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**CONFORMITY TO PERCEIVED DRINKING NORMS WITHIN COLLEGE CLUB
SPORT TEAMS**

A Dissertation in Kinesiology and Clinical & Translational Science

by

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ABSTRACT

Alcohol use among college students is a considerable public health concern and there is evidence that sport-playing students are at heightened risk. Emerging adults are highly susceptible to peer influences, and they often model their drinking behaviors based on what they believe to be the attitudes and behaviors of their peers. These *normative influences* are thought to be particularly strong within small proximal groups, such as student sport clubs. It is nevertheless unclear how perceived norms within these groups relate to students' alcohol use behavior over time, and why some students adhere to perceived group drinking norms more (or less) than others. This dissertation comprises two standalone papers that address these knowledge gaps. To accomplish the goals of this research, data were collected at three timepoints across the school year from 1,054 students who were nested in 35 intact collegiate club sport teams. In Paper One, I examined prospective associations between perceived descriptive and injunctive group drinking norms and students' own alcohol use frequency. Results from random-intercept cross-lagged panel modeling indicated that descriptive and injunctive group drinking norms were both positively related to students' alcohol use frequency at the between-person level. Models also differed regarding whether descriptive or injunctive norms were included. For descriptive norms, results revealed a strong contemporaneous association with 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 processes (i.e., injunctive norms predicted alcohol use). Paper Two was designed to test the extent that aspects of the group environment moderated associations between perceived descriptive/injunctive group drinking norms and students' alcohol use behavior. I specifically explored moderators of adherence to

perceived team drinking norms. Employing a longitudinal three-level modeling approach (responses nested in people, who were nested in groups), several significant interactions identified moderating effects at within- and between-person levels. Students who identified more strongly with their team also more readily adhered to perceived drinking norms. Norm adherence was also greater at timepoints when students identified more strongly, relative to aggregated person-mean levels. Another key finding was that students with lower social standing within respective groups (i.e., lower indegree centrality, captured via social network analysis) adhered to perceived injunctive drinking norms to a greater extent. Cross-level interactions revealed that belonging to a more tightknit group (i.e., network with high density) amplified the extent that students adhered to perceived descriptive drinking norms. Paper Two findings also revealed that norms were forged over time, whereby teammates approached consensus on the groups' descriptive and injunctive drinking norms, along with alcohol use behaviors. Taken together, results from these two dissertation studies advance our understanding of alcohol-related peer influences within student sport teams and identify underlying group processes that tend to render social influences more salient. Findings will inform the strategies that practitioners use to implement norms-based harm-reduction strategies, especially when tailoring normative messages so they can be implemented within proximal student groups.

TABLE OF CONTENTS

LIST OF TABLES	vii
LIST OF FIGURES	viii
ACKNOWLEDGMENTS	ix
CHAPTER ONE: General Introduction	1
Social Influence	2
How Groups Impact Health Behavior.....	6
Emerging Adulthood.....	8
Susceptibility to Peer Influence	9
Methods to Examine Social Influence	12
Overview of Current Research.....	16
CHAPTER TWO: Longitudinal Associations Between Perceptions of Peer Group Drinking Norms and Students’ Alcohol Use Frequency Among College Sport Teams	20
Abstract.....	21
Social Norms and College Student Alcohol Use	23
Current Study	26
Method	28
Participants and Procedures	28
Measures	30
Analyses	30
Results.....	32
Preliminary Findings.....	32
Random Intercept Cross-Lagged Panel Models	35
Discussion.....	36
Implications.....	42
Limitations and Future Directions	43
Conclusion	45
CHAPTER THREE: Leveraging Multilevel Modelling to Unpack Associations Between Group Drinking Norms and Alcohol Use During a Collegiate Club Sport Season	46
Abstract.....	47
Social Norms and College Student Alcohol Use	49
Norm Adherence within Small, Proximal, Peer Groups.....	51
Sex Differences in Norm Adherence	54
The Current Study.....	54
Method	56
Participants and Procedures	56
Measures	57
Analyses.....	59

Results.....	62
Consensus Emergence	64
Multilevel Models.....	65
Discussion.....	72
Implications.....	77
Limitations and Future Directions	79
Conclusion	81
CHAPTER FOUR: General Discussion.....	82
Methodological Implications	86
Theoretical Implications	90
Applied Implications.....	94
Future Directions for Novel Norms-Based Strategies	98
Conclusion	101
REFERENCES.....	102
Appendix A: Visual Depictions of Team Networks.....	128
Appendix B: Items to Assess Alcohol Use Frequency, Descriptive Norms, and Injunctive Norms from Study One.....	129
Appendix C: Picture Showing Participants how much Alcohol is Considered to be One Drink	131
Appendix D: Daily Drinking Questionnaire from Study Two.....	132
Appendix E: Descriptive Norms Rating Form from Study Two	133
Appendix F: Injunctive Norms Scale from Study Two	134
Appendix G: Social Identity Questionnaire for Sport from Study Two	135
Appendix H: Social Network Items used to Compute Indegree Centrality in Study Two	136

LIST OF TABLES

Chapter One

Table 1. 1 Study goals and hypotheses.	19
---	----

Chapter Two

Table 2. 1 Means, standard deviations, and bivariate correlations.	34
---	----

Chapter Three

Table 3. 1 Descriptive statistics for key study variables, across all timepoints.	63
--	----

Table 3. 2 Mean and ICC values for key study variables at each timepoint.	63
--	----

Table 3. 3 Comparing models of consensus emergence for weekly drinks and perceptions of group norms.	64
---	----

Table 3. 4 Three-level consensus emergence models.	65
---	----

Table 3. 5 Multilevel zero-inflated negative binomial regression models evaluating alcohol use as a function of descriptive norms.	68
---	----

Table 3. 6 Multilevel zero-inflated negative binomial regression models evaluating alcohol use as a function of injunctive norms.	69
--	----

Chapter Four

Table 4. 1 Summary of support for study hypotheses.	85
--	----

LIST OF FIGURES

Chapter One

Figure 1. 1 Conceptual model for underlying processes linking the group environment to individuals' conformity to group norms.	12
Figure 1. 2 Overview of dissertation studies and theoretical framework.	17

Chapter Two

Figure 2. 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..	37
Figure 2. 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.	38

Chapter Three

Figure 3. 1 Simple slopes visualizing significant interactions with descriptive norms.....	70
Figure 3. 2 Simple slopes visualizing significant interactions with injunctive norms.....	71

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CHAPTER ONE: GENERAL INTRODUCTION

Sport participation during college can be a context for developing meaningful social connections and a positive source of social identification (Graupensperger, Panza, & Evans, 2019; Rees, Haslam, Coffee, & Lavalley, 2015). There is nevertheless evidence that student-athletes engage in greater levels of health-risk behaviors compared to non-sport playing-college students (Brisola-Santos et al., 2016; Green, Nelson, & Hartmann, 2014; Martens, Dams-O'Connor, & Beck, 2006). These risky behaviors extend across domains, with evidence that student-athletes are at heightened risk for recreational drug use (e.g., Egan, Erausquin, Milroy, & Wyrick, 2016), performance-enhancing drug use (Buckman, Farris, & Yusko, 2013), and concealing concussion symptoms to remain in a game (Chinn & Porter, 2016; Kroshus, Kubzansky, Goldman, & Austin, 2015). Student-athletes often see health-risk behaviors as prototypical behavior for athletes (Sønderlund et al., 2014; Zhou & Heim, 2014). Risky behavior is even embedded within the athletic identity itself for some sporting domains (Kroshus et al., 2015).

Whereas the majority of extant research in this domain has shown that substance use is problematic among NCAA-level student-athletes, my recent research has revealed these risks also extend to less-competitive sport. Even students participating in club and intramural sport engage in consistently higher levels of alcohol misuse across college, relative to non-sport-playing peers (Graupensperger, Linden-Carmichael, Turrisi, & Mallett, *Under Review*). Studying these patterns is necessary to promote health among sport-playing students, specifically, but the context of intercollegiate sport can also tell us a lot about the role of group processes in preventing risky behaviors that impact emerging adults more generally.

Across the spectrum of health-risk behaviors, alcohol misuse is a particularly significant

health concern for college students and is especially prevalent among student-athletes (Ford, 2007; Patrick & Terry-McElrath, 2017; Turrisi, Mallett, Mastroleo, & Larimer, 2006). College students are impacted by alcohol in detrimental ways including thousands of deaths and serious injuries each year (Hingson, Zha, & Smyth, 2017). Long-term consequences of student alcohol misuse include post-graduation unemployment (Bamberger et al., 2017), alcohol dependence (Merrill, Wardell, & Read, 2014), and irreversible damage to the still-developing brain (Hermens & Lagopoulos, 2018; Silveri, 2012; Zeigler et al., 2005). Given that alcohol-related lifestyle habits are formed during emerging adulthood (Arria et al., 2016), it is a critical priority to understand the etiology of college student alcohol misuse to inform prevention and intervention efforts.

College alcohol use typically takes place within peer group environments where behaviors are shaped by others (Grossbard, Hummer, LaBrie, Pederson, & Neighbors, 2009). Alcohol researchers have even posited that perceptions of peers' alcohol misuse is among the most robust predictors of students' own alcohol misuse (Neighbors, Lee, Lewis, Fossos, & Larimer, 2007). Understanding these social processes in sport teams – as a valuable and intact peer group context – could be critical for understanding and preventing college students' alcohol misuse. Sport teams thus provide a critical conduit for studying the magnitude of peer social influence and identifying the individuals and groups that are more or less likely to conform to peer behaviors or attitudes regarding alcohol use.

Social Influence

Human behavior is largely determined by social influences that tend to be transmitted through the opinions and actions of those within our own social groups (Hogg & Reid, 2006; Latane, 1981; Rimal & Lapinski, 2015). Seminal research in this domain identified two

interrelated pathways by which social influences drive behavior through the attitudes and opinions of others (Deutsch & Gerard, 1955). The first, *normative social influence*, refers to behavior that is driven by the anticipated benefits of obtaining social approval. We are inclined to behave in ways that will enable us to be viewed favorably by others. *Informational social influence* alternatively refers to behavior that is driven by the assumption that others' actions are the proper way to behave or relate to some evidence about reality. This is also referred to as "social proof," because individuals take cues from others and mimic what they believe to be correct behavior (Cialdini, 1984).

The attitudes and actions of fellow group members are used by individuals to form perceptions about the patterns of behavior that are expected of group members, which are called social norms (Cialdini, Reno, & Kallgren, 1990). The focus theory of normative conduct holds that when these social norms are salient, they can strongly influence individuals' behaviors (Cialdini, Kallgren, & Reno, 2000). This theory distinguishes between two types of social norms that uniquely influence individuals' behaviors: Injunctive norms that characterize the perceptions of what others approve or disapprove of (what one "ought to do"), and descriptive norms that entail perceptions of what others actually do (Cialdini & Goldstein, 2004). Whereas injunctive norms can serve as a moral compass for behavior, descriptive norms provide an individual with a blueprint for how to behave like a prototypical member of the group. Although both forms of social norms powerfully shape human behavior, the influence of a given type of norm – or social norms more generally – is dictated by individual and situational differences.

Decisions to abide by social norms are often intuitive, but this is nevertheless a highly motivated process (Nail, MacDonald, & Levy, 2000). Theorists have highlighted several motives that underpin the inherent drive to adhere to group norms (Nail et al., 2000). First, it expected

that those who align their behavior with the normative standards of the group will be socially accepted by fellow members while those who deviate from the norms may face social rejection. Norm adherence may thus provide individuals with an avenue to fulfill the innate desire for affiliation, belongingness, and acceptance among peers (Baumeister & Leary, 1995). A second major source of motivation for adhering to normative group behavior is to increase one's status within the group by aligning with other high-status group members. Mimicking or emulating the behaviors of high-status peers is a reasonable strategy for improving one's own social standing within the group (Cialdini, Kallgren, & Reno, 1991). Finally, adhering to group norms allows individuals to establish or maintain a positive self-concept as a member of the group by proving consistency and commitment (Cialdini & Goldstein, 2004). Individuals can support their own positive self-concept by behaving in ways that are consistent with their idealized identity and can derive positive self-assessments from showing commitment to a valued group (Brewer, 1991). Although the three motives for norm adherence described above are central within the social influence literature, there are indeed numerous – and potentially overlapping – reasons why individuals are driven to conform to group norms.

Just as there are varying reasons why individuals conform, contemporary theorists are also careful to distinguish different types of responses to social norms. *Conformity* is broadly defined as behavior or belief that is consistent with the prevailing norms or standards of fellow group members (Nail et al., 2000). Because this definition incorporates both outward behavior as well as internal belief, several forms of conformity are plausible based on whether individuals conform regarding their attitudes, behaviors, or both. As one example, Asch's (1956) study demonstrated conformity regarding line-perception tasks, but also included qualitative responses from participants who conformed. Although many participants indeed reported being convinced

that the lines differed in length, there were others who were aware that others' responses were incorrect but outwardly conformed in their response to the task anyways. From this example, conversion refers to conformity at both the levels of observable behavior as well as internal attitudes, whereas compliance describes outward behavioral conformity without internal acceptance of the norm (Nail, 1986). There are also important distinctions with regard to circumstances where one's behavior and attitudes are already aligned with norms and is maintained as a group member (i.e., congruence), compared with when individuals shift behavior and attitudes to align with the group norms (Willis, 1963).

A crucial component of social norms theory is the focus on subjective normative perceptions and on how commonly we misperceive the actions and attitudes of others. Individuals' behaviors are often guided by incorrect perceptions of how the other members of their social groups think and behave (Berkowitz, 2004). The concept that perceptions of others' drinking-related attitudes and behaviors shape one's own alcohol use is particularly problematic given consistent evidence that students' tend to overestimate these social norms (Perkins, Haines, & Rice, 2015). Students often estimate that peers engage in more alcohol use than they actually do and tend to think that peers are more accepting of alcohol use than they truly are (Giese, Stok, & Renner, 2019; Neighbors, Dillard, Lewis, Bergstrom, & Neil, 2006). These misperceptions of drinking norms have been shown to facilitate greater levels of alcohol use among students (Cox et al., 2019).

Despite the many complex theoretical frameworks of conformity, one central message holds true across the extant literature: Social norms are a powerful source of peer influence that play a critical role in shaping human behaviors such as alcohol use. A further perspective on these social influences is to also recognize that norms emerge from varying referent groups, and

that these groups may shape the salience and relevance of norms.

How Groups Impact Health Behavior

Groups are ubiquitous and shape our lives in myriad ways. When considering the role of groups within health, one approach is to consider the direct value of group memberships upon physical and psychosocial wellbeing (Graupensperger, Panza, Budziszewski, & Evans, *Under Review*). The association between affiliating with a social group and subjective wellbeing has, for instance, been uncovered in studies of at-risk populations like those recovering from addiction and those diagnosed with serious health conditions such as a stroke (Best et al., 2012; Haslam et al., 2008). Simply reporting memberships in one or more small groups exhibits a protective influence, even despite other forms of stress and isolation. Large-scale reviews summarizing emerging evidence for the many ways that social identification with groups can positively impact our lives (i.e., the ‘social cure’) have highlighted clear links between social connectedness and general wellbeing (Jetten, Haslam, Haslam, Dingle, & Jones, 2014).

Beyond the direct link between group memberships and health, small groups shape members’ health behaviors through *indirect* pathways. When members develop positive relationships and true-group experiences, they may align themselves with the behaviors of others within health-related groups. Using fitness groups as examples, small group environments are associated with physical activity program enjoyment and adherence (Graupensperger, Gottschall, et al., 2019), and are readily employed in interventions to promote physical activity (e.g., Beauchamp et al., 2018). The actions and beliefs of other group members can alternatively have a more pernicious impact. Individuals may experience pressures to engage in health-risk behaviors such as alcohol and other substance use when they feel their groups endorse supportive attitudes and behaviors for those risky actions (Capone, Wood, Borsari, & Laird, 2007;

Graupensperger, Benson, Bray, & Evans, 2019). Some groups are even formed by members explicitly to engage in risk behavior (e.g., drinking groups), which continually influence and reinforce harmful behavior (Dumas, Wells, Flynn, Lange, & Graham, 2014).

It is anticipated that the direct and indirect peer influences will be more powerful in smaller groups, compared to situations where more diffuse categories or collectives are considered as the normative referent. The theory of normative social behavior holds that normative influences on behavior are more pronounced when the normative referent is relatable to the individual (Rimal & Real, 2005). Whereas social categories can exert pressure when considered at a larger level – like the attitudes of *typical* college students – proximal groups with well-defined membership have an especially powerful normative influence (Cox & Bates, 2011; Larimer et al., 2009; Neighbors et al., 2008; Woolf, Rimal, & Sripad, 2014). For example, adolescent athletes are more susceptible to peer/teammate norms around doping than they are to the norms of doping use among professional athletes (Woolf et al., 2014).

Why should we expect that norms are particularly salient in proximal groups like sport teams, drinking groups, student organizations, family units, and work groups? Proximal groups are often smaller and closely linked to individuals' self-concept, thus increasing the salience of one's group membership (Forsyth, 2019). Small groups are also distinct from other types of peer affiliations because they entail rich group processes and other shared characteristics that may connect group members on a deeper level (e.g., interdependence, roles, cohesion). Such groups directly influence members' behaviors through a collective identity and close member interactions, which generate dense peer influence (Hogg & Reid, 2006; Hogg & Turner, 1987b; Kim & Wiesenfeld, 2017; Smith & Louis, 2008). Lastly, behavior is more apparent and visible to fellow group members within small proximal groups; adherence to or deviation from group

norms is directly observable by peers, which may exacerbate pressures to conform.

Emerging Adulthood

Whereas all social groups have a distinct set of standards that emerge through member interactions to inform member behavior, social influences are especially notable during emerging adulthood. Other sources such as parental norms remain important, but emerging adults are most strongly influenced by peer norms (Cail & LaBrie, 2010; Neighbors et al., 2008; Perkins, 2002). This is in part because emerging adulthood is a developmental stage in which individuals have a high sensitivity to peer influence and a strong drive for peer approval (Burnett, Sebastian, Cohen Kadosh, & Blakemore, 2011). Considering this orientation toward inclusion and esteem from peers, emerging adults especially value the social rewards for norm adherence while also holding strong concerns for the social repercussions of norm deviance. As an example of research derived through brain imaging methods, it has been found that the brain is highly susceptible to the rewarding properties that result from peer-influenced risk-taking behaviors during this stage (e.g., alcohol use; Webber, Soder, Potts, Park, & Bornovalova, 2017). Beyond the biological predisposition towards peer influences during this developmental stage, it is also important to consider environmental factors that may explain why emerging adults are so strongly influenced by social norms.

Emerging adulthood is a period in which many individuals are in situations that require developing new friendships and entering diverse social circles, which may intensify the power of peer influences (Arnett, 2007). Perkins (2002) describes college as a “peer-intensive” environment where emerging adults are surrounded by peers and have relatively limited contact with other influences such as siblings and parents. Those who attend college are presented with myriad opportunities to join new clubs or other informal social groups, which all entail distinct

sets of social norms that may shape an individuals' behavior (Levine & Dean, 2012). College students also leave behind their established social groups such as their high school friends, which is an opportunity to redefine oneself and affiliate with different types of people. It is important to note that there are undoubtedly selection processes that take place alongside of these peer influences. For instance, emerging adults tend to organize into groups of similar peers according to the principle of homophily, so some peer influence may emerge in terms of sanctioning existing behaviors. Considering the surfeit of evidence indicating that emerging adults are highly susceptible to peer influence and are in a life stage where they are forming new affiliations with social groups, it is critical to understand the processes through which health behaviors are influenced by peers.

Susceptibility to Peer Influence: Merging Theories and Empirical Findings to Explain Normative Influence

It is well-established that perceptions of group norms strongly relate to individuals' behavior, yet less is known about why some individuals are more susceptible to normative influence than others. It is also pertinent to consider group-level factors that may explain variability in conformity. Some groups may promote diversity and independence – a 'come as you are' mindset – while other groups exert pressure on members to conform to the group norms. Despite decades of theorizing, a critical gap remains in that few studies have been conducted within intact group settings to understand variability in conformity *in situ*. Furthermore, few studies have examined the psychosocial processes that amplify or diminish: (a) the attention that individuals pay toward their group's norms, or (b) the extent to which identifiable norms emerge at a group level to guide behavior. I anticipate that this variability could be explained by group differences, individual differences, and developmental contexts. I constructed Figure 1.1 to

produce an integrated perspective from several theoretical traditions to explain individuals' motivations to conform to perceived group drinking norms.

Social Identity. A predominant social psychology perspective pertaining to how groups impact individuals' behaviors relates to the extent that one identifies and self-categorizes with the referent group. People are drawn to identify with groups as a way to find one's place within the social world while being a source of pride and self-esteem (Tajfel, 1978). Recall that establishing and maintaining a positive self-concept as a group member is a core motive to conform and adhere to group norms; thus, it is fitting to examine conformity from an approach underpinned by social identity theory and self-categorization theory – collectively recognized as the social identity approach (Hogg & Turner, 1987a; Rees et al., 2015; Turner et al., 1994).

Social identity refers to “that part of an individual's self-concept which derives from his/her knowledge of his/her membership of a social group (or groups) together with the value and emotional significance attached to that membership” (Tajfel, 1981, p. 255). Strong social identification is theorized to lead individuals to internalize normative group behavior and strive to uphold the characteristics of a prototypical group member by adhering to the group norms (Hogg, 2016; Jetten, Spears, & Manstead, 1997). This process is called depersonalization, and involves an individual coming to view himself or herself less as a unique individual and more as a stereotypical member of the group (Hogg, Abrams, & Brewer, 2017). In seminal theorizing about how social identities come to shape our behavior, Hogg and Turner (1987b) posited that:

“First, individuals categorize and define themselves as members of a distinct social category or assign themselves a social identity; second, they form or learn the stereotypic norms of that category. They ascertain that certain ways of behaving, perceiving and believing are criterial attributes of category membership; that certain appropriate,

expected or desirable behaviors are used to define the category as distinct from other categories, and, finally, they assign these norms to themselves and thus their behavior becomes more normative (conformist) as their category membership becomes salient.” (p. 149).

In describing the temporal process above, these authors position group members’ perceptions of social norms – and the salience of those norms – alongside the process of identifying with the group. Pertaining to our drive to support a positive self-concept through social identification, the motivation to conform to ingroup norms is particularly strong when the group has high status, whereby membership provides individuals with desirable social recognition (optimal distinctiveness theory; Brewer, 1991). There is indeed evidence that one’s strength of social identification with his or her group may amplify the willingness to adhere to group norms (Jetten et al., 1997). However, there are surprisingly few studies that have empirically investigated the link between social identification and conformity, especially considering the strong theoretical rationale that social identification strength directly elicits a tendency to conform and adhere to group norms.

Network structure. The network structure of a group or organization refers to the complex relations (e.g., social ties) between members, and may play a key role in the extent that members feel pressured to adhere to group norms. Whereas tight-knittedness (i.e., an index of social connectivity among group members; see Appendix A for visual example) is typically considered to be a positive group attribute that fulfills members’ need for affiliation, there is the possibility that tight-knit groups may feature stronger pressures for members to conform to the normative behaviors of the group. Group structure may also influence *individuals’* susceptibility to peer influence as a function of where members stand within the group. Individuals with less

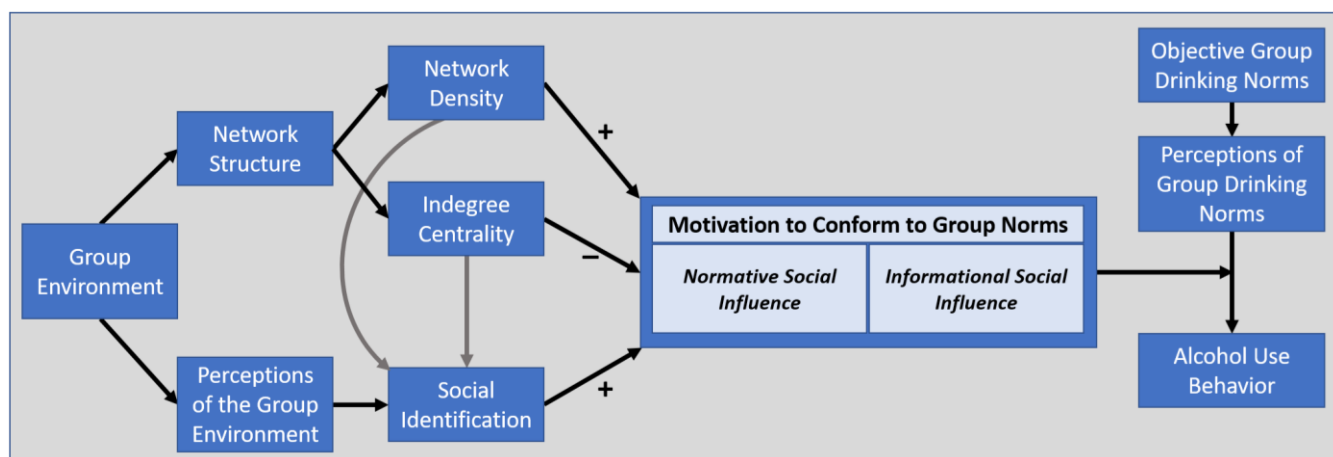


Figure 1. 1 Conceptual model for underlying processes linking the group environment to individuals' conformity to group norms. Gray arrows represent findings from a previous study within this line of research (Graupensperger, Panza, & Evans, 2019).

social status may be more motivated to adhere or conform to the group's norms as an attempt to gain approval and demonstrate commitment to the group (Cialdini & Goldstein, 2004; Deutsch & Gerard, 1955; Nail et al., 2000).

Methods to Examine Social Influence

Alongside the complex network of constructs required to theorize about social influence, empirical study of social influence entails novel methods. Early work in this domain relied on laboratory experiments that involved mundane and ambiguous tasks like estimating the number of beans in a bottle (Jenness, 1932), or estimating how far a light had moved (Sherif, 1935).

Then, in the 1950's, Asch conducted a series of conformity studies using a task where the participants were pressured to respond in a way that was obviously incorrect (e.g., Asch, 1956):

“Asch used simple perceptual stimuli on which participants had to match the length of a standard line against the lengths of three comparison lines. Because the discrimination was very easy (i.e., hardly anybody made a mistake when working alone), conformity to group pressure meant that participants had to agree with others even when these others were apparently wrong. Moreover, participants in Asch's studies were not in any sense

forced to conform, as they did not receive persuasive communications or threats from other group members.” (Levine, 1999, p. 358).

Although this early research on conformity has had a tremendous impact on the field of social psychology and are among the most widely replicated effects within the field, experimental laboratory paradigms are limited for several reasons. First, these experiments often only work with the use of confederates, so studying conformity within naturally occurring authentic groups is not possible. Second, conforming to a response regarding the length of a line is not comparable to conforming to group norms that pertain to behaviors such as alcohol use. Lastly, the manipulations within some of these paradigms are explicitly apparent (by design), which introduces limitations to ecological validity. Methodological innovation is thus required to further advance our understanding of social influences.

A critical point that informs how researchers study social influence is that theorists position social influence as a *process*; a series of interactions and subsequent responses of group members. This construal as a process means that, to study social influence, we must: (a) observe it in terms of constructs that may only emerge over time (e.g., conformity or compliance), and (b) examine the nomological network of inputs and outputs that help predict emergent processes. To build upon lab-based paradigms that were essential to demonstrate how social interactions influence decision-making, studies of social influence must employ ecologically valid experimental designs, methods that investigate responses clustered within intact groups, and methods that track individual and group responses over time (Hackman, 2012).

The relative dearth of empirical evidence pertaining to the susceptibility of groups or individuals to normative influence may be partially explained by the difficulty in studying group influences on behavior. To study this process, researchers need to recruit and sample intact and

naturally occurring social groups over a period of time, which can indeed be challenging. In addition to studying the groups that are naturally relevant to one's own behaviors, studying intact groups enables the use of sophisticated methodology that delivers rich insights into how groups can shape individuals' behavior.

One promising way to study variability in conformity to group norms is by capitalizing on the multilevel nature of groups as nested systems. Although nested data structures are often viewed as an issue that violates the assumption of independence, advances in multilevel modeling approaches have revealed that clustered data represent an opportunity to better understand how groups can impact individuals' behaviors (Snijders & Bosker, 1999). One distinct benefit of sampling intact groups is the ability to cluster group members' data to contrast individuals' responses alongside members of their own group, as well as contrasting group-level variables between groups. Multilevel modeling techniques enable researchers to disentangle these within- and between-group effects (Enders & Tofighi, 2007). As a hypothetical example, researchers could examine social cohesion between members as an aggregated group-level variable to investigate mental health benefits of belonging to a cohesive group. Nested within this question, a corresponding individual-level question would entail asking whether members who have low perceptions of the group's social cohesion, relative to other group members, are more likely to report symptoms of depression. Although methodological advancements for studying how groups shape behavior are becoming more prevalent in sport group research (e.g., Graupensperger, Benson, et al., 2019), a multilevel modeling approach has not yet been utilized to study social influences of group norms within sport teams.

Examining intact groups also enables the use of a highly descriptive methodology called social network analysis (e.g., Borgatti, 2013). With reference to small groups, social network

analysis commonly refers to the mathematical mapping of social-relational ties that are often generated through group members' self-reported interactions with one-another. This methodology can uncover latent aspects of a group's structure, such as how tight-knit a group is relative to other groups (i.e., network density), alongside indices of where each member sits within their group's status hierarchy (i.e., indegree centrality; Graupensperger, Panza, & Evans, 2019; McLaren & Spink, 2019). These group- and individual-level indices are valuable for testing theoretical propositions.

Particularly with respect to social identity theory, a network approach provides the means to test expectations that more tight-knit groups would entail greater pressures to conform to group norms, which has been theorized (e.g., Turner & Oakes, 1986), but never empirically supported. Network mathematicians have also emphasized that a group's social structure has implications for conformity and consensus among members (Zollman, 2010), but this has not been studied in real-world social groups. Because of the complexities involved with sampling intact groups and analyzing network data, social influence researchers underuse network analysis despite its utility for understanding how groups shape behavior.

With rich examination of intact groups comes inherent challenges of observing how social processes emerge over time. Although it is intuitive that groups – and members' perceptions of those groups – constantly change and evolve, critical assessment of the group dynamics literature revealed researchers' shortcomings in failing to measure group processes in a dynamic fashion (Cronin, Weingart, & Todorova, 2011). Notably, it remains uncertain whether norms have a temporal effect on behavior (i.e., conformity), or if one's behavior actually shapes the way that individuals perceive the normative behavior for their group (i.e., projection; Lewis, Litt, & Neighbors, 2015). We likewise know little about whether group norms are dynamic, and

whether they demonstrate emergence, whereby member beliefs coalesce over time.

Examining groups over time can be challenging but doing so can reveal crucial insights that are overlooked by cross-sectional designs. First, certain longitudinal designs enable researchers to examine the direction of an association, which may also reveal bidirectional or reciprocal associations (Hamaker, Kuiper, & Grasman, 2015). Moreover, longitudinal designs may reveal that perceived norms and behaviors do not have a longitudinal association at all, but rather that conformity unfolds contemporaneously. It is important to recognize that studying intact groups longitudinally is rife with logistical challenges such as attrition and can more than double or triple the effort involved with data collection (Curran & Bauer, 2011). For example, a cross-sectional study of 30 intact sport teams would require 30 meetings, while a three-wave longitudinal study would entail 90 meetings to collect data. Longitudinal study of small groups is nevertheless necessary for advancing our current understanding of how health behaviors may be predicted by processes that take place in real-life small groups.

Overview of Current Research

The overarching purpose of this dissertation research is to provide a deeper understanding of how perceptions of group norms within college sport teams are associated with individuals' health risk behavior – both in terms of the decision-making process and in terms of self-reported behavior. In addition to being an at-risk subpopulation for alcohol misuse and other health-risk behaviors, studying sport teams is an ideal domain for uncovering how social influences within peer groups can impact behavior (Kniffin & Sugiyama, 2018). In particular, sport teams are bounded networks, meaning that membership is clearly defined, and all members can be surveyed. These bounded networks are critical for meeting the assumptions of multilevel designs and network analyses.

Guided by the theoretical frameworks described above and displayed in Figure 1.2, this dissertation package comprises two studies (see Table 1.1 for overview of goals and hypotheses). The two papers within this dissertation package are each self-contained manuscripts that cohesively fill important gaps in the literature on social influence, and build upon this line of research that I have pursued throughout my graduate education.

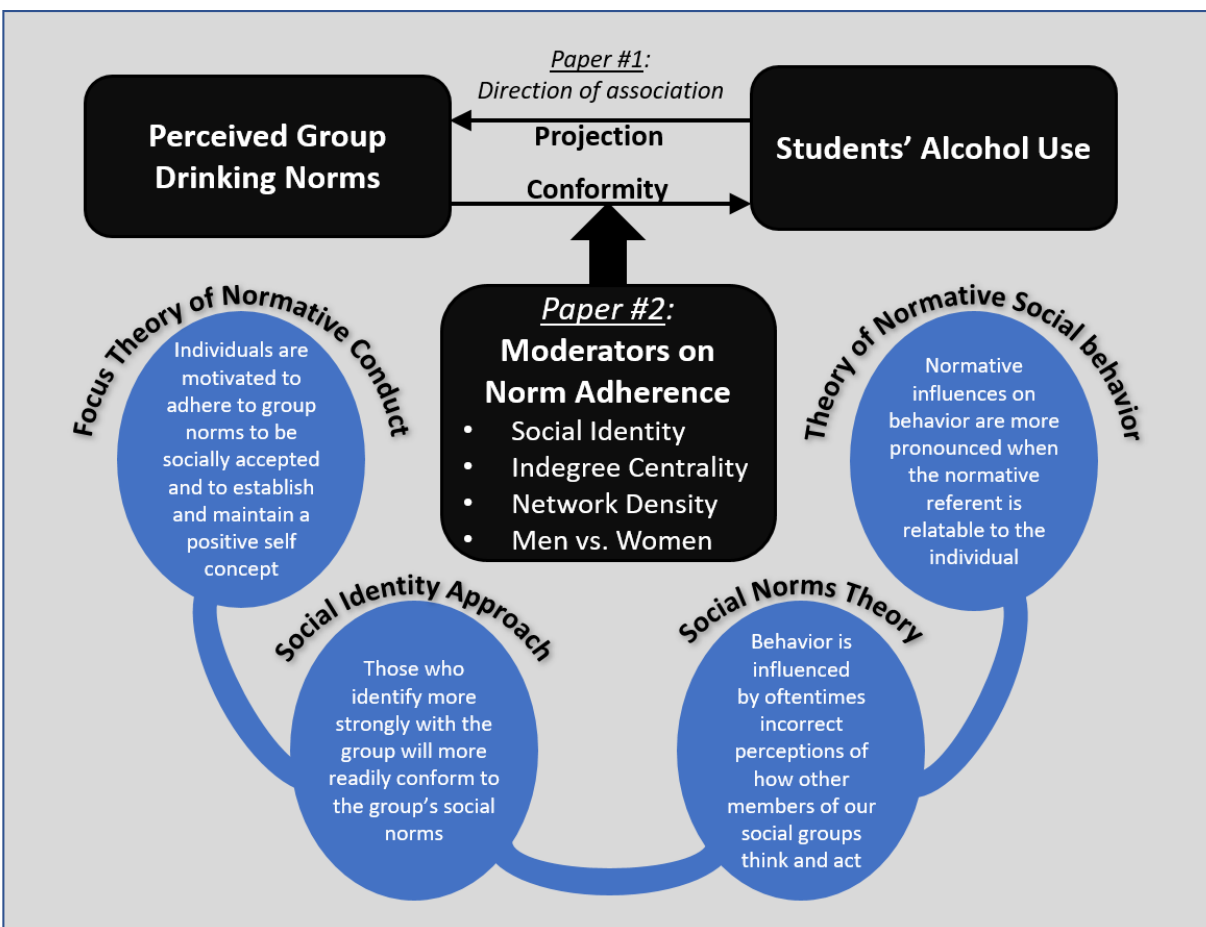


Figure 1. 4 Overview of dissertation studies and theoretical framework.

These studies held unique goals:

1. **Paper 1: Examining the directionality of the association between perceived group norms and alcohol use within intact sport teams.** In my previous research I employed a quasi-experimental approach that entailed manipulating team norms pertaining to

hypothetical situations (Graupensperger, Benson, & Evans, 2018). The first dissertation study was designed to build upon this previous experimental research involving manipulated norms by testing the associations between *actual* perceived group norms and athletes' self-reported alcohol use behaviors. Although conformity is one reason for members' health-risk behaviors to show interdependence among teammates, there are numerous competing explanations (e.g., group homogeneity and peer selection). It was thus critical to examine the extent that the association between perceived group norms and individuals' drinking behavior is directional, bidirectional, or contemporaneous. This first paper describes a longitudinal study in which we employed innovative cross-lagged structural equation modeling (i.e., random intercepts cross-lagged panel model; Hamaker et al., 2015) to estimate the strength of associations between perceived group descriptive/injunctive norms and alcohol use. Across three timepoints (i.e., beginning, middle, and end of the school year) these longitudinal models also revealed the extent that the association between perceived group norms and alcohol use took place at the within- and/or between-person level.

2. **Paper 2: Identifying individual and group characteristics that amplify adherence to group norms.** Social psychology theorists have described complex frameworks for explaining why people are motivated to adhere to social norms, but very few studies have examined individual and group level factors that may explain why some people more readily conform to social norms than others. The second study was thus designed to enhance our understanding of the variability in how susceptible people are to peer-influence. Using a three-level multilevel modeling approach (i.e., timepoints nested in people who were nested in groups) we tested individual- and group-level moderator variables that were theoretically

anticipated to amplify the strength of association between perceived group norms and alcohol use. Interaction terms were specified to examine the role of social identification strength, indegree centrality, team-level density, and team sex on susceptibility to peer-influence.

Table 1. 1 Study goals and hypotheses.

Study Goals	Hypotheses
<p>Study #1</p> <ul style="list-style-type: none"> • To test the temporal direction of the association between perceived drinking norms and self-reported alcohol use frequency. <ul style="list-style-type: none"> ○ To examine the extent that the norms-behaviors association occurs at the between- and within-person levels. 	<ol style="list-style-type: none"> 1. Descriptive and injunctive norms will prospectively predict alcohol use frequency (conformity), but alcohol use will not prospectively predict perceived norms. 2. I anticipate strong between-person (trait) associations between perceived norms and alcohol use frequency alongside moderate within-person (state) associations.
<p>Study #2</p> <ul style="list-style-type: none"> • To test group processes that are theorized to moderate the association between perceived drinking norms and alcohol use, thus revealing factors that may partially explain variability in norm adherence. <ul style="list-style-type: none"> ○ To examine time-varying interaction effects explaining within-person variation in norm adherence. ○ Use consensus emergence modeling to test the extent that groups approach consensus on perceptions of drinking norms and alcohol use behaviors over time. 	<ol style="list-style-type: none"> 3. At the individual-level, I anticipate that the association between perceived drinking norms and alcohol use will be stronger for (a) those with stronger social identification strength, and (b) those with lower indegree centrality (i.e., prestige/popularity). 4. At the group-level, I anticipate stronger norms-behavior associations for those who belong to denser (i.e., tight-knit) teams. 5. As an exploratory hypothesis, I am examining whether the norms-behavior association differs between men's and women's sport teams. 6. I anticipate that groups will approach consensus in perceptions of group drinking norms and that drinking behaviors among group members will become more similar over time.

CHAPTER TWO: PAPER ONE

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

Note: A version of this paper is currently being considered for publication within *Alcoholism: Clinical and Experimental Research*. Some aspects of the formatting are aligned with this journal's requirements.

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 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.

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

The high prevalence of alcohol misuse among college students remains a significant public health concern (Hingson et al., 2017; Patrick & 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 & 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, Chein, & Steinberg, 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 & 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 what behaviors are effective or adaptive (Cialdini & 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. 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 & 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 & Evans, 2018; Kim & 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 is 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, Benson, et al., 2018; 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).

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, Dillard, & Klein, 2012; Lewis et al., 2015; Litt, Lewis, Rhew, Hodge, & Kaysen, 2015; Neighbors et al., 2006). However, these extant studies examined distal norms pertaining 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, Davis, & Neighbors, 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 & 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 & 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)?

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 & 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, Benson, et al., 2018). 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. 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 2.1.

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.

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 & 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 were missing completely at random. We conducted Little's (1988) test separately for each timepoint, which revealed that the data 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 ($t = 1.13, p = .26$).

Descriptive statistics are displayed in Table 2.11. 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.

Table 2. 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. * $p < .05$, ** $p < .01$.

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 2.1). 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 2.2), 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 & 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

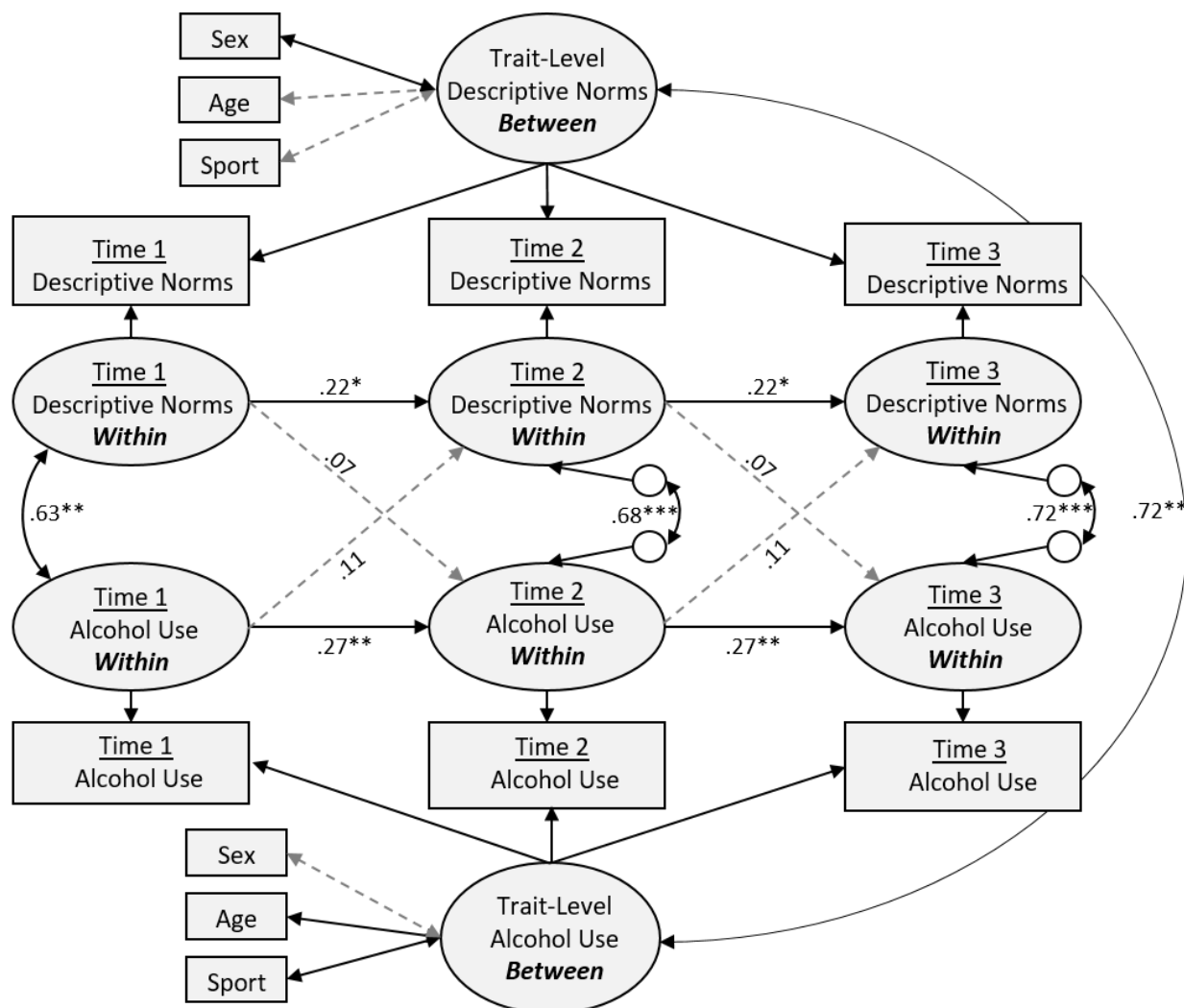


Figure 2. 1 Random intercept cross lagged panel model of the association between alcohol use frequency and perceived descriptive norms of students' club sport team across three waves, with 3-month lag intervals. The model contains two random intercepts (Trait-Level Alcohol Use and Trait-Level Descriptive 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. * $p < .05$, ** $p < .01$, *** $p < .001$.

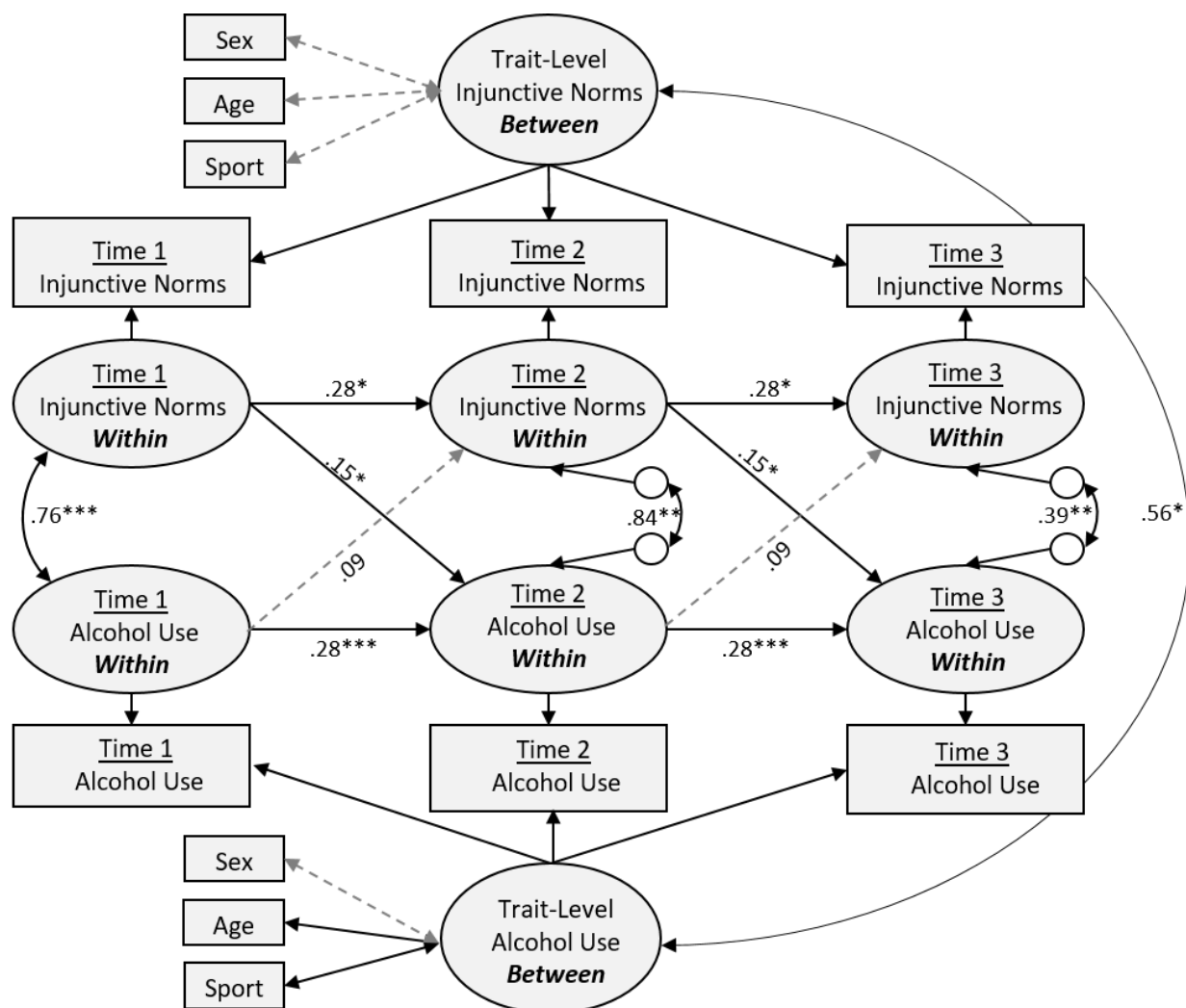


Figure 2. 2 Random intercept cross lagged panel model of the association between alcohol use frequency and perceived injunctive norms of students' club sport team across three waves, with 3-month lag intervals. The model contains two random intercepts (Trait-Level Alcohol Use and Trait-Level Injunctive 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. * $p < .05$, ** $p < .01$, *** $p < .001$.

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 & 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 & 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 & 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 small 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 small groups as students are able to gain a clearer sense for what is and is not acceptable behavior. Taken together, these 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 & Read, 2013).

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 & Graham, 2002; Tan, Dierker, Rose, & Li, 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 & Cronce, 2007). The current study aligns with claims 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, Hummer, Neighbors, & Pedersen, 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, Heiman, & Menczer, 2015; Valente, 2012).

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, Panza, 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. Researchers should also examine these associations with regard to additional indices of alcohol use such as the number of heavy-episodic drinking episodes. 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, Eys, & Bruner, 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, Benson, et al., 2018). 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.

CHAPTER THREE: PAPER TWO

Leveraging multilevel modelling to unpack associations between group drinking norms and alcohol use during a collegiate club sport season

Note: A version of this paper will be submitted to *Psychology of Addictive Behaviors*. Some aspects of the formatting are aligned with this journal's requirements.

Abstract

Building from strong evidence that perceived social norms predict college students' alcohol use, it is critical to explore heterogeneity in these patterns to identify which students adhere to perceived drinking norms to a greater extent than others. The current study examined students' adherence to perceived group drinking norms within intact club sport teams at three timepoints across the school year ($N = 1,054$; $k = 35$). A primary focus of this study was to examine how the association between self-reported alcohol use behavior and perceived descriptive/injunctive norms was moderated by constructs at the within-person, between-person, and between-group levels. Employing a three-level modeling framework, we tested moderators that included social identification strength, along with social network-derived indices of indegree centrality (i.e., social status), and network density (i.e., group-level connectedness). Consensus emergence modeling revealed that groups forged norms over time, whereby teammates approached consensus on the groups' descriptive and injunctive drinking norms, along with alcohol use behaviors. Regarding multilevel moderation findings, students who identified more strongly with their team more readily adhered to perceived drinking norms. Norm adherence was also greater at timepoints when students identified more strongly, relative to aggregated person-mean levels. Another key finding was that students with lower social status (i.e., lower indegree centrality) adhered to injunctive norms to a greater extent. Cross-level interactions revealed that network density amplified the extent that students adhered to perceived descriptive drinking norms. Taken together, the current findings advance our understanding of social influences on students' alcohol use behaviors within proximal peer groups.

Leveraging multilevel modelling to unpack associations between group drinking norms and alcohol use during a collegiate club sport season

Emerging adults belong to a wide spectrum of social groups that can shape individuals' lives in myriad ways. These groups often entail broad categorizations such as identifying as a student at a university, but also include informal collectives (e.g., students studying together for an exam). Students also enter tightknit formal groups that establish shared goals and interact socially, such as the sport teams and Greek organizations that are ascribed with high entitativity (Lickel et al., 2000). Considering how groups influence student risk behaviors, there are cases where the groups to which students belong can shape health behaviors directly, such as drinking groups (Lange, Devos-Comby, Moore, Daniel, & Homer, 2011). However, the influence of groups on behavior is often less direct. Health behaviors like alcohol use are largely determined by indirect social influences that stem from the attitudes and actions of others within one's own social groups (Hogg & Reid, 2006; Latane, 1981; Rimal & Lapinski, 2015).

Social norms are a salient form of social influence, and entail implicit and explicit patterns of behavior that are expected of individual members of social groups or categories (Cialdini et al., 1990). There is consensus among alcohol researchers that social norms (i.e., perceptions of peers' alcohol-related attitudes and behaviors) are among the most robust predictors of college students' alcohol use (Krieger et al., 2016; Neighbors et al., 2007). Although other sources of social influence such as parental norms remain important, college students are most strongly influenced by peer norms (Cail & LaBrie, 2010). This is because emerging adulthood is a developmental stage in which individuals have a particularly high sensitivity to peer influence and a strong desire for peer approval (Burnett et al., 2011). College is also characterized as a 'peer-intensive' environment in which students are surrounded by

fellow emerging adults and have relatively less contact with other sources of social influence (e.g., parents; Perkins, 2002).

Although it is well-established that perceptions of group norms predict students' alcohol use, some individuals are more strongly influenced by drinking norms than others. Despite many theoretical frameworks describing individuals' motivations to conform to norms, there is less evidence regarding factors that produce heterogeneity in normative influence. A critical gap in this literature is that we know little about the psychosocial processes within student groups that may amplify adherence to group drinking norms. The primary goal of this study was thus to test theoretical individual- and group-level factors that may amplify, or diminish, students' adherence to perceived group drinking norms.

Social Norms and College Student Alcohol Use

The focus theory of normative conduct specifically describes *injunctive norms* as perceptions of what others approve or disapprove of (what one "ought to do"), and *descriptive norms* as perceptions of what others actually do (Cialdini & Goldstein, 2004). While there is evidence that both injunctive and descriptive norms relate to students' alcohol use behaviors (e.g., Krieger et al., 2016), motivational processes are theorized to differ between the two sources of normative influence (Cialdini et al., 1990). Cialdini and colleagues (1990) suggest that individuals are motivated to adhere to injunctive norms to gain social acceptance from peers, while individuals are motivated to adhere to descriptive norms because they believe that peers' behaviors are effective or adaptive ways to behave. We nevertheless note that these motives are not mutually exclusive. In a study testing injunctive and descriptive norms as competing models, Lac and Donaldson (2018) highlighted the importance of the normative referent group in terms of proximity to the individual. This study found that descriptive norms were relatively stronger

predictors of students' alcohol use when assessed relative to a *typical* university student, but that injunctive norms for one's proximal peers were indeed a strong predictor of alcohol use when mediated through attitudes towards alcohol use. It is thus plausible that injunctive norms about what behaviors are accepted by peers increase in salience in smaller groups. Injunctive and descriptive norms are nevertheless both important social influences that may hold unique processes related to whether the referent group for those norms is relatively proximal or distal.

In addition to studying social norms from an etiological perspective, alcohol researchers have demonstrated translational value in normative influence. Grounded in social norms theory (Perkins, 2002), which posits that overestimation of peers' approval and usage of alcohol increases one's own alcohol use, researchers have developed several promising norms-based interventions. For example, personalized normative feedback strategies seek to correct normative misperceptions by highlighting discrepancies between (a) individuals' estimations of others' drinking attitudes/behaviors, (b) individuals' own drinking attitudes/behaviors, and (c) the actual drinking norms of others (Miller & Prentice, 2016). Norms-based interventions have also been shown to be efficacious when employed within student groups such as Greek organizations (LaBrie et al., 2008). In a review of intervention literature, Lewis and Neighbors (2006) noted that personalized normative feedback may be more effective when norms are based on more proximal referent groups. Despite the promise of norms-based strategies, it has been argued that the effects are often short lived and that effect sizes from these interventions could be improved upon (Cronce & Larimer, 2012). Identifying underlying factors that explain variability in students' susceptibility to normative peer influences will add to our understanding of alcohol use etiology and provide critical insights for improving norms-based interventions.

Norm Adherence within Small, Proximal, Peer Groups

The strength of normative influence is thought to vary depending on the nature of the referent group as well as one's social standing within that group. Students often align their behaviors with the norms of distal referents (e.g., campus-wide norms), but there is evidence to suggest that students' drinking behaviors are particularly shaped by the norms for proximal referent groups, such as student clubs (Hummer & Davison, 2016; LaBrie et al., 2008). Tenets of both social comparison theory (Festinger, 1954) and social impact theory (Latane, 1981) posit that proximal referent groups may exert greater normative influence on beliefs and behavior, relative to distal referent groups. Smaller proximal social groups are often closely linked to individuals' sense of self-concept, which increases the salience of group membership (Forsyth, 2019). Small groups are distinct from other peer affiliations because they entail rich group processes (e.g., collective identity) and a dense social structure with close member interactions that may generate particularly powerful peer influences (Eys & Evans, 2018; Kim & Wiesenfeld, 2017). Individuals may also feel stronger pressure to adhere to small group norms because close interactions among members make norm adherence (or deviance) highly visible.

Whereas small groups typically entail these features, groups may differ regarding whether members develop a clear identity and social structure. Members also vary regarding their social standing within that structure. We leverage this perspective when identifying the value of intact peer groups to examine how adherence to perceived drinking norms may be predicted by individuals' social identification strength and the nature of the group's structure. The extent that these aspects of the peer group environment are linked to members' adherence to group norms has not yet been tested, primarily because of challenges associated with sampling enough intact and naturally-occurring groups to estimate such effects.

Social identity. A predominant social psychology perspective pertaining to how groups shape individuals' behavior relates to the extent that one identifies and self-categorizes with the normative referent group (i.e., social identity approach; Hogg & Turner, 1987; Turner, Oakes, Haslam, & McGarty, 1994). Strong social identification is theorized to lead individuals to internalize normative group behavior and strivings to uphold the characteristics of a prototypical group member (Hogg, 2016; Jetten, Spears, & Manstead, 1997). The extent that one's social identification strength influences behavior is thought to be especially pronounced within smaller and more proximal groups that generate powerful peer influences, such as student clubs (Hogg & Reid, 2006; Kim & Wiesenfeld, 2017).

In line with this theoretical perspective, there is evidence that social identification strength may play a key role in adherence to perceived drinking norms. When examining the relative strength of normative influence from different referent groups including same-sex, same-race, and same-Greek-status students, researchers reported that students with strong identities within a given referent group reacted more strongly to the perceived descriptive norms (i.e., drinking norms and behaviors had a stronger association; Neighbors et al., 2010). In a similar study, researchers found that the association between perceived injunctive norms for friends and students' own alcohol use was stronger for students who identified more strongly with their group of friends (Reed, Lange, Ketchie, & Clapp, 2007). A recent study involving intercollegiate student-athletes also demonstrated that social identification strength with students' sport teams predicted the extent that students conformed during a quasi-experimental paradigm in which researchers manipulated information regarding team drinking norms (Graupensperger, Benson, et al., 2018). Considering this growing body of evidence, it is prudent to examine the extent that students' social identification strength with their proximal peer groups amplifies the extent that

students adhere to perceived drinking norms for those groups.

Group structure. Social connections between members of small groups naturally produce a group structure that governs members' behaviors, especially as it pertains to the status or position of individual members (Forsyth, 2019). It is thus anticipated that the structure of student groups, in terms of intragroup relations among members, may play a key role in the extent that members feel pressure to adhere to group norms. Norm adherence may provide individuals with an avenue to fulfill innate desires for affiliation, belongingness, and acceptance among peers (Baumeister & Leary, 1995). Indeed, attaining peer approval and status within one's group is a central motivating factor for conforming to the group's norms (Nail et al., 2000). Within a given peer group, individuals with less social status may be more motivated to adhere to the group's norms as an attempt to gain approval and demonstrate commitment to the group (Cialdini & Goldstein, 2004; Deutsch & Gerard, 1955).

Alongside indices of where an individual sits within their respective social group, a group's structure as a whole may also influence the extent that members conform to group norms. Network density is a sociometric index of social connectivity among members of a group and is typically considered to be a positive group attribute that fulfills members' need for affiliation. However, it is plausible that more densely connected groups may feature stronger pressures for members to conform to the normative behaviors of the group. Network scientists have approached the concept of social norms as a 'complex contagion' and have posited that network density may amplify the extent that social norms influence individuals' behavior (Davis et al., 2015). Dense groups feature more social ties between members, meaning there are more paths by which members can influence one another.

Sex Differences in Norm Adherence

When examining variability in adherence to group drinking norms, it is important to explore sex differences. In aggregating findings from experimental conformity tasks, a meta-analysis showed that women tended to conform more readily than men, but only to a small degree (Eagly, Wood, & Fishbaugh, 1981). Social psychologists have theorized that men and women may conform to group norms for different reasons; men may be more concerned with conforming to maintain social status while women conform to maintain social connections and group harmony (Eagly, 1983). Among student-athletes, a recent study reported that women more readily conformed to manipulated team norms pertaining to prosocial behaviors such as volunteerism, but men more readily conformed to health-risk behaviors including heavy episodic drinking and marijuana use (Graupensperger, Benson, et al., 2018). It nevertheless remains unclear whether adherence to actual perceptions of group drinking norms varies between groups of men and groups of women.

The Current Study

The purpose of the current study was to examine variability in the extent that students adhere to perceived peer group drinking norms. We specifically sought to identify factors that may amplify or depress the salience of small group norms for one's own behavior. We adopted a longitudinal approach to examine associations between perceived group drinking norms and students' own alcohol use at three timepoints across a single school year. Using a multilevel design (i.e., responses nested within people who are nested within groups) enabled us to examine time-varying moderation effects on the norms-behavior association. We specifically focused on associations at the between-person level to examine *who* is more likely to adhere to group drinking norms, as well as the within-person level to examine *when* individuals are more likely

to adhere to group drinking norms relative to aggregated person-mean levels. For example, disentangling the within-person effects may reveal that students are more willing to adhere to group drinking norms at timepoints when they identify more strongly with their group – relative to one’s usual level of social identification.

To best-specify emerging group processes – and examine their boundedness within real-life groups – it was critical to sample intact and naturally-occurring groups of students that feature ongoing interactions. Student club sport teams represented a valuable group context for these research questions because these groups remain intact throughout the school year and are readily accessible given the popularity of extracurricular sport organizations. In addition to sport-playing students being a relatively high-risk subgroup for alcohol use (Turrisi et al., 2006), sport teams are ideal proximal peer groups for studying group processes such as conformity because of shared tasks and identities (Graupensperger, Benson, et al., 2018).

Aligned with the vast extant literature in this domain, we anticipated that students’ self-reported alcohol use would be predicted by perceptions of the descriptive and injunctive norms within their sport teams. However, the primary focus of the current study was to examine interaction effects regarding the extent that the norms-behavior association was moderated by components of the group environment. We specifically examined the role of: (a) social identification strength, (b) indegree centrality, and (c) group-level network density. We formulated hypotheses that aligned with group dynamics theory and empirical findings:

H1. The association between perceived norms and alcohol use will be stronger for students who identify more strongly with their sport team at both the within- and between-person levels.

H2. The association between perceived norms and alcohol use will be stronger for those who are less central in their team relative to teammates, at both the within- and between-person levels.

H3. The association between perceived norms and alcohol use will be stronger for students' who belong to relatively more tightknit clubs (i.e., network density).

By studying naturally occurring same-sex groups and collecting data from most or all team members, we could also pursue exploratory goals. As an exploratory aim, we examined whether the norms-behavior association differed in strength between men's and women's sport clubs. Studying intact groups over the course of a school year also presented the unique opportunity to examine the extent that groups come to a consensus on descriptive and injunctive drinking norms. Although perceptions of group drinking norms are an individual-level phenomenon, past research using large and diffuse referent groups has lacked the capacity to test whether consensus among group members emerges over time. Consensus emergence modeling specifically enabled us to test whether students' perceptions of group drinking norms and self-reported alcohol use behaviors became more similar within-groups across the school year.

Method

Participants and Procedures

We sampled 1,054 college students (61% female) from a large public university in the United States. Most participants identified as white (82%) and the sample comprised 28% freshmen, 23% sophomores, 26% juniors, 22% seniors, and 1% graduate students. Participants were nested within 35 intact sport teams (e.g., ultimate frisbee, lacrosse, soccer, equestrian) that were same-sex and competed at the intercollegiate 'club' level. Each team was formally organized by an established club sport department within the institution and was led primarily by student leaders. At the outset of the study, the average team size was 24.34 students ($SD = 12.66$), with members having reported an average team tenure of 1.73 seasons ($SD = 0.69$).

Approval was obtained from the authors' institutional review board prior to recruitment.

Researchers met with members of each participating team as a group, before or after practices or team meetings to provide an overview of the study and invite students to participate. Data were collected at three timepoints with three-month lags. Whereas Time one (T1) took place at the middle of the fall semester after all teams had formed and commenced training, Time two (T2) took place early in the spring semester and Time three (T3) took place late in the spring semester. Participants used electronic tablets and smart phones to complete surveys. Participation was incentivized at each timepoint by the choice of either: (a) a \$5 gift card or (b) credit towards the community service hours required of each student by the club sport organization. Data obtained from the initial timepoint have been reported in a prior publication that only incorporated the peer nomination and social identity items from this research (see Graupensperger, Panza, & Evans, 2019).

Measures

Alcohol use and perceived drinking norms. We employed comparable rating scales to measure the three core constructs reflecting students' self-reported alcohol use behavior, perceived descriptive norms, and perceived injunctive norms. Participants were first shown detailed descriptions of how much alcohol is considered to be one standard drink for various types of alcohol (e.g., wine, beer, liquor). Using the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985), participants reported the typical number of drinks they had on each day of the week for the past three months. Responses across days of the week were aggregated into a typical weekly number of drinks variable. Perceptions of descriptive norms for participants' respective club sport teams were assessed using the Drinking Norms Rating Form (DNRF; Baer, Stacy, & Larimer, 1991). This normative assessment mirrors the structure of the DDQ items, but included a stem that directed participants to respond regarding their club:

“During a typical week in the past 3 months, how many drinks do you estimate that a typical *member of your club sport team* had on each day of the week?” Krieger and colleagues (2016) demonstrated that injunctive norms should also be assessed on the same scale as other scales in an investigation used to reflect alcohol use. Following this recommendation, the items reflecting injunctive norms entailed the same drink-based scale as the DDQ and DNRF, followed by the prompt: “During a typical week in the past 3 months, how many drinks do you estimate that a typical *member of your club sport team* views as being acceptable on each day of the week?”

Social identification strength. The Social Identity Questionnaire for Sport (Bruner & Benson, 2018) was used to assess participants’ identification with their club sport team. This 9-item scale specifically measures the strength of athletes’ social identities pertaining to their club membership, and encompasses three subdomains. Considering our general theoretical proposition that social identification strength would moderate key associations, we operationalized social identification as a global construct and aggregated all items. Items nevertheless reflect perceptions of ingroup ties (e.g., “I feel strong ties to other members of this team”), ingroup affect (e.g., “Generally, I feel good when I think about myself as a team member”), and cognitive centrality (e.g., “In general, being a member of this team is an important part of my self-image”). Likert-type response options ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). Scale validation research has demonstrated that this scale is appropriate for measuring social identification as a unidimensional construct – aggregating ingroup ties, ingroup affect, and cognitive centrality subdimensions (Bruner & Benson, 2018).

Indegree centrality and group density. Peer nomination items were used to construct club-specific social networks, from which we computed: (a) individual indices of member centrality within the group, and (b) group density. This social network-based approach aligns

with educational psychology studies that construct classroom networks by asking students to identify affiliations with classmates (e.g., Serdiouk, Berry, & Gest, 2016). Surveys displayed a roster of all team members alongside Likert-type response options where participants indicated social ties with each teammate. The item specifically read: “I spend time with this teammate outside of club sport activities,” on a scale ranging from 0 (*not at all*) to 4 (*all the time*). Participants were informed that leaving a blank response would score as ‘0’ for that club member. Networks were computed for clubs at each timepoint (i.e., 105 networks in total).

We computed *indegree centrality* as the total number and strength of incoming ties, whereby each participants’ raw centrality score reflected the sum of all incoming nomination values from peers. Raw indegree centrality scores were standardized at the within-team level to control for varying team sizes, meaning that indegree centrality variables reflect centrality relative to one’s teammates at a given timepoint. *Network density* is a group-level variable that was calculated using the number and strength of actual ties within a network divided by the highest possible number and strength of potential ties. Students who were listed on club rosters, but who did not participate in the study, were removed from networks when computing density scores at each timepoint to avoid penalizing density scores for non-responders (Žnidaršič, Ferligoj, & Doreian, 2018). A detailed description of managing these social network analyses is also available in a previous study (Graupensperger, Panza, et al., 2019), and visual examples of network indices are displayed in Appendix A.

Analyses

Preliminary analyses entailed calculating descriptive statistics across the study as well as separately at each timepoint. To reduce the influence of outliers, extreme values for number of weekly drinks, perceived descriptive norms, and perceived injunctive norms were recoded to

three standard deviations above the mean at each timepoint (Tabachnick & Fidell, 2019).

Preliminary analyses. The data structure entailed several levels of clustering whereby multiple responses over time were nested in participants who were nested within intact groups. This necessitated the use of multilevel analytic approaches. Intraclass correlation coefficients (ICC) were computed as a descriptive step to estimate the extent that variance in study variables was attributed to the clustered structure of the data. We first estimated ICC values at each wave of responding, which estimates the percentage of total variability that is due to between-person and between-group variability. The three-level structure also required parsing two ICC values when considering variability in all data: (a) variance attributed to the person-level (ICC_{lv2}), and (b) variance attributed to the group-level (ICC_{lv3}). Similarly, multilevel alpha (α) – accounting for nesting within teams – was calculated for the social identity scale at each timepoint to estimate scale reliability.

Consensus emergence. Addressing a descriptive goal of this research to examine the group-level properties of subjective norms and alcohol use, we conducted multilevel consensus emergence modelling (Lang, Bliese, & de Voogt, 2018). Consensus emergence refers to the extent that group members become more similar over time. Consensus emergence models are, in effect, null latent growth models including time and group membership functions. We fit a three-level model that included factors to control-for baseline differences among group members at the first measurement occasion (e.g., baseline drinking). Models included an exponential variance function (i.e., δ_1 coefficient) that identifies emergence (Pinheiro & Bates, 2000). *Negative* δ_1 values signify a linear decrease in residual variance across measurement occasions and indicates that decreasing amounts of residual variance remain after accounting for group membership and time. Effect size for the δ_1 coefficient was calculated as the percentage of reduction in the

residual standard deviation at each measurement occasion. For example, a δ_1 coefficient of -0.05 indicates that the residual variance is reduced by approximately 5% with each measurement occasion (see Lang et al., 2018).

Primary regressions. The primary analyses entailed fitting three-level models with participants' number of weekly drinks as the outcome variable. Separate models were fit for descriptive norms (Model 1) and injunctive norms (Model 2) as predictors to understand how these unique forms of social influence relate to students' alcohol use, and how other study variables may moderate these associations. The three-level modeling approach enabled us to examine both time-varying (i.e., state) and time-invariant (i.e., trait) predictors of weekly drinks.

Models were evaluated hierarchically to identify main effects in Step 1 prior to probing interaction effects in Step 2 (Cohen, Cohen, West, & Aiken, 2003). Participants' age and sex were entered as control variables. Perceived group drinking norms, social identification strength, and indegree centrality were all entered at both the within- (person-mean centered) and between-person (grand-mean centered) levels to estimate time-varying and time-invariant effects. Finally, group-level density was entered as a level-3 time-varying predictor. Decisions to center variables at either the person-mean or grand-mean levels were oriented around the approach best-suited for interpreting effects relative to normative adherence (Brincks et al., 2017). At the within-person level (level-1), variables were person-mean centered to examine time-varying associations and interactions. Between-person (level-2) responses were aggregated across the timepoints and then grand-mean centered to examine time-invariant associations at the trait-level. Interaction terms examined the extent that social identification strength, indegree centrality, network density, and team sex moderated the associations between perceived group drinking norms and participants' number of weekly drinks. To interpret interaction effects, simple slopes were estimated from

parameter estimates at low (-1 SD) and high (+1 SD) levels of the moderator variables.

Multilevel modeling is flexible when managing missing responses, and provided opportunities to include even participants who only completed a survey at one timepoint as this information contributes to between-person and group-level parameters (Kwok, Underhill, Berry, Elliott, & Yoon, 2008). The outcome variable in the current study, number of weekly drinks, was a count variable that was skewed with many responses indicating zero drinks of alcohol. This negative binomial distribution necessitated the use of zero-inflated negative binomial regression within the multilevel framework (see Atkins, Baldwin, Gallop, & Neighbors, 2013). When using this approach, beta coefficients are exponentiated (e^b) to yield rate ratios that indicate the proportional change in the outcome with a one-unit increase in the predictor (Atkins et al., 2013).

Results

Of the total 1,054 participants, 737 participated at two or more waves (70%) and 492 participated in all three waves (47%). Broken into timepoint samples, 847 students participated at T1, 726 participated at T2, and 703 participated at T3. Descriptive statistics showing aggregated values across all three timepoints are displayed in Table 3.1. On average, participants reported 11.19 weekly drinks, which is similar to weekly drinks reported in studies examining college student-athletes (e.g., Dams-O'Connor, Martin, & Martens, 2007), but higher than studies with more general college student samples (e.g., Cail & LaBrie, 2010). Mean values for perceptions of descriptive and injunctive norms were also higher than the number of weekly drinks that students reported.

Table 3.2 displays mean and ICC values for study variables at each timepoint. ICCs indicated that between 58-70% of the variance in study variables was attributable to between-person effects, and between 6-18% of variance was attributable to between-group effects,

highlighting the importance of accounting for group memberships in analyses. Multilevel α estimates indicated that the social identity scale had high reliability within our sample at all timepoints, ranging from .95 to .97 at the between-group level and from .90 to .92 at the within-group level.

Table 3. 1 Descriptive statistics for key study variables, across all timepoints.

Variable	Range	Mean (SD)	Median	% of responses equivalent to zero	ICC	
					Person (Lv-2)	Group (Lv-3)
Drinks per Week ^a	0 – 44	11.19 (9.43)	10	14.59%	.70	.14
Descriptive Norms ^a	0 – 45	14.84 (9.18)	13	4.70%	.58	.18
Injunctive Norms ^a	0 – 45	14.95 (9.78)	13	5.45%	.60	.18
Social Identification	1 – 7	5.57 (1.06)	5.78	--	.63	.06
Indegree Centrality ^b	0 – 88	22.65 (15.65)	20	5.96%	--	--
Network Density	0.34 – 2.06	1.09 (0.99)	0.42	--	--	--

Note: ^aTo reduce the influence of outliers, extreme values were recoded to three standard deviations above the mean (Tabachnick & Fidell, 2019). ^b Values shown here represent raw indegree centrality scores, which were transformed prior to analyses by standardizing values within-group. ICC = Intraclass correlation coefficient.

Table 3. 2 Mean and ICC values for key study variables at each timepoint.

Variable	Mean (SD)			Group-level ICC		
	T1	T2	T3	T1	T2	T3
Drinks per Week ^a	12.24 (10.08)	10.85 (9.98)	10.30 (8.96)	.13	.19	.10
Descriptive Norms ^a	15.77 (9.64)	14.26 (8.80)	14.32 (8.88)	.18	.22	.15
Injunctive Norms ^a	15.58 (10.12)	14.48 (9.52)	14.68 (9.41)	.18	.17	.15
Social Identification	5.63 (0.97)	5.51 (1.08)	5.57 (1.14)	.09	.04	.08
Indegree Centrality ^b	21.34 (16.35)	23.47 (15.47)	23.13 (15.15)	--	--	--
Network Density	.92 (0.41)	1.18 (0.40)	1.19 (0.39)	--	--	--

Note: Sample size T1 = 847, T2 = 726, T3 = 703. ^aTo reduce the influence of outliers, extreme values were recoded to three standard deviations above the mean (Tabachnick & Fidell, 2019). ^b Values shown here represent raw indegree centrality scores, which were transformed prior to analyses by standardizing values within-group.

Consensus Emergence

Consensus emergence model results are provided in Table 3.3. The three significant χ^2 values between the null models (i.e., holding residual variance constant across time) and models including the exponential variance function (δ_1 coefficient) signify that models allowing for change in the residual error variance fit better than models that assume equal error variance. The results shown in Table 3.4 demonstrate that this pattern represents consensus emergence, as there were negative δ_1 coefficients for all models. In other words, these decreases in residual variance over time indicate that group membership accounted for increasing amounts of individual-level variance across timepoints. Descriptively, consensus emergence was most evident for the number of weekly drinks variable.

Table 3. 3 Comparing models of consensus emergence for weekly drinks and perceptions of group norms.

Model	AIC	BIC	LogLik	df	χ^2	<i>p-value</i>
Weekly Drinks						
Mod 1: No Emergence (null)	15719.54	15759.64	-7852.77	7		
Mod 2: Consensus Emergence	15707.14	15752.97	-7845.57	8	14.39	<.001
Descriptive Norms						
Mod 1: No Emergence (null)	15888.35	15928.46	-7937.18	7		
Mod 2: Consensus Emergence	15885.81	15931.65	-7934.91	8	4.54	.033
Injunctive Norms						
Mod 1: No Emergence (null)	16146.77	16186.88	-8066.39	7		
Mod 2: Consensus Emergence	16139.15	16184.99	-8061.58	8	9.62	.002

Note: The consensus emergence models (Mod 2) add residual variance terms allowing residual variances to change over time. Significant χ^2 values indicate that models allowing for change in the residual error variance fit the data better than models that assume equal error variance.

Table 3. 4 Three-level consensus emergence models.

Parameters	Weekly Drinks	Descriptive Norms	Injunctive Norms
Intercept, γ_{000}	12.03***	15.07***	15.02***
TIME, γ_{100}	-0.63***	-0.43*	-0.17
Group intercept variance, $\sigma^2_{\beta_{00}}$	17.13	25.95	23.49
Group variance for TIME, $\sigma^2_{\beta_{10}}$	0.31	0.62	0.38
Person intercept variance, $\sigma^2_{\pi_0}$	52.20	34.78	41.92
Residual variance, σ^2_e	41.07	45.92	55.59
TIME, δ_1	-.11***	-.06*	-.09**

Note: TIME (δ_1) represents the exponential variance function weight for time, showing the direction and extent of change in residual variance from previous timepoints [e.g., For weekly drinks, a decrease in residual variance from 41.07 at baseline to $41.07 \times \exp(2 \times -0.11 \times 2) = 26.45$ at time two]. * $p < .05$, ** $p < .01$, *** $p < .001$.

Multilevel Models

Recall that three-level multilevel models first estimated the main effects of predictor variables on the number of weekly drinks (Step 1), and then estimated moderation of these associations (Step 2). In both the descriptive and injunctive norms models, adding the interaction terms in Step 2 significantly improved the model fit ($p < .001$).

Descriptive norms (Model 1). Table 3.5 displays the results for the descriptive norms model. Interpreting Step 1, within-person effects showed that when students perceived descriptive norms for their respective groups that were above their aggregated person-mean, they also reported greater-than-usual alcohol consumption. Descriptive norms also significantly predicted weekly drinks at the between-person level; students who perceived relatively higher levels of descriptive norms on average also engaged in greater alcohol use. Weekly drinks was

positively predicted by within-person variability in students' social identification strength as well as students' indegree centrality at the between-person level. Network density was a group-level variable that positively predicted alcohol use; students who belonged to relatively more dense networks reported higher numbers of weekly drinks.

Moderating effects were the primary focus of this study, and results revealed significant interactions related to social identification and team density (see Figure 3.1). In support of our first hypothesis, social identification strength significantly moderated the association between descriptive norms and weekly drinks at both the within- and between-person levels. This finding indicates that the association between descriptive drinking norms and alcohol use was greater among students who reported relatively strong social identification – relative to their own mean (within-person), and relative to other participants (between-person). Counter to our second hypothesis, indegree centrality did not moderate the association of interest at either the within- or between-person level. Network density was a significant moderator, whereby adherence to perceived descriptive norms was amplified within teams that were relatively more dense, thus supporting our third hypothesis. Finally, sex was not a significant moderator.

Injunctive norms (Model 2). Perceived injunctive norms significantly predicted students' number of weekly drinks at both the within- and between-person levels (Table 3.6). This indicates that in addition to typical perceptions of injunctive norms predicting students' typical alcohol use, students engaged in greater-than-usual alcohol use at timepoints when they perceived higher-than-usual injunctive norms. The main effects within the multilevel model including injunctive norms also differed from the descriptive norms model in several ways. Social identification strength was not a significant predictor of alcohol use at either the within- or between-person level and network density was no longer a significant group-level predictor of

alcohol use.

Interaction terms were interpreted to examine hypothesized moderator variables on the association between perceived injunctive norms and number of weekly drinks. Students' social identification strength, at both within- and between-person levels, significantly moderated the association (Figure 3.2). This shows that students who identified more strongly at the trait-level adhered to perceived injunctive norms to a greater extent, while students identifying more strongly than their usual response also adhered more strongly to the injunctive norms than at other timepoints.

The interaction between injunctive norms and indegree centrality revealed that students who were nominated as less central, relative to teammates, more readily adhered to perceived injunctive group drinking norms. It was also revealed that at the within-person level, students adhered to perceived injunctive norms to a greater extent at timepoints when they were nominated as relatively less central. These findings are in support of our second hypothesis but are incongruent with the findings derived from the descriptive norms model in which indegree centrality did not moderate the association between descriptive norms and alcohol use. Counter to our third hypothesis, network density did not amplify the extent that students adhered to perceived injunctive norms, which is also incongruent with the descriptive norms model – highlighting differences between the influence of descriptive and injunctive norms. Similar to descriptive norms, sex was not a significant moderator.

Table 3. 5 Multilevel zero-inflated negative binomial regression models evaluating alcohol use as a function of descriptive norms.

Predictor	Step One: AIC = 13843; -2LL = 13,817				Step Two: AIC = 13818 ; -2LL = 13,778			
	e^b	e^b 95% CI	z	p -value	e^b	e^b 95% CI	z	p -value
Level-1 (Within-Person Time-Varying)								
Age _(GMC) γ^{100}	1.048	[1.027, 1.068]	4.65	<.001	1.042	[1.011, 1.074]	2.69	.007
Descriptive Norms _(PMC) γ^{200}	1.027	[1.023, 1.031]	14.60	<.001	1.015	[1.004, 1.027]	2.66	.008
Social Identity _(PMC) γ^{300}	1.034	[1.028, 1.041]	10.13	<.001	1.038	[1.003, 1.074]	2.15	.032
Indegree Centrality _(PMC) ^a γ^{400}	1.001	[0.959, 1.045]	0.05	.958	1.006	[0.968, 1.045]	0.29	.769
Level-2 (Between-Person Time-Invariant)								
Descriptive Norms _(GMC) γ^{010}	1.045	[1.043, 1.047]	52.98	<.001	1.034	[1.014, 1.055]	3.35	<.001
Social Identity _(GMC) γ^{020}	0.991	[0.971, 1.012]	-0.81	.420	0.987	[0.946, 1.029]	-0.62	.533
Indegree Centrality _(GMC) γ^{030}	1.074	[1.061, 1.088]	11.15	<.001	1.090	[1.045, 1.136]	4.05	<.001
Level-3 Variables (Group-Level)								
Sex (<i>Men</i> = 0, <i>Women</i> = 1) γ^{001}	0.930	[0.903, 0.959]	-4.71	<.001	0.878	[0.773, 0.998]	-1.99	.047
Network Density _(Time-Varying) γ^{002}	0.918	[0.875, 0.963]	-3.52	<.001	0.941	[0.873, 1.015]	-1.58	.115
Level-1 Interactions (Within-Person Time-Varying Moderation)								
Descriptive Norms _(PMC) \times Social Identity _(PMC) γ^{500}					1.010	[1.026, 1.018]	4.39	<.001
Descriptive Norms _(PMC) \times Indegree Centrality _(PMC) γ^{600}					0.978	[1.001, 0.989]	-1.84	.066
Level-2 Interactions (Between-Person Time-Invariant Moderation)								
Descriptive Norms _(GMC) \times Social Identity _(GMC) γ^{040}					1.007	[1.002, 1.011]	2.86	.004
Descriptive Norms _(GMC) \times Indegree Centrality _(GMC) ^a γ^{050}					0.998	[0.993, 1.003]	-0.90	.371
Cross-Level Interactions								
Descriptive Norms _(PMC) \times Density γ^{202}					1.010	[1.000, 1.019]	1.97	.048
Descriptive Norms _(GMC) \times Sex γ^{011}					1.006	[0.994, 1.018]	1.01	.312
Zero-Inflation Model								
Intercept	$b = -2.02, se = .03, z = -59.30, p <.001$				$b = -1.95, se = .06, z = -32.46, p <.001$			

Note: e^b = exponentiated beta, which represents proportional change for each unit increase in the predictor (e.g., an e^b of 1.03 = 3% increase for each unit change in the predictor). GMC indicates that variable was grand-mean-centered. PMC indicates that variable was person-mean-centered. ^aIndegree centrality was standardized within each club (i.e., scores are relative to fellow club members). Step two was significantly better fit to the data: $\chi^2 = 38.85, p < .001$.

Table 3. 6 Multilevel zero-inflated negative binomial regression models evaluating alcohol use as a function of injunctive norms.

Predictor	Step One: AIC = 13,939; -2LL = 13,911				Step Two: AIC = 13,921 ; -2LL = 13,881			
	e^b	e^b 95% CI	z	p -value	e^b	e^b 95% CI	z	p -value
Level-1 (Within-Person Time-Varying)								
Age _(GMC) γ^{100}	1.038	[1.005, 1.072]	2.25	.024	1.043	[1.011, 1.076]	2.64	.008
Injunctive Norms _(PMC) γ^{200}	1.020	[1.017, 1.024]	10.67	<.001	1.017	[1.005, 1.029]	2.87	.004
Social Identity _(PMC) γ^{300}	1.034	[0.994, 1.070]	1.62	.104	1.023	[0.986, 1.061]	1.21	.227
Indegree Centrality _(PMC) ^a γ^{400}	1.005	[0.965, 1.047]	0.23	.817	1.012	[0.971, 1.054]	0.57	.568
Level-2 (Between-Person Time-Invariant)								
Injunctive Norms _(GMC) γ^{010}	1.039	[1.034, 1.044]	16.02	<.001	1.029	[1.014, 1.044]	3.93	<.001
Social Identity _(GMC) γ^{020}	0.991	[0.956, 1.048]	0.03	.977	0.998	[0.952, 1.047]	-0.06	.950
Indegree Centrality _(GMC) γ^{030}	1.116	[1.061, 1.172]	4.31	<.001	1.129	[1.069, 1.192]	4.35	<.001
Level-3 Variables (Group-Level)								
Sex (<i>Men</i> = 0, <i>Women</i> = 1) γ^{001}	0.907	[0.780, 1.054]	-1.27	.201	0.913	[0.790, 1.056]	-1.23	.221
Network Density _(Time-Varying) γ^{002}	0.930	[0.853, 1.014]	-1.64	.103	0.931	[0.853, 1.016]	-1.61	.108
Level-1 Interactions (Within-Person Time-Varying Moderation)								
Injunctive Norms _(PMC) \times Social Identity _(PMC) γ^{500}					1.018	[1.009, 1.027]	4.08	<.001
Injunctive Norms _(PMC) \times Indegree Centrality _(PMC) γ^{600}					0.984	[0.973, 0.995]	-2.85	.004
Level-2 Interactions (Between-Person Time-Invariant Moderation)								
Injunctive Norms _(GMC) \times Social Identity _(GMC) γ^{040}					1.006	[1.001, 1.010]	2.27	.023
Injunctive Norms _(GMC) \times Indegree Centrality _(GMC) ^a γ^{050}					0.994	[0.989, 0.999]	-2.17	.029
Cross-Level Interactions								
Injunctive Norms _(PMC) \times Network Density γ^{202}					1.002	[0.992, 1.012]	0.37	.714
Injunctive Norms _(GMC) \times Sex γ^{011}					1.007	[0.998, 1.016]	1.42	.156
Zero-Inflation Model								
Intercept	$b = -1.94, se = .07, z = -28.16, p <.001$				$b = -1.96, se = .07, z = -25.33, p <.001$			

Note: e^b = exponentiated beta, which represents proportional change for each unit increase in the predictor (e.g., an e^b of 1.03 = 3% increase for each unit change in the predictor). GMC indicates that variable was grand-mean-centered. PMC indicates that variable was person-mean-centered. ^aIndegree centrality was standardized within each club (i.e., scores are relative to fellow club members). Step two was significantly better fit to the data: $\chi^2 = 29.66, p < .001$.

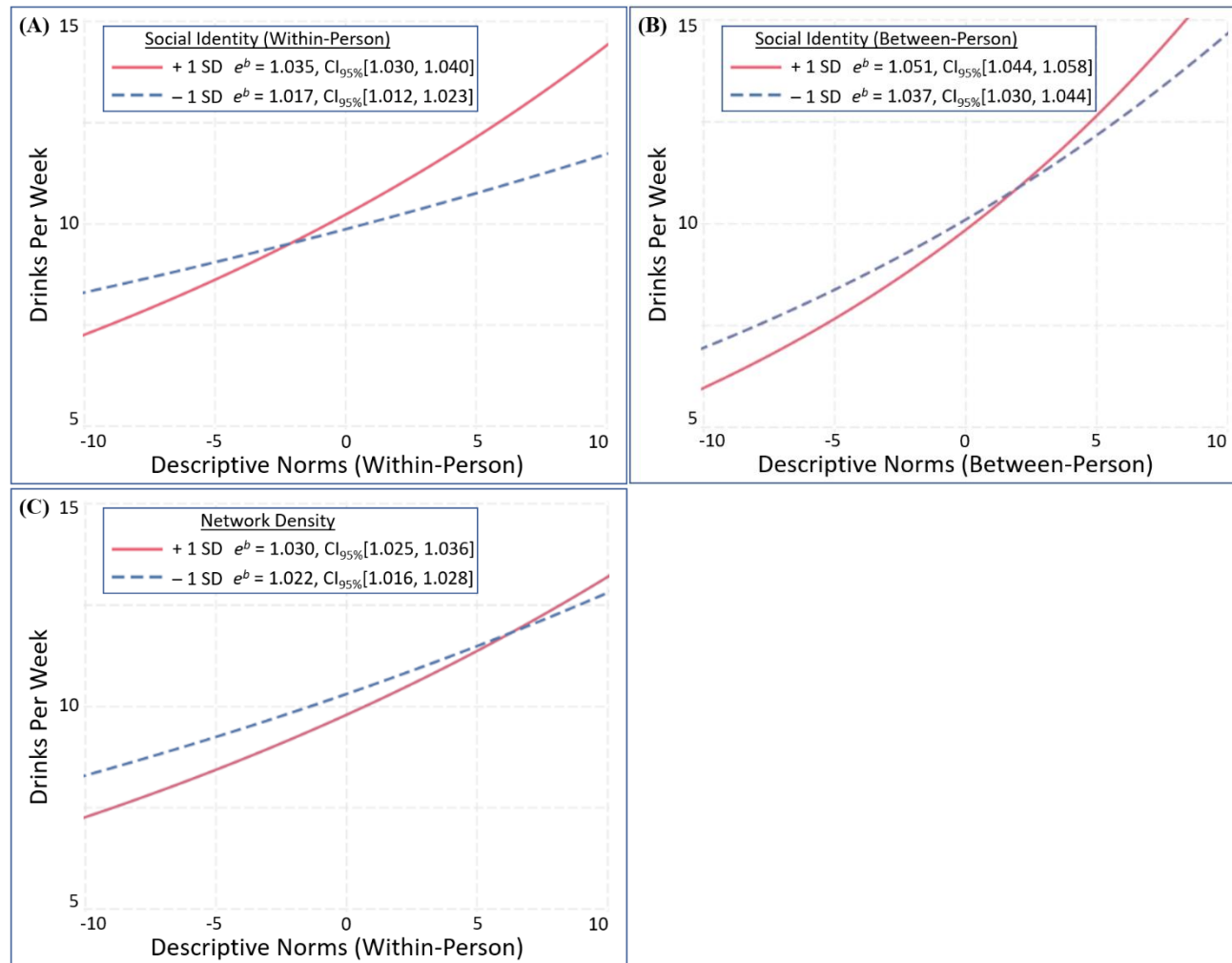


Figure 3. 1 Simple slopes visualizing significant interactions with descriptive norms. Figures demonstrate moderation by: (A) social identity (within-person), (B) social identity (between-person), and (C) network density.

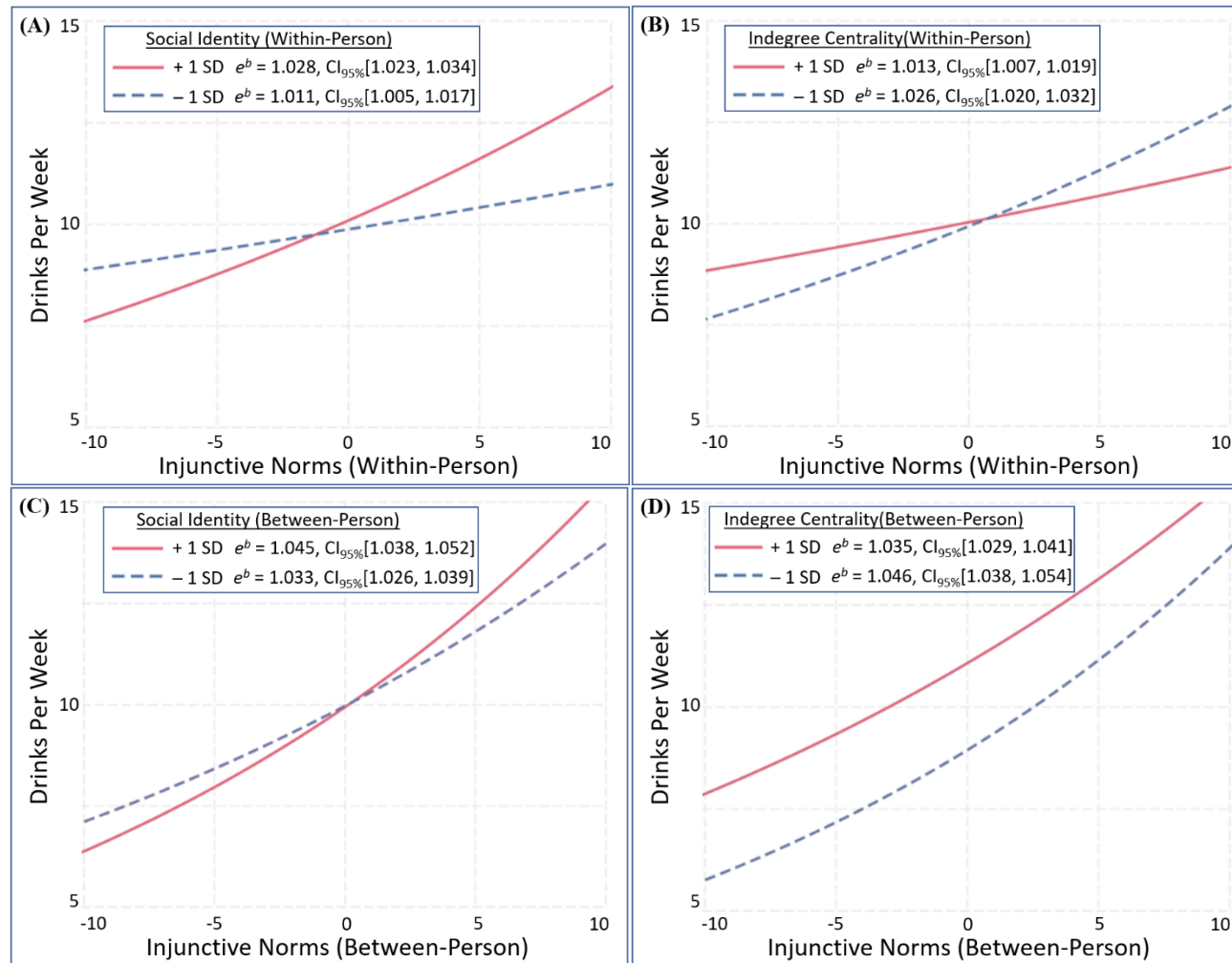


Figure 3. 2 Simple slopes visualizing significant interactions with injunctive norms. Figures demonstrate moderation by: (A) social identity (within-person), (B) indegree centrality (within-person), (C) social identity (between-person), and (D) indegree centrality (between-person).

Discussion

College students experience numerous social relationships that influence their alcohol use behavior. The current study focused on social influences within small groups of students, which are thought to be salient sources of peer influence on alcohol use, even when the group is structured around task-focused activities like sport competitions. The purpose of the current study was to examine aspects of the group environment within proximal groups that explain variability in the extent that students adhered to perceived descriptive and injunctive drinking norms for their sport team. We employed a longitudinal design to examine the extent that social identification strength, indegree centrality, and network density moderated the effects of perceived norms on students' typical number of weekly drinks at both within- and between-person levels. Collectively, the findings revealed that small group alcohol use norms are an emergent and dynamic process, and that students' perceptions of group drinking norms predicted alcohol use behaviors. We also identified several components of small group environments that may amplify the association between subjective norms and alcohol use.

Central to the effects described in this study were underlying findings that perceptions of descriptive and injunctive drinking norms for students' sport team predicted alcohol use behavior. These effects extend existing literature in this domain by examining both trait- and state-level effects of perceived norms on students' alcohol use. In addition to a between-person effect of perceived norms on number of weekly drinks (trait-level), the significant within-person effects indicated that students reported higher engagement in alcohol use at specific timepoints in which they perceived higher group drinking norms. This shows that the association between perceived norms and alcohol use may be dynamic; fluctuations in perceptions of peers' drinking attitude and behaviors over time relate to variability in students' own alcohol use.

These effects were nevertheless moderated, in line with hypotheses. In support of social identity theorizing (e.g., Hogg, 2016), students who identified more strongly with their respective sport team more readily adhered to perceived descriptive and injunctive drinking norms. This interaction effect occurred at the between-person level as well as at the time-varying within-person level such that adherence to perceived drinking norms was more pronounced at timepoints when students reported relatively stronger social identification. This builds upon evidence that normative influences are particularly strong when students form strong identities around memberships to proximal peer groups (Graupensperger, Benson, et al., 2018; Neighbors et al., 2010; Reed et al., 2007). Group researchers agree that identifying with a social group can facilitate psychological and developmental benefits (Greenaway, Cruwys, Haslam, & Jetten, 2016); however, the current findings reveal a possibly pernicious effect. Those who identify strongly with their social group may feel stronger pressures to adhere to the norms of the group. Within-person level moderation effects from this study were nevertheless novel, revealing that norm adherence was increased when individuals identified more strongly than normal. These findings provide comparably stronger evidence for this association by factoring out some complications within between-subjects effects (e.g., inference errors; Curran & Bauer, 2011) and align with theorizing that group members' identities fluctuate with time and can impact the connections that individuals feel with their groups.

Interaction effects also revealed aspects of groups' network structure that may influence adherence to perceived group drinking norms. Individual members who were less central to the group's social structure (at both within- and between-person levels) reported greater adherence to injunctive norms, although this interaction was non-significant in the descriptive norms model. This provides evidence that perceptions of what peers' deem to be *acceptable* drinking behaviors

are especially influential for those individuals with lower social standing within a group. Provided that the social ties within the current study were comprised of the strength and frequency of social interactions among teammates, we draw from constructs of status and popularity within networks to interpret these effects (Asher & McDonald, 2009). The finding that those lower in centrality are more susceptible to injunctive normative influence aligns with theorizing that individuals may conform to injunctive group norms in attempt to increase their status and attain peer approval (Cialdini & Goldstein, 2004). This result also aligns with neuroscience findings that in-group conformity activates neural rewards in a brain region closely linked to social acceptance, suggesting that those who are more socially excluded may conform more readily to obtain these positive neural responses (Stallen, Smidts, & Sanfey, 2013).

We acknowledge that there may be reason to anticipate that norm adherence would be stronger for more central group members. Group leaders, for example, may face strong pressures to behave in line with group norms, as prototypical members (Hogg, 2016). Studying drinking groups that exist purely to imbibe together, researchers also reported that students nominated as having higher status engaged in heavy episodic drinking at a level that was more similar to the groups' actual aggregate mean-level, relative to members receiving fewer nominations from peers (Dumas, Davis, Maxwell-Smith, & Bell, 2018). These researchers failed to replicate this finding in a second study, however. Although the current study differed in numerous ways from the work of Dumas et al., including the relative salience of drinking norms to the identity of the group, it is nevertheless important to note the potential for social status and peer nominations to produce complex motives related to norm adherence.

Alongside indices of centrality within one's network, network density also moderated the effect of descriptive drinking norms on students' own alcohol use. Members of networks

featuring denser social ties among members more readily adhered to perceptions of descriptive drinking norms. Because network density was assessed as a time-varying group-level variable, the results indicated that norm adherence was stronger at timepoints when network density scores were higher. Although this cross-level interaction effect was near the threshold to be considered statistically significant, it aligns with social identity theorists who have posited that group norms are more salient within more dense social networks (Hogg, 2016). To our knowledge, this finding is also the first to support ‘complex contagion’ theorizing by network scientists who have argued that network density would increase the salience of social norms (Davis et al., 2015).

Interpretation of the effects regarding centrality and density should both be made while recognizing that the networks used to derive these indices were based on self-reported social ties regarding time spent together outside of sport. Given that peer nominations in the current study involved reporting interactions away from training settings, athletes with higher centrality and/or in more dense groups may experience more opportunities to be exposed to group norms and to be observed by other members. One counter explanation is that members of teams that spend more social time together may be more likely to drink similar amounts of alcohol because they are attending the same social gatherings, and this behavioral homogeneity could be misinterpreted as norm adherence. This is especially pertinent considering that network density amplified norms-behavior association with descriptive norms but not injunctive norms pertaining to peers’ approval. The findings are nevertheless a novel addition to the peer influence literature and the first study to our knowledge that has examined norm adherence in relation to social network indices of intact groups.

Although it was not a central aim, sampling intact same-sex groups of students provided

a unique opportunity to test whether adherence to perceived group drinking norms differed between men's and women's sport teams. Our results however did not identify differences between men and women in terms of adherence to group drinking norms. Perhaps perceived norms are equally influential for both groups of men and women, meaning that norms-based interventions could be a promising harm-reduction strategy regardless of sex. Nevertheless, we note that it may be prudent for future studies to examine three-way interactions to determine whether the moderating effects of social identification and indegree centrality on norm adherence differs by sex. As an example, this recommendation is made in light of evidence that women are more sensitive to social exclusion, which is relevant given that concerns about peer acceptance can motivate conformity to group norms (Benenson et al., 2013). Perhaps the power of group-related constructs on normative adherence is the effect moderated by gender, as opposed to the simpler association between perceived norms and behavior.

Whereas the primary focus of this research was to examine interaction effects, several study variables predicted students' alcohol use at both within- and between-person levels. At the between-person level, students who were nominated by peers as being more central to the team social network (i.e., indegree centrality) reported greater alcohol use. At the within-person level, it was revealed that students engaged in greater alcohol use at timepoints when they reported stronger social identification with their respective sport teams – relative to one's own mean level of social identification strength. It should be noted, however, that this main effect was only significant in the model that included the effect of descriptive norms. Finally, there was evidence that belonging to a team with higher network density may predict greater alcohol use, though this effect was only significant in the injunctive norms model.

As we investigate how students' proximal peer groups can influence decisions to engage

in alcohol use, a secondary aim was to explore the extent that members' perceptions of group drinking norms approached consensus over time. Evidence for consensus emergence for both perceived group drinking norms and self-reported alcohol use behavior documents the process regarding how peer groups socialize members' attitudes and behaviors (McCabe et al., 2005). By sampling many intact peer groups at several timepoints, we revealed that student club sport teams approached consensus pertaining to perceptions of the groups' descriptive and injunctive drinking norms. Although each individual held unique normative perceptions, they demonstrated similarities with other team members that strengthened across the school year. Consensus emergence modeling also revealed that students' alcohol use behaviors became more similar within groups over time. This evidence is particularly novel considering that it extends beyond mere selection effects (e.g., those with heavier drinking behavior initially selecting a sport club that engages in heavy alcohol use). Given that we sampled task-focused sport groups, where it is assumed that students join for the primary purpose of playing sport rather than for alcohol-specific reasons that are common in other types of student groups (e.g., Greek organizations), this evidence for socialization effects on alcohol use is particularly compelling.

Implications

Identifying moderators on the extent that students adhere to normative perceptions will nevertheless enhance our understanding of social processes that may shape students' drinking behaviors. When interpreting these findings regarding factors that may amplify or diminish adherence to group drinking norms, it is critical to emphasize that adherence to group norms is not necessarily a risky process. Adherence to norms can be protective at times. For example, if a student adheres to perceptions that drinking is *not* approved of by fellow group members, the student may indeed drink *less* than they otherwise would. There are accordingly applied

implications, with normative perceptions being the target of interventions related to a spectrum of health risk behaviors. Interventions to shape perceptions of peer norms are an especially common strategy in approaches targeting college students, and if stakeholders are able to shift drinking norms downward, then increasing norm adherence would be constructive.

Social identification strength may amplify the extent that individuals adhere to the drinking norms of their peer groups. While this is desirable when perceived group drinking norms are low, this can also increase risky behavior when individuals hold perceptions that group members approve of and engage in heavy alcohol use. As such, the challenge in translating these findings into practice is identifying strategies to foster strong group identities, while also addressing pressures to adhere to health-risk norms such as heavy alcohol use. The content of a group's identity can be modified through interventions (see Steffens et al., 2019), and it may be possible to promote constructive behaviors as part of a group's identity from the early stages of group formation. That is, it may be possible to build the group's identity around healthful behaviors that can then become ingrained within members' sense of self concept. For example, therapists have been able to increase patients' commitment to sobriety by gradually shaping individuals' social identity from 'user' to 'in recovery' (e.g., Dingle et al., 2019). The current finding that social identification may amplify adherence to group drinking norms adds to a growing literature on ways in which social identification can be a salient source of positive influence on substance use that may be targeted alongside beliefs about normative behaviors.

Results regarding the salience of norms in more dense teams also demonstrates the practical value in intervening within proximal groups (Labrie, Hummer, Huchting, & Neighbors, 2009). Presuming that norm-adherence may increase as a group becomes more densely connected, norms-based strategies may be more effective after group members have had time to

develop meaningful social connections. Network analyses also showed that less central members who are on the periphery of a group's social structure may be particularly motivated to adhere to injunctive drinking norms, perhaps as a way of gaining social approval. As such, it is important for student groups to provide avenues for members to demonstrate commitment and gain approval from other members, which may alleviate pressures to adhere to group drinking norms. University stakeholders should inform student leaders of college sport teams that members with low social standing may experience pressures to conform their behaviors in risky ways. This may be particularly important for socializing new members into student groups, in which on-boarding procedures can emphasize positive and healthy norms.

Limitations and Future Directions

Several limitations pertaining to study design warrant further discussion. As an initial point, we note that the zero-inflated nature of this data meant that effect sizes from this study cannot readily be compared with effect sizes from studies based on assumptions of normal distributions and with only alcohol-using students. Specifically, effect sizes appear relatively small across the presented results because the sample contained a substantial number of non-drinkers, which deflates effect sizes for predictor variables such as perceived descriptive norms. For example, a non-drinking student who reported consuming zero drinks in a typical week may still report ten or more drinks for the descriptive group norms item – inflating the standard error. Nevertheless, the magnitude of the interaction effects found in the current study are similar to those reported by researchers who examined the moderating effect of identification strength with same-sex, same-race, and same-Greek status normative referents that also used negative binomial regression analyses (Neighbors et al., 2010).

The current study entailed three waves of data collection that were lagged at three-month intervals to feasibly assess student groups across the school year. We note that group processes such as social identification and network density may be highly dynamic, and three-months may be too long of an interval to capture how these processes influence norm adherence. Sport researchers have recently assessed daily fluctuations in social identification strength using daily-diary sampling (Benson & Bruner, 2018). Pairing such assessments with daily drinking may be a promising future direction to examine how social identification may have a more immediate influence on students' adherence to group drinking norms, while also gaining a more sensitive measure of alcohol use.

Finally the circumstances surrounding the team environment may also influence the effects reported. As it pertains to alcohol use among student-athletes, some researchers have noted that alcohol use may be more prevalent during the off-season (Martens, Dams-O'Connor, & Duffy-Paiement, 2006), although these differences may be negligible (Dams-O'Connor et al., 2007). Because college club sport teams practice and train throughout the entire school year with competitions often scheduled sporadically, we were unable to systematically control for when teams were nearing peak competitive seasons. A related point is that norm adherence may be greater within sport teams that entail high task interdependence (e.g., soccer) relative to individual sports (e.g., golf). The sport teams that we sampled all included some level of interdependence, and even individual sports all involved a collective outcome across all members. To test whether normative effects vary based on sport type, future research will need to sample groups with more variability in levels of interdependence by including a wider range of individual sports.

Conclusion

The current study examined college students' adherence to perceived group drinking norms within intact sport teams at three timepoints across the school year. We used novel methodological tools within this context, including social network analyses within a multilevel framework. Several novel findings revealed group processes that may amplify the extent that students adhere to perceived group drinking norms. The longitudinal design also revealed time-varying moderation, such that fluctuations in students' perceptions of the group environment and dynamic aspects of the group structure explained variance in the extent that students adhered to perceived group drinking norms. Taken together, the findings from the current study make a novel contribution to our understanding of peer influences on college student alcohol use and hold practical implications for norms-based harm reduction strategies. Building upon the current results, we encourage future research efforts to continue to study students' proximal peer groups, like student clubs and organizations, as salient sources of social influence.

CHAPTER FOUR: GENERAL DISCUSSION

With estimates of over 2 million U.S. college students participating on club sport teams each year, sport is among the most popular extracurricular activities for students (Pennington, 2008). At the Pennsylvania State University, for example, it is estimated that nearly 3,000 students formally participate in a club sport, not including intramural participation. This is encouraging given that participation in such student clubs can have positive effects on psychosocial development for college students (Doerksen, Elavsky, Rebar, & Conroy, 2014). Moreover, sport participation is linked to social connectedness (Hoye, Nicholson, & Brown, 2015), improved mental health (Panza et al., *Under Review*), and other indices of health-related quality of life (Eime, Harvey, Brown, & Payne, 2010). Alongside these benefits, however, there is growing concern that sport-playing college students may engage in greater levels of health-risk behaviors – especially alcohol use (Graupensperger, Linden-Carmichael, et al., *Under Review*; Turrisi et al., 2006). To ensure that sport participation is a constructive and healthy activity for college students, it is critical that we understand how sport groups can influence individuals' decisions to engage in health-risk behaviors.

My doctoral research program examined how peers (i.e., teammates) and the group environment of collegiate sport teams can be determinants of students' attitudes and behaviors pertaining to health-risk behaviors, with a focus on alcohol use. Proximal peer groups such as club sport teams often entail close relationships among members, which contribute to these groups becoming a salient source of social influence (Graupensperger, Panza, et al., 2019). In a previous study within this line of research we found that student-athletes' attitudes towards numerous health risk behaviors clustered within teams, including attitudes towards behaviors like heavy episodic drinking and marijuana use. Clustering of these behaviors meant that members of

the same team held attitudes that were more similar to one another, relative to the attitudes of members of other sport teams (Graupensperger, Benson, et al., 2019). A related study revealed that student-athletes looked toward their teammates when deciding the extent that they anticipated engaging in health-risk behaviors when faced with hypothetical scenarios. Specifically, when we manipulated group norms to make it appear as though team members strongly endorsed hypothetical risky behaviors, approximately 20-30% of student-athletes changed their responses to report that they too would engage in riskier behavior (i.e., conformity; Graupensperger, Benson, & Evans, 2018). Further, we found that conformity within this paradigm was positively predicted by social identification strength such that students who identified more strongly with their respective team were more likely to shift their responses following exposure to the ostensible team norms. The two studies contained within this dissertation were designed to extend these previous findings and continue to enhance our understanding of how sport teams can influence students' risk behaviors.

The studies within this dissertation specifically sought to fill knowledge gaps pertaining to the association between perceived group drinking norms and individuals' own alcohol use. Study One was designed to test the temporal direction of this association, asking to what extent perceptions of norms prospectively predicted alcohol use (i.e., conformity) versus one's own alcohol use prospectively predicting perceptions of peer drinking norms (i.e., projection)? Study Two was designed to understand variability in the extent that students adhere to the perceived drinking norms of their respective sport teams; do aspects of the group environment contribute to students' susceptibility to normative influence? I specifically tested whether the association between perceived group drinking norms and students' own alcohol use was moderated by social identification strength, indegree centrality, network density, and sex of the team.

A review of the study hypotheses and a brief summary of the results are provided in Table 4.1. In the first study, random intercept cross-lagged panel modeling yielded results indicating that perceptions of injunctive norms prospectively predicted one's own alcohol use at three-month lagged intervals, but one's own alcohol use did not prospectively predict perceptions of injunctive norms. This finding provides support for a conformity model as opposed to a projection model or a bidirectional model. However, there were no significant prospective associations for perceptions of descriptive norms and one's own alcohol use. The models did reveal that both descriptive and injunctive norms were strongly related to one's own alcohol use at the between-person level, as well as contemporaneously at the within-person level. This latter finding can be interpreted to suggest that students drank more frequently than their own usual level at timepoints when they perceived relatively higher group drinking norms. To my knowledge, this was the first study to test conformity versus projection pathways in small proximal groups of student sport teams.

The goal of the second study was to better understand variability in the extent that students adhere to perceptions of group drinking norms by testing aspects of the group environment that were theorized to amplify or diminish norms-behavior associations. Students reported greater adherence to perceived descriptive and injunctive drinking norms at timepoints in which they reported relatively stronger social identification with their respective club sport teams. Students also reported greater adherence to perceived injunctive drinking norms at timepoints in which they were nominated as being less central to their group's social hierarchy – relative to aggregate person-mean scores of indegree centrality. Interpreting cross-level interactions, it is evident that students reported greater adherence to perceived injunctive drinking norms at timepoints in which network density of their respective group was higher.

Table 4. 1 Summary of support for study hypotheses.

Hypotheses	Support
<p>Study #1</p> <ol style="list-style-type: none"> 1. Descriptive and injunctive norms will prospectively predict alcohol use frequency (conformity), but alcohol use will not prospectively predict perceived norms. 2. Strong between-person (trait) associations between perceived norms and alcohol use frequency alongside moderate within-person (state) contemporaneous associations. 	<ol style="list-style-type: none"> 1. Partially Supported. Findings indicated that perceptions of injunctive norms, but not descriptive norms, prospectively predicted students' alcohol use frequency. In line with the hypothesis, one's own alcohol use did not prospectively predict perception of group drinking norms. 2. Supported. At the between-person level, there were strong associations between both perceived descriptive and injunctive norms and alcohol use. Strong associations were also revealed at the within-person level, signifying a strong contemporaneous association at each timepoint.
<p>Study #2</p> <ol style="list-style-type: none"> 3. At the individual-level, the association between perceived drinking norms and alcohol use will be stronger for (a) those with stronger social identification strength, and (b) those with lower indegree centrality (i.e., prestige/popularity). 4. At the group-level, I anticipate stronger norms-behavior associations for those who belong to denser (i.e., tight-knit) teams. 5. As an exploratory hypothesis, the norms-behavior association may differ between men's and women's sport teams. 6. Groups will approach consensus in perceptions of group drinking norms and that drinking behaviors among group members will become more similar over time. 	<ol style="list-style-type: none"> 3. Partially Supported. (a) Social identification strength did amplify the extent that students adhered to both descriptive and injunctive drinking norms. (b) Indegree centrality moderated the norms-behavior association in the hypothesized direction for injunctive norms, but did not moderate the association for descriptive norms. 4. Partially Supported. Network density amplified the extent that students adhered to descriptive but not injunctive group drinking norms. 5. Although no specific hypothesis was made, the results indicated that sex did not moderate associations between perceived group drinking norms and one's own alcohol use. 6. Supported. Groups approached consensus on perceptions of descriptive and injunctive drinking norms over time. The results also indicated that drinking behaviors became more similar within groups over time.

Taken together, the moderation effects found in the second study make novel contributions to our understanding of students' susceptibility to normative peer influences within proximal peer groups.

Whereas normative perceptions take place at the individual-level and may vary considerably between individuals within the same group, it has often been assumed that peer groups have objective norms around behaviors such as alcohol use. Findings derived from consensus emergence modeling in Study Two demonstrated that, over the course of a school year, members of student sport teams indeed approached a consensus on the group's norms for drinking approval and drinking behavior. An additional contribution of this study was the finding that members of these groups also became more similar to one another on self-reported drinking behaviors over time. Findings from the consensus emergence models provide additional evidence that group memberships may socialize students' drinking attitudes and behaviors over time, even within peer groups that are primarily formed around participating in a non-alcohol-related activity like sport competition. Nevertheless, these patterns also reveal that substantial variability in norm perceptions within group were maintained, which descriptively supports the sense that each individual is likely to view their group from their own unique perspective.

Methodological Implications.

One area of contribution was that these dissertation studies used advanced quantitative methodologies that enabled deeper investigation of normative influences within peer groups. Central to the aims of the first study was the use of contemporary structural equation modeling that yields more accurate estimations of directional cross-lagged effects. Researchers have previously examined similar research questions (i.e., directionality of norms-behavior association), but Study One was the first to my knowledge that has employed a random-intercept

approach. Using this strategy, we estimated more accurate cross-lagged prospective associations between perceived norms and alcohol use by factoring-out the trait-level and contemporaneous effects. Although traditional cross-lagged models remain a popular strategy, the findings of Study One showed that unique effects exist at both between-person and within-person (prospective and contemporaneous) levels – highlighting the value in moving towards a random-intercept approach when fitting cross-lagged models (Berry & Willoughby, 2017; Hamaker et al., 2015).

In Study Two, I utilized the longitudinal nested data structure (i.e., responses nested within people who were nested within groups) to draw inferences regarding time-varying moderation effects as well as group-level moderating effects (i.e., cross-level interactions). While this methodological approach was complex, this study was the first to my knowledge to disaggregate between- and within-person effects of perceived norms on alcohol use to examine time-varying interaction effects. This is an important implication given that researchers often make incorrect inferences about time-varying associations from cross-sectional or other between-person data (Curran & Bauer, 2011). Longitudinal multilevel modeling with intact groups enabled investigation of cross-level interactions to examine how time-varying group-level variables may amplify or diminish individual-level associations between perceived norms and alcohol use. Tracking intact groups over time is a strong methodological contribution given that groups are constantly evolving and changing in dynamic ways that are challenging to capture, logistically, but reveal key insights regarding how groups may shape individuals' health behaviors (Cronin et al., 2011; Latkin et al., 2013).

A second methodological contribution of Study Two was the use of social network analyses to capture sociometric indices of participants' social standing within respective peer

groups (i.e., indegree centrality). Network-derived indices of social standing are highly objective as they entail incoming nominations from the peers within one's network. Social network analysis also enabled us to examine whether group-level connectedness – operationalized as network density – amplified the extent that students adhered to perceived group drinking norms. Although studies have examined how individuals' ego-networks (i.e., limited to one's self-report of ties to others) may influence drinking behavior (e.g., DeMartini, Prince, & Carey, 2013), network studies sampling intact groups enable investigation of the network structure, as a whole, alongside where one sits within respective networks. While Study Two highlights the value in using social network analysis, especially when exploring domains such as peer influence, it is worth noting that there are even more complex and descriptive network analyses that would make even stronger contributions to the literature. For example, longitudinal network strategies like stochastic actor-oriented models or exponential random graph models are well-suited to examine how ties between specific members within networks may change over time, and can even be used to examine how these changes to one's network can influence behaviors such as alcohol use (Steglich, Snijders, & Pearson, 2010). I anticipate moving towards using more complex models in my future research, but the use of social network analysis in Study Two is nevertheless innovative, and the first study to my knowledge to examine how network indices may relate to norm adherence.

The second study within this dissertation also employed a novel methodological framework – consensus emergence modeling – to test the extent that members of student sport clubs approached consensus on perceptions of descriptive and injunctive group drinking norms. This was again only made possible by sampling intact groups longitudinally. Whereas the intraclass correlation coefficient (ICC) is a useful estimate of how similar members are within a

group, relative to between groups, ICCs are not appropriate for interpreting temporal changes in groups' similarity over time. This is because ICCs account for both within-group variance and between-group variance, meaning that researchers cannot be certain that group members became more similar as they could have instead just become more dissimilar to members of other groups. Interpreting ICCs longitudinally also does not provide an omnibus statistical test for the overall pattern across measurement points (Lang et al., 2018). Consensus emergence modeling was thus developed as a strategy to overcome these limitations of interpreting ICCs as temporal patterns. Study Two was the first to my knowledge that applied consensus emergence modeling to examine the development of group drinking norms over time. In doing so, this study demonstrated the value in using this strategy to better understand how group norms form within small groups and how group memberships may influence members' behaviors over time through socialization processes.

The methodological implications of this research are nevertheless bound to considerations related to the validity of underlying measures to represent behavior, norms, and group perceptions. Alcohol use is a behavior that shares similarities to other health-related behaviors like physical activity, eating behavior, or broader substance use in that there are established biases that inform individuals' self-reported behavior. It is nevertheless important to note that students' self-reports of alcohol use have been found to be highly reliable and valid (e.g., Babor, Stephens, & Marlatt, 1987; Miller et al., 2002). However, researchers have identified procedures that may improve the accuracy of self-report assessments, such as bogus pipeline procedures in which participants are asked to list someone to verify the participants' drinking behaviors (Larimer, Turner, Mallett, & Geisner, 2004).

Researchers often draw upon several common alcohol use measures (e.g., DDQ; Collins et al., 1985), but the clinical significance of different measures is of key importance. In the first study we investigated frequency of alcohol use, which is an important indicator especially as it pertains to dependency or other alcohol use disorders but requires careful thought for populations such as college students and athletes. For instance, it is plausible that athletes may drink less frequently than non-sport playing students due to frequent athletic practices and competitions but may drink in extreme excess on a weekend in which the team has no sporting events. Similarly, the second study assessed typical number of weekly drinks, which may entail key limitations. One student who drinks a single glass of wine on five nights a week may score the same as a student who drinks only once a week but has five drinks in a two-hour period (i.e., heavy episodic drinking), even though these risk-profiles are very different. Ultimately, to ensure rigorous examination of student alcohol use, there is a need to invest greater effort into understanding and refining the measures and/or constructs that we use as indicators of alcohol use with consideration for unique samples (e.g., student-athletes).

Theoretical Implications.

Findings from this program of research hold several key theoretical implications pertaining to our understanding of how small groups and peers can influence risk behaviors such as alcohol use. While these studies were grounded in existing social psychology theories related to conformity and group norms, much of this theorizing had not been empirically supported. These studies make noteworthy contributions to group dynamics theorizing because we sampled naturally occurring and highly-interactive peer groups that are highly representative of a social group that a typical college student might join, and not just groups that form purely for the sake of engaging in alcohol use together (e.g., Dumas et al., 2018).

From Study One, we found evidence that the association between perceived drinking norms and one's own alcohol use may be more reflective of conformity processes rather than projection. This was particularly true for injunctive norms, which highlights the importance of peer approval within small proximal groups. Injunctive norms reflect perceptions of what one 'ought' to do, and adherence to these norms is motivated by fear of rejection if one's behavior does not align with what peers approve of (Cialdini et al., 1990). Although conformity theories differentiate motives between descriptive and injunctive norms, theorists have not reflected on the timing of how these influences may shape behavior. Interpretation of our findings provides an initial indication that injunctive norms may prospectively predict behavior even months later, while the influence of descriptive norms may be more immediate (i.e., contemporaneous associations). To better understand the temporality of normative influences, future research should seek to examine these associations across a variety of time-lags, including daily and momentary assessments.

Many social psychology and group dynamics theories have considered underlying motivations that may drive conformity to norms, but few studies have sought to provide understanding as to why some individuals are more susceptible to normative pressures than others. By examining group-relevant factors that may amplify the extent that students adhere to perceived drinking norms, Study Two directly tested social psychology theorizing regarding underlying group processes that predict conformity and/or adherence to drinking norms. The social identity approach is a broad theoretical framework that has posited that strong social identification with one's group can elicit behavior that is in line with the prototypical behavior of the group (e.g., Hogg & Turner, 1987b). Findings from Study Two supported this theorizing with evidence that norm adherence was greater for those individuals who identified more strongly

with their respective sport team. Findings also extended this theory by showing that within-person fluctuations in one's social identification strength related to adherence to perceived group drinking norms. Although it has been argued that social identification is a dynamic group process that fluctuates (e.g., Benson & Bruner, 2018), major theories within this domain have not made any specific claims pertaining to how fluctuation in one's social identification strength may influence how the salience normative group influences. Thus, the current findings are well-suited to advance social identity theory as applied to ingroup conformity.

Social psychology theories have also posited that a group's structure can influence the extent that members feel pressured to conform or adhere to group norms (Davis et al., 2015; Nail et al., 2000). Despite the prevalence of social groups within students' lives, researchers have yet to examine how a group's structure may relate to peer influences on alcohol use. The findings from Study Two provide novel evidence that normative influences may be stronger within dense peer networks. This finding aligns with tenets of the theory of normative social behavior, which holds that normative influences are more salient when the referent is relatable and proximal to the individual (Rimal & Real, 2005). Time-varying analyses specifically revealed that when teams are more densely connected, in terms of spending time together outside of sport, members showed closer adherence to perceived descriptive group drinking norms. This is a notable finding because it extends existing theory by examining dynamic aspects of groups (Cronin et al., 2011).

The results also showed that adherence to injunctive norms was greater for individuals who were less central to their group. Although this finding aligns with theorizing that less central members may conform to normative behaviors as a means of improving one's status within the group and seeking approval of peers (Cialdini & Goldstein, 2004), there is also theoretical rationale for anticipating the opposite. Social identity theorists may indeed argue that the most

central members of a group would be those who most closely abide by the norms of the group (i.e., prototypical members; Hogg, 2016). Although we provide initial support that network centrality is inversely related to norm adherence, it is prudent to further explore these patterns over a longer period of time. Doing so may reveal temporal patterns such that members who are initially on the periphery of their group are motivated to conform, and that this conformity does indeed facilitate greater centrality over time. Another important consideration is the underlying motivation to become more central as not all individuals wish to be central members of the group. Our theoretical expectation that members with low centrality would be more willing to adhere to group norms is based upon the assumption that all individuals will seek prominence within their groups. As such, a critical future direction for researchers in this domain is to better examine individuals' motivations for conforming, perhaps through in-depth qualitative research, or through mechanistic research using mediation analyses.

Studying intact sport groups across the school year enabled us to also provide additional understanding for how real-life peer groups develop norms over the life of a group. Consensus emergence modeling demonstrated that drinking norms are indeed an emergent group process that becomes clearer to members over time. However, even within these highly interactive proximal groups, there is more variance in members' perceptions of drinking norms than one might expect. This supports the tenets of social norms theory, highlighting that students' perceptions of peers' alcohol use attitudes and behavior are often inaccurate (Perkins, 2002). This variability also shows that the influence of social norms may be more of an individual phenomenon such that one's unique perceptions of drinking norms may be more influential than the *true* drinking norms that are often more latent.

Applied Implications

Sport has broad potential for physical and psychosocial health benefits, but the high prevalence of health-risk behaviors among sport-playing college students highlights the need to integrate prevention efforts within sport contexts (Martens, Dams-O'Connor, & Kilmer, 2012). One clear theme that emerged from this line of research is that social influences stemming from teammates and group environments play a salient role in shaping students' alcohol use behaviors. As such, there is potential to implement group-based prevention and intervention strategies within college sport teams. Group-based strategies are particularly promising because they have been found to be highly efficient compared to strategies that target individuals. Delivering harm-reduction strategies to small groups decreases the amount of resources needed and can thus improve the reach of these harm-reduction strategies through the ability to intervene upon a greater number of individuals (Michael, Curtin, Kirkley, Jones, & Harris, 2006).

Alcohol researchers and clinicians understand that perceptions of peers' alcohol use behaviors and attitudes can strongly predict students' own alcohol use and, as such, have leveraged these normative influences within harm-reduction strategies. For example, personalized normative feedback strategies aim to reduce student alcohol use by correcting misperceptions about drinking norms (Larimer & Cronce, 2007). Researchers have specifically found that normative feedback is an effective strategy when employed within groups of student-athletes as emerging adults are strongly influenced by the drinking attitudes and behaviors of the peers within their close social circles (Labrie et al., 2009; LaBrie et al., 2008). Although norms-based interventions have become a key tool used by colleges and other stakeholders to reduce alcohol use (Cronce et al., 2018), few have directly leveraged the strong normative influences that may be present within proximal groups of students (e.g., student clubs and organizations).

Findings from this dissertation hold implications for improving existing norms-based strategies and help to identify aspects of peer group environments that may entail strong pressures to adhere to group drinking norms. Incorporating the major takeaways from the present results, there are several key applied implications that are described in the following paragraphs. Normative influences may be especially strong within students' proximal peer groups, so I first discuss how these findings may be integrated into group-based interventions of naturally occurring student groups. Conforming or adhering to group norms can be constructive in cases where the group has positive and healthy group norms. As such, I discuss how the current findings regarding group processes that amplify the salience of group norms may be leveraged within harm-reduction strategies. There may also be value in reducing pressures to conform to group norms by emphasizing that individuality among group members is constructive. Finally, I discuss the need for and potential to develop strategies that are capable of completely shifting drinking norms downward.

The first study demonstrated that perceptions of injunctive drinking norms prospectively predicted students' alcohol use at later timepoints – highlighting the salient influence of peers' approval/disapproval of alcohol use. As such, one promising avenue for harm reduction entails targeting the extent that alcohol use is viewed as acceptable by peers within student sport teams. I see potential in developing team-based motivational interviewing sessions in which team members openly share attitudes about drinking alcohol, and the group works together to develop a clear consensus that risky alcohol use is not constructive to the team's goals and is therefore not an acceptable behavior for members. Existing group-based motivational interviewing interventions could be adapted to create injunctive norms within sport teams (e.g., LaBrie, Thompson, Huchting, Lac, & Buckley, 2007). A related strategy for shifting the approval of

alcohol within groups entails social network interventions that intervene directly upon a subset of highly influential group members. Grounded in network theory, one promising avenue would be to implement social network interventions that teach influential members to openly display disapproval of alcohol use, with the expectation that these influential members will disperse these attitudes across the group and implicitly shift the injunctive drinking norms of the group (Davis et al., 2015; Valente, 2012).

The second study found evidence that aspects of the group environment may amplify the extent that students adhere to perceived group drinking norms. This knowledge holds practical implications in that norms-based strategies may be more effective for those who are more willing to adhere to perceived drinking norms. It is nevertheless important to consider that norm-adherence, in and of itself, is not necessarily a risky process and can indeed be protective in instances when individuals view group drinking norms as low. It is also important to consider that college students tend to overestimate perceptions of drinking norms among peers (Giese et al., 2019), meaning that individuals may often feel pressures to adhere to inflated and inaccurate drinking norms. As such, students who are more easily influenced by peers may be ideal candidates for norms-based strategies.

We currently found that teams approached consensus over time on groups' actual drinking norms, but the results indicated that there is still considerable variance between group members on perceptions of normative drinking levels. This wide variability means that, even within these close groups of students, norms for drinking are not always clear to group members. Student clubs may benefit from setting clear expectations for alcohol use at the beginning of the school year, and continual reminders of these expectations throughout the year may remind group members of the groups' ideal drinking norms. In addition to clear expectations that may

come in the form of rules (i.e., akin to injunctive norms), student-leaders should also reinforce descriptive normative influences by highlighting that most students in the group are not engaging in risky alcohol use.

Given that students more readily adhered to perceived group drinking norms at timepoints in which they identified more strongly with their respective team, there may be value in taking initial steps to build groups' identities around constructive and positive behaviors. Groups are able to build and strengthen identities through various interventions, which I believe could be modified to target risky alcohol use (Steffens et al., 2019). Once the group has established an identity that is supportive of productive behaviors, then it is anticipated that increasing one's social identification strength would serve to increase the extent that individuals adhere to the constructive group norms. The second study also found evidence that students who belonged to densely connected groups more readily adhered to descriptive group drinking norms. From this, it can be inferred that norms-based strategies may be more effective in tightknit groups and after group members have had time to develop meaningful social connections. Finally, group members more readily adhered to injunctive group drinking norms, perhaps to gain social approval from fellow members. Although additional research is needed to understand students' motives for adhering to group drinking norms, this finding may imply that student groups that promote individuality and feelings of belongingness could alleviate pressures to adhere to group drinking norms. Indeed, a qualitative study of college sport team socialization processes has highlighted that feelings of belongingness are not contingent upon similarities between group members and that individualized approaches to socializing members (as opposed to institutionalized approaches) enable members to feel like they belong while reducing pressures to be a prototypical member (Benson, Evans, & Eys, 2016). I see potential in structuring team-

building sessions in which individuals can demonstrate commitment to the group and gain social approval from peers in constructive ways that celebrate individuality. Such sessions could be specifically designed to show students that they will be accepted by the group regardless of alcohol use behaviors. This may be particularly important for socializing new members into student groups, so there may be value in integrating positive and constructive norms into onboarding procedures at the start of a new school year. There has similarly been a strong focus on ‘rites of passage’ in sport teams, as these processes can be constructive for increasing commitment to the group and can socialize prosocial expectations of group members, but are often rife with risky and humiliating behaviors (e.g., hazing; Johnson, Holman, Chin, & Signer-Kroeker, 2018).

Future Directions for Novel Norms-Based Strategies

Although norms based harm-reduction strategies are promising and widely used for promoting health-related behaviors, there is room for improvement (Dempsey, McAlaney, & Bewick, 2018). One issue with norms-based strategies is that they aim to bring heavy drinkers back down to normative levels by correcting normative misperceptions; however, these normative levels often remain high. As such, I see value in developing strategies that can shift the actual drinking norms downward. Social psychology researchers have found emerging evidence that individuals align their behavior with the social norms that they anticipate being prevalent in the future, more so than the current norms (Sparkman & Walton, 2017). Because of this ‘pre-conformity’ tendency, even a minority norm can be highly influential when it is perceived to be increasing in popularity (Mortensen et al., 2018). Contrary to *static norms* that reflect the current state of normative behavior, *dynamic norms* emphasize that a behavioral norm is beginning to shift (Loschelder, Siepelmeier, Fischer, Rubel, & Fischer, 2019). Guided by the

focus theory of normative conduct, which holds that people adhere to norms in order to behave in socially-appropriate ways (Cialdini et al., 1991), recent dynamic norms interventions have been successful at changing behaviors related to water conservation, plastic cup use, and meat consumption (Loschelder et al., 2019; Sparkman & Walton, 2017). Based on this promising and innovative social psychology literature, a dynamic norms intervention has great potential to be applied as an alcohol-related harm-reduction strategy for college students.

A related avenue for leveraging social norms within harm-reduction strategies is the use of social network interventions (Valente, 2010). Although formats vary, social network interventions generally entail the “purposeful efforts to use social networks or social network data to generate social influence, accelerate behavior change, improve performance, and/or achieve desirable outcomes among individuals, communities, organizations, or populations” (Valente, 2012, p. 49). On a basic level, social network analyses can be used to identify highly influential members of groups or networks (i.e., key players) who can be targeted with an intervention in anticipation that the effects will disperse throughout the entire network (Borgatti, 2006; Ott, Light, Clark, & Barnett, 2018). These network-based strategies may shift the social norms in constructive ways through changing the attitudes and behaviors of key members. Although network scientists have made critical advancements on mathematically mapping networks to identify highly influential, there are several hurdles that we must first overcome before implementing these strategies.

Findings about the structure of groups and their association with alcohol use highlight the importance of network structure within behavioral interventions for drinking. For example, the finding that group density predicted norm adherence signals that this is a modifiable factor of network structure that could influence alcohol use through intervention.

These network-related findings also highlight the potential for the existing network structure of groups to influence the effectiveness or implementation of interventions. As a result, there is a need to further pilot test interventions to maximize the effectiveness and feasibility of social network-based approaches. Although researchers have made strong statistical and computational innovations that enable identifying and targeting influential members within networks, these strategies are of little use if the intervention components are not being adequately implemented in real-world settings.

An initial target for social network-based intervention research is to identify which members should be targeted within a network intervention. Although individuals may be ideally located within their network structure, not all individuals will have ideal interpersonal qualities for dispersing intervention effects. For example, some individuals may be too introverted to share relevant information with fellow group members or may simply be unwilling to accept the responsibility of being the intervention target. A related concern is that targeting only a subset of key network members may have iatrogenic effects for these individuals. For example, there may be negative effects on an individual's personal relationships if fellow network members begin to ostracize the individual who was targeted with an intervention (e.g., reduced alcohol use). It is also necessary to clarify which intervention components are ideal for network interventions. That is, are the effects of some interventions such as motivational interviewing more readily diffused throughout a network? Considering these concerns, it is suggested that social network interventionists collaborate with implementation scientists on preliminary efforts to complement the highly innovative network analyses.

Conclusion

“The reward for conformity is that everyone likes you except yourself.”

-Dr. Rita Mae Brown

The social groups to which we belong are closely tied to our sense of self identity and play an important role in shaping our behavior. College is a time for identity exploration and one in which students are highly susceptible to peer influences. Sport participation has vast potential to be a constructive extracurricular activity for students, but there is also evidence that sport-playing students engage in high levels of alcohol use. This dissertation research enhanced our understanding of how the group environment within student club sport teams can influence members' alcohol use through normative influences (i.e., conformity processes), and identified aspects of the group environment that may amplify the extent that group drinking norms shape individuals' behaviors. These studies filled critical knowledge gaps that were the focus of social psychology theory for decades but had rarely been tested empirically, including balances between conformity and projection, the role of social identity on normative influences, and the extent that subjective norms represent a *group* process. Findings from these studies are also well-suited to inform translational research that will ultimately enhance the way that normative peer influences are leveraged within harm-reduction strategies.

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Appendix A

Visual Depictions of Team Networks

Figure is taken from a previous publication within this program of research (Graupensperger, Panza, & Evans, 2019)

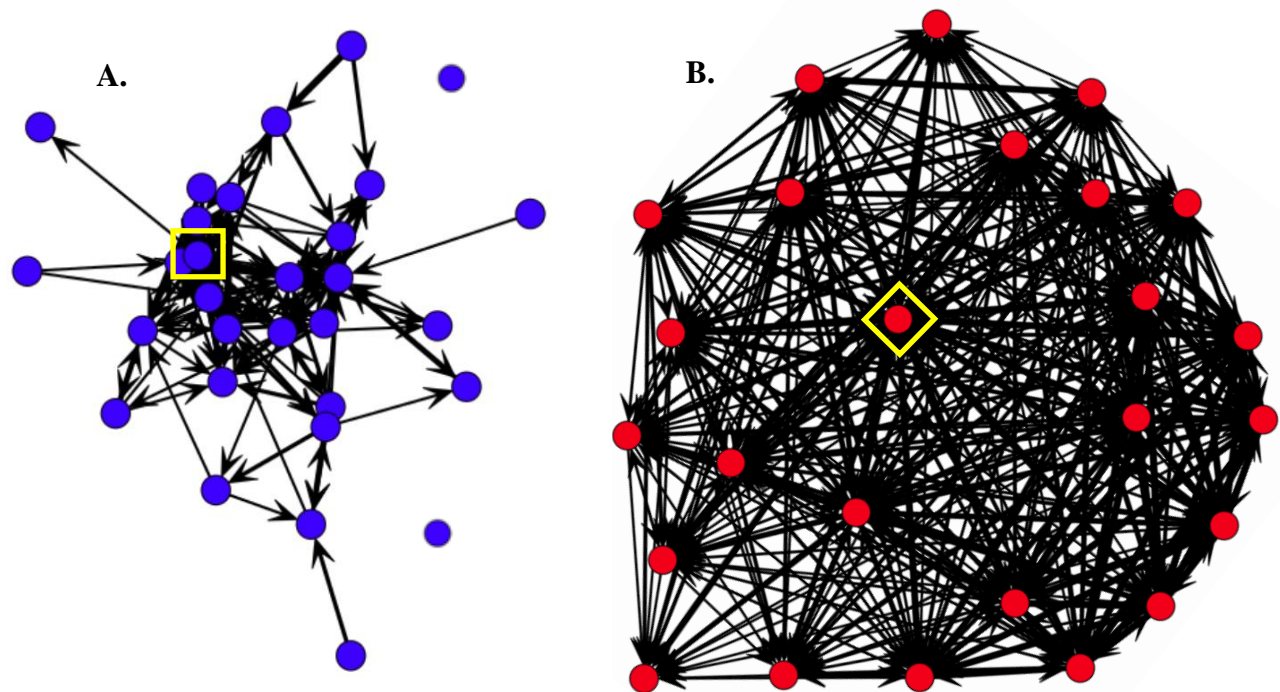


Figure A1. Example sociograms of the teams with lowest density (A – on left; 0.34) and highest density (B – on right; 1.76) pertaining to time spent together outside of sport – the social interaction item. Line width indicates strength of tie and arrows represent direction of tie. Note that the low-density group included numerous members who were considered isolates (i.e., no incoming or outgoing nominations) or pendants (i.e., only a small number of outgoing nominations), along with several members with numerous strong ties. To demonstrate the nature of centrality values, Figure A includes a node within the yellow box, which had a standardized outdegree centrality of 2.67 (raw score = 65) and indegree centrality value of .82 (raw score = 15). Meanwhile, the node highlighted within the yellow diamond in Figure B had a standardized outdegree centrality of 2.42 (raw score = 86) and indegree centrality value of .53 (raw score = 46).

Appendix B

Items to Assess Alcohol Use Frequency (A), Descriptive Norms (B), and Injunctive Norms (C) from Study One.

A. During the last 3 months, what was the frequency that you engaged in alcohol use?

- Never
- Less than once per month
- Once a month
- Twice a month
- Three times a month
- Once a week
- Twice a week
- Three times a week
- Four times a week
- Five times a week
- Six times a week
- Every day

B. 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?

- Never
- Less than once per month
- Once a month
- Twice a month
- Three times a month
- Once a week
- Twice a week
- Three times a week
- Four times a week
- Five times a week
- Six times a week
- Every day

C.

What is the average frequency of drinking that you estimate a typical **MEMBER OF YOUR CLUB SPORT TEAM** would consider to be acceptable.

- Never
- Less than once per month
- Once a month
- Twice a month
- Three times a month
- Once a week
- Twice a week
- Three times a week
- Four times a week
- Five times a week
- Six times a week
- Every day

Appendix C

Picture Showing Participants how much Alcohol is Considered to be One Drink

STANDARD DRINK CONVERSION

When asked how much you drink in the following questions use this chart.

ONE STANDARD DRINK IS EQUAL TO:



Standard American BEER 12 oz. Can, Bottle or Glass
(3-5% alcohol)

Microbrew or European BEER 1/2 of a 12 oz. Can or Bottle
(8%-12% alcohol)



WINE (12 – 17% alcohol) 4 oz. Glass

WINE Cooler 10 oz. Bottle



HARD LIQUOR 1-1/2 oz. or One Standard Shot
(80-proof, 40% alcohol)

HARD LIQUOR 1 oz.
(100-proof, 50% alcohol)



WINE: 1 Bottle

25 oz. (12 – 17% alcohol) = 5 standard drinks

40 oz. (12 – 17% alcohol) = 8 standard drinks



HARD LIQUOR: 1 Bottle

12 oz. = 8 standard drinks

25 oz. = 17 standard drinks

40 oz. = 27 standard drinks

Appendix D

Daily Drinking Questionnaire from Study Two

(Collins et al., 1985)

During a typical week in the past 3 months, how many drinks did you have on each night of the week:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

SUNDAY

Appendix E

Descriptive Norms Rating Form from Study Two

(Baer, Stacy, & Larimer, 1991)

During a typical week in the past 3 months, how many drinks do you estimate that a typical **MEMBER OF YOUR CLUB SPORT TEAM** had on each night of the week:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

MONDAY

A horizontal slider bar for Monday. The bar is a thin grey line with a blue dot at the left end, corresponding to the number 0 on the scale above.

TUESDAY

A horizontal slider bar for Tuesday. The bar is a thin grey line with a blue dot at the left end, corresponding to the number 0 on the scale above.

WEDNESDAY

A horizontal slider bar for Wednesday. The bar is a thin grey line with a blue dot at the left end, corresponding to the number 0 on the scale above.

THURSDAY

A horizontal slider bar for Thursday. The bar is a thin grey line with a blue dot at the left end, corresponding to the number 0 on the scale above.

FRIDAY

A horizontal slider bar for Friday. The bar is a thin grey line with a blue dot at the left end, corresponding to the number 0 on the scale above.

SATURDAY

A horizontal slider bar for Saturday. The bar is a thin grey line with a blue dot at the left end, corresponding to the number 0 on the scale above.

SUNDAY

A horizontal slider bar for Sunday. The bar is a thin grey line with a blue dot at the left end, corresponding to the number 0 on the scale above.

Appendix F

Injunctive Norms Scale from Study Two

(Krieger et al., 2016)

During a typical week in the past 3 months, how many drinks do you estimate that a typical **MEMBER OF YOUR CLUB SPORT TEAM** views as being acceptable on each night of the week:

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

MONDAY



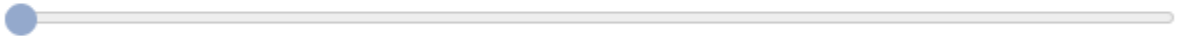
TUESDAY



WEDNESDAY



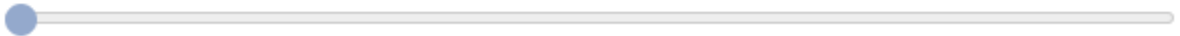
THURSDAY



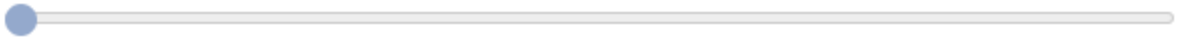
FRIDAY



SATURDAY



SUNDAY



Appendix H

Social Network Items used to Compute Indegree Centrality in Study Two

In the following questions we are going to ask you about your relationships with your teammates. This is a key component of the research project, so please take your time on this section.

Please respond for each teammate, but skip the response to your own name. If you see a name that is not on your team, please skip the name and inform the researchers.

I spend time with this teammate outside of club sport activities:

	Not at all		Sometimes		All the time
NAME1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME3	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME6	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME10	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME11	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME12	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME14	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NAME15	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input style="width: 100%;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input style="width: 100%;" type="text"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Curriculum Vitae -- Scott A. Graupensperger

EDUCATION

- 2019 **Dual Title PhD: Kinesiology / Clinical & Translational Science.** The Pennsylvania State University.
2016 **M.A., Developmental Psychology.** Bowling Green State University.
2016 **M. Ed., Kinesiology – Sport and Exercise Psychology.** Bowling Green State University.
2014 **B.A., Psychology.** Northern Arizona University.

GRANTS & COMPETITIVE RESEARCH FUNDING

- 2019-20 **National Research Service Award (F31 AA027685)** *National Institute for Alcohol Abuse and Alcoholism.*
2019-20 **NCAA Graduate Student Research Grant, P.I. (\$5,625)** *National Collegiate Athletic Association (NCAA).*
2018-19 **Prevention and Methodology Training Fellowship (T32 DA017629)** *National Institute on Drug Abuse.*
2018-19 **NASPSPA Graduate Student Research Grant, P.I. (\$2,000).**
2017-18 **Training Fellowship in Translational Science (TL1 TR002016)** *Center for Advancing Translational Science.*
2017-18 **NCAA Graduate Student Research Grant, P.I. (\$6,000)** *National Collegiate Athletic Association (NCAA.)*
2017 **Translational Science Fellowship (UL1 TR002014)** (\$5,844) *Center for Advancing Translational Sciences.*

SELECT AWARDS

- 2019 **Enoch Gordis Research Recognition Award** – Research Society on Alcoholism.
2019 **National Graduate Student Writing Award** - American Kinesiology Association.
2019 **Outstanding Student Paper Award** - North American Society for the Psychology of Sport and Physical Activity.
2018 & 2019 **Top Student Poster Award** – Society for Prevention Research.

SELECT PUBLICATIONS. (As of November 2019: *Published Journal Articles = 15; Invited Book Chapters = 3*)

- Graupensperger, S.,** Corey, J., Turrisi, R. J., & Evans, M. B. (*In-Press*). Individuals with spinal cord injury have greater odds of substance abuse disorders than non-SCI comparisons. *Drug and Alcohol Dependence.*
- Graupensperger, S.,** Benson, A. J., Bray, B. C., & Evans, M. B. (2019). Social cohesion and peer acceptance predict student-athletes' attitudes toward health-risk behaviors: A within- and between-group investigation. *Journal of Science and Medicine in Sport, 22,* 1280-1286.
- Graupensperger, S.,** Panza, M. J., & Evans, M. B. (*In-Press*). Network centrality, group density, and strength of social identification in college club sport teams. *Group Dynamics: Theory, Research, and Practice.*
- Evans, M. B., **Graupensperger, S.,** Benson, A. J., Eys, M. A., Hastings, B., & Gottschall, J. S. (*In-Press*). Groupness perceptions and basic needs satisfaction within fitness groups. *Group Dynamics: Theory, Research, and Practice.*
- Graupensperger, S.,** Wilson, O. W. A., Bopp, M., & Evans, M. B. (2019). Longitudinal association between alcohol use and physical activity in US college students: Evidence for directionality. *Journal of American College Health. 1-8.*
- Graupensperger, S.,** Gottschall, J., Benson, A. J., Eys, M.A., Hastings, B., & Evans, M. B. (2019). Perceptions of groupness during fitness classes predict exertion, enjoyment, and satisfaction: An intensive longitudinal investigation. *Sport, Exercise, and Performance Psychology, 8,* 290-304.
- Evans, M. B., **Graupensperger, S.,** Benson, A. J., Eys, M. A., Hastings, B., & Gottschall, J. S. (2019). Group structure and entitativity in exercise: Considering within- and between-group perceptions of groupness. *Psychology & Health, 34,* 715-732.
- Graupensperger, S.,** Benson, A. J., & Evans, M. B. (2018). Everyone else is doing it: The association between social identity and susceptibility to peer influence in NCAA athletes. *Journal of Sport and Exercise Psychology, 20,* 1-11.
- Graupensperger, S.,** Jensen, C. J., & Evans, M. B. (2018). A meta-analytic review of studies using the Prosocial and Antisocial Behavior in Sport Scale: Associations among intergroup moral behaviors. *Sport, Exercise, and Performance Psychology, 7,* 186-204.