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Longitudinal associations between perceptions of peer group drinking norms and students' alcohol use frequency within college sport teams

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Abstract

Background.—Students' alcohol use behaviors are shaped by the attitudes and behaviors of others, especially the peers within students' proximal social groups. Explaining the association between perceived drinking norms and alcohol use, researchers propose contradicting pathways that focus on conformity (i.e., social norms predict alcohol use) and projection (i.e., alcohol use predicts perceived norms). The current study examined the extent to which conformity and projection processes were evident in the association between college student alcohol use and the perceived alcohol use norms for students' club sport teams.

Method.—The sample comprised 1,054 college students (61% female) nested in 35 intact same-sex club sport teams. On three separate occasions during a single school year (three-month lag), participants reported drinking frequency and perceptions of descriptive and injunctive group drinking norms. We employed random intercepts cross-lagged panel modeling to estimate prospective within-person associations separately from stable trait-like between-person associations.

Results.—Descriptive and injunctive group drinking norms were both positively related to students' alcohol use frequency at the between-person level. Individuals nevertheless demonstrated variability at the within-person level. Results revealed a strong contemporaneous association between descriptive norms and alcohol use frequency within each time point, but no prospective associations. Models including perceptions of injunctive drinking norms demonstrated similar contemporaneous associations with alcohol use frequency, but also identified significant prospective associations signifying conformity.

Conclusion.—Findings align with previous research reporting a strong and positive association between student's self-reported alcohol use and subjective peer alcohol use norms. After disentangling within- and between-person effects to probe for conformity and projection

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processes, the current findings are somewhat contrary to previous research that has reported reciprocal relationships between social norms and alcohol use behavior. Further investigation of the potential conformity and projection mechanisms of social norms is critical to advance norm-based strategies to reduce harm.

Keywords

Peer Influence; Conformity; Injunctive Norms; Descriptive Norms; Athletes

The high prevalence of alcohol misuse among college students remains a significant public health concern (Hingson et al., 2017; Patrick and Terry-McElrath, 2017). Alongside the immediate risks and consequences (e.g., blackouts, poor scholastic performance), alcohol misuse during college can have lasting negative effects including post-graduation unemployment, alcohol dependence, and irreversible damage to the developing brain (Bamberger et al., 2017; Hermens and Lagopoulos, 2018; Merrill et al., 2014). Among numerous social and developmental factors, emerging adults are especially sensitive to the alcohol use attitudes and behaviors of their peers (Albert et al., 2013; Perkins, 2002). Perceptions of peers' alcohol-related attitudes and behaviors are thought to be the most robust psychosocial predictor of students' alcohol use (Neighbors et al., 2007). Students' beliefs about peers' attitudes and behaviors regarding alcohol use are nevertheless dynamic and highly individual, with findings consistently showing that students tend to overestimate the drinking norms of their peers (Neighbors et al., 2006). It is also possible that students may project their own beliefs and behaviors onto their peers. Understanding these etiological social processes is a critical step towards reducing college students' alcohol misuse.

Social Norms and College Student Alcohol Use

Social norms are the perceived patterns of behavior that are expected of members of a social group (Cialdini et al., 1991). The focus theory of normative conduct holds that when these social norms are salient, they can strongly shape individuals' behaviors (Cialdini et al., 2000). This theory distinguishes between two types of social norms that uniquely influence individuals' behavior: Injunctive and descriptive norms (Cialdini and Goldstein, 2004). Injunctive norms entail the perceptions of what others approve or disapprove of (what one "ought to do") and serve as a moral compass for behavior. In the case of alcohol use, a student's injunctive normative perceptions entail what he or she believes are peers' predominate attitudes regarding how much a college student *should* drink. Conversely, descriptive norms are perceptions of what others actually do and provide an individual with information about how to fit-in with the behaviors of others (e.g., how much college students *do* drink). Although injunctive and descriptive norms are disparate forms of social influence, researchers have found evidence that each can powerfully shape college students' alcohol use (e.g., Krieger et al., 2016).

Injunctive and descriptive norms are derived from different forms of peer interactions and may thus produce unique motivational processes, though these motives are not necessarily mutually exclusive. On one hand, people are motivated to adhere to injunctive norms to obtain the anticipated social rewards (e.g., peer acceptance, social status) and to avoid

repercussions of deviating from the norm, such as social exclusion or rejection (Cialdini et al., 1990). On the other hand, descriptive norms are thought to motivate norm adherence by showing which behaviors are effective or adaptive (Cialdini and Goldstein, 2004). As an example applied to alcohol use, it is reasonable for college students to conclude that if the peers in their social circle drink alcohol on Thursday nights that it must be a sensible thing to do.

Proximal and distal group norms.

The aforementioned role of social norms is evident relative to numerous referents, ranging from the typical college student to students within their own college, dormitory, or peer group (Neighbors et al., 2008). The referent group from which one derives perceptions of social norms is nevertheless critical for understanding the relevance of a given norm for an individual's behavior. For example, Lewis and Neighbors (2007) reported that gender-specific normative feedback had greater influence on one's own drinking behaviors (relative to 'typical' student norms) and that this effect was amplified by how strongly participants identified with their gender identity. Larimer and colleagues (2009) additionally found that peer norms had more salience for student drinking when they were derived from categories like peers of one's own ethnicity or who live in one's dormitory, compared to more generalized student drinking norms. Specificity of normative referent groups may be particularly important because students are able to more accurately perceive drinking norms for more specific groups (i.e., greater overestimation of drinking norms in more distal referent groups; Larimer et al., 2011). Despite these studies examining varying specificity of normative referents, few studies have examined normative influences within naturally occurring proximal student peer groups. That is, although students conform to drinking norms that they perceive from distal referents (e.g., norms for typical college students), the norms within students' proximal peer groups, such as student clubs and organizations, may have a unique normative influence (Cox and Bates, 2011; Neighbors et al., 2010).

Leveraging the theory of normative social behavior, Rimal and Lapinski (2015) argued that normative influences are more pronounced when the normative referent is relatable to the individual. Proximal groups are often smaller and closely linked to individuals' self-concept, thus increasing the salience of membership and the visibility of one-another's behavior (Forsyth, 2019). Small groups are distinct from other types of peer affiliations because they entail rich group processes (e.g., interdependence) and other shared characteristics that may connect group members on a deeper level. Such groups directly influence members' behavior through a collective identity and close member interactions, which generate dense peer influence (Eys and Evans, 2018; Kim and Wiesenfeld, 2017). From a practical perspective, it is also plausible that individuals may feel pressure to adhere to small group norms by virtue of being observable; because members interact with one another regularly, it may be easier to identify and reward alignment with group norms. Because many college students join formal peer groups such as clubs, and often belong to several informal social groups (e.g., dormitory units), understanding peer group influences on alcohol use may inform norms-based intervention and prevention strategies.

Conformity and projection.

Alongside strong theoretical support indicating that perceived group norms shape behavior, there is also experimental evidence that efforts to manipulate peer alcohol use norms can modify behavior (Graupensperger et al., 2018a; Teunissen et al., 2012). Nevertheless, directionality has yet to be established regarding the association between perceptions of group norms and student drinking. Notably, there is evidence that those who drink more alcohol hold inflated perceptions for how much alcohol their peers drink (i.e. false consensus; Wild, 2002). These opposing theoretical perspectives contrast conformity and projection processes. Proponents of a *conformity model* argue that individuals adjust their own attitudes and behaviors to align with perceived norms of the group. The *projection model* alternatively holds that individuals estimate other group members' drinking based on their own attitudes and behaviors as a way of sanctioning their own behavior and reducing feelings of dissonance (Lewis et al., 2015).

In a recent large-scale experimental study on heavy-drinking college students, Neighbors and colleagues (Neighbors et al., 2016) examined conformity and projection processes following randomization into two intervention conditions: personalized *normative* feedback and personalized *social comparison* feedback. Using longitudinal mediation analyses, researchers reported that the feedback interventions employing 'typical' students at the participants' university as the normative referent predicted reduced perceived drinking norms at 3-month post-intervention. Compared to social comparison feedback, those in the normative feedback condition also subsequently reported less alcohol use at 6-month post-intervention; this demonstrates a pattern of conformity. In a separate model, researchers also tested the extent that reductions in alcohol use at 3-month post-intervention would subsequently predict lower perceived drinking norms at 6-month post-intervention (i.e., projection). However, this mediation model was non-significant. Despite the strengths of this experimental design, conformity and projection models were analyzed separately, which makes it unclear how these two processes may be interrelated over time.

Whereas conformity and projection are independent processes, they could also have an additive influence on the norm-behavior association. According to Bandura's (1977) principle of reciprocal determinism, conformity and projection operate reciprocally over time such that perceived group norms predict one's drinking, and one's own drinking behavior is then projected as being normative. This link is critical to understand in light of suggestions that a reciprocal cycle may perpetuate alcohol use (Lewis et al., 2015).

Current Study

Several studies have examined the longitudinal association between alcohol use and social norms with the aims of identifying directionality. Researchers have reported evidence that both conformity and projection may occur reciprocally (Ferrer et al., 2012; Lewis et al., 2015; Litt et al., 2015; Neighbors et al., 2006). However, these extant studies examined distal norms pertaining to broad social categories (e.g., *typical* university students, Lewis et al., 2015; sexual minority women, Litt et al., 2015) that are more diffuse than small proximal groups (Dumas et al., 2019). Given that proximal groups of students' immediate peers are

expected to have a particularly strong social influence on alcohol use, there is a need to examine these associations within intact peer groups.

Existing studies also share a methodological limitation. It has recently been noted that the analytic technique used by these authors—cross-lagged panel modeling—inaccurately examine interindividual change and misattributes sample-level effects onto the individual (Berry and Willoughby, 2017). The path estimates in traditional cross-lagged models partially reflect true intraindividual change, but also incorporate interindividual change that muddies the validity and interpretation of these effects. Effects estimated within traditional cross-lagged models are thus conglomerations of true within-person variability that is indiscernible from variability at the between-person level, which introduces errors of inference and ecological fallacy (Curran and Bauer, 2011). To address these analytical limitations, statisticians introduced an innovative longitudinal methodology that enables stronger directional inferences to be made about within-person changes over time by disentangling within- and between-person effects called random intercepts cross-lagged panel modeling (RI-CLPM; Hamaker et al., 2015). This innovative analytic strategy has been used to examine the association between students' alcohol use and physical activity (i.e., Graupensperger, Wilson, Bopp, & Evans, 2018), but has not yet been utilized to examine how perceived social norms relate to alcohol use.

The overarching purpose of the current study was to advance understanding of peer influences on college students' alcohol use by examining the extent that perceived group norms prospectively predicted alcohol use (i.e., conformity) and/or the extent that students' own alcohol use prospectively predicted perceptions of group drinking norms (i.e., projection). Moreover, we examined the possibility that this association may be reciprocal over time or, alternatively, that the association is contemporaneous rather than prospective. To advance the literature in this domain we employed a longitudinal RI-CLPM approach to examine the directionality of associations between students' alcohol use frequency and perceptions of social norms for alcohol use among proximal peers whom they were sampled alongside. Considering the limitations in modelling approaches used in past research, our critical goal when examining these questions was to disentangle within- and between-person effects. That is, to what extent do students who *typically* perceive higher drinking norms for their group *typically* engage in more frequent alcohol use (between-person effect)? After accounting for these trait-level effects, do students perceiving higher drinking norms than usual also tend to engage in more frequent alcohol use than they usually do (i.e., within-person effects)?

We presently focus on frequency of alcohol use as this indicator is highly observable to ingroup peers, whereas other indices may be less perceptible. For example, it may be more challenging to observe how many drinks a peer consumes (e.g., heavy episodic drinking patterns) or the negative consequences that a peer experiences. Moreover, when exploring the link between perceived drinking norms and behavior, it may be advisable to examine indicators that are comparable across people. For example, variance in students' body weight can result in varying effects on blood alcohol concentration levels from similar amounts of alcohol use. Additionally, we focus on *perceptions* of group drinking norms rather than actual group drinking averages because it is the variance in individuals' unique

perceptions of drinking norms that is theorized to be the conduit through which group member attitudes and behaviors influence an individual. In other words, norms are theorized to influence behavior to the extent they are perceived by the focal individual.

To accomplish the aims of the current study, it was pertinent to sample intact and naturally occurring groups of students, in the form of club sport teams. In addition to sport-playing students being particularly at-risk for alcohol misuse (e.g., Ford, 2007), we sampled complete club sport teams because these proximal groups are ideal for understanding how peer groups can influence individuals' behaviors. There is strong theoretical support for the influence of sport team drinking norms on behavior (Zhou and Heim, 2014). Previous quasi-experimental research also indicates that student-athletes are indeed susceptible to pressures to conform to the drinking norms of their sport teams (Graupensperger et al., 2018a). The current study extended this literature by providing a rich longitudinal examination of group processes that may influence students' alcohol use.

Method

Participants and Procedures

The sample comprised 1,054 college students (61% female) who were nested in 35 intact same-sex sport teams at a large public university in the United States. Students competed at the club-level in varying sports (e.g., soccer, water polo, ice hockey). While these teams participate in intercollegiate competition including regional and national championships, club teams were predominately student-led with limited direct supervision. Based on the presence of direct physical contact between players, 14 teams (40%) were classified as contact sports (e.g., lacrosse), while 21 teams (60%) were non-contact (e.g., crew, golf). The mean number of respondents from each team was 24.34 members at time one (T1), 20.97 members at T2, and 20.06 members at T3 (*Median*: T1 = 25; T2 = 20; T3 = 19). The majority of participants self-reported identifying as white (82%), reported a mean grade point average (GPA) of 3.38 (*SD* = 0.32), and comprised 28% freshmen, 23% sophomores, 26% juniors, 22% seniors, and 1% graduate students. Additional descriptive details are provided in Table 1.

Prior to the start of the school year, researchers presented an overview of the study at a meeting for club sport student-leaders to generate interest and provide contact information for the research team. To reduce the likelihood of self-selection biases at the club-level, this initial presentation described the aim of the current research broadly in terms of how membership in student clubs may relate to students' health behaviors (i.e., alcohol use was not explicitly mentioned). When club leaders demonstrated interest in the study, researchers met with teams before or after scheduled practices to provide an overview of the study (i.e., including a description of researchers' interest in studying alcohol use behaviors) and invite participation from individual members. Participants completed surveys administered on electronic tablets and participants' smart phones that took between 10 to 15 minutes to complete. To ensure the voluntary nature of this research and to protect individuals' right to confidential participation, researchers did not explicitly count the number of students who chose not to participate. However, we note that in nearly all cases, every student who was present at the team practice or meeting opted to participate in the study.

Club sport teams were sampled at three timepoints that were separated by three-month lags: Mid-fall semester (T1), early spring semester (T2), and late spring semester (T3). While the specific date of survey completion for teams may have varied by as much as three weeks within a timepoint, we strove to retain the three-month gap between assessments. At each timepoint, participants chose between two forms of compensation: (a) a \$5 gift card, or (b) 20 minutes of community service credit towards the number of hours required by the university for club sport participation (i.e., one hour of credit assigned to members who participated at all three timepoints). All participants provided informed consent and ethical approval was obtained from the authors' institutional review board prior to recruitment.

Measures

To measure the frequency that participants engaged in alcohol use we used a single item that asked: "During the last 3 months, what was the frequency that you engaged in alcohol use?" (Krieger et al., 2016). Participants answered using a range of 12 responses: 1 = *Never*, 2 = *Less than once per month*, 3 = *Once a month*, 4 = *Twice a month*, 5 = *Three times a month*, 6 = *Once a week*, 7 = *Twice a week*, 8 = *Three times a week*, 9 = *Four times a week*, 10 = *Five times a week*, 11 = *Six times a week*, and 12 = *Every day*. Using the same scale range, participants completed self-report measures of perceived injunctive and descriptive norms regarding alcohol use. As demonstrated by Krieger and colleagues (2016) it is critical to assess normative perceptions of others' alcohol use on the same scale used to assess one's own personal drinking. Perceptions of descriptive norms were assessed by an item that asked: "During the last 3 months, what do you estimate was the frequency that a typical member of your club sport team *engaged in alcohol use*?" Likewise, participants reported perceptions of injunctive norms following the prompt: "During the last 3 months, what is the frequency of alcohol use that you estimate a typical member of your club sport team *would consider to be acceptable*?"

Analyses

Preliminary data management entailed assessing patterns of missingness using Little's (1988) test and exploring potential predictors of attrition. To explore patterns of attrition, we compared participants who completed responses at all three timepoints to those who provided responses at two or fewer timepoints to see whether attrition was related to sex, age, GPA, or alcohol use frequency. Preliminary analysis when sampling participants within groups also involves considering interdependence between responses within teams (i.e., clustering of responses within team). We computed intraclass correlation coefficients to estimate the percentage of total variability in alcohol use frequency and social norms attributed to between-group variability, at each of the three timepoints.

Following assessments of initial descriptive statistics and bivariate correlations, primary analyses entailed examining longitudinal associations between perceived social norms for participants' fellow sport team members and participants' own alcohol use frequency. Separate analyses were conducted for descriptive norms (Model 1) and injunctive norms (Model 2). We used RI-CLPM, which is a nuanced form of structural equation modeling that appropriately treats measurement occasions as nested within individuals, while parsing out

estimates of time-invariant trait-like differences between individuals (Hamaker et al., 2015). Considering that alcohol use behavior entails substantial between-person effects that are conceptually distinct from within-person processes, RI-CLPM was appropriate for the purpose of this study.

RI-CLPMs were fit using Mplus v8.0 (Muthén and Muthén, 2018) following recommendations from Hamaker and colleagues (2015). Between-person variability was accounted-for by two random intercept latent variables that reflect stable trait-like differences: one for alcohol use frequency and one for perceived group norms (Model 1: Descriptive; Model 2: Injunctive). The correlation between the latent random intercepts estimates the between-person association between alcohol use frequency and perceived social norms. Regarding the remaining within-person effects, several paths were estimated: (a) autoregressive paths between the same construct across timepoints to estimate deviation from expected values, (b) cross-lagged paths that estimate prospective associations between alcohol use frequency and perceived social norms, and (c) contemporaneous associations between alcohol use frequency and perceived social norms at each of the three time points. Cross-lagged paths were of particular interest for the current study and are interpreted as the extent that deviating from one's own typical perceived social norms predicted deviation from one's own typical alcohol use frequency three months later (and vice versa). To control for potential differences in alcohol use, participants' sex, age, and contact vs. non-contact sport were specified as covariates. Lastly, to facilitate interpretation, within-person cross-lagged paths were constrained to equality. This decision to fit a more parsimonious constrained model is justified methodologically given that timepoints were equally spaced. To account for the non-independence within teams, we specified '*TYPE = COMPLEX*' in Mplus to correct the chi-square statistics and standard errors of the model estimation.

Models were fit using maximum likelihood estimation with robust standard errors that were robust to non-normality and non-independence of observations. Rather than listwise deletion of participants with missing timepoints, we used full-information maximum likelihood estimation to include cases with missing responses. This approach to handling missingness estimates parameters using all variables included in the model and provides accurate and unbiased parameter estimates (Enders, 2008). We also utilized participants' GPA and tenure with their team as auxiliary variables that were not included within the RI-CLPMs but facilitated the estimation of missing data (Enders, 2008). Model fit was assessed using indices derived from the χ^2 test, root mean square error of approximation (RMSEA), comparative fit index (CFI), and standardized root mean square residual (SRMR).

Results

Preliminary Findings

All 35 club sport teams agreed to participate at all three timepoints, but it was prudent to test the extent that individual responses at a given wave were missing completely at random. The sample decreased across the three waves (*N*'s: T1 = 847, T2 = 726, T3 = 703). As we retained all teams across all waves, we expect that this attrition was largely due to students no longer belonging to their club sport team, rather than otherwise dropping out of the study. We conducted Little's (1988) test separately for each timepoint, which revealed that the

missing responses were indeed missing completely at random (i.e., T1: $\chi^2 = 5.61, p = .06$; T2: $\chi^2 = 0.97, p = .62$; T3: $\chi^2 = 1.78, p = .41$). We then explored whether attrition was associated with participants' age, sex, GPA, or alcohol use frequency. Sex was the only significant correlate with attrition, whereby women were more likely to have a response at all three timepoints (52%) than men (39%; $\chi^2 = 16.50, p < .001$). Welch's two-sample *t*-tests revealed no significant differences in attrition by age ($t = 0.41, p = .68$), GPA ($t = -1.56, p = .12$), or alcohol use frequency ($t = 1.13, p = .26$). Missing data analyses did not indicate any concerning patterns of missingness, which supports our decision use imputation procedures to estimate missing responses (Enders, 2008).

Descriptive statistics are displayed in Table 1. Intraclass correlation coefficients indicated that drinking behavior and perceptions of drinking norms clustered within clubs to a small but nevertheless important degree. Between-group differences accounted for between 10-13% of the variance in alcohol use frequency, 6-11% of the variance in descriptive norms, and 3-6% of the variance in injunctive norms. These values indicate that the nested data structure is prudent to consider and supports the decision to account for participant clustering within the models.

Alcohol use frequency and social norms variables were normally distributed, with mean response values near scale mid-points. Examining the summary statistics for the sample, the average participant reported drinking alcohol almost once per week at each of the three timepoints, while the average response on perceptions of descriptive and injunctive norms was nearly twice per week. Strong correlations between alcohol use across T1, T2, and T3 suggested that alcohol use was relatively stable across the school year. Compared to men, women did not report engaging in more frequent alcohol use but did hold slightly higher perceptions of drinking norms at several timepoints. It was also revealed that students who participated in contact sports engaged in more frequent alcohol use at each timepoint, relative to those who participated in non-contact sports. Significant associations with sex and sport type justified decisions to control for these variables.

Random Intercept Cross-Lagged Panel Models

Descriptive norms.—Model 1 was employed to examine the association between participants' alcohol use frequency and perceived descriptive norms of teammates' alcohol use frequency. This model fit the data very well: $\chi^2 = 17.11, p = .65$; RMSEA $< .01$; CFI $> .99$; SRMR = .03 (Figure 1). A strong between-person association was found ($b = .72$), indicating that those individuals who typically perceived higher descriptive norms for drinking frequency also engaged in more frequent alcohol use. Examining cross-lagged paths, there was not a significant within-person longitudinal association between descriptive norms and alcohol use frequency. Meanwhile, we observed strong within-person contemporaneous associations between the two variables (b 's ranging from .63 to .72), indicating that variability in one variable is associated with variability in the other. Taken together, these data indicated that there was a strong trait-level link between perceived descriptive norms and self-reported alcohol use – and strong within-person consistency in these variables – but changes within person in one variable did not prospectively predict change in the other.

Injunctive norms.—In Model 2 (Figure 2), we examined the association between participants' alcohol use frequency and perceived injunctive norms – which refer to perceptions of teammates' approval of drinking frequency. Model fit indices demonstrated excellent fit: $\chi^2 = 19.32$, $p = .50$; RMSEA < .01; CFI > .99; SRMR = .04. There was a significant between-person association between perceptions of injunctive norms and alcohol use frequency ($b = .56$). Moreover, there were moderate-to-strong within-person contemporaneous associations between the two variables (b 's ranging from .39 to .84). The within-person cross-lagged longitudinal paths indicated that injunctive norms significantly predicted participants' alcohol use frequency at 3-month lagged timepoints (i.e., conformity; $b = .15$), but alcohol use frequency did not prospectively predict perceptions of injunctive norms (i.e., projection; $b = .09$).

Discussion

Perceptions of social norms continue to be a key focus within alcohol use etiology research. Existing studies have primarily explored the role of norms for distal referent groups, but there is an emerging understanding that norms derived from students' proximal groups are exceedingly important (Dumas et al., 2019). The current study thus examined how perceived social norms within intact student clubs relate to students' alcohol use, as norms among these proximal group contexts are anticipated to be a highly salient influence. Building upon previous studies that have examined temporal associations between social norms and drinking behaviors (Lewis et al., 2015; Wardell and Read, 2013), the current study extended our understanding of the underlying social processes by testing conformity and projection pathways using advanced methods that estimate both within- and between-person effects. We found large between-person associations regarding both descriptive and injunctive norms indicating that students who typically perceive higher group drinking norms also typically tend to drink more frequently (at the level of stable trait-like features). Findings also revealed that perceptions of both descriptive and injunctive group norms were strongly correlated with students' alcohol use frequency at the initial timepoint and had strong residual correlations at timepoints two and three. This finding shows that deviations from an individual's expected value on one variable may be contemporaneously linked to deviations from expected values on the other variable. For example, when an individual reported higher-than-expected perceptions of descriptive drinking norms, the individual also tended to report higher-than-expected drinking frequency within the same timepoint. Finally pertaining to the cross-lagged associations, the descriptive norms model revealed no significant prospective associations (i.e., neither conformity or projection), while the injunctive norms model revealed that perceptions of injunctive norms prospectively predicted students' alcohol use at later timepoints – thus, providing support for the conformity hypothesis.

The current findings contribute to our existing understanding of social influences on college students' alcohol use. Although researchers have previously examined temporal associations between social norms and drinking behaviors (Lewis et al., 2015; Wardell and Read, 2013), we extended this literature in two key ways. First, the current study examined perceived norms for students' proximal peers within intact student clubs, which are thought to be particularly influential, relative to the distal norms for *typical* college students. Second, the

present findings were derived from advanced analytic methods that were not well known when researchers previously addressed similar research questions. Specifically, RI-CLPM enabled us to parse out time-invariant trait-like differences between individuals to provide more appropriate estimates of longitudinal within-person effects. These two major differences in study design are important to consider when contrasting the current findings against the findings reported from similar previous research.

Parsing out the between-person effects enabled accurate estimation of within-person prospective associations, but also revealed key insights. The strong between-person associations between perceived norms and alcohol use highlight a link at the level of trait-like qualities; students who held higher perceptions of peers' drinking also tended to engage in more alcohol use. This evidence may indicate that there is some stability in how social norms relate to alcohol use, even after factoring out the dynamic within-person effects.

Including a random intercept within the cross-lagged models also revealed that injunctive norms prospectively predicted alcohol use while descriptive norms did not. This was unanticipated as researchers have found that descriptive norms tend to be a stronger predictor of students' alcohol use than injunctive norms (Lac and Donaldson, 2018). There are several plausible arguments to explain why injunctive norms prospectively predicted alcohol use frequency while descriptive norms did not. We focus our interpretation on the small group context as a referent, aligning with evidence from Lac and Donaldson (2018). Predicting self-reported alcohol use, these researchers reported that descriptive norms were relatively stronger predictors when assessed relative to *typical* university students, but that injunctive norms for one's close friends were indeed strongly predictive of alcohol use. Drinking attitudes were also identified as a key mediator for the association between close-friend injunctive norms and alcohol use (Lac and Donaldson, 2018). With regard to the current findings involving proximal group norms, students may place a particularly high value on the approval and disapproval of peers (i.e., "ought to" norms). Individuals are motivated to conform to injunctive norms as a means of achieving social acceptance and avoiding rejection – concerns that are highly relevant within individuals' proximal groups (Cialdini and Goldstein, 2004). Acceptance and rejection may be more salient within students' closer social circles. Students' drinking behaviors are also often highly visible to fellow members of proximal peer groups, so those who are concerned with fitting-in may be strongly influenced by peers' approval and disapproval (i.e., injunctive norms), relative to what they perceive their peers are actually doing (i.e., descriptive norms). It is also plausible that injunctive norms are more salient within proximal groups as students are able to gain a clearer sense for what is and is not acceptable behavior.

Taken together, the current findings are counter to previous reports that descriptive and injunctive drinking norms for typical college students reciprocally relate to students alcohol use behaviors over time (Wardell and Read, 2013). This lack of reciprocal association was evident when examining within-person processes: changes in one's own drinking (relative to one's own average) did not prospectively predict within-person changes in normative perceptions at lagged timepoints. It should nevertheless be noted that the strong between-person associations between norms and drinking behaviors are not able to capture directionality of effects. Whereas temporal reciprocal effects were not evident at the within-

person level, tenets of Bandura's (1977) theorizing about reciprocal determinism may instead exist as trait-level phenomena – or as phenomena that emerge across wider or narrower time horizons. It is also important to note that evidence of reciprocal associations between perceived drinking norms and alcohol use was reported in previous studies that used traditional cross-lagged modeling analyses, which may have yielded inaccurate estimates of cross-lagged effects. Indeed, effects estimated within traditional cross-lagged models are confounded because within- and between-person effects are intermingled (Curran and Bauer, 2011).

The current study also differed significantly from existing studies in that we examined these effects within highly proximal peer groups. Whereas projection processes (and thus, reciprocal associations) may indeed exist with regard to drinking norms of distal groups (e.g., typical student; Lewis et al., 2015), projection may be less likely within proximal groups in which norms are more readily discernible. For example, a sport-playing student who increases his or her alcohol use from timepoint one to timepoint two may not project this increased use onto his or her proximal peers because the student would be able to observe whether his or her group's drinking norms did indeed shift. Projection processes may thus be more evident for distal, rather than proximal, normative referents.

The current findings showed that both injunctive and descriptive norms were contemporaneously related to individuals' alcohol use frequency at the within-person level. This means that perceived norms and behavior may be strongly related at a given timepoint. It is likely that shared environmental or temporal features influence both norms and self-reported behavior, including aspects related to timing of the academic year or the competitive season. There is nevertheless also cause to consider how more frequent measurement could account for this variability and better explain the role of descriptive norms. Three-month lagged interval spacing is consistent with previous studies (e.g., Lewis et al., 2015), and is optimal for describing processes that unfold across the school year. However, this may be too large of a gap between measurements to capture conformity if temporal processes linking perceived norms to alcohol use are more immediate. For example, perceptions that one's peers are going to be drinking alcohol this weekend are likely to influence an individual's drinking in the short term, but not necessarily at three-month lagged timepoints. Researchers should thus consider not only the direction of the association between perceived norms and behaviors, but also the timing with which perceived norms may influence individuals' behaviors (Collins and Graham, 2002; Tan et al., 2011).

Implications

The current findings hold important implications for alcohol-related harm reduction. Researchers and clinicians have understood that the behaviors and attitudes of others can have detrimental effects on students' behaviors, but that these powerful influences can also be mobilized within harm-reduction strategies. Personalized normative feedback interventions, as one example, can reduce student alcohol use by correcting misperceptions about drinking norms (Larimer and Cronce, 2007). There is nevertheless still debate regarding the ideal level of reference group proximity for integrating normative influences

into harm-reduction strategies. For instance, Labrie and colleagues (2013) designed a large randomized control trial to test whether normative feedback was more effective when using more specific referent group combinations (e.g., gender, race). Surprisingly, normative feedback for ‘typical’ student norms had the strongest effect on reducing drinking behaviors relative to more specific groups.

Despite the surprising findings of Labrie and colleagues (2013), we highlight two important considerations when interpreting these results. One explanation is that individuals may simply be more accurate at perceiving the existing norms within more proximal referent groups (Larimer et al., 2011). If proximal group descriptive norms are more accurately perceived, then perhaps it is simply the approach to delivering normative feedback that is less powerful for proximal groups. Researchers may instead pursue novel approaches for small group interventions beyond direct feedback of existing norms such as strategies regarding the intentions of the group members or their underlying values related to drinking. Labrie and colleagues also note that specificity of a referent groups may not be as important as the meaning or social identity that one draws from a given referent group. Even if effects are less powerful within proximal groups, we should not conflate this to mean that groups to which we strongly identify are not potential settings to target for interventions. The findings from the current study aligns with existing findings that norms-based interventions may be particularly effective within proximal groups as students are strongly influenced by the drinking attitudes and behaviors of the peers within their close social circles (LaBrie et al., 2008). The results may also indicate that both injunctive norms relating to peers’ approval and disapproval of drinking and descriptive norms relating to peers’ drinking behaviors should be included within norms-based interventions as they are both related to students’ alcohol use behaviors.

Norms-based interventions that correct overinflated misperceptions about drinking norms are effective for bringing heavy drinking students back down to normative levels, but in many instances these normative levels remain problematic, especially within high-risk groups such as athletes. It is thus important to consider ways of advancing current harm-reduction strategies. The present findings show that perceived injunctive norms prospectively predicted alcohol use at later timepoints, meaning that it is prudent to target the extent that alcohol use is socially approved of within these student groups. Whereas shifting these norms within broad student groupings (e.g., university wide) would be exceedingly difficult, changing the acceptability of alcohol use within proximal student groups is feasible. Conducting change-based interventions that include strategies like team-based motivational interviewing conducted in existing groups could produce the context for members to share their attitudes explicitly and openly. Another promising strategy for shifting group norms could involve intervening directly with only a subset of members who disseminate intervention effects, via social network interventions. Consistent with network theory, social network interventions typically target key influential members to openly display disapproval of alcohol use among group members, with the expectation that this will implicitly shift the group environment (Davis et al., 2015; Valente, 2012).

The current study also holds methodological implications for how alcohol researchers estimate prospective associations between two variables. This study utilized a contemporary

structural equation modeling strategy that can yield more accurate estimations of directional cross-lagged effects. Using this RI-CLPM approach, we estimated more accurate cross-lagged prospective associations between perceived norms and alcohol use by factoring-out the trait-level and contemporaneous effects, thus making statistical advancements over similar previous studies (e.g., Lewis et al., 2015). The effects we estimated are more conservative than those reported in comparable previous studies, which may also indicate that artefacts pertaining to analyses and measurement might enter-in to longitudinal studies through inflated estimates of cross-lagged effects. Although traditional cross-lagged models remain a popular strategy among alcohol use researchers (Acuff et al., 2020), the findings of this study demonstrate that unique effects may often exist at both between-person and within-person levels (prospective and contemporaneous). This specifically highlights the value in moving towards a random-intercept approach when fitting cross-lagged models to produce estimates of social influence that factor-out many alternative reasons for lagged associations (Berry & Willoughby, 2017; Hamaker et al., 2015).

Limitations and Future Directions

Several limitations should be highlighted alongside the strengths of the current study. The participants were entirely sport-playing college students, which is a valuable sample given that this is a high-risk subpopulation for drinking (Green et al., 2014). Generalizability is nevertheless limited for non-sport playing college students, or even from a sample extending beyond the university from which data were collected. Potential application to varying group contexts means that future research should examine the association between social norms and alcohol use in other types of proximal student groups such as Greek organizations. When studying student sport clubs as proximal small groups, we make assumptions that participating in sport together constitutes an intact peer group that interacts outside of sport; however, this may vary by club. Using social network analysis, researchers have nevertheless found that club sport teams often do indeed spend considerable time together outside of sport activities, and that this facilitates social identification with the group (Graupensperger et al., 2019). It is also plausible that subgroups or cliques form within these sport clubs and that students spend more time with fellow club members who drink at similar levels. When asked to report on perceptions group drinking norms, participants' responses may be particularly influenced by the behaviors and attitudes of the peers within their subgroups or cliques. Future research should thus investigate the extent that the norms for students' most proximal peers – even within an intact group – are predictive of drinking behaviors above and beyond the influence of the perceived norms for the group as a whole.

An additional limitation is that the current study only examined the frequency of alcohol consumption. Frequency is an important marker of alcohol use norms as it is readily observable by peers but does not extend to other clinical or problematic drinking outcomes. For instance, the nature of consequences of one's alcohol use are the anticipated mechanism for many of the likely effects of problematic drinking behaviors for college students. Researchers should thus examine these associations with regard to additional indices of alcohol use such as the number of heavy-episodic drinking episodes and alcohol-related consequences. However, some indicators of alcohol use are zero-inflated count variables that require complex count-regression modeling that are not well-suited for structural equation

models like the RI-CLPM (Atkins et al., 2013). As such, researchers interested in testing directional effects via cross-lagged approaches face limitations pertaining to which alcohol use indicators can be used.

Although we currently control for differences in contact and non-contact sports as a theoretically relevant covariate, additional considerations for types of groups may be warranted in future research. Whereas it could be surmised that norms hold more value within interactive teams relative to individual sports, the sport teams that we sampled all included forms of interdependence, either in the form of team sports with integrated forms of interdependence, or in terms of individual sports that involve collective outcomes across all members (Evans et al., 2012). Sport researchers interested in whether normative effects are indeed stronger within interdependent groups would need to sample a wider range of individual sports in future research. A related limitation is our inability to systematically control for when teams were in and out of their competitive seasons as club sport teams often practice and compete throughout the entire school year.

Finally, the current study examined prospective associations at three-month lagged intervals, which may be too long of an interval to capture conformity. Quasi-experimental research has demonstrated that norms can have an immediate influence on conformity to group drinking norms even within a short 30-minute session (Graupensperger et al., 2018a). Researchers should thus extend this work by examining conformity as a more immediate process, perhaps using daily-diary or momentary assessments.

Conclusion

The current study makes novel contributions to the literature on the psychosocial etiology of student alcohol use. Many have questioned whether the processes underlying the association between perceived norms and alcohol use reflect conformity, projection, or reciprocal determinism. Interpretation of the current findings suggests that descriptive group drinking norms relate to students' alcohol use frequency at the between-person level, and contemporaneously (but not prospectively) at the within-person level. Perceived injunctive drinking norms were related to alcohol use frequency at the between-person level and also prospectively predicted alcohol use at three-month lagged timepoints. These findings are somewhat contrary to previous studies within this domain, which is plausibly due to differences in normative referent group (i.e., proximal rather than distal) and the use of an appropriate modern analytic strategy within the current study. Along with these theoretical insights regarding the role of norms for college students, these findings support the need for continued research studying norms relative to alcohol use and, by extension, intervening upon them.

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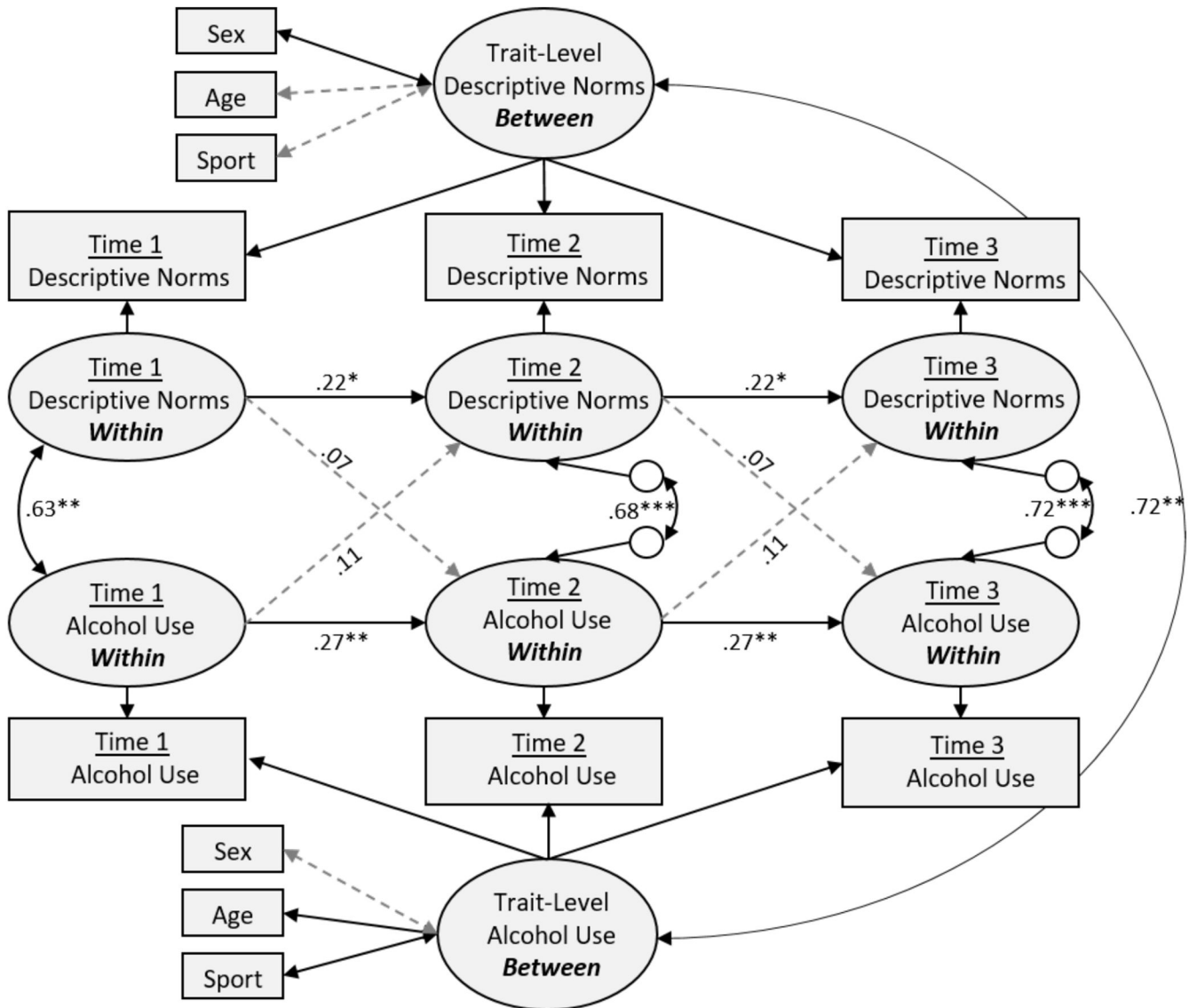


Figure 1. Random intercept cross lagged panel model of the association between alcohol use frequency and perceived descriptive norms of students’ club sport team across three waves, with 3-month lag intervals. The model contains two random intercepts (Trait-Level Alcohol Use and Trait-Level Descriptive Norms) that reflect between-person differences. Factor loadings onto latent variables are set to 1. Within-person processes are reflected by autoregressive paths between variables across timepoints. Cross-lagged paths between variables reflect the reciprocal relationship between alcohol use frequency and perceived descriptive norms. Sex (men = 0, women = 1), age at T1, and sport type (non-contact = 0, contact = 1) are added to the model as covariates at the between-person level. Solid lines indicate significant paths and dashed lines indicate nonsignificant paths. Longitudinal paths are constrained to be equivalent across time. Coefficients are unstandardized. Model Fit: $\chi^2 = 17.11$ $p = .65$; RMSEA < .01; CFI > .99; SRMR = .03.

* $p < .05$, ** $p < .01$, *** $p < .001$.

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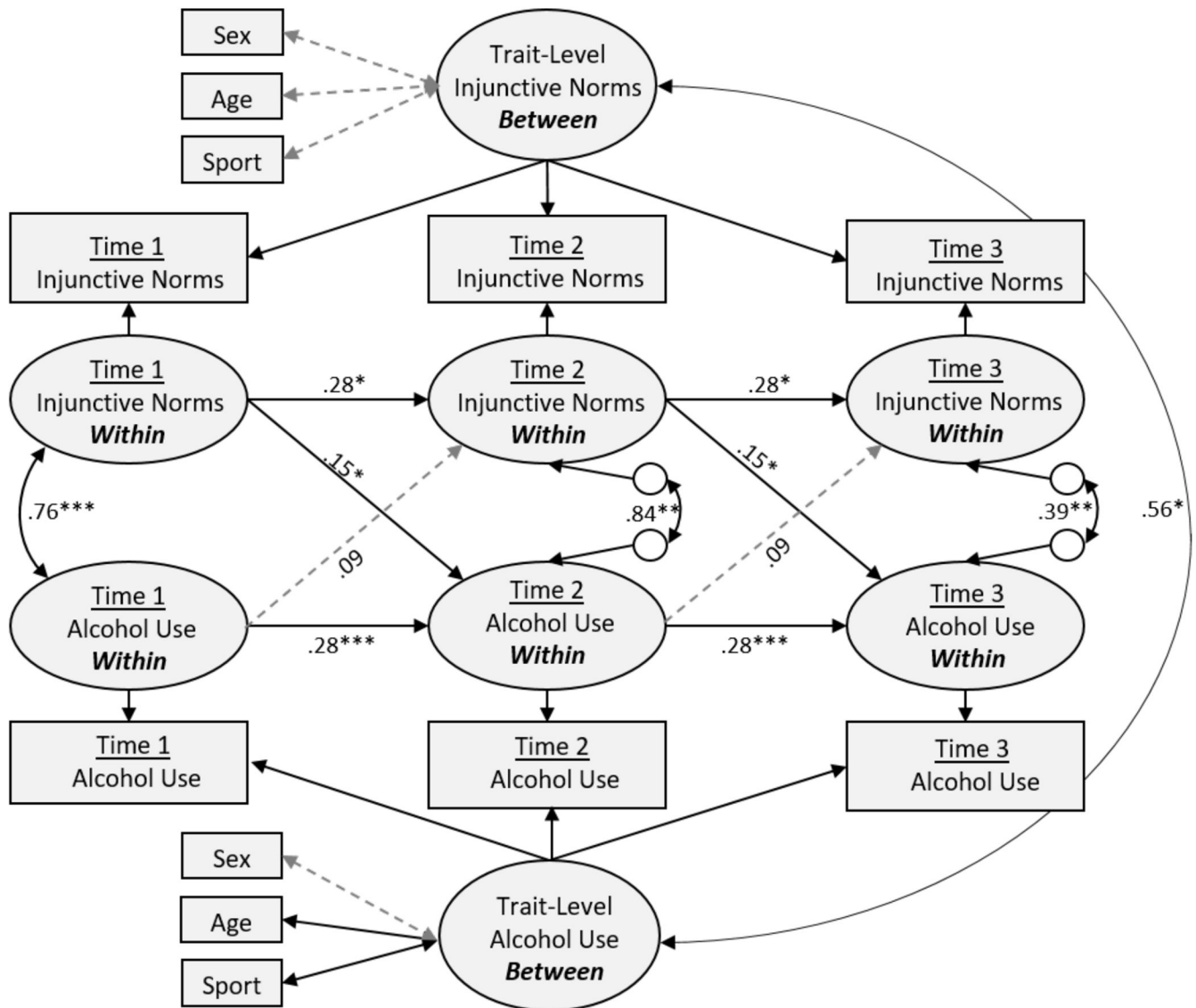


Figure 2. Random intercept cross lagged panel model of the association between alcohol use frequency and perceived injunctive norms of students’ club sport team across three waves, with 3-month lag intervals. The model contains two random intercepts (Trait-Level Alcohol Use and Trait-Level Injunctive Norms) that reflect between-person differences. Factor loadings onto latent variables are set to 1. Within-person processes are reflected by autoregressive paths between variables across timepoints. Cross-lagged paths between variables reflect the reciprocal relationship between alcohol use frequency and perceived injunctive norms. Sex (men = 0, women = 1), age at T1, and sport type (non-contact = 0, contact = 1) are added to the model as covariates at the between-person level. Solid lines indicate significant paths and dashed lines indicate nonsignificant paths. Longitudinal paths are constrained to be equivalent across time. Coefficients are unstandardized. Model Fit: $\chi^2 = 19.32$ $p = .50$; RMSEA < .01; CFI > .99; SRMR = .04.

*p < .05, **p < .01, ***p < .001.

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Table 1

Means, standard deviations, and bivariate correlations

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Alcohol Use Frequency T1	(.13)												
2. Alcohol Use Frequency T2	.74**	(.10)											
3. Alcohol Use Frequency T3	.66**	.75**	(.13)										
4. Descriptive Norms T1	.35**	.25**	.26**	(.06)									
5. Descriptive Norms T2	.24**	.33**	.24**	.36**	(.06)								
6. Descriptive Norms T3	.16**	.19**	.34**	.24**	.36**	(.11)							
7. Injunctive Norms T1	.30**	.17**	.22**	.58**	.36**	.23**	(.06)						
8. Injunctive Norms T2	.12**	.27**	.24**	.28**	.69**	.31**	.34**	(.03)					
9. Injunctive Norms T3	.13**	.17**	.28**	.25**	.41**	.68**	.34**	.47**	(.06)				
10. Sex (Men = 0, Women = 1)	.01	-.05	.01	.07*	.04	.11**	.05	.04	.09*				
11. Age at T1	.17**	.18**	.10**	-.02	.01	-.03	-.00	.00	.04	-.10**			
12. Tenure with team (years)	.21**	.19**	.20**	.02	.02	.04	.02	.04	.05	.02	.63**		
13. GPA	-.00	.02	.05	-.06	.02	.05	-.02	.04	.07	.02	.02	.05	
14. Contact Sport (No = 0, Yes = 1)	.14**	.15**	.17**	.07	.01	.03	.01	-.01	.04	-.15**	.06*	.04	.05
Mean	5.93	5.73	5.60	6.92	6.69	6.71	6.97	6.70	6.79	--	19.58	2.17	3.38
SD	2.35	2.32	2.36	1.61	1.89	1.80	1.72	2.09	1.81	--	1.25	1.13	0.33

Note. Intraclass correlation coefficients are displayed along the diagonal in parentheses, which estimate the amount of variance due to between-group differences. For reference, alcohol use frequency and normative possible response ranges were from 1-12. Means for alcohol use behavior and norms ranging from 5 to 7 signify from three times a month to two times per week.

* $p < .05$

** $p < .01$.