

Sport Participation and Alcohol Use during Adolescence: Mediators and  
Moderators Explaining the Positive Relation

by

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A Thesis Presented in Partial Fulfillment  
of the Requirements for the Degree  
Master of Science

Approved March 2011 by the  
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ARIZONA STATE UNIVERSITY

May 2011

## ABSTRACT

Previous research suggests that the relation between sport participation and alcohol use is positive, but small in size. Few explanations for this positive relation have been empirically tested. Theories denote that the relation between sport participation and alcohol use is explained by peers and that the relation varies based on the models adolescents are exposed to. This study tested mediators (popularity and friends' alcohol use) and moderators (sport-focus, teammates' alcohol use, gender, popularity, and friends' alcohol use) for the relation between sport participation and alcohol use. Analyses were conducted through path models in Mplus v5.1. The sample included 48,390 adolescents (mean age=15.8 years; 51% female) from the National Longitudinal Study of Adolescent Health. In the self-administered in-school questionnaire, adolescents reported on their activity participation, alcohol use, friendship nominations, and demographic characteristics. Friend indicators were based on friends' self-reported alcohol use. Results suggested that popularity mediated, but did not moderate the relation between sport participation and alcohol use. In contrast, friends' alcohol use moderated, but did not mediate this relation. The relation was positive and strongest for sport-focused adolescents, and for adolescents whose teammates and sport friends used high levels of alcohol. The findings of this study suggest athletes are at an elevated risk for alcohol use, but not all athletes drink. Peers are important predictors, such that, sport participation may be related to alcohol use, partially, because it promotes adolescents' social status. The sport context is also important, such that, athletes are more likely to use alcohol if they

are highly involved in sports, and they have sport friends and teammates who drink. Specific types of athletes, such as popular athletes, should be targeted for alcohol use interventions. Intervention programs should also be designed to capture specific aspects of the sport context, such as teams without no tolerance substance use policies, and highly competitive or stressful sports.

This thesis is dedicated to my high school coaches and teachers for showing me the power of sports to teach me dedication, responsibility, and perseverance off the court and outside of the classroom. To Coach Petty for teaching me through softball that “I can’t” is never acceptable, no matter the circumstances, on the field or off the field. To Coach Boone for teaching me that my dreams go so far beyond the volleyball court and never letting me quit. To my high school literature teacher, Mr. Poe, for being my strength during the transition to college and believing in my full academic potential. This thesis is dedicated to these coaches and teachers for teaching me to “build a bridge” to get over the trivialities of life and to transfer my athletic drive into a “life” drive.

## ACKNOWLEDGMENTS

I am especially grateful for the support and guidance of my advisor, Sandi, for not only pushing me harder than I thought I could handle, but for providing the skills and tools needed to do quality research. I am still, every day, amazed by your ability to write a manuscript and to keep your smile even after dozens of models crashing. Also, for reminding me that, when I'm forced to tears and think there's no end in sight, that's just the beginning.

I also acknowledge the significant amount of time and energy contributed by my other committee members, David and Kim. Your feedback on this document has been more than valuable and it could not have been produced without you. Thank you, David, for always challenging me and keeping me on my toes. Thank you, Kim, for forcing me to really know my study and training me to translate scientific findings into real-life advice.

This research uses data from a project designed by Udry, Bearman and Harris. Funded by grant P01-HD31921 from NICHD, with cooperative funding from 17 other agencies. Special acknowledgement to Rindfuss and Entwisle for assistance in the original design. Persons interested in obtaining data files should contact AddHealth, Carolina Population Center, 123 W. Franklin St., Chapel Hill, NC 27516 ([addhealth@unc.edu](mailto:addhealth@unc.edu)).

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## **Introduction**

In 2002, more than half of all students in high school participated in sport activities (52%; United States Department of Education [USDE], 2007). Federal government agencies, such as the United States Department of Health and Human Services (USDHHS), endorse participation in sports as a primary means to increase adolescents' physical activity (USDHHS, 2000). Although participation in sport activities is associated with a variety of positive adjustment outcomes for adolescents, such as social well-being, sport participation is also associated with higher alcohol use (e.g., Linver, Roth, & Brooks-Gunn, 2009; Zarrett et al., 2009). Researchers have speculated about the positive relation between sport participation and alcohol use, yet, few of these explanations have been empirically tested. The overarching goal of this study was to empirically test possible mediators and moderators that explain the positive relation between sport participation and alcohol use.

### **Sport Participation and Alcohol Use**

Alcohol use is becoming a normative trend among high school students. In recent years, almost half (43%) of all high school students drank alcohol in the last month (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Although most adolescents who use alcohol do not go on to become problematic substance users, research suggests that adolescent alcohol use is associated with other immediate dangers, such as violence and school dropout (Newcomb, 1995). Recent research suggests that alcohol use during adolescence may be particularly prevalent for certain adolescents, such as adolescents who participate in sport activities. Sport

participants tend to use more alcohol than adolescents who participate in other extracurricular activities and adolescents who do not participate in any extracurricular activities (Darling, Caldwell, & Smith, 2005; Hoffman, 2006; Eccles, Barber, Stone, & Hunt, 2003; Fauth, Roth, & Brooks-Gunn, 2007; Fredricks & Eccles, 2005).

Adolescents' risk-taking behaviors, such as drinking alcohol, often occur when adolescents are unsupervised after school (Osgood, Anderson, & Schaffer, 2005). Theoretically, organized after-school activities, such as sport activities, should provide a safe, enjoyable environment for adolescents. Sport activities provide a place to build adolescents' athletic skills, social skills, and increase adolescents' motivation and thus, should function to prevent adolescent alcohol use (Hansen, Larson, & Dworkin, 2003). Sport participation protects against other drug use, such as marijuana and cigarette use, but surprisingly does not always protect against alcohol use (Choquet & Arvers, 2002; Darling et al., 2005; Duncan, Duncan, Strycker, & Chaumeton, 2002; Eccles & Barber, 1999; Hoffman, 2006; Miller, Melnick, Barnes, Sabo, & Farrell, 2007; Peretti-Watel, Beck, & Legleye, 2002). Explaining why and the conditions under which sport participation is positively related to alcohol use would help elucidate this unexpected finding.

Although the relation between sport participation and alcohol has been replicated across several studies, it is typically small in size (e.g., Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2007; Ferron, Narring, Caudey, & Michaud, 1999; Leaver-Dunn, Turner, & Newman, 2007; Mays et al., 2010;

Osgood, Wilson, O'Malley, Bachman, & Johnston, 1996; Pate, Heath, Dowda, & Trost, 1996). One reason that the overall effect may be small is that there is heterogeneity in the effect. Some scholars suggest that sports is associated with alcohol use because athletes are popular and have friends who drink (Barber, Eccles, & Stone, 2001; Gardner, Roth, & Brooks-Gunn, 2009; Mays & Thompson, 2009; Peretti-Watel et al., 2003). Thus, the first goal of this study was to empirically test popularity and friends' alcohol use as possible mediators of the relation between sport participation and alcohol use. The second goal of this study was to determine the conditions under which a positive relation between sport participation and alcohol use exists. Specifically, the second goal was to examine whether (a) adolescents' focus on sport activities versus other activities, (b) teammates' alcohol use, (c) gender, (d) popularity, and (e) friends' alcohol use moderated the link between sport participation and alcohol use.

### **Mediators of the Relation between Sport Participation and Alcohol Use**

Eccles and Barber's (1999) theoretical model on the reciprocal relations between adolescents' activities, friendships, and outcomes suggests that the relation between sport participation and alcohol use may emerge because of two mechanisms: popularity and friends' alcohol use. This model suggests that activities matter because they help maintain old friendships and develop new friendships. Thus, sport activities are theorized to connect adolescents with friends that have certain characteristics, such as, alcohol use, which influences adolescents' alcohol use. In this case, it is likely that athletes use alcohol partially because their friends, drawn from sport activities, also use alcohol.

The crowd literature supports these notions. Adolescents segment themselves into distinct social crowds based partially on their participation in different types of extracurricular activities (Brown, 2004; Eccles & Barber; Brown & Dietz, 2009). Many of the athletes are part of the jock crowd, which provides a basis by which athletes and their friends form identities and assimilate behaviors (Barber et al., 2001; Eccles & Barber). Adolescents in the jock crowd are regarded as elite, athletic, and popular, and tend to interact with other jocks (Barber et al.; Brown). These crowds can be further differentiated into smaller, more proximal friendship groups. Friendship groups differ from crowds because they are smaller and more intimate. Further, adolescents in friendship groups directly interact together, whereas members of crowds do not necessarily have direct interaction. Extracurricular activities matter because they facilitate adolescents' social status and friendship groups.

**Popularity.** The jock crowd is one of the prominent, popular crowds in high-school settings (Brown, 2004; Eccles & Barber, 1999) and being popular is related to higher alcohol use (Alexander, Piazza, Mekos, & Valiente, 2001; Diego, Field, & Sanders, 2003; Santor, Messervey, & Kusumakar, 2000). Developmental researchers have theorized that athletes are more likely to drink alcohol than non-athletes because athletes are more likely to be popular and have a higher social standing among their peers than non-athletes (Barber et al., 2001; Fredricks & Eccles, 2006; Moore & Werch, 2005). Related literatures have found that popularity accounts for the relation between sport participation and violence (Kreager, 2007a; Kreager, 2007b; Moody, Brynildsen, Osgood, Feinberg, & Gest,

in press; Staff & Kreager, 2008), but the relations between sport participation, popularity, and alcohol use have not been empirically tested to our knowledge. Thus, based on theory and related research, it is plausible that the popularity of an athlete leads to elevated alcohol use. A goal of this study is to empirically test popularity as a mediator for the relation between sport participation and alcohol use.

**Friends' alcohol use.** Researchers theorize that participation in extracurricular activities is particularly important during adolescence because these activities help youth establish and maintain friendships (Barber et al., 2001; Urberg, Degirmencioglu, & Tolson, 1998). During adolescence, friendships become important influences on adolescents' decisions and behaviors (Brown, 2004; Larson, 2001). Friends are particularly influential in regards to adolescents' decisions about their daily behaviors and activities, such as alcohol use (Youniss & Smollar, 1985).

The literature on friendships has shown that one of the more important influences on adolescents' behavior is whether their friends engage in the same behavior (Hartup & Stevens, 1997). Indeed, the peer homophily literature has shown that friends' alcohol use is a strong predictor of adolescents' alcohol use (Jaccard, Blanton, & Dodge, 2005; Popp, Laursen, Kerr, Stattin, & Burk, 2008; Steglich, Snijders, & West, 2006; Urberg, Degirmencioglu, & Pilgrim, 1997). Researchers have found that athletes are part of groups that include friends with prosocial characteristics, such as friends who achieve well academically, and

negative characteristics, such as friends who use alcohol (Eccles & Barber, 1999; Gardner et al., 2009; Mahoney, Larson, Eccles, & Lord, 2005).

Peers' deviant characteristics have been found to mediate relations between sport participation and general delinquency (delinquency in this study did not include alcohol use; Gardner et al., 2009). Very few studies have focused on whether friends' characteristics mediate the relations between participation in sport participation and alcohol use (e.g., Eccles & Barber, 1999). In fact, only one study to our knowledge tested friends' *alcohol use* as a mediator. That study found that friends' alcohol use did *not* mediate relations between *general* activity participation and alcohol use (Darling et al., 2005). Further, because sport participants use more alcohol than non-sport participants (Hoffman, 2006; Eccles et al., 2003; Fauth et al., 2007; Fredricks & Eccles, 2005), it is also important to distinguish whether adolescents' friends participate in sports. We build on this study of general activity participation by testing if friends' alcohol use mediates the relation between *sport* participation and alcohol use for sport friends and non-sport friends.

### **Moderators of the Relation between Sport Participation and Alcohol Use**

According to Bandura's (1989) social learning theory, adolescents' behavior is shaped by the behaviors of those around them. Adolescents may be more likely to use alcohol as their exposure to peers who use alcohol increases. The second goal of this study was to identify theoretically relevant contexts in which peers are exposed to high alcohol-using peers. Specifically, the second goal of this study was to examine if the relation between sport participation and

adolescent alcohol use varied based on (a) the adolescents' focus on sport activities compared to other activities, (b) teammates' alcohol use, (c) gender, (d) popularity, and (e) friends' alcohol use.

**Focus on sports.** Sport participants use more alcohol than other activity participants and adolescents who do not participate in any extracurricular activities (e.g., Eccles et al., 2003). Athletes who also participate in art, academic, or other non-sport activities are also exposed to adolescents who have been characterized as using less alcohol. For these adolescents, participation in sports may not strongly predict alcohol use because they are exposed to variant models concerning alcohol use. In other words, adolescents' participation in sports may predict higher alcohol use for adolescents who limit their activity participation to only sport activities compared to adolescents who participate in sports plus other activities.

Empirical findings suggest that adolescents have differing profiles of participation, with some adolescents focusing on sports (i.e., participating in only sport activities ) and other adolescents who participate in sport plus other activities (Bartko & Eccles, 2003; Linver et al., 2009; Zarrett et al., 2009). Previous studies cite that focusing on sports is associated with more detrimental outcomes than participation in multiple types of activities (Bartko & Eccles; Mahoney, Lord, & Carryl, 2005; Morris & Kalil, 2006; Shanahan & Flaherty, 2001; Zarrett et al.). For example, Zarrett et al. found that focusing on sports (compared to participation in sports plus other activities) was associated with more risky behaviors, with alcohol use being one of several indicators in a scale

of risky behaviors. Another study, examining alcohol use specifically, found that focusing on sports (compared to participation in sports plus other activities) was associated with *less* alcohol use (Linver et al.). Further research is needed to determine whether alcohol use is associated with participating in only sports versus participating in sports plus other activities. Based on theories and empirical findings on sport-focused adolescents, we expected the positive relation between sport participation and alcohol use to be stronger for adolescents who only participated in sport activities compared to adolescents who participated in sports plus other types of activities.

**Teammates' alcohol use.** Athletes are members of organized sport teams in which they are exposed to their teammates on a regular basis. Previous research suggests that there is rich variability among different types of sport teams in terms of alcohol use. Specifically, team sport participants (e.g., basketball) use more alcohol than individual sport participants (e.g., diving; Paretti-Watel et al., 2003). Variability in different types of sport teams is also important for predicting adolescents' violent behaviors. For example, participants in contact sports, such as football, displayed more violent behaviors outside of football than participants in other types of sports (Kreager, 2007b). Based on social learning theory, it is likely that the variability among athletes' alcohol use is partly due to their exposure to teammates who use alcohol (Bandura, 1989). Although studies have examined variability in types of sports, to our knowledge, previous researchers have not examined variability in teammates' alcohol use. We expected that

adolescents whose teammates use high levels of alcohol would use more alcohol than adolescents whose teammates use low levels of alcohol.

**Gender differences.** Existing research suggests that these processes may function differently for males and females. Males participate in sports more often than females, giving them more opportunities to become exposed to other sport participants, establish more friendships with sport participants, and assimilate behaviors of other sport participants (Eccles & Barber, 1999; Posner & Vandell, 1994; Shann, 2001; Simpkins, Ripke, Huston, & Eccles, 2005; Youniss, & Smollar, 1985). Further, it is more socially acceptable for males to participate in sports and to engage in deviant behaviors (e.g., violence; Kreager, 2007b). Males are more likely to engage in deviant behaviors, including using alcohol, with their friends than females (Youniss, & Smollar; Kreager). Mean level differences in alcohol use suggest that males use more alcohol than females (Darling, 2005; Eccles et al., 2003; Elder, Leaver-Dunn, Wang, Nagy, & Green, 2000; Hoffman, 2006). Although several studies have used gender to predict mean-level differences in sport participation and alcohol use, a recent study suggested that the relation between sport participation and alcohol use may vary by adolescent gender (Mays & Thompson, 2009). Specifically, they found that sport participation was not related to alcohol use for males, but was negatively related to alcohol use for females. Based on previous findings, we expected that the positive relation between sport participation and alcohol use would be stronger for males than females.

**Popularity.** Popularity and sport participation are related to elevated alcohol use in high school (Alexander et al., 2001; Diego et al., 2003; Eccles et al., 2003; Santor et al., 2000). Popular athletes are more likely to be exposed to two sources of peers characterized as using high levels of alcohol. An athlete who is popular may be more likely to use alcohol than an athlete who has average or low social status because popular athletes may have higher exposure to peers who use alcohol than less popular athletes. This study tested if the relation between sport participation and alcohol use varied by adolescents' popularity. We expected that the relation between sport participation and alcohol use would be stronger for popular adolescents than for less popular adolescents.

**Friends' alcohol use.** Research shows that adolescents spend increasingly more time with peers in organized activities than with family (e.g., Larson & Richards 1991) and that peers become central relationship figures during adolescence (Furman & Buhrmester, 1992). Social learning theory suggests that adolescents' behaviors are likely to vary based on their friends' behavior because of this increased exposure and salience (Bandura, 1989). Because athletes are more likely to use alcohol than non-athletes (Darling et al., 2005; Hoffman, 2006; Eccles et al., 2003; Fauth et al., 2007; Fredricks & Eccles, 2005), we differentiated between adolescents' sport and non-sport friends. It is possible that athletes may be differentially influenced by their friends who participate in sports versus their friends who do not participate in sports. We expected that the relation between sport participation and alcohol use would be positive for all groups, but

strongest for adolescents whose sport friends use high levels of alcohol and for adolescents whose non-sport friends use high levels of alcohol.

### **Summary and Study Goals**

Although participation in sport activities is associated with many positive indicators of adjustment, it is also associated with increased alcohol use (Eccles & Barber, 1999). Explanations for the positive link between sport participation and alcohol use are limited. The first goal of this study was to examine whether popularity and friends' alcohol use mediated the relation between sport participation and alcohol use. Theoretically, participation in sports is associated with being part of popular crowds and friendship cliques composed of adolescents who drink alcohol (Barber et al., 2001; Eder, 1985). We expected that popularity and friends' alcohol use would explain the relation between sport participation and alcohol use.

The second goal was to examine whether adolescents' focus on sport activities, teammates' alcohol use, gender, popularity, and friends' alcohol use changed the strength of the relation between sport participation and adolescents' alcohol use. Previous research suggests that the relation between sport participation and alcohol use may vary by the models athletes are exposed to. We expected the relation between sport participation and alcohol use to be stronger for (a) adolescents who participated in only sport activities compared to adolescents who participated in sport plus other activities, (b) athletes whose teammates used high levels of alcohol compared to athletes whose teammates used low levels of alcohol, (c) males compared to females, (d) athletes who were

popular compared to athletes were less popular, (e) athletes whose sport friends used high levels of alcohol compared to athletes whose sport friends used low levels of alcohol, and (f) athletes whose non-sport friends used high levels of alcohol compared to athletes whose non-sport friends used low levels of alcohol.

## **Method**

### **Participants**

This study used data from the National Longitudinal Study of Adolescent Health (Add Health; Udry, 2003). Add Health is a nationally representative study of 7<sup>th</sup> through 12<sup>th</sup> grade adolescents across the United States. Approximately 90,000 middle and high school adolescents completed the in-school questionnaire at Wave 1. This investigation focused on adolescents in high school (i.e., grades 9-12;  $N = 55,615$ ). The sample in this study included 48,390 adolescents who completed the in-school questionnaire (including the friend nominations) and had sampling weights. Adolescents from a variety of racial groups participated: 59% European American, 18% Hispanic, 13% African American, 4% Asian American, 2% Other, and 4% multi-racial. The sample was 51% female and on average 15.80 years of age ( $SD = 1.24$  years). Adolescents reporting participation in greater than 10 total activities and greater than 6 sport activities (approximately 1% of the sample) were dropped from the analyses because these cases were deemed unreliable. For example, many of these adolescents reported that they participated in every activity listed or that they participated in every sport which is not possible. This same criterion was used by Add Health staff in their pre-computed activity network dataset (Udry).

Individuals in the sample retained were compared to the high school individuals in the sample that were dropped ( $N = 6,078$ ) on all study variables. Five of the ten comparisons were statistically significant. A t-test revealed that individuals in the sample retained were older than individuals in the sample dropped ( $M$  ages = 15.81 and 15.73, respectively;  $t = -4.79, p < .001$ ). A chi-square test revealed that individuals in the sample retained were significantly different than individuals in the sample dropped in terms of participation (sport participation versus no sport participation;  $\chi^2(1) = 7.849, p < .01$ ), race (white versus non-white;  $\chi^2(1) = 26.91, p < .001$ ), gender ( $\chi^2(1) = 30.73, p < .001$ ), and sport-focus ( $\chi^2(4) = 7.96, p < .001$ ). The adjusted standardized residuals (ASR) of each cell provided further detail on the relations between sample retained versus the sample dropped. The ASRs should be interpreted as z-scores, such that, ASR values above 1.96, 2.58 and 3.29 are significant at .05, .01, and .001 levels, respectively. Individuals in the sample retained were less likely to be sport participants (ASR = -2.8,  $p < .01$ ), non-white (ASR = -5.2,  $p < .001$ ), female (ASR = -5.5,  $p < .001$ ), and were less likely to participate in sport plus other activities (ASR = -2.8,  $p < .01$ ).

In addition, particular research questions required the use of two specific subsamples. First, the research questions on friends' alcohol use required that we know the alcohol use of adolescents' friends. Adolescents that did not nominate any friends were dropped from these analyses because friends' alcohol use was not known. This subsample included 37,349 adolescents (i.e., 11,041 adolescents did not nominate any friends and thus, were dropped). Second, the research

question on whether adolescents' sport-focus moderates the relation between sport participation and alcohol use required only sport participants (i.e., participation in only sports versus participation in sports plus other activities). Similarly, the research question regarding whether teammates' alcohol use moderates the relation between sport participation and alcohol use required that adolescents participate in a sport activity (i.e., adolescents that did not participate in a sport activity did not have indicators for teammates' alcohol use). Thus, this subsample included 23,561 adolescents who participated in at least one sport activity.

## **Measures**

The data used in this report were from Wave 1 of the Add Health adolescent in-school questionnaire. In the self-administered in-school questionnaire, adolescents reported on their activity participation, alcohol use, friendship nominations, and demographic characteristics.

**Sport participation.** Adolescents reported which of 12 school-based sport activities they participated in or were planning to participate in during the school year. One of these indicators as an "other" indicator (i.e., other sports) and was dropped because the particular activity could not be identified. Adolescents reported on 12 sport activities (0 = *no*, 1 = *yes*): cheerleading/dance team, baseball/softball, basketball, field hockey, football, ice hockey, soccer, swimming, tennis, track, volleyball, and wrestling. Sport participation was measured as a count variable of the number of sport activities in which the adolescent participated.

**Adolescents' alcohol use.** Adolescents reported how often in the past 12 months they drank beer, wine, or liquor (0 = *never*, 6 = *nearly every day*).

**Friends' alcohol use.** Two measures of friends' alcohol use were created: sport friends' alcohol use and non-sport friends' alcohol use. Adolescents identified up to 5 of their closest female and male friends (up to 10 friends total) at their school. Add Health strived to interview all adolescents in each Add Health school. As a result, indicators of adolescents' friends were created based on the friends' self-reported data. For each adolescent, members of their friendship network were identified based on adolescents' nominations. Non-sport friends were those friends nominated who did not participate in any sport activities. Sport friends were those friends nominated who participated in one or more sport activities. The measures of sport friends' alcohol use and non-sport friends' alcohol use were the mean alcohol use of all of adolescents' sport friends and non-sport friends.

**Teammates' alcohol use.** Adolescents of the same gender who attended the same school and participated in the same sport activity (of the 12 available sport activities) were considered members of the same team. To be considered a team, each activity had to have at least 5 participants. Teammates' alcohol use was measured based on the team members' self-report of their own alcohol use as detailed above. Teammates' alcohol use was the mean alcohol use of all team members. For adolescents who participated in multiple sports, teammates' alcohol use was a mean team alcohol use score across all of the adolescents' sport teams.

**Popularity.** Popularity was measured based on the total number of friend nominations received, or *in-degree*. In-degree is a count of the number of times the adolescent was named as a friend by a schoolmate. Higher in-degrees represent higher popularity. Following established procedures used in previous Add Health studies measuring popularity, we converted the score to a percentile rank within the school using PROC RANK procedures in SAS v9.2 (Moody et al., in press).

**Sport-focus.** Adolescents who were sport-focused were adolescents who participated in only sport activities (i.e., one or more of the 12 sport activities listed above). In addition to the 12 sport activities available in Add Health, adolescents reported which of 19 school-based clubs and organizations they participated in or were planning to participate in during the school year. One of these indicators was an *other* indicator (i.e., other clubs) and was dropped because the particular activity could not be identified. The 19 activities included: French club, German club, Latin club, Spanish club, book club, computer club, debate team, drama club, Future Farmers of America, history club, math club, science club, band, chorus or choir, orchestra, honor society, newspaper, student council, and yearbook. Adolescents who were not sport-focused participated in one or more of the 12 available sport activities and also participated in one or more of the 19 other activities.

**Controls.** Race, age, and parents' education were used as controls in all analyses. One dichotomous variable for white versus other race adolescents was included as a measure of race. Adolescents' age was the self-reported age at the

time that the questionnaire was administered. Adolescents reported their mother's level of education (0 = *less than a high school degree*, 4 = *higher than a bachelor's degree*). For all analyses including friend indicators, the number of friends was also included as a control. The number of friends was the total number of adolescents that the target adolescent nominated as a friend.

### **Analysis Plan**

All analyses were conducted through path models in Mplus v5.1 (Muthén & Muthén, 2007). Full information maximum likelihood was used to incorporate cases with missing data. All analyses were weighted with sampling weights to account for the complex sampling design. In Add Health, adolescents were nested within schools. We accounted for the clustering of students within schools to correct for correlated errors in the models. In the basic model, adolescents' sport participation (i.e., count of number of sport activities) was used to predict their concurrent alcohol-use, controlling for race, age, and parents' education. This basic model served as the basis for the models testing our hypotheses.

The first goal of the study was to examine potential mediators of the relation between sport participation and alcohol. Under this goal, we expected that the relation between sport participation and alcohol use would be mediated by (a) adolescents' popularity and (b) friends' alcohol use. Each of these mediators was tested in a separate model. In addition to the direct path between sport participation and alcohol use, sport participation predicted the mediator, which in turn, predicted adolescents' alcohol use. In the friends' alcohol use model, two indicators of friends' alcohol use were included: non-sport friends' alcohol use

and sport friends' alcohol use. Mediation was tested by estimating the indirect effect in Mplus v5.1, reporting the 95% or 99% confidence interval (CI; MacKinnon, Lockwood, & Williams, 2004).

Our second goal was to examine possible moderators of the relation between sport participation and alcohol use, namely adolescents' focus on sports, teammates' alcohol use, gender, popularity and friends' alcohol use. The test of moderation depended on whether the moderator was dichotomous or continuous.

We examined differences on dichotomous moderators, namely adolescents' focus on sports and gender, through multi-group tests. Specifically, we tested the change in chi-square between two models: (a) a model in which the path from participation to alcohol use was freely estimated for the two groups, and (b) a model in which the path from participation to alcohol use was constrained to be equal for the two groups. In the test of adolescents' focus on sports as a moderator for the relation between sport participation and alcohol use, we tested a model examining differences between (a) sport-focused adolescents and (b) sport-plus adolescents. In the test of gender as a moderator for the relation between sport participation and alcohol use, we tested a model examining differences between (a) males and (b) females. A non-significant change in chi-square with one degree of freedom would signify that the relation between sport participation and alcohol use was similar across the two groups. A significant change in chi-square with one degree of freedom would signify that the relation between sport participation and alcohol use was significantly different for adolescents in the two groups.

The last four moderators were continuous: teammates' alcohol use, popularity, sport friends' alcohol use, and non-sport friends' alcohol use. We used an interaction term between sport participation and the continuous moderator to test moderation. Simple slope analyses were used to follow up on significant interactions through the online calculator at [www.quantpsy.org](http://www.quantpsy.org) (Preacher, Curran, & Bauer, 2006). Because the moderators were continuous, we tested the simple slope at one standard deviation above the mean of the moderator, one standard deviation below the mean of the moderator, and at the mean of the moderator (Aiken & West, 1991).

## Results

### Descriptive Patterns

**Alcohol use.** Descriptive analyses were conducted to examine differences in alcohol use among different subgroups of sport participants. Specifically, a 2 (gender) X 3 (sport participation status) ANOVA was conducted to examine differences in alcohol use by gender and adolescents' sport participation status (i.e., sport-plus versus sport-focus versus non-sport). As shown in Table 1, there were significant main effects of gender and sport participation status on alcohol use,  $F(1, 43,013) = 236.84, p < .001$ ;  $F(2, 43,013) = 21.38, p < .001$ , respectively. There was also a significant interaction between gender and sport participation status,  $F(2, 43,013) = 5.87, p < .01$ . As shown in Table 1, Tukey's HSD post-hoc follow-up tests suggested that for both males and females, sport-plus adolescents used lower levels of alcohol than all other groups ( $ps < .05$ ). Male non-sport adolescents used similar levels of alcohol to male sport-focus adolescents ( $ps <$

.05), whereas female non-sport adolescents used lower levels of alcohol compared to female sport-focus adolescents ( $ps < .05$ ).

**Bivariate relations.** Bivariate correlations among all study variables are shown for the total sample in Table 2 and separately for males and females in Table 3. In the total sample, sport participation was related to several of the demographic variables and other analysis variables. Sport participation was related to being male, being younger, having parents' with higher education, and being non-white. Further, sport participation was related to using more alcohol, having non-sport friends (but not sport friends) that use more alcohol, having teammates that use more alcohol, and participating in sports plus other activities (as opposed to participating in only sports). In the total sample, alcohol use was related to several of the demographic variables and other analysis variables. Alcohol use was related to being male, being older, having parents with lower education, and being white. Further, alcohol use was positively related to popularity, all other alcohol use measures, and sport-focus.

Relations changed slightly within males and females. Within males and females, sport participation had the same relations with the demographic variables except that male and female sport participation was related to being white and female sport participation was related to being older. Sport participation had the same relations with other variables except that within males and females, sport participation was positively related to *all* alcohol use measures and being sport-focused (instead of sport-plus). Alcohol use had similar relations to all demographic variables, except that within males and females, alcohol use was

related to having parents with higher education. Alcohol use had similar relations with the other analysis variables except that the relation between alcohol use and teammates' alcohol use was negative for males.

### **Tests of Mediation**

Two models tested whether (a) popularity and (b) non-sport friends' alcohol use and sport friends' alcohol use mediated relations between adolescents' sport participation and alcohol use. Goodness of fit statistics indicated that both mediation models achieved adequate fit (popularity model:  $\chi^2(4) = 242.15, p < .001$ ; SRMR = .02; RMSEA = .03; friends' alcohol use model:  $\chi^2(11) = 413.85, p < .001$ ; SRMR = .05; RMSEA = .03). All of the demographic controls significantly predicted alcohol use in the expected direction in both models (Table 4). Females were less likely than males to participate in sports. Age was significantly and positively related to alcohol use, whereas parents' education was significantly and negatively related to alcohol use. White adolescents were more likely than other adolescents to participate in sports. Number of friends did not significantly predict alcohol use in the friends' alcohol use model.

In the popularity model, sport participation significantly predicted popularity and popularity significantly predicted alcohol use (Table 4). Sport participation did not have a significant, direct association with alcohol use. There was a significant indirect effect of sport participation on alcohol use through popularity (mediated effect = 0.09,  $p < .001$ ; CI = 0.100, 0.156).

In the friends' alcohol use model, sport participation did not significantly predict sport friends' alcohol use or non-sport friends' alcohol use<sup>1</sup>. In contrast, sport friends' alcohol use and non-sport friends' alcohol use significantly predicted adolescents' alcohol use in the positive direction (Table 4). Sport participation was not significantly related to alcohol use. Indirect effects were not statistically significant (sport friends = -0.01, *ns*; CI = -0.061, 0.018; non-sport friends = 0.01, *ns*; CI = -0.015, 0.056).

### **Tests of Moderation**

**Sport-focus.** Goodness of fit statistics indicated that the multi-group path model testing sport-focus as a moderator of the relation between sport participation and alcohol use achieved adequate fit ( $\chi^2(12) = 68.93, p < .001$ ; SRMR = .02, RMSEA = .02). The model indicated that the relation between sport participation and alcohol use was significantly different for sport-focus versus sport-plus adolescents,  $\Delta\chi^2(1) = 22.17, p < .001$ . As shown in Table 5 and Figure 1, sport participation was significantly and positively related to alcohol use for sport-focus adolescents, but sport participation was not significantly related to alcohol use for sport-plus adolescents.

**Gender.** Goodness of fit statistics indicated that the multi-group path model testing gender as a moderator of the relation between sport participation

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<sup>1</sup> A mediation model examining total friends' alcohol use (as opposed to sport and non-sport friends' alcohol use) was conducted. The results were similar to the model presented.

and alcohol use achieved adequate fit ( $\chi^2(7) = 48.18, p < .001$ ; SRMR = .01, RMSEA = .02). The model indicated that the relation between sport participation and alcohol use was similar for males and females,  $\Delta\chi^2(1) = .80, ns$ . Because the path between sport participation and alcohol use did not significantly vary by adolescent gender, the coefficients are presented for the path that was constrained to be equal across both genders (Table 5).

**Teammates' alcohol use.** Goodness of fit indicators suggested that the model including teammates' alcohol use as a moderator of the relation between sport participation and alcohol use fit the data adequately ( $\chi^2(4) = 36.74, p < .001$ ; SRMR = .01, RMSEA = .02). Sport participation and teammates' alcohol use were both significantly and positively related to adolescents' alcohol use (Table 6). The model indicated that there was a significant interaction between sport participation and teammates' alcohol use. Simple slope analyses revealed that there was a significant and positive relation between sport participation and alcohol use at one standard deviation above the mean of teammates' alcohol use ( $z = 7.31, p < .001$ ), but there was a significant and negative relation between sport participation and alcohol use one standard deviation below the mean of teammates' alcohol use ( $z = 5.41, p < .001$ ). The slope was not significant at the mean of teammates' alcohol use ( $z = .94, ns$ ). As shown in Figure 2, if adolescents participated on teams with above average alcohol use, participation in more sport activities was associated with higher alcohol use. In contrast, if adolescents participated on teams with below average alcohol use, participation in more sport activities was associated with lower alcohol use.

**Popularity.** Goodness of fit statistics indicated that model including popularity as a moderator of the relation between sport participation and alcohol use achieved adequate fit ( $\chi^2(5) = 47.92, p < .001$ ; SRMR = .01, RMSEA = .02). The model indicated that there was not a significant interaction between sport participation and popularity (Table 6). Popularity, but not sport participation, significantly predicted adolescents' alcohol use.

**Sport friends' alcohol use.** Goodness of fit indicators suggested that the model testing sport friends' alcohol use as a moderator of the relation between sport participation and alcohol use achieved adequate fit ( $\chi^2(5) = 47.55, p < .001$ ; SRMR = .01, RMSEA = .02). Sport friends' alcohol use was significantly and positively related to adolescents' alcohol use (Table 6). The interaction term between sport participation and sport friends' alcohol use was significant and positive (Figure 3). Simple slope analyses revealed that there was a significant and positive relation between sport participation and alcohol use at the mean and one standard deviation above the mean of sport friends' alcohol use ( $z = 45.28, p < .001$ ;  $z = 57.62, p < .001$ , respectively), but there was a significant and negative relation between sport participation and alcohol use one standard deviation below the mean of sport friends' alcohol use ( $z = 32.95, p < .001$ ). As shown in Figure 4, if adolescents' sport friends had average or above average levels of alcohol use, participation in more sport activities was associated with higher alcohol use. In contrast, if adolescents' sport friends had below average levels of alcohol use, participation in more sport activities was associated with lower alcohol use. In other words, sport participation was *risky* for adolescents' alcohol use for

adolescents with sport friends who use high levels of alcohol.

**Non-sport friends' alcohol use.** Goodness of fit indicators suggested that the model testing non-sport friends' alcohol use as a moderator of the relation between sport participation and alcohol use achieved adequate fit ( $\chi^2(5) = 47.23$ ,  $p < .001$ ; SRMR = .01, RMSEA = .02). Non-sport friends' alcohol use was significantly and positively related to adolescents' alcohol use (Table 6). Results indicated that the interaction term between sport participation and non-sport friends' alcohol use was significant and negative (Figure 4). Simple slope analyses revealed that there was a significant and positive relation between sport participation and alcohol use at the mean and one standard deviation below the mean of non-sport friends' alcohol use ( $z = 31.98$ ,  $p < .001$ ;  $z = 39.69$ ,  $p < .001$ , respectively), but there was a significant and negative relation between sport participation and alcohol use one standard deviation above the mean of non-sport friends' alcohol use ( $z = 24.26$ ,  $p < .001$ ). As shown in Figure 4, if adolescents' non-sport friends had average or below average levels of alcohol use, participation in more sport activities was associated with higher alcohol use. In contrast, if adolescents' non-sport friends had above average levels of alcohol use, participation in more sport activities was associated with lower alcohol use. In other words, sport participation was *protective* for adolescents' alcohol use for adolescents with non-sport friends who use high levels of alcohol.

The interaction between sport participation and non-sport friends' alcohol use was in the unexpected direction (i.e., the relation between sport participation and alcohol use was significant and *positive* for adolescents with non-sport friends

who use *low* levels of alcohol). One explanation for this finding was that the relation between sport participation and alcohol use may be positive for sport participants who have non-sport friends' who use low levels of alcohol because they have other sport friends who use high levels of alcohol. A follow-up analysis was conducted to investigate the unexpected relation between sport participation and non-sport friends' alcohol use. Specifically, a three-level categorical variable was formed for each friends' alcohol use measure: friends' alcohol use less than 1SD below the mean, between 1SD below and 1SD above the mean, and greater than 1SD above the mean. The same three category variable was created for sport friends' alcohol use ( $M = 1.49, SD = 1.27$  and  $M = 1.48, SD = 1.19$ , for non-sport and sport friends' alcohol use, respectively). A 3X3 chi-square analysis was conducted to examine the correspondence between non-sport friends' alcohol use and sport friends' alcohol use. The chi-square analysis revealed that adolescents whose non-sport friends' alcohol use was above average were more likely to have sport friends whose alcohol use was above average ( $ASR = 28.6, p < .001$ ) and less likely to have sport friends whose alcohol use was average or below average ( $ASR = -10.6, p < .001, ASR = -15.6, p < .001$ , respectively). The same patterns emerged for adolescents whose non-sport friends' alcohol use was average and below average. Specifically, adolescents whose non-sport friends' alcohol use was average were more likely to have sport friends whose alcohol use was average ( $ASR = 10.9, p < .001$ ) and less likely to have sport friends whose alcohol use was below average or above average ( $ASR = -3.0, p < .01, ASR = -10.8, p < .001$ , respectively). Finally, adolescents whose non-sport friends'

alcohol use was below average were more likely to have sport friends whose alcohol use was below average (ASR = 19.2,  $p < .001$ ) and less likely to have sport friends whose alcohol use was average or above average (ASR = -3.1,  $p < .01$ , ASR = -15.1,  $p < .001$ , respectively). In summary, levels of non-sport friends' alcohol use corresponded directly to levels of sport friends' alcohol use.

## **Discussion**

This study supported previous research suggesting that the relation between sport participation and alcohol use was positive across all adolescents, but generally small (e.g., Barnes et al., 2007; Ferron et al., 1999; Leaver-Dunn et al., 2007; Linver et al., 2009; Mays et al., 2010; Osgood et al., 1996; Pate et al., 1996). This study extended previous research by systematically testing possible mediators and moderators explaining this positive relation. First, we expected that popularity and friends' alcohol use would explain the positive relation between sport participation and alcohol use. Second, we expected that the positive relation between sport participation and alcohol use would vary by adolescents' sport-focus, teammates' alcohol use, gender, popularity, and friends' alcohol use. The discussion of the study findings is organized by the three overarching settings addressed in this research: peer relationships, sport context, and gender.

### **Peer Relationships**

This study examined two leading peer predictors of alcohol use: popularity and friends' alcohol use. Each peer predictor was tested as a mediator and a moderator to test two theories. First, Eccles and Barber (1999) theorized that the relation between sport participation and alcohol use would be explained by

popularity and friends' alcohol use. Second, social learning theory suggests that adolescents' alcohol use depends on the models they are exposed to (Bandura, 1989). Our findings suggest that popularity functioned as a mediator, whereas friends' alcohol use functioned as a moderator.

Popularity functioned as a mediator of the relations, but not as a moderator. In other words, although sport participation was associated with alcohol use regardless of adolescents' popularity, popularity explained the positive relation between sport participation and alcohol use. These findings suggest that athletes use alcohol partially because they tend to be popular, which is associated with elevated alcohol use (Alexander et al., 2001; Diego et al., 2003; Santor et al., 2000). Researchers have also attributed athletes' violent behavior outside of sports to popularity (Kreager, 2007b). In line with Eccles and Barber's model (Barber et al., 2001; Eccles & Barber, 1999), sport activities may promote particular deviant behaviors because sport activities promote individual's social status, which in turn, is related to some forms of deviancy. In other words, sport activities shape adolescents' friendships by providing a peer group characterized by popularity, which in turn, is characterized by alcohol use.

These findings do not, however, negate the possibility that certain people or people with particular personalities may select to participate in sports and to engage in these deviant behaviors. In other words, there may be a selection effect that "sensation-seeking" persons participate in sports and engage in deviant behaviors. It is plausible that popularity is the driving force for deviant behaviors, such as alcohol use. That is, the relation between sport participation and alcohol

use may, in fact, be spurious because popularity drives sport participation and alcohol use.

In contrast to popularity, friends' alcohol use did not serve as a mediator, but functioned as a moderator. Our findings suggest that friends' alcohol use functioned as a moderator, such that, friends' alcohol use changed the relation between sport participation and alcohol use. Interestingly, the findings varied based on sport friends compared to non-sport friends. The findings with sport friends align with social learning theory (Bandura, 1989). Adolescents' alcohol use increased with sport participation if they had sport friends with average or high alcohol use. In contrast, adolescents' alcohol use decreased with sport participation if they had sport friends with low alcohol use.

The findings with non-sport friends provide an interesting caveat to social learning theory. One explanation for this finding was that the relation between sport participation and alcohol use may be positive for sport participants who have non-sport friends' who use low levels of alcohol because they have other sport friends who use high levels of alcohol. Our follow-up analyses did not support this explanation. Rather, although the relations between sport participation and alcohol use were different for non-sport and sport friends, alcohol use levels across athletes' non-sport and sport friends seemed to be fairly uniform. Athletes' sport and non-sport friends typically used similar levels of alcohol. Thus, there may to be differential influence mechanisms occurring for athletes' sport versus non-sport friends. Findings suggest that the alcohol use of adolescents' non-sport friends was an important predictor when adolescents had

low or no participation in sports. However, as adolescents' participation in sports increased, the predictive power of non-sport friends' alcohol use diminished.

The differential findings for sport friends' versus non-sport friends may also be explained by opportunities to influence, as suggested by Brown and colleagues (2008). Adolescents highly involved in sports may be less influenced by non-sport friends than adolescents who are not highly involved in sports. Adolescents highly involved in sports may spend less time with non-sport friends than adolescents who are not involved or have little involvement in sports. Limited time with non-sport friends may restrict the number of opportunities non-sport friends have to influence adolescents' behavior. Adolescents highly involved in sports may also be less motivated to emulate the behaviors of their non-sport friends than adolescents who are not involved or have little involvement in sports. The findings on non-sport friends suggest that the influence of friends is not uniform. One must consider the extent to which an adolescent is embedded within a particular group, the extent to which there are opportunities to spend time with friends, and the motivation to change behavior (Brown et al.).

The null mediation findings in regards to friends' alcohol use may also be explained by Brown and colleagues' conditions under which friends' behavior should influence adolescents' behavior (Brown, Bakken, Ameringer, & Mahon, 2008). They theorized that in order for friends to influence adolescents' behaviors, such as alcohol use, friends must display those behaviors. We expected that friends would influence adolescents' alcohol use, thus, friends must use alcohol in order to influence adolescents in this direction. We may not have found

mediation in our study because there was variability in whether friends drank alcohol, which was evidenced in the moderation analyses. That is, friends' alcohol use may not be a significant mediator of the relation between sport participation and adolescents' alcohol use because not all friends drank alcohol.

### **The Sport Context**

This study found that not all sport contexts are the same. We examined two aspects of the sport context relevant to alcohol use: sport focus and teammates' alcohol use. Based on social learning theory (Bandura, 1989), adolescents who are only exposed to one model are more likely to emulate the behavior of that model. Thus, adolescents who are exposed to social influences supportive of alcohol use should be at higher risk for alcohol use than adolescents who are exposed to social influences who are not supportive of alcohol use. This study found that sport participation was more strongly related to alcohol use for adolescents who participated in only sport activities and who had teammates' who used average or high amounts of alcohol.

Our finding that sport participation was more strongly related to alcohol use for adolescents who participated in only sport activities than adolescents who participated in sports and other activities. This finding is consistent with previous research suggesting that sport-focused adolescents were at higher risk for detrimental outcomes compared to adolescents that participate in sports plus other domains, other domains alone, or do not participate in extracurricular activities (Zarrett et al., 2009). This finding underscores the importance of considering the constellation of activities in which an adolescent participates. Pattern-centered

approaches capture the broader array of extracurricular activity participation across multiple activity domains (e.g., Bartko & Eccles, 2005, Linver et al., 2009; Zarrett et al.). These studies suggest that although it is critical to examine each setting an adolescent is embedded in to understand mechanisms and processes, it is also important to compliment that work with research examining multiple settings. As noted in Bronfrenbrenner's ecological theory (1979) and the current findings, the influence of any one particular setting may depend on the influence from other settings.

Qualities of the sport setting, such as the emotional and motivational climate, team cohesiveness, and performance, influence adolescents' adjustment (e.g., Gill, 2007; Landers & Luschen, 2007; Scanlan, Babkes, & Scanlan, 2005). This study suggests that teammates' behavior outside of the sport setting, namely their alcohol use, also predicts adolescents' adjustment. Sport participation predicted higher alcohol use among adolescents who participated on sport teams characterized by high alcohol use. In contrast, sport participation was associated with lower alcohol use among adolescents who participated on teams characterized by low alcohol use.

Although we could not test in Add Health why particular teams had higher alcohol use than other teams, the research on sports and stress provides some insight. Sport activities can induce stress because they are often characterized as highly competitive environments with high performance expectations from coaches, parents, and significant others (e.g., Scanlan & Lewthwaite, 1984). However, the amount of stress varies by the type of sport and particular sport

events. Certain types of sports, such as contact sports, are associated with more stressful experiences than other sports (Scanlan, Babkes, & Scanlan, 2005). Further, games or tournament competitions can be particularly stressful events for athletes (Scanlan, Stein, & Ravizza, 1991; Simon & Martens, 1979). Adolescents often use alcohol as a coping mechanism (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001), and to alleviate competitive stress and anxiety (Smoll & Smith, 1990). Thus, it is plausible that athletes in particular types of sports use more alcohol than athletes in other sports in order to cope with stress. Further, athletes may use more alcohol at certain points in the season than others, such as, to cope with losing games, or even to celebrate wins.

### **Gender**

Although several studies have examined mean differences between sport participation and alcohol use for males and females, only one other study to our knowledge examined the moderation effect of gender. Mays and Thompson (2009) found that sport participation was protective against general alcohol use for females, but not males. Our results suggest that gender did not moderate the relation between sport participation and alcohol use. However, the Mays and Thompson study also suggested that the relation between sport participation and alcohol use depends on the type of alcohol use and gender. These authors found that sport participation was related to increased drinking and driving for both males and females and binge drinking for males. Health professionals are particularly concerned with risky alcohol use, such as drinking and driving because of the potential consequences of risky alcohol use (Bonar & Rosenberg,

2010; Wechsler & Nelson, 2001). For example, although adolescents drink and drive less frequently than adults, adolescents' drinking and driving is one of the leading causes of adolescent fatalities (Williams, 2003). One direction for future research should be to explore whether gender moderates the relation between sport participation and *risky* alcohol use.

### **Limitations and Future Directions**

This study provided multiple explanations for the positive relation between sport participation and alcohol use by testing potential mediators and moderators. Furthermore, this study extended the previous literature in innovative ways, such as using network data to examine friends' and teammates' alcohol use. This study fills several gaps in the literature, but leaves some unanswered questions for future research.

Two of the clearest directions for future research emerge from data constraints. The first is based on the debate in the friendship literature on whether similarities between friends emerge from selection or socialization (Kandel, 1978). For example, it is likely that popular adolescents select to participate in sports, and adolescents become popular because they participated in sports. Selection and socialization processes that evolve over longer periods of time, such as these, may require yearly longitudinal data. Unfortunately, because activity data are only available at Wave I in Add Health, we were unable to empirically examine this reciprocal process. In reality, it is likely that both processes are at work. Second, other processes may be more episodic and require a different type of longitudinal data collection. For example, stressful games and being in-season

versus off-season are related to athletes' alcohol use (Brown & Martin, 1999). Experience Sampling Methods (Larson & Richards, 1991) or daily diaries may be necessary to disentangle episodic behaviors that vary daily, by particular events (e.g., before games or after games), or seasons.

It is important to note two distinctions with regard to our measure of sport participation. First, the activity question measured adolescents' participation in sports and planned participation in sports over the school year. Although research using the theory of planned behavior indicated that intentions to participate in leisure activities were highly correlated with involvement a year later (Ajzen & Driver, 1992), it will be important for researchers to separate actual participation from intentions. Second, this study used a sport participation measure based on the number of sport activities rather than an indicator of time spent in sport activities. Previous research suggests that indicators of time-use are important for predicting developmental outcomes (e.g., frequency and duration of participation; Simpkins et al., 2005). Although the number of sport activities and time spent in sport activities are positively correlated, they are conceptually distinct and uniquely predict outcomes (Bohnert, Fredricks, & Randall, 2010). These indicators were not available in Add Health to use in this study, but future research should examine multiple indicators of participation in sport activities.

Finally, this study examined sport participation in any type of sport activity. Previous research suggests that there is great variability among different types of sport teams in terms of alcohol use, popularity, and stress. Previous research suggests that alcohol use may be elevated only for adolescents that

participate in particular types of sports (Moore & Werch, 2005). For example, participation in male-stereotyped sports, such as football and wrestling, is related to higher alcohol use than participation in female dominated sports, such as cheerleading and dance. Furthermore, particular types of sports are more popular than others and may be related to different patterns of alcohol use (Peretti-Watel et al., 2003). The research on stress in sports suggests that stress varies by the type of sport and the situation. For example, individual sport competitors (e.g., diving) experience more pressure, anxiety and stress from competitions than team sport competitors (e.g., basketball; Simon & Martens, 1979). Unfortunately, more information was needed about the sport activity to test these hypotheses with this dataset.

## **Conclusions**

The findings of this study suggest athletes are at an elevated risk for alcohol use, but not all athletes drink. Sports may be related to alcohol use, in part, because it promotes adolescents' social status. Athletes are more likely to use alcohol if their sport friends drink, they are highly involved in sports, and they have teammates who drink. Intervention and prevention programs aimed at deterring adolescents' alcohol use should consider particular types of athletes, such as popular athletes. Further, these programs should also be designed to capture specific aspects of the sport context, such as teams composed of adolescents that use alcohol, teams without no tolerance substance use policies, and highly competitive sports.

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Table 1

*Mean Levels (and Standard Deviations) of Alcohol Use by Participation Status for the Total Sample and for Males versus Females*

	Total Sample		Males		Females	
	<i>N</i>	<i>M (SD)</i>	<i>N</i>	<i>M (SD)</i>	<i>N</i>	<i>M (SD)</i>
Alcohol use	45964	1.44 (1.58)	22841	1.59 (1.71)	22931	1.30 (1.42)
Participation status						
Sport-plus	11108	1.33 (1.52)	4,817	1.49 <sup>b</sup> (1.70)	6,260	1.20 <sup>a</sup> (1.35)
Sport-focus	11785	1.51 (1.59)	7,859	1.56 <sup>a</sup> (1.64)	3,882	1.40 <sup>b</sup> (1.46)
Non-sport	20285	1.42 (1.55)	8,422	1.58 <sup>a</sup> (1.70)	11,779	1.31 <sup>c</sup> (1.42)

<sup>abc</sup>Superscripts within a column represent homogeneous subgroups. For example, sport-focus and non-sport participants are similar to each other, but different from sport-plus participants.

Table 2

*Bivariate Correlations between All Study Variables for the Total Sample*

Variable	1	2	3	4	5	6	7	8	9	10
1. Female										
2. Age	-.05**									
3. Parents' education	-.06**	-.05**								
4. White	-.01*	-.05**	.17**							
5. Sport participation	-.13**	-.14**	.09**	-.01						
6. Alcohol use	-.09**	.14**	-.02**	.06**	.02**					
7. Popularity	.08**	-.04**	.09**	.05**	.11**	.03**				
8. Sport friends' alcohol use	-.02**	.15**	-.02**	.07**	-.01	.33**	.02**			
9. Non-sport friends' alcohol use	-.02**	.11**	-.02**	.09**	.02**	.33**	.02**	.28**		
10. Sport focus	-.24**	.01	-.13**	-.05**	-.08**	.05**	-.09**	.07**	.06**	
11. Teammates' alcohol use	-.39**	.06**	.05**	.17**	.07**	.29**	-.04**	.24**	.14*	.04**

\*  $p < .05$ ; \*\*  $p < .01$ .

Table 3

*Bivariate Correlations between All Study Variables for Males and for Females*

Variable	1	2	3	4	5	6	7	8	9	10
1. Age		-.04**	-.05**	-.17**	.09**	-.09**	.12**	.09**	.00	.01
2. Parents' education	-.05**		.17**	.10**	-.02**	.09**	-.03**	-.03**	-.11**	.06**
3. White	-.04**	.16**		.02**	.08**	.07**	.07**	.09**	-.04**	.15**
4. Sport participation	-.11**	.07**	-.02**		.00	.14**	-.01	.02**	-.10**	.02**
5. Alcohol use	.16**	-.03**	.05**	.01**		.03**	.34**	.35**	.06**	.29**
6. Popularity	.01**	.10**	.04**	.11**	.05**		.03**	.02**	-.06**	-.01
7. Sport friends' alcohol use	.17**	-.02**	.08**	.00	.32**	.02**		.28**	.05**	.27**
8. Non-sport friends' alcohol use	.13**	-.02*	.08**	.01	.31**	.02*	.28**		.06**	.17**
9. Sport focus	-.02**	-.17**	-.05**	-.09**	.02*	-.08**	.07**	.06**		-.02*
10. Teammates' alcohol use	.03**	.02**	.21**	.07**	.27**	-.01	.25**	.14**	-.06**	

*Note.* Correlations for males are presented below the diagonal, whereas correlations for females are presented above the diagonal. \*  $p < .05$ ; \*\*  $p < .01$ .

Table 4

*Unstandardized Path Coefficients (and Standard Errors) from Mediation Models*

Predictors	Popularity Model		Friends' Alcohol use Model	
	Sport participation predicting popularity	Predictors of alcohol use	Sport participation predicting friends' alcohol use	Predictors of alcohol use
Popularity	—	0.05 (.01) <sup>***</sup>	—	—
Non-sport friends' alcohol use	—	—	—	0.25 (.01) <sup>***</sup>
Sport friends' alcohol use	—	—	—	0.27 (.01) <sup>***</sup>
Female	—	-0.09 (.01) <sup>***</sup>	—	-0.07 (.01) <sup>***</sup>
Age	—	0.15 (.01) <sup>***</sup>	—	0.09 (.01) <sup>***</sup>
Parents' education	—	-0.04 (.01) <sup>***</sup>	—	-0.03 (.01) <sup>**</sup>
White	—	0.04 (.02) <sup>*</sup>	—	0.02 (.01) <sup>*</sup>
Number of friends	—	—	—	0.02 (.01)
Sport participation	0.13 (.01) <sup>***</sup>	0.01 (.01)	0.01 (.01) Non-sport -0.02 (.02) Sport	0.003 (.01)

*Note.* Dashes represent paths not included in the model. <sup>\*</sup>  $p < .05$ ; <sup>\*\*</sup>  $p < .01$ ; <sup>\*\*\*</sup>  $p < .001$ .

Table 5

*Unstandardized Path Coefficients (and Standard Errors) from Models with Dichotomous Moderators*

	Model	
	Sport-focus	Gender
Alcohol use on		
Female	-0.06 (0.01) <sup>***</sup>	—
Age	0.20 (0.02) <sup>***</sup>	0.17 (0.01) <sup>***</sup>
Parents' education	0.18 (0.01) <sup>***</sup>	-0.05 (0.01) <sup>***</sup>
White	0.06 (0.20) <sup>**</sup>	0.15 (0.06) <sup>**</sup>
Sport participation	0.08 (0.02) <sup>***</sup>	0.04 (0.02)
	-0.01 (0.02)	Sport-focus Sport-plus

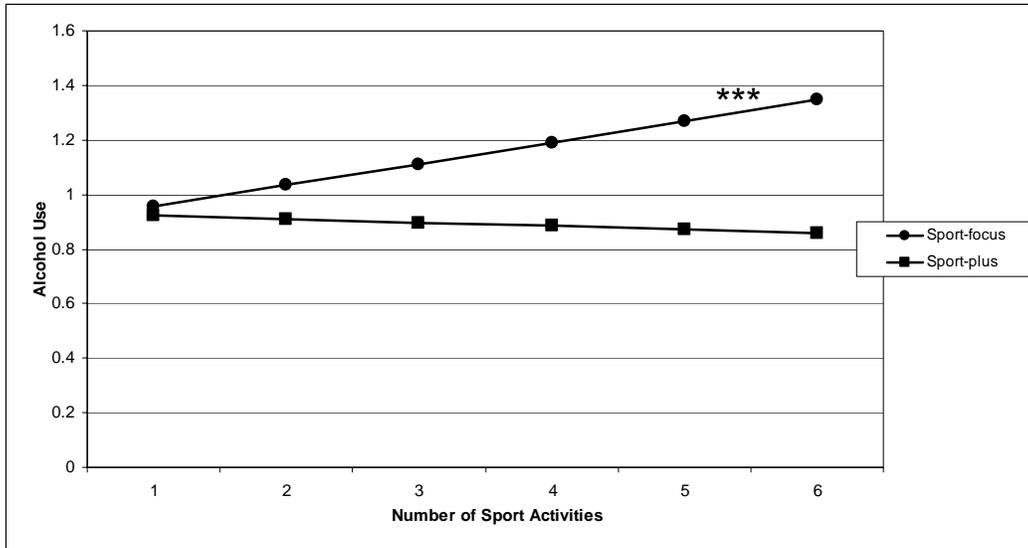
*Note.* Dashes represent paths not included in the model. \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

Table 6

*Unstandardized Path Coefficients (and Standard Errors) from Models with Continuous Moderators*

Predictors	Model			
	Teammates' alcohol use	Popularity	Sport friends' alcohol use	Non-sport friends' alcohol use
Female	0.04 (.01) <sup>***</sup>	-0.09 (.01) <sup>***</sup>	-0.18 (.02) <sup>***</sup>	-0.18 (.03) <sup>***</sup>
Age	0.16 (.01) <sup>***</sup>	0.15 (.01) <sup>***</sup>	0.12 (.01) <sup>***</sup>	0.14 (.01) <sup>***</sup>
Parents' education	-0.04 (.01) <sup>***</sup>	-0.04 (.01) <sup>***</sup>	-0.03 (.01) <sup>***</sup>	-0.03 (.01) <sup>*</sup>
White	0.03 (.01) <sup>**</sup>	0.04 (.02) <sup>**</sup>	0.03 (.01) <sup>**</sup>	0.20 (.01) <sup>*</sup>
Number of friends	—	—	0.02 (.01)	0.02 (.01)
Sport participation	0.02 (.01)	0.01 (.01)	0.04 (.01) <sup>*</sup>	0.01 (.01)
Teammates' alcohol use	0.28 (.01) <sup>***</sup>	—	—	—
Sport X teammates' alcohol use	0.06 (.01) <sup>***</sup>	—	—	—
Popularity	—	0.06 (.01) <sup>***</sup>	—	—
Sport X popularity	—	-0.02 (.01)	—	—
Non-sport friends' alcohol use	—	—	—	0.31 (.01) <sup>***</sup>
Sport X non-sport friends' alcohol use	—	—	—	-0.05 (.01) <sup>***</sup>
Sport friends' alcohol use	—	—	0.31 (.01) <sup>***</sup>	—
Sport X sport friends' alcohol use	—	—	0.04 (.01) <sup>***</sup>	—

*Note.* Dashes represent paths not included in the model. <sup>\*</sup>  $p < .05$ ; <sup>\*\*</sup>  $p < .01$ ; <sup>\*\*\*</sup>  $p < .001$ .



*Figure 1.* Sport-focus as a moderator of the relation between sport participation and alcohol use. \*\*\*Slope is significant at  $p < .001$ .

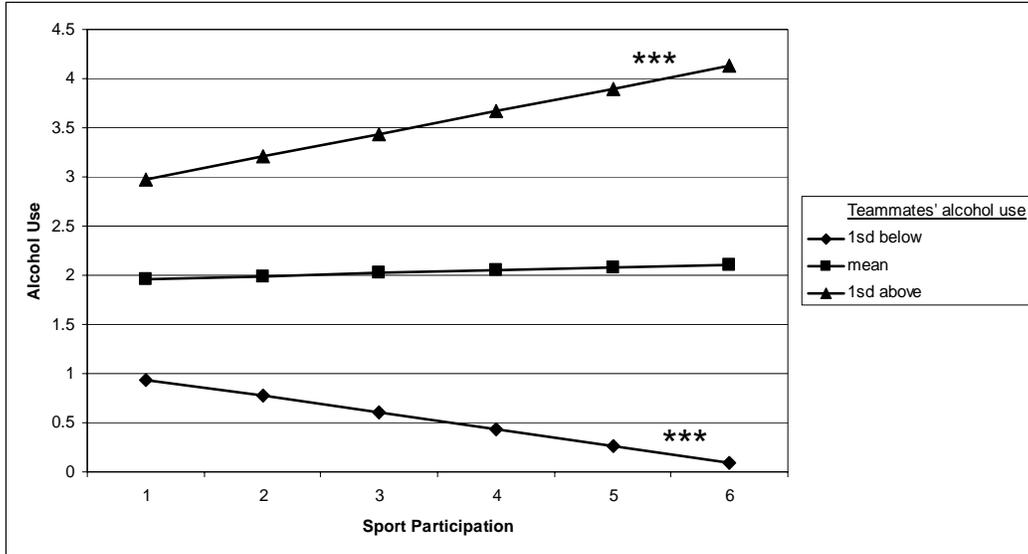


Figure 2. Teammates' alcohol use as a moderator of the relation between sport participation and alcohol use. \*\*\*Slope is significant at  $p < .001$ .

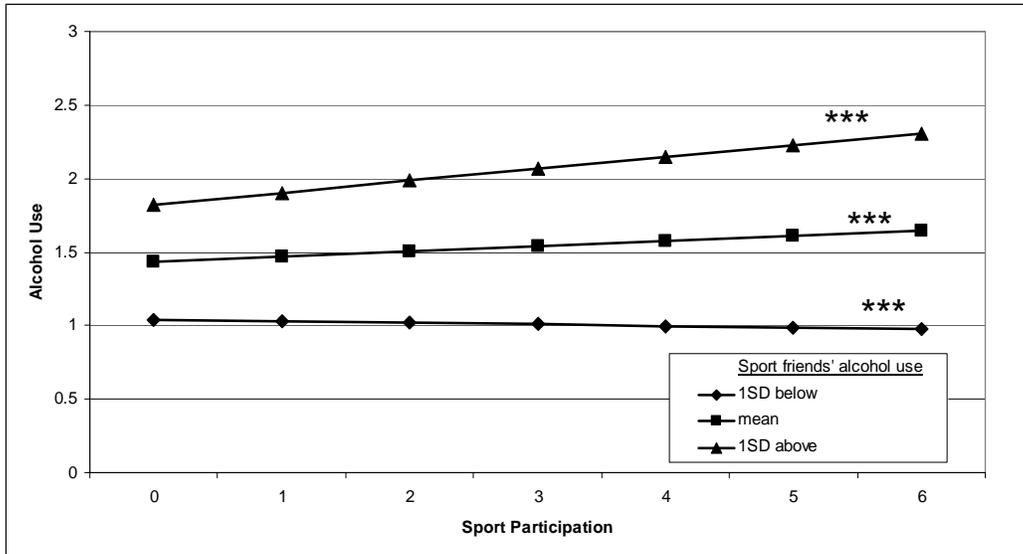


Figure 3. Adolescents' sport friends' alcohol use as a moderator of the relation between sport participation and alcohol use. \*\*\*Slope is significant at  $p < .001$ .

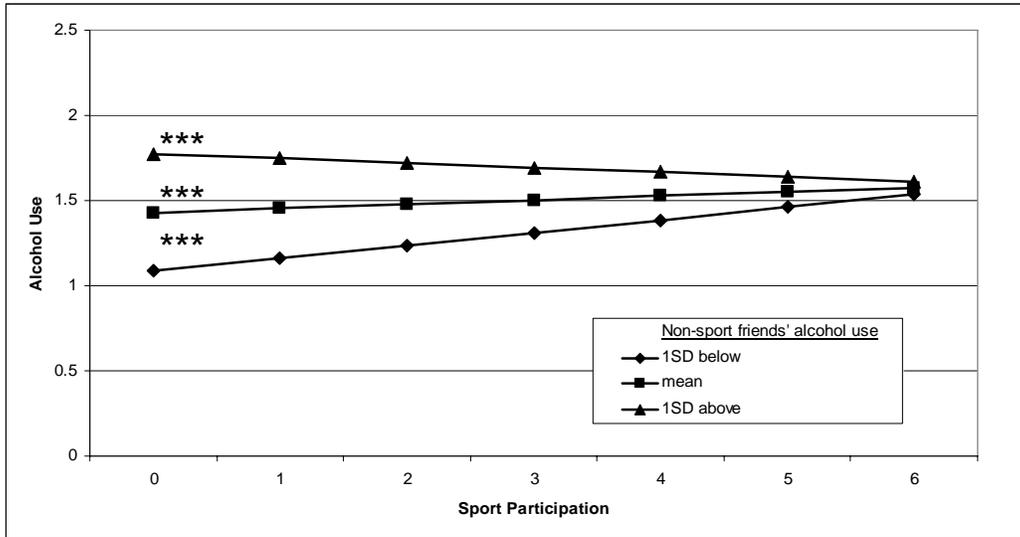


Figure 4. Adolescents' non-sport friends' alcohol use as a moderator of the relation between sport participation and alcohol use. \*\*\*Slope is significant at  $p < .001$ .