

Scripts, Sects, and Sex Among Adolescents: A Network Approach of Reference Groups

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Key Words: Reference Groups, Adolescent Peer Networks, Sexual Behavior

Word Count:

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ABSTRACT: We combine insights from reference group theory and network perspectives to understand how peer groups inform adolescent sexual behavior. We argue that adolescents' sexual behavior more or less adheres to prevailing group sexualized romantic relationship "scripts," which capture the extent to which members sanction sexual activity within ideal romantic relationships. However, we hypothesize that the association between scripts and behavior varies according to individual, group, and school characteristics, including positions within group networks, group cohesion, and social closure. To test our hypotheses, we identify adolescent peer groups with friendship network data from Add Health using Girvan and Newman's (2002) edge betweenness algorithm. Results indicate that individuals' racial similarity with group members, social proximity to group members, and occupying within-group brokerage roles strengthen the association between groups' sexualized scripts and sexual intercourse. School level social closure—as measured by transitivity—and group network density also intensify the association between scripts and intercourse.

INTRODUCTION

While the proportion of young people who are sexually experienced has decreased in recent years, estimates from 2008 indicate 43% of adolescents have had sexual intercourse (Amba, Martinez, and Copen 2010). In addition, 26% of female and 29% of male adolescents reported having two or more sexual partners in their lifetime. Early sexual activity and other potentially risky behavior such as intercourse with multiple partners place adolescents at increased risk of pregnancy and sexually transmitted disease (STD) transmission (Madkour et al. 2010). Indeed, recent figures indicate that while adolescents and young adults aged 15 to 24 represent 25% of the sexually experienced population aged 15 to 44, they acquire roughly 48% of all new cases of sexually-transmitted diseases (Weinstock, Berman, and Cates 2004). Further insight into the development of adolescent sexual behaviors may alleviate adverse social- and health-related outcomes among teenagers and young adults, and facilitate the realization of a number of objectives outlined in Healthy People 2010 and 2020 (Healthy People 2000, 2010).

Estimates from a nationally-representative of adolescents in the United States indicate more than one-third of adolescent virgins (42% of girls and 35% of boys) cited religion or morality as the main reason for abstaining from sexual intercourse (Amba et al. 2010). The role of religion and morality in sexual decision making processes in turn points to the importance of social groups in shaping adolescents' approach to potential sexual relationships. Acknowledging the importance of group influence, researchers are increasingly examining the "normative climates" of adolescent contexts to explain variation in sexual outcomes (Butler 2002; Mollborn 2010; Warner et al. n.d.). Within the context of sexual behavior, normative climates consist of attitudes towards and social definitions of sexual behavior shared by members of a social

aggregate. These attitudes and definitions in turn either encourage or discourage certain types of behavior among group members.

Much of the recent research on the impact of norms and definitions on adolescent sexual behavior has focused on peer group contexts, and for good reasons. Compared to children and adults, adolescents attribute greater importance to friends, spend more time with socializing with friends, and are more strongly influenced by the behaviors and attitudes of their friends (Giordano, Cernkovich, and Holland 2003). Indeed, prior research indicates that friend and peer influence is one of the most robust predictors of adolescent problem behaviors (Haynie and Osgood 2005; McGloin 2009; Warr 2002). In terms of peer influence on sexual behavior, permissive sexual norms and attitudes among peers are consistently and positively associated with adolescents' sexual behavior (Buhi and Goodson 2007).

While informative, the vast majority of research focusing on peers' normative influence on sexual behavior is limited in important ways. First, much of the research on peer norms and sexual risk behavior use "perceptual" measures to capture peer group normative and behavioral climates. For example, survey researchers frequently ask respondents the extent to which their friends or peers approve or disapprove of having sex. Perceptual measures are potentially biased as that they do not directly measure the views, norms, and attitudes that are *actually held* by peers. This introduces a potential "same source" bias that may reflect "projection," or assuming that others hold views opinions that are similar to one's own (Gottfredson and Hirschi 1990). Accordingly, any causal claims regarding peer normative influence are dampened by potential biases of perceptual measures.

Another limitation of perceptual studies of peer influence is that they fail to capture the exact composition of adolescent peer groups. For instance, studies often ask respondents to

indicate the proportion of persons whom they know that have had sex. This measurement strategy leaves important aspects of peer groups, such as group size, unspecified. In addition, network characteristics of groups, such as social cohesion, cannot be adequately measured with perceptual measures of peer norms. Finally, the processes through which group norms and values influence individual action are theoretically underdeveloped in most models of peer normative influence and sexual behavior. Little is known as to *why* individuals adhere to prevailing norms, attitudes, and values of peer group members through their sexual behavior (Harding 2007).

We address these and other limitations of prior research on peer influence on adolescent sexual behavior in a number of important ways. First, following insights from reference group theory (Bock, Beeghley, and Mixon 1983; Merton and Rossi 1957; Shibutani 1955), we specify the conditions under which adolescents' sexual behavior most strongly adheres to prevailing sexualized relationship "scripts" (Harding 2007) within peer groups. In our study, sexualized relationship scripts capture the extent to which sexual activity would occur within the ideal romantic relationships of our respondent (at the time of the first interview). At the same time we integrate recent advancements in social network analysis and cultural sociology into our approach to peer influence, which allows for a more complete understanding of the processes through which individuals adhere to prevailing group relationship scripts in their sexual behavior. Using data from two waves of the National Longitudinal Study of Adolescent Health (hereafter Add Health), we first identify adolescent school-based peer groups that are based on friendship ties using Newman and Girvan's (2004) edge betweenness community detection algorithm. We then construct group-level measures of prevailing sexualized relationship scripts and measure the association between scripts and likelihood of sexual intercourse among group members with multilevel statistical models.

Informed by reference group theory, we then test whether individual, peer group, and school-level characteristics condition the association between group-level scripts and individual members' sexual behavior. In particular, we first examine whether individuals' similarity in race and socioeconomic status among individuals and other reference group members accentuates the association between reference group sexualized relationship scripts¹ and individuals' behavior. We then assess whether similarity in individuals' sexualized relationship scripts and prevailing group scripts accentuates the association between group scripts and individuals' sexual behavior. Next, we test whether group-level heterogeneity in relationship scripts (i.e., ambiguity in relationship scripts among members) attenuates the association between sexualized relationship scripts and sexual behavior. Finally, incorporating insights and analytical techniques from social network perspectives (Gould and Fernandez 1989; Granovetter 1973; Freeman 1979; Friedkin 1991), we evaluate the extent to which occupying brokerage roles and central network positions within groups, as well as school-levels of transitivity, accentuate the association between reference group scripts and sexual behavior.

Our research design takes into account the content and network structure of adolescent peer groups and directly measures peer group relationship scripts, thus circumventing many of the empirical and theoretical shortcomings associated with “perceptual” measures of peer group norms and behaviors. Results from our study ultimately demonstrate the value of incorporating insights from reference group theory and social network perspectives into the understanding of peer and group influence processes.

THEORIES OF PEER INFLUENCE

Peer influence has long been central in explanations of crime, delinquency, and adolescent problem behaviors. However until more recently, researchers have in large part overlooked the potential effect of peer characteristics on adolescent sexual behavior. Even fewer studies have used social network data to understand the role of peer influence in shaping sexual behavior (Ali and Dwyer 2011). In the sections that follow, we describe our approach to peer influence, paying close attention to the mechanisms through which reference groups shape individual action. We then incorporate recent advancements in cultural sociology and social network perspectives into our theoretical approach to reference groups, which allows for a more thorough operationalization of key theoretical concepts and social processes central to peer influence.

REFERENCE GROUP THEORY: PROSPECTS

Reference group theory explains the processes through which individual and group characteristics shape individuals' behavioral orientation towards the norms and social definitions of specific reference groups (rather than those of another). Rather than assuming that all group members are uniformly influenced by group norms and behavior, Merton and Rossi (1957) first ask, "When do individuals orient themselves to others in their occupational group, in their congeniality groups, or in their religious group? How can we characterize the *structure of the social situation* which leads to one rather than another of these several group affiliations being taken as the significant context?" (p. 239, emphasis in original). These questions highlight four features of group influence processes that are theoretically relevant to the present analysis. The first feature is that individual orientations towards a given reference group vary across its members. Related, the second feature indicates that strengths of orientations towards specific reference groups vary *within* individuals. The third feature is that individuals are exposed to a

number of reference groups that vary in their demographic and cultural content, while the fourth point is that characteristics of both reference groups and individuals (i.e., the structure of the social situation) determine whether individuals orientate their behavior towards cultural frameworks of specific reference groups.

Building on Bock and colleagues' (1983) formal proposition regarding the influence of reference groups, Cochran and Beeghley (1991) specify criteria under which particular groups provide the most salient behavioral guidelines for individual behavior. The authors state that the extent to which groups or collectivities serve as reference groups for an individual is a positive and additive function of:

(1) the degree of *similarity* between the status attributes of an individual and the other members; (2) the degree to which an individual's values and beliefs *agree* with those of other members; (3) the degree of *clarity* in a group's values and beliefs; (4) the degree to which an individual is in *sustained interaction* with other group members; and (5) the degree to which an individual defines group leaders as *significant others* (p. 47, emphasis in original).

While reference group theory identifies the conditions under which individuals most likely direct actions towards other group members, fundamental aspects of group influence are left under-theorized in the model. The first aspect relates to the very definition of a reference group. According to the theory, reference groups must satisfy two requirements. The first requirement is that members maintain interaction in accordance to normative standards, while the second requires members to self-identify, and be identified by others, as group members (Clarke, Beeghley, and Cochran 1990). As we demonstrate below, membership recognition is a dynamic process that is never complete. Accordingly, incorporating self-and social identification into a definition of reference groups is problematic and unnecessary because it presents the researcher with the near-impossible task of delineating groups and identifying members on the basis of more-or-less arbitrary criteria. In addition, membership criteria within larger umbrella

institutions (e.g., the Catholic Church) may vary across their satellite subgroups (e.g., specific parishes). Rather, we advance a definition of reference groups that focuses on the structure of social ties connecting individuals.

An additional limitation of reference group theory is that it employs a vague conception of how cultural aspects of reference groups influence behavior. Merton and Rossi (1957) emphasized that individuals use norms and values of reference groups as points of orientation for their actions. More recently, researchers testing reference group theory have proposed that group-based “beliefs” factor into individuals’ adherence to group standards (Cochran and Beeghley 1991; Cochran et al. 2004). The mechanisms through which beliefs, norms, and values influence individual behavior are underdeveloped in reference group theory. We instead focus on how reference groups influence behavior through the provision of prevailing behavioral scripts, or “strategies of action” (Harding 2007; Swidler 1986), which members use to inform their approaches to sexual behavior within romantic relationships. This more nuanced understanding of culture provides further insight into the mechanisms through reference groups influence behavior.

In the following section, we explain the reasoning behind our actor-based approach to defining peer reference groups. We identify peer reference groups on the basis of individuals’ social ties, from which peer groups emerge, and on the aggregate, constitute the “community structure” of larger social networks. We then explore how culture is commonly conceptualized in reference group theory, and explain how our alternative approach to culture enriches the understanding of the conditions under which individuals construct action in accordance to group standards.

A NETWORK APPROACH TO DEFINING REFERENCE GROUPS

Recent formulations of reference group theory have primarily focused on groups comprising of “persons who are in sustained interaction in accord with normative patterns and who define themselves and are defined by others as members” (Bock et al. 1983:p. 547). This particular definition outlines three key components of reference groups, namely that members are in constant and structured interaction with one another, members define themselves as members, and others define members as members. Bock and colleagues (1983) state that families and churches satisfy these defining qualities of reference groups.

Merton and Rossi (1957) espoused efforts aimed at identifying the conditions under which varieties of groups and collectives influence behavior, including occupational, religious, and “congeniality” groups. However, there are significant theoretical and empirical problems with analyzing peer groups as reference groups, as defined by Bock and colleagues. While peer groups comprise of persons who interact in accordance to normative patterns, they are typically not formally defined, and their members typically do not officially identify themselves or other individuals in the group, as members. Accordingly, peer groups most often do not have distinct boundaries as they are not defined on the basis of formal membership criteria. As a result, most peer groups do not satisfy Bock and colleagues’ definitional requirements of reference groups.

Another limitation of current definitions of reference groups is that formalized recognition processes may be at odds with members’ actual interaction patterns. In the current theoretical model, reference groups are intrinsically tied to institutions, such as religions in the case of congregations, or kinship patterns in the case of nuclear families. Reference groups are, in turn, also defined by members’ interaction patterns that are informed in large part by group-

level normative standards. However, these two defining qualities of reference groups may contradict one another in certain instances. For example, a church member may maintain infrequent contact with other parishioners, yet still self-identify, and be identified by others, as a family member. Membership status in this case depends on whether intermittent contact is normal among members.

In addition, more marginal group members may not be identified as members by every other member. For example, it is likely that active churchgoers differentially recognize marginal parishioners as members of the congregation, in part because they are unfamiliar with more peripheral members, but also because the criteria for membership vary across members. More central members, who maintain frequent contact with other members, likely disagree as to whether individuals who only attend religious services on religious holidays are indeed members. The social content of groups and their boundaries become blurred when they are defined through subjective identification processes in such a case. The fact that membership criteria and normative interaction patterns are not universal within or across groups further attests to the theoretical ambiguity of the defining qualities of reference groups, as outlined by Bock and colleagues.

We propose that redefining reference groups as those that are *empirically identifiable through structured relational and/or interactional patterns* enriches the understanding of reference group influence processes in a number of ways. First, it provides an alternative method for identifying groups that is based on *actual* interaction patterns (as measured through social network data), rather than subjective assessments regarding membership status from others within the group. This relieves the theoretical and empirical ambiguity built into Bock and colleagues' definition of reference groups.² A second benefit of our network approach is that it

allows for a more thorough incorporation of network mechanisms into the study of group influence, which helps provide a more complete understanding of the conditions under which individuals orientate action towards specific reference groups.

While there are a number of algorithms that identify densely connected groups in social networks, most are premised on the notion that groups consist of relatively small, coherent, and cohesive assemblages of individuals who more frequently associate with each other than with non-members (Kreager, Rulison, and Moody 2011; Reitz 1988; Frank 1995; Moody 2001; Newman and Girvan 2004). Most network techniques of “community detection” typically identify discrete non-overlapping groups³ by maximizing the proportion of within group ties compared to intergroup ties through iterative mathematical algorithms.

An additional benefit of identifying mutually-exclusive subgroups is that they may be used as a discrete unit of analysis in multilevel statistical models of group influence. To test reference group theory, we first identify subgroups within larger school communities with Newman and Girvan’s (2004) edge betweenness clustering algorithm. We then construct variables that capture prevailing sexualized relationship scripts within the resulting peer groups and examine the conditions under which members are most likely to adhere to relationship scripts in their sexual behavior. We provide more details on the edge betweenness algorithm and our modeling strategy in our analytic strategy section.

REFERENCE GROUPS AND CULTURE: FROM NORMS AND VALUES TO SCRIPTS

In addition to providing an imprecise definition of reference groups, reference group theory does not fully explore how cultural features groups of factor into members’ behavior. Merton and Rossi (1957) suggest that symbolic aspects of groups are consequential for individual behavior

because they present members with norms, values, and definitions of situations that comprise structured “frames of reference” (p. 238). Definitions of situations in part inform roles that members take while interacting with other members (e.g., Priest versus parishioner), while norms provide members with means for governing conduct. Group values help members realize their own ideals, hopes and desires (Young 2010).

While drawing attention to the importance of norms, values, and social definitions in shaping individual behavior, reference group theory’s conception of culture limits the understanding of cultural influence in important ways. First, it excessively focuses on norms and values as the primary symbolic elements of reference groups that are consequential for action. Young (2010) points out that values pertain to issues surrounding what people think they ought to do or want to do, while norms relate to social sanctions and rewards associated with particular behavior. Acknowledging that groups contain wide varieties of norms, which at times are conflicting in their proscriptions, decreases the significance of group norms with regards to understanding how cultural features of groups shape action. Furthermore, understanding adherence to specific norms reveals little about the processes, apart from operant conditioning, through which individuals use norms to direct action. For example, while restrictive sexual norms may be negatively associated with members’ sexual behavior, rationales for sexual restraint vary across individuals. Some may adhere to norms because of fear of being reprimanded or ostracized by group members, while others may value their chastity for more personal reasons (e.g., “saving one’s self” for marriage). Narrowly focusing on norms that either discourage or encourage certain types of behavior does little to explain individual action because individuals adhere to norms for an infinite number of reasons.

Additionally, while individuals may commit to certain values, the extent to which they are associated with behavioral outcomes systematically varies across social groups. For example, oppositional culture theory (Ogbu 1978; Fordham and Ogbu 1986) attributes disadvantaged groups' low school performance to their resistance of conventional values that stress scholastic achievement and degree attainment. However, recent research indicates that members of oppressed groups do maintain values that stress the importance of higher education (Downey 2008). In fact, Ainsworth-Darnell and Downey (1998) found that compared to whites, black adolescents on average expressed greater optimism about their future, held more pro-school attitudes, and viewed education as more important in their lives. At the same time, blacks on average performed worse in school than whites. These findings call into question the utility of incorporating values into explaining how individuals use cultural features of reference groups to structure action.

Acknowledging the limitations of conceiving of culture in terms of norms and values, sociologists are increasingly conceiving of culture as a "tool kit" of symbols and world views (Swidler 1986), that people draw from when constructing action. Rather than guiding behavior through the provision of norms and values, culture is instead thought to present individuals with strategies of action that inform the actions of group members by providing persistent and more-or-less specific ways of ordering action to achieve desired ends. Importantly, elements of culture, including strategies of action and "frames," which are understandings of how the world works (Goffman 1974; Harding 2007; Young 2004), are transmitted by actors in various contexts of interaction, including reference groups, neighborhoods, or larger-scale institutions such as mass media. Furthermore, frames and strategies of action embedded within specific contexts are more

or less heterogeneous, and at times, contradict one another. We argue that the same may be said of frames and strategies of action within and between reference groups.

We intentionally downplay the importance of group-based norms and values in shaping action, which have been central in prior formulations of reference group theory. We instead orientate our empirical focus towards relationship “scripts,” which provide reference group members with cultural templates for “the sequencing of behavior over time” (Harding 2007:p. 346). Akin to Swidler’s (1986) concept “strategies of action,” scripts provide individuals with cultural road maps that may be used to achieve desired outcomes, which in our case, is their own ideal romantic relationship. Importantly, this understanding of culture is readily incorporated into our reformulated reference group theoretical framework.

Throughout this paper we argue that individuals likely adhere to prevailing reference group scripts. We assess the validity of this claim by testing the following hypothesis:

H.1. Peer group sexualized relationship scripts are positively associated with the likelihood of having sexual intercourse among group members.

As reference group theory rightly points out, characteristics of groups (e.g., clarity) and individuals (e.g., sustained interaction with group members) determine whether individuals adhere to prevailing group scripts. In the following section we revisit the criteria outlined by Cochran and Beeghley (1991) and present our reformulated approach of reference groups that provides a more thorough account of mechanisms through which sexualized relationship scripts influence adolescent sexual behavior.

REFERENCE GROUPS REVISITED

Having made a case for our reformulated approach to reference group theory, we return to Cochran and Beeghley’s (1991) reference group criteria. Merton and Rossi’s (1957) original

statement of reference group theory maintained that individuals who perceive similarity in status attributes between themselves and group members are more likely to use group norms as references for their own actions (Brock et al. 1983). Building on this idea, Cochran and Beeghly state that individuals' adherence to prevailing group norms is in part a function of their similarity in status attributes with other members. A number of factors likely contribute to this process.

Shibutani (1955) proposes that differential contact across class, racial, and occupation groups contributes to variation in norms, values, and behavior across social aggregates. Similarity in status attributes not only factors into the probability of contact between two individuals, as illustrated in race- and class-based social and residential segregation, but is also instrumental in maintaining group boundaries and restricting communication channels between groups. Similarity in status attributes between members of a group and a particular member may also increase the likelihood that the individual will conceptualize prevailing behavioral scripts as appropriate courses of action, because of his or her perception of a shared class or racial experience with other members.

Homophily—the tendency for people with similar characteristics to associate with one another—has been recognized as a guiding principle for friendship formation (McPherson, Smith-Lovin, and Cook 2001). In addition to being marked by considerable sociodemographic homophily, adolescent friendships are also characterized by substantial behavioral and attitudinal homophily (Kandel 1978). Unfortunately, how similarity in status attributes factors into behavioral homophily and group influence processes has not been thoroughly explored in research, even in empirical tests of reference group theory. We assess whether similarity in status attributes between an individual and group members conditions the association between group sexualized relationship scripts and sexual behavior by testing the following hypotheses:

- H.2. *The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse is stronger among individuals who are racially similar to other group members, and*
- H.3. *The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse is stronger among individuals who are similar to other group members with regards to their socioeconomic status.*

The second criterion, *agreement*, predicts that individuals are most likely to adhere to reference group standards when their own norms, values, and beliefs are similar to those held by other reference group members. Shibutani (1955) notes individuals constantly undertake different roles that are informed by their relations to others within particular reference groups or contexts. For example, one may undertake the role of a hard-nosed boss in one context and a doting husband in another. Differential role taking is a function of individual characteristics and the social composition and cultural features of particular groups in which individuals are embedded.

Features of individual personalities and world views are in turn expressed through the continual process of role taking. However, prevailing behavioral scripts of particular reference groups may be at odds with those that are most relevant to a particular member. As a result, individuals may adhere to a dominant group behavioral script while interacting with members, but behave in accordance to opposing scripts while outside of group confines. This process is illustrated in compulsory heterosexuality within school (Tolman et al. 2003) and workplace settings (MacKinnon 1979; Rich 1980). Conversely, prevailing reference group scripts most strongly and consistently inform individual behavior when they are closely aligned with individuals' own worldviews and favored strategies of action. We assess the validity of this claim by testing the following hypothesis:

H.4. The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse is stronger among individuals whose sexualized scripts are similar to those of other members.

The third criterion, *clarity*, predicts that individuals are more likely to adhere to reference group scripts when there is greater consensus regarding strategies of action among group members. A similar claim is made in the cultural heterogeneity perspective (Harding 2007), which maintains that individuals are presented with a number of behavioral scripts throughout their daily interactions. Cultural heterogeneity in part entails greater levels of incoherence regarding behavioral scripts within social aggregates. The lack of clarity in individuals' behavioral scripts within certain contexts or social groups is consequential for group influence processes. As Harding (2007) points out, individuals who encounter a wider array of cultural models within their primary reference groups draw from greater numbers of potentially conflicting behavioral scripts when constructing action. Accordingly, individuals may conform to a particular sexual relationship script encoded in the reference group, even though it may not be the *prevailing* behavioral script. Such a scenario is increasingly likely with greater script heterogeneity because members are presented with increasing numbers of behavioral scripts to follow. Accordingly, we hypothesize that individuals are less likely to adhere to a prevailing relationship script when there is lower consensus surrounding the script in question among group members. We assess this claim by testing the following hypothesis:

H.5. The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse is weaker among individuals who are members of groups with greater heterogeneity in sexualized relationship scripts.

SCRIPTS AND NETWORK STRUCTURE

Apart from enabling the identification of reference groups through the structure of friendship ties, incorporating insights and methodologies from social network analysis into our study allows for more robust tests of reference group theory's criteria. Cochran and Beeghley's fourth criterion states that individuals most likely adhere to group-based scripts when they maintain *sustained interaction* with other members. In prior research, this criterion has been tested with measures capturing church attendance (Clarke et al. 1990) and membership in religious organizations (Cochran et al. 2004). Building on insights from social network perspectives, we operationalize sustained interaction among group members at multiple levels. First, we assess whether transitivity, which refers to tendencies towards social closure within larger school networks accentuates the association between groups' sexualized relationship scripts and the likelihood of having intercourse. Next, we examine the extent to which social cohesion among group members accentuates the association between sexualized relationship scripts and the outcome. We then test whether individuals more strongly adhere to sexualized relationship scripts when they have a greater proportion of within-group brokerage relationships compared to out-group brokerage relations (Gould and Fernandez 1989).

We propose that network processes operating beyond reference groups factor into individual adherence to behavioral scripts of reference groups. For example Shibutani (1955) notes individuals live more or less "compartmentalized lives," in which they encounter different reference groups that vary in their social and cultural content. Differential contact between in- and out-group members fosters cultural variation across social aggregates. Accordingly, social closure is not only crucial for maintaining cultural variation, but also conditions the probability that individuals will come into contact with members of different groups.

Individual exposure to different relationship scripts likely factors into individual adherence to prevailing group scripts. Individual exposure to different reference groups is in turn conditioned by overall tendencies towards social closure in networks. This assertion parallels Granovetter's (1973) "strong tie" argument. Granovetter points out that greater tendency towards strong ties, or social closure, at the individual level increases the likelihood that the overall network will be partitioned into densely connected subgroups, or cliques, with few bridging ties spanning subgroups in the aggregate. This global property of network structure ultimately limits interaction between members of different groups.

Apart from limiting intergroup contact, social closure restricts individual exposure to behavioral scripts of different reference groups. As a result, we anticipate that high levels of transitivity at the school level increases individual adherence to prevailing behavioral scripts of reference groups. We assess the validity of our claim with the following hypothesis:

H.6. The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse increases as school levels of transitivity increases.

Social control theory (Hirschi 1969) maintains that strong bonds and affective ties to others (i.e., attachment), at both the group and individual-level, deter individuals from engaging in delinquency and other anti-social behavior (including sexual promiscuity). Hirschi proposes that cohesive groups and strong attachments discourage maladaptive behavior by constraining natural impulses towards criminality and non-conforming behavior. Accordingly, quintessential hypotheses of social control theory predict that individual attachment and group-level cohesion are negatively associated with delinquency, as well as other anti-social and risky behavior.

From a social network perspective, the internal structures of peer groups influence behavior in more complex ways. Building on insights from Krohn (1986), Haynie (2001) points

out that cohesive networks foster members' awareness of salient group-level norms, expectations, and obligations of behavior because they are associated with higher levels of communication and interaction among members. Higher levels of communication and interaction foster increased opportunities for group members to express views regarding appropriate behavior among group members (Haynie 2001). More frequent interaction also fosters norm and value enforcement processes by making violations more evident. Cohesive internal group network structures thus help convey clear "normative orders" (Podolny and Baron 1997) that limit confusion surrounding the prevailing behavioral scripts among group members. Accordingly, cohesive groups, characterized by dense network structures, facilitate common identities and constrain members' behavior to be consistent with the behavior of other network members (Haynie 2001), as well as prevailing scripts. From a reference group perspective, dense group networks likely result in greater adherence to group cultural standards at the individual level. Following past research on adolescent peer networks, we hypothesize:

H.7. The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse increases as group network density increases.

Our network approach to reference group theory predicts that tendencies towards transitivity in the aggregate promote individual adherence to group scripts by restricting exposure to non-group behavioral scripts. Network density at the group level is thought to facilitate the circulation and reinforcement of group cultural standards. At the individual level, reference group theory predicts that sustained interaction with group members increases the likelihood of adhering to the standards of the group. We build on insights from past research and theory on brokerage in networks (Gould and Fernandez 1989) to understand how higher levels of

interaction with group members (as opposed to non-members) results in greater adherence to sexualized relationship scripts.

IN- AND OUT-GROUP BROKERAGE

Marsden (1982) defines brokerage as a process by which “intermediary actors facilitate transactions between other actors lacking access to or trust in one another” (p. 202, cited in Gould and Fernandez 1989, p. 91). A broker most commonly refers to an individual who facilitates social, or financial, or resource transactions between two “principals,” or otherwise disconnected actors. Actors remain brokers regardless of whether mediation between principals was intentional. We build upon Gould and Fernandez’s (1989) notion of “brokerage roles” to test whether individuals’ level of sustained interaction with reference group members conditions the association between romantic relationship behavioral scripts and adolescents’ sexual behavior.

When individuals in a social network can be sorted into mutually-exclusive subgroups, brokerage roles convey specific forms of inter- and intra-group mediation. Gould and Fernandez (1989) point out that in the case of political negotiations, one may broker a relationship between two actors who are members of different political parties, while another may broker a relationship between two principals who are members of the same party as the broker. In these two cases, the brokers hold different *brokerage roles*, which can be differentiated according to the group memberships of the three actors involved.

Gould and Fernandez identified 5 mutually exclusive brokerage roles that exist in directed networks (see Figure 1). An individual fulfills the role of *coordinator* (role “w_I” in Figure 1) when he or she brokers a relationship between principals who members of the same subgroup, and who are also in the same group as the broker. An *itinerant broker* (role “w_O” in

Figure 1) connects two principals who are members of the same group, of which the broker is not a member. A *gatekeeper* (role “b_{OI}” in Figure 1) connects an out-group member to a principal who is a member of the same group as the broker. An actor is a *representative* (role “b_{IO}” in Figure 1) when she or he connects a fellow group member to a principal who is not a group member. Finally, an individual is a *liaison* (role “b_O” in Figure 1) when the broker and the two principals are all members of different groups.

< **Figure 1.** 5 Types of Brokerage Relations >

Much of the research surrounding brokerage focuses on how occupying different roles influences access to network resources, transfer of resources, and other market outcomes (Burt 2001, 2004). However, the concept of brokerage roles is also useful for operationalizing the extent to which individuals’ network connections span groups. For example, an individual who more frequently interacts with members of his or her group is likely to more often fill the coordinator role than other roles involving two or three groups. Accordingly, we rely on Gould and Fernandez’s brokerage roles to operationalize respondents’ levels of sustained interaction within and between reference groups. Following insights from reference group theory, we predict that individuals who more frequently fulfill coordinator roles (i.e., brokers a relationship between principals, and all three actors are members of the same group), compared to brokerage roles involving members of different groups, will more strongly adhere to group relationship scripts. We test this claim with the following hypothesis:

- H.8. The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse is stronger among individuals who more frequently serve as coordinators compared to other brokerage roles.*

CENTRALITY AND SCRIPTS

The final criterion of reference group theory specifies that individuals are most likely to adhere to group scripts when they *identify group leaders as significant others*. In prior tests of reference group theory, group leaders typically consist of leaders of church congregations, such as priests, rabbis, or other ordained group members. According to Cochran and colleagues (2004), the most devout members of religious groups are in direct contact with congregation leaders, and obtain the counsel of these leaders during times of need. However, within peer groups, prominent members are unlikely to hold formal leadership positions. Prominent peer group members are instead likely to maintain structurally central positions located within group social networks, compared to less prominent members, who are more likely to be located on the margins of the networks.

Another key difference between peer groups and religious groups, the latter of which has been the focus of most empirical tests of reference group theory, is that behavioral scripts of religious groups are more formally institutionalized through religious writings and teachings, which are in turn, legitimized and promoted by group leaders. Prevailing behavioral scripts of peer groups, on the other hand, are shaped by individual members' prior experiences with various reference groups that they encounter throughout interaction, and are constantly evolving. In addition, prevailing scripts are shaped by the structure of social relations of members and non-members. Accordingly, prevailing scripts are emergent properties of inter- and intra-group interaction, and are sustained by interaction and differential adherence to scripts among members. Importantly, scripts persist and evolve despite not being formally institutionalized by religious canon or legitimized by congregation leaders.

While common sense would suggest that more central individuals are more effective at shaping group standards and influencing the behavior of others on account of their network

status, central individuals are more likely to adhere to the standards of their groups than peripheral members for a number of reasons. First, those who are central are more visible to other members than those closer to the group margins. Increased visibility escalates the likelihood that other members will observe behavior that is either in accord or violation of group norms, values, or scripts. Thus, strong associations between group scripts and individual behavior among central individuals may occur because central individuals are more subject to group control than marginal members (Haynie 2001). Alternatively, fear of being ostracized or losing network prominence may provide motivation for central individuals to “live up” to the expectations of other group members. Conversely, the behavior of marginal group members may less strongly adhere to prevailing behavioral scripts of reference groups because they perceive that they have less status to lose in violating group standards.

Peer group members who are more centrally located within the group’s social network are also less dependent upon intervening actors to recognize prevailing behavioral scripts than more marginal members (Friedkin 1991). Conversely, marginal members rely upon more central actors to mediate the prevailing behavioral scripts. Accordingly, “the shorter the average distance of an actor to other actors, the more direct and efficient is the actor’s impact because fewer intermediaries are involved in the transmissions” (Friedkin 1991:p. 1490). Following this logic, individuals who are more centrally located within the peer group, and who are most socially proximate to other group members, are most likely to adhere to the behavioral standards and scripts that prevail within the group. We assess the validity of our claim with the following hypothesis:

H.9. The association between peer group sexualized relationship scripts and the likelihood of having sexual intercourse increases as network centrality increases.

METHODS

DATA

We use data from Add Health to test hypotheses related to reference group sexualized relationship scripts and adolescents' sexual behavior. Add Health is a nationally representative longitudinal survey that explores the etiology of health-related behaviors and outcomes throughout adolescence and into young adulthood. All respondents were nested within randomly selected high schools and feeder schools in the United States (respondents ranged from 7th to 12th graders). A random sample of 80 high schools was compiled that was stratified by region, urbanicity, school type (i.e. public/private), ethnic makeup, and population size. The largest feeder school for each high school was also recruited when available, which resulted in a sample of more than 140 schools (Resnick et al. 1997).

All respondents in our analysis completed the first two In-Home interviews in 1995 and 1996. We exclude a number of schools in which less than 50 percent of the student body completed an initial In-School questionnaire (in which friendship nominations were collected) as these schools would yield unreliable network measures. We also dropped respondents who were nested in peer groups that included fewer than 3 respondents who answered questions regarding the sexualized relationship script, as we focus on heterogeneity and similarity in relationship scripts. Finally, we excluded respondents who had missing Wave 2 sampling weights⁴. Our final sample consists of 9,900 respondents nested within 1,160 peer groups, and 115 schools.

DEPENDENT VARIABLE

Respondents were asked the most recent dates of their sexual intercourse at both interview waves. *Sexual intercourse* is a binary variable indicating whether the respondent engaged in vaginal intercourse after the date of the Wave 1 In-Home interview (0 = no, 1 = yes).

INDEPENDENT VARIABLES

As part of an initial In-School survey, which took place approximately 6 months prior to the Wave 1 In-Home survey, respondents were asked to nominate up to 5 male and 5 female friends. Respondents who did not take the In-School survey, but participated in the subsequent interviews were asked to nominate up to 10 friends (5 male and 5 female) during the In-Home surveys. To help obtain adequate sample sizes necessary to construct group-level measures of sexualized and romanticized relationship behavioral norms, we replaced missing friendship nominations for respondents not participating in the In-School survey with those from the Wave 1 In-Home interview. After constructing school-based networks consisting of In-School and In-Home friendship nominations, we identified reference groups using Newman and Girvan's (2004; Girvan and Newman 2002) edge betweenness algorithm, which is described in greater detail in the Analytic Strategy section below.

We use information regarding respondents' ideal romantic relationship to operationalize sexualized relationship scripts at the reference group level. As part of the Wave 1 In-Home survey, respondents were presented 17 cards that describe behaviors (e.g., we would hold hands, have sex) and feelings (e.g., we would think of ourselves as a couple) that are commonly performed or experienced within romantic relationships. Respondents were asked to discard cards describing events and feelings that would not ideally happen in a romantic relationship at this stage in their lives. The remaining cards indicate feelings and behaviors that respondents

would experience within their ideal romantic relationships. Our measure of *sexualized relationship scripts* emphasizes the performance of sexual behavior within ideal romantic relationships. The measure consists of 3 items, including 1) “We would talk about contraception or sexually transmitted infections,” 2) “We would touch each other under our clothing or with no clothes on,” and 3) “We would have sex” ($\alpha = .712$). We use multi-level Item Response Theory (IRT) scaling techniques to construct measures that capture sexualized relationship scripts that prevail in peer groups. More information on our scaling approach is provided in the Analytic Strategy section below.

Our first hypotheses informed by reference group theory predicts that similarity in status attributes accentuates the association between sexualized scripts and the likelihood of having intercourse. *Racial similarity* is measured by the proportion of other group members who are in the same racial category as the respondent. To measure *similarity in socioeconomic status*, we first construct a continuous measure of respondent socioeconomic status, which consists of the mean of the standardized values of parental occupational status and parental education level, which refer to the highest educated parent or the parent with the highest occupational status ($r = .478$). We then classified respondents as belonging to one of 5 socioeconomic quintiles (i.e., 20th, 40th ... 80th percentile). We then measured the proportion of other group members whose parents are in the same socioeconomic quintile as the respondent, which indicates individual similarity in socioeconomic status with other group members. Both racial similarity and similarity in socioeconomic status and range from 0 to 1, with 0 indicating that no other group member belongs to the same status category, and 1 indicating that all other members are in the same status category.

We measure respondents' *similarity in sexualized relationship scripts* as follows. We first extracted the level-2 (i.e., individual-level) empirical Bayes (EB) residuals from the three-level IRT model that we used to measure groups' prevailing sexualized relationship scripts. Within this particular model, values of the EB residuals indicate the degree to which respondents' individual relationship scripts diverge from the group's prevailing sexualized relationship script (i.e., the group-mean). Across all of the individuals, this value is normally distributed with mean of 0. We then take the absolute value of each respondent's EB residual to capture his or her level of *dissimilarity* in sexualized scripts. Finally, we subtract from 1 the value of the maximum deviation divided by the respondent's absolute deviation from their respective group means. The resulting measure, which potentially ranges from 0 to 1, captures the extent to which respondents' sexual scripts are similar to the prevailing group script, with higher values representing greater similarity between an individual's script and the group relationship script.

We test a series of hypotheses that assess whether school, group, and individual-level network characteristics accentuate the association between sexualized relationship scripts and the likelihood of intercourse. At the aggregate level, *transitivity* captures the overall tendency towards closure across school network (Wasserman and Faust 1994). To estimate transitivity within each school, we first symmetrized each school friendship network (i.e., made the networks "undirected"), such that a tie exists between respondent i and j if either i nominated j , j nominated i , or i and j nominated each other. We then counted the number of open and closed "triads," which consist of three actors who are connected by two or three symmetric ties, respectively, for each school. We then divided the number of "closed" triads by the number of total triads (i.e., the number of closed plus the number of open triads). The resulting measure

ranges from 0 to 1, with higher values indicating greater tendencies towards social closure within the school network.

To measure reference group *density*, we first constructed networks for each of the 1,160 reference groups included in our analysis. These networks consist only of group members and the ties between them (i.e., we dropped all out-group ties). We then calculated the number of ties between group members, divided by the number of possible ties. The resulting measure potentially ranges from 0 to 1, with higher values indicating greater cohesion, and 1 indicating that every respondent is tied to every other respondent in the peer group.

We utilize Gould and Fernandez's (1989) brokerage roles to capture individuals' sustained interaction with group members. *Within group brokerage* is calculated as follows:

$$\text{Within Group Brokerage}_i = \frac{N(w_I)_i}{[N(w_I)_i + N(w_O)_i + N(b_{OI})_i + N(b_{IO})_i + N(b_O)_i]}$$

where $N(w_I)_i$ is the number of times respondent i fulfills a coordinator role, while $N(w_O)_i$, $N(b_{OI})_i$, $N(b_{IO})_i$, and $N(b_O)_i$ represent the number of times respondent i fulfills itinerant broker, gatekeeper, representative, and liaison roles, respectively (see Figure 1 for graphical depictions of brokerage roles).⁵ The resulting measure indicates the proportion of within-group brokered relationships and captures individual embeddedness within the peer group (as to compared embeddedness outside of the group). We include a binary variable indicating whether the respondent does not broker any relationships and replace the values of these respondents' score on within group brokerage score with 0.

We use a sociometric measure of closeness centrality (Sabidussi 1966; Freeman 1979; Wasserman and Faust 1994) to capture the extent to which individuals are socially proximate to central group members. To estimate closeness centrality, we first symmetrized the 1,160 group-

level networks used to estimate reference group density. We then calculated the closeness of each individual with Sabidussi's (1966) closeness index, which may be stated as:

$$C_C(n_i) = \left[\sum_{j=1}^g d(n_i, n_j) \right]^{-1}$$

where $d(n_i, n_j)$ is a distance function, as represented by the number of lines in the geodesic (i.e., shortest path) linking respondents i and j . The variable measures the inverse of the sum of the distances from individual i to all of the other actors in the network (Wasserman and Faust 1994). The resulting measure ranges from 0 to 1, with higher values indicating higher centrality or closer proximity to prominent members.

CONTROL VARIABLES

We also include a number of individual-level variables that have been associated with sexual behavior in past research. *Family attachment* measures the degree to which respondents feel close to their parents. The scale includes responses from five questions such as “how close do you feel to your mother,” and “how much do you think your father cares about you?” Each question is asked in reference to the mother and then the father, for a potential total of 10 questions indicating attachment. To account for respondents in single parent households, we took the maximum value from each paired response for each measure and constructed a 5-item scale ($\alpha = .846$). We measure family attachment by constructing a three-level hierarchical linear IRT model with scale items at level one, individuals at level two, and schools at level three. We then extract the individual-level empirical Bayes-adjusted intercept (i.e., the EB residual added to the school intercept), which represents the respondent's latent level of family attachment.

We include a measure of *school attachment*, which captures affective bonds with students and teachers in the school. The 6-item scale measures respondents' agreement with statements such as "teachers care about you" and "you feel close to people at your school." To construct the scale, we recoded responses to indicate higher school attachment and took the mean of the standardized items ($\alpha = .725$). We include a measure of *religiosity* as it has been associated with sexual behavior in past research (Rostosky, Regnerus, and Wright 2003; Rostosky et al. 2004). We measure religiosity with a four-item scale that includes the frequency of prayer, religious service attendance, youth group participation, and importance of religion for the respondent. Our religiosity measure represents the mean of the standardized items, with higher values indicating greater religiosity ($\alpha = .845$). We also include a binary measure indicating whether the respondent took a pledge to remain a virgin until he or she is married, prior to the wave 1 interview (Bearman and Bruckner 2001; Bersamin et al. 2005).

We control for depression at wave 1 since this is associated with sexual behavior (Whitbeck et al. 1999). Depression is measured with 19 items indicating prevalence of emotional and other mental health problems (e.g. "felt sad") throughout the past week. Responses for individual items were dichotomized with those indicating having experienced the problems "a lot of the time" or "all or most of the time" as having the depressive symptom throughout the past week (0 = non, 1 = yes). Respondent depression represents the empirical Bayes-adjusted intercept from a three-level Rasch model ($\alpha = .822$). *Impulsivity* is measured with a 7-item scale that includes items that capture low self-control. The first 5 items assess respondents' agreement with statements such as "When making decisions, you usually go with your 'gut feeling' without thinking too much about the consequences of each alternative," and "When you have a problem to solve, one of the first things you do is get as many facts about the problem as

possible.” Responses ranged from 1, indicating “strongly agree,” to 5 indicating “strongly disagree.” The final two items assess the frequency in which respondents had trouble paying attention in school or getting school work done. Responses for the final two items ranged from 0 indicating “never” to 4 indicating “every day.” To construct our scale we recoded responses to indicate high impulsivity, and took the mean of the standardized items ($\alpha = .659$).

We also include controls for *age*, *race* (binary indicators for black, Latino, and other, with white as reference), and *family structure* (1 = single parent household), *parental education*, and a binary variable indicating parent’s receipt of *public assistance*. We also include binary variables that indicate whether the respondent was in a romantic relationship at the time of the Wave 1 In-Home interview, another measure indicating whether the respondent would like to be in a romantic relationship in the following year, as well as a measure of *prior sexual intercourse*, which is a binary and indicates whether the respondent had sexual intercourse prior to the Wave 1 interview (0 = no, 1 = yes).

We control for a number of school-level variables to account for regional and other compositional confounders. First, we include a measure of school size, which represents the number of students who were on the school roster on the date of the in-school survey. We also include binary variables indicating whether the school is private (public as reference), as well as controls for urbanicity (suburban/rural as reference), and region (West, Midwest, and Northeast, South as reference). Finally, at the peer group level, we include controls for the proportion of members who have had sexual intercourse (prior to Wave 1) as well as peer group size, which is the count of group members as identified by the edge betweenness algorithm. Descriptive statistics for individual, peer group, and school-level variables used in the analyses are displayed in Table 1.

< **Table 1.** Descriptive Statistics >*IDENTIFYING PEER REFERENCE GROUPS*

We utilize Newman and Girvan's (2004) "edge betweenness" algorithm to detect adolescent peer groups within the school friendship networks. Like all methods of detecting community structure of networks, the edge betweenness algorithm identifies densely connected groups of nodes or individuals, within which ties are more likely to form than between. The edge betweenness algorithm relies on a generalized notion of Freeman's (1979) betweenness centrality, which defines centrality of actor i as the number of shortest paths between two pairs of other actors (i.e., geodesics) that run through actor i . Freeman's original measure captures actors' ability to control the flow of information between other actors in a network; actors with high betweenness serve as "bridges" connecting other individuals who are more marginal in the social space and who may otherwise be disconnected from the larger network. The betweenness of an edge, or a direct tie connecting two actors, is defined as the number of shortest paths between pairs of actors that run along a particular edge. As with the actor-based betweenness centrality, edges that lie on several geodesics have high betweenness centrality.

Newman and Girvan point out that if networks contain groups that are connected by few intergroup edges, then most of the shortest paths spanning different communities will run along edges with high betweenness. Removing edges with the highest betweenness reveals the community structure of a particular network by separating groups that are connected by these few bridging ties. The edge betweenness algorithm adheres to this logic, and operates as follows: in Step 1, calculate the betweenness of all edges in the network. In Step 2, remove the edge with

the highest betweenness. If two or more edges have the same betweenness, then remove both edges. Next, in Step 3, recalculate the betweenness for all edges that were affected by the removal, which are those ties that were a part of the same component, or connected subgroup, as the removed edge. Finally, in Step 4, repeat Steps 2 and 3 until no edges remain.

This iterative process produces a hierarchical map, or dendrogram, indicating the sequential removal of the edges according to their betweenness. The community structure of each school network is derived by maximizing the modularity score, Q , which is a weighted function of within-group to inter-group ties (Newman and Girvan 2004). The modularity score is calculated whenever the algorithm splits a group into two subgroups, and is recalculated until all ties are removed. The peer group structure of a school (i.e., the configuration peer groups clusters) is settled upon when removing additional edges decreases the modularity score of the network. Across the 115 school networks, the algorithm identified 3,120 peer group clusters, which included on average 23.42 respondents (Min = 2, Max = 470, SD = 39.94). The average modularity of the school networks was .563 (Min = .1150, Max = .76, SD = .09).⁶ After excluding peer groups with fewer than 3 members participating in the Wave 1 In-Home Survey, the mean group size was 50.11 respondents (Min = 3, Max = 470, SD = 53.41), and the mean number of group members participating in the Wave 1 In-Home survey was 12.57 (Min = 3, Max = 222, SD = 15.90).

MEASURING PREVAILING REFERENCE GROUP SCRIPTS

Following Raudenbush and Sampson's (1999) "ecometric" approach, we use a single-parameter multilevel Rasch model to construct our peer group level measure of sexualized relationship

scripts. The model consists of items nested within individuals nested within peer groups. The level 1 model may be stated as:

$$\eta_{ijk} = \pi_{0jk} + \sum_{p=1}^2 a_p D_{pijk}$$

where η_{ijk} the log-odds that respondent j in peer group k would like to perform the i_{th} item in an ideal romantic relationship and D_{pijk} is a dummy variable taking on a value of 1 if the response i is to item p in the three item scale. Because we “center” each D_{pijk} around its grand mean, π_{0jk} represents the adjusted log odds of respondent j endorsing a “typical” scale item. Finally, a_p reflects the “severity” level of item p within the sexualized script scale. The level 2, or individual level model, may be stated as:

$$\pi_{0jk} = \beta_{00k} + r_{0jk}$$

where β_{00k} is the group-level intercept and r_{0jk} is an individual-level error term that is assumed to be normally distributed with a mean of zero and variance τ_π . We use the values of r_{0jk} , which are the individual-level empirical Bayes (EB) residuals, in our individual measure of individual-level similarity in sexualized scripts. The peer cluster (level 3) model may be stated as:

$$\beta_{00k} = \gamma_{000} + u_{00k}$$

where γ_{000} is the grand mean intercept and u_{00k} is the cluster-specific error term, or the level 3 EB residual. We use the values of β_{00k} , or the empirical Bayes-adjusted intercepts, to capture prevailing sexualized romantic scripts across peer groups in our multilevel regression models of sexual intercourse. The level 3 reliability of the sexualized script measure was .673.

MODELING STRATEGY

We estimate a series of multilevel logistic regression models in order to test the association between groups' sexualized relationship scripts and respondents' sexual behavior (Raudenbush and Bryk 2002). Our 3-level models are comprised individuals at level 1, peer friendship clusters at level 2, and schools at level 3. The level 1 model may be stated as

$$\eta_{ijk} = \pi_{0jk} + \sum_{p=1}^P \pi_{pjk} a_{pijk}$$

where η_{ijk} the log-odds that respondent i in peer group j in school k had sexual intercourse between Waves 1 and 2 and π_{0jk} represents the adjusted mean log odds of having intercourse in peer group j (i.e., group level intercept). a_{pijk} are $p = 1, \dots, P$ individual characteristics that predict sexual behavior and π_{pjk} are level-1 coefficients indicating the effect of characteristic p on individual i 's sexual behavior. The level two model may be stated as:

$$\pi_{0jk} = \beta_{00k} + \beta_{01k}(\text{SexScript}_{jk}) + \sum_{q=1}^{Q-1} \beta_{qjk} X_{qjk} + r_{0jk}$$

where β_{00k} is the intercept, β_{01k} is the effect of the sexualized script on the log odds of sexual intercourse, and r_{0jk} is a normally distributed peer-group level error term with a mean of 0 and variance τ_{π} . X_{qjk} are $q = 2, \dots, Q$ peer group characteristics that predict sexual behavior and β_{qjk} is a coefficient indicating the effect of reference group characteristic q on individual i 's sexual behavior. The school-level model may be stated as follows:

$$\beta_{00k} = \gamma_{000} + \sum_{s=1}^S \gamma_{00s} W_{sk} + u_{00k}$$

where γ_{000} is the intercept, W_{sk} are $s = 1, \dots, S$ school characteristics that predict sexual behavior and γ_{00s} are coefficients indicating the effect of school characteristic s on the log odds that

individual i had intercourse between waves. Finally, u_{00k} is a school-level error term that is normally distributed and has a mean of 0 and variance τ_β .

Missing values on individual-level independent variables were multiply imputed using Stata's Imputation through Chained Equations (ICE) command (Royston 2004). Following von Hippel (2007), we created 10 imputed datasets from a dataset that included respondents with missing data on the dependent variable, and dropped respondents who did not answer questions regarding sexual intercourse in our final statistical models. We estimate all models with the imputed datasets using HLM7's multiple imputation procedure. Individual- and school-level survey weights are applied at the individual and school levels that account for Add Health's complex survey design (Chantala 2006). Because a number of peer groups include relatively few Wave 1 respondents, we weigh our models at level 2 by the level 3 reliability of the sexualized script scale that was obtained from the three-level Rasch model. See Raudenbush and Sampson (1999) for more information on estimating the level 3 reliability.

RESULTS

Across all models, we control for age, gender, race, parental education, family attachment, religiosity, depression, impulsivity, and school attachment at level 1. We also include binary variables indicating whether respondents were in romantic relationships at the time of the wave 1 interview, whether they desired to be in a romantic relationship, took an abstinence pledge, had a parent who receives public assistance, or had sexual intercourse prior to wave 1. At level 2 we control for the size of the peer group as well as the proportion of members that had intercourse prior to wave 1. Finally, at level 3, we include measures of school size, transitivity, and binary variables indicating region, urbanicity, and whether the school is private/Catholic. Coefficients

and standard errors for most control variables are omitted from the main tables, but are available from the authors upon request. Across all models, we display the unstandardized beta coefficients and robust standard errors (in parentheses).

< **Table 2. Multilevel Logit Models of Sexual Intercourse Regressed on Sexualized Relationship Scripts, Similarity in Race, and Similarity in Socioeconomic Status** >

Table 2 displays models testing the association between sexualized scripts and the likelihood of having intercourse, as well as models that assess whether the association varies by racial similarity and similarity in socioeconomic status (Hypotheses 1-3). Model 1 tests Hypothesis 1 by measuring the direct association between reference group sexualized relationship scripts and the log odds of having intercourse between waves. Results indicate that the sexualized group relationship script measure is positively and significantly associated with the log odds of having sexual intercourse, even after controlling for prior sexual behavior and the proportion of group members who have had intercourse. We see that a 1 standard deviation increase in the sexualized relationship script results in a roughly 43% increase in the odds that the respondent had sexual intercourse between study waves ($\exp^{(.79*.451)} = 1.428$). This change appears especially large considering a 1 standard deviation increase in the proportion of group members who have had intercourse results in a 24% increase in the odds of having intercourse ($\exp^{(.30*.724)} = 1.243$).

In Model 2 (displayed in Table 2) we test Hypothesis 2 which predicts that racial similarity between individuals and other group members accentuates of the association between group scripts and sexual behavior. While the effect for racial similarity is not significant, the interaction term is positive and significant, suggesting that the association between sexualized

scripts and sexual behavior is stronger among respondents who are embedded in reference groups that include higher proportions of members who are of the same race as the respondents. Model 3 (displayed in Table 2) omits the measure for proportion of other group members who are the same race and its interaction term and introduces a measure of the proportion of other group members who are in the same socioeconomic status quintile and its interaction with sexualized relationship scripts. While the effect for proportion of same SES quintile is negative and marginally significant, the interaction term does not approach significance, suggesting that the strength of the association between sexualized relationship scripts and sexualized behavior does not vary according to individual similarity in socioeconomic status with other members.

<**Table 3. Multilevel Logit Models of Sexual Intercourse Regressed on Sexualized Relationship Scripts, Reference Group Heterogeneity, and Individual Similarity in Group Relationship Scripts**>

Table 3 displays models that test whether the association between sexualized scripts of reference groups and the likelihood of sexual intercourse varies according to the extent that individuals' scripts agree with other members' scripts and script heterogeneity. Model 1 omits the variables introduced in Model 3 from Table 2 and introduces a measure that captures individual agreement with the dominant group script and its interaction with the reference group sexualized script. Although the interaction term is in the expected direction, the non-significant coefficient suggests that the association between groups' sexualized scripts and the likelihood of having sexual intercourse does not vary according to the extent to which individuals' scripts agree with prevailing group scripts. Model 2 in Table 3 omits the script similarity measure and its interaction term and introduces a group-level measure of script heterogeneity and its interaction with the dominant group script. Contrary to findings from past research regarding

cultural heterogeneity and sexual behavior (Harding 2007), the main effect of group script heterogeneity is negative, although non-significant.⁷ In addition, while the interaction term for script heterogeneity and the sexualized group script is negative and in the expected direction, the coefficient is not significant. Thus the results from Model 2 in Table 3 fail to support Hypothesis 5, which predicts that the association between sexualized scripts and the likelihood of sexual intercourse varies according to script heterogeneity.

Table 4 displays models that test hypotheses concerning the interactive effects of group sexualized scripts and network characteristics on the likelihood of intercourse. In Model 1 we test Hypothesis 6, which predicts that school-level transitivity accentuates the association between group relationship scripts and the outcome. The positive and significant interaction term supports our hypothesis that tendencies towards social closure at the aggregate level accentuate the association between reference group scripts and individuals' sexual behavior. Model 2 omits the transitivity/sexualized script interaction term and introduces a reference group-level measure of network density and its interaction with groups' sexualized relationship script. This model tests Hypothesis 7, which predicts that network density accentuates the association between sexualized relationship scripts and individual sexual behavior. While the main effect of network density is non-significant, the interaction term is positive and significant, suggesting that the association between groups' sexualized scripts and the likelihood of sexual intercourse intensifies as group density increases.

< **Table 4.** Multilevel Logit Models of Sexual Intercourse Regressed on Sexualized Relationship Scripts, Transitivity, Group Density, Within Group Brokerage, and Closeness Centrality >

In Model 3 in Table 4, we omit the main effect of density and its interaction term and introduce a measure of within group brokerage, its cross-level interaction with group sexualized script, and a binary variable indicating that the respondent does not occupy a brokerage role (coefficient not displayed). This model tests Hypothesis 8, which predicts that the strength of the association between group scripts and sexual behavior is stronger among individuals who more frequently interact with members compared to non-members. In support of our hypothesis, we find that the interaction term is positive and significant, suggesting that high levels of within compared to out-group brokerage increases individual adherence to sexualized behavioral scripts.

We test our final hypothesis, which predicts that centrality within reference groups accentuates the association between group sexualized scripts and sexual behavior, in Model 4 in Table 3. For this model we omit the interaction term and brokerage variables introduced in Model 3 and introduce the closeness centrality measure and its interaction with group sexualized relationship script. The marginally-significant and positive interaction term provides some evidence that social proximity to central group members accentuates the association between group sexualized scripts and the likelihood of having sexual intercourse between study waves.

CONCLUSION

We have demonstrated that there is a strong association between sexual scripts that prevail in adolescent peer groups and the likelihood of sexual intercourse among group members.

Adolescents who are embedded in peer groups that sanction sexual activity within ideal romantic relationships have an increased likelihood of subsequently engaging in sexual intercourse.

Interestingly, the effect of sexualized relationship scripts remained after taking into account the

sexual behavior of other group members. In fact, the effect of sexualized scripts on the likelihood of intercourse was stronger in magnitude than the effect of peer group members' sexual behavior. These findings reflect those from prior research that found associations between "perceptual" measures of permissive peer norms and adolescent sexual behavior. In addition, at least in regards sexual outcomes, peer group scripts, frames of reference, and behavioral standards may be as important in shaping adolescents' sexual behavior as the actual level of sexual activity amongst peers (Harding 2010; Warr and Stafford 1991).

Our results for the most part supported hypotheses that were informed by reference group theory. We found that adolescents who are racially similar to other group members, are more central within their peer groups, and who more frequently interact with other group members, more strongly adhere to prevailing sexualized relationship scripts of their peer groups in their sexual behavior. In addition, school-levels of social closure and peer group cohesion, as measured by transitivity and group-level network density, respectively, accentuated the association between group scripts and sexual behavior. Conversely, we found little evidence that the association between sexualized relationship scripts and sexual behavior varied according to script heterogeneity or the degree to which individuals are similar to other group members in terms of socioeconomic status or their own ideal relationship script.

Collectively, our results underscore the value of incorporating insights and analytical techniques from social network perspectives into the study of peer influence and sexual outcomes. While we concur that network structure and individuals' positions within social networks have independent on effects health-related behavior and outcomes (Bearman and Moody 2004; Cornwell and Laumann 2011; Mangino 2009; Smith and Christakis 2008), our study adds to the mounting evidence that social network characteristics condition the association

between peer characteristics and sexual behavior (Soller and Haynie 2010, 2011). In addition, we found that network processes occurring at multiple levels accentuate the association between intercourse and group sexualized scripts. Future research and theory focusing on network processes in a multi-level framework may provide more insight into the mechanisms through which larger social structures influence group and individual outcomes. Conversely, simulation models (e.g., ERGM) may be applied to network data to understand how individual preferences and behavior give rise to aggregate relational structures (Bearman, Moody, and Stovel 2004).

More generally, our results point to the conditions under which individuals most likely adhere to group cultural standards in their behavior. Both aggregate levels of social closure and individuals' social distance from non-group members interaction with other reference groups that may otherwise provide alternative behavioral scripts, frames of reference, and different modes of thought. This idea parallels Burt's (2004) finding that brokerage in company networks entails greater access to new interpretations and more novel information, which advantages well-placed individuals in their efforts at developing innovative ideas. From our standpoint, those with ties to others beyond their primary reference groups are most likely to be exposed to behavioral scripts and frames of reference that are different from those that prevail within their primary reference groups. Increased awareness of alternative behavioral scripts likely attenuates one's behavioral adherence to a primary reference groups' standards. Conversely, fettered interaction with out-group members facilitates reference group influence processes as it limits exposure to alternative behavioral scripts. Future research employing analytical techniques and insights from social network perspectives may advance the understanding of how social isolation at both the individual and group level factor into group influence processes.

While our study potentially contributes to the understanding of peer group influence on adolescent sexual behavior, a number of limitations must be addressed. First, we were not able to construct measures of friends' (i.e., those to whom one is directly connected) sexualized relationship scripts because questions regarding ideal relationships were only asked of randomly-selected respondents in the first two waves of the In-Home interview of Add Health.

Accordingly, we were not able to assess the relative influence of close friends' scripts to that of the larger reference group. It may be that relationship scripts of close friends matter more for individual sexual outcomes compared to less proximate group members. In addition, we were forced to drop a number of peer groups because they did not include, or included fewer than three, respondents who took in the In-Home survey. Although we used survey weights to account for Add Health's complex survey design and unequal probability of selection into the In-Home survey when calculating group scripts and in estimating our statistical models of sexual intercourse, dropping clusters with no (or few) In-Home respondents likely introduced some bias in our statistical models. However, increased representation of respondents in the peer clusters would have decreased the amount of missing data and likely increased the statistical power of our multilevel models. Accordingly, the limited amount of data we had for measuring peer group relationship scripts most likely biased our results towards the null.

Another limitation is that the reference groups identified in our study relate specifically to within-school friendships. In addition, we had to drop isolates as they were not members of any school-based reference groups. These respondents may have been part of tight-knit peer groups outside of school, which could otherwise serve as reference groups for within-school isolates. Further research focusing on non-school friendships may provide more insight into the extent to which non-school reference groups influence individuals' sexual behavior. Also, simultaneously

taking into account more *types* of ties, such as overlap in coursework (Frank et al. 2008), school-based extracurricular activities (Schaefer et al. 2011), or aggressive relations (Faris and Felmlee 2011), may shed more light onto peer influence processes. Recent advancements in the analysis of the community structure of multiplex networks, or networks consisting of multiple types of relations, may also foster superior specifications of reference groups than methods based on a single type of tie (Mucha et al. 2010). Finally, the first wave of Add Health began in 1994. Whether the mechanisms identified in the current study still operate more than 15 years later after the first wave of Add Health is in question. New large-scale data collection efforts that incorporate network components into their research designs will help determine how adolescent networks factor into the behavioral health of today's youth and adolescents.

We aimed to provide a more thorough understanding of peer influence processes by incorporating insights from reference group theory, cultural sociology, and social network analysis into our study of adolescent sexual behavior. We hope that future research will build on our network approach to reference groups and further clarify the mechanisms through which adolescent peer groups influence adolescents' sexual outcomes. Doing so may foster healthy sexual development in adolescence and young adulthood and ultimately improve the overall health of our society.

NOTES

¹ We use this term rather than “sexual scripts” to distance our approach to sexual behavior from that of Gagnon and Simon (2005). Sexual scripts comprise of two key elements, the first being the organization of meanings of behavior and situations that facilitate sexual activity (which is more than “rubbing two sticks together to produce fire” [p. 15]), and second being behavioral sequences, or orders of sexual acts within sexualized encounters. While informative, Gagnon and Simon primarily focus on the structuring of sexual acts and potential sexual encounters; we focus on the structuring of sexuality within romantic relationships.

² Recent research suggests that network techniques that define peer groups on the basis on structural properties of networks yield peer clusters that reflect individuals’ subjective perceptions of existing groups (Gest, Moody, and Rulison 2007).

³ See Vedres and Stark (2010) for their approach to identifying overlapping subgroups.

⁴ A total of 14,738 respondents participated in the first two waves of the Add Health In-Home survey.

⁵ If Figure 1 displays all of the brokerage roles that the actor at the center of each diagram fulfills, that actor’s within-group brokerage score would be .167, because:

$$1(w_I)/[1(w_I)+1(w_O)+2(b_{OI})+1(b_{IO})+1(b_O)]=.167$$

⁶ Newman (2004) notes that $Q=0$ indicates that a particular division of groups within a network gives no more “within-group community edges than would be expected by random chance” (p. 1). In such a case, the clustering algorithm performed poorly and failed to reveal the community structure of the network. Conversely, values of $Q=.3$ and above are in practice indicative of a significant community structure. Across all of the schools in our sample, only one school had a modularity score below .3, suggesting that the algorithm was effective at capturing within school peer clusters across all of the schools.

⁷ It should be noted that Harding’s theory of cultural heterogeneity refers to heterogeneity within larger social contexts such as neighborhoods. Conversely, our measure captures within group heterogeneity. Thus we do not propose that we provide a test of Harding’s theoretical model in our analysis.

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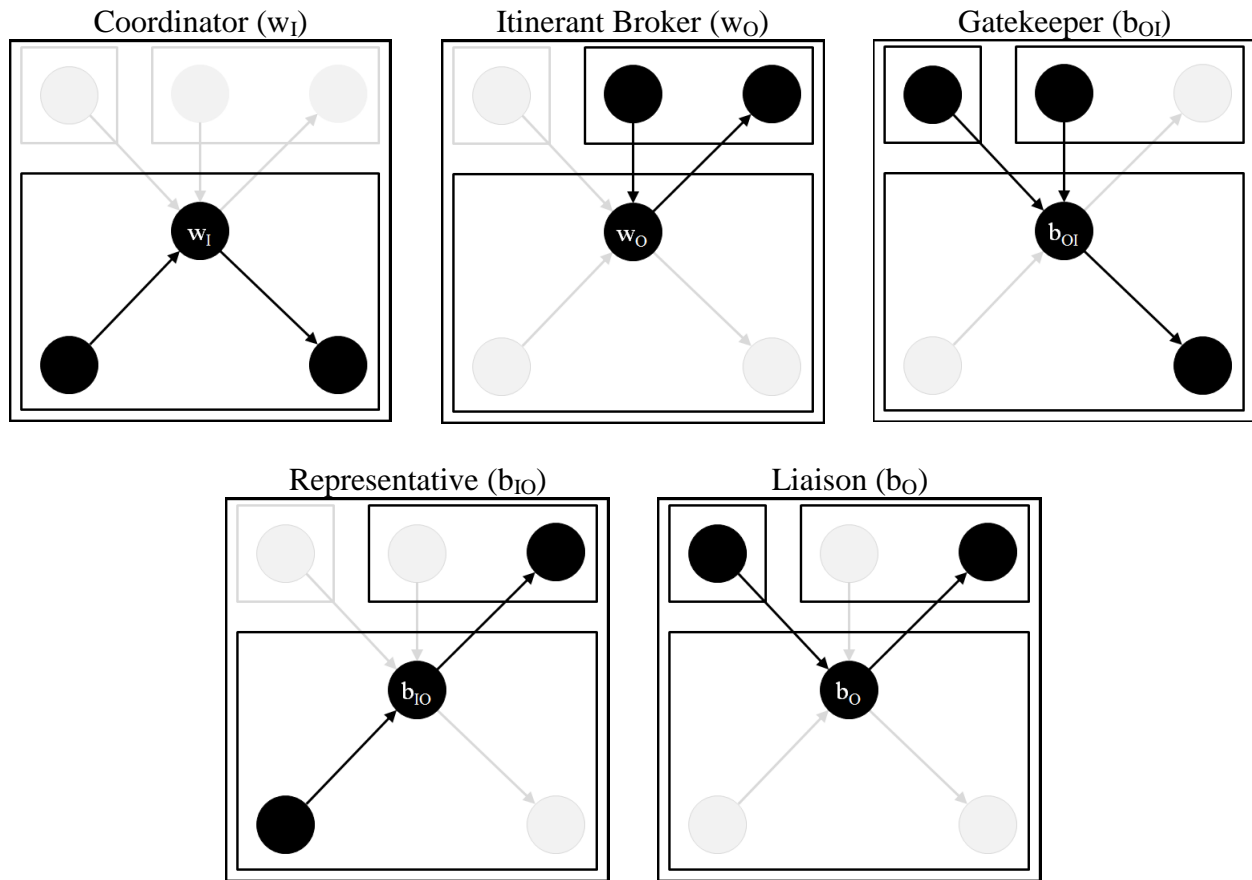
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FIGURES AND TABLES

Figure 1. 5 Types of Brokerage Relations



Note: Black lines indicate brokerage relationships, black points represent actors involved in the particular brokerage relationship. Squares are reference group boundaries. The broker lies in the center of each depiction. Adopted from Gould and Fernandez (1989).

Table 1. Descriptive Statistics

	Mean	(SD)	Min	Max
Individual Variables (N=9900)				
Sexual Intercourse Between Waves	0.36		0	1
Age	15.82	(1.55)	11.82	20.57
Male	0.47		0	1
White	0.54		0	1
Black	0.21		0	1
Latino	0.14		0	1
Other	0.11		0	1
1st Socioeconomic Status Quintile	0.17		0	1
2nd Socioeconomic Status Quintile	0.25		0	1
3rd Socioeconomic Status Quintile	0.19		0	1
4th Socioeconomic Status Quintile	0.22		0	1
5th Socioeconomic Status Quintile	0.17		0	1
Receipt of Public Assistance	0.10		0	1
Single Parent Household	0.28		0	1
Parental Attachment	4.53	(0.47)	1.55	5.63
Religiosity	0.02	(0.83)	-2.58	1.99
Abstinence Pledge	0.14		0	1
School Attachment	0.02	(0.64)	-2.84	1.63
Depression	-2.66	(1.05)	-4.17	2.00
Impulsivity	0.00	(0.57)	-1.40	2.99
Currently In Romantic Relationship	0.54		0	1
Would Like to be in Romantic Relationship	0.82		0	1
Prior Sexual Intercourse	0.34		0	1
Proportion of Group Same Race	0.64	(0.29)	0	1
Proportion of Group Same SES Quintile	0.27	(0.15)	0	1
Similarity in Relationship Script	0.68	(0.19)	0.01	1
Within Group Brokerage	0.42	(0.38)	0	1
No Brokerage Relationship	0.20		0	1
Closeness Centrality	0.38	(0.13)	0.14	1
Reference Group Variables (N=1190)				
Sexualized Relationship Script	0.21	(0.79)	-2.27	2.26
Proportion Had Intercourse	0.40	(0.30)	0	1
Sexualized Script Heterogeneity	0.75	(0.24)	0	1.30
Peer Group Network Density	0.13	(0.12)	0.01	1
Peer Group Size	50.11	(53.41)	3	470
School Variables (N=115)				
School Size	817.52	(626.55)	26	3334
Transitivity	0.21	(0.07)	0.11	0.66
Region: South	0.43		0	1
Region: West	0.17		0	1
Region: Midwest	0.23		0	1
Region: Northeast	0.17		0	1
Urban	0.28		0	1
Private/Catholic	0.10		0	1

Note: Standard Deviations in Parentheses.

Table 2. Multilevel Logit Models of Sexual Intercourse Regressed on Sexualized Relationship Scripts, Similarity in Race, and Similarity in Socioeconomic Status

	Model 1	Model 2	Model 3
Individual Variables			
Black	-0.079 (0.134)	-0.088 (0.138)	-0.072 (0.134)
Latino	0.346* (0.165)	0.240+ (0.131)	0.373* (0.165)
Other	-0.167 (0.371)	-0.236 (0.320)	-0.179 (0.370)
1st Socioeconomic Status Quintile	0.367* (0.187)	0.396* (0.184)	0.375* (0.178)
2nd Socioeconomic Status Quintile	0.309* (0.136)	0.336* (0.134)	0.311* (0.124)
3rd Socioeconomic Status Quintile	0.518** (0.160)	0.541** (0.160)	0.481** (0.158)
4th Socioeconomic Status Quintile	0.251+ (0.132)	0.265* (0.131)	0.228+ (0.134)
Prior Sexual Intercourse	1.914*** (0.093)	1.937*** (0.092)	1.911* (0.091)
Proportion Same Race		-0.037 (0.199)	
Proportion Same Socioeconomic Status Quintile			-0.586+ (0.341)
Reference Group Variables			
Sexualized Relationship Script	0.451*** (0.094)	0.417*** (0.090)	0.450*** (0.094)
Script X Proportion Same Race		0.557* (0.245)	
Script X Proportion Same SES Quintile			-0.114 (0.401)
Proportion Had Intercourse	0.724* (0.353)	0.755* (0.368)	0.718* (0.346)
Intercept	-2.241*** (0.202)	-2.269*** (0.206)	-2.237*** (0.184)

Note: Robust standard errors in parentheses. Coefficients for control variables omitted from table. Missing values on individual-level variables imputed using multiple imputation with 10 replications. Individual N=9900; Peer Group N=1160; School N=115.

***p < .001, **p < .01, *p < .05, +p < .10 (two-tailed tests).

Table 3. Multilevel Logit Models of Sexual Intercourse Regressed on Sexualized Relationship Scripts, Reference Group Heterogeneity, and Individual Similarity in Group Relationship Scripts

	Model 1	Model 2
Individual Variables		
Prior Sexual Intercourse	1.922*** (0.094)	1.914*** (0.093)
Similarity in Sexualized Script	0.258 (0.284)	
Reference Group Variables		
Sexualized Relationship Script	0.450*** (0.095)	0.441*** (0.103)
Script X Individual Similarity in Script	0.266 (0.303)	
Script Heterogeneity		-0.241 (0.291)
Script X Script Heterogeneity		-0.189 (0.275)
Proportion Had Intercourse	0.736* (0.352)	0.724* (0.357)
Intercept	-2.245*** (0.197)	-2.233*** (0.202)

Note: Robust standard errors in parentheses. Coefficients for control variables omitted from table. Missing values on individual-level variables imputed using multiple imputation with 10 replications. Individual N=9900; Peer Group N=1160; School N=115.

***p < .001, **p < .01, *p < .05 (two-tailed tests).

Table 4. Multilevel Logit Models of Sexual Intercourse Regressed on Sexualized Relationship Scripts, Transitivity, Group Density, Within Group Brokerage, and Closeness Centrality

	Model 1	Model 2	Model 3	Model 4
Individual Variables				
Prior Sexual Intercourse	1.905*** (0.093)	1.912*** (0.093)	1.922*** (0.094)	1.907*** (0.093)
Within Group Brokerage			-0.105 (0.135)	
No Brokerage Roles			-0.075 (0.119)	
Closeness Centrality				0.827+ (0.423)
Reference Group Variables				
Sexualized Relationship Script	0.349*** (0.097)	0.470*** (0.088)	0.438*** (0.097)	0.396*** (0.088)
Network Density		0.104 (0.634)		
Script X Network Density		1.340* (0.626)		
Script X Within Group Brokerage			0.419* (0.168)	
Script X Closeness Centrality				0.983+ (0.575)
Proportion Had Intercourse	0.873* (0.360)	0.728* (0.355)	0.783* (0.356)	0.681+ (0.368)
School Variables				
Transitivity	-0.180 (0.930)	-0.887 (1.387)	-2.453 (1.547)	-1.748 (1.348)
Script X Transitivity	2.477* (0.947)			
Intercept	-2.182*** (0.188)	-2.206*** (0.201)	-2.227*** (0.204)	-2.248*** (0.190)

Note: Robust standard errors in parentheses. Coefficients for control variables omitted from table. Missing values on individual-level variables imputed using multiple imputation with 10 replications. Individual N=9900; Peer Group N=1160; School N=115.

***p < .001, **p < .01, *p < .05, +p < .10 (two-tailed tests).