

THE INFLUENCE OF
UNRECIPROCATED BEST FRIENDS ON
ADOLESCENT ALCOHOL USE

Richard Ernest Hicks

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Psychology (Clinical).

Chapel Hill
2006

Committee members
Advisor: Andrea Hussong, PhD
Reader: Patrick Curran, PhD
Reader: Susan Ennett, PhD
Reader: Deborah Jones, PhD
Reader: Mitch Prinstein, PhD

ABSTRACT

RICHARD E. HICKS: The Influence of Unreciprocated Best Friends
on Adolescent Alcohol Use
(Under the direction of Andrea Hussong)

The project aimed to better understand whether some adolescents conform to the alcohol use behaviors of non-reciprocating best friends in order to obtain reciprocated friendships. The study examined (1) the relative influence of unreciprocated and reciprocated best friends on adolescent alcohol use behaviors; (2) the relative strength of unreciprocated best friend influence in two peer contexts – one in which the adolescent has no reciprocated friendships and the other in which the adolescent has reciprocated friendships; and (3) the success of alcohol use conformity in establishing reciprocated friendships. This project gave particular attention to adolescents whose only friendships within the school context were non-reciprocated relationships. Changes in adolescent alcohol use behaviors and changes in adolescent friendship reciprocity (e.g., transition from an unreciprocated best friendship at 8th grade to a reciprocated best friendship at 9th grade) were examined through the use of school-based survey data. Peer nomination data were used to determine reciprocity within friendship dyads and to obtain self-reports of peer alcohol use behaviors during the 8th and 9th grades, a time when the adolescents in this study were transitioning from middle school to high school.

The findings suggested that adolescents are influenced by the alcohol use behavior of their best friend when the relationship is reciprocated. Additionally, for a subgroup of adolescents with unreciprocated best friends, those without any reciprocated friend, best

friends exerted influence on their subsequent alcohol use behaviors. These relationships held only in the prediction of frequency of alcohol use, and not for initiation of alcohol use. There was modest support for the proposition that initiation of alcohol use facilitated the formation of reciprocated friendships with similar peers. This work may help elucidate the role of friendship selection and influence processes in the development of alcohol use behaviors, and it may help in the identification of adolescents who are particularly susceptible to peer influence.

To
Tika Johnson Hicks
&
Nora Nicole Hicks

ACKNOWLEDGEMENTS

I am particularly indebted to Andrea Hussong, my research advisor, for her invaluable role in assisting me with this project and for her important role in guiding my academic and professional growth. Her encouragement, advice, patience, mentoring, and research support throughout my doctoral studies have made this dissertation possible. This dissertation is part of the research carried out through her creative and ardent vision. I also want to thank Susan Ennett, Deborah Jones, Mitch Prinstein, and Patrick Curran, who served on my dissertation committee and offered valuable guidance, support, and feedback on this research project. Through their own research, they have contributed to my understanding of adolescents and their social environments. Thanks go out to many others who have read and listened to me present my ideas and results, especially Susan Purcell, Suzanne Levy, Matthew Hersh, Chris Galloway, Laura Feagans, Gaby Stein, and Jennifer Manning.

I am fortunate to have had the opportunity of working with a truly talented and caring group of professors during my doctoral training at UNC. In particular, I want to thank Janis Kupersmidt, for her instrumental role in helping me enter into graduate studies; Don Baucom, who has overseen an exemplary clinical psychology program; and Dianne Chambless, who, along with Don, served as an inspirational model of the scientist-practitioner psychologist. I also want to thank the psychology staff at Dorothea Dix Hospital, particularly Elliot Silverstein, David Hattem, Nancy Lloyd, Paul Mermin, Dick Rumer, and Mark Stein, who through my clinical internship and subsequent employment at the hospital

have provided me the opportunity to complete this dissertation project while simultaneously developing as a clinician.

I am immeasurably grateful and lovingly indebted to Tika Hicks, who throughout my graduate studies has generously given so much to me in so many ways. Her support, encouragement, love, and understanding has helped me accomplish my goal of becoming a clinical psychologist. I am appreciative of my friends Paul Tsasa and Joseph Ayscue, who each helped me explore and transition into the field of psychology. My parents, Jean and Ernest Hicks, receive my deepest gratitude and love, for they provided the foundation that made possible my pursuit of graduate studies. Lastly, my heartfelt love and thanks go out to my daughter, Nora, who has been so patiently waiting for me to finish school.

TABLE OF CONTENTS

	Page
LIST OF TABLES	x
LIST OF FIGURES	xi
LIST OF ABBREVIATIONS	xii
INTRODUCTION	1
Influence as a Prominent Theory of Adolescent Substance Use	2
Friendship Measurement	6
Why Unreciprocated Friends May Be Important in Understanding Influence	10
Alcohol Use as a Mechanism that Facilitates Friendship Formation	19
Goals of the Study	22
METHOD	25
Study Overview	25
Analysis Sample	26
Design and Procedure	28
Measures	30
Demographic and Control Variables	30
Friendship Nominations and Derived Variables	31
Alcohol Use Variables	34
RESULTS	38
Descriptive Analyses	38

Variation across the Schools	38
Differences between Adolescents with Reciprocated and Unreciprocated Best Friendships	39
Relations between Alcohol Use and Adolescent Descriptive Variables	40
Determination of Control Variables	41
Best Friend Alcohol Use and Best Friend Reciprocity Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 1)	42
Best Friend Alcohol Initiation, Best Friend Reciprocity, and Friendship Context Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 2)	44
Formation of Reciprocated Friendships through the Initiation of Alcohol Use (Hypothesis 3)	47
Statistical Power Analysis	49
Post-Hoc Analyses	50
Alternative Tests of the Interaction of Best Friend Alcohol Use, Reciprocity, and Context	50
Exploring Who is Being Selected as Best Friends	53
DISCUSSION	55
Best Friendship Reciprocity and Adolescent Alcohol Use	56
Best Friendship Reciprocity, Friendship Context, and Adolescent Alcohol Use	57
Adolescent Alcohol Use Contributing to Friendship Formation	60
Conclusions.....	62
TABLES	67
FIGURES	76
APPENDICES	81
REFERENCES	85

LIST OF TABLES

	Page
Table 1 Frequencies of Descriptive Variables by T1 Schools	67
Table 2 Means of Descriptive Variables by T1 Schools	68
Table 3 Comparisons of Adolescents with a Reciprocated and an Unreciprocated Best Friend	69
Table 4 Correlations, Means, and Standard Deviations for Adolescent Variables	70
Table 5 Best Friends Alcohol Use & Best Friend Reciprocity Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 1)	71
Table 6 Best Friend Alcohol Use, Best Friend Reciprocity, & Friendship Context Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 2)...	72
Table 7 T1 Best Friendship with an Alcohol Using Peer & T2 Adolescent Alcohol Initiation Interactively Predicting Reciprocated Friendship formation with an Alcohol-Using Peer (Hypothesis)	73
Table 8 Best Friend Alcohol Use, Best Friend Reciprocity & Friendship Context Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 2, Alternative Model)	74
Table 9 Post-hoc Comparison of Types of Best Friends, Based on Their Reciprocation of Adolescent Nominations	75

LIST OF FIGURES

	Page
Figure 1 Design Overview of the High School Transition Study	76
Figure 2 Overview of Analysis Sample	77
Figure 3 Best Friend Alcohol Use & Reciprocity Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 1; OLS Model)	78
Figure 4 Best Friend Alcohol Use, Best Friend Reciprocity & Friendship Context Predicting Frequency of Alcohol Use (Hypothesis 3; Logistic Model)	79
Figure 5 The Predicted Probability of at T1 Abstainer with an Unreciprocated Best Friend Forming a T2 Reciprocated Friendship with an Alcohol Using Peer (Hypothesis 2, Alternative Test; OLS Model)	80

LIST OF ABBREVIATIONS AND SYMBOLS

alpha	Cronbach's alpha	B	unstandardized beta
BF	best friend	β	standardized beta
gender	biological sex	e^{β}	odds ratio
HSTS	High School Transition Study	F	F-test
OLS	ordinary least squares	N	sample size
PI	principal investigator	n	subsample size
RF	reciprocated friend	r	correlation
SES	socioeconomic status	SD	standard deviation
SNA	social network analysis	t	t-test
T1	time 1 or phase I	$Wald's \chi^2$	Wald's Chi-Square statistic
T2	time 2 or phase III		

INTRODUCTION

This project will examine the role of peers in the development of adolescent alcohol use behaviors during the transition from middle school to high school. The project will pay particular attention to adolescents who have difficulty gaining acceptance and establishing friendships with their same-age peers, as this is a subset of adolescents that show risk for maladjustment (Henrich, Kuperminc, Sack, Blatt, & Leadbeater, 2000) and may be particularly susceptible to social pressures (Abel, Plumridge, & Graham, 2002). A large body of literature supports the idea that friendships are an important part of adolescent development (Hartup, 1996) and that not having friends may contribute to difficulties later in life (Bagwell, Newcomb, & Bukowski, 1998). Additional support for the importance of friendships in understanding adolescent substance use comes from longitudinal studies on the development of delinquency that indicate that substance use is embedded within the peer group (Elliot, Huizinga, & Ageton, 1985; Hawkins, Catalano, & Miller, 1982), from theoretical models of adolescent substance use that suggest that friends play a prominent role in adolescent substance involvement (e.g., Oetting & Donnermeyer, 1998), and from substance abuse prevention efforts that commonly include components designed to help teens resist pressure from peers (Botvin, 1986). In an effort to better understand the social context in which peer influence on adolescent substance use may occur, the proposed research will examine whether not having reciprocity with one's self-identified best friend increases susceptibility to influence from the peer. This susceptibility to influence by such peers may be particularly salient for adolescents who not only have an unreciprocated best friendship,

but who also reside in a context without any reciprocated friends. The current study will test whether adolescents in such social contexts are at increased risk for alcohol use and whether alcohol use functions to create reciprocated friendships.

Influence as a Prominent Theory of Adolescent Substance Use

Peers are thought to be important socializing agents, and this view has been supported by a large body of research establishing that adolescents are likely to be similar to their friends in many attributes, including drug use behaviors (for a review, see Akers 1985; Kandel, 1978). Within the field of adolescent substance use, many theoretical models stress the role of peer influence in the initiation, development, and maintenance of substance use behaviors (Newcomb & Bentler, 1989), and consistent findings support the important role of peers in the development of adolescent substance use (e.g., Bahr, Hawks, & Wang, 1993; Bentler, 1992; Clapper, Martin, & Clifford, 1994; Curran, Stice, & Chassin, 1997; Urberg, Değirmencioğlu, & Pilgrim, 1997).

As noted by Urberg (1999), the simplified and stereotypical influence model is of the “good” teen being approached by the “bad” teen who offers and often pressures, through taunting and teasing, the “good” teen into using cigarettes, drugs, or alcohol. Although more complex in their approach, several prominent drug use researchers have presented models that conclude that peer influence is one of the major reasons adolescents begin to use drugs (e.g., Newcomb & Bentler, 1989; Oetting & Donnermeyer, 1998). For example, Oetting and Donnermeyer’s primary socialization theory proposes that drug use behavior is the result of the interaction between social, psychological, and cultural characteristics and that drug use is predominantly learned and maintained in a peer context which is dominated by interactions with peer groups or “clusters” (i.e. tightly knit and cohesive subsets of the peer group, such

as best-friend dyads, small groups, or couples). In their model, peer clusters provide the major source of deviant norms supporting substance use during adolescence. This emphasis on peers as important socializing agents of drug use is also reflected in the many prevention efforts that focus on teaching adolescents how to resist peer pressure (for reviews see Botvin, 1986; Bukowski, 1986; Donaldson, Graham, & Hansen, 1994; Flay, 1985; Paglia & Room, 1999).

The processes of peer influence are typically described within a social learning framework (Graham, Marks, & Hansen, 1991). The specific mechanisms of influence, which can be defined as the “power to sway or affect based on prestige, wealth, ability, or position” (American Heritage Dictionaries, 1993, p. 697), may occur in a variety of ways, both directly and indirectly, with peers modeling drug use; shaping norms, drinking preferences, and expected consequences; providing access to drugs; and reinforcing drug use (Ennett & Bauman, 1991). As suggested by these mechanisms, peer influence may occur within a variety of peer relationships (e.g., close friends, friendship groups, desired friends, etc.).

Whereas the ability to get along with peers and to develop social relationships may be particularly relevant to the study of adolescent substance use, there are multiple aspects of peer relationships, and distinguishing among these aspects is necessary to understand the context in which peer influence is embedded (Hartup & Laursen, 1999). A challenge facing researchers trying to understand the social context of adolescent substance use is determining how to define and at what level to examine the social context. As described by Hussong (2002), developmental models of peer interaction have identified three important levels of structure within the peer context: best friendships, peer groups or cliques, and social crowds (Hartup, 1996; Brown, 1990; Brown, Eicher, & Petrie, 1986). Research has shown that

substance use within each of these levels of the peer context is associated with increased substance use at the individual level (e.g., Downs & Rose, 1991; Erickson, Crosnoe, & Dornbusch, 2000; Graham, Marks & Hansen, 1991; Hussong, 2002; Mounts & Steinberg, 1995; Urberg et al., 1997). Urberg et al. compared the influence from two of these levels, the closest friend and the friendship group, on alcohol use behaviors. They found only the closest friend was influential for initiation of alcohol use, whereas closest friends and friendship groups were influential for increasing alcohol use. Similar findings by Hussong (2002) compared the unique effects of alcohol use by best friendships, cliques, and social crowds. Hussong found all three levels of social context to be associated with adolescent substance. However, the strongest of these three predictors was the level of substance use by the adolescent's best friend. Whereas these studies did not test specific mechanisms of social influence, the findings highlight the overall importance of the peer context and the particular importance of best friendships on adolescent substance use. As such, the current study will focus on understanding the influence of best friends on the development of adolescent substance use.

Even with the focus on best friends, research studies of peer influence have been critiqued as confounding influence with other explanations for the similarity in substance use among best friends. In the majority of studies of adolescent peer influence, researchers have utilized cross-sectional data to offer the simple correlation between participants' report on their friends' characteristics with the participant's self-report of their own characteristics as evidence of peer influence (Berndt, 1999; Ennett & Bauman 1994). Critics of this approach have noted that two alternative explanations for these robust associations are projection (i.e. attributing one's own behavior to the behavior of friends) and selection (i.e. the role of drug

use in friendship formation; e.g., Bauman & Ennett, 1994). Several research studies suggest that the similarity between adolescents and their friends on substance use behaviors may be the result of projection, and relying on adolescent reports of their friends' substance use is thought to spuriously inflate the substance use similarity between adolescents and their friends (Fisher & Bauman, 1988; Iannotti, Bush, & Weinfurt, 1996). The effects of selection are also thought to account for substance use similarity among friends. When friendships are established based on substance use similarity, the substance use of friends is correlated, but the correlation reflects the friend selection process rather than friend influence. Researchers have argued that selection effects can be addressed by using longitudinal data to assess changes in the behavior of adolescents and their peers, for example, assessing influence after a friendship has formed (i.e. after selection has occurred; e.g., Berndt, 1996; Urberg, 1999). To differentiate influence from effects of projection and selection, Ennett and Bauman (1994) call for the use of mutual assessment data (i.e. both subject and friend self-report of substance use), which allow for friend characteristics to be based on the friend's self-report rather than the nominator's perception of a friend's behavior, and for the use of longitudinal data, so that stability and change in friendships and substance use may be independently assessed.

When studies address these critiques, researchers find that the degree to which peer influence is responsible for adolescent substance use is less than previously assumed. As reviewed by Urberg, Pilgrim, and Değirmencioğlu (2003), the magnitude of peer influence on adolescent substance use, when compared to the effects of selection, is currently thought to be overestimated in the research literature. Several studies comparing the effects of selection and influence have found selection effects to be as powerful as or more powerful

than influence effects in accounting for the similarity between adolescents and their friends in cigarette use (Ennett & Bauman, 1994), sexual behavior (Billy & Udry, 1985), and drug use (Farrell & Danish, 1993). Other studies that have controlled for selection have found meaningful effects of influence, but the magnitude of influence has been relatively weak (Berndt & Keefe, 1995; Jaccard, Blanton, & Dodge, 2005; Urberg et al., 1997). Although it may be that influence effects are less operative than selection effects, influence effects may also be underestimated because they do not consider two possibilities. First, the effects of peer influence may be most prominent during specific periods of the formation and development of a peer friendship and, second, influence within friendship dyads may depend on the adolescent's relations with others in the peer context (Urberg, et al., 2003; Urberg, 1999). Neither of these moderating factors have been tested in previous research.

Friendship Measurement

Common approaches that use mutual assessment data to examine influence rely on linking self-reported friendship nominations with a network of peers (e.g., Ennett & Bauman, 1993; Fisher & Bauman, 1988; Urberg et al., 1997). Referred to as social network data, participants are asked to provide a list of their friends and then participant data are linked to data collected from the people who are listed as friends. The collection of social network data is often quite feasible when working with children and adolescents, as much of this research is conducted in the school setting and the majority of child and adolescent friendships are within schools (Urberg, Değirmencioğlu, Tolson, & Halliday-Scher, 1995; Blythe, Hill, & Thiel, 1982). In differentiating types of peer relationships, and various ways of defining friendships, the structural definitions and techniques that have arisen in social network approaches provide terminology that is helpful both in thinking about and in communicating

about friendships. In particular, social network analysis provides a way of defining reciprocity. This approach builds on the mutual assessment approach by asking study participants to create a list of people they consider to be their close friends, with friendship choice information obtained by a question such as “please write the names of your best friends.” The list of “nominations”, or nominated friends, generated by each participant is then compared to the nominations generated by every other participant. The social network data is then most often arranged within a matrix where the nominators, or choosers, make up the rows, and the nominees, or chosen, make up the columns. This arrangement enables identification of any pairing of nominees.

When two participants both nominate each other within their list of “friends”, the structure of their connection is referred to as a reciprocated, or mutual, link. That is, the two nominators provide reciprocal nominations and their relationship appears to be one of mutual liking (i.e. the relationship is reciprocated). The reciprocated friendship represents the threshold at which friendship is commonly defined in the developmental literature on peer relationships (Furman, 1996). If a nominator’s choice of a friend is not reciprocated, the link between these two individuals is referred to as an unreciprocated, or unilateral, link, and the relationship can be viewed as an unreciprocated friendship for the nominator whose nominee does not reciprocate. If there is no link between a nominator and a peer (i.e. the peer does not appear on the nominator’s nomination list), then the relationship can be referred to as a non-friendship, or a null dyad.

Within the child developmental literature on peer relationships, friendship has often been assessed as a dichotomous relationship in which peers are defined as either friends or non-friends. Given that friendships are typically defined as relationships of mutual liking,

there has been a common reliance on reciprocated nominations to define friendship, and to distinguish relations of mutual liking from unreciprocated relationships which do not meet the threshold for “friendship” (Furman, 1996). The distinction between these two types of nominations is supported by research that shows that reciprocated friendships, in comparison to unreciprocated friendships, last longer (Bukowski & Newcomb, 1984; Gershman & Hayes, 1983) and have more contact, positive feelings, equity, closeness, loyalty, and liking (Newcomb & Bagwell, 1995).

However, this approach to defining friendship does not distinguish between unreciprocated friends and non-friends. Treating unreciprocated friendships as non-friends may overlook the uniqueness of unreciprocated relationships. As Furman noted (1996), one could argue that from the point of view of the child, unreciprocated relationships are friendships. For some unreciprocated relationships, the child may view the peer as a friend and interact with them as a friend. On the other hand, some unreciprocated relationships may be the result of admiration directed toward adolescents held in high esteem (e.g., popular peers). Although these unreciprocated relationships may be more similar to non-friendships, this subtype of unreciprocated relationship is likely quite infrequent because best friend choices in adolescence rarely arise from simply admiration or esteem (Hallinan, 1978/79). The limited research in this area with children suggests that unreciprocated friendships have qualities that are both similar to reciprocated friendships as well as qualities that are similar to non-friendships. In work by Hartup and colleagues examining peer conflict, and utilizing both self-report and observational data, the conflicts of unreciprocated friends were found to be most similar to those of non-friends, although they also resembled reciprocated friends in

that conflicts were typically followed by continued social interactions (Hartup, Laursen, Stewart, & Eastenson, 1988).

A recent study by Adams, Bukowski, and Bagwell (2005) highlights the potential importance of differentiating between unreciprocated and reciprocated friendships. In an effort to better understand developmental outcomes related to aggression, the researchers examined how friendship type (unreciprocated versus reciprocated) and friend characteristics (level of aggression) might interactively contribute to the stability of aggression in early adolescence. The researchers hypothesized that whereas friends influence each other's aggressive behaviors, not having a reciprocated friend results in greater stability of aggression. It was their contention that difficulty in forming and maintaining a friendship can lead to aggression, as the lack of a meaningful reciprocated relationship leads to negative affect and, in turn, aggression. Their findings show that although early adolescent aggression was fairly stable over a six month period, the stability varied as a function of the aggression of both individuals in the friendship and the friendship type (i.e., whether the friendship was reciprocated or unreciprocated). As the researchers predicted, children who were aggressive and who had unreciprocated friendships with aggressive peers were the most stably high in aggression. The findings underscore the utility of identifying unreciprocated friendships as a unique type of friendship and the potential importance that they may serve in better understanding processes of peer influence.

In sum, unreciprocated friendships need to be treated as a category that is distinct from both reciprocated friendships and non-friendships. Approaches that fail to treat unreciprocated friends as a distinct type of friendship (e.g., approaches that restrict friendships to a definition requiring reciprocity) may overlook the potential importance of

these meaningful relationships. When examining adolescent best friendships, researchers commonly find between 10 to 30 percent of adolescent best friendships are unreciprocated (e.g., Hallinan, 1978/79; Stevens & Prinstein, 2005). By treating these unreciprocated relationships as non-friends, or failing to distinguish them from reciprocated friends, researchers may be overlooking a potentially important peer context for understanding social influence and substance use outcomes.

Why Unreciprocated Friends May Be Important In Understanding Influence

In work examining the relative stability of unreciprocated and reciprocated friendship dyads, Hallinan (1978/79) presents a four step sequential process for friendship formation. First, the person, P, must desire to have another person, O, as a friend. Second, P must initiate a move to establish a friendship with O. Third, O must recognize P's overture of friendship. Fourth, O must reciprocate P's offer of friendship. Theoretical support for this friendship model can be found in the literature (e.g., Goffman, 1963; Waller, 1938), and empirical work by Hallinan (e.g., Hallinan, 1978/79) supports this model. As described by Hallinan, the process of making friends is conceptualized as a sequence of tentative steps on the part of one person toward another. The first three of these steps occur while the relationship is in an asymmetrical state (i.e. the relationship is unreciprocated), with the fourth step moving the relationship to a reciprocated relationship or leading to the withdrawal of the friendship overture, resolving as a non-friendship. Based on exchange theory research (e.g., Blau 1964; Newcomb, 1956; and Thibaut & Kelley, 1959), Hallinan states that the initiator of the friendship offer generally has lower status than the recipient. In this model, unreciprocated relationships are unfinished interactions that will change to reciprocated friendships or non-friendships when the desired friends respond to the offers.

Generally consistent with this view is Dishion, Capaldi, Spracklen, and Li's (1995) summary of the confluence hypothesis (Dishion, Patterson, and Geisler, 1994) in which they state that the induction of similarity of problem behavior, including substance use, between adolescent male peers is thought to be quite powerful during the initial stages of a friendship formation. Additionally, French and Raven (1959) have provided a model for thinking about processes of social influence that when applied to adolescent best friendships supports the hypothesis that susceptibility to influence may be heightened when a relationship is unreciprocated. These authors refer to the capacity to exert influence over others as social power, and they formulate their theory from the point of view of the recipient of influence. The strength of social power may be limited by the connectedness between a recipient of influence and an influential agent (e.g., between an adolescent and his or her best friend), with the maximum possible influence exerted in either strong relationships (e.g., best friendships) or unilateral relationships (e.g., unreciprocated friendships), and less influence occurring in weak or disconnected relationships. Given that unreciprocated best friendships are both strong, as suggested by the labeling as "best," and that they have an inherent power differential created by the lack of reciprocity, social power processes of influence appear to be particularly relevant for these relationships. This view is consistent with exchange theory, which suggests that those adolescents in unreciprocated relationships might be more likely to go along with peers to gain acceptance (e.g., Nisbett & Ross, 1980; Thibaut & Kelley, 1959). Again, this may be especially true if the unreciprocated relationship is a best friendship, as this is one that may be more valued by the adolescent, who then may be more likely to change his or her behavior to please the desired friend.

Additionally, if these models of social influence are extended into a broader peer context, unreciprocated best friendships that occur within a context where the adolescent has no reciprocated friends may exert the greatest influence. Adolescents who have solely unreciprocated friends can be thought of as less connected to a peer social network and of lower status as compared to those who do have reciprocated friends. These adolescents may then be the most motivated to try to gain relationship reciprocity with their best friend, as the power differential between themselves and their unreciprocated friend is posited to be greater than it is for adolescents who have some reciprocated friendships. As Baumeister and Leary (1995) proposed, the human need to form and maintain interpersonal relationships (i.e. the need to belong), is a powerful, fundamental, and extremely pervasive motivation. Those deprived of this belongingness may then be the most motivated to find belongingness.

Empirical support for the suggestion that peer influence on substance use may vary by reciprocity status and the larger peer context primarily comes from several studies that have utilized social network data to examine how peer cliques and positions within the social network are related to substance use behaviors (Abel et al., 2002; Aloise-Young, Graham, & Hansen, 1994; Ennett & Bauman, 1993; Fang, Li, Stanton & Dong, 2003; Pearson & Michell, 2000; and Pearson & West, 2003). Several of these peer clique studies suggest that social isolation is a risk factor for substance use. Research by Ennett and Bauman (1993) found a strong association between social isolation and adolescent substance use. In their study, 9th grade adolescents who were relatively isolated, or less connected, to the peer context were more likely to smoke than were clique members (i.e. adolescents with multiple relationships that form a cohesive peer group) or liaisons (i.e. adolescents who were not a member of a clique, but who had links to clique members). As defined in the Ennett and

Bauman study, the relatively isolated adolescents were those adolescents with few or no links to other adolescents in the network and the category included dyads (i.e. adolescents whose only friendship links are to each other; an isolated friendship dyad), tree nodes (i.e. adolescents whose connection to the larger peer network was dependent on their relationship with one other person, without whom they would be isolated from the network), and true isolates (i.e. adolescents with no friends or only one friend). Although relatively isolated adolescents could have reciprocated friends, the relatively isolated adolescents were not integrated into peer cliques, had fewer links to other adolescents in the network, and were less connected overall to the school social network. Using slightly different methodological definitions (e.g., use of reciprocated links to define peer cliques), Pearson and Mitchell (2000) found that relatively isolated adolescents engaged in higher levels of risk-taking behavior, including smoking. Similarly, Abel et al. (2002) and Fang et al. (2003) found that relatively isolated adolescents engaged in higher levels of smoking.

As a whole, these findings suggest that adolescents less connected to school social networks, and presumably those with fewer reciprocated friendship links, are more likely to use substances. Because the adolescents defined as relatively isolated could have reciprocated or unreciprocated friends, the findings are unclear regarding how having an unreciprocated best friend or not having any reciprocated friends may contribute to this relative isolation and the associated risk for substance use. However, given that adolescents without reciprocated friendships may also be thought of as less connected to the social context, these findings suggest that these adolescents are also at risk for substance use.

As part of an effort to better understand relatively isolated adolescents (i.e. adolescents who are not in peer cliques or connected to peer cliques), the New Zealand

researchers Abel et al. (2002) examined the process by which these adolescents strive for group membership. To accomplish this, they cluster analyzed unreciprocated and reciprocated friendship links in adolescents who were identified as non-clique members in an earlier analysis (i.e. liaisons, dyads, tree nodes, and isolates). Whereas clique membership within this study was defined by patterns of reciprocated friendship links, the cluster analysis grouped the adolescents who were not clique members based on structural profiles that characterized their patterns of reciprocated and unreciprocated links. The cluster analyses identified four clusters within these non-clique members, and smoking behavior varied across these clusters of non-clique members. Interestingly, a cluster identified as ‘try-hards’ (because they had few reciprocated links but were making numerous unreciprocated links) were characterized by either smoking more than the other clusters, or having never smoked, depending on to which clique the ‘try-hard’ adolescent was most closely linked. That is, these adolescents were thought to be influenced by the clique that they were ‘trying hard’ to get into. Adolescents with an unreciprocated best friendship and those without any reciprocated friendships may be similar to these “try-hards,” as they, too, are characterized by friendship nominations that are unreciprocated. As a whole, these studies of peer cliques demonstrate that adolescents less connected to their peers may be at higher risk for substance use and they highlight a potential role that unreciprocated friends may serve in influencing substance use behaviors.

In using these peer clique analyses to better understand the possible associations between unreciprocated best friendships and adolescent substance use it is important to note several confounding issues that arise. First, none of these peer clique studies simultaneously examined dyadic relationships. What appears to be an association between substance use and

relative isolation from peer cliques may also be an association with isolation that occurs through not having a reciprocated best friend or from not having reciprocated friendships. Though Urberg et al. (1995) found that 50-70% of an adolescent's close friendship nominations are in their friendship group, 30-50% are not in their friendship group. Additionally, separating dyadic effects from group effects may be important because if influence derives in part from conforming to the behavior of a friend, then influence may differ depending on whether the adolescent is conforming to the behaviors of a group or to those of a specific peer. Second, the peer cliques that are typically defined in social network analyses are often comprised of friends with both reciprocated and unreciprocated links, though the way groups are defined varies somewhat across studies. For example, some researchers defined groups based on both unreciprocated and reciprocated links (e.g., Ennett & Bauman, 1993). However, other researchers relied exclusively on reciprocated friendship links (e.g., Pearson & Michell, 2000; Abel et al., 2002). Third, whereas peer cliques are suggestive of specific types of peer contexts, there is often much heterogeneity in the way the clique membership is defined and clique membership or non-membership does not map precisely onto the peer contexts of interests in the current study (i.e. contexts of either all unreciprocated friends vs. some reciprocated friends). For example, most of the studies use NEGOPY software (Richards, 1989) to identify social positions within a peer social network; however, these studies vary in how they define peer cliques and how they combine adolescents in various social positions to determine which adolescents are relatively isolated from the larger peer network. Nonetheless, these studies generally support the importance of considering an adolescent's connectedness to other peers and to the larger peer context as predictors of substance use, and several of the studies provide specific support for the

hypothesis that those adolescents who are relatively isolated from their peers are at higher risk for substance use.

The few studies that have utilized social network data to examine dyadic relationships and their influence on substance use have not distinguished between unreciprocated and reciprocated friendships (e.g., Gaughan, 2003; Rice, Donohew, & Clayton, 2003; and Urberg et al., 1997; Urberg, et al., 2003). One exception is a study by Aloise-Young et al. (1994) that extended beyond peer clique analyses by simultaneously examining the role of unreciprocated and reciprocated best friends on adolescent smoking behavior. Their project found that adolescents who did not have any reciprocated friendships were affected more by the smoking of their best friend than were adolescents whose friendships were all reciprocated. In other words, the unreciprocated best friend of adolescents with no reciprocated friends was more influential on adolescent smoking behavior than the reciprocated best friend of those adolescents with all reciprocated friends. Moreover, the study found that adolescents without reciprocated friends were twice as likely to begin smoking if their desired best friend was a smoker than if their desired best friend was a non-smoker. This study highlights the potential interactions between best friend use, reciprocity status, and peer context on adolescent substance use.

Interestingly, Aloise-Young et al. (1994) also found that although 7th grade reciprocated friends were initially more similar in their smoking behavior than 7th grade unreciprocated friends, the unreciprocated friendships that transitioned into 8th grade reciprocated friendships (i.e. changed from unreciprocated to reciprocated friendships over the course of a year) were as similar in smoking behavior as those 8th grade reciprocated friendships that maintained reciprocity over the same period of time. This finding does not

clarify whether these adolescents became similar and then became reciprocated friends or whether they became reciprocated friends and then became similar. However, the finding does suggest that peer influence that occurs over the course of an established reciprocated friendship may be less of a contributor to friend substance use similarity than influence that occurs earlier in time, during the course of friendship formation (i.e. during the process of selection and movement from an unreciprocated to a reciprocated friendship).

In sum, the majority of studies of peer influence and selection on adolescent alcohol use have not included data from both subjects and their friends, and thus, these studies have not distinguished between unreciprocated and reciprocated friendships. Prior research that has included examination of reciprocity has predominately focused on analyses of influence for those adolescents with reciprocated friendships or has confounded the distinctions between best friends and peer cliques when examining social networks. As a result, important aspects of peer influence on alcohol use have been omitted, namely, influence that may occur before the establishment of a reciprocated friendship (e.g., during friendship formation). That is, adolescents may be influenced not only by their existing friends (i.e. reciprocated friends), but also by their unreciprocated friends. How the reciprocity status of best friendships may impact the relation between an adolescent's own alcohol use and that of his or her best friend has not been previously examined.

To address this issue, the current study tested two hypotheses. The first hypothesis tested whether the alcohol use behavior of an adolescent's best friend not only influences an adolescent's alcohol use behavior, but also whether the influence of the best friend varies as a function of friendship type (i.e. unreciprocated versus reciprocated). Adolescents with an unreciprocated best friend were expected to show more conformity with the behavior of their

best friend than were adolescents with a reciprocated best friend. The second hypothesis tested whether adolescent conformity with an unreciprocated best friend varies across two overall friendship contexts in which (1) the unreciprocated best friendship occurs in a context where the adolescent has no reciprocated friendships and (2) the unreciprocated best friendship occurs in a context where the adolescent has other friendships that are reciprocated. Adolescents with an unreciprocated best friend were expected to show more conformity with the behavior of their best friend in the friendship context of no reciprocated friendships.

The examination of alcohol use behavior in the current study was guided by methods described by Urberg (1999). In an issue of the *Merrill-Palmer Quarterly* focused on the study of peer influence, Urberg noted that the effects of influence and selection can be differentiated only through the use of longitudinal data. Urberg described three methods of separating the effects of influence processes from those of selection. One way is to examine influence after selection has occurred (e.g., Fisher & Bauman, 1988; Billy & Udry, 1985; Kandel 1978). By restricting analysis to only those subjects who retained their best friend over time, the researchers minimized the possibility that selection processes were operating. A second way to establish influence processes, independent of selection, is by examining the onset or initiation of drug use behaviors. For example, if a drug-using friend of a non-drug using adolescent at Time 1 predicts the onset of drinking at Time 2, then one can reasonably conclude that peer influence was operating since their selection as friends at Time 1 could not have been based on similar drug use behavior. Ennett and Bauman (1994) employed this approach when examining the homogeneity of peer group smoking behavior, and similar approaches have been used by Chassin, Presson, Sherman, Montello, and McGrew (1986)

and Urberg et al. (1997). However, peers may not only be influential at the onset of behaviors, but also at the point of increases in behaviors (e.g., increases in quantity or frequency). The third method for separating influence processes from those of selection is to use statistical controls, which allows for the examination of increases in behavior. This approach is usually done using hierarchical regression to predict future behavior, while controlling for prior behavior. This approach not only controls for the adolescent's Time 1 behavior, so that the friend's behavior is predicting change in the adolescent's behavior, but it also controls for selection by taking out the similarity, or variance, that the two friends have in common. This approach has been utilized by Berndt and Keefe (1995) and Mounts and Steinberg (1995). The first of these three methods (i.e. the examination of influence in stable friendships) is not well suited for the current set of hypotheses because (1) the current study focuses on examining unreciprocated friendships, which are typically short-lived (e.g., Hallinan, 1978/79), and (2) the study's two assessment points span a school transition, which is thought to disrupt friendship stability (e.g., Hardy, Bukowski, & Sippola, 2002). However, the current study will use the second and third methods to examine influence, independent of selection based on substance use behaviors. Therefore, to examine each of the hypotheses presented, measures of (1) initiation of alcohol use and (2) frequency of alcohol use served as outcome variables that were tested separately for each hypothesis.

Alcohol Use as a Mechanism that Facilitates Friendship Formation

Beyond understanding the potential unique influence of unreciprocated best friends within various peer contexts, this study sought to examine the possible role of similarity in substance use behaviors in facilitating the formation of reciprocated friendships for those adolescents with an unreciprocated best friend. Similarities in activity preferences appear to

be an important aspect in friendship formation at all ages (Aboud & Mendelson, 1996). Conversations aimed at establishing a common activity, but not conversations aimed at other similarities and differences, predict whether pairs of children who meet for the first time will “hit it off” (Gottman, 1983). Similarity within adolescent friendships is thought to be rewarding in at least two ways (Aboud & Mendelson, 1996). First, having similar behaviors provides validation of one’s attitudes and beliefs by the peer. Second, similarity provides opportunities for participating in shared activities which are mutually enjoyable and which place peers in close proximity to one another. Kandel (1978) and Cohen (1977) have discussed the process of homophily, a term that refers to the tendency for people to be attracted to others similar to themselves. Though there are many dimensions upon which common ground can be established, Kandel (1985) found that adolescents generally select friends of similar age, the same gender, and race. Beyond demographic attributes, Kandel found that substance use behaviors are the next most shared characteristic. Substance use behaviors may communicate shared attitudes and provide opportunities for shared activities that facilitate friendship formation.

Even though homophily is thought to be an important determinant of friendship selection, the role of substance use similarity in facilitating the formation of reciprocated friendships (i.e. the transition from unreciprocated to reciprocated friendships) has been previously examined in only one study. Aloise-Young et al. (1994) examined the relationship between smoking similarity and the transition from an unreciprocated friendship to a reciprocated friendship. In their longitudinal study examining adolescents during the 7th and 8th grades, the authors predicted that similarity in smoking status (e.g., both the adolescent and the unreciprocated best friend are smokers) at 8th grade would increase the chances that

an unreciprocated friendship in the 7th grade would become a reciprocated friendship in the 8th grade, independent of smoking similarity in the 7th grade. Their findings indicate that similarity in smoking status was related to the formation of friendship reciprocity, but not the breakdown of reciprocated friendships. In other words, adolescents with unreciprocated best friendships were more likely to gain reciprocity within the friendship if the adolescent's smoking status was similar or became similar to their best friend's than if it was inconsistent. The results indicated that adolescents may view smoking as a mechanism for gaining friendship, and for some adolescents this appears to be an accurate view.

The current study attempted to extend the findings of Aloise-Young et al. (1994) to similarity based on alcohol use behaviors, specifically examining the impact of alcohol use similarity on the transition from unreciprocated to reciprocated friend status. To address this, the current study examined non-alcohol using adolescents with an unreciprocated best friend to see if increases in the adolescent's own alcohol use behavior facilitated a reciprocated friendship formation with an alcohol-using peer.

In the Aloise-Young et al. (1994) study the researchers tested to see if adolescent initiation of substance use would increase the likelihood that an adolescent in an unreciprocated friendship with a substance-using peer would later form a reciprocated relationship with this same peer. However, most unreciprocated friendships do not become reciprocated (Hallinan, 1978/79) and school transitions, as in the current study, are thought to decrease friendship stability (e.g., Berndt & Hoyle, 1985; Bukowski & Newcomb, 1984; Hardy, Bukowski, & Sippola, 2002). Nevertheless, if an adolescent adopts the substance use behavior of a desired friend, this new behavior may facilitate increased opportunities for friendship formation, even if the friendship is not formed with the individual that influenced

the adolescent's change in behavior. Additionally, researchers have noted that old friends tend to be replaced with someone who is similar to the original friend (e.g., Bearman & Brückner, 1999; Billy & Udry, 1985) and adolescents tend to choose new friends who are as similar to them as are their existing friends (Değirmencioğlu & Urberg, 1995, as cited in Urberg et al., 1997). As such, the current study examined whether movement toward substance use similarity with an unreciprocated best friend facilitated an adolescent later forming a reciprocated friendship. The question of how substance use similarity may facilitate the transition from an unreciprocated friendship to a reciprocated friendship was not limited to a specific dyad, but was examined more broadly to examine if changes in adolescent substance use behaviors facilitated friendship reciprocity with a substance using peer for those adolescents who earlier selected an unreciprocated substance using best friend.

Goals of the Study

To better understand the potential influence of unreciprocated best friends on adolescent alcohol use, the present study tested three sets of hypotheses.

First, adolescents with an unreciprocated best friend were expected to show more conformity with the alcohol use behavior of their best friend than were adolescents with a reciprocated best friend due to the inherent power differential created by the lack of reciprocity in the relationship. This hypothesis was tested in two separate models, one examining initiation of alcohol use for those adolescents who were not using at the initial assessment and the other examining changes in the frequency of alcohol use.

The second hypothesis tested whether adolescent conformity with an unreciprocated best friend varied across two overall friendship contexts in which (1) the unreciprocated best friendship occurred in a context where the adolescent had no reciprocated friendships and (2)

the unreciprocated best friendship occurred in a context where the adolescent had other friendships that were reciprocated. Adolescents with an unreciprocated best friend were expected to show more conformity with the behavior of their best friend when they resided in a context without any reciprocated friends, as adolescents less connected to the peer context may be more invested in trying to gain friendship reciprocity through conforming to the behaviors of others. As in the first hypothesis, the second hypothesis was tested in two separate models, one examining initiation of alcohol use for those adolescents who were not using alcohol at the initial assessment and the other examining changes in the frequency of alcohol use.

Third, changing alcohol use behaviors to match an unreciprocated best friend's alcohol use, specifically, initiation of alcohol use, was expected to facilitate reciprocated friendship formation with an alcohol-using peer. Given that similar substance use behaviors appear to be an important aspect of friendship selection and that many adolescents accurately view smoking as a mechanism for gaining friendship reciprocity, this hypothesis extended current findings into the area of alcohol use.

These hypotheses were examined within a short-term longitudinal sample of adolescents in 8th and 9th grades. This transition is considered a time of significant developmental change, especially in two areas relevant to the current study - social context and alcohol use behaviors. The high school transition for the adolescents in this study is marked by moving to new and larger schools. Based on previous research of school transition, the adolescents in the current study were expected to be in an environment that provides ample opportunity for both continuity and change in their social network (e.g., Hardy et al., 2002), thus providing a rich context in which to examine peer friendship.

Additionally, rates of alcohol use increase dramatically during this time. National data from 2004 indicate that 44% of 8th graders and 64% of 10th graders report having previously initiated alcohol use (i.e. lifetime prevalence), and 19% of 8th graders and 35% of 10th graders report having used alcohol in the past 30 days; (Johnston, O'Malley, Bachman, Schulenberg, 2005). Analyses of the current study indicated a similar marked rise in alcohol consumption across this transition, with initiation increasing from 39% for 8th graders to 49% for 9th graders, and past 6-month alcohol use increasing from 26% for 8th graders to 41% for 9th graders.

METHOD

Study Overview

The current study uses data collected through the High School Transition Study (HSTS), a multi-stage, longitudinal study of adolescents, their parents and their friends (PI: Andrea Hussong; Hussong, 2000, 2006). The HSTS includes four phases of data collection. (See Figure 1 for design overview). In Phase I, 399 of 436 8th grade students in participating schools completed classroom administered surveys assessing a broad array of factors, including risk indicators for substance use in high school (i.e., initiation of alcohol use themselves or by their friends). For Phase II, participants were recruited during a time-limited period from the Phase I sample according to their rank-ordering of risk status (i.e., from high to low). (Because this stage required completion during the summer between 8th and 9th grade, we limited recruitment efforts to an eight-week period.) We attempted to contact 198 Phase I participants, with 81 agreeing to participate. Primary reasons for non-participation were inability to contact ($n = 33$), ineligibility ($n = 20$, language barrier, moving, did not pass grade), limited availability ($n = 17$), and privacy concerns ($n = 11$). Of 145 eligible, contacted families, 56% participated in Phase II. In Phase III, we conducted school-based assessments in 9th grade at two of three county high schools with 351 out of 434 enrolled students participating. Because 8th grade schools did not include all feeder schools for 9th grade schools (i.e., one 8th grade school attended the non-participating high school, one non-participating 8th grade school attended a participating high school), our Phase III sample included only 273 of those participating in the Phase I sample. In Phase IV,

we conducted follow-up interviews with 56 participants from our Phase II sample (69% participation rate). Because the current study only uses data from Phases I and III, only those phases are discussed in detail below.

Analysis Sample

The current study utilizes a sample of adolescents who participated in the school-based surveys, Phases I and III, referred to hereafter as Time 1 (T1) and Time 2 (T2) of the HSTS. Time 1 included 8th grade students from seven of nine county middle schools. Prior to administration of the T1 surveys (8th grade surveys), school rosters were obtained from the schools indicating that a total of 436 students were enrolled across the seven participating middle schools in spring 2002. However, 8 students had moved out of the school district before assessment, leaving a total enrollment of 428 students at the time of assessment. Of these eligible students, 399 completed the data collection (92%), 4 were absent on both school assessments (i.e., initial and make-up times), 4 were incomplete or refused because the participant did not understand English well enough to complete the survey, 15 students' parents refused their child's participation, and 6 students did not assent to participate.

School based survey data collection occurred again, approximately 1 year later, in spring 2003 (Time 2). Two of the county's three high schools participated in the study. The consent, assent, and collection procedures for the high school surveys followed the same procedures used at Time 1. Prior to administration of the T2 surveys (9th grade surveys), school rosters were obtained from the schools indicating that a total of 434 students were enrolled across the two participating high schools. Of these eligible students, 351 completed the data collection, which represents 81% of the eligible school roster, and 89% of the eligible school roster of those who completed Phase I. Students who did not participate at

Phase III included 1 who was not eligible due to having sophomore standing, 2 who had moved, 3 who were unable to complete the survey due to language barriers, 26 who had parent or adolescent refusals, and 51 absentees.

Some participants from Phase I were not eligible to participate at Phase III since they were assigned to the non-participating high school. Additionally, some of the Phase III participants were not eligible at Phase I (i.e. they were not enrolled in participating Phase I schools). Across assessments, this resulted in a sample of 273 adolescents who participated at Phase I and Phase III. Analyses in the current study included only those adolescents from the school-based surveys who 1) participated in both Phase I and Phase III (i.e. T1 & T2) ; 2) provided valid alcohol use (at T1 and T2) and friendship nomination data (at T1; and for Hypothesis 3, at T2); and 3) nominated at least one friend who completed an 8th grade survey. As indicated in Figure 2, which provides an overview of the analysis sample, of the 273 adolescents who participated at both T1 and T2, 23 were excluded due to missing data (7 did not nominate a participating peer at T1; 13 were missing alcohol use data; and 3 had nominated best friends who were missing alcohol use data). This resulted in an available sample size of 250 for the OLS regression analyses examining frequency of alcohol use in hypotheses 1 and 2, and referred to as *Subsample A* ($n = 250$). Of these 250 adolescents, 156 had not initiated alcohol use at T1, resulting in a sample of T1 abstainers for the logistic regression analyses examining initiation of alcohol use in hypotheses 1 & 2, and referred to as *Subsample B* ($n = 156$). The final hypothesis of the current study utilized a subsample of adolescents who were T1 abstainers who also had a T1 unreciprocated best friend. Of the 156 T1 abstainers, 47 of these adolescents had a T1 unreciprocated best friend. However,

participants did not have any best friends with alcohol use data, resulting in *Subsample C* ($n = 45$).

In the 8th grade, the largest of these samples, Subsample A, was 48% female; 75% White non-Hispanic, 18% black non-Hispanic, 2% Hispanic, 1% American Indian/Alaskan Native, 1% Asian, 1% Native Hawaiian or Pacific Islander, and 3% other race/ethnicity; with a mean age of 13.59 ($SD = 0.57$) and 51% 13 years of age, 43% 14 years of age, and 6% 15 years of age at the time of the assessment. The average parental education of at least one parent is 2.41 ($SD = 1.08$), which falls between the levels of “some college or technical school” and “college graduate.”

Analyses comparing the T1 participants in Subsample A ($n = 250$) and those excluded ($n = 149$; 145 of which reported on alcohol use) found that excluded adolescents were somewhat more likely to have initiated alcohol use ($t(393) = 1.86, p = .06$; 45 vs. 39%) and nominated fewer friends ($t(393) = -3.47, p < .001$; $M = 3.95$ vs. 4.36) as compared to adolescents in Subsample A.

Design and Procedure

Seven of nine Chatham County schools with 8th grade students participated in the study. Three weeks prior to data collection, we mailed directly to students' parents a packet explaining the study and a notecard that parents could return if they did not want their child invited to participate in the study. The same packet was also sent home from school with students to share with their parents. We placed on reserve at the school a copy of the survey for parents to review. Teachers and principals also received a set of instructions for data collection (i.e., what to expect and what they would be asked to do/ not do) prior to our arrival. Data collection took place with all 8th graders in a single period on a single day,

although we returned to schools to assess absentees. We entered classrooms as pairs of data collectors, explained the study, obtained informed consent, demonstrated how to fill out the friendship nomination items, administered the survey, and rewarded participants with an HSTS keychain. Teachers were often, though not always, present during testing and it is our sense that their presence helped with class discipline but without interfering in the test protocol.

School based survey data collection occurred again, approximately 1 year later, in spring 2003 (Time 2). Two of the county's three high schools participated in the study, which prevented Time 2 data from being collected on students who were assigned to the non-participating high school. This mainly consisted of students from one of the seven participating middle schools ($n = 48$). The consent, assent, and collection procedures for the high school surveys followed the same procedures used at Time 1. Unlike Time 1 data collection, where the surveys were administered within classrooms, the high school surveys were administered in large rooms (i.e. the cafeteria). As in the Time 1 data collection, teachers were present during testing, helping with discipline, however the test administrators monitored the school staff and none were noted interfering in the test protocol.

The Time 1 and Time 2 surveys were similar in content and length. All respondents were given the same survey within each time point, which took approximately 45 minutes to complete. Research assistants distributed a survey and a student directory (to complete friendship nominations), referred to as a List of Student Names, to each participating student. The survey contained a variety of measures including questions about positive and negative affect, school environment, aggression, delinquency, stress and coping, anxiety, and drug use behaviors.

Measures

All measures described below were assessed at T1 and T2. Subsample A ($n = 250$) was utilized to obtain the descriptive statistics that are provided within the following text and in Tables 1-4.

Demographic and Control Variables

Demographic variables included self-reported age, gender, race, and parental education. The mean age at T1 was 13.52 years of age ($SD = .57$), with ages ranging from 13 to 15 years of age. Gender was dummy coded as 0 = girl, 1 = boy, with girls as the reference group. Race was dummy coded as 0 = non-White, 1 = White, with non-White as the reference group. Parental education served as an SES indicator and was scored as the maximum level of mother education and father education. The mean parental education was 2.39 ($SD = 1.06$), with the average parental education falling between “some college or technical school” and “college graduate”.

Given that the friendship variables of interest in the study may serve as a proxy for other constructs (e.g. having unreciprocated friends may be related to delinquency; or having reciprocated friends may be related to one’s connectedness to the school environment), variables assessing delinquency and school closeness were included as possible control variables.

Six items from the Problem Behavior Scale (Farrell, Jung, White, & Valois, 2000) assessed delinquency problems (e.g. damaged property, stolen something, shoplifted). Adolescents reported the frequency of engaging in each delinquent behavior on a 6-point response scale that ranged from never (0) to 20 or more times (5). Scores on this measure at T1 ranged from 0 to 2.83. The scale had a mean of 0.28 ($SD = 0.46$) and an acceptable

reliability (Cronbach's $\alpha = 0.79$). The scale did not include any items that asked about substance use.

School closeness was measured by one item where participants answered whether or not they agreed with the statement "I feel close to people at this school," using a five-point scale varying from 0 to 4 where higher ratings indicated more agreement. The mean response on this item was 3.15 ($SD = 0.92$). This item was selected from a scale of school bonding from the Context Study of Adolescent Substance Use by Ennett, Bauman, Hussong, Faris, Foshee, DuRant, and Cai (in press).

Friendship Nominations and Derived Variables

Following procedures used by Ennett and colleagues (Ennett et al., in press), the final section of the survey asked adolescents to list the initials of their best friends who are around their same age, "starting with your very best friend". Adolescents were given five spaces to indicate the initials of their "very best friend," "second best friend," through "fifth best friend." The five spaces for friendship nominations that were provided are thought to provide a sufficient balance between having adolescents provide too few nominations, which inadequately captures their close friends, and too many nominations, which may result in some participants nominating peers who are not close friends (Rogers & Kincaid, 1981). Additionally, we did not want adolescents to name casual acquaintances, so we specifically requested "best friends." Previous work by Urberg suggests that most adolescents nominate 4 to 5 friends (Urberg et al., 1995). After listing the initials of up to five best friends, the participants were given five additional spaces to list a code for each of their friends. To list a code for each friend, participants used The List of Student Names, which included an alphabetical roster of all students enrolled in the same grade at their school along with a four

digit numerical identifier that was unique to each student. Friends not listed in the List of Student Names (e.g., friends from other grades or other schools) were identified using the code of “00”. Use of the unique code allowed for subsequent determination of friendship reciprocity among participants by the researchers. Additionally, adolescents were asked to rate how close they felt to each of their friends, ranking each relationship as “very close,” “pretty close,” or “not very close.”

Several variables were derived from these nominations to characterize the peer context. Friendship reciprocity was coded as “reciprocated” if (1) the peer that was selected as an adolescent’s friend also selected the adolescent as a friend (i.e., any of the five available friend nominations) within the same assessment period; AND (2) the adolescent and the peer both ranked each other as either “very close” or “pretty close” friends (i.e., A nominated B, B nominated A, and A and B ranked each other as either a “very close” or “pretty close” friends).¹ Friendship reciprocity was coded as “unreciprocated” when a participant’s nomination of another participant was either not mutual (i.e. A nominated B, but B failed to nominate A) or not positive (i.e. A ranks B as “very close” or “pretty close” friends, but B ranks A as “not very close”). The method of limiting reciprocity to those with a closeness rating of “very close” or “pretty close” is consistent with methods used within other studies (e.g., Henrich et al., 2000).²

Best friendship reciprocity. Best friend was operationalized as the study participant who was listed first among the up to five participants listed by the nominator. This best

¹ Seven adolescents were previously excluded (i.e., excluded prior to forming the subsamples of analyses) due to not having at least one nominated friend who participated in the study at T1.

² For a few participants ($n = 7$; 2.8% of the total number of best friend nominations), utilization of this closeness criteria in defining friendship resulted in the recoding of best friend reciprocity (see description of *best friend reciprocity* variable) from “reciprocated” to “unreciprocated.”

friendship may be more accurately thought of as the best friend among participants within the school context. Other studies have used similar approaches to identify best friendships, for example, relying on the first listed nomination when an adolescent failed to identify a best friend (e.g., Urberg et al., 1997). Defining best friend as the first listed participant, rather than the first listed nomination, allows for the inclusion of additional participants who would otherwise not be included because their first nomination was directed toward a non-participant (77% directed their first nomination toward a participant; see Table 1 for rank of best friend). Of the 250 participants in the sample of interest, 186 (74%) had a reciprocated best friend and 64 (26%) had an unreciprocated best friend.

Friendship context. Friendship context is a dichotomous variable that coded the reciprocity of each of the adolescent's nominated friends, excluding the relationship defined as the Best Friendship nomination. That is, the variable coded the peer context in which the best friendship occurred, indicating whether or not any of the adolescent's other nominations, with a maximum possible quantity of four, were reciprocated. The variable was coded as "0" for "no reciprocated friends," if all the adolescent's other nominations had friendship reciprocity coded as unreciprocated. It was coded as "1" for "some reciprocated friends," if at least one nomination was coded as reciprocated.

Best friend reciprocity/context. This variable was created for post-hoc analyses to test whether best friend reciprocity had a different relation to alcohol use if it occurred within versus outside of a context with other reciprocated friends. Best Friend Reciprocity/Context was defined with three categories based on a combination of the two variables, best friend reciprocity and friendship context. This coding allowed for the comparison of a peer context in which the adolescent had no reciprocated friends within the school and a peer context

where the adolescent had some reciprocated friends within the school. If best friend reciprocity was coded as “unreciprocated” and friendship context was coded as “no reciprocated friends”, the variable was coded as “unreciprocated best friend/no reciprocated friends.” If best friend reciprocity was coded as “unreciprocated” and friendship context was coded as “some reciprocated friends,” the variable was coded as “unreciprocated best friend/some reciprocated friends.” If best friend reciprocity was coded as “reciprocated,” then the variable was coded as “reciprocated best friend.” The categories resulted in 21 adolescents with no reciprocated friends, 64 adolescents with an unreciprocated best friend but some reciprocated friends, and 165 adolescents with a reciprocated best friend. Dummy coded variables were then created to allow for comparisons of the three resulting categories.

Across all three categories, the majority of adolescents nominated 4 to 5 participants as their friends. Among the 21 adolescents categorized as having no reciprocated friends, all except 1 nominated 2 or more participants as a best friend (i.e., all but 1 had the opportunity to be included in the “unreciprocated best friend/some reciprocated friends” category).

Indegree. For use in descriptive post-hoc analyses, an indicator of popularity was created by counting the number of friendship nominations that an adolescent received and dividing it by the number of possible friendship nominations (i.e. the number of peers within the adolescent’s school who completed a survey; calculated as $([“arrows-in” / (\# \text{ of school participants} - 1)] \times 100)$). This is a measure of the proportion of friendship nominations received. It is standardized across respondents from varying school sizes.

Alcohol Use Variables

Data on alcohol use behaviors were based on direct reports rather than on the adolescent’s perceptions of friends’ behavior, thus avoiding artificial inflation of friends’

behavior due to projection (e.g., Bauman & Fisher, 1986). The alcohol use items used in this study were adapted from a measure assessing adolescent substance use by Chassin, Rogosch, & Barrera (1991).

Alcohol initiation. One item measuring lifetime alcohol use was used to determine the initiation of alcohol use. The item reads, “What is the most that you have ever used alcohol? By alcohol, we mean more than just a sip of beer, wine, wine cooler, or hard liquor.” The scale was dichotomized between points 0 (never) and 1 (1-2 times in my life) to code as “lifetime non-drinker” (also referred to as “abstainer”) or “drinker” status at 8th Grade and 9th Grade. Additionally, if the participant indicated use on any of the other T1 alcohol use items (i.e. 3 items that assessed past 6 month frequency of use, heavy use, and being drunk), this item was recoded to 1 (e.g., if this item was missing but other alcohol use items completed by the participant indicated they had previously used alcohol). At T1, 94 adolescents (37.6%) had initiated alcohol use. At T2, 146 adolescent (58.4%) had initiated alcohol use.

Frequency of alcohol use. Because peers may not only be influential at the onset of behaviors, but also at the point of increases in behaviors (e.g., increases in quantity or frequency), one item measuring frequency of adolescent alcohol use over the past 6 months was used. Measures of alcohol use frequency are considered more appropriate than measures of quantity consumed for this age group (Wills, McNamara, Vaccaro, & Hirk, 1996). On the HSTS survey the 8-point response scale ranged from never (1) to every day (8). This item was adapted from Chassin, Rogosch, and Barrera (1991) and the response scale is consistent with scales from Wills (1986). For the current analyses the scale range was transformed into

a 5-point response scale by collapsing the three highest response levels, with the transformed scale ranging from never (1) to once a week or more (5).³

This variable was used as a single item measure of frequency of alcohol use for each time point – 8th Grade (T1) and 9th Grade (T2). Analyses at T1 ($n = 250$) indicated that scores on this measure ranged from 1 to 5 with a mean of 1.31 ($SD = .74$), with 53 (21 %) adolescents reporting alcohol consumption in the past 6 months. This mean falls between “not at all” and “1-2 times in the past 6 months.” Analyses at T2 ($n = 250$) indicated that scores on this measure ranged from 1 to 5 with a mean of 1.58 ($SD = .96$), with 95 (38 %) adolescents reporting alcohol in the past 6 months. This mean falls between “not at all” and “1-2 times in the past 6 months.”

T2 frequency of alcohol use served as an outcome variable in two OLS regression analyses. The skewness and kurtosis (2.12, 4.45) of this variable, and the related Shapiro-Wild statistic ($W=.63$, $p<.05$), indicate that this variable has a non-normal distribution, and as such, the OLS regression models using this outcome variable are interpreted in tandem with the parallel logistic models which examine initiation of alcohol use.

Alcohol similarity. Friends within assessment were matched on similarity of alcohol use behaviors using the alcohol initiation variable. This is a dichotomous variable that was coded as 1 = “similar/both users”, indicating that the adolescent and their best friend had both initiated alcohol use, or 0 = “dissimilar or both non-users.” This was used only as a descriptive variable to better understand the sample of analysis.

³ The single item of frequency of alcohol use was used, rather than including other alcohol use items (i.e. two heavy alcohol use items), because frequency of use more closely parallels the initiation of use variable and because it measures more normative and overt adolescent behaviors that may be more easily observed and modeled by peers. Prior to deciding on the single variable outcome, a multi-item measure of alcohol use was formed using the frequency of use item with the two heavy use items, however, this had little impact on the distribution of the outcome variable or on the results of an initial OLS analyses of hypothesis 1.

T2 reciprocity/alcohol using friend. This variable summarizes the adolescent's friendship nominations to indicate whether or not the adolescent had any friendships that were reciprocated with an alcohol-using peer. T2 reciprocity/alcohol using friend is a dichotomous variable that was coded as 1 = "adolescent has formed a reciprocated friendship with an alcohol using peer at T2" or 0 = "adolescent has not formed a reciprocated friendship with an alcohol using peer at T2."

RESULTS

Descriptive Analyses

Descriptive statistics were examined to characterize variability across schools in the primary variables of interest (Tables 1 & 2) as well as differences between adolescents with and without a reciprocated best friend (Table 3). In addition, I examined bivariate associations among primary variables of interest (Table 4).

Variation across the Schools

Variation in demographic variables and other variables of interest were examined across schools. Mean levels and frequencies of variables by school are presented in Tables 1 and 2. The number of participants included in the current sample from the T1 schools varied widely, from $n = 4$ to 109. The large majority of adolescents (77.2%) nominated a within-grade and within-school peer (i.e. an adolescent on their within-grade school roster) as their “very best friend”. Overall, 93% of the adolescents ranked a peer from their school roster as one of their top two friends. For T1 Middle School #1, only 86% of the adolescents ranked a peer from their school roster as one of their top two friends. The participants at this school also reported a greater percentage of alcohol use (64.3%) and a greater percentage of alcohol similarity with their best friend (57.1%) when compared to the overall T1 percentages of 37.6% and 19.2%, respectively. However, this is a small school ($n = 23$) and the absence of a few males on the day of testing resulted in an unbalanced gender split among participants, with this school sample being 78% male, as compared to the overall percentage of 49.2% male. T1 Middle School #7 had only 4 participants because this is the one middle school that

was a feeder school for a high school that did not participate in the T2 school survey. As such, only a few of the T1 participants from this school had T2 data available (a requirement for inclusion in subsequent analyses) because most of these students went to the high school that did not participate in T2 of the project.

Student nestedness within schools created potential non-independence in alcohol use measures. To examine if students from the same school may be more similar on alcohol use behaviors than students from different schools, a random effects ANOVA model was run using the SAS PROC MIXED (SAS Institute Inc., 2003) procedure with the dependent variable assessing lifetime alcohol use (i.e. “What is the most that you have ever used alcohol?”) examined by school (seven T1 schools). Intraclass correlations indicated a small amount of nesting ($ICC = 0.007$). Though this variance was not of theoretical interest within the current study, it is a violation of the assumption of independence for subsequent regression analyses. Steps were taken to control for the effects of this nesting by including the school variable as a possible statistical control within the analyses. T1 schools were dummy coded and examined in both a logistic regression model predicting T2 alcohol initiation and an OLS regression model predicting T2 frequency of alcohol use. T1 school was not a significant predictor of T2 alcohol use and was therefore not included as a control variable in subsequent regression analyses.

Differences between Adolescents with Reciprocated and Unreciprocated Best Friendships

Because a central aim of this study was to examine how best friend reciprocity status may interact with other variables to predict subsequent alcohol use, the similarities and differences between adolescents with an unreciprocated best friend versus those with a reciprocated best friend were explored through a series of t-tests.

Of the participants in Subsample A ($n = 250$), 74.40% had a reciprocated best friend best friend and 25.60% had an unreciprocated best friend at T1. The mean levels of descriptive variables, as well as significance tests, for continuous variables comparing adolescents with and without a reciprocated best friend are presented in Table 3.

Those adolescents with a reciprocated best friend were more likely to be female ($\chi^2(1, n = 250) = 9.29, p < 0.01$) and more likely to be White ($\chi^2(1, n = 250) = 6.11, p = 0.00$).

Those adolescents with a reciprocated best friend also tended to have a greater number of reciprocated friendships ($t(248) = 9.12, p < 0.00$) than adolescents with an unreciprocated best friend. Additionally, a marginally significant finding suggests that adolescents with a reciprocated best friend had a higher average rank for their best friend ($t(248) = 1.74, p = 0.09$) than adolescents with an unreciprocated best friend. That is, their best participating friend tended to occur earlier in the list of nominated friend (e.g. a nomination in the first of five survey spaces would be higher than one in the second space). Adolescents having a reciprocated best friend, as opposed to an unreciprocated best friend, did not differ on parent education, delinquency, school closeness, the overall number of friendship nominations, or the number of out of school/grade friendship nominations (all $p > 0.10$).

Relations between Alcohol Use and Adolescent Descriptive Variables

Table 4 shows the correlations among relevant model and control variables. Adolescent frequency of alcohol use was positively related to subsequent adolescent alcohol use and concurrent best friend alcohol use. Additionally, best friend alcohol use was positively related to subsequent adolescent alcohol use. This suggests that adolescents who drink alcohol are more likely to affiliate with other adolescents who drink, and that affiliation with adolescents who drink is associated with subsequent alcohol use. Older adolescents

tended to drink alcohol more frequently than younger adolescents did, and higher levels of delinquent behavior were associated with higher levels of concurrent and subsequent alcohol use as well as concurrent best friend alcohol use. School closeness and socioeconomic status were not correlated with alcohol use.

Additional chi-square tests showed that alcohol use did not vary by gender [T1 Initiated Alcohol Use ($\chi^2(1, n = 250) = 2.26, p = .013$), T2 Initiated Alcohol Use ($\chi^2(1, n = 250) = 0.98, p = 0.33$), T1 frequency of alcohol use ($t(248) = -1.13, p = 0.26$), or T2 frequency of alcohol use ($t(248) = 0.77, p = 0.44$)] or by reciprocity status of the best friendships [T1 Initiated Alcohol Use ($\chi^2(1, n = 250) = 0.77, p = 0.38$), T2 Initiated Alcohol Use ($\chi^2(1, n = 250) = 0.60, p = 0.44$), T1 Alcohol Similarity ($\chi^2(1, n = 250) = 1.00, p = 0.32$), T2 Alcohol Similarity ($\chi^2(1, n = 250) = 0.95, p = 0.33$), T1 frequency of alcohol use ($t(248) = 1.25, p = 0.21$), or T2 frequency of alcohol use ($t(248) = -0.51, p = 0.61$)].

To examine potential multicollinearity problems in subsequent analyses, bivariate correlations among predictors were also examined. All bivariate correlations of variables that appear within a single regression analysis as predictors fall below .60, well below the correlation values (.90 and higher) where multicollinearity problems are more likely to occur (Tabachnick & Fidell, 1996). Nonetheless, to reduce multicollinearity between main effect and interaction terms, predictor variables that were continuous measures (i.e. T1 frequency of alcohol use, T1 delinquency) were centered before being entered into regression equations (Aiken & West, 1991).

Determination of Control Variables

As a means of determining which control variables to include in the regression models for hypothesis testing, the potential control variables of gender, race, age, parent

education, delinquency, school closeness, and school were first modeled as predictors of the alcohol use outcome variables. First, these potential control variables were modeled with the alcohol use outcome variables of T2 alcohol initiation, using logistic regression, and T2 frequency of alcohol use, using OLS regression. In initial models, all of the above potential control variables were included in the tests. The variable of school, consisting of 6 dummy coded variables, was non-significant in both of the tests. The tests were then run again without the school variable. Gender (logistic, $\beta = -1.07, p = 0.00$; OLS, $\beta = -1.13, p = 0.04$), race (logistic, $\beta = 1.23, p = 0.01$; OLS, $\beta = 0.00, p = 0.97$), and delinquency (logistic, $\beta = .65, p = 0.35$; OLS, $\beta = 0.35, p = 0.00$) emerged as the significant predictors of T2 alcohol use and were therefore included as control variables in the subsequent OLS and logistic regression analyses. Subsequent OLS and logistic analyses both used the same control variables for comparability.

Best Friend Alcohol Use and Best Friend Reciprocity Interactively

Predicting Subsequent Adolescent Alcohol Use (Hypothesis 1)

To test the hypothesis that unreciprocated best friendships exert more influence than reciprocated best friendships on changes on the frequency of adolescent alcohol use, an OLS regression model was estimated using the SAS PROC REG procedure with the dependent variable of T2 frequency of alcohol use (Hypothesis 1; see Table 5). The analysis included both T1 alcohol users and T1 abstainers (Subsample A, $n = 250$). Prior alcohol use was controlled by including T1 frequency of alcohol use in the model. In the first step, the control variables were entered into the model as well as the main effects of T1 adolescent frequency of alcohol use, T1 best friend alcohol initiation, and T1 best friend reciprocity. In the second step, the interaction between T1 best friend alcohol initiation and T1 best friend reciprocity

was added to the model. The overall model accounted for 20% of the variance in T2 frequency of alcohol use ($F(7,242) = 8.38, p < 0.00$). The addition of the two-way interaction contributed 2% additional variance beyond the model with only the control variables and main effects. The interaction contributed significantly to the prediction of T2 frequency of alcohol use ($\beta = 0.24, p = 0.03$). Control variables and main effects (step 1) accounted for most of the variance in T2 frequency of alcohol use, with delinquency ($\beta = 0.23, p = 0.00$) and T1 frequency of alcohol use ($\beta = 0.17, p = 0.02$) predicting greater T2 frequency of alcohol use. Gender marginally predicted subsequent alcohol use (i.e. being a girl; $\beta = -0.11, p = 0.07$) whereas race ($\beta = 0.03, p = 0.65$) did not uniquely predict subsequent alcohol use.

The significant two-way interaction was interpreted by calculating the predicted values of T2 frequency of alcohol use at varying levels of T1 best friend alcohol initiation (i.e. non-drinker or drinker status) and T1 best friend reciprocity (i.e. unreciprocated or reciprocated status). Figure 3 shows the resulting findings.⁴ These results suggest that best friend alcohol use contributed greatest to subsequent alcohol use when the best friendship was reciprocated and the best friend had initiated alcohol use. This is inconsistent with the hypothesis that had predicted that having an alcohol using unreciprocated friend would uniquely contribute to subsequent alcohol use, however, more generally the finding supports the possible interactive effects of best friend use and reciprocity status.

A parallel model was tested to examine the dichotomous dependent variable of T2 alcohol initiation. Specifically, a logistic regression model, analyzed using the SAS PROC LOGISTIC procedure, was estimated to test the hypothesis that non-alcohol using adolescents with a best friend who drinks are more likely to subsequently initiate alcohol

⁴ The relations are plotted using the reference group for the dichotomous covariates (i.e. girl, non-White) and the mean of the centered variables of T1 frequency of alcohol use and delinquency.

when their best friendship is unreciprocated than when it is reciprocated (Hypothesis 1; see Table 5). Prior alcohol use was controlled by limiting the analyses to the subsample of adolescents who had not initiated drinking at T1 (Subsample B, $n = 156$). As a first step in the model, the previously identified control variables of gender, race, and delinquency, along with the main effects of T1 best friend alcohol initiation and T1 best friend reciprocity, were entered into the logistic model. Next, the interaction between T1 best friend alcohol initiation and T1 best friend reciprocity were entered into the logistic model to test the hypothesis of interest. The overall model was significant, $Wald's \chi^2(6, n = 156) = 18.568, p = 0.01$. However, the interaction between T1 best friend alcohol use and T1 best friend reciprocity did not contribute significantly to the prediction of T2 alcohol initiation ($\beta = .336, p = .70$). The main effects of being White (White compared to non-White; $\beta = 1.56, p = 0.00$), being a girl (boy compared to girl; $\beta = -1.40, p = 0.00$), and having a T1 best friend who had initiated alcohol use ($\beta = 1.4, p = 0.01$) contributed significantly to T2 alcohol initiation.

Across the two models, there was some support for the hypothesized interaction between best friend alcohol use and friendship reciprocity, however, contrary to my hypothesis, adolescents who had a reciprocated best friend that had initiated alcohol use were at highest risk of subsequently increasing their alcohol use. This finding held only with the outcome of frequency of alcohol use, not initiation of alcohol use.

Best Friend Alcohol Initiation, Best Friend Reciprocity, and Friendship Context Interactively

Predicting Subsequent Adolescent Alcohol Use (Hypothesis 2)

The second hypothesis posited that adolescent conformity with the alcohol use of an unreciprocated best friend varies across two overall friendship contexts in which (1) the unreciprocated best friendship occurs in a context where the adolescent has no reciprocated

friendships and (2) the unreciprocated best friendship occurs in a context where the adolescent has other friendships that are reciprocated. The first model testing this hypothesis used an OLS regression model and included the full subsample comprised of both T1 alcohol users and T1 abstainers (Subsample A, $n = 250$). Prior alcohol use was controlled by including T1 frequency of alcohol use in the model. In the first step, the control variables were entered into the model as well as the main effects of T1 adolescent frequency of alcohol use, T1 best friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context. In the second step, the effects of the 2-way interactions between T1 best friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context were added to the model. In the third step of the model, the 3-way interaction between T1 best friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context was tested. The overall model accounted for 20% of the variance in T2 frequency of alcohol use ($F(11,238) = 5.55, p = 0.00$; see Table 6). The addition of the interactions to the model contributed 2% additional variance beyond the model with only the control variables and main effects. However, the 3-way interaction of interest did not significantly contribute to the prediction of T2 frequency of alcohol use ($\beta = .290, p = .25$). As in the previous OLS model for the test of hypothesis 1, control variables and main effects (step 1) accounted for most of the variance in T2 frequency of alcohol use, with delinquency ($\beta = 0.24, p = .00$), T1 frequency of alcohol use ($\beta = 0.18, p = .0$), and T1 best friend alcohol initiation ($\beta = 0.16, p = .01$) predicting greater T2 frequency of alcohol use. Gender marginally contributed to subsequent alcohol use (i.e. being a girl; $\beta = -0.12, p = 0.06$), whereas race ($\beta = 0.03, p = 0.63$) and T1 friendship context ($\beta = -0.51, p = 0.38$) did not uniquely contribute to subsequent alcohol use.

Next, a parallel logistic model was tested to examine the dichotomous dependent variable of T2 alcohol initiation (Hypothesis 2; see Table 6). Following the procedures described for the logistic analysis of hypothesis 1, prior alcohol use was controlled by limiting the analyses to the subsample of adolescents who had not initiated drinking at T1 (Subsample B, $n = 156$). As a first step in the model, the previously identified control variables of gender, race, and delinquency, along with the main effects of T1 best friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context, were entered into the logistic model. Next, the 2-way interactions between T1 best friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context were entered. In the third step, the 3-way interaction between T1 best friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context were entered into the logistic model. The overall model accounted for a significant proportion of variance in T2 alcohol use ($Wald's \chi^2(10, n = 156) = 20.58, p = 0.02$). However, the interaction between T1 best friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context did not contribute significantly to the model ($\beta = 1.41, p = 0.52$). Within the logistic model, being female (male compared to female; $\beta = -1.40, p = 0.00$) being White (White compared to non-White; $\beta = 1.55, p = 0.00$), and having a T1 best friend who had initiated alcohol use ($\beta = 1.14, p = 0.01$) contributed to alcohol initiation, whereas delinquency ($\beta = 0.49, p = 0.48$), best friend reciprocity ($\beta = -0.50, p = 0.24$), and friendship context ($\beta = 0.01, p = 0.98$) did not contribute significantly to the subsequent initiation of alcohol use.

In sum, adolescents with an unreciprocated best friend were expected to show more conformity with the alcohol use behavior of their best friend when they resided in a context without any reciprocated friends, as adolescents less connected to the peer context may be

more invested in trying to gain friendship reciprocity through conforming to the behaviors of others. Overall, these tests did not provide support for the hypothesized interaction between best friend alcohol use, friendship reciprocity, and friend context in the prediction of either subsequent alcohol initiation or changes in frequency of alcohol use.

*Formation of Reciprocated Friendships through the
Initiation of Alcohol Use (Hypothesis 3)*

The third model tested whether changing alcohol use behaviors to match an unreciprocated best friend's alcohol use (i.e., initiation of alcohol use) facilitated reciprocated friendship formation with an alcohol-using peer (Hypothesis 3, see Table 7). The test of this hypothesis utilized Subsample C ($n = 45$), a subsample of adolescents who were T1 abstainers who also had a T1 unreciprocated best friend. Use of this sample controlled for prior alcohol use and best friend reciprocity. In the first step of a logistic model, the main effects of T1 best friend alcohol use and T2 adolescent alcohol initiation were modeled on T2 reciprocity/alcohol using friend which indicated whether the adolescent had form a reciprocated friendship with an alcohol using peer at T2. In the second step the effects of the 2-way interaction between T1 best friend alcohol use and T2 adolescent alcohol initiation were added to the model to test the hypothesis of interest. The overall model accounted for a significant proportion of variance in the outcome ($Wald's \chi^2(3, n = 45) = 7.78, p = 0.05$). The interaction between T1 best friend alcohol use and T1 best friend reciprocity marginally contributed to the prediction of T2 reciprocity/alcohol using friend ($\beta = -3.06, p = 0.06$).⁵

⁵ Initially, the control variables of gender, race, and delinquency were included in this model. With the control variables included in the model, the 2-way interaction between T1 best friend alcohol use and T2 adolescent alcohol initiation was significant ($\beta = 3.32, p = 0.05$), however, the control variables were all non-significant and the overall model was non-significant ($Wald's \chi^2(6, n = 45) = 8.93, p = 0.18$). The control variables were subsequently removed from the model so as to not reduce power in this small sample.

The marginally significant two-way interaction was interpreted by calculating the predicted probabilities of forming a reciprocated friendship with an alcohol using peer (see Figure 4). Within this sample of non-users with unreciprocated best friends, the probability of subsequently having a reciprocated friendship with an alcohol using peer was lowest for those adolescents who had a T1 best friend who had not initiated alcohol use and subsequently did not initiate alcohol use ($Pr = 0.30$). The odds for other adolescents forming a reciprocated friendship with an alcohol using friend were greater, with predicted probabilities ranging from 0.60 – 0.86. Those adolescents who nominated an alcohol using unreciprocated best friend at T1 were more likely to have an alcohol using reciprocated friend at T2, regardless of whether or not they initiated alcohol use. Among those adolescents who nominated a non-using unreciprocated best friend at T1, those adolescents who subsequently initiated alcohol use were more likely to form a reciprocated friendship with an alcohol using peer at T2, while those who did not initiate were less likely to form such a relationship. Thus, adolescents who either initiated alcohol use or had a best friend who had used alcohol at T1 were more likely to have a reciprocated friendship with an alcohol using peer at T2. Alcohol use initiation only seemed to work as a strategy for forming a reciprocated friendship with an alcohol using peer for adolescents who identified an abstaining best friend at T1. Indeed, these findings could suggest an alternative interpretation, namely, that adolescents who chose not to initiate use in order to gain friendship with abstaining peers, and not alcohol using peers, were successful. The findings do suggest that adolescents who abstained at T2 successfully avoided reciprocated friendships with alcohol using peers at T2 to a greater extent than any of their peers. However, subsequent analyses did not suggest that these abstaining adolescents who

nominated an abstaining best friend at T1 were more successful in gaining reciprocated friendships with peers (alcohol using or not) at T2. In fact, the opposite seems to be true. Only 22% of adolescents who abstained from using over time and selected abstaining unreciprocated best friends at T1 actually showed a reciprocated best friendship with any peer (alcohol using or not) at time T2. The percentage of these adolescents gaining a reciprocated T2 friend was much lower than the corresponding percentages for all other groups of adolescents in these analyses (40-71%). Although based on small sample sizes, these comparisons suggest that the formation of reciprocated friendships is more likely for adolescents with unreciprocated best friendships if they either initiate alcohol use or target best friends who have used alcohol.

Statistical Power Analysis

Because several of the predicted interactive effects testing my hypotheses were non-significant, power analyses were performed to determine whether the current sample size was sufficient to detect effects within the regression analyses. First, STATISTICA (Steiger, 1999) power analysis software was used to calculate estimates of the effect size that can be detected through regression analysis with the available sample sizes. Four sets of fix parameters (i.e. power of 0.80; alpha of .05; sample size of either 156 or 250; and degrees of freedom of either 10 or 7) were entered into the software. The sample size of 156 reflects the sample available for tests of initiation of alcohol use (i.e. those non-users at T1; Subsample B) and 250 reflects the sample available for tests of frequency of alcohol use (Subsample A). The degrees of freedom reflect the number of variables entered into the models, which includes control variables, main effects, and interaction terms. The full models have 6 and 10 degrees of freedom for logistic models and 7 and 11 degrees for freedom for OLS models, over

hypotheses 1 and 2, respectively. The inclusion of 11 degrees of freedom allows for 4 control variables, 3 main effects, 3 two-way interaction terms, and 1 three-way interaction term.

The results indicate that with $N = 156$ and $df = 10$, an $r^2 = 0.09$ can be detected with power of 0.80; with $N = 156$ and $df = 6$, an $r^2 = 0.08$ can be detected; with $N = 250$ and $df = 11$, an $r^2 = 0.063$ can be detected; and with $N = 250$ and $df = 7$, an $r^2 = 0.056$ can be detected. These effect sizes ranging from 0.06 to 0.09 fall between a small ($r^2 = 0.02$) and moderate effect size ($r^2 = 0.13$), as defined by Aiken and West (1991). However, the STATISTICA software does not address the decreased reliability that occurs through the creation of an interaction term. Using Aiken and West's (1991) tables for estimating statistical power with regression equations that include interaction terms, a sample size of 909 is suggested to detect a small effect ($r^2 = 0.02$) for a 2-way interaction with predictor variables of moderate reliability (0.80) and an overall power of 0.80. A sample size of 132 is suggested to detect moderate effects ($r^2 = .13$) in a similar regression equation. Based on the results of the STATISTICA (1999) power analysis software and the guidelines provided by Aiken and West (1991), the sample sizes of this study ($n = 156$ or $n = 250$) are perhaps best suited to detect moderate effects. (Similar power estimates are not available for the 3-way interactions that are part of the current analyses).

Post-hoc Analyses

Alternative Tests of the Interaction of Best Friend Use, Reciprocity, and Context

Given the limited power for small effects and the absence of support for the importance of friendship context in moderating the relation between best friend alcohol use and reciprocity predicting changes in adolescent alcohol use, post-hoc analyses tested hypothesis two using an alternative model. Rather than utilizing three variables (i.e. T1 best

friend alcohol initiation, T1 best friend reciprocity, and T1 friendship context) and a 3-way interaction to test the hypothesis of interest, the variables of best friend reciprocity and friendship context were combined into one three-level variable, best friend reciprocity/context, that could then be used in a two-way interaction with T1 best friend alcohol initiation to test the hypothesis of interest. The three levels of T1 best friend reciprocity/context were defined as level 1 for adolescents with an unreciprocated best friend and no reciprocated friends (i.e. no reciprocated friends); level 2 for adolescents with an unreciprocated best friend and some reciprocated friends; and level 3 for adolescents with a reciprocated best friend. T1 best friend reciprocity/context was dummy coded for analyses. The model was estimated twice, alternating the reference category, so that all three contrasts could be examined.

Using regression procedures previously described in the testing of hypothesis 2, both an OLS regression model and a logistic model were estimated (see Table 8 and Figure 5). In the first step of the OLS regression, the control variables were entered into the model, as well as the main effects of T1 adolescent frequency of alcohol use, T1 best friend alcohol initiation, and two dummy variables representing T1 reciprocity/context (where adolescents with a reciprocated best friend was the initial reference group). In the second step, the interaction between T1 best friend alcohol initiation and T1 reciprocity/context were added to the model. The overall model accounted for 20% of the variance in T2 frequency of alcohol use ($F(9,240) = 6.78, p = 0.00$). The addition of the two-way interaction terms contributed 2% additional variance beyond the model with only the control variables and main effects. The 2-way interaction between T1 best friend alcohol initiation and T1 reciprocity/context contributed significantly to the prediction of T2 frequency of alcohol use, with the significant

interaction occurring between T1 best friend alcohol use and the contrast between adolescents with an unreciprocated best friend and some reciprocated friends compared to adolescents with a reciprocated best friend ($\beta = -0.20, p = 0.02$). The interaction between T1 best friend alcohol use and the other two contrasts of T1 reciprocity/context were non-significant (best friend alcohol use interacting with: adolescents with no reciprocated friends compared to adolescents with a reciprocated best friend, $\beta = -0.03, p = 0.43$; and adolescents with an unreciprocated best friend and some reciprocated friends compared to adolescents with no reciprocated friends, $\beta = -0.14, p = 0.33$).

The significant two-way interaction was interpreted by calculating the predicted values of T2 frequency of alcohol use at varying levels of T1 best friend alcohol initiation (i.e. non-drinker or drinker status) and each of the three categories of T1 reciprocity/context. Figure 5 shows the resulting findings.⁶ These results suggest that best friend alcohol use predicted greatest subsequent alcohol use when 1) the best friendship was reciprocated and the best friend had initiated alcohol use; or when 2) the best friendship was unreciprocated, existed in a context of no reciprocated friendships, and the best friend had initiated alcohol use. This provides some support for the proposed hypothesis.

A parallel model was tested to examine the dichotomous dependent variable of T2 alcohol initiation. In the first step of the logistic regression predicting T2 alcohol initiation, the control variables were entered into the model, as well as the main effects of T1 best friend alcohol initiation and two dummy coded variables representing T1 reciprocity/context. In the second step, the interactions between T1 best friend alcohol initiation and T1 reciprocity/context were added to the model. The overall model accounted for a significant

⁶ The relations are plotted using the reference group for the dichotomous covariates (i.e. girl, non-White) and the mean of the centered variables of T1 frequency of alcohol use and delinquency.

proportion of the variance in the outcome of T2 alcohol initiation, *Wald's* $\chi^2(8, n = 156) = 19.876, p = 0.01$. However, the interaction between T1 best friend alcohol initiation and T1 best friend reciprocity/context did not contribute significantly to the prediction of T2 alcohol initiation (best friend alcohol use interacting with: adolescents with no reciprocated friends compared to adolescents with a reciprocated best friend, $\beta = 0.95, p = 0.58$; adolescents with an unreciprocated best friend and some reciprocated friends compared to adolescents with a reciprocated best friend, $\beta = -0.68, p = 0.50$; adolescents with an unreciprocated best friend and some reciprocated friends compared to adolescents with no reciprocated friends, $\beta = -1.64, p = 0.39$).

Exploring Who is Being Selected as Best Friends

To examine whether adolescents with an unreciprocated best friend versus those with a reciprocated best friend may be selecting from different groups of peers, analyses were conducted to better understand the adolescents who were being selected as best friends. Within subsample A, the 250 adolescents chose 173 adolescents as best friends. T-tests compared three groupings of best friends: best friends who did not reciprocate any adolescent nominations ($n = 28$); best friends who both reciprocated and did not reciprocate adolescent nominations ($n = 28$); and best friends who reciprocated all the nominations directed toward them ($n = 117$). (See Table 9). Contrasts between best friends who reciprocated all nominations and those who did not reciprocate any nominations suggest that adolescents who did not reciprocate were more likely to be non-White ($\chi^2(1, n = 143) = 2.77, p = 0.09$) and male ($\chi^2(1, n = 143) = 8.39, p = 0.00$), to feel less close to their school environments ($t(143) = 2.50; p = 0.01$), and tended to have a greater frequency of alcohol use ($t(143) = -2.66; p = 0.09$). However, these groups of best friends did not appear to vary by initiation of alcohol

use ($\chi^2(1, n = 143) = 0.89, p = 0.34$), delinquency ($t(143) = -0.19; p = 0.85$), or the proportion of nominations they received ($t(143) = -0.84; p = 0.40$).

Some recent studies have found that one's status within their adolescent peer group is positively associated with substance use (Ennett, et al., in press). Adolescents were compared with their best friends to see if particular groups of adolescents, based on reciprocity and friendship context, choose adolescents of differing status as best friends. Across groups, adolescents tended to select as best friends adolescents who were more popular (i.e. a higher proportion of nominations; indegrees) than themselves. This was most pronounced for the adolescents who did not have any reciprocated friends, where the adolescents had few indegrees relative to the adolescents they selected as their best friends [i.e., adolescents without reciprocated friends compared to their best friends ($t(20) = -6.92, p < .001; M = 1.43$ ($SD = 0.59$) vs. 7.43 ($SD = 0.79$)); adolescents with an unreciprocated best friend in a context of at least one reciprocated friend compared to their best friends ($t(20) = -3.37, p < .05; M = 5.00$ ($SD = 0.53$) vs. 7.54 ($SD = 0.64$)); adolescents with a reciprocated best friend compared to their best friends ($t(20) = -2.47, p < .05; M = 6.13$ ($SD = 0.38$) vs. 6.98 ($SD = 0.41$))].

DISCUSSION

The motivation of this study was to better understand how friendship reciprocity may moderate the relationship between peer and adolescent alcohol use, and how adolescent use may facilitate the formation of reciprocated friendships. I had a particular interest in a subset of adolescents, those without any reciprocated friends, who I hypothesized to be particularly susceptible to peer influence. Through three hypotheses and post-hoc analyses, I examined how reciprocity status impacts models of peer influence and selection in the development of adolescent alcohol use behaviors. As expected, I found some support for the proposition that the relation between best friend alcohol use and adolescent alcohol use is moderated by reciprocity status, that this relationship is context dependent, and that alcohol use may contribute to friendship formation. Within models examining peer influence, the results were not consistent across the two outcome variables of alcohol initiation and frequency of alcohol use. The models that estimated alcohol initiation, which had less power (i.e. smaller sample size), both produced null results. However, the models that estimated changes in frequency of alcohol use suggested that reciprocity does impact peer influence on subsequent alcohol use, and furthermore, that the interactive relationship between best friend alcohol use and reciprocity may be moderated by the friendship context in which the best friendship occurs (i.e. a context of no reciprocated friends versus one of some reciprocated friends). In addition, the results of a third model examining selection suggested that both adolescent alcohol use and selection of alcohol using best friends may contribute to the formation of reciprocated friendships.

Best Friendship Reciprocity and Adolescent Alcohol Use

I predicted that adolescents with unreciprocated friendships would be most likely to adopt the alcohol use behaviors of their best friend. This hypothesis was based on the inherent power imbalance within the unreciprocated friendships and attempts by adolescents to gain mutual liking by conforming to the behavior of their desired friends (i.e., a striving for acceptance). However, contrary to what I hypothesized, the interaction between best friend alcohol use and best friend reciprocity suggested that best friend alcohol use is a more powerful predictor of subsequent use when the relationship is reciprocated. Though not predicted within this study, social learning theory may account for these findings in that social learning posits influence to be greatest in the presence of close bonds. The prediction of social learning theory is thus in contrast to the hypothesis of the current study that imbalanced or looser social bonds will have a greater influence on behavior. Consistent with this interpretation of the findings, Hussong and Hicks (2003) found that the relationship between peer use and adolescent use was dependent on the quality of the friendship, with the relationship between peer use and adolescent use being heightened within relationships with fewer negative friendship qualities. Thus, reciprocated friendships, which presumably differ in quality from unreciprocated relationships, may have more opportunities for socialization to occur (e.g., more shared activities; more time together; more contact outside of school; i.e., social learning theory; Bandura, 1977), wherein the friends may influence each other to engage in similar behaviors (e.g. Wills & Cleary, 1999). Hence, the results of Hypothesis 1 would appear to be most consistent with the predictions of social learning theory. However, these findings were qualified by the results of Hypothesis 2.

Best Friendship Reciprocity, Friendship Context, and Adolescent Alcohol Use

Several previous studies have suggested that being less connected to school social networks (i.e., social isolation) is a risk factor for substance use (e.g., Abel et al., 2002; Ennett & Bauman, 1993; Fang et al., 2003; and Pearson & Mitchell, 2000). To examine this aspect of the peer context, this study tested whether adolescent alcohol use conformity with an unreciprocated best friend varied across two overall friendship contexts in which (1) the unreciprocated best friendship occurred in a context where the adolescent had no reciprocated friendships and (2) the unreciprocated best friendship occurred in a context where the adolescent had other friendships that were reciprocated. Adolescents with an unreciprocated best friend were expected to show more conformity with the behavior of their best friend in the friendship context of no reciprocated friendships. Consistent with this prediction, best friend adolescent alcohol use was a greater predictor of adolescent use among adolescents with unreciprocated best friends and no reciprocated friends (i.e. those least connected to their peers) as compared to adolescents with an unreciprocated best friend that occurred in a peer context of at least one reciprocated friend. Additionally, best friend alcohol use continued to be a powerful predictor of subsequent use when the relationship was reciprocated. The initial finding that reciprocated friends exert substantial influence is supported by the socialization processes thought to underlie homophily and the mechanisms of social learning theory, and it is counter to the argument that those adolescents less socially connected to their peers may be most susceptible to peer influence. However, the current findings indicate that both processes may be at work for different groups of adolescents. Specifically, these findings suggest that there is an additional subgrouping of adolescents, those without any reciprocated friends (i.e. a group of relatively isolated adolescents), that

may also be substantially influenced by the alcohol use behaviors of their desired best friends.

Interestingly, those adolescents least connected and those adolescents most connected to their peers appear to be most susceptible to the influence of their best friends. This suggests that the relationship between social connectedness and alcohol use is not linear and that there may be multiple paths that lead to adolescent alcohol use behaviors. Post hoc analyses comparing adolescents selected as best friends by teens in these different groups further support this interpretation of multiple pathways of risk. These comparisons suggest that adolescents who have unreciprocated friendships may be selecting their friends from a different group of adolescents than those with reciprocated friends. While adolescents who have no reciprocated friends appear to be choosing friends equally as popular as the adolescents with reciprocated best friends, the adolescents with unreciprocated friends appear to be selecting among a group of somewhat more marginal peers – less connected to their school with a greater tendency to use alcohol.

I proposed that a motivation for an adolescent to conform to the behaviors of their best friend was a striving for acceptance, with this motivation to conform being strongest in relationships with an imbalance in power. I examined this imbalance through friendship reciprocity, suggesting that unreciprocated friendships exhibited this motivating power imbalance. However, dyadic relations can also be imbalanced through other dimensions such as social status or popularity. One possibility is that a differential in social status may contribute to the adolescents' susceptibility to influence that is already heightened by the unreciprocated nature of their relationships. Comparisons between adolescents and their best friends suggest that adolescents without any reciprocated friends appear to be choosing best

friends who are much more popular than themselves, whereas other adolescents are choosing best friends that are only slightly more popular than themselves. Consistent with this interpretation, recent work by Bot, Engles, Knibbe, and Meeus (2005) shows that a difference in social status may contribute to peer influence. They found that adolescents were most likely to adopt the drinking behavior of their best friend when it was an unreciprocated friend with a higher sociometric status (e.g. a higher score based on “most popular” and “least popular” peer nominations). Utilizing a sample of 12-14 year old adolescents, these researchers found that best friend alcohol use was associated with the adolescent’s alcohol use 6 months later, with this relationship being strongest when the best friendship was both unreciprocated and with a higher status peer.

An alternative explanation for these findings may be that adolescents are generally at risk for using if their best friend uses (regardless of reciprocity), however, there may be particular social relations and contexts that are protective. Within this study, those least susceptible to influence appeared to be those adolescents with an unreciprocated best friend and at least one reciprocated friend. Though the friendship contexts of adolescents with reciprocated best friends were not fully examined within this study, perhaps being socially connected (e.g. having some reciprocated friends), but not too connected, is somewhat protective. This may fit with some recent findings from social network analyses that both adolescents who are least and who are most visible in the school network (e.g. popular, or central within their friendship group) are vulnerable to substance use, whereas those that do not necessarily stand out but have some close friendships are the least vulnerable to use (Ennett et al., in press).

Adolescent Alcohol Use Contributing to Friendship Formation

This study also examined a model of peer selection, assessing the possible utility of initiating alcohol use as a means of forming reciprocated friendships. In the model examining selection, there was modest support for the proposition that initiation of alcohol use facilitated formation of a reciprocated friendship with a similar peer (i.e. with an alcohol using peer). The findings suggest that adolescents exhibited some stability in the alcohol use behaviors of the peers they chose as friends as adolescents with a T1 desired best friend who used alcohol were more likely to have an alcohol using reciprocated best friend at T2. Within this study, adolescents who nominated an unreciprocated alcohol using friend at T1 were more likely to have reciprocated friendships with alcohol using peers at T2, regardless of whether or not the adolescent initiated use. For these adolescents, new friends appear to be similar to old friends on alcohol use behaviors. This is consistent with previous findings that adolescents tend to choose new friends who are similar to their existing friends, suggesting that there is some consistency across time in the characteristics of the peers being chosen as friends (e.g. Değirmencioğlu & Urberg, 1995, as cited in Urberg et al., 1997). There also was some evidence for stability among the adolescents who selected a non-alcohol using friend at T1. The findings suggested that adolescents who abstained at T2 successfully avoided reciprocated friendships with alcohol using peers at T2 to a greater extent than any of their peers.

Further probing of this interaction also suggested that the introduction of alcohol (through either initiation of alcohol use or through the selection of an alcohol using friend) may more generally facilitate formation of reciprocated friendships. This suggests that having alcohol in the mix (i.e. being in closer proximity to alcohol), either through initiation,

or through having a connection to a best friend who uses, increases an adolescent's risk for forming reciprocated friendships with alcohol using peers. More generally, close proximity to alcohol appears to help adolescents without reciprocated friendships form reciprocated friendships.

Across the analyses, the most isolated adolescents appear to be susceptible to influence from their nominated best friends, they tend to select their best friends from a group of peers that have a tendency toward heightened deviance, and they tend to select as best friends peers who are much more popular than themselves. Additionally, showing some conformity to their best friends' alcohol use behaviors, either through initiation of use or continued selection of friends who use, may help these adolescents form reciprocated friendships.

These associations may be explained, in part, through Kaplan's self-derogation theory (Kaplan, Martin, & Robbins, 1984). Kaplan postulated that adolescents who have self-devaluing experiences in peer groups develop self-rejecting attitudes. Consequently, these adolescents lose the motivation to conform to normative peer behaviors, moving instead toward non-normative peer contexts where they are more likely to be accepted and, subsequently, achieve self-accepting attitudes. These non-normative peer groups are thought to offer increased affiliation with substance using friends who model and reinforce substance use (see Swaim, Oetting, Edwards, & Beauvais, 1989). Consistent with Kaplan's model, adolescents with unreciprocated friends may be striving for acceptance (e.g., reciprocity), and thus suffer from feelings of self-derogation as well as from relative social isolation and rejection as suggested by Kaplan. Based on the types of peers that were nominated as desired friends, they are likely seeking entry to more deviant peer groups. Thus, they are likely to

experience a subsequent social drift in the peers with whom that associate, gravitating toward those with whom they may more easily gain acceptance. Consequently, adolescents without reciprocated friends may face several risks for alcohol use, including negative feelings toward themselves due to devaluing peer experiences, affiliating with more deviant peers, and the possibility that their movement toward deviant peers is being rewarded through increased peer acceptance.

Other explanations may account for these findings. First, the absence of mutual friendships, may serve as a stressor. Given that these adolescents are relatively isolated, they may have less social support available to help cope with their stress. With alcohol possibly available through a best friend that already uses, these adolescents may have both the motivation and means to attempt to self medicate through alcohol use (i.e. self medication hypothesis; see Damphousse & Kaplan, 1998). Second, these adolescents that appear to be isolated within the current study may have a reciprocated best friend and other friendships outside of the school setting. Out-of-school peers may be older or more deviant, with use occurring through social learning processes described previously. Though our data suggests that this is unlikely (i.e. adolescents without reciprocated friends differed only slightly from their peers in their nomination of best friends who were not in the same grade and school), further study is required to more fully understand the possible mechanisms underlying the results of this study.

Conclusions

The current study provides support for interactions between best friend alcohol use, best friend reciprocity, and friendship context in the prediction of adolescent alcohol use. Best friend alcohol use has consistently been found to be associated with adolescent use,

however, by considering relationship and contextual factors, this study has identified specific high-risk groups of adolescent and possible mechanisms related to their alcohol use.

The analyses provided here have some strengths. First, the sample utilized data collected from adolescents' peers, so as to not rely solely on adolescent perceptions of peer relationships and behaviors. Second, the study made use of longitudinal data to assess changes in alcohol use behavior over time. Third, the regression analyses controlled for previous levels of alcohol use and thereby provided a conservative statistical test regarding the long-term impact of best friend alcohol use on subsequent adolescent alcohol use.

The study also has several limitations. The hypotheses of this study were tested within relatively a small sample; and the findings were not consistent across similar models of differing alcohol use outcomes; the effects were small or marginal, especially the interactive effects. Replication of this study with a larger sample would offer many benefits. Currently, it is unclear if the discrepancy in the findings across alcohol outcomes was solely due to power constrained by the small sample used in the analyses of initiation of alcohol use or if there are different processes for initiation and escalation in use. The examination of selection was done with a very small subset of adolescents in the study. A larger sample would provide for a more powerful test of selection, one that could examine changes in particular relationships (i.e. does initiation help in forming a relationship with a particular peer). Being able to track specific relationships overtime would also allow for the examination of other aspects of influence and selection that might clarify the mechanisms suggested within the current study (e.g. deselection processes - do unreciprocated friendships dissolve more quickly than reciprocated friendships when the behaviors of the adolescent and their best friend become dissimilar?).

Additionally, a better understanding of the relations between the peer constructs used here and those used to examine ideas within social network analysis would also be useful. There is a growing body of literature that utilizes social network techniques. Though this study was informed by research using social network analyses, the analyses did not make use of this approach. However, several of the variables included in this study parallel those used in social network analyses (e.g. indegrees), and some of the findings within this study appear compatible with findings from the social network literature (e.g. isolated adolescents are at high risk for use). Additional analyses using social network analysis techniques with friendships could help further bridge between the developmental literature and the social network literature. For example, it is unclear whether the relatively isolated adolescents within the current study are similar to “isolates” as defined through social network analysis. Similarly, the adolescents within this study who appear to be at lower risk of peer influence to use (i.e. adolescents with some reciprocated friends, but without a reciprocated best friend) may be similar to adolescents with particular social network structural dimensions (e.g. liaisons). The current study has tried to bridge the developmental and social network analysis literatures, and a larger sample would afford more opportunity to connect the current findings with social network analysis.

The design of the current study was school based on and limited to adolescents within the same grade at the times of measurement. This may have lead to an underestimation of the influence of friends for some of the adolescents. Mahoney and Stattin (2000) suggest that friends in out-of-school settings exert more influence on deviant behavior than friends within school settings. Out-of-school friends are more likely to include dropouts, expelled students, or older adolescents who may be more involved with alcohol use. Within this study, there

was some evidence that adolescents with unreciprocated friends were slightly more likely to choose a best friend who was not a participant in the study. Additionally, it is not known if school based studies such as this are generalizable to adolescents who are not in traditional school settings (e.g. dropouts, adolescents in detention or alternative schools; Chassin, 1984).

Despite these limitations, the current study holds promise for a line of research with important implications for understanding the development of adolescent alcohol use behaviors. This study highlights the importance of considering the interactive impact of dimensions of friendship, particularly reciprocity and peer context, when examining adolescent alcohol use behavior. The findings suggest ways that researchers who are concerned with understanding the peer context of adolescent substance use may better understand aspects of social relationships that moderate the link between adolescent and peer alcohol use. These results highlight the potential importance of considering the interactive effects of best friends' alcohol use and the reciprocity status of these relationships when examining the mechanisms of alcohol use. The resulting findings may help bridge between research in social network analyses and developmental theory in the identification adolescents that are at risk for alcohol use.

Furthermore, understanding what puts some adolescents, but not others, at heightened risk for alcohol use is important for the design and improvement of programs that attempt to decrease adolescent alcohol involvement. The current findings highlight that adolescent susceptibility to influence processes depends on individual, dyadic, and peer context characteristics, and that there may be multiple pathways to adolescent alcohol use. These findings, combined with future work, may have implications for prevention programming in several ways. First, combining self reports with peer reports of social relationships may help

to better identify and assess adolescents who may be at risk for alcohol involvement. Second, because some adolescents appear to target alcohol using peers as friends, prior to their own use, interventions that rely heavily on developing peer resistance skills may not be sufficiently helpful for these adolescents. Third, adolescents who are less successful at forming reciprocated friendships may find particular benefit from interventions that focus on friendship selection and relationship building skills. Finally, interventions may benefit from programming that capitalizes on prosocial peer influences when targeting adolescents who appear to be particularly responsive to peer influences.

Table 1: *Frequencies of Descriptive Variables by T1 Schools.*

School	All T1	Participating Middle Schools ($n = 7$)						
		MS1	MS2	MS3	MS4	MS5	MS6	MS7
School Size	428	23	74	109	36	63	74	49
Number of participants in Subsample A	250	14	60	62	23	36	51	4
<u>Variables</u> (% of Subsample A participants)								
Gender (Boy)	49.2	78.6	51.7	43.6	56.5	38.9	51.0	25.0
Race (White)	72.8	92.9	80.0	59.7	43.5	83.3	78.4	100.0
Initiated Alcohol Use (ever tried)	37.6	64.3	33.3	38.7	47.8	36.1	31.4	25.0
Alcohol Similarity (both tried)	19.2	57.1	8.3	22.6	34.8	22.2	7.8	25.0
Rank of Best Friend								
1 st Nomination	77.2	50.0	85.0	74.2	65.2	72.2	86.3	100.0
2 nd Nomination	14.8	35.7	10.0	16.1	26.1	16.7	7.8	0
3 rd Nomination	4.8	14.3	1.7	6.5	0	8.3	3.9	0
4 th Nomination	2.4	0	3.3	1.6	8.7	0	2.0	0
5 th Nomination	0.8	0	0	1.6	0	2.8	0	0

Note: $n = 250$.

Table 2: Means of Descriptive Variables by T1 Schools.

	Participating Middle Schools ($n = 7$)							
	All T1 ($n = 250$)	MS1 ($n = 14$)	MS2 ($n = 60$)	MS3 ($n = 62$)	MS4 ($n = 23$)	MS5 ($n = 36$)	MS6 ($n = 51$)	MS7 ($n = 4$)
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Parent Education	2.36 (1.07)	2.03 (0.79)	2.07 (1.14)	2.50 (1.07)	1.94 (1.09)	2.38 (0.96)	2.73 (0.97)	3.25 (0.50)
T1 Delinquency	0.29 (0.46)	0.57 (0.42)	0.26 (0.45)	0.25 (0.30)	0.60 (0.75)	0.11 (0.22)	0.26 (0.38)	0.79 (1.36)
T1 School Closeness	3.12 (0.92)	2.86 (1.03)	3.30 (0.94)	2.87 (1.09)	3.04 (0.93)	3.25 (0.60)	3.23 (0.79)	3.00 (0.82)
# Nominations on Roster	4.36 (0.96)	4.00 (0.96)	4.55 (0.83)	4.40 (0.98)	4.09 (1.00)	3.97 (1.08)	4.54 (0.88)	4.50 (1.00)
# Nominations Not on Roster	0.57 (0.89)	1.00 (0.96)	0.42 (0.81)	0.44 (0.76)	0.83 (0.98)	0.89 (1.04)	0.45 (0.88)	0.50 (1.00)
# Nominations Missing	0.08 (0.46)	0.00 (0.00)	0.03 (0.26)	0.16 (0.73)	0.09 (0.42)	0.14 (0.59)	0.00 (0.00)	0.00 (0.00)
# Reciprocated Friendships	2.20 (1.24)	1.71 (1.14)	2.25 (1.19)	1.89 (1.23)	2.35 (1.19)	2.00 (1.01)	2.69 (1.39)	2.50 (0.58)
Rank of Highest BF	1.35 (0.75)	1.64 (0.74)	1.23 (0.65)	1.40 (0.82)	1.52 (0.90)	1.44 (0.88)	1.22 (0.61)	1.00 (0.00)
Frequency of Alcohol Use	1.31 (0.74)	1.64 (1.08)	1.25 (0.70)	1.26 (0.63)	1.52 (1.04)	1.28 (0.74)	1.25 (0.56)	1.75 (1.50)

Table 3: *Comparisons of Adolescents with a Reciprocated Vs. an Unreciprocated Best Friend.*

Variable	T1 Reciprocated Best Friend		T-test
	No (<i>n</i> = 64)	Yes (<i>n</i> = 186)	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	
T1 Parent Education	2.28 (1.02)	2.39 (1.08)	-0.72
T1 Delinquency	0.29 (0.48)	0.29 (0.45)	0.00
T1 School Closeness	3.00 (1.01)	3.15 (0.89)	-1.21
T1 # of Nominations on Roster	4.31 (1.01)	4.37 (0.95)	0.42
T1 # of Nominations Not on Roster	0.61 (0.95)	0.55 (0.87)	0.43
T1 # of Reciprocated Friendships	1.14 (1.10)	2.56 (1.07)	9.12***
T1 Rank of Highest (Best) Friend	1.52 (0.96)	1.29 (0.66)	1.74 [†]

Note: T-statistic tests. *n* = 250. [†]Satterthwaite unequal variances. **p* < 0.05, ***p* < 0.01, ****p* < 0.001, [†]*p* < 0.10.

Table 4: *Correlations, Means, and Standard Deviations for Adolescent Variables.*

	Variable	1.	2.	3.	4. [†]	5.	6.	7.	8.
1.	T1 Alcohol Use	1.00							
2.	T1 Best Friend Alcohol Use	0.15*	1.00						
3.	T2 Alcohol Use	0.33***	0.15*	1.00					
4.	T2 Friend Alcohol Use [†]	0.04	0.05	0.14*	1.00				
5.	T1 Age	0.18**	0.04	0.10 ⁺	0.14*	1.00			
6.	T1 Parent Education	0.04	-0.08	0.01	0.01	-0.09	1.00		
7.	T1 Delinquency	0.58***	0.19**	0.33***	0.07	0.15*	0.01	1.00	
8.	T1 School Closeness	-0.06	-0.09	-0.09	-0.02	-0.07	0.00	0.02	1.00
	Mean	1.31	1.34	1.58	1.75	13.54	2.36	0.29	3.12
	Standard Deviation	0.74	0.76	0.96	1.14	0.57	1.07	0.46	0.92
	N	250	250	250	234	250	250	250	250

Note. $n = 250$, except [†] $n = 234$. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ⁺ $p < 0.10$.

Table 5: *Best Friend Alcohol Use & Best Friend Reciprocity Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 1).*

Model for Hypothesis 1	OLS Regression		Logistic Regression		
	β	t	B	Wald's χ^2	e^B (odds ratio)
<u>Step 1: Main Effects</u>					
Intercept	0	7.35**	1.778	4.895*	--
Gender (boy)	-0.113	-1.84 ⁺	-1.406	11.046***	0.245
Race (White)	0.027	0.45	1.559	8.277**	0.210
T1 Delinquency	0.234	3.19**	0.495	0.498	1.640
T1 Alcohol Use	0.178	2.45*	--	--	--
T1 BF Alcohol Use	0.161	2.68**	1.136	7.583**	3.114
T1 BF Reciprocity	0.054	0.89	-0.499	1.375	0.607
<u>Step 2: 2-Way Interaction</u>					
T1 BF Alcohol Use x Reciprocity	0.244	2.20*	0.336	0.146	1.400

Note. For OLS Regression, $n = 250$, β 's reflect standardized parameter estimates. For Logistic Regression, $n =$

156. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ⁺ $p < 0.10$.

Table 6: *Best Friend Alcohol Use, Best Friend Reciprocity, & Friendship Context Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 2).*

Model for Hypothesis 2	OLS Regression		Logistic Regression		
	β	t	B	Wald's χ^2	e^B (odds ratio)
<u>Step 1: Main Effects</u>					
Intercept	0	4.97***	1.771	3.974*	--
Gender (boy)	-0.119	-1.92 ⁺	-1.405	10.687**	0.245
Race (White)	0.029	0.48	1.559	8.275**	0.210
T1 Delinquency	0.240	3.26**	0.494	0.492	1.638
T1 Alcohol Use	0.177	2.42*	--	--	--
T1 BF Alcohol Use	0.162	2.70**	1.136	7.583**	3.114
T1 BF Reciprocity	0.057	0.93	-0.499	1.373	0.607
T1 Friend Context	-0.051	-0.87	0.009	0.001	1.009
<u>Step 2: 2-Way Interactions</u>					
T1 BF Alcohol Use x Reciprocity	0.244	2.18*	0.332	0.135	1.394
T1 BF Alcohol Use x Friend Context	-0.020	-0.14	-0.675	0.466	0.509
T1 BF Reciprocity x Friend Context	0.111	0.75	-1.687	2.527	0.185
<u>Step 3: 3-Way Interaction</u>					
T1 BF Alcohol Use x BF Reciprocity x Friend Context	0.290	1.15	1.413	0.418	4.110

Note. For OLS Regression, $n = 250$, β 's reflect standardized parameter estimates. For Logistic Regression, $n =$

156. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ⁺ $p < 0.10$.

Table 7. *T1 Best Friendship with an Alcohol Using Peer & T2 Adolescent Alcohol Initiation Interactively Predicting Reciprocated Friendship Formation with an Alcohol-Using Peer (Hypothesis 3).*

Model for Hypothesis 3	Logistic Regression		
	B	Wald's χ^2	e^B (odds ratio)
<u>Step 1: Main Effects</u>			
Intercept	-0.558	1.960	--
T1 BF Alcohol Initiation	1.360	3.139 ⁺	3.895
T2 Adolescent Alcohol Initiation	0.906	1.746	2.473
<u>Step 2: Main Effects & 2-Way Interaction</u>			
T1 BF Alcohol Initiation X T2 Adolescent Alcohol Initiation	-3.060	3.492 ⁺	0.047

Note. $n = 45$. This sample was limited to adolescents who were T1 abstainers with unreciprocated best friends. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ⁺ $p < 0.10$.

Table 8: *Best Friend Alcohol Use, Best Friend Reciprocity & Friendship Context Interactively Predicting Subsequent Adolescent Alcohol Use (Hypothesis 2, Alternative Model).*

	OLS Regression		Logistic Regression		
	β	t	B	Wald's χ^2	e^B (odds ratio)
<u>Step 1: Controls & Main Effects</u>					
Intercept	0	9.35***	0.869	0.655	--
Gender (boy)	-0.117	-1.89 ⁺	-1.382	10.637**	0.251
Race (White)	0.031	0.52	1.595	8.269**	0.203
Delinquency	0.242	3.29**	0.410	0.339	1.507
T1 Alcohol Use	0.177	2.44*	--	--	--
T1 BF Alcohol Use	0.161	2.68**	1.145	7.574**	3.142
T1 BF Reciprocity/Context (No Reciprocated Friends vs. Reciprocated Best Friend)	0.026	0.43	-0.428	0.258	0.652
T1 BF Reciprocity/Context (Unreciprocated Best Friend w/ Some Reciprocated Friends vs. Reciprocated Best Friend)	-0.079	-1.29	0.776	2.76 ⁺	2.172
<u>Step 2: 2-Way Interactions</u>					
T1 BF Alcohol Use x Reciprocity/Context (No Reciprocated Friends vs. Reciprocated Best Friend)	-0.035	-0.45	0.954	0.311	2.596
T1 BF Alcohol Use x Reciprocity/Context (Unreciprocated Best Friend w/ Some Reciprocated Friends vs. Reciprocated Best Friend)	-0.201	-2.39*	-0.682	0.465	0.506

Note. For OLS Regression, $n = 250$, β 's reflect standardized parameter estimates. For Logistic Regression, n

= 156. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, ⁺ $p < 0.10$.

Table 9: *Post-hoc Comparison of Types of Best Friends, Based on Their Reciprocation of Adolescent Nominations.*

Best Friend Type	Best Friends Who Did Not Reciprocate Any Adolescent Nominations (n = 28)	Best Friends Who Both Reciprocated and Did Not Reciprocate Adolescent Nominations (n = 28)	Best Friends Who Reciprocated All Their Adolescent Nominations (n = 117)
<u>Variables (Percentages)</u>			
Gender (boy)	71.43 ^b	53.57	41.03 ^b
Race (White)	67.86 ^{a, b+}	92.86 ^a	82.05 ^{b+}
Alcohol Initiation	46.43	35.71	36.75
<u>Variables (Means)</u>			
Delinquency	0.32	0.36	0.30
School Closeness	2.79 ^{a+, b}	3.21 ^{a+}	3.25 ^b
Frequency of Alcohol Use	1.54 ^{b+}	1.36	1.27 ^{b+}
Indegree	6.96	8.23 ^c	6.20 ^c

Note: $n = 173$ (i.e. the number of unique best friends nominated within Subsample A, $n = 250$). Values in a column within a

variable row with same subscripts differ significantly, $p < 0.05$, or marginally, $^+ p < 0.10$.

Figure 1: Design Overview of the High School Transition Study.

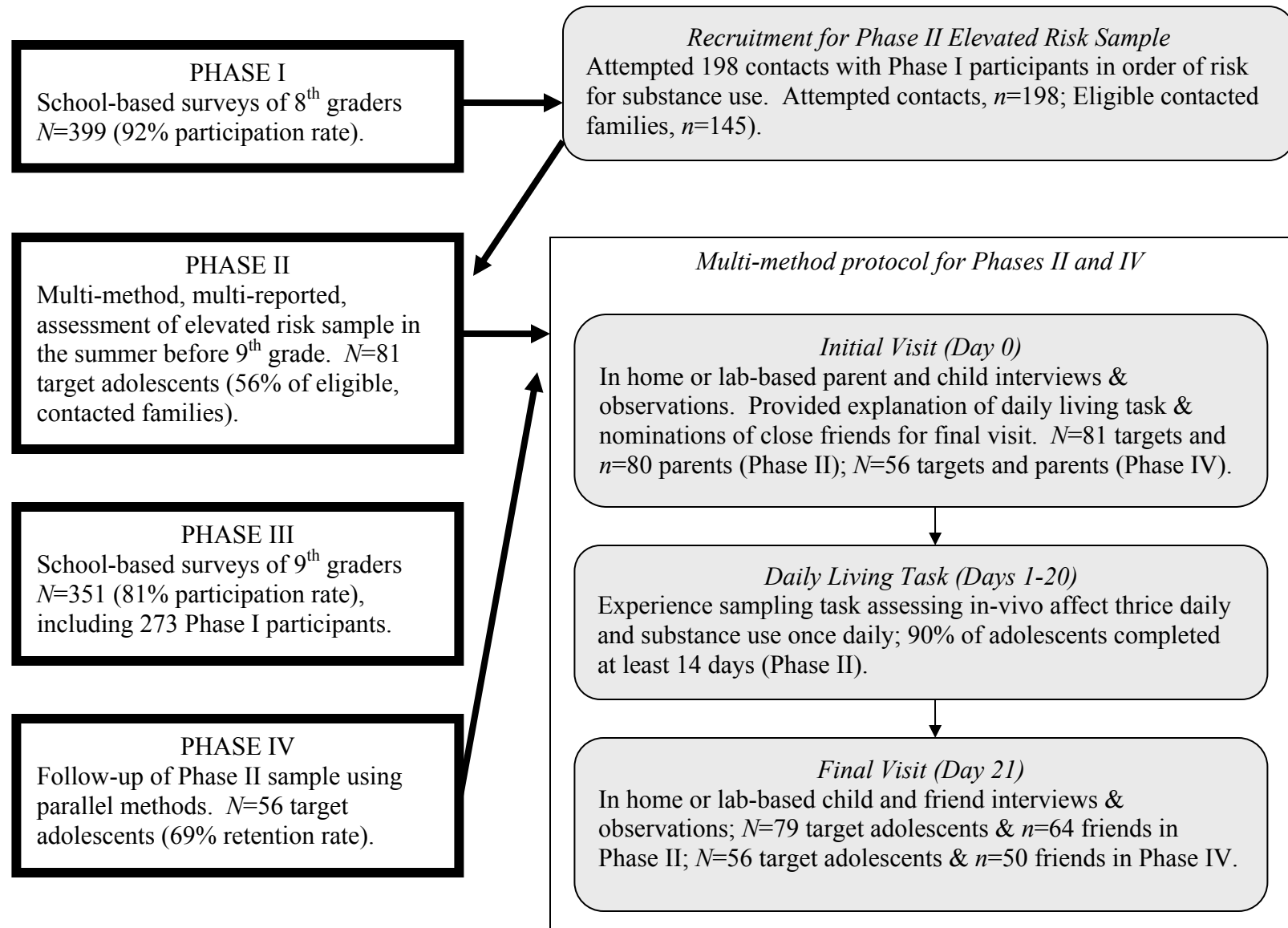


Figure 2: Overview of Analysis Sample

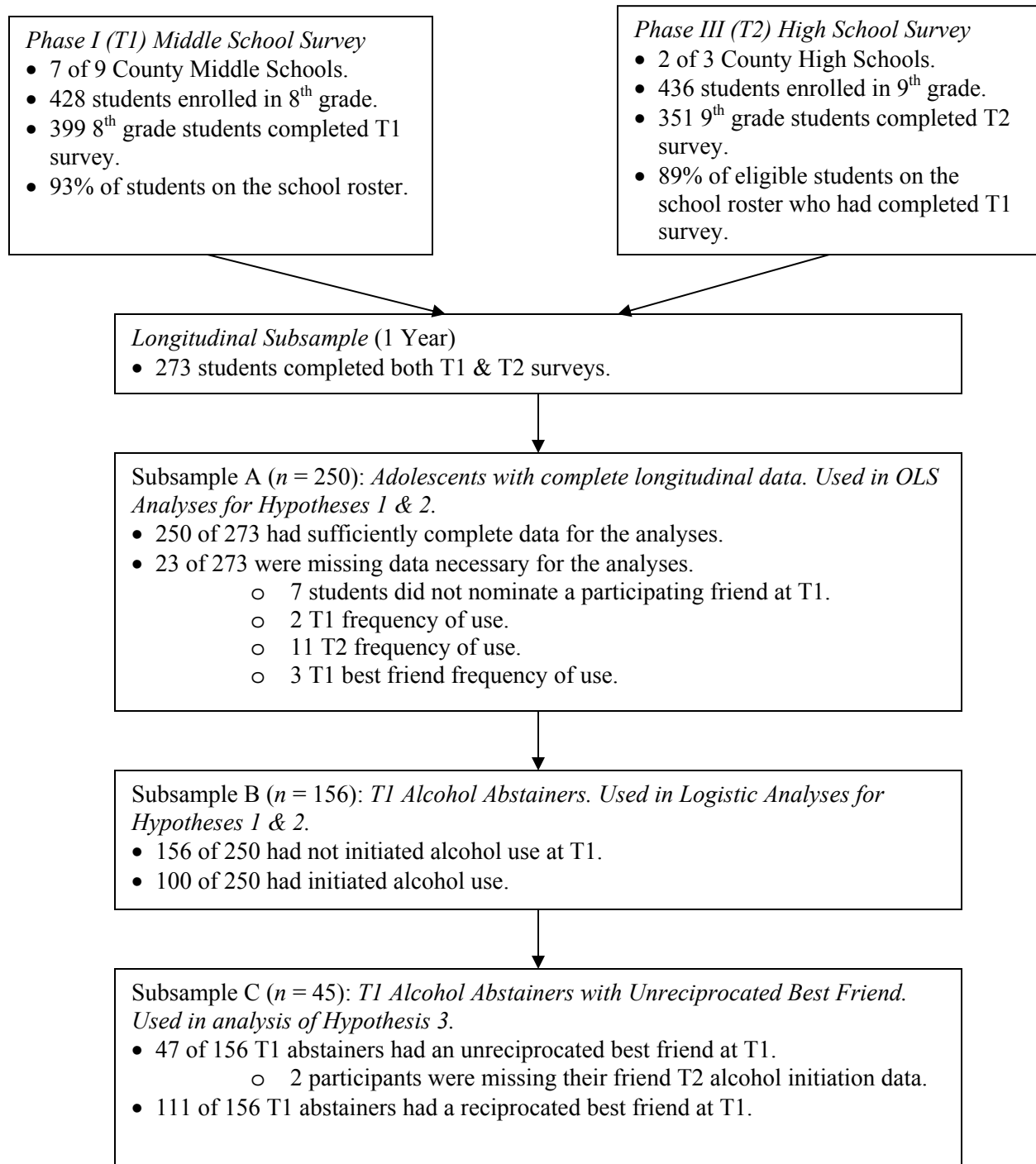


Figure 3. Best Friend Alcohol Use & Reciprocity Interactively Predicting Subsequent Frequency of Adolescent Alcohol Use (Hypothesis 1; OLS Model).

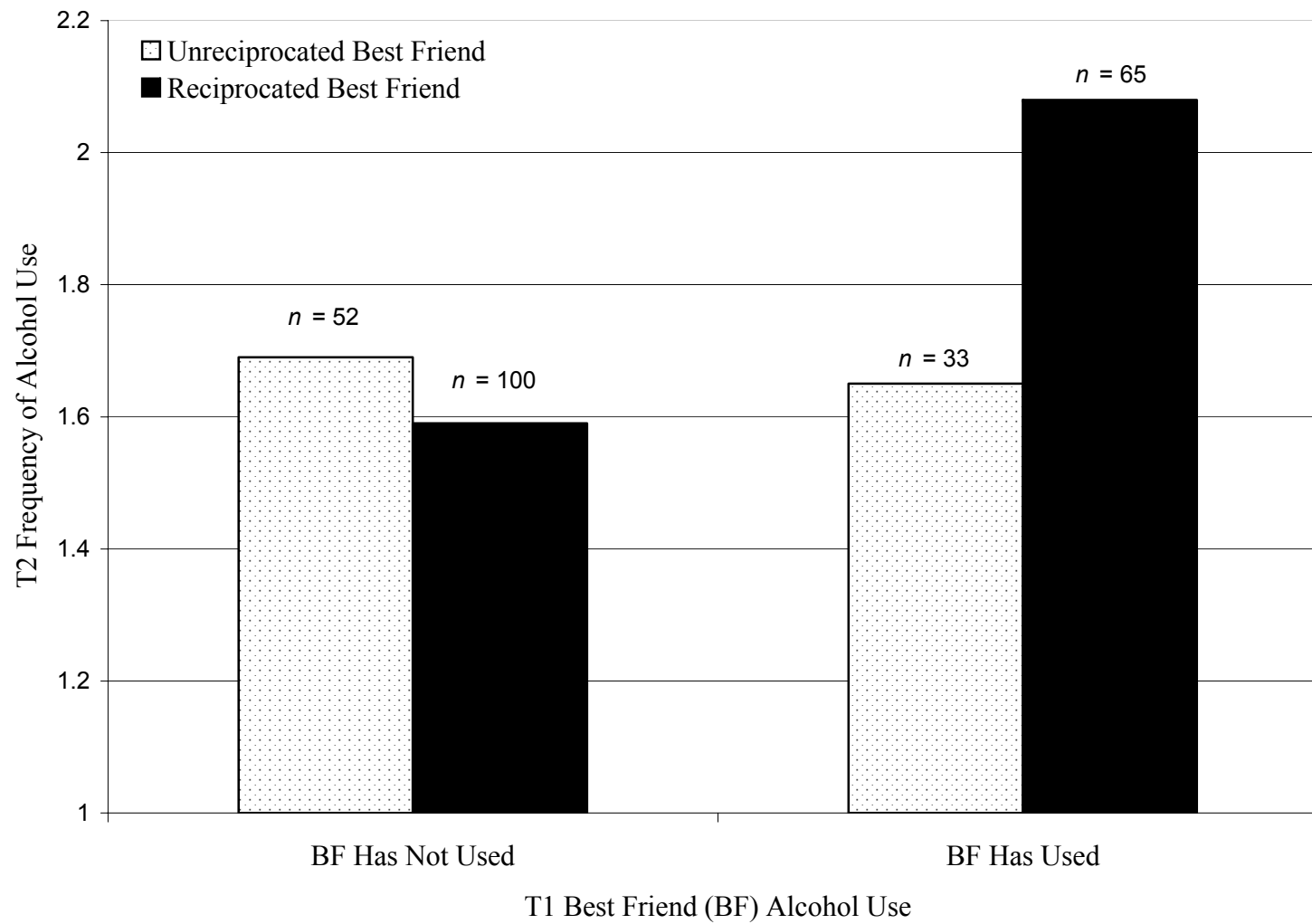


Figure 4. The Predicted Probability of at T1 Abstainer with an Unreciprocated Best Friend Forming a T2 Reciprocated Friendship with an Alcohol Using Peer (Hypothesis 3; Logistic Model).

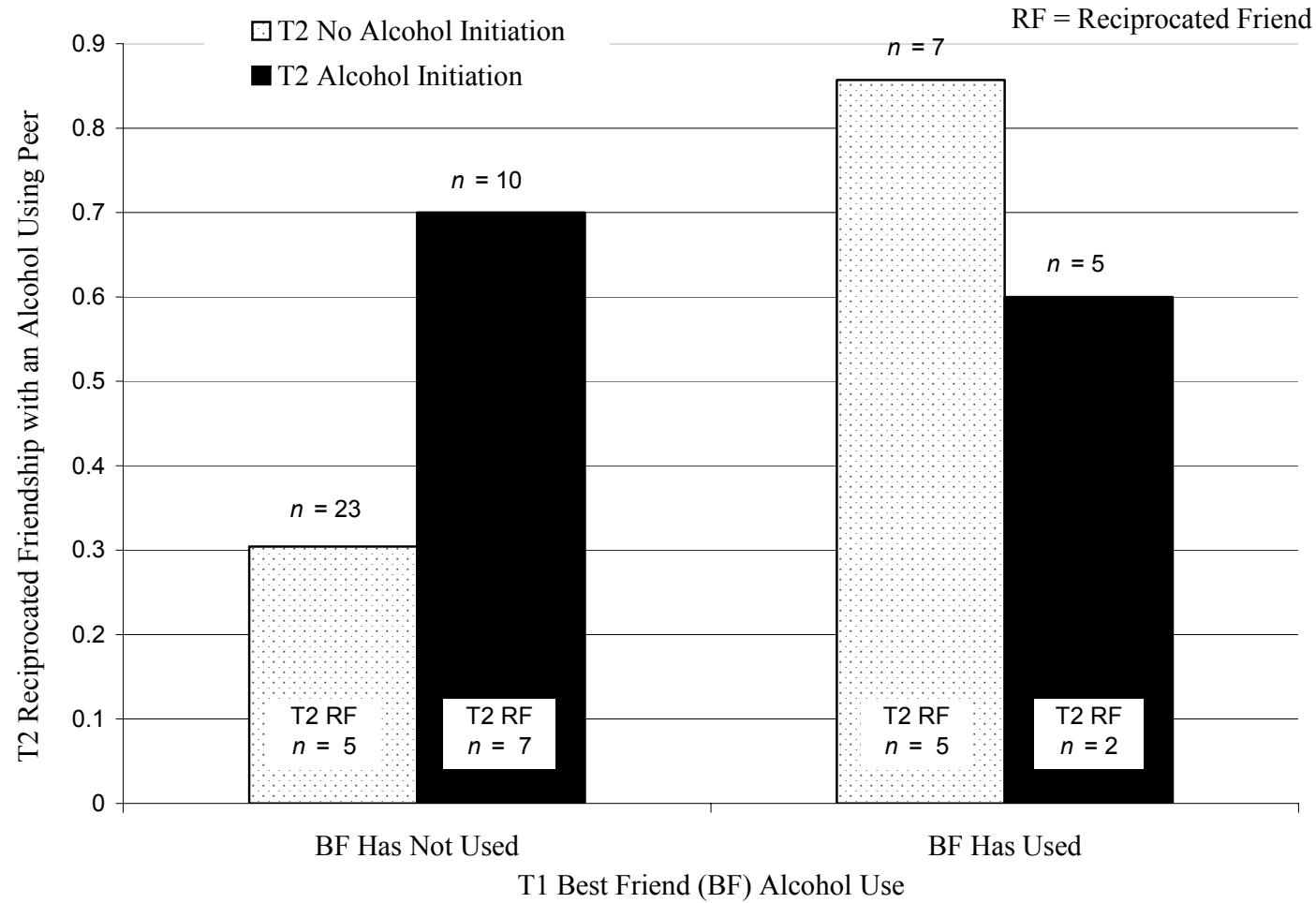
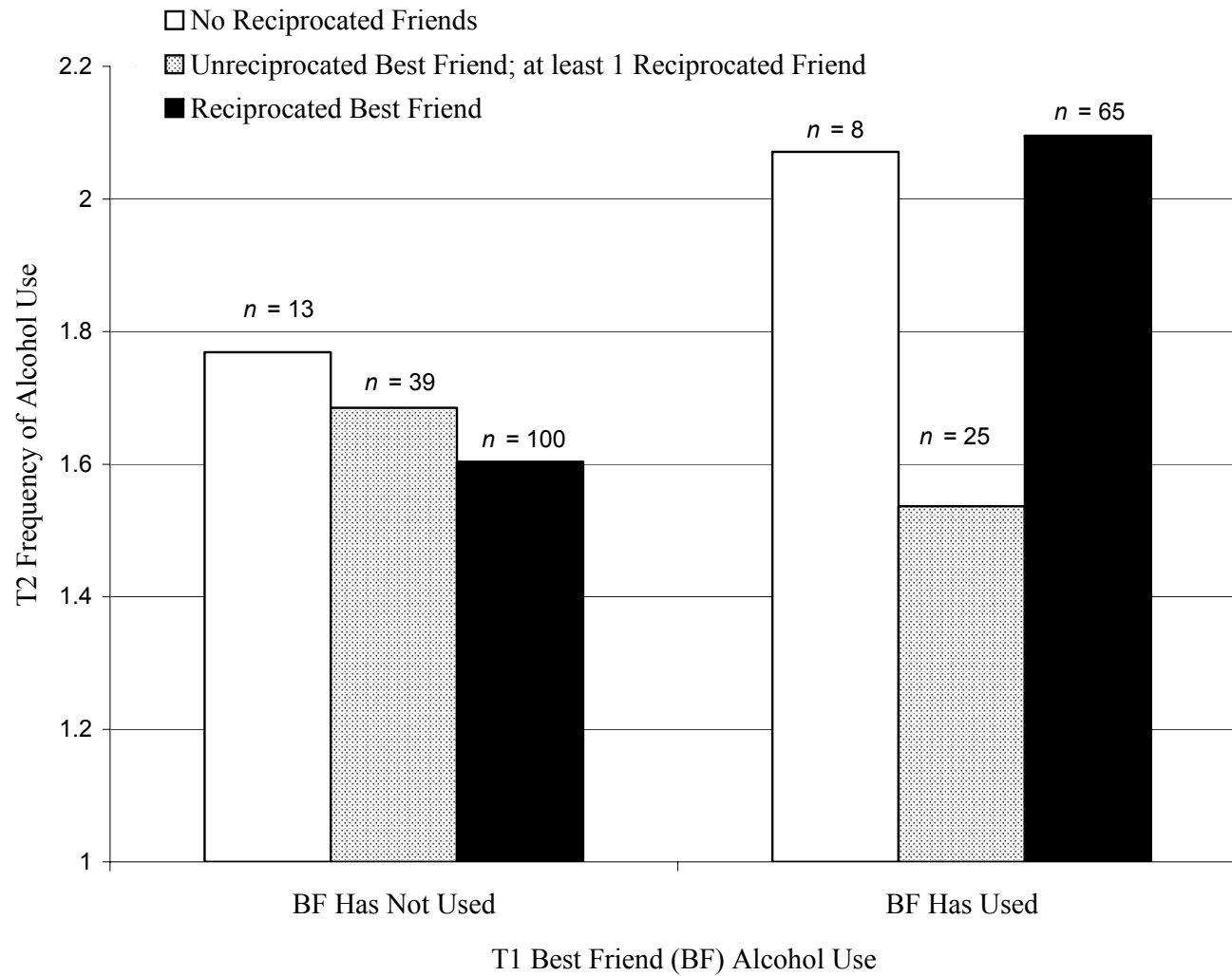


Figure 5 . Best Friend Alcohol Use, Best Friend Reciprocity/Context Predicting Frequency of Adolescent Alcohol Use (Hypothesis 2, Alternative Test; OLS Model).



APPENDIX I:

Demographic Measures

The following questions are about you. Please take your time and read each question carefully. Remember that all of your answers will be kept private. Mark your answer for each question by putting an X in the to the left of the answer that best describes you. If you have a question, ask the High School Transition Project Staff person working in your classroom today. Thank you for your help!

How old are you?

11 12 13 14 15 or older

What is your gender?

Boy Girl

Which of the following best describes you? Even if you consider yourself to be multi-racial, which one of the following best describes you?

White
Black or African American
Hispanic
American Indian or Alaska Native
Asian
Native Hawaiian or Pacific Islander
Other. Describe: _____

What is the highest level of education your mother has completed?

Less than high school
High school graduate
Some college or technical school
College graduate
Graduate or professional school
Don't know

What is the highest level of education your father has completed?

Less than high school
High school graduate
Some college or technical school
College graduate
Graduate or professional school
Don't know

APPENDIX II:

Control Measures

Delinquency Items.

About how many times have you done the following behaviors in the past SIX MONTHS. Remember that all of your answers will be kept private. Your answers are very important to us, but you may skip a question if you feel uncomfortable.

	Never	1-2 times	3-5 times	6-9 times	10-19 times	20 times or more
Skipped school						
Damaged school or other property that did not belong to you						
Stolen something from another person						
Cheated on a test						
Taken something from a store without paying for it (shoplifting)						
Been on suspension						

School Closeness Item.

How strongly do you agree or disagree with each of the following statements?

	Strongly Agree	Agree	Neither	Disagree	Strongly Disagree
I feel close to people at this school.					

APPENDIX III:

Friendship Nomination Measures

The next questions are about friendships. Please write the initials of your best friends around your age, but not a brother or sister, on the "Initials" line below. You can list from one to five people, starting with your very best friend.

	Very best Friend	Second best friend	Third best friend	Fourth best friend	Fifth best friend
Initials	_____	_____	_____	_____	_____

If your friends go to your school, look up his or her name on the List of Student Names and write the number on the "Number" line. If your friend does not go to school or is not in the list of student names, then write 00 on the "Number" line.

	Very best Friend	Second best friend	Third best friend	Fourth best friend	Fifth best friend
Initials	_____	_____	_____	_____	_____

How close do you feel to each of your friends?

	Very best Friend	Second best friend	Third best friend	Fourth best friend	Fifth best friend
Very close					
Pretty close					
Not very close					

APPENDIX IV:

Alcohol Use Measures

The following questions ask about cigarettes, alcohol and drug use. When we ask you about drug use we do NOT mean medicines that you take as prescribed or as given to you by your doctor. We want to know about your use of drugs that were NOT PRESCRIBED BY YOUR DOCTOR. Remember that no one will know your answers; they are completely private and confidential. Your answers are very important to us, but you may skip a question if you feel uncomfortable.

What is the most that you have ever used alcohol? By alcohol, we mean more than just a sip of beer, wine, wine cooler, or hard liquor.

- Never
- 1-2 times in my life
- 3-5 times in my life
- More than 5 times, but less than once a month
- 1-3 times a month
- 1-2 times a week
- 3-5 times a week
- Every day

In the past 6 months, how often did you drink alcohol (beer, wine, wine cooler or hard liquor)?

- Not at all
- 1-2 times
- Once a month
- 2-3 times a month
- Once a week
- 2-3 times a week
- 4-5 times a week
- Every day

In the past 6 months, how often have you had 5 or more drinks (of beer, wine, wine cooler, or hard liquor) at one time?

- Not at all
- 1-2 times
- Once a month
- 2-3 times a month
- Once a week
- 2-3 times a week
- 4-5 times a week
- Every day

In the past 6 months, how often have you gotten drunk on alcohol (not just lightheaded)?

- Not at all
- 1-2 times
- Once a month
- 2-3 times a month
- Once a week
- 2-3 times a week
- 4-5 times a week
- Every day

REFERENCES

- Abel, G., Plumridge, L., Graham, P. (2002). Peers, networks, or relationships: Strategies for understanding social dynamics as determinants of smoking behavior. Drugs: Education, Prevention, and Policy, 9, 325-338.
- Aboud, F.E., & Mendelson, M.J. (1996). Determinants of friendship selection and quality: Developmental perspectives. In W.M. Bukowski (Ed.), The company they keep: Friendship in childhood and adolescence (pp. 87-112). New York: Cambridge University Press.
- Adams, R.E., Bukowski, W.M., & Bagwell, C. (2005). Stability of aggression during early adolescence as moderated by reciprocated friendship status and friend's aggression. International Journal of Behavioral Development, 29, 139-145.
- Aiken, L.S., & West, S.G. (1991). Multiple regression: Testing and interpreting interactions. Newbury Park: Sage.
- Akers, R.L. (1985) Deviant behavior: A social learning approach. 3d ed. Belmont: Wadsworth.
- Aloise-Young, Graham, J.W., & Hansen, W.B. (1994). Peer influence on smoking initiation during early adolescence: A comparison of group members and group outsiders. Journal of Applied Psychology, 79, 281-287.
- American Heritage Dictionaries (Ed.). (1993). The American heritage college dictionary (3rd ed.). p. 697. Boston, MA: Houghton Mifflin Company.
- Bagwell, C. L., Newcomb, A. F. & Bukowski, W. M. (1998). Preadolescent friendship and peer rejection as predictors of adult adjustment. Child Development, 69, 140-153.
- Bahr, S.J., Hawks, R.D., & Wang, G. (1993). Family and religious influences on adolescent substance abuse. Youth and Society, 24, 443-465.
- Bandura, A. (1977). Social learning theory. Englewood Cliffs: Prentice Hall.
- Bauman, K.E., & Ennett, S.T. (1994). Peer influence on adolescent drug use. American Psychologist, 49, 820-822.
- Bauman, K.E., & Fisher, L.A. (1986). On the measurement of friend behavior in research on friend influence and selection: Findings from longitudinal studies of adolescent smoking and drinking. Journal of Youth and Adolescence, 15, 345-353.
- Baumeister, R.F., & Leary, M.R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. Psychological Bulletin, 117, 497-529.

- Bearman, P., & Brückner, H. (1999). Peer effects on adolescent sexual debut and pregnancy: An analysis of a national survey of teen girls. In P. Bearman, H. Brückner, B.B. Brown, W. Theobald, & S. Philliber (Eds.), Peer potential: Making the most of how teens influence each other. Washington, DC: National Campaign to Prevent Teenage Pregnancy.
- Bentler, P.M. (1992). Etiologies and consequences of adolescent drug use: Implications for preventions. Journal of Addictive Diseases, 11, 47-61.
- Berndt, T.J. (1996). Transitions in friendship and friends' influence. In J. Grabner, J. Brooks-Gunn, & A. Peterson (Eds.), Transitions through adolescence: Interpersonal dimensions and context (pp. 57-84). Mahwah, NJ: Erlbaum.
- Berndt, T.J. (1999). Friends' influence on students' adjustment to school. Educational Psychologist, 34, 15-28.
- Berndt, T.J. & Hoyle, S.G. (1985). Stability and change in childhood and adolescent friendships. Developmental Psychology, 21, 1007-1015.
- Berndt, T.J., & Keefe, K. (1995). Friends' influence on adolescents' adjustment to school. Child Development, 66, 1312-1329.
- Billy, J.O.G., & Udry, J.R. (1985). Patterns of adolescent friendship and effects on sexual behavior. Social Psychology Quarterly, 48, 27-41.
- Blau, P.M. (1964). Exchange and power in social life. New York: Wiley.
- Blythe, D.A., Hill, J.P., & Thiel, K.S. (1982). Early adolescents' significant others: Grade and gender differences in perceived relationships with familial and nonfamilial adults and young people. Journal of Youth and Adolescence, 11, 425-445.
- Bot, S.M., Engles, R.C.M.E., Knibbe, R.A., Meeus, W.H.J. (2005). Friend's drinking behavior and adolescent alcohol consumption: The moderating role of friendship characteristics. Addictive Behaviors, 30, 929-947.
- Botvin, G.J. (1986). Substance abuse prevention research: Recent developments and future directions. Journal of School Health, 56, 369-374.
- Brown, B.B. (1990). Peer groups and peer culture. In S.S Feldman and G.R Elliott (Eds.), At the threshold: The developing adolescent, (pp. 171-196). Cambridge, MA: Harvard University Press.
- Brown, B.B., Eicher, S.A., & Petrie, S. (1986). The importance of peer group ("crowd") affiliation in adolescence. Journal of Adolescence, 9, 73-96.

- Bukowski, W.J. (1986). School-based substance abuse preventions: A review of program research. In S. Griswold-Ezekoy, K.L. Kumpfer, & W.J. Bukowski (Eds.), Childhood and chemical abuse (pp. 95-115). New York: Haworth.
- Bukowski, W.M., & Newcomb, A.F. (1984). Stability and determinants of sociometric status and friendship choice: A longitudinal perspective. Developmental Psychology, 20, 941-952.
- Chassin, L.A. (1984). Adolescent substance use and abuse. In P. Karoly & J.J. Steffen (Eds.), Adolescent behavior disorders: Foundations and contemporary concerns (pp. 99-152). Lexington, MA: Lexington Books.
- Chassin, L., Presson, C.C., Sherman, S.J., Montello, D., McGrew, J. (1986). Changes in peer and parent influence during adolescence: Longitudinal versus cross-sectional perspectives on smoking initiation. Developmental Psychology, 22, 327-334.
- Chassin, L., Rogosch, F., & Barrera, M. (1991). Substance use and symptomatology among adolescent children of alcoholics. Journal of Abnormal Psychology, 100, 449-463.
- Clapper, R.L., Martin, C.S., and Clifford, P.R. (1994). Personality, social environment, and past behavior as predictors of late adolescent alcohol use. Journal of Substance Abuse, 6, 305-313.
- Cohen, J.M. (1977). Sources of peer group homogeneity. Sociology of Education, 50, 227-241.
- Cottrell, L., Li, X., Harris, C., D'Allessandri, D., Atkins, M., Richardson, B., & Stanton, B. (2003). Parent and adolescent perceptions of parental monitoring and adolescent risk involvement. Parenting: Science and Practice, 3, 179-195.
- Curran, P.J., Stice, E., & Chassin, L.A. (1997). The relation between adolescent alcohol use and peer alcohol use: A longitudinal random coefficients model. Journal of Consulting and Clinical Psychology, 65, 130-140.
- Damphousse, K. & Kaplan, H.B. (1998). Intervening processes between adolescent drug use and psychological distress: An examination of the self-medication hypothesis. Social Behavior and Personality, 26, 115-130.
- Değirmencioglu, S.M., & Urberg, K.A. (1995). Friend influence, selection, and deselection in adolescent substance use: A two-wave analysis. Poster session presented at the Biennial Meeting of the Society for Research in Child Development, Indianapolis, IN.
- Dishion, T. J., Capaldi, D., Spracklen, K. M., Li, F. (1997). Peer ecology of male adolescent drug use. Development and Psychopathology, 7, 803-824.

- Dishion, T. J., Patterson, G.R., & Griesler, P.C. (1994). Peer adaptation in the development of antisocial behavior: A confluence model. In L.R. Huesmann (Ed.), Aggressive behavior: Current perspectives (pp. 61-95). New York: Plenum Press.
- Donaldson, S.I., Graham, J.W., and Hansen, W.B. (1994). Testing the generalizability of intervening mechanism theories: Understanding the effects of adolescent drug use prevention interventions. Journal of Behavioral Medicine, 17, 195-216.
- Downs, W.R., & Rose, S.R. (1991). The relationship of adolescent peer groups to the incidence of psychosocial problems. Adolescence, 26, 473-491.
- Elliott, D.S., Huizinga, D., & Ageton, S.S. (1985). Explaining delinquency and drug use. Beverly Hills, CA: Sage.
- Ennett, S.T. & Bauman, K.E. (1991). Mediators in the relationship between parental and peer characteristics and beer drinking by early adolescents. Journal of Applied Social Psychology, 21, 1699-1711.
- Ennett, S.T., & Bauman, K.E. (1993). Peer group structure and adolescent cigarette smoking: A social network analysis. Journal of Health and Social Behavior, 34, 226-236.
- Ennett, S.T., & Bauman, K.E. (1994). The contribution of influence and selection to adolescent peer group homogeneity: The case of adolescent cigarette smoking. Journal of Personality and Social Psychology, 67, 653-663.
- Ennett, S.T., Bauman, K.E., Hussong, A.M., Farris, R., Foshee, V.A., Durant, R., & Cai, L. (in press). The peer context of adolescent substance use. Findings from social network analysis. Journal of Research on Adolescence.
- Erickson, K.G., Crosnoe, R., & Dornbusch, S.M. (2000). A social process model of adolescent deviance: Combining social control and differential association perspectives. Journal of Youth and Adolescence, 29, 395-425.
- Fang, X., Li, X., Stanton, B., Dong, Q. (2003). Social network position and smoking experimentation among Chinese adolescents. American Journal of Health Behavior, 27, 257-267.
- Farrell, A.D., & Danish, S.J. (1993). Peer drug associations and emotional restraint: Causes or consequence of adolescents' drug use? Journal of Consulting and Clinical Psychology, 61, 327-334.
- Farrell, A.D., Kung, E.M., White, K.S., & Valois, R.F. (2000). The structure of self-reported aggression, drug use, and delinquent behaviors during early adolescence. Journal of Clinical Child Psychology, 29, 282-292.

- Fisher, L.A., & Bauman, K.E. (1988). Influence and selection in the friend-adolescent relationship: Findings from studies of adolescent smoking and drinking. Journal of Applied Social Psychology, 18, 289-314.
- Flay, B.R. (1985). Psychosocial approaches to smoking prevention: A review of findings. Health Psychology, 4, 449-488.
- French, J.R.P., & Raven, B. (1959). The bases of social power. In D. Cartwright (Ed.), Studies in Social Power (pp. 150-167). Ann Arbor: University of Michigan Press.
- Furman, W. (1996). The measurement of friendship perceptions: Conceptual and methodological issues. In W.M. Bukowski (Ed.), The company they keep: Friendship in childhood and adolescence (pp. 41-65). New York: Cambridge University Press.
- Gaughan, M. (2003). Predisposition and pressure: Mutual Influence and adolescent drunkenness. Connections, 25, 7-31.
- Gershman, E.S., & Hayes, D.S. (1983). Differential stability of reciprocal friendships and unilateral relationships among preschool children. Merrill Palmer Quarterly, 29, 169-177.
- Goffman, E. (1963). Behavior in public places. New York: Free Press.
- Gottman, J.M. (1983). How children become friends. Monographs of the Society for Research in Child Development, 48, (3, Serial No. 201).
- Graham, J.W., Marks, G., & Hansen, W.B. (1991). Social influence processes affecting adolescent substance use. Journal of Applied Psychology, 76, 291-298.
- Hallinan, M.T. (1978/79). The process of friendship formation. Social Networks, 1, 193-210.
- Hardy, C.L., Bukowski, W.M., & Sippola, L.K. (2002). Stability and change in peer relationships during the transition to middle-level school. Journal of Early Adolescence, 22, 117-142.
- Hartup, W.W. (1996). The company they keep: Friendships and their developmental significance. Child Development, 67, 1-13.
- Hartup, W.W. & Laursen, B. (1999). Relationships as developmental contexts: Retrospective themes and contemporary issues. In W.A. Collins & B. Larsen (Eds.), The Minnesota Symposia on Child Psychology: Vol. 30. Relationships as developmental contexts (pp. 13-35). Mahwah, NJ: Lawrence Erlbaum Associates Inc.
- Hartup, W.W., Laursen, B., Stewart, M.I., & Eastenson, A. (1988). Conflict and the friendship relations of young children. Child Development, 59, 1590-1600.

- Hawkins, D. J., Catalano, R.F., & Miller, J.Y. (1992). Risk and protective factors for alcohol and other drug problems in adolescence and early adulthood: Implications for substance abuse prevention. Psychological Bulletin, 112, 64-105.
- Henrich, C.C., Kuperminc, A.S., Blatt, S.J., Leadbeater, B.J. (2000). Characteristics and homogeneity of early adolescent friendship groups: A comparison of male and female clique and nonclique members. Applied Developmental Science, 4, 15-26.
- Hussong, A.M. (2000). Self-medication and adolescent substance use. Unpublished NIH grant application.
- Hussong, A.M. (2002). Differentiating peer contexts and risk for adolescent substance use. Journal of Youth and Adolescence, 31, 207-220.
- Hussong, A.M., Feagans Gould, L., & Hersh, M.A. (2006). The relation between negative affect and drinking in adolescence: Defining mechanisms. Manuscript submitted for publication.
- Hussong, A.M., & Hicks, R.E. (2003). Affect and peer context interactively impact adolescent substance use. Journal of Abnormal Child Psychology, 31, 413-426.
- Ianotti, R.J., Bush, P.J., & Weinfurt, K.P. (1996). Perception of friends' use of alcohol, cigarettes, and marijuana among urban schoolchildren: A longitudinal analysis. Addictive Behaviors, 21, 615-632.
- Jaccard, J., Blanton, H., Dodge, T. (2005). Peer Influences on Risk Behavior: An Analysis of the Effects of a Close Friend. Developmental Psychology, 41, 135-147.
- Johnston, L.D., O'Malley, P.M., & Bachman, J.G., & Schulenberg, J.E. (2004). Monitoring the Future national results of adolescent drug use, 1975-2003. Volume I: Secondary school students (NIH Publication No. 04-5507). Bethesda, MD: National Institute on Drug Abuse.
- Kandel, D.B. (1978). Homophily, selection and socialization in adolescent friendships. American Journal of Sociology, 84, 427-436.
- Kandel, D.B. (1985). On processes of peer influence in adolescent drug use: A developmental perspective. Advances in Alcohol and Substance Abuse, 4, 139-163.
- Kaplan, H.B., Martin, S.S., & Robbins, C. (1984). Pathways to adolescent drug use: Self-derogation, peer influence, weakening of social controls, and early substance use. Journal of Health and Social Behavior, 25, 270-289.
- Mahoney, J.L., & Stattin, H. (2000). Leisure activities and adolescent antisocial behavior: The role of structure and social context. Journal of Adolescence, 23, 113-127.

- Mounts, N.S., & Steinberg, L. (1995). An ecological analysis of peer influence on adolescent grade point average and drug use. Developmental Psychology, 31, 915-922.
- Newcomb, T. (1956). The prediction of interpersonal attraction. The American Psychologist, 11, 575-581.
- Newcomb, A.F., & Bagwell, C.L. (1995). Children's friendship relations: A meta-analytic review. Psychological Bulletin, 117, 306-347
- Newcomb, M.D., & Bentler, P.M. (1989). Substance use and abuse among children and teenagers, American Psychologist, 44, 242-248.
- Nisbett, R.E. & Ross, L. (1980). Human inference: Strategies and shortcomings of social judgment. Englewood cliffs, NJ: Prentice-Hall.
- Oetting, E.R., & Donnermeyer, J.F. (1998). Primary socialization theory: The etiology of drug use and deviance. I. Substance Use and Misuse, 33, 995-1026.
- Paglia, A., & Room, R. (1999). Preventing substance use problems among youth: A literature review and recommendations. Journal of Primary Prevention, 20, 3-50.
- Pearson, M., & Michell, L. (2000). Smoke rings: Social network analysis or friendship groups, smoking, and drug-taking. Drugs: Education, Prevention and Policy, 7, 21-37.
- Pearson, M., & West, P. (2003). Drifting smoke rings: Social network analysis and Markov processes in a longitudinal study of friendship groups and risk-taking. Connections, 25, 59-76.
- Rice, R.E., Donohew, L., & Clayton, R. (2003). Peer network, sensation seeking, and drug use among junior and senior high school students. Connections, 25, 32-58.
- Richards (1995). NEGOPY 4.30 Manual and User's Guide. Burnaby: Simon Fraser University.
- Rogers, E. & Kincaid, D.L. (1981). Communication Networks: Toward a New Paradigm for Research. New York: Free Press.
- SAS Institute Inc. (2003). SAS OnlineDoc®, Version 9.1. Cary, NC: SAS Institute Inc.
- Steiger, J.H. (1999). STATISTICA Power Analysis. StatSoft, Inc. Tulsa, OK. www.statsoft.com.
- Stevens, E.A. & Prinstein, M.J. (2005). Peer contagion of depressogenic attributional styles among adolescents: A longitudinal study. Journal of Abnormal Child Psychology, 33, 25-37.

- Swaim, R.C., Oetting, E.R., Edwards, R.W., & Beauvais, F. (1989). Links from emotional distress to adolescent drug use: A path model. Journal of Consulting and clinical Psychology, *57*, 27-231.
- Tabachnick, B.G., & Fidell, L.S. (1996). Using multivariate statistics (3rd ed). New York: HarperCollins College Publishers.
- Thibaut, J.W., & Kelley, H.H. (1959). The Social Psychology of Groups. New York: Wiley.
- Urberg, K.A. (1999). Introduction to invitational issue: Thoughts about studying the influence of peers on children and adolescents. Merrill-Palmer Quarterly, *45*, 1-12.
- Urberg, K.A., Luo, Q., Pilgrim, C., Değirmencioğlu, S.M. (2003). A two-stage model of peer influence in adolescent substance use: Individual and relationship-specific differences in susceptibility to influence. Addictive Behaviors, *28*, 1243-1256.
- Urberg, K.A., Değirmencioğlu, S.M., & Pilgrim, C. (1997). Close friend and group influence on adolescent cigarette smoking and alcohol use. Developmental Psychology, *33*, 834-844.
- Urberg, K.A., Değirmencioğlu, S.M., Tolson, J.M., & Halliday-Scher, K. (1995). The structure of the peer network. Developmental Psychology, *31*, 540-547.
- Waller, W. (1938). The family: A dynamic interpretation. New York: Dryden.
- Wills, T.A. (1986). Stress and coping in early adolescence: Relationships to substance use in urban school samples. Health Psychology, *5*, 503-529.
- Wills, T.A., & Cleary, S.D. (1999). Peer and adolescent substance use among 6th-9th graders: Latent growth analyses of influence versus selection mechanisms. Health Psychology, *18*, 453-463.
- Wills, T.A., McNamara, G., Vaccaro, D., & Hirky, A.E. (1996). Escalated substance use: A longitudinal grouping analysis from early to middle adolescence. Journal of Abnormal Psychology, *105*, 166-180.