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Risky Drinking in College Changes as Fraternity/Sorority Affiliation Changes: A Person–Environment Perspective

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Abstract

This study aimed to resolve the direction of the relation between Greek affiliation and substance use by taking advantage of the quasi-experimental nature of change in college fraternity/sorority affiliation. Precollege individual differences and college substance use were examined as a function of time-varying Greek status to characterize self-selection (by which heavy substance users opt into Greek systems) and socialization (by which Greek systems foster heavy substance use). Prospective data on continuously enrolled college students ($N = 2,376$), assessed at precollege and in the first 6 semesters of college, were used. Latent class analysis indicated 4 discrete groups of status: constant Greek members (30%), constant nonmembers (64%), late joiners (2%), and droppers (4%). Random coefficient models demonstrated disaffiliation with Greek systems is associated with decreases in risky drinking and alcohol-conducive environmental factors (peer norms and alcohol availability), whereas affiliation is associated with increases, indicating Greek socialization via sociocognitive and physical environments. Future Greeks differed from nonmembers in diverse individual characteristics and heavier substance use at precollege, suggesting multiple selection paths into Greek systems. Findings suggest a reciprocal relation between Greek environment and individuals in determining the trajectories of college drinking and heterogeneity in drinking as functions of changes in Greek affiliation.

Keywords

substance use; alcohol use; fraternity and sorority; college environment

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Substance use on college campuses has been a major source of public health concern. Studies consistently document that the highest rates of heavy alcohol use and alcohol use disorders occur in the college-age population, with higher rates among college students than among their noncollege peers (Dawson, Grant, Stinson, & Chou, 2004; Grant et al., 2004; Slutske, 2005; Slutske et al., 2004). Although rates of use for substances other than alcohol are lower, recent increases in marijuana and other illegal drug use among college students have been reported in national studies (Gledhill-Hoyt, Lee, Strote, & Wechsler, 2000; Johnston, O'Malley, Bachman, & Schulenberg, 2005; Mohler-Kuo, Lee, & Wechsler, 2003). Among college students, affiliation with Greek societies has been identified as, arguably, the strongest risk factor for substance use. For example, of 33 individual difference variables studied by Wechsler, Dowdall, Davenport, and Castillo (1995), residence in a Greek house was the

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strongest correlate of binge drinking in college. Other studies have found that Greek members are more likely to be diagnosed with alcohol use disorders (Knight et al., 2002) and to experience more alcohol-related consequences (Alva, 1998) than are nonmembers. National data also show that Greek members have higher rates of cigarette, marijuana, and ecstasy use (McCabe et al., 2005; Mohler-Kuo et al., 2003; Yacoubian, 2003) than do nonmembers.

Self-Selection and Socialization in the Relation Between Greek Affiliation and Substance Use

Despite well documented heavy substance use in Greek organizations, the mechanisms underlying the relation between the Greek environment and individual characteristics and the trajectories of substance use have not been extensively modeled. Recent efforts to understand the mechanisms can be summarized with a question of whether the Greek environment fosters substance use (socialization) or whether heavy substance users select into the Greek environment (self-selection). Extant evidence seems to suggest that both selection and socialization processes occur, at least regarding heavy alcohol use (Baer, Kivlahan, & Marlatt, 1995; Park, Sher, Wood, & Krull, 2006; Wechsler, Kuh, & Davenport, 1996) and marijuana use (McCabe et al., 2005); that is, Greek members' levels of substance use are higher than those of nonmembers even before they enter college, and their already heavy substance use increases to a greater degree in college.

However, there are several important issues yet to be resolved in the relation between Greek affiliation and substance use. First, the potential confounding effect of selection has not been fully recognized and appropriately modeled in prior research on Greek socialization. Greater rates of increase in substance use among Greek members than among nonmembers do not necessarily indicate socialization. Given consistent findings of strong selection into Greek systems, pre-existing individual differences prior to Greek affiliation should be statistically controlled for in order to isolate a Greek environmental effect. Second, extant empirical research on mechanisms through which Greek socialization occurs has been limited to sociocognitive aspects of the Greek environment, such as heavy peer alcohol use and permissive peer drinking norms (e.g., Baer, Stacy, & Larimer, 1991). The potential roles of the other environmental characteristics, such as greater alcohol availability, need to be examined. Along with precise assessment of socialization by controlling for selection, identification of specific environmental factors that promote substance use would facilitate understanding of the mechanism by which the Greek socialization occurs. Especially, documentation of change in environmental factors consistent with changes in Greek affiliation would help us to rule out alternative explanations of socialization with greater confidence. Third, the issue of whether the Greek socialization effect persists beyond the period of Greek affiliation has rarely been explored, with two noteworthy exceptions (Bartholow, Sher, & Krull, 2003; McCabe et al., 2005). The nonenduring Greek effect on substance use after premature disaffiliation in the course of college would suggest the role of the environment that is specific to Greek systems and not attributable to the general college environment. Also, it would inform us of the relative importance of long-term versus short-term substance use outcomes of Greek affiliation and thus help us to determine the focus of interventional strategies to reduce Greeks' substance use. Finally, self-selection into the Greek system based on individual characteristics other than substance-use-related factors has been largely unaddressed. Extant literature has focused on drinking-based self-selection, obscuring the other bases for selecting into that high-risk environment (e.g., McCabe et al., 2005). Identification of diverse selection paths may provide a foundation for investigating potentially differential responses to the impact of the Greek environment. Certain characteristics of Greek systems may attract individuals with personality traits and reasons for college attendance that are compatible with the Greek life. For example, its group-centered features may be appealing to extraverted individuals; its party-

centered life may attract disinhibited sensation-seeking individuals with high motivations for partying, dating, and sports activities, but lower motivations for learning.

Changes of Greek Affiliation in College: A Quasi-Experiment on the Greek Effect

One of the fundamental methodological considerations in research on substance use in Greek organizations is the assessment of fraternity/sorority membership. A dichotomous, fixed (i.e., time-invariant) variable of Greek status assessed at a single time point has been used almost exclusively in the research literature. However, this single "snapshot" view of Greek membership does not fully capture the nature of the construct. A minority of students changes Greek affiliation over the course of college; some join Greek organizations at a relatively later stage of college life, and some leave prior to graduation. Although only a relatively small proportion of students changes Greek status over time, investigation of substance use in these groups provides valuable naturalistic opportunities to characterize selection and socialization processes surrounding Greek substance use. Such an approach permits comparisons between those students who leave the Greek system prior to graduation and those who maintain Greek affiliation throughout their time in college, which would inform us whether a socialization effect persists beyond the period of immediate exposure to the Greek environment. In addition, such an approach allows the comparison of the precollege characteristics of those who join Greek systems early and those who join later, which provides an opportunity to identify diverse self-selection paths into Greek systems.

To our knowledge, a recent national study by McCabe and colleagues (2005) is the only published investigation of the relation between changes in Greek status and substance use in college. Although changes in Greek status were not a main focus of that study, rates of heavy drinking and marijuana use decreased over 4 years of college (with a 2-year interval) for students who dropped out of Greek systems and increased for students who joined Greek systems in their later college careers. However, no differential increase in rates of cigarette use or illegal substances other than marijuana as a function of Greek status was found. These findings, based on an investigation of within-person variation, represent an important extension of prior studies that treated Greek status as a time-invarying covariate. As the authors noted, however, major changes in substance use as a function of changes in Greek status may be accounted for by self-selection based on pre-existing characteristics, rather than by socialization of the Greek environment. Accordingly, it is critical to control for precollege differences across Greek status. The Greek socialization effect also can be convincingly documented by investigating whether Greek environmental factors, which potentially engender a socialization effect, change in response to changes in Greek status in the same manner as substance use does. These Greek environmental factors could be either sociocognitive (e.g., perceived peer norms of drinking) or physical (e.g., availability of alcohol in the residence).

Study Goals and Hypotheses

The current study aimed to elucidate the direction of the relation between Greek affiliation and trajectories of substance use by taking advantage of the quasi-experimental nature of changes in Greek status during the course of the college career. This study endeavored to expand previous literature in the following ways. First, changes in alcohol-conducive environmental factors (as well as heavy drinking, alcohol consequences, cigarette use and marijuana use) were examined as a function of Greek status over time to better portray potential environmental effects on changes in substance use while controlling for precollege levels. Alcohol availability and peer drinking norms were hypothesized to be key mechanisms by which Greek socialization operates, and thus, as individuals affiliate or disaffiliate with Greek systems, those environmental factors were hypothesized to increase or decrease accordingly. Second, in

addition to precollege substance use, a number of other individual difference variables (academic performance, personality traits, and motivation to attend college) were examined to identify potential factors by which selection into Greek environments occurs. Given Greek systems' reputation for partying and emphasis on social activities, it was hypothesized that individuals with higher personality traits of extraversion, novelty seeking, and disinhibition; higher motivations of partying, dating, and sports activities; and lower levels of academic achievement would be more likely to select into Greek systems. Finally, prospective data, with assessments conducted at precollege and each semester of the first 3 years of college, were used to better characterize temporal changes in substance use and its correlates over time than has been possible in any previous study of these effects.

Method

Participants

Data were collected as part of a prospective study of the trajectories of college drinking spanning the summer prior to college entrance and the 4 years of college. For the precollege assessment, 3,720 (88%) of 4,226 incoming first-time freshmen at a large, Midwestern state university completed a paper-and-pencil questionnaire during summer orientation preceding college matriculation by, on average, 2 months. This precollege sample has been followed up and was administered a Web-based survey every semester during the following 4 years. Assent/ consent (and parental consent for participants under age 18) was obtained from each participant. All measures and procedures were reviewed and approved by the human subjects institutional review board.

Data from the precollege (Wave 0) and the first six college assessments (Waves 1−6) of 2,376 participants were included in this study. Participants were selected based on two criteria: (a) continuous enrollment as full-time students throughout the first 3 years of college and (b) participation in at least one or more college assessments (in addition to the precollege assessment). Only full-time students were included because the effect of Greek affiliation presumably differs among full-time students versus part-time students or noncollege students. Among continual full-time students who participated in the precollege assessment ($n = 2,596$), 8% ($n = 220$) were excluded because they did not participate in any of the college assessments. The mean age of this sample at the precollege baseline was 17.9 years ($SD = 0.4$), and the sample included more women (58%) than men (42%), and more nonGreek members (66% −69%) than Greek members. Our sample was predominantly non-Hispanic Caucasian (90%; $n = 2,134$), but also included 112 non-Hispanic African-Americans (5%), 81 Asians (3%), 35 Hispanics (1%), 13 Native Americans (1%), and 1 participant missing on ethnicity. This sample was approximately demographically representative of the population of the university studied.

A multivariate logistic regression analysis including all precollege variables showed that attrition was significantly predicted only by being male (odds ratio [OR] = 2.09; 95% confidence interval [CI] = 1.49, 2.93) and being low in a high school class rank (OR = 0.99; 95% CI = 0.98, 0.99). The overall effect of all precollege variables on attrition was small; the proportion of the variance of attrition accounted for by those precollege variables (as measured by Negelkerke R^2; Nagelkerke, 1991) was only 5%.

Measures

Demographics and academic data—Demographic data, including age, gender, and ethnicity, were obtained from the registrar's office of the university. Full-time student status at each college semester, an ACT composite score (potentially ranging from 1 to 36; $M = 26.00$, $SD = 3.44$), and high school class rank (percentile; $M = 80.31$, $SD = 16.15$) were also obtained from the registrar's office.

Fraternity/sorority affiliation—A dichotomous Greek status variable (1 = Greek member; 0 = nonmember) was determined from participants' responses at each college assessment (Waves 1 to 6) reflecting their degree of affiliation with a fraternity or sorority. Participants who indicated that they were not members were classified as nonmembers regardless of how frequently they attended fraternity or sorority activities. Although nonnegligible proportions of nonGreek participants indicated their occasional (29% to 36%) and regular (4% to 6%) participation in Greek events, the Greek variable was dichotomized due to its complicated time-varying nature over six college assessments. That is, any more than two groups would yield too many potential patterns of change over time to meaningfully analyze. Over the course of study, 31% to 36% ($n = 361-421$) of women and 26% to 32% ($n = 181-246$) of men were classified as Greek members.

Personality traits—Scales were administered to measure extraversion, novelty seeking, and conduct problems at Wave 1 (and Wave 2 to those who did not participate at Wave 1). The 12 items of the Extraversion scale of the NEO Five Factor Inventory (Costa & McCrae, 1989) were measured on a 0−4 Likert scale and were summed to create a composite Extraversion score ($M = 30.77$, $SD = 6.03$; $\alpha = .80$). The 13 yes/no items of the shortened Novelty Seeking scale (Sher, Wood, Crews, & Vandiver, 1995) of the Tridimensional Personality Questionnaire (Cloninger, 1987) were similarly summed to create a composite Novelty Seeking score ($M = 4.88$, $SD = 2.82$; $\alpha = .70$). Finally, 10 yes/no items regarding conduct problems before the age of 15 (e.g., shoplifting, skipping school, damaging someone's property) based on conduct disorder symptoms from the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; American Psychiatric Association, 1994) were summed to create a composite conduct disorder score ($M = 1.14$, $SD = 1.49$; $\alpha = .74$).

College attendance motivation—At Wave 0, six mean scores (each ranging from 1 to 4) were used to measure self-reported reasons for attending college. The mean of two variables, importance of parties in college and importance of attending college to have fun, was used to measure party motivation ($M = 2.88$, $SD = 0.71$; $\alpha = .64$). The mean of two variables, importance of attending college to meet a boyfriend/girlfriend and to find a spouse, was used to measure dating/mating motivation ($M = 1.72$, $SD = 0.80$; $\alpha = .82$). The mean of four variables, importance of attending college to learn, to broaden perspectives, to attain feelings of accomplishment, and to develop interpersonal skills, was used to measure edification motivation ($M = 3.32$, $SD = 0.53$; $\alpha = .74$). The mean of two variables, importance of attending college to get a more satisfying job and to increase earning potential, was used to measure career motivation ($M = 3.67$, $SD = 0.50$; $\alpha = .70$). The mean of two variables, importance of athletics and importance of sports events as college activities, was used to measure sports motivation ($M = 2.51$, $SD = 0.80$; $\alpha = .60$). Finally, the mean of three variables, importance of arts, political activism, and community service as college activities, was used to measure extracurricular activity motivation ($M = 2.01$, $SD = 0.59$; $\alpha = .44$). Note that the internal consistency of extracurricular activity motivation is not expected to be high because it comprises causal indicators rather than effect indicators (for further discussion of causal indicators, see Bollen & Lennox, 1991). Confirmatory factor analysis of the correlated six-factor model showed a reasonable fit to the data, $\chi^2(76, N = 2{,}245) = 950.99$, $p < .001$ (root-mean-square error of approximation = .07, adjusted goodness-of-fit index = .91, comparative fit index = .89, normed fit index = .88), especially considering that four out of the six subscales consist of only two items. The intercorrelations among college motivation factors were low (ranging from −.02 between career and extracurricular activity motivations to .19 between party and sports motivations), supporting their relative independence. We also note that correlations of these scales with other constructs were as might be expected; for example, party motivation showed moderate associations with heavy drinking ($r = .40-.44$), smoking ($r = .23-.28$), and marijuana use ($r = .22-.32$).

Heavy drinking—The frequency of having five or more drinks in a single sitting during the past 30 days was assessed at every assessment. Participants responded to each item based on an 8-point scale ranging between 0 (Didn't drink five or more drinks in the past 30 days), 1 (*Once in the past 30 days*), 2 (*2 to 3 times in the past 30 days*), 3 (*Once or twice a week*), 4 (*3 to 4 times a week*), 5 (*5 to 6 times a week*), 6 (*Nearly every day*), and 7 (*Every day*). Means ranged from 1.05 (*SD* = 1.48) at Wave 0 to 1.42 (*SD* = 1.44) at Wave 6.

Alcohol consequences—A set of 36 negative consequences due to drinking (e.g., passing out, missing a class, and losing friends) during the past 3 months was assessed at every measurement (α = .90−.95). Items were largely based on our previous work on alcohol consequences among young adults (Young Adult Alcohol Problems Screening Test; Hurlbut & Sher, 1992), with four items excluded to reduce redundancy, seven new items included to reflect alcohol dependence diagnostic criteria (American Psychiatric Association, 1994; for specific items, see Grekin & Sher, 2006), and six new items included to increase coverage of alcohol problem areas and severity (three items were from the Rutgers Alcohol Problem Inventory, White & Labouvie, 1989, and three items were adapted from the Wechsler Problem Index and the College Alcohol Study, Wechsler, 1999). Note that the precollege assessment of alcohol consequences was based on the past year, whereas the freshman year assessment was based on the past 3 months. Product–moment correlations with a concurrent heavy drinking variable ranged from .58 to .75. Means ranged from 4.28 (*SD* = 4.61) at Wave 1 to 5.07 (*SD* = 5.26) at Wave 6.

Alcohol availability—Apparent alcohol availability was measured by a sum (ranging from 0 to 5) of a 5-item yes/no scale regarding perceived ease of obtaining alcohol, having a fake ID to obtain alcohol, knowing a place to get alcohol without showing an identification card, obtaining alcohol from someone 21 or older, and keeping alcohol in living quarters. Alcohol availability was measured at Waves 1 to 6; however, we note that some items measuring alcohol availability were not administered at Wave 3 and thus all participants were treated as missing at Wave 3. Also note that only the first two items were administered at Wave 0, and thus, a weighted sum, also ranging from 0 to 5, was used to measure availability at precollege. Means ranged from 1.40 (*SD* = 1.62) at Wave 0 to 3.63 (*SD* = 1.12) at Wave 6. Note that the internal consistency is not an appropriate measure of psychometrics of this scale because the items measuring alcohol availability should be regarded as causal indicators (Bollen & Lennox, 1991). Evidence for this scale's construct validity, however, can be found in terms of its theoretically predictable association with other constructs; (a) its means dramatically increased as participants got older (1.40, *SD* = 1.62, at Wave 0; to 3.63, *SD* = 1.12, at Wave 6); (b) those who were of legal age (i.e., 21 or older) showed a much higher mean level (3.92, *SD* = 0.84) than those who were underage (2.85, *SD* = 1.40) at Wave 6; and (c) it showed a strongly positive association with heavy drinking (past-month frequency of having five or more drinks in a single sitting: *r* = .55−.59) in the freshman and sophomore years when 99% of participants who provided data on age were underage.

Perceived peer drinking norms—At each assessment, six items were administered to measure perception of close friends' drinking behaviors and feelings about drinking based on 0−4 scales: "How do most of your friends feel about drinking?", "How do most of your friends feel about getting drunk?", "How many of your close friends drink alcohol?", "How many of your close friends get drunk on a regular basis (at least once a month)?", "How many of your close friends drink primarily to get drunk?", and "When your close friends drink, how much (on average) does each person drink?" A mean score (α = .91−.94) of those items was used for analyses. Means ranged from 2.29 (*SD* = 1.13) at Wave 0 to 2.63 (*SD* = 0.97) at Wave 6.

Cigarette use—Past-month frequency of cigarette use was measured at every assessment based on a 7-point scale ranging between 0 (*I didn't smoke any cigarette in the past month*), 1 (*once or twice*), 2 (*a few days [3 to 4 days a month]*), 3 (*a couple of days a week [5 to 11 days a month]*), 4 (*three times a week [12 to 14 days a month]*), 5 (*most days of the week [15 to 25 days a month]*), and 6 (*daily or almost daily [26 to 30 days a month]*). Due to sparse responses to Options 2 to 5 (2% to 5% of participants), those responses were collapsed into one response category to make the item normally distributed, resulting in a 0−3 scale. Means ranged from 0.52 (*SD* = 0.94) at Wave 3 to 0.56 (*SD* = 0.96) at Wave 0.

Marijuana use—The frequency of marijuana (or hashish) use was measured at every assessment based on the following response options: 0 (*Didn't use*), 1 (*Once to 10 times*), and 2 (*11 or more times*). We note that a past-year frequency was used at Wave 0 (*M* = 0.43, *SD* = 0.69), whereas a past 3-month frequency was used at Waves 1 to 6 (*M* = 0.26, *SD* = 0.55, to 0.29, *SD* = 0.59).

Results

Discrete Latent Greek Status: Latent Class Analysis (LCA)

The use of observed variables of Greek status was precluded for the following reasons. First, only 52% (*n* = 1,237) of our sample had complete data on Greek status across all six college assessments, and the proportion of participants with missing data on Greek status ranged from 18% to 26% across assessments. Second, among individuals with complete data on Greek status, 22% (*n* = 146) changed their Greek status over time, and a total of 25 discrete patterns out of 64 (2^6) possible patterns of Greek status over the six semesters of college were observed. Thus, LCA were used to disaggregate participants into discrete latent subgroups of Greek status over the first 3 years of college, accounting for its time-varying nature and the missing data.

LCA is a technique used to classify individuals into subgroups (i.e., classes) that are not directly observable (i.e., latent) and that are qualitatively different and mutually exclusive (i.e., discrete). Multiple categorical items are considered as imperfect indicators of an underlying discrete latent variable. Based on the patterns of covariance among multiple categorical variables, LCA ascertains distinct latent classes of individuals underlying those observed variables. (For further information regarding concepts and statistics of LCA, see Lazarsfeld & Henry, 1968; Lanza, Flaherty, & Collins, 2003). In the current analysis, six dichotomous Greek status variables, measured over the first six semesters of college, were used to categorize participants into latent discrete groups of Greek status over time. LCA models were fit for two to five latent classes,[1] using maximum likelihood estimation with standard errors and a chi-square test robust to nonnormality (MLR) in version 3.01 of *Mplus* (Muthén & Muthén, 1998 −2004). Model fit indexes and solutions of these latent class models are shown in Table 1.

A four-class solution was retained based on improvement in model fit, parsimony, and interpretability of the solution. Although the five-class solution seemed to show slightly better fit than the four-class solution, the improvement in fit of the five-class model over the four-class model (ΔAkaike information criterion [AIC] = 43.53; Δsample-size-adjusted Bayesian information criterion [BIC] = 25.36) was considerably less than that of the four-class model over the three-class model (ΔAIC = 196.96; ΔBIC = 178.79). Also, the deterioration of classification accuracy (indicated by a decrease in entropy) was noticeably larger for the five-class model (Δentropy = .032) than for the four-class model (Δentropy = .002). Parsimony and interpretability of solutions supported the four-class model as well. The classes of the four-class model were constant non-Greek members (64%; *n* = 1,511), constant Greek members

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[1]An attempt to estimate six latent classes failed due to a negative residual variance.

(30%; $n = 710$), nonGreek to Greek members (late joiners: 2%; $n = 58$), and Greek to nonGreek members (droppers: 4%; $n = 97$). Proportions of men in the four classes were 41% ($n = 293$) in constant Greeks, 44% ($n = 666$) in constant nonGreeks, 23% ($n = 22$) in droppers, and 48% ($n = 28$) in late joiners. Classes 4 and 5 of the five-class model divided droppers into two small classes depending on the time of disaffiliation (consisting of 2% and 3% of participants, respectively). Probability of Greek affiliation based on the most likely latent class membership of the four-class solution is presented in Figure 1. The average latent class probabilities for the most likely latent class membership ranged from 93% to 99% across the four classes.[2]

Trajectories of Substance-Related Behaviors as a Function of Greek Status: Evidence of Socialization

Random coefficient models were used to examine potential differences in the trajectories of substance-related behaviors in college as a function of the four-group latent Greek status variable as identified by LCA. Unlike traditional analytic techniques which require complete longitudinal data, random coefficient models allow the inclusion of participants who may be missing data at one or more time points but give more weight to cases with complete data, thus taking advantage of all available information while acknowledging differential reliability across participants (Raudenbush & Bryk, 2002). PROC MIXED in SAS version 8 with default restricted/residual maximum likelihood estimation was used.

The six college measurements were coded as −14.5, −9.5, −2.5, 2.5, 9.5, and 14.5, to represent linear growth over time based on differences in months between measurements, and these coefficients were squared to represent quadratic growth.[3] Linear growth estimates linear slopes (straight-line trajectories), but it cannot model changes of the slopes over time (curvilinear trajectories). In order to better capture changes in the substance use trajectories in response to the changes in Greek status, quadratic growth was also estimated. Patterns of changes in mean levels of substance-related variables over time also suggested curvilinear trend. As a result, three growth terms were estimated: intercept (mean level at the time point when growth terms are centered), linear slope (linear increase or decrease rate over time) and quadratic slope (curvilinear change rate over time). These growth terms were centered at the midpoint of the six measurements to reduce collinearity between linear and quadratic growth, and thus intercept and linear and quadratic slope terms should be interpreted at a point midway between Waves 3 and 4 (i.e., between the third and fourth semesters of college). In addition to fixed effects of linear and quadratic growth, a random effect of linear growth was included in all models. A random effect of quadratic growth was included only in the model predicting alcohol consequences because no random quadratic effect was estimable for the other substance-related variables (that is, we found a very small random variance which was difficult to estimate in the rates of curvilinear changes of those variables over time among participants). Note that even relatively large longitudinal datasets can typically support the estimation of only a limited number of random effects, and it is not uncommon for random components of higher order growth to show little or no variability (Raudenbush & Bryk, 2002). The Greek class variable (as determined by LCA) was represented with a series of three weighted orthogonal variables: a contrast of constant Greeks to constant nonGreeks, a contrast of droppers to constant Greeks, and a contrast of late joiners to constant nonGreeks. These three vectors were included as main effects and in interaction with both linear and quadratic growth. Omnibus tests of overall Greek

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[2]A comparison between the LCA classifications from the four-class solution and the observed Greek status variables for those participants who provided these data at all six college assessments revealed that 94% ($n = 282$) of the constant Greeks class reported that they were Greek members at all six time points, and 96% ($n = 809$) of the constant nonGreeks class reported that they were nonGreek members at all time points. Of the droppers class, 24% ($n = 13$) and 40% ($n = 22$) changed their reports of Greek status from Greek to nonGreek at Waves 3 and 5, respectively. Of the late joiners class, 69% ($n = 24$), 14% ($n = 5$), and 11% ($n = 4$) changed their reports of Greek status from nonGreek to Greek at Waves 3, 4, and 5, respectively. Remaining participants showed inconsistent Greek status over time.

[3]In a model for alcohol availability of which some items were not administered at Wave 3, all participants were treated as missing at Wave 3.

status and its interactions with linear and quadratic growth also were estimated. A main effect of gender was included in all models to control for gender effects, but interactions between gender and Greek status variables were not modeled because the subgroups of particular interest were too small to be divided by gender (i.e., 28 men among 58 late joiners and 22 men among 97 droppers). Separate random coefficient models were used for each substance-related variable, in order of heavy drinking, alcohol consequences, peer drinking norms, alcohol availability, cigarette use, and marijuana use. Unstandardized estimates from these random coefficient models are presented in Table 2, and plots of estimated trajectories of substance-related behaviors during the first six semesters of college as a function of Greek status are presented in Figure 2.

In the first semester of college, those who were Greek members in early college career (i.e., constant Greeks and droppers) showed higher levels of all substance-related variables examined than did initial nonGreeks (i.e., constant nonGreeks and late joiners). Specifically, supplementary analyses in which time (growth variables) was centered at the first semester of college showed significant effects of being initial Greeks (vs. initial nonGreeks): for heavy drinking, $\gamma = .18$, $p < .001$; for alcohol consequences, $\gamma = .45$, $p < .001$; for peer drinking norms, $\gamma = 15$, $p < .001$; for alcohol availability, $\gamma = .16$, $p < .001$; for cigarette use, $\gamma = .06$, $p < .001$; and for marijuana use, $\gamma = .01$, $p = .03$. However, there were no differences in any variable between droppers and constant Greeks and between late joiners and constant nonGreeks at the $p < .10$ level.

Of particular interest, students showed differential rates of change in alcohol-related variables over time as a function of Greek status patterns; omnibus tests of overall differences across Greek status were significant for linear and quadratic growth of heavy drinking, linear growth of peer norms, and linear and quadratic growth of alcohol consequences (see Table 2). Estimated trajectories shown in Figure 2 suggested that constant Greeks increased heavy drinking, alcohol consequences, and peer drinking norms to a greater degree than did constant nonGreeks. For heavy drinking, droppers decreased to a greater degree than did constant members, $\gamma = -.0274$, $p = .047$, whereas late joiners increased to a greater degree than did constant nonmembers, $\gamma = .0269$, $p = .002$. Estimated trajectories of alcohol consequences showed very similar patterns of differential trajectories across Greek status, even though no significant interaction between linear/quadratic growth and Greek status contrast variables was found. For peer norms, late joiners increased more than did constant nonmembers, $\gamma = .0117$, $p = .049$; droppers seemed to decrease more than constant Greeks as shown in Figure 2, although this difference was not significant, $\gamma = -.0168$, $p = .07$. For alcohol availability, other groups of students seemed to catch up with constant Greeks by the junior year when a majority of the sample (73%) reached the legal drinking age. Thus, all groups increased alcohol availability; however, droppers' accelerated rate in increase was significantly smaller than that of constant Greeks, $\gamma = .0041$, $p = .01$. The other planned comparisons of groups with changing Greek status were not significant at the level of $p < .05$. This failure to detect significant differences in substance-related variables as a function of changes in Greek status might be due to lack of power because the numbers of individuals who changed Greek status (58 late joiners and 97 droppers) were very small. In fact, as shown in Table 2, magnitudes of nonsignificant estimates of interactions between growth (either linear or quadratic) and droppers or late joiners were much greater than magnitudes of significant estimates of interactions between growth and constant Greeks ($n = 710$; in a comparison with 1,511 constant nonGreeks). Models predicting cigarette and marijuana use revealed no significant differential trajectories as a function of Greek status (as indicated by nonsignificant interactions between linear/quadratic growth and Greek status comparison variables).

The proportion of intercept and slope variance accounted for by Greek status was calculated as a measure of effect size. Specifically, introduction of the Greek status variable to the model

explained 14% of the variance (across participants) in intercepts for heavy drinking, 8% for alcohol consequences, 9% for alcohol availability, 11% for peer drinking norms, 2% for cigarette use, and less than 0.1% for marijuana use. The proportion of variance in linear growth explained by Greek status was 1% for heavy drinking, 0.1% for alcohol consequences, 5% for alcohol availability (with Greek status accounting for less than 0.1% of the quadratic growth in this variable), 1% for peer drinking norms, 0.2% for cigarette use, and less than 0.1% for marijuana use.

Differences in Individual Characteristics Across Greek Status at Precollege: Evidence of Self-Selection

A series of four one-way Greek Status (Greeks, droppers, late joiners, and nonGreeks) multivariate analyses of variance (MANOVAs), controlling for gender, was used to examine whether the Greek status groups differed at precollege in terms of (a) high school academic performance, (b) personality traits, (c) college attendance motivation, and (d) substance-related behaviors. Within each MANOVA, three (Bonferroni α-adjusted) planned comparisons were performed: constant Greeks versus droppers, constant nonGreeks versus late joiners, and freshman Greeks (i.e., constant Greeks and droppers) versus freshman non-Greeks (i.e., constant nonGreeks and late joiners). Results of the MANOVAs, gender-adjusted means, and significant planned comparisons at the $p \leq .01$ level (in order to maintain the level of Type I errors across multiple familywise comparisons, roughly corresponding to $p < .05$) are presented in Table 3.

Freshman Greeks had a lower average high school class rank but had higher levels of extraversion, party, and sports motivation, and of all substance-related variables at precollege than did freshman nonGreeks. Such differences were maintained during the first semester of college, as indicated by a supplementary one-way MANOVA of substance-related behaviors in the first semester (as well as the random coefficient models described earlier) which showed a similar patterns of results (Wilks's lambda = .88), multivariate $F(18, 5103) = 13.44$, $p < .001$, with the exception of a nonsignificant Greek difference in marijuana use (data not shown). In terms of college motivation at precollege, constant Greeks differed from droppers only in terms of higher levels of dating/mating and sports activity motivations. No significant differences between constant nonGreeeks and late joiners emerged in any of the variables studied; that is, those who joined Greek societies late were indistinguishable at precollege and during the first semester of college from those who never joined.

Discussion

The current study demonstrated selection and socialization processes in the relation between Greek affiliation and substance use in college by exploiting the fact that Greek affiliation is a time-varying phenomenon. Our study extends the research literature by providing some evidence that changes in Greek status are associated with changes in alcohol-related environmental factors (peer norms and availability) as well as changes in alcohol use behaviors. Our study also showed that future Greek members differ from nonmembers in terms of diverse individual characteristics (academic performance, personality, and college attendance motivation) as well as substance use even prior to college entrance, although these precollege correlates were related to selection into Greek systems only for those who affiliated soon after matriculation. These findings based on prospective data of a large cohort of incoming college students provide convincing evidence of the dynamic and reciprocal relation between Greek environment and individual characteristics in determining the trajectories of substance use in college. Equally important, our findings also indicate that there is considerable heterogeneity in Greek members as a function of time of affiliation.

In terms of socialization, the trajectories of heavy drinking and alcohol consequences in college followed the courses of direct exposure to Greek environment. That is, heavy drinking and alcohol consequences decrease as individuals disaffiliate from Greek systems, whereas heavy drinking and alcohol consequences increase as individuals affiliate with Greek systems. This result is consistent with the findings of McCabe et al. (2005) regarding heavy drinking in college. It is also conceptually similar to the observation of Sher, Bartholow, and Nanda (2001) and Bartholow et al. (2003; using data from a different cohort of high-risk college students) that socialization effects associated with Greek affiliation do not persist after graduation.

Perhaps more important, the current study found some evidence that the trajectories of alcohol-conducive environmental factors (peer drinking norms and alcohol availability) followed the trajectories of heavy drinking and consequences in similar ways, enabling us to interpret our socialization findings with greater confidence. Because previous literature tended to focus on the effect of higher social drinking norms in Greek systems (e.g., Baer et al., 1995; Bartholow et al., 2003), our finding of the parallell high alcohol accessibility is especially noteworthy in terms of potential diverse paths of the Greek socialization. Our related work demonstrated that peer drinking norms mediated the Greek socialization effect during the first semester of college, but the additional increase in peer norms associated with continuing Greek affiliation did not mediate further Greek-related increase in drinking later in college (Park et al., 2006). Thus, it appears that Greek members' higher levels of heavy drinking and alcohol consequences can be attributed to both the sociocognitive and the physical environments of Greek organizations and that, fortunately, this detrimental Greek effect does not appear to persist beyond the period of immediate exposure to the Greek environment even among students still enrolled in college.

Unlike what we found for alcohol-related variables, we did not find differential trajectories of cigarette and marijuana use as a function of Greek status changes. McCabe et al. (2005) found that the course of annual marijuana use followed the pattern of changes in Greek status but that the courses of past-month cigarette use and annual use of other illegal drugs did not. Given that our measures of cigarette and marijuana use were based on the past-month use, our null findings seem to be consistent with McCabe et al.'s findings. Relatively low prevalence of cigarette and marijuana use on college campuses may make it difficult to document differential trajectories of monthly substance use as a function of Greek status changes, which highlights the need to employ more sensitive measures of tobacco and illicit substance use. Although the use of illegal drugs in Greek systems appears to be less ubiquitous than risky alcohol use, given recently documented increases in illegal drug use in Greek systems (Mohler-Kuo et al., 2003; Yacoubian, 2003), more research is necessary.

In terms of self-selection, Greek members in the early years of college differ from nonmembers at that time even prior to college entrance on an array of existing individual difference factors as well as substance use. Specifically, freshman Greek members had higher extraversion and higher party and sports college attendance motivations but poorer high school academic performance than did freshman nonmembers. Consistent with previous literature, freshman Greek members also showed higher levels of substance use (heavy drinking, cigarette use, and marijuana use) and peer drinking norms and alcohol availability at precollege than did freshman nonmembers. Higher extraversion and higher party and sports motivations, along with heavier substance use, among future Greek members may represent reasons why they find the Greek environment appealing; through selecting into Greek systems, they may seek out fulfillment of their social needs and maintain existing sensation-seeking patterns.

However, it is striking that these precollege differences between Greeks and nonGreeks held only for those who were traditional Greek members (those who affiliated soon after matriculation). Indeed, no differences in substance use, high school academics, personality

traits, and college attendance motivations at precollege were found between late joiners and constant nonGreeks. This finding suggests that late joiners' affiliations with Greek organizations are based on different factors than those of early joiners. Certain experiences later in college may make the Greek environment more appealing to some students, such as the desire to enhance prestige or to be involved with community service. However, it is critical to emphasize that, once individuals affiliate with Greek systems, the Greek environment is so compelling that it yields a comparable level of substance use regardless of the timing of affiliation, previous substance use, and existing individual differences.

On the whole, our findings demonstrate powerful and multiple self-selection paths into Greek organizations based on an array of individual characteristics and substance use behaviors. Our findings also suggest that multiple Greek socialization paths through both sociocognitive and physical aspects of the environment. Although the current study dealt with the specific issue of changes in Greek status, our findings provide important insight on the more general issue of individual/environment interaction in the longitudinal course of substance use behaviors. The mechanism underlying the dual processes of selection and socialization may represent an "accentuation effect" (Feldman & Newcomb, 1969) as discussed in the broader literature in that pre-existing characteristics (heavy substance use and party/social activity-focused lifestyles) motivate individuals to select into the Greek environment, and immersion in this environment results in maintaining and even strengthening those characteristics (Park et al., 2006).

Our findings have significant implications for prevention and intervention efforts to curb substance use in Greek systems. First, potential benefits of delaying the time of Greek affiliation to the sophomore year have been suggested (e.g., Kuh & Arnold, 1993), based on the observation of greater vulnerability to peer pressure in the early stage of Greek affiliation. However, our finding of late joiners' catching up with regular Greek members in substance use suggests that delayed Greek affiliation may not serve as a protective factor against the Greek environmental effect, and thus, the intervention of belated immersion into Greek culture is not likely to be effective in dampening the socialization process in the long term. Second, the finding of decreases in substance use in response to Greek disaffiliation during the course of college has a significant prognostic value, indicating that Greek socialization did not have enduring effects on substance use beyond the direct affiliation period. Accordingly, intervention efforts focusing on immediate negative consequences of concurrent substance use may be more effective than those focusing on long-term consequences. Relatedly, our finding suggests that mandatory Greek disaffiliation could be an effective disciplinary action to deal with extreme cases of risky substance use. Our finding of changes in substance-related environmental factors (that are consistent with changes in Greek affiliation) also highlights the need for intervention on situational factors that have direct impacts on substance use, such as alcohol-involved Greek events, substances available in Greek houses, and senior students' facilitating roles in substance use (e.g., direct offers of substances, getting fake IDs for underage students, and pressure to drink).

Several limitations of our study and related future directions are worthy of mention. First, although the droppers and late joiners are informative in demonstrating both the robustness of socialization and the highly conditional (on time of affiliation) nature of selection, these groups represent atypical cases of Greek affiliation and disaffiliation. Consequently, this prevents us from generalizing our findings to a larger population. Second, our sample is based on a single Midwestern public school with large Greek systems and an emphasis on athletes, and thus, findings may not be applied to other campuses with different characteristics of student bodies, Greek systems, and alcohol control policies. Thus, our results should be interpreted within a context of national findings and replicated on other populations, preferably nationally representative samples and diverse campuses. Third, our findings of changes in substance-use-

related behaviors as a function of changes in Greek status might represent as much a selection effect based on individual characteristics as a socialization effect of the Greek environment. Even though our examination of changes in environmental factors and quasi-experimental prospective design allows us interpret those findings as a socialization effect with greater confidence, examination of the reasons for Greek disaffiliation and characteristics of post-disaffiliation environments is needed to further differentiate confounding effects of selection and socialization after disaffiliation. Finally, potential sex differences among those who join later or who prematurely leave Greek systems were not examined because of their small sizes. Because of paucity of studies on individuals who change Greek status in college, it is difficult to generate specific hypotheses regarding potential gender differences. Even with a time-invarying dichotomous Greek status variable, evidence of gender differences in socialization is not consistent (e.g., a null finding of McCabe et al., 2005; stronger socialization in women in Wechsler et al., 1996; stronger socialization in men in Park et al., 2006), whereas evidence of the importance of a self-selective process in men appears to be robust (e.g., McCabe et al., 2005; Wechsler et al., 1996). Consistent findings of gender differences in trajectories of substance use among college students in general (for a review, see O'Malley & Johnston, 2002), however, strongly call for the investigation of potential gender differences in socialization and selection paths of Greek substance use.

Acknowledgments

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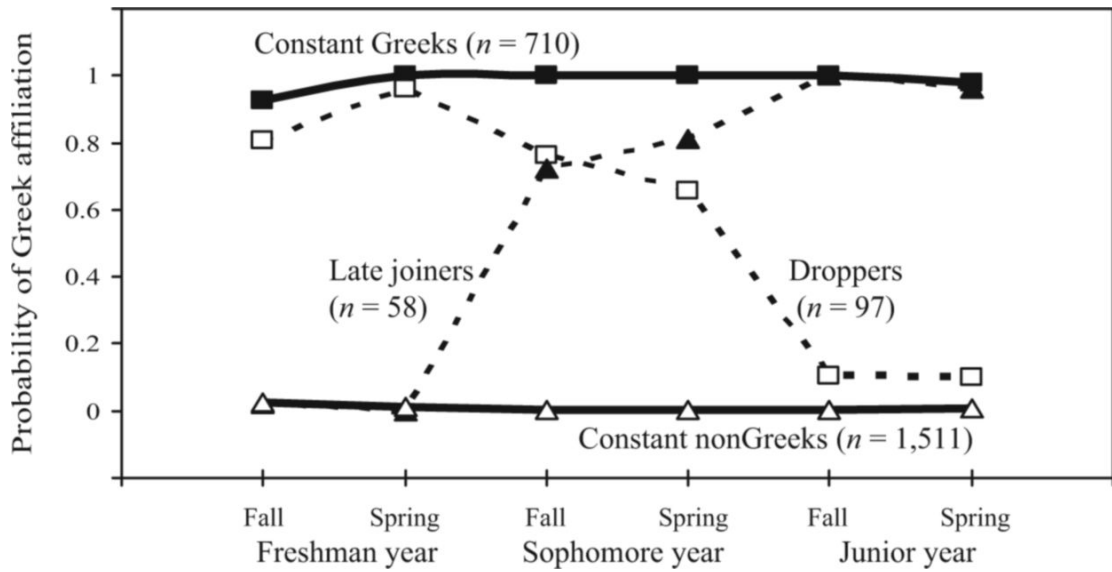
Figure 1.
Probability of Greek affiliation based on the most likely latent class membership in the four-class latent class analysis of Greek status.
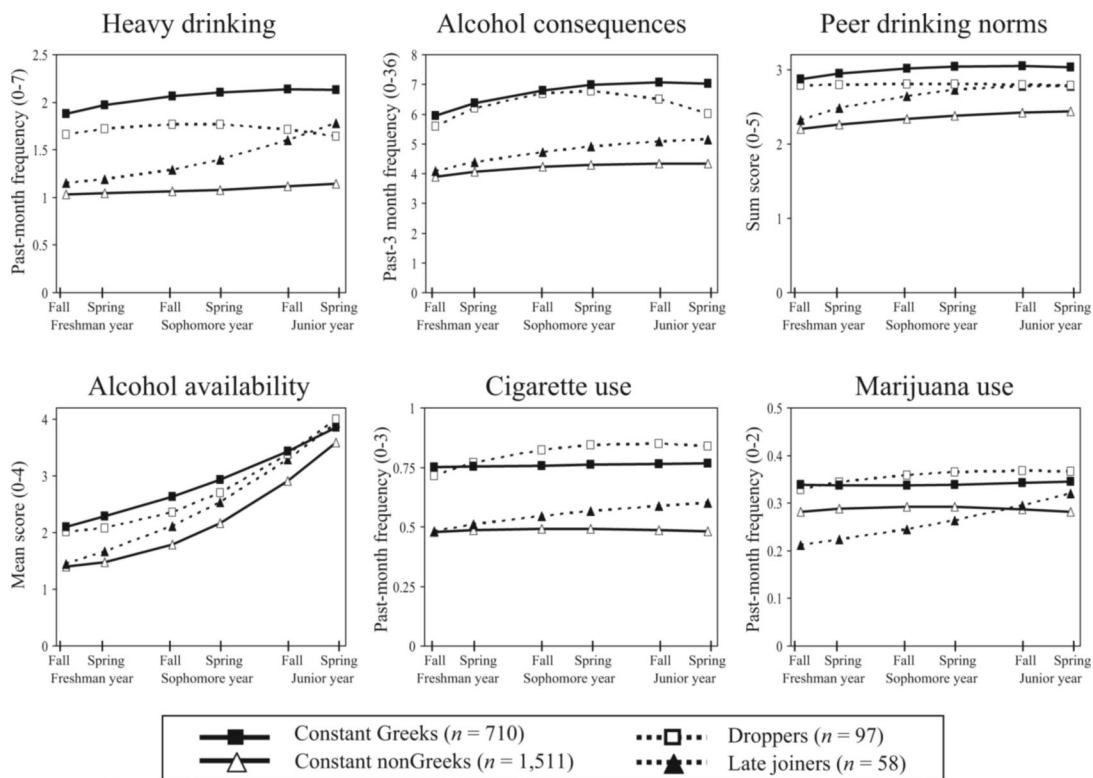
Figure 2.
Estimated trajectories of substance-related behaviors during the first six semesters of college as a function of Greek status as identified by latent class analysis.

Table 1

Summary of Latent Class Analyses of Greek Status Over the First 3 Years of College

			Model fit index			Solution				
Model	χ^2	df	AIC	BIC	Entropy	Class 1 (constant nonGreeks)	Class 2 (constant Greeks)	Class 3 (NonGreek to Greeks)	Class 4 (Greek to nonGreeks)	Class 5 (Greek to nonGreeks)
2-class	515.27 ***	47	5,991.33	6,025.07	0.97	1,546 (65%)	830 (35%)			
3-class	269.70 ***	40	5,770.45	5,822.37	0.95	1,523 (64%)	774 (33%)	79 (3%)		
4-class	94.85 ***	35	5,573.49	5,643.58	0.95	1,511 (64%)	710 (30%)	58 (2%)	97 (4%)	
5-class	26.52	28	5,529.96	5,618.22	0.92	1,472 (62%)	712 (30%)	57 (2%)	58 (2%)[a]	77 (3%)[a]

Note. N = 2,376. AIC = Akaike information criteria; BIC = sample-size-adjusted Bayesian information criteria.

[a] Estimated latent class probabilities suggested that individuals in Class 4 left Greek organizations between the 1st and 2nd years of college, and those in Class 5 left between the 2nd and 3rd years of college.

*** $p < .001$.

Table 2

Random Coefficient Models Predicting Substance-Use-Related Variables From Greek Status

Predictor	Alcohol-related variables				Other substance use variables	
	Heavy drinking	Alcohol consequence	Drinking norms	Alcohol availability	Cigarette use	Marijuana use
Fixed effects						
Intercept	1.4257***	5.6288***	2.7148***	2.4304***	0.6400***	0.2603***
Linear growth[a]	0.0065***	0.0283***	0.0062***	0.0662***	0.0008	0.0003
Quadratic growth[a]	−0.0002*	−0.0018***	−0.0003***	0.0016***	−0.0001	−0.00001
Gender[b]	0.6912***	0.8758***	0.1739***	0.1286**	0.0828*	0.1497***
Overall Greek status difference[c]	($F = 113.76$***)	($F = 50.42$***)	($F = 87.46$***)	($F = 76.85$***)	($F = 16.27$***)	($F = 1.65$)
Initial Greeks (vs. initial nonGreeks)[d]	0.2168***	0.5816***	0.1422***	0.1720***	0.0615***	0.0112*
Droppers (vs. constant Greeks)	−0.9347*	−0.3909	−0.6641*	−0.7658*	0.2230	0.0715
Late joiners (vs. constant nonGreeks)	0.4089	0.8265	0.4986**	0.5233*	0.0971	−0.0593
Linear × Overall Greek Status[e]	($F = 5.12$**)	($F = 2.30$)	($F = 4.70$**)	($F = 16.79$***)	($F = 1.00$)	($F = 0.87$)
Linear × Initial Greeks (vs. initial nonGreeks)[d]	0.0007	0.0041*	−0.0008*	−0.0032***	0.0002	0.0001
Linear × Droppers (vs. constant Greeks)	−0.0274*	−0.0649	−0.0168	0.0243	0.0107	0.0031
Linear × Late Joiners (vs. constant nonGreeks)	0.0269**	0.0327	0.0117*	0.0154	0.0060	0.0057
Quadratic × Overall Greek Status[e]	($F = 3.16$*)	($F = 2.19$)	($F = 1.61$)	($F = 13.67$***)	($F = 0.47$)	($F = 0.33$)
Quadratic × Initial Greeks (vs. initial nonGreeks)[d]	−0.0001**	−0.0004	−0.00003	−0.0003***	0.00001	0.00001
Quadratic × Droppers (vs. constant Greeks)	−0.0006	−0.0077	0.0008	0.0041*	−0.0008	−0.0003
Quadratic × Late Joiners (vs. constant nonGreeks)	0.0008	−0.0003	−0.0007	−0.0011	−0.00002	0.0002
Random effects						
Intercept variance	1.1574***	18.7660***	0.7351***	0.7937***	0.7201***	0.2398***

Predictor	Alcohol-related variables				Other substance use variables	
	Heavy drinking	Alcohol consequence	Drinking norms	Alcohol availability	Cigarette use	Marijuana use
Variance in linear growth	0.0008 ***	0.0155 ***	0.0005 ***	0.0008 ***	0.0004 ***	0.0002 ***
Variance in quadratic growth		0.0001 ***				
Residual variance	0.5166 ***	7.0459 ***	0.1737 ***	0.6550 ***	0.1653 ***	0.0921 ***

Note. These effects are based on data of 9,538 to 11,255 observations from 2,376 participants.

[a] Time was coded as −14.5, −9.5, −2.5, 2.5, 9.5, and 14.5 according to the differences in months between measurements, centering around the mid-point of measurements.

[b] 0 = female; 1 = male.

[c] The degree of freedom between was 3; the degree of freedom within ranged from 2361 to 2370 across analyses.

[d] Initial Greek members included constant Greeks ($n = 710$) and droppers ($n = 93$); initial nonGreeks included constant nonGreeks ($n = 1,511$) and late joiners ($n = 58$).

[e] The degree of freedom between was 3; the degree of freedom within ranged from 7164 to 8874.

*
$p < .05$.

**
$p < .01$.

***
$p < .001$.

Table 3

Summary of One-Way, Greek Status Univariate and Multivariate Analyses of Variance, After Controlling for Gender

Cluster	Variable	Adjusted means, controlling for gender				Univariate F^a	Significant planned comparison[b]
		Constant Greeks (G)	Droppers (D)	Late joiners (J)	Constant nonGreeks (NG)		
High school academics: Wilks's lambda = .98, Multivariate $F(6,4484) = 5.67^{***}$	ACT mean score	25.54	25.42	25.71	26.36	9.98***	
	High school class rank	78.76	76.95	82.04	80.88	4.23**	J & NG > G & D
Personality traits: Wilks's lambda = .94, Multivariate F $(9,4707) = 12.59^{***}$	Extraversion	32.62	31.54	30.89	29.55	36.88***	G & D > J & NG
	Novelty seeking	4.95	5.35	4.63	4.86	0.96	
	Conduct problems	1.12	1.37	1.22	1.24	1.17	
College motivations: Wilks's lambda = .91, Multivariate $F(18,6647) = 13.12^{***}$	Party	3.16	3.06	2.91	2.75	59.48***	G & D > J & NG
	Dating/mating	1.87	1.64	1.61	1.69	9.67***	G > D
	Edification	3.35	3.35	3.24	3.29	2.70*	
	Career	3.73	3.73	3.69	3.63	7.85***	
	Sports	2.80	2.48	2.54	2.41	39.75***	G > D > J & NG
	Extracurricular activity	1.99	2.00	1.94	2.00	0.31	
Substance-related variables at precollege: Wilks's lambda =.88, Multivariate $F(18,6540) = 17.12^{***}$	Heavy drinking	1.69	1.42	0.80	0.78	70.54***	G & D > J & NG
	Alcohol consequences	6.44	6.23	3.62	3.40	58.36***	G & D > J & NG
	Peer drinking norms	2.78	2.67	2.28	2.05	75.36***	G & D > J & NG
	Alcohol availability	1.79	1.79	1.43	1.19	23.50***	G & D > J & NG
	Cigarette use	0.68	0.77	0.43	0.46	10.53***	G & D > J & NG
	Marijuana use	0.53	0.59	0.25	0.38	11.57***	G & D > J & NG

Note. Total sample size is 2,376, which consists of 710 constant Greeks (G), 93 droppers (D), 58 late joiners (J), and 1,511 constant nonGreeks (NG).

[a]The degree of freedom between was 3; the degrees of freedom within ranged from 1936 to 2355.

[b]The three planned comparisons that were tested include comparisons of constant Greeks versus droppers, constant nonGreeks versus late joiners, and initial Greeks (i.e., constant Greeks and droppers) versus initial nonGreeks (i.e., constant nonGreeks and late joiners). All group comparisons were α adjusted using the Bonferroni procedure.

*
$p < .05$.

**
$p < .01$.

***
$p < .001$.