>Community activities</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outdoor</td>
<td>.02</td>
<td>.01</td>
<td>.04</td>
<td>.09</td>
<td>.04</td>
<td>.01</td>
<td>-.09</td>
<td>-.06</td>
<td>-.01</td>
</tr>
<tr>
<td>Religious</td>
<td>.01</td>
<td>.10</td>
<td>.05</td>
<td>-.01</td>
<td>.02</td>
<td>-.02</td>
<td>-.02</td>
<td>.02</td>
<td>.01</td>
</tr>
<tr>
<td>Hobby</td>
<td>.11</td>
<td>.08</td>
<td>-.07</td>
<td>-.05</td>
<td>-.11</td>
<td>.11</td>
<td>.02</td>
<td>.07</td>
<td>.04</td>
</tr>
<tr>
<td>Neighborhood club</td>
<td>.20**</td>
<td>.18**</td>
<td>.03</td>
<td>-.04</td>
<td>-.06</td>
<td>.06</td>
<td>-.01</td>
<td>.02</td>
<td>.02</td>
</tr>
<tr>
<td>Summer program</td>
<td>.13*</td>
<td>.01</td>
<td>.13*</td>
<td>.02</td>
<td>.05</td>
<td>.05</td>
<td>-.02</td>
<td>-.12</td>
<td>.05</td>
</tr>
<tr>
<td>Other</td>
<td>.01</td>
<td>.05</td>
<td>.04</td>
<td>-.02</td>
<td>-.14*</td>
<td>.15*</td>
<td>.16**</td>
<td>-.01</td>
<td>.06</td>
</tr>
</tbody>
</table>

*Note. Though all are included in the same table, the data for each activity represents a separate analysis. Two coefficients indicate female and male relationships, respectively, that resulted from a significant interaction effect. The p-value presented for these models represents the significance level for the interaction. Single coefficients indicate the sex interaction was not significant in the model. Sex, race/ethnicity, college sport participation, and involvement in other college organizations were controlled in all models. *p < .05, **p < .01, ***p < .001.*
Table 6-5. Standardized regression coefficients for physical activity and psychosocial variables predicted from total participation in extracurricular activities and time spent in school activities during high school

<table>
<thead>
<tr>
<th>Activity</th>
<th>High school moderate activity</th>
<th>High school vigorous activity</th>
<th>Social support</th>
<th>School connectedness</th>
<th>Self-esteem</th>
<th>Depression</th>
<th>Hopelessness</th>
<th>Loneliness</th>
<th>Suicidal ideation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total # of extracurricular activities (TEAP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of involvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderately involved (2-5 activities)</td>
<td>.26</td>
<td>-.45</td>
<td>-.86*</td>
<td>-.65</td>
<td>-.51</td>
<td>.08</td>
<td>-.35</td>
<td>.42</td>
<td>.32</td>
</tr>
<tr>
<td>Highly involved (6-8 activities)</td>
<td>.31</td>
<td>-.30</td>
<td>-.83</td>
<td>-.60</td>
<td>-.55</td>
<td>-.02</td>
<td>-.42</td>
<td>.33</td>
<td>.35</td>
</tr>
<tr>
<td>Extremely involved (≥ 9 activities)</td>
<td>.55</td>
<td>-.07</td>
<td>-.79</td>
<td>-.53</td>
<td>-.58</td>
<td>.07</td>
<td>-.48</td>
<td>.36</td>
<td>.34</td>
</tr>
<tr>
<td>Time spent in school activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 to 4 hrs/wk</td>
<td>.00</td>
<td>-.10</td>
<td>.17</td>
<td>-.13</td>
<td>.20</td>
<td>-.18</td>
<td>-.25/.03**</td>
<td>-.18</td>
<td>-.14</td>
</tr>
<tr>
<td>5 to 9 hrs/wk</td>
<td>.08</td>
<td>.11</td>
<td>.27*</td>
<td>-.10</td>
<td>.21</td>
<td>-.27*</td>
<td>-.33**</td>
<td>-.17</td>
<td>-.27*</td>
</tr>
<tr>
<td>≥ 10 hrs/wk</td>
<td>.30*</td>
<td>.45***</td>
<td>.32**</td>
<td>.16*</td>
<td>.32**</td>
<td>-.34**</td>
<td>-.36**</td>
<td>-.32**</td>
<td>-.35**</td>
</tr>
</tbody>
</table>

Note. Though both are included in the same table, the data for the extracurricular activity participation variable and time spent in extracurricular activities variable represent separate analyses. Two coefficients indicate female and male relationships, respectively, that resulted from a significant interaction effect. The p-value presented for these models represents the significance level for the interaction. Single coefficients indicate the sex interaction was not significant in the model. Sex, race/ethnicity, college sport participation, and involvement in other college organizations were controlled in all models. * p < .05, ** p < .01, *** p < .001.
Figure 6-1. Model presenting proposed mechanisms through which sport participation influences the risk of suicidal ideation
Note. Sex and race/ethnicity were controlled in all models. Also, involvement in sports or other organizations during college were controlled in models that included extramural sport participation. Two coefficients indicate female and male relationships, respectively, that resulted from a significant interaction effect. The p-value presented for these models represents the significance level for the interaction. Single coefficients indicate the sex interaction was not significant in the model. * p < .05, ** p < .01, *** p < .001.

Figure 6-2. Path model with standardized regression coefficients
CHAPTER 7
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The present work focused on the relationship between sport participation and risk of suicide among young people. Specifically, the work served three purposes: 1) to highlight potential ways sport participation may enhance resilience in youth and, thus, reduce the risk of suicide; 2) to further explore associations among physical activity, sport participation, and suicide risk; and 3) to address key methodological limitations in the extant literature. Five investigations extend the current literature and address weaknesses in previous research.

Chapter 2 described an investigation that synthesized the empirical evidence regarding sport participation and protective factors associated with resilience in youth. Findings suggested that involvement in sports may represent an optimal activity to promote mechanisms that enhance resilience in youth. The article titled “Sport Participation: A Vehicle for Promoting Resilience in Youth” was published in The Health Education Monograph Series, November 2008.

The research presented in Chapter 3 examined relationships between different types of physical activity and rates of hopelessness, depression, and suicidal behavior among college students. Data for this paper derived from the 2005 American College Health Association - National College Health Assessment. This study represented the first investigation to examine the association between strength or toning activity and suicide risk among college students, and one of only two studies to examine the effects of aerobic activity on suicide risk among college students. Findings provided empirical evidence that establishes the association between physical activity, especially aerobic activity, and reduced risk of suicidal behavior among young adults. However, findings also suggested that for some students, engaging in frequent exercise with the
intent to lose weight related to increased risk of emotional distress. Also, females who combined frequent exercise and deleterious dieting behavior showed increased suicide risk. The article based on this research, titled “Associations Between Physical Activity and Reduced Rates of Hopelessness, Depression, and Suicidal Behavior Among College Students,” was published in the January/February 2009 issue of the *Journal of American College Health*.

The study presented in Chapter 4 examined associations among physical activity, sport participation, and suicide risk in adolescents using data from the Centers for Disease Control and Prevention’s 2005 Youth Risk Behavior Survey. In October 2008, the *Journal of School Health* published findings from this research in the article “High School Youth and Suicide Risk: Exploring Protection Afforded Through Physical Activity and Sport Participation.” To test the assumption that involvement in organized sports affords distinct protection against suicide risk, sport participation was controlled for during the physical activity analyses, and physical activity was controlled for during the sport analyses. By controlling the effect of one variable while examining the relationship between the other variable and the outcome measures, this study added to the literature and provided a more clear understanding of relationships among the variables. Findings from this study confirmed that mechanisms other than physical activity contribute to the protective association between sport participation and reduced risk of suicide. Furthermore, findings indicated that, for females, exercising to lose weight, as well as restricting calories or taking diet supplements to attain the same goal, significantly increased suicide risk.

Chapter 5 described research conducted with students enrolled in undergraduate courses at the University of Florida. This study sought to test the hypothesis that sport participation protects against risk factors associated with suicide through multiple mechanisms. Analyses also
tested the hypothesis that participating in sports provides college students increased protection against suicidal ideation more effectively than does participating in other activities.

This study represented the first effort to test a model depicting potential mechanisms through which collegiate sport participation relates to reduced risk of suicidal ideation among college students. Analyses confirmed a path model and tested for mediation effects. Vigorous activity mediated relationships between sport participation and self-esteem and depression; and self-esteem and depression mediated the relationship between vigorous activity and suicidal ideation. Social support mediated relationships between sport participation and depression, hopelessness, and loneliness; and each of these risk factors partially mediated the relationship between social support and suicidal ideation. However, no variable fully mediated the relationship between sport participation and suicidal ideation.

This study also compared effects of sport participation to involvement in other extracurricular activities. Findings indicated that participation in non-sport university activities did not provide students with the same psychosocial benefits as did sport participation. Findings from this research appear in the manuscript titled “Exploring Potential Mediating Pathways Through Which Participation in Sports Relates to Reduced Risk of Suicidal Ideation,” accepted for publication in *Research Quarterly for Exercise and Sport*.

Chapter 6 discussed an investigation that tested an enhanced model examining the effects of involvement in sports during high school. Improved assessments of sport participation and involvement in other extracurricular activities allowed for a detailed analysis regarding types of activities that afforded the greatest benefit. This study revealed partial support for the proposed model. Vigorous activity was not related to self-esteem or depression, but vigorous activity mediated the relationship between extramural sport participation and suicidal ideation. Social
support and school connectedness mediated relationships between extramural sport participation and depression, hopelessness, loneliness, and suicidal ideation. Furthermore, each of these risk factors mediated the relationship between the protective factors and suicidal ideation. Findings also showed that, compared to other activities, extramural sport participation related to higher levels of protective factors and to lower levels of risk factors associated with suicide risk. The manuscript based on this research, titled “Exploring Protective Relationships Between Participation in Sports and Risk Factors Associated with Adolescent Suicide,” has been submitted for publication.

Conclusions

Findings from this line of research support the contention that sport participation favorably affects a variety of broadly defined outcomes including social and psychological well-being [67, 74]. Researchers identified a relationship between sport participation and reduced risk of suicidal behavior [5-13, 73]. Researchers also proposed hypothetical mechanisms to explain the association between sport participation and reduced odds of suicidality [80]. However, no study specifically tested these mechanisms. This research advanced the science in this area by exploring potential mechanisms that account for the relationship between sport participation and reduced risk of suicidality among young people.

Consistent with previous research [4, 70, 72], findings from the present studies support an association between physical activity and decreased risk of suicidal behavior. However, after controlling for sport participation, relationships sometimes changed. For example, among females in one study, no significant differences emerged between physical activity and suicidal behavior after sport participation was controlled [178]. Also, two studies that tested the mediating effect of physical activity on the relationship between sport participation and suicidal ideation yielded inconsistent findings. When sport participation, physical activity, and suicidal
ideation were included in one model, the first study showed that sport participation mediated the relationship between physical activity and suicidal ideation. Conversely, in the second study, physical activity mediated the relationship between sport participation and suicidal ideation. The two investigations explored relationships between suicidal ideation, and physical activity and sport participation using different independent variables. Therefore, reasons for the dissonant results remain uncertain.

Furthermore, among some female students, engaging in frequent physical activity to lose weight, and/or engaging in deleterious dieting behavior, related to increased suicide risk. These findings may explain relationships found in previous research between high levels of physical activity and increased risk of suicidal behavior among females [9, 10]. Thome and Espelage [129] found that exercise related to positive psychological health in college females, but only when exercise was unassociated with an eating disorder. Thus, findings from the present research support the theory that factors related to poor body image may contribute to low self-esteem, depression, and suicidal feelings that likely influence the relationship between physical activity and suicidal behavior [9, 10].

The inverse relationship between sport participation and suicide risk remained consistent across the three studies in this dissertation that examined sports’ effects on suicidality. Findings support previous research that showed direct effects of sport participation on suicide risk [6, 7, 10-13]. Furthermore, tests of a theoretical model suggest that vigorous activity, social support, and school connectedness at least partially account for the relationship between sport participation and reduced risk of suicidal ideation. These three factors influence the relationship between sport participation and suicidal ideation by protecting against significant risk factors – low self-esteem, depression, hopelessness, and loneliness – associated with adolescent suicide.
The two studies that compared effects of sport participation to involvement in other extracurricular activities yielded consistent findings. Specifically, these studies found that participation in non-sport activities did not provide students with the same psychosocial benefits as did sport participation. These findings support previous research that examined similar relationships among high school students [5, 170]. Furthermore, an examination of differential effects across types of sports identified extramural sport participation as more beneficial than involvement in intramural or community sports. This finding supports findings from Marsh and Kleitman [67] and Broh [179] who determined that extramural/interscholastic sports produced more positive effects than intramural sports.

In conclusion, this research advances the science regarding sport participation and risk of suicide. Findings from this line of inquiry provide a foundation for research to examine pathways through which sport participation relates to reduced risk of suicidal behavior. Researchers and practitioners should not oversimplify or overstate the associations between sport participation and suicide risk, but findings suggest opportunities for prevention and merit consideration in public health policy and planning [12]. Health professionals may use this research to advocate for increased opportunities to involve young people in sports and vigorous activity. School officials and public health planners can use these findings as a tool to evaluate health costs associated with eliminating sport activities, especially as programs face cuts during economic difficulties [177]. Eventually, practitioners may incorporate these findings into intervention efforts to prevent and treat suicidal tendencies among young people [80].

**Recommendations for Future Research**

- Test the proposed model using longitudinal designs.
- Validate the model with high school students and with a larger sample of males.
• Incorporate enhanced assessments of physical activity and suicidal behavior (e.g., history of suicide attempts).

• Empirically study ways through which sport participation enhances resilience in young people, thus helping to reduce the risk of suicide.

• Continue exploring relationships between involvement in different types of extracurricular activities and psychosocial variables.

• Explore the association between sport participation and suicidality among young people with a broader range of mood disturbances and mental health problems to determine whether or not research with a more distressed population yields similar findings.
APPENDIX A
DEMOGRAPHIC AND BACKGROUND INFORMATION

1. What is your sex?
   - Female
   - Male

2. How old are you? ______ years

3. What is your class level? (check one circle) (item included only for Chapter 6)
   - Freshman
   - Sophomore
   - Junior
   - Senior
   - Graduate

4. In what semester year did you graduate from high school? (check one circle) (item included only for Chapter 6)
   - Winter (end of fall) 2007
   - Spring 2008
   - Summer 2008
   - Did not graduate, but passed GED test

5. From what kind of high school did you graduate? (check one circle) (item included only for Chapter 6)
   - Public school (not charter or magnet)
   - Public charter school
   - Public magnet school
   - Private religious/parochial school
   - Private independent college-prep school
   - Home school

6. Which of the following best describes your ethnic background? (check one circle)
   - Hispanic or Latino
   - Not Hispanic or Latino

7. Which of the following best describes your race? (check one circle)
   - White or Caucasian
   - Black or African American
   - Asian
   - American Indian or Alaskan Native
   - Native Hawaiian or Other Pacific Islander
   - Some Other Race
   - Multi-Racial (option included only for Chapter 6)
APPENDIX B
PHYSICAL ACTIVITY, SPORT PARTICIPATION, AND INVOLVEMENT IN OTHER EXTRACURRICULAR ACTIVITIES

The following items were included for Chapters 5 and 6.

1. On how many of the past 7 days did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors? (check one circle)

   O 0   O 1   O 2   O 3   O 4   O 5   O 6   O 7

2. On how many of the past 7 days did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as jogging, swimming laps, fast bicycling, fast dancing, or similar aerobic activities? (check one circle)

   O 0   O 1   O 2   O 3   O 4   O 5   O 6   O 7

(CDC’s YRBS, 2006 [79])

The following items were included only for Chapter 5.

3. During the past 12 months, how many UF sponsored clubs or organizations (not including sport teams) have you been a member of?

   O 0   O 1   O 2   O 3   O 4 or more

For the following questions, do NOT include sport classes you took for credit.

4. During the past 12 months, on how many varsity or club sports teams run by UF did you play?

   O 0   O 1   O 2   O 3   O 4 or more

5. During the past 12 months, on how many intramural sports teams run by UF did you play?

   O 0   O 1   O 2   O 3   O 4 or more

The following items were included only for Chapter 6.

6. During your last year of high school, on how many days during a typical week did you participate in physical activity for at least 30 minutes that did not make you sweat or breathe hard, such as fast walking, slow bicycling, skating, pushing a lawn mower, or mopping floors? (check one circle)

   O 0   O 1   O 2   O 3   O 4   O 5   O 6   O 7
7. During your last year of high school, on how many days during a typical week did you exercise or participate in physical activity for at least 20 minutes that made you sweat and breathe hard, such as jogging, swimming laps, fast bicycling, fast dancing, or similar aerobic activities? (check one circle)

O 0   O 1   O 2   O 3   O 4   O 5   O 6   O 7

8. During the past 12 months, were you a member of any college intramural, club, or varsity sports teams?

O No    O Yes

9. During the past 12 months, were you a member of any other college organizations (not including sports teams)?

O No    O Yes

10. During the past 12 months, how much total time did you spend on all extracurricular activities sponsored by your HIGH SCHOOL in a typical week? (check one circle)

O None
O Less than 1 hour per week
O 1 to 4 hours per week
O 5 to 9 hours per week
O 10 to 19 hours per week
O 20 hours or more per week
The following 4 scales were included only for Chapter 6.

Participation in Organized Sports

Please mark all that apply for each interscholastic, intramural, and community sport activity you participated in during high school.

**INTERSCHOLASTIC** means your school team competed against other school teams (i.e., freshman, junior varsity, or varsity team).

**SCHOOL INTRAMURAL** means the teams were within your own school (do not include PE classes).

**COMMUNITY ACTIVITY** means the teams were run by community organizations, not your high school (i.e., YMCA, county league, other community recreation center).

<table>
<thead>
<tr>
<th>MARK ALL THAT APPLY ON EACH LINE:</th>
<th>School Did Not Have</th>
<th>Did Not Participate</th>
<th>Participated in Intramural Sports</th>
<th>Participated on a Junior Varsity or Freshman Team</th>
<th>Participated on a Varsity Team</th>
<th>Participated on a Community Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Baseball/Softball</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Football</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. Basketball</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. Soccer</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>e. Swim team</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>f. Cheerleading</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>g. Dance/Drill team</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>h. Other team sport (hockey, volleyball, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>i. Other individual sport (cross-country, track, golf, gymnastics, wrestling, tennis, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Participation in Other School-Sponsored Activities

Please check one circle for each school-sponsored club or group you participated in during high school.

<table>
<thead>
<tr>
<th>MARK ONE ON EACH LINE:</th>
<th>School Did Not Have</th>
<th>Did Not Participate</th>
<th>Participated</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Band, choir, orchestra, or other school music group</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. School play or musical, or drama club</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. Student government</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. National Honor Society or other academic honor society</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>e. School yearbook, newspaper, or other literary magazine</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>f. Service clubs (AFS, Key club, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>g. Academic clubs (Art, Computer, Debate, Foreign languages, Science, Psychology, Math, Philosophy, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>h. Hobby clubs (photography, chess, frisbee, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>i. Vocational education or professional clubs</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>j. Religious organization or group</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Participation in Other Community Activities

Please check one circle for each community group or organization, not including sport teams, you participated in during high school.

<table>
<thead>
<tr>
<th>MARK ONE ON EACH LINE:</th>
<th>Did Not Have</th>
<th>Did Not Participate</th>
<th>Participated</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Scouting</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>b. Religious youth groups</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>c. Hobby clubs</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>d. Neighborhood clubs or programs</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>e. Boys’ clubs or girls’ clubs</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>f. 4-H</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>g. YMCA or other youth groups</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>h. Summer programs such as workshops or institutes in science, drama, language, etc.</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>i. Other</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

(National Center for Education Statistics, 1988 [172])
### APPENDIX C
### SCHOOL CONNECTEDNESS SCALE

Indicate how much you agree or disagree with each of the following statements regarding your high school experience. Check one circle for each.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I felt close to people at my high school.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2. I felt like I was part of my high school.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>3. I was happy to be at my high school.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4. The teachers at my high school treated students fairly.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>5. I felt socially accepted at my high school.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>6. I felt safe at my high school.</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

(Bearman, Jones, & Udry, 1998 [173])
APPENDIX D
SCALES THAT CANNOT BE REPRODUCED

Personal Resource Questionnaire85 - Part II (Weinert, 1987 [154])

Adult Suicidal Ideation Questionnaire (Reynolds, 1991 [161])

Beck Hopelessness Scale (Beck, 1974 [157])

Rosenberg Self-Esteem Scale (Rosenberg, 1965 [155])

Center for Epidemiologic Studies Depression Scale (Radloff, 1977 [156])

Revised UCLA Loneliness Scale (Russell, 1980 [160])
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BIOGRAPHICAL SKETCH

Lindsay A. Taliaferro was born in 1976 in Chicago, Illinois. She grew up in northern Virginia and graduated from Oakton High School in 1994. Lindsay attended the Virginia Polytechnic Institute and State University (Virginia Tech). In 1998, Lindsay earned a Bachelor of Science degree from Virginia Tech in Psychology. After graduation, Lindsay enrolled at Florida International University. She earned a Master of Science degree in Sports Management. In 2001, Lindsay enrolled at the University of South Florida (USF). While pursuing a master's degree at USF, Lindsay worked as a Graduate Research Assistant for the Florida Prevention Research Center. Lindsay earned a Master of Public Health in Health Education from USF in 2003. After graduation, Lindsay worked as a Research Study Coordinator for the Health Outcomes and Behavior Program at the H. Lee Moffitt Cancer Center and Research Institute.

Lindsay entered the Ph.D. program in the Department of Health Education and Behavior at the University of Florida (UF) in 2005. During her first year at UF, Lindsay clarified her research focus. She developed a line of research investigating the relationship between participation in sports and reduced risk of suicide among young people. Lindsay's doctoral dissertation includes several scientific papers based on her research submitted for publication to scholarly journals. Lindsay will be granted a Doctor of Philosophy in Health and Human Performance with an emphasis in Health Behavior in August 2009.