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Adolescent pathways to adulthood drinking: sport activity involvement is not necessarily risky or protective

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Abstract

Aims—Use pattern-centered methods to examine how adolescents' alcohol use and sports activities are related both to childhood sport and problem behavior and to heavy drinking in early adulthood.

Design—The data used in this study come from four waves of the Michigan Study of Adolescent Life Transitions (MSALT) that began in 1983, when participants were approximately age 12, and continued into early adulthood, when participants were approximately age 28.

Participants—Sixty per cent of the approximately 1000 MSALT youth living in south-eastern Michigan were females and 97% were European American. Approximately 28% of one or both parents held at least a college degree, and 45% held a high school diploma or lower.

Findings—Pattern-centered analyses revealed that the relation between adolescent sport activity and age 28 heavy alcohol use obtained primarily for sport participants who were also using more than the average amount of alcohol and other drugs at age 18. Similarly, children who were characterized by relatively high levels of sport participation, aggression and other problem behavior at age 12 were more likely than expected by chance to become sport participants who used more than the average amount of alcohol and other drugs at age 18.

Conclusions—The results indicate that childhood problem behavior and adolescent sport participation can, but do not necessarily, presage heavy drinking in adulthood and that pattern-centered analytical techniques are useful for revealing such theoretically generated predictions.

Keywords

Alcohol; life-span; sports

INTRODUCTION

The use and abuse of alcohol across the life-span is influenced by a wide range of personal and contextual factors [1–5]. For example, in addition to the standard finding that later alcohol use tends to be predicted best by earlier alcohol use [6,7], various patterns of alcohol

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Conflicts of interest

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use in adulthood have been predicted by a variety of adolescent factors, such as parental education [8], family and peer behavior [9–11], delinquent behavior [12–14], aggressive behavior [15,16], dropping out of high school [17] and sport activity [18].

Consistent with the other papers in this supplemental issue [10–13,15], we attempt to determine which adolescent factors, considered within the context of many such factors, are associated most strongly with alcohol use in adulthood. We are particularly interested in testing the hypothesis that the relation of adolescent sport activity to alcohol use in early adulthood varies as a function of, for example, sport, alcohol and problem behavior profiles. Focusing upon sport activity allows us to (i) demonstrate how the predictive utility of a variable can vary dramatically within the context of either a variable-centered analysis focused upon a heterogeneous sample or a pattern-centered analysis focused upon homogeneous subgroups; and (ii) clarify an area of inconsistency in the literature on the relation between sport activity and alcohol use.

In effort to align our research methods with an 'interdisciplinary developmental science framework that emphasizes multidimensional and multidirectional developmental change across life' ([7], p. 2), in the first part of the study we move from analyses focused on the relations among variables, in the first part of the study, to analyses focused on the relations among similar kinds of people in the latter part of the study. Specifically, we use pattern-centered methods (e.g. cluster analysis) to reframe our research questions from the level of the average person in the sample, controlling for relevant variables, to the level of homogeneous subgroups of people characterized by similar patterns of values on relevant variables:

> Pattern-centered analytic techniques refer to a family of research tools that identify patterns or profiles of variables within individuals and thereby classify individuals into homogeneous subgroups based on their similarity of profile. This is contrasted with variable-centered techniques, a family of research tools in which the *relations of variables across individuals* is the main focus . . . The term 'person-centered' is used to contrast with the traditional emphasis on variables; the term 'pattern-centered' is used to extend the principles of person-centered approaches to other levels of analysis (e.g. social context) ([19], p. 110).

In short, we hope to promote theoretical integration by highlighting the use of pattern-centered approaches to understanding complex developmental processes characterized by sample heterogeneity.

Sport activity and alcohol use

Participating in sports during adolescence has been viewed as a protective factor for healthy development because sport activity includes features that are similar to a wide variety of other seemingly health-enhancing activities [20]. For example, Eccles & Gootman [21] reviewed evidence suggesting that extracurricular activities characterized by opportunities for adolescents to interact with positive peers, develop competencies and skills and exercise autonomy promote a variety of forms of healthy development, including lower levels of alcohol use. Consistent with this view, participating in sports during junior and senior high

school is related to a variety of concurrent and prospective indicators of positive youth development [22–26].

Despite evidence that sport activity is associated generally with healthy development, evidence about the relation of sport activity to alcohol use has been mixed. In some studies, sport activity is associated with lower levels of alcohol use [27–29]. For example, Fredricks & Eccles [27] found that 11th-graders participating in sports reported lower amounts of alcohol use than 11th-graders not participating in sports [after controlling for family socio-economic status (SES), achievement motivation and previous levels of alcohol use]. Other studies have found no relation between participating in sports and alcohol use [20]. Most studies, however, have found a positive relation between participating in sports and alcohol use (e.g. [18,22,26,30–32]). For example, Garry & Morrissey [31] found a positive relation between sport participation and alcohol use among middle school students, and Eccles & Barber [18] found a predictive relation between 10th-grade sport participation and increases in alcohol use between the 10th and 12th grades.

Despite the preponderance of evidence indicating a positive relation between sport activity and alcohol use, the overall portrait of mixed findings suggests that participating in sports is not necessarily a risk or protective factor for alcohol use. Specifically, the relation between sport activity and alcohol use appears to vary as a function of factors such as race, sex, identity, type of sport, amount of participation and overall extracurricular activity pattern [18,22,26–28,30,31,33,34]. For example, Eitle *et al*. [30] found a positive relation between middle school sport participation and alcohol use for white males only, and this relation was particularly strong for football players.

In an effort to place sport activity into a wider context of extracurricular activities, Zarrett [26] used a pattern-centered approach to examine cross-sectional and longitudinal rates of alcohol use separately for youth whose activity patterns were characterized primarily by sport participation only versus youth who were involved with sports in addition to other types of activities (e.g. school clubs, volunteering and work). Although 7th- and 8th-grade alcohol use did not differ between the ‘sport-only’ and the ‘sport + activity’ or ‘other-activities’ groups, the 11th-grade sport-only group reported higher levels of alcohol use than the 11th-grade sport + activity and other-activities groups (after controlling for family SES and academic achievement). These higher levels of alcohol use by the 11th-grade sport-only youth were also found at 1 and 3 years post-high school. Similarly, although alcohol use increased for all youth between the 7th and 11th grades, it was the sport-only youth (not the sport + activity youth) for whom the rate of alcohol use increased faster than the other-activities youth.

Sport activity, alcohol use and multi-level systems

The results of these diverse studies suggest that it is not simply participating in sports that drives the apparent relation between sport activity and alcohol use; rather, there are a variety of factors characterizing youth who participate in sports that may influence alcohol use, including personal factors (e.g. temperament and identity) involved with choosing to participate in specific kinds of activities (including both sports and drinking) as well as features of the social context in which these activities occur (e.g. peers and adults who do or

do not condone drinking). Typical of complex multi-level systems, there are apparently many factors involved with the development of drinking behavior patterns, and different factors are likely to be relevant for different individuals growing up in different contexts during different developmental periods [5,35–38]. For example, heavy drinking behavior may be fueled by high levels of sensation-seeking coupled with time spent engaged in unsupervised activity settings characterized by heavy drinking peers for some people and by high levels of need for belonging coupled with time spent in activity settings characterized by socially sanctioned drinking for other people.

Consequently, we expected to find several different subgroups of adolescents characterized by several different profiles of functionally interconnected factors. For example, given our hypothesis that participating in sports may be linked to heavy drinking for some but not all individuals, we expected to find some adolescents characterized by relatively high levels of sport activity and alcohol use and others characterized by relatively high levels of sport activity but low levels of alcohol use. Further, given the relative stability of such functional interconnections [2,38,39], we expected that adolescents characterized by relatively high levels of both sport activity and alcohol use, rather than adolescents characterized only by relatively high levels of sport activity, would be the most likely to become heavy drinkers in early adulthood. Similarly, not every person who scores high on a measure of externalizing behavior will necessarily be a heavy drinker, so we expected to find functional interconnections among variables indicating delinquency that include high levels of alcohol use for only some individuals. For example, latent growth mixture modeling has been used to identify various ‘trajectories’ of delinquent behavior from 10th to 12th grade [14] and to show that not all youth who are on developmental pathways characterized by high levels of delinquent behavior have trouble with alcohol as young adults [40].

Pattern-centered approaches to data analysis are ideally suited for examining hypotheses involving functionally interconnected variables that combine differently within different people both within and across time. Most of the studies reviewed above used variable-centered approaches that assume that: (i) a person's score on a variable achieves its meaning largely by reference to other people's score on the variable [41]; and (ii) the relative strength of the relations between predictor and criterion variables can be estimated accurately using standardized regression coefficients [42]. If these assumptions are false, or inapplicable because of the extent to which the people sampled are heterogeneous with respect to the operating characteristics being studied [43,44], then proceeding as if these assumptions are true may account for the diversity of findings about the relation between sports and alcohol use. In other words, the results may vary because different investigators are: (i) using different sets of variables to specify different models; and (ii) applying these models to people who differ in how these variables cohere intraindividually and, thereby, violating the homogeneity assumption upon which general linear modeling approaches are based.

Pattern-centered approaches can be used to help solve both these problems because they encourage investigators to: (i) analyze profiles of variables separately at different levels of analysis and different points in time, which is practically necessary for discerning level-specific dynamics [41,45]; and then (ii) identify homogeneous subgroups defined in terms of cross-level configurations of these profiles. One of the central features of pattern-centered

approaches is the assumption that a person's score on a variable achieves its meaning not by reference to interindividual differences but by reference to intraindividual differences [41]; that is, it is the pattern of scores within each person (i.e. the profile) that determines the functional significance of any single score for any given person. In addition, pattern-centered approaches almost always involve the integration of variable- and pattern-centered methods. For example, after first using variable-centered methods to determine covariances among items and scales and then pattern-centered methods to identify homogeneous subgroups of people based on scale-score profiles, variable-centered analyses can be applied within these homogeneous groups to provide a sufficient basis for generalizing ‘effects’ to populations of people defined in terms of similar profile patterns [46].

In this study, our first set of analyses was based on variable-centered approaches to examining the relations of childhood and adolescent predictor variables to the frequency of drinking and heavy drinking in early adulthood. Our second set of analyses integrated variable- and pattern-centered approaches by using a subset of variables from the first set of analyses as the basis for: (i) age 12 and age 18 cluster analyses of predictor variables; and (ii) linking these clusters to each other and to age 28 heavy alcohol use. In this way, we identify developmental pathways from childhood and adolescent sport, social and externalizing behavior profiles to heavy drinking tendencies in early adulthood. In both sets of analyses, we explore but do not predict differences by gender.

We expected our variable-centered analyses to reveal a weak but positive association between adolescent sport activity involvement and age 28 alcohol use. As reviewed above, many studies have found a positive association between sport activity and alcohol use within the context of cross-sectional or short-term longitudinal studies. In this study, we tested this relation across a minimum of 10 years and included a multitude of predictor variables in our models. We expected our pattern-centered analyses to reveal positive associations between adolescent sport activity involvement and age 28 alcohol use for some participants, but negative and no associations for other participants. Specifically, we expected that the positive relation often observed between sport activity and alcohol use would be generated by a relatively small, homogeneous subgroup characterized by sport activity and externalizing behavior.

METHOD

Participants

The data used in this study come from four waves of the nine-wave Michigan Study of Adolescent Life Transitions (MSALT) that began in 1983, when participants were in the 6th grade, and continued into early adulthood when participants were approximately age 28 [47,48]. We focus here upon data collected near the end of the 6th grade (approximately age 12), near the end of the 12th grade (approximately age 18) and 2 and 10 years post-high school (approximately ages 21 and 28, respectively). Retention rates were 75 and 67% from ages 12–18 and 18–28, respectively.

Attrition patterns across the nine waves of MSALT data are complicated by the fact that two school districts were dropped from the study. The retention percentages reported here are

based only upon participants from the school districts that were not dropped from the study. Logistic regression analyses revealed that attrition between ages 12 and 18 was predicted uniquely by higher levels of problem behavior and lower levels of both importance of popularity and academic performance at age 12. Attrition between ages 18 and 28 was predicted uniquely by lower levels of mother's education and academic performance at age 18. More complex prediction models involving attrition patterns and their relations to the data used here are discussed in the section on pattern-centered analyses.

Sixty per cent of the approximately 1000 MSALT youth living in south-eastern Michigan were females. At age 12, participants were in one of 10 predominantly European American (97%), lower-middle to middle-class school districts in south-eastern Michigan. Mother surveys were mailed directly to their home. Youth completed questionnaires at ages 12 and 18 in the schools. Ages 21 and 28 surveys were mailed directly to the participants. The average family income at age 12 ranged from $30 000 to $40 000 per year. Approximately 28% of one or both parents held at least a college degree, and 44% held a high school diploma or less. More than 86% of the youth lived with their biological parents and 93% had one to three siblings [mean = 2.7; standard deviation (SD) = 1.2].

Measures

Measures corresponding to the 10 domains common to the other papers in this supplement, as well as to our primary outcome variables—the frequency of general alcohol use (i.e. general alcohol use) and drunkenness (i.e. heavy alcohol use)—are described in Table 1. Measures that are relatively unique to MSALT are described in Table 2. For the pattern-centered analyses, we converted the age 28 heavy alcohol use variable into a four-level categorical variable where 0 = getting drunk once or less (in the past 6 months; 39%), 1 = two to six times (20%), 2 = seven or more times (10%) and 3 = missing data at age 28 (32%).

Including an age 28 heavy alcohol use category representing individuals who had complete data at age 18 but who either did not have complete data or were missing completely from the study at age 28 is useful for at least two purposes. First, it allows us to examine explicitly the extent to which missing data status at age 28 relates systematically to age 18 profile status. Secondly, it allows us to estimate the extent to which developmental pathways from age 18 to age 28 occur at rates that are more or less likely than expected by chance, while taking into account that individuals from some age 18 profile groups may be more or less likely than individuals from other age 18 profile groups to be missing data at age 28.

Analysis plan

We began by conducting separate multivariate regression analyses of the associations of ages 12 and 18 ‘common’ and ‘unique’ predictor variables to ages 21 and 28 general and heavy alcohol use variables for males and females. The primary purpose of these variable-centered analyses was to determine which ages 12 and 18 variables, considered simultaneously, would predict uniquely the frequency of general drinking and drunkenness at ages 21 and 28. The second set of analyses (e.g. the cluster analyses) used a small subset of the original variables characterized by their (i) strong showing in the regression analyses

or (ii) theoretical relevance to questions about the relation of adolescent sport participation to adult alcohol use. These pattern-centered analyses were focused initially upon identifying homogeneous subgroups at age 18 and linking them to age 28 heavy alcohol use. Finally, using similar variables, we identified age 12 homogeneous subgroups and linked them to age 18 subgroups.

RESULTS

Descriptive statistics for all variables are shown in Table 3, and bivariate correlations among key predictor and criterion variables are shown in Table 4. We conducted 26 preliminary multivariate regression analyses corresponding to the various combinations of ages 12 and 18 common and unique predictor variables and females' and males' ages 21 and 28 general and heavy alcohol use criterion variables. Given our primary focus on the pattern-centered analyses, we report the complete results only for the combined effects of age 12 and age 18 predictors on female and male general and heavy alcohol use at ages 21 and 28. We used one-tailed significance tests for hypothesized relations reported in the pattern-centered analysis section; a 0.05 alpha level was used for all other statistical tests.

Variable-centered analyses

As expected, there were generally strong autoregressive relations between age 18 alcohol use and females' and males' age 21 general [B = 0.67/0.72, standard error (SE) = 0.07/0.09, β = 0.51/0.59] and heavy (B = 0.69/0.82, SE = 0.07/0.09, β = 0.54/0.63) alcohol use. The only other predictor of females' age 21 general alcohol use (R^2 = 0.34) was age 18 sport activity (B = 0.14, SE = 0.05, β = 0.12). In contrast, males' age 21 general alcohol use (R^2 = 0.40) was predicted by age 12 grade point average (GPA) (B = 0.13, SE = 0.06, β = 0.15), age 18 family conflict (B = 0.25, SE = 0.12, β = 0.12) and age 18 difficulty making friends (B = –0.33, SE = 0.11, β = –0.21). The only other predictor of females' age 21 heavy alcohol use (R^2 = 0.20) was age 18 sport activity (B = 0.13, SE = 0.05, β = 0.11) and age 18 skipping school (B = 0.13, SE = 0.06, β = 0.11). In contrast, males' age 21 heavy alcohol use (R^2 = 0.43) was also predicted by mother's education (B = 0.26, SE = 0.11, β = 0.13), age 12 GPA (B = 0.13, SE = 0.06, β = 0.14) and difficulty making friends (B = –0.32, SE = 0.11, β = –0.20).

As shown in Table 5, and in addition to the autoregressive relations, females' age 28 general alcohol use was also predicted by age 18 family conflict and age 18 GPA; males' age 28 general alcohol use was also predicted by age 12 GPA, age 12 social ability, age 18 importance of making friends, age 18 importance of popularity and age 18 peer focus. The only other predictor of females' age 28 heavy alcohol use was age 18 family conflict, and the only other predictor of males' age 28 heavy alcohol use was age 18 difficulty making friends. The proportion of variance accounted for by these models, after considering the autoregressive relations associated with age 18 alcohol (and other drug) use, did not exceed 12%.

Pattern-centered analyses

In an effort to: (i) promote theoretical and methodological integration in relation to a few of the variables used in the regression analyses; and (ii) address questions about the relation of adolescent sport activity to heavy drinking in early adulthood, we used the Sleipner (version 2.1) statistical package for pattern-oriented analyses [49,50] to examine a small subset of the age 18 variables (i.e. general alcohol use, other drug use, problem behavior, sport activity, sport values, social efficacy and importance of making friends). We began by using the IMPUTE module to assign valid variable values to 39 participants who were missing data on no more than two of the cluster variables (the imputed values were taken from the participant with the closest matching profile) and the RESIDUE module to remove 30 multivariate outliers (i.e. participants whose pattern of values on the cluster variables matched no more than two other participants).

The CLUSTER module (using Ward's method on squared Euclidian distances) was used to obtain initial cluster solutions ranging from two to 20 groups. These solutions were evaluated by reference to the proportion of the total error sum of squares (ESS) [ESS can be defined more formally as the sum of squared differences between individual values on the cluster variables and the means of these variables within each cluster (i.e. the centroid), summed across all clusters [43]] explained by each cluster solution and the change in ESS between adjacent solutions. Where used to create a scree-type plot (see Fig. 1a), this change in ESS information can be used to determine the statistically justifiable upper and lower number of cluster groups that provide unique information. In this case, the results provided statistical justification for selecting as few as four or as many as 10 cluster groups. We selected the seven-cluster solution based on its theoretical meaningfulness in relation to our question about different kinds of adolescent athletes and subsequent alcohol use. Finally, we used the RELOCATION module to conduct a *k*-means relocation analysis of the seven-cluster Ward's solution. This procedure re-assigned 239 youth to cluster groups that best matched their individual profile, thereby correcting for premature classification by the hierarchical algorithm and further increasing within-group homogeneity. The centroids, standard deviations and homogeneity coefficients for each cluster group are shown in Table 6.

The first five cluster groups constitute approximately 60% of the sample and are marked by distinct profiles of sports, substance use and problem behavior: cluster I (jock-only) is marked by relatively high levels of sport activity; cluster II (J-Alc-PB) is marked by relatively high levels of sport activity, alcohol use and problem behavior; cluster III (J-drugs) is marked primarily by relatively high alcohol use, other drug use and problem behavior, but is also characterized by moderate (i.e. high relative to clusters IV–VII) levels of sport activity; cluster IV (Alc-Drg) is marked by relatively high alcohol and drug use but relatively low levels of sport activity; and cluster V (Alc-PB) is marked by relatively high alcohol use and problem behavior but relatively low levels of sport activity.

Pathways from ages 18 to 28

Using these groups, we examined the extent to which adolescent sport activity was associated with heavy drinking at age 28. We expected that the relation between sports and

drinking that we and others have found using variable-centered analyses would look different when considered from a pattern-centered perspective. For example, we predicted that heavy drinking at age 28 would be associated not with sport activity alone but with sport activity coupled with other factors (e.g. adolescent drug use). If sport activity is necessarily related to higher levels of age 28 heavy alcohol use, then the jock-only, J-Alc-PB and J-drugs group members should all report high levels of heavy alcohol use at age 28.

As reported in our preliminary investigations [51], we expected to find a 'jock-only' group (i.e. individuals who reported relatively high levels of sport activity but relatively low levels of drinking) and that members of this group would be unlikely to evidence heavy drinking at age 28. We also expected to find some kind of 'jock' plus 'heavy alcohol use' group and assumed that this group would be most likely to report heavy drinking at age 28. After completing the age 18 cluster analyses and finding two groups of sport participants characterized by relatively high levels of alcohol use (i.e. J-Alc-PB and J-drugs), and two other groups characterized by relatively high levels of alcohol use but relatively low sport participation (i.e. Alc-Drg and Alc-PB), we expected that members of all four of these groups would be more likely to report heavy drinking at age 28 than expected by chance.

We tested these hypotheses by cross-tabulating the age 18 cluster groups and the age 28 heavy alcohol use group. [The same pattern of age 18 to age 28 results reported here for 'getting drunk' was also obtained where using similarly constructed age 28 outcome categories based on variables assessing (i) drinking five or more drinks in a row; (ii) frequency times amount of alcohol use; (iii) driving under the influence (DUI) arrests.] The results indicated that members of the age 18 jock-only group were no more likely than expected by chance to report heavy drinking at age 28 [adjusted standardized residual (ASR) (ASRs are interpreted as *Z*-scores, e.g. ASR values above ±1.96, 2.58, and 3.29 are significant at the two-tailed 0.05, 0.01, and 0.001 levels, respectively) = –1.5, $P < 0.20$] and were more likely than expected by chance to report getting drunk one or fewer times in the past 6 months (ASR = 1.7, one-tailed $P < 0.05$). The results also revealed that J-Alc-PB youth were likely to become age 28 heavy drinkers (ASR = 1.7, one-tailed $P < 0.05$) and that J-drugs youth were 2.8 times more likely than expected by chance to be heavy drinkers at age 28 (ASR = 5.0, $P < 0.001$). This latter finding is particularly noteworthy because J-drugs youth were the only participants who were more likely than expected by chance to be missing from the age 28 data collection (ASR = 2.1, $P < 0.05$). Finally, contrary to our expectations, members of the Alc-Drg and Alc-PB groups were no more likely than expected by chance to be age 28 heavy drinkers (ASRs = 0.9 and –0.9, respectively) or to be missing at age 28 (ASRs = 0.2 and 0.2, respectively).

Considering these relations separately for females and males revealed that both female (ASR = –0.9) and male (ASR = –1.3) jock-only youth were no more likely than expected by chance to report heavy age 28 drinking and both female (ASR = 4.1, $P < 0.001$) and male (ASR = 2.7, $P < 0.01$) J-drugs youth were likely to report heavy drinking at age 28. Female Alc-Drg youth were somewhat likely to become age 28 heavy drinkers (ASR = 1.7, one-tailed $P < 0.05$).

Pathways from ages 12 to 18

After determining that the relation between age 18 sport activity and age 28 heavy drinking applied primarily to 'jocks' who were engaged in relatively high amounts of problem behavior (including alcohol and other drug use) at age 18, we examined the extent to which these late adolescent behavior patterns could be predicted by late childhood (i.e. age 12) behavior patterns. We knew from earlier work that males who were among the top 30% in age 12 aggression were likely to become jocks who used more than the average amounts of alcohol and other drugs at age 18 [51], but we wanted to take a more differentiated approach to addressing the question of late childhood precursors to the age 18 J-drugs and jock-only group memberships because these were the two age 18 profile patterns that distinguished most clearly between those who would and would not go on to become the heaviest drinkers in early adulthood.

We began by cluster analyzing a set of age 12 variables that matched closely the set used for the age 18 cluster analysis: bring alcohol to school, aggression, problem behavior, sport activity, sport values, difficulty making friends (reversed) and importance of making friends. There were several notable differences between the age 12 and age 18 cluster variables. First, there was no measure of alcohol or other drug use at age 12; in their place we used the bring alcohol to school variable. Secondly, we used separate indicators of 'aggression' and 'problem behavior' to examine their potentially distinct roles in the age 12 profiles and relations to the age 18 profiles. Thirdly, the difficulty making friends and social ability variables did not form a reliable composite at age 12 so we used only the difficult making friends variable. We followed the same imputation (n = 79), multivariate outlier (n = 43), Ward's method and k-means relocation procedures on the age 12 data that we described above for the age 18 data. The scree-plot of the change in ESS data provided statistical justification for selecting as few as four or as many as 14 cluster groups (see Fig. 1b). We selected the seven-cluster solution because it differentiated sufficiently the aggressive and problem behavior sport participants from those who were relatively low on these factors. The centroids, standard deviations and homogeneity coefficients for each cluster group are shown in Table 7.

The first four cluster groups constitute approximately 54% of the sample and are marked by distinct profiles of sports, aggression and problem behavior: cluster I (J-Psoc) is marked by relatively high levels of sports and low levels of problem behavior; cluster II (J-PB) is marked by relatively high levels of sports and problem behavior; cluster III (J-Agg-PB) is marked primarily by relatively high levels of sports, aggression and problem behavior; and cluster IV (J-Alc) is marked by high levels of bringing alcohol to school along with relatively high levels of sports, aggression and problem behavior. We expected that J-Psoc youth would become jock-only youth at age 18 (e.g. because their age 12 profile is the most similar to the age 18 jock-only profile) and that J-Alc and J-Agg-PB youth would become J-drugs youth at age 18 (e.g. because their age 12 profiles are the most similar to the age 18 J-drugs profile).

Consistent with our hypothesis, the results of cross-tabulating the age 12 and age 18 cluster solutions revealed that age 12 J-Psoc youth were likely to become age 18 jock-only youth

(ASR = 2.4, one-tailed $P < 0.01$), and age 12 J-Agg-PB youth were likely to become age 18 J-drugs youth (ASR = 5.4, one-tailed $P < 0.0001$). [Profile groups tended not to vary systematically with demographic background variables. For example, we examined the relation between mother's education (1 = less than high school graduate, 2 = high school graduate, 3 = some college and 4 = BA/BS or higher) and the age 12 profiles and found no statistically significant relation between these variables. Further pattern-centered analysis focused on profiles of demographic background factors may provide more leverage for addressing potential selection effects, but these analyses are beyond the scope of the paper.] However, contrary to our expectations, age 12 J-Alc youth were no more likely than expected by chance to become age 18 J-drugs youth (ASR = –0.8). Rather, of the four key age 12 groups, J-Alc youth were the only ones who were missing age 18 data at rates that were higher than expected by chance (ASR = 3.3, $P < 0.001$). We also found that age 12 J-PB youth were likely to become age 18 J-Alc-PB youth (ASR = 3.1, $P < 0.01$).

Considering these relations separately for females and males revealed that both female (ASR = 3.4, $P < 0.001$) and male (ASR = 3.1, $P < 0.01$) age 12 J-Agg-PB youth were likely to become age 18 J-drugs youth. Age 12 J-Psoc males were likely to become age 18 jock-only youth (ASR = 2.5, $P < 0.05$) and not likely to be missing at age 18 (ASR = –2.5, $P < 0.05$). In contrast, age 12 J-Psoc females were no more likely than expected by chance to either become age 18 jock-only youth (ASR = 1.0) or be missing at age 18 (ASR = 1.0). Both J-Alc males (ASR = 2.5, $P < 0.01$) and females (ASR = 1.7, one-tailed $P < 0.05$) were likely to be missing at age 18. Finally, whereas J-PB males were likely to become age 18 J-Alc-PB youth (ASR = 3.0, $P < 0.01$), J-PB females were likely to become age 18 J-drugs youth (ASR = 1.7, one-tailed $P < 0.05$).

DISCUSSION

The variable-centered analyses showed that a range of childhood and adolescent variables are potentially relevant for understanding general and heavy drinking behaviors in early adulthood, but consistent patterns were rare and the proportion of variance in adulthood alcohol use that was accounted for by the predictor variables, particularly where considered without reference to prior levels of alcohol use, was generally small. For example, the variable-centered analyses revealed a weak but positive association between adolescent sport activity and early adulthood alcohol use, but this relation generally vanished within the context of the many other variables included in the regression models. The pattern-centered analyses revealed that the relation between adolescent sport activity and heavy drinking in early adulthood pertains to some people but not everyone who participates in sports during high school. Specifically, adolescents who played sports during high school and who consumed less than the average amount of alcohol and drugs were unlikely to be heavy drinkers in early adulthood. In contrast, adolescents who played sports but consumed more than the average amount of alcohol and drugs were significantly more likely than expected by chance to be heavy drinkers in early adulthood. Consequently, the results of this study support the conclusion that playing sports is not necessarily risky or protective with respect to heavy drinking in early adulthood.

Variable-centered approaches

Although models using subsets of predictors (e.g. using only age 12 variables common to the other studies in this supplement) showed that a variety of personal and social factors were related to general and heavy alcohol use at ages 21 and 28, the full models showed that after considering the associations with previous alcohol use few other predictor variables contributed uniquely, or in total, to variance in early adult alcohol use. Overall, the results of the many regression analyses we conducted failed to provide clear information about the relations of childhood and adolescent psychological, behavioral and social factors to general and heavy adulthood drinking at ages 21 and 28. Although we found several apparently meaningful results associated with some of the many predictor variables, sample heterogeneity limits the generalizability of these results to members of the population from which the sample was drawn.

Pattern-centered approaches

The results of the cluster analyses showed that sport participation and values, alcohol and other drug use, and aggressive and other problem behavior are configured differently within different individuals, and the results of cross-tabulating these configurations with each other and heavy drinking at age 28 showed that adolescent sport participants do not necessarily turn out to be the heaviest drinkers in early adulthood. We predicted and found that age 28 heavy drinking was not associated specifically with the amount of age 18 sport activity but, rather, to a profile of characteristics that included sport activity along with alcohol use, other drug use and other forms of problem behavior. If the primary driving force responsible for heavy drinking during early adulthood was related specifically and only to whatever caused the relatively high levels of alcohol use at age 18, then we should have found high rates of age 28 heavy drinking among equally high proportions of youth across all the age 18 cluster groups that were marked by relatively high levels of age 18 alcohol use; namely, clusters II (J-Alc-PB: jock–alcohol use–problem behavior), III (J-drugs: jock–drug use), IV (Alc-Drg: alcohol use–drug use), and V (Alc-Prb: alcohol use–problem behavior). However, our results showed that only age 18 youth with high levels of drinking accompanied by relatively high levels of sport activity, valuing sport activity, aggression and other drug use (i.e. J-drugs youth) were likely to become age 28 heavy drinkers.

The idea that heavy drinking is part of a constellation of behavior that may or may not include factors associated with sport activity is also supported by the results showing a link between age 18 J-drugs and age 12 J-Agg-PB (jock-aggressive–problem behavior). Age 12 J-Agg-PB youth reported levels of sport activity and values similar to age 12 J-Psoc (jock–positive social), J-PB (jock–problem behavior), and J-Alc (jock–alcohol use) youth but levels of aggression and other problem behavior that were both similar to J-Alc youth and substantially higher than J-Psoc and J-PB youth. This configuration of sport, aggressive and other problem behavior clearly persisted across adolescence for a non-random proportion of these J-Agg-PB youth and, as indicated by the J-drug profile, the behavioral profiles of these youth eventually included high levels of alcohol and other drug use.

We also expected that members of the age 12 J-Alc group—characterized by relatively high levels of sport activity, aggression and other problem behavior—would become members of

the age 18 J-drugs group. However, the results were not entirely consistent with this prediction: rather than finding age 12 J-Alc youth in the age 18 J-drugs group, most of these J-Alc youth (i.e. 84%) appeared to have dropped completely out of the study by age 18. Further, consistent with Larson's [52] finding that adolescents who engage in the highest levels of 'delinquent' behavior tend to drop out of school athletic participation over time, we also found that age 12 J-Alc youth were unlikely to become age 18 jock-only youth.

Limitations

The most severe limitations of this study are associated probably with the concept of model misspecification. For example, there is little doubt that patterns of alcohol use across the life-span are affected by genetic factors [38,53,54], yet we have no way of estimating how explicitly including information about these factors would affect the apparent relations between the predictor and criterion variables we modeled in this study. For example, it is likely that including measures of genetic factors in our variable-centered models of heavy drinking would influence substantially the obtained beta coefficients. Similarly, including in these analyses other relevant operating factors, particularly those that are malleable such as identity and socialization, would inform more clearly prevention and intervention strategies designed for specific kinds of people in specific kinds of contexts.

CONCLUSIONS

The results of this study do not necessarily provide information about the 'unique' effects of sport participation on alcohol use because: (i) we do not believe that sport activity can have 'direct' effects on drinking behavior (e.g. whatever association exists between sport activity and drinking behavior must be mediated by other factors such as availability, beliefs and impulse control); (ii) we do not believe that whatever 'indirect' effects sport activity has on drinking for some people necessarily exist or operate in the same way for everyone (in the sample or population); and (iii) few of the factors associated with playing sports that might contribute to the indirect effects of sport activity on drinking behavior were included in this study. Rather, the results of this study mainly provide information about the extent to which drinking behavior is influenced by a constellation of factors that come together differently in different people and that may or may not include sport activity.

Despite the relatively restricted set of variables used here, the results indicate that alcohol use appears to be governed by different personal and social factors for different people at different points in time. The variable-centered (e.g. regression) analyses suggest that the effects of childhood factors on drinking behavior in early adulthood are mediated primarily by factors associated with adolescent drinking behavior, and the pattern-centered (e.g. cluster) analyses reveal that sport activity is not necessarily associated with concurrent or subsequent drinking behavior. A more detailed understanding of the relations among personal and social childhood and adolescent factors on drinking behavior across the life-span could be obtained by conducting more detailed, level-specific integration of variable- and pattern-centered analyses that include measures of a wider range of operating characteristics at more points in time. Using this kind of approach it should be possible to determine, for example, which developing youth are more or less susceptible to which

socialization factors at which points in their development of alcohol use behavior. Knowing this information would lay the groundwork for more specific intervention efforts tailored to each individual's own vulnerabilities.

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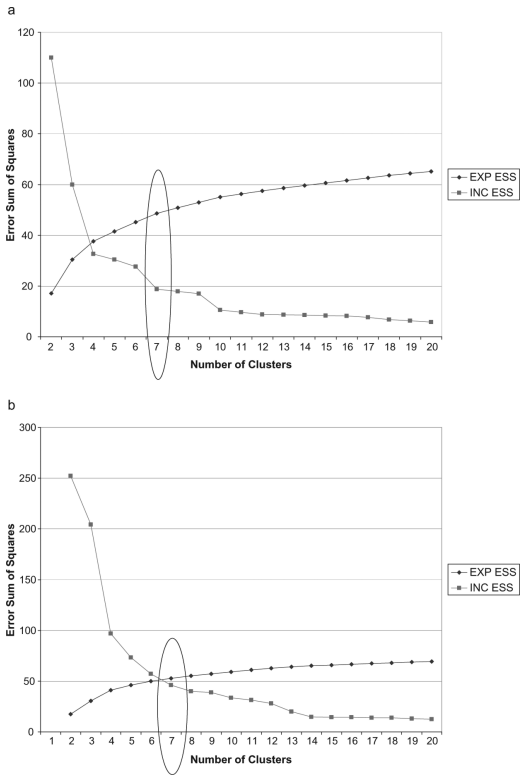

Figure 1.

(a) Increases and explained error sum of squares for 20 age 18 cluster solutions. (b) Increases and explained error sum of squares for 20 age 12 cluster solutions. EXP ESS: explained error sum of squares; INC ESS: increase in error sum of squares

Table 1

Measures common to the other Center for Analysis of Pathways from Childhood to Adulthood (CAPCA) studies included in this supplement, by age and domain.

Domain	
Parental socio-economic status	**Mother's education** in 1984: 1 = grade school (8%), 3 = high school (44%), 5 = college (10%), 8 = PhD (3%)
Family relations	**Family conflict** at ages 12 (α = 0.65) and 18 (α = 0.68), 3 items: 'I have a lot of fights with my parents about their rules and decisions for me' (1 = never true, 4 = always true)
Peer relations	**Difficulty making friends** at age 12, 3 items: e.g. 'How hard is it for you to make friends?' (1 = very easy, 7 = very hard), α = 78
	At age 18, 2 items: e.g. 'How hard is it for you to make friends?' (1 = very easy, 7 = very hard), α = 79
Academic achievement	**Grade point average** (from school records): at age 12(1 = F, 16 = A+); at age 18 (0 = F, 4 = A)
Truancy	**Skipped school** at age 12, 1 item: 'Since past January, how many times have you not come to school when you were supposed to?' (0-12 times)
	At age 18, 1 item: i.e. 'How often in the past 6 months did you skip school?' (0-12 times)
Future expectations	**College plan** at age 12, 1 item: 'Do you plan to go to college after high school?' (1 = no, 2 = I don't know, 3 = yes)
	At age 18, 1 item: 'When you think about the future, how likely do you think it is that you will graduate from college (4-year college)?' (1 = very unlikely, 7 = very likely)
Externalizing	**Aggression** at age 12, 3 items: e.g. 'In last 3 weeks at school how many times did you punch or push another student?' (0 = never to 12 or more times), α = 0.70
	At age 18, 5 items: e.g. 'About how often in the last 6 months did you get into a fist fight with another kid?' (1 = never, 7 = 21 or more), α = 0.72
Substance use	**Bring alcohol or drugs to school** at age 12, 1 item: 'In the last 3 weeks at school how many times did you bring alcohol or drug to school?' (0-12 or more)
	Alcohol use at age 18, a composite of general and heavy alcohol use: e.g. 'How often in past 6 months did you get drunk?' (1 = never, 7 = 21 times or more), α = 0.95
	Other drug use at age 18, 3 items: e.g. 'How often in the past 6 months did you use chemicals/drugs other than marijuana/alcohol?' (1 = never, 7 = 21 or more), α = 0.75
Age 21/28 alcohol use	**General alcohol use** at ages 21 and 28, 1 item: 'How often in the past 6 months did you drink alcohol?' (1 = never, 2 = once, 3 = 2-3 times, 4 = 4-6 times, 5 = 7-10 times, 6 = 11-20 times, 7 = 21 or more)
	Heavy alcohol use at ages 21 and 28, 1 item: 'How often in the past 6 months did you get drunk?' (1 = never, 2 = once, 3 = 2-3 times, 4 = 4-6 times, 5 = 7-10 times, 6 = 11-20 times, 7 = 21 or more)

α, coefficient alpha.

Table 2

Measures not common to the other Center for Analysis of Pathways from Childhood to Adulthood (CAPCA) studies included in this supplement, by age and domain.

Domain	
Parental relations	**Participate in decision making** at ages 12 (α = 0.61) and 18 (α = 0.58), 2 items: e.g. 'How often do you take part in making family decisions that concern yourself?' (1 = never, 4 = always)
Social relations	**Social ability** at age 12, 4 items: e.g. 'I can make friends if I really work at it' (1 = not at all true; 7 = very true), α = 0.76
	At age 18,1 item: 'How good are you at making friends?' (1 = not at all good, 7 = very good)
	Importance of making friends at age 12 and 18, 1 item: 'For me making friends is...' (1 = not important, 7 = very important)
	Time spent with friends at age 12, 1 item: 'Outside school, how much time do you spend with your friends?' (1 = 3 hours or more, 7 = rarely)
	At age 18, 1 item: 'Outside school, how many hours do you spend with your friends each week?' (1 = 0-8 = 21 or more)
	Importance of popularity at ages 12 (α = 0.84) and 18 (α = 0.67), 2 items: e.g. 'For me being popular is...' (1 = not important at all, 7 = very important)
	Peer focus at age 18, 4 items: e.g. 'Would you get lower grade to be popular with friends?' (1 = never, 7 = always), α = 0.68
	Social efficacy at age 18, a composite of social ability and difficulty making friends (reverse-coded), α = 0.82
Externalizing	**Other problem behavior** (i.e. not specific to aggressive behavior or bringing alcohol to school) at age 12, 4 items: e.g. 'In the last three weeks at school, about how many times did you... write or draw anything on school property when you were not supposed to?' (0 = never, 12 = 12 or more), α = 0.75
Other	**Sport value** at ages 12 (α = 0.76) and 18 (α = 0.87), 2 items: e.g. 'How much do you like playing sports?' (1 = a little, 7 = a lot)
	Sport activity at age 12, 1 item: i.e. 'How much time do you spend on sports?' (1 = less than 15 minutes a day 4 = 1 hour or more a day)
	At age 18,2 items: e.g. 'In the last 6 months, how many hours did you spend each week on... taking part in an organized sport?' (1 = less than 15 minutes a day, 4 = 1 hour or more a day), α = 0.72

α, coefficient alpha.

Table 3

Descriptive statistics for all study variables for females and males.

			Females		Males	
Measures	***Low***	***High***	***Mean***	***SD***	***Mean***	***SD***
Age 12						
Mother's education	1	8	3.60	1.13	3.74	1.13
Family conflict	1	4	2.01	0.73	2.04	0.76
Decision making	1	4	2.06	0.59	2.07	0.64
Difficulty making friends	1	7	2.58	1.30	2.82	1.40
Grade-point average	1	16	12.02	2.22	11.12	2.41
Skip school	0	12	0.55	1.75	0.96	2.42
College plan	2	3	2.70	0.42	2.76	0.43
Aggression	0	12	2.13	2.69	3.87	3.50
Bring alcohol or drug to school	0	12	0.07	0.71	0.43	1.91
Other problem behavior	0	12	0.83	1.40	1.4	2.09
Social ability	1	4	3.16	0.65	3.11	0.65
Importance of making friends	1	7	6.28	1.17	6.01	1.34
Time spent with friends	1	5	3.91	1.35	4.10	1.25
Importance of popularity	1	7	4.68	1.55	4.82	1.56
Sports value	1	7	5.16	1.70	5.86	1.48
Sport activity	1	4	2.74	1.14	3.35	0.99
Age 18						
Family conflict	1	7	3.91	0.99	3.94	0.96
Decision making	1	4	3.23	0.59	3.83	0.66
Difficulty making friends	1	7	2.63	1.22	2.88	1.36
Grade-point average	0	4	2.79	0.79	2.58	0.78
Skip school	1	7	2.88	1.55	2.97	1.62
College plan	1	7	4.89	1.87	4.86	1.74
Aggression	1	7	1.18	0.36	1.69	0.84
Alcohol use	1	7	3.00	1.90	3.29	2.12
Other drug use	1	7	1.26	0.61	1.52	1.01
Social ability	1	7	5.65	1.16	5.50	1.31
Importance of making friends	1	7	5.66	1.32	5.53	1.35
Time spent with friends	1	8	5.40	1.79	5.66	1.75
Importance of popularity	1	7	4.25	1.29	4.84	1.22
Peer focus	1	7	2.90	1.07	3.44	1.06
Social efficacy	1	7	5.51	1.07	5.31	1.21
Sport values	1	7	3.88	1.93	5.34	1.71
Sport activity	1	8	2.38	1.64	3.40	1.89
Ages 21 and 28						
General drinking 21	1	7	4.27	1.95	5.10	2.10
Heavy drinking 21	1	7	3.03	1.92	3.98	2.24

			Females		*Males*	
Measures	***Low***	***High***	***Mean***	***SD***	***Mean***	***SD***
General drinking 28	1	7	4.43	1.93	5.31	1.93
Heavy drinking 28	1	7	2.25	1.46	3.20	2.00

SD = standard deviation.

Table 4

Correlations among key study variables for females (above the diagonal) and males (below the diagonal).

Measures	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*
1 Mother's education	1.00	–0.02	0.14*	0.05	0.01	–0.16*	0.20*	0.05	0.08	–0.02	–0.03	0.10*	0.14*	0.13*	0.08
2 Social ability 12	–0.21*	1.00	–0.03	–0.09	–0.07	0.04	–0.01	–0.00	–0.01	0.03	0.04	–0.06	–0.05	–0.14*	–0.10
3 CPA 12	0.20*	–0.06	1.00	–0.02	0.05	–0.17*	0.55	–0.07	0.07	0.02	0.02	0.18*	0.15	0.23	0.10
4 Diff. making friends 18	0.01	–0.07	–0.06	1.00	0.04	–0.12*	0.08	–0.11*	–0.13*	–0.31*	–0.23*	–0.25*	–0.23*	–0.16*	–0.22*
5 Family conflict 18	–0.01	–0.02	0.04	–0.02	1.00	–0.17*	0.14*	–0.10*	0.01	0.04	–0.10*	0.08	–0.04	0.11	0.00
6 Other problem behavior 18	0.00	–0.11	–0.01	0.06	–0.09*	1.00	–0.25*	0.34*	0.08	0.04	0.37*	0.11	0.17*	–0.00	0.16*
7 CPA 18	0.24*	–0.07	0.58*	0.03	0.10*	–0.09	1.00	–0.18*	0.06	–0.02	–0.13*	0.03	–0.03	0.12	–0.11
8 Other drug use 18	0.02	–0.02	0.02	–0.05	–0.11*	0.26*	–15*	1.00	–0.01	0.03	0.43*	0.24*	0.30*	0.16*	0.29*
9 Sport activity 18	0.13*	–0.05	0.11*	–0.05	0.10*	0.07	0.18*	–0.03	1.00	0.15*	0.09	0.12*	0.14*	0.10	0.15*
10 Imp. of making friends 18	0.09	0.01	0.17*	–0.20*	0.04	0.11*	0.08	0.05	0.14*	1.00	0.14*	0.12	0.10*	0.20*	0.13*
11 Alcohol use 18	0.04	–0.05	0.07	–0.12*	–0.05	0.28*	–0.04	0.11*	0.01	0.17*	1.00	0.41*	0.47*	0.26*	0.37*
12 General alcohol	0.13*	–0.01	0.16*	0.05	0.07	0.13	0.11*	0.22*	0.16*	0.14*	0.46*	1.00	0.82*	0.49*	0.43*
13 Heavy alcohol use 21	0.11*	–0.02	0.10*	–0.08	–0.04	0.17*	0.06	0.25*	0.14*	0.18*	0.50*	0.80*	1.00	0.44*	0.50*
14 General alcohol use 28	0.09*	–0.03	0.11*	0.02	–0.14*	0.13*	0.13*	0.10*	0.14*	0.20*	0.18*	0.35*	0.31*	1.00	0.64*
15 Heavy alcohol use 28	0.06	0.03	0.04	0.02	–0.19*	0.23*	0.02	0.23*	0.08	0.18*	0.27*	0.37*	0.45*	0.64*	1.00

*$P < 0.05$; 12 = age 12; 18 = age 18; 21 = age 21; 28 = age 28. GPA: grade point average.

Table 5

Unstandardized and standardized beta weights, standard errors and proportions of variance accounted for from final hierarchical regression equations describing the relations of age 12 and age 18 predictors to age 28 heavy alcohol use (conducted separately for males and females).

	Female						***Male***					
	General 28			***Heavy 28***			***General 28***			***Heavy 28***		
Final equation	***B***	***SE***	***β***	***B***	***SE***	***β***	***B***	***SE***	***β***	***B***	***SE***	***β***
Mother's education	0.05	0.10	0.03	0.05	0.07	0.04	0.20	0.13	0.12	0.17	0.13	0.10
Family conflict 12	–0.02	0.16	–0.01	0.00	0.12	0.00	0.26	0.20	0.10	0.16	0.20	0.07
Difficulty make friends 12	0.08	0.10	0.05	0.02	0.07	0.02	–0.02	0.13	–0.02	0.06	0.13	0.04
Aggression 12	0.01	0.08	0.01	0.01	0.06	0.01	–0.06	0.08	–0.07	–0.04	0.08	–0.04
Social ability 12	–0.05	0.18	–0.02	0.12	0.13	0.06	–0.46*	0.22	–0.16	–0.35	0.23	–0.12
GPA 12	0.00	0.06	0.00	–0.02	0.05	–0.03	0.15*	0.07	0.19	0.13	0.07	0.15
Skipping school 12	0.00	0.07	0.00	0.02	0.05	0.03	0.05	0.07	0.06	0.01	0.07	0.01
College plan 12	0.20	0.27	0.04	–0.15	0.19	–0.04	–0.05	0.34	–0.01	–0.18	0.34	–0.04
Time spent with friends 12	0.13	0.09	0.09	0.11	0.06	0.10				0.19	0.12	0.12
Family conflict 18	–0.26*	0.11	–0.13	–0.22*	0.08	–0.15	0.18	0.15	0.09	0.12	0.15	0.06
Difficult making friends 18	0.11	0.12	0.07	0.07	0.08	0.06	–0.17	0.14	–0.12	–0.28*	0.14	–0.19
Other problem behavior 18	0.35	0.33	0.06	0.42	0.24	0.11	–0.24	0.20	–0.11	–0.01	0.20	–0.00
Social ability 18	0.13	0.12	0.08	0.06	0.09	0.04	–0.05	0.16	–0.03	–0.07	0.14	–0.05
GPA18	0.38*	0.19	0.15	0.18	0.13	0.10	0.20	0.23	0.08	–0.28	0.23	–0.11
Skipping school 18	–0.03	0.08	–0.02	0.02	0.06	0.02	0.10	0.10	0.09	0.00	0.10	0.00
College plan 18	–0.02	0.07	–0.02	0.08	0.05	0.10	0.05	0.09	0.04	0.09	0.09	0.08
Other drug use 18	0.07	0.21	0.02	0.16	0.16	0.07	0.02	0.18	0.01	–0.05	0.18	–0.03
Sport activity 18	0.12	0.07	0.10									
Importance making friends 18							0.51*	0.17	0.36			
Important of popularity 18							–0.62	0.20	–0.39			
Peer focus 18							0.39*	0.15	0.21			
Alcohol use 18	0.19*	0.09	0.15	0.22*	0.07	0.22	0.33*	0.11	0.30	0.54*	0.11	0.47
R^2 =		0.22			0.18			0.34			0.32	

12 = age 12; 18 = age 18; B = unstandardized regression coefficient; SE = standard error of B; β = standardized regression coefficient; R^2 = proportion of variance accounted for by the model. GPA: grade point average

*$P < 0.05$.

Table 6

Centroids, standard deviations, homogeneity coefficients and demographics for the age 18 cluster groups.

	I Jock-only n = (147)	***II J-Alc-PB (97)***	***III J-drugs (88)***	***Alc-Drg (99)***	***V Alc-PB (106)***	***VI Soc-Pos (184)***	***VII Soc-Neg (156)***
Homogeneity coefficient	0.81	1.0	1.15	1.08	0.98	0.67	0.90
Sport activity	1.02 (0.77)	1.29 (0.75)	0.56 (0.90)	–0.57 (0.47)	–0.52 (0.43)	–0.67 (0.43)	–0.59 (0.49)
Sport values	0.85 (0.39)	1.12 (0.24)	0.74 (0.58)	0.56 (0.79)	–0.31 (0.79)	–0.60 (0.84)	–0.60 (0.86)
General alcohol use	–0.64 (0.52)	0.55 (0.84)	1.24 (0.78)	0.70 (0.71)	0.61 (0.87)	–0.61 (0.60)	–0.66 (0.58)
Other drug use	–0.53 (0.36)	–0.26 (0.59)	1.81 (0.63)	1.44 (0.57)	–0.39 (0.44)	–0.59 (0.21)	–0.48 (0.42)
Problem behavior	–0.56 (0.55)	0.69 (0.84)	1.33 (0.89)	0.07 (0.78)	0.78 (0.75)	–0.71 (0.38)	–0.62 (0.58)
Social efficacy	–0.04 (0.84)	0.55 (0.83)	0.40 (0.76)	–0.01 (0.88)	0.03 (0.76)	0.49 (0.47)	–0.90 (0.81)
Importance of making friends	0.06 (0.82)	0.52 (0.65)	0.33 (0.70)	0.07 (0.85)	0.25 (0.73)	0.54 (0.60)	–1.12 (0.82)
Percent female	56%	29%	21%	71%	56%	79%	68%
Mother's education	4.19	3.83	3.91	3.90	3.76	3.72	3.81

Cluster labels are defined by marker variables for the given profile: J-Alc-PB = jock-alcohol-problem behavior; J-drugs = jock-drugs; Alc-Drg = alcohol–drugs; Alc-PB = alcohol–problem behavior; Soc-Pos = social–positive; Soc-Neg = social–negative.

Table 7

Centroids, standard deviations, homogeneity coefficients and demographics for the age 12 cluster groups.

	I J-Psoc n = (455)	*II J-PB (346)*	*III J-Agg-PB (264)*	*IV J-Alc (55)*	*V Soc-Pos (300)*	*VI J-Nsoc (383)*	*VII Soc-Neg (279)*
Homogeneity coefficient	0.42	0.55	1.02	1.44	0.69	0.95	1.19
Sport activity	0.65 (0.38)	0.57 (0.51)	0.46 (0.68)	0.53 (0.66)	–1.05 (0.59)	0.33 (0.69)	–1.53 (0.54)
Sport values	0.28 (0.53)	0.54 (0.54)	0.39 (0.68)	0.28 (0.70)	–0.35 (0.77)	0.21 (0.66)	–1.69 (0.77)
Bring alcohol to school	–0.20 (0.00)	–0.20 (0.00)	–0.20 (0.00)	5.00 (0.94)	–0.20 (0.00)	–0.20 (0.00)	–0.20 (0.00)
Aggression	–0.53 (0.51)	0.12 (0.60)	1.85 (0.66)	1.53 (0.89)	–0.51 (0.49)	–0.41 (0.53)	–0.36 (0.65)
Problem behavior	–0.85 (0.38)	0.80 (0.52)	1.13 (0.67)	1.79 (0.25)	–0.42 (0.71)	–0.37 (0.74)	–0.20 (0.91)
Difficulty making friends (R)	0.67(0.58)	0.49 (0.66)	–0.08 (1.00)	–0.48 (1.00)	0.48 (0.65)	–0.95 (0.79)	–0.58 (0.90)
Importance of making friends	0.51 (0.54)	0.47 (0.56)	0.01 (0.87)	–0.66 (1.18)	0.46 (0.55)	–0.76 (0.99)	–0.50 (1.11)
Percent female	56%	44%	30%	22%	79%	44%	71%
Mother's education	3.70	3.63	3.79	3.45	3.76	3.59	3.74

J-Psoc = jock–social–positive; J-PB = jock–problem behavior; J-Agg-PB = jock–aggression–problem behavior; J-Alc = jock–alcohol; Soc-Pos = social–positive; J-Nsoc = jock–social–negative; Soc-Neg = social–negative; (R) = reverse-coded.