The Structure of Male Adolescent Peer Networks and Risk for Intimate Partner Violence Perpetration: Findings from a National Sample

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Abstract

Although peer networks have been implicated as influential in a range of adolescent behaviors, little is known about relationships between peer network structures and risk for intimate partner violence (IPV) among youth. This study is a descriptive analysis of how peer network "types" may be related to subsequent risk for IPV perpetration among adolescents using data from 3,030 male respondents to the National Longitudinal Study of Adolescent Health. Sampled youth were a mean of 16 years of age when surveyed about the nature of their peer networks, and 21.9 when asked to report about IPV perpetration in their adolescent and early adulthood relationships. A latent class analysis of the size, structure, gender composition and delinquency level of friendship groups identified four unique profiles of peer network structures. Men in the group type characterized by small, dense, mostly male peer networks with higher levels of delinquent behavior reported higher rates of subsequent IPV perpetration than men whose adolescent network type was characterized by large, loosely connected groups of less delinquent male and female friends. Other factors known to be antecedents and correlates of IPV perpetration varied in their distribution across the peer group types, suggesting that different configurations of risk for relationship aggression can be found across peer networks. Implications for prevention programming and future research are addressed.

Keywords

Intimate partner violence; Perpetration; Peer networks

Introduction

The perpetration of intimate partner violence (IPV) has long been recognized as a complex behavior (e.g. Heise 1998). Although believed to have antecedents at multiple levels, most research has examined IPV risk factors that emerge from individual-level or family of origin

characteristics and experiences. However, emerging work demonstrates that other factors, notably the behaviors and perceived attitudes of peers, also are linked to risk for physical (Arriaga and Foshee 2004) and sexual (Abbey et al. 2001) aggression against women. In light of this, greater information is needed about the role of peer influences. Previous research has largely focused on how single aspects of peer relationships (such as perceived attitudes) are related to risk for aggression, with less attention to how multiple characteristics of peers may combine into "types" of peer social networks with differential levels of risk. Such information could be useful in understanding how involvement in particular types of networks are influenced by earlier negative events, are associates of other IPV risk factors, and—importantly—differentially relate to intimate aggression.

Peer Network Contributors to Intimate Partner Violence

Social networks constitute crucial sites for identity development and support for, or inhibition of, specific behaviors and attitudes (Erickson 1997; Haynie 2001), and have been implicated as influential in a range of adolescent behaviors including substance use (Bot et al. 2004.), delinquency (Dishion et al. 1999) and sexual behaviors (DiIorio et al. 2001). Theories regarding the mechanisms of influence inherent in peer groups have generally centered on the notion of homophily, or the idea that peer environments typically reflect and are consistent with individuals' own beliefs and behaviors. Mounting evidence suggests that homophily likely occurs through an interactional process between differential selection, in which youth choose or end up with peers similar to themselves, and socialization, in which youth are further shaped by the attitudes and behaviors of their peers (Thornberry et al. 1994). For example, Espelage et al. (2003) found that bullying and fighting behavior both clustered in particular middle school peer networks, and that peer behaviors predicted individuals' levels of bullying and fighting over time. Similarly, Thornberry et al. (1994) demonstrated that selection into delinquent peer groups reinforced individual youth's misconduct, which in turn exposed those youth to further peer delinquency. Dishion et al. (1999) suggest that delinquent peer groups reinforce antisocial behavior through attention and conferment of status in a process termed "deviancy training." This theory offers a conceptual mechanism that integrates processes of influence and homophily relative to rule-breaking and aggressive behaviors.

Compared to the arenas of delinquency and bullying, relatively little theorizing has addressed potential relationships between peer networks and risk for IPV. However, notions of homophily and deviancy training may apply. Different types of peer networks may differentially set the stage for acceptance of interpersonal violence through endorsement of negative and aggressive attitudes or behaviors towards partners, rendering some more "risky" as reinforcers of partner mistreatment. For example, Capaldi et al. (2001) demonstrated that observed hostile talk about women between adolescent male friends predicted later aggression toward an intimate female partner. Similarly, in a sample of adult men enlisted in US armed forces, peer climates characterized by "group disrespect" (negative, sexualized conversation and behavior regarding women) were associated with higher rates of IPV perpetration (Rosen et al. 2003). Evidence suggests that social networks play a role for college men also, as perceived male peer support for sexually aggressive

attitudes and conduct has been shown to differentiate sexually aggressive men from non-perpetrators (Abbey et al. 2001; DeKeseredy and Kelly 1995; Schwartz and Nogrady 1996).

Indeed, delinquent or aggressive conduct itself within peer groups is likely related to risk for IPV perpetration and may serve as a mechanism of peer influence. For example, delinquent conduct (Malamuth et al. 1995), violent behavior with peers (Herrenkohl et al. 2007; Ozer et al. 2004) and bullying behaviors (Connolly et al. 2000) are predictive of higher rates of subsequent physical aggression with dating partners. Further, association with delinquent friends is highly related to youth's own delinquent behavior (Garnier and Stein 2002; Haynie 2001) and to physical and sexual aggression with female partners (Malamuth et al. 1991; Windle and Mrug 2009). Similarly, research has demonstrated that youth who have friends who have specifically perpetrated dating violence are themselves more likely to be or to become physically abusive with a dating partner (Arriaga and Foshee 2004). It may be that abuse of an intimate partner is part of a larger pattern of aggressive conduct that is differentially displayed and reinforced across different peer groups.

Social Network Structure as a Mechanism of Influence

Social network theory (e.g. Wellman 1988) suggests that another potential mechanism of influence within peer networks is their structure (size, density and patterns of relationships). It is likely that combinations, or patterns, of both internal peer group behaviors and overall peer network characteristics may produce particular structures that contribute to the strength or degree of peer network influence. For example, "dense" (highly interconnected) networks in which most members are close to all other members tend to have a stronger common identity and generate greater expectations for, and constraints on, members' behavior (Bott 1957; Podolny and Baron 1997). Similarly, highly bounded, structured groups also characterized primarily by "strong" ties (close connections between individuals) tend to have more prescribed ideas about appropriate behavior, and can create greater pressure to conform (Back 1990; Heaney and Israel 2002). In contrast, networks containing larger numbers of members combined with more casual or "weak" ties (relatively informal connections) may be more likely to have access to diverse information, opinions and influences (Granovetter 1973) and thus be less influenced by a particular set of attitudes within the network.

It can be speculated that males in networks characterized by the combination of delinquent behavior, small size and dense inter-connectedness may be at greater risk of assuming or continuing aggressive behavior patterns than those in peer networks characterized by exposure to a broader range of friends and behaviors. This would be consistent with findings from Haynie (2001), who found that membership in youth networks that combine density (interconnectedness) with delinquent behavior was more associated with individual teens' anti-social behavior than was affiliation in similar delinquent networks that were looser and less cohesive. Additionally, boys who are in networks with both young men and young women may have a greater probability of exposure to attitudes and behaviors incompatible with relationship aggression. This speculation is supported by research that has demonstrated links between sexual assault perpetration and membership in close-knit, all-male groups characterized by an emphasis on competition, aggressiveness or traditional

notions of masculinity, such as athletic teams or fraternities (Crosset et al. 1995; Forbes et al. 2006; Koss and Gaines 1993). To date, however, research has not examined the explicit relationships between types of peer network structures and risk for IPV perpetration among young men.

Other Early and Concurrent Risk Factors for Intimate Partner Violence

Social network subtypes may be further related to IPV perpetration by serving as sites that concentrate adolescents with individual-level risk factors for IPV perpetration, reinforcing or exacerbating those risks. These include both pre-existing and concurrent risk factors for IPV. For example, previously experiencing physical and/or sexual abuse as a child has been shown to be related to both subsequent membership in particular "at-risk" or deviant peer groups (Fergusson and Horwood 1999; Maschi et al. 2008) and to risk for perpetrating IPV (Ehrensaft et al. 2003; Herrenkohl et al. 2003). In terms of concurrent correlates of IPV perpetration, males who report physical aggression with a female partner are more likely to report problems with alcohol (Rosen et al. 2003), higher levels of depressive symptoms (Chen and White 2004; Rosen et al. 2003) and perpetrating violence against non-intimate acquaintances (Ozer et al. 2004), issues which may similarly cluster by peer group. Further, peer-specific factors have been implicated in risk for IPV perpetration, such as a lack of friendship quality and closeness (Lackey and Williams 1995; Linder and Collins 2005) and participation in aggressive all-male sports teams (Forbes et al. 2006). While it may be that such individual-level risk factors for intimate partner aggression are concentrated within particular network types—possibly intensifying their impact on young men's subsequent behavior—the relationship between peer group membership and these factors has not been explored.

Identifying Network Profiles: Latent Class Analysis

As discussed, it may be that particular "types" of adolescent peer groups may be more associated with IPV perpetration than others. In particular, characteristics within unique networks may intersect to exacerbate risk (i.e. small, dense delinquent networks may have a more powerful influence over youth than larger, relatively diffuse ones). A useful analytical approach for identifying subtypes within a larger population is the multivariate technique called Latent Class Analysis (LCA). LCA is an empirically driven method of detecting distinct and mutually exclusive "categories" of individuals using a range of variables simultaneously. Rather than examining the effect of each aspect of network structure in isolation, LCA identifies profiles across multiple variables, and allows researchers to understand how variables of interest may combine in unique ways to create distinct sub-groups (in this case, distinct peer network types) within a larger population.

Gaps in the Literature and Study Aims

In summary, although evidence suggests that peer networks may be an important location of risk factors and/or support for aggression with intimate partners, little is known about naturally occurring peer network subtypes, how such subtypes are related to other factors known to increase IPV risk, and which subtype structures are associated with IPV perpetration. Additionally, peer network research to date has relied primarily on young

men's own perceptions of the behaviors of their friends, an approach to measuring social network factors that is pragmatic, but of unclear accuracy in gauging the actual patterns of conduct in friendship groups. Finally, no studies to date have examined the relationship between peer network factors and IPV perpetration within national, general population samples.

The aim of this analysis is to address these gaps using data from the National Longitudinal Study of Adolescent Health [Addhealth] (Udry 2003), a nationally representative study of US adolescents that followed participants longitudinally. Specifically, social network data from the study is used to empirically examine whether unique "types" of adolescent peer structures exist, and to describe whether and how correlates of IPV and IPV perpetration itself are differentially distributed among these unique peer network subgroups. Because social network data in Addhealth is based on the self-reports of youths' identified friends, the data reflect reported rather than perceived structures and behavioral patterns within peer groups, thereby addressing methodological concerns about the accuracy of previous peer-level data. Specifically, three hypotheses are explored. First, we anticipate that unique subtypes of adolescent peer networks can be identified. Second, we hypothesize that non-network variables known to be risk factors for IPV perpetration will primarily cluster in subtypes with dense, delinquent male networks. Third, we anticipate that members of small, dense, mostly male networks characterized by delinquent behavior will have the highest rates of subsequent IPV perpetration.

Methods

Sample

Data are from the National Longitudinal Study of Adolescent Health (Addhealth), a nationally representative sample of U.S. teens drawn from 132 randomly selected high schools and feeder institutions. Data collection occurred in three waves between 1995 and 2001. Two components of data collection are relevant to the analyses presented here. First, over 90,000 youth in selected schools completed 45-min in-school questionnaires in the first wave of data collection in 1995. School-based surveys included questions asking youth to identify up to 10 friends (5 males and females each), producing information which could then be used to reconstruct patterns of social networks within schools. Second, approximately 27,000 of the 90,000 school-based youth were selected through random sampling and specific population over-sampling to constitute the target sample and participate in extensive in-home surveys. In-home surveys were administered by trained interviewers using laptop computers, with sensitive portions of the interview being conducted via an audio-Computer Assisted Survey Interview approach.

Of the youth selected for in-depth interviews, 10,264 male respondents completed in-home surveys in Wave 1 in 1995, representing a response rate of 78.9%. Of these, 7,167 completed Wave 3 in-home surveys as young adults in 2001. Of these, 3,030 were selected as the analysis sample. Inclusion criteria were having complete IPV and social network data (the Addhealth team constructed social network data only for schools with 50% or more of the student population completing these items, resulting in network data for approximately half of the sample) and being assigned a sampling weight (the Addhealth team did not assign

weights to the approximately 20% of the sample surveyed only for specialized sub-population analysis; Chantala and Tabor 1999). The average weighted age of men in the sample was 16.0 at Wave 1 and 21.9 at Wave 3. Students were roughly evenly distributed across grades at Wave 1, with 16.6% in grade 7, 16.9% in grade 8, 16.4% in grade 9, 15.7% in grade 10, 15.9% in grade 11 and 17.5% in grade 12 (weighted percentages). The weighted distribution of race/ethnicity in the sample was 13.7% African American, 3.7% Asian or Asian American, 9.5% Hispanic, 1.9% Native American, 69.6% White, and 1.7% "other." Because the sample used in these analyses included approximately 42% of all male Wave 3 Addhealth respondents, attrition analyses on key variables were conducted. Non-included respondents (those without social network data, IPV data or sample weights) were significantly older (16.07 vs. 15.96 years of age), significantly less likely to be white (61.4 vs. 69.6%) and significantly more likely to have perpetrated physical aggression against an intimate partner (19.7 vs 17.0%).

Measures

Social Network Data from Peers—Four aspects of the structure and nature of youths' peer networks were assessed at Wave 1 (these items are not available in later data collection time points). These dimensions came from social network data constructed from youths' nominations of friendships, and were calculated by the Addhealth research team (Carolina Population Center 2001). These data reflect the respondents' friends' own self-reports. Means and bivariate correlations are summarized in Table 1.

Network Size: Network size is the total number of individuals nominated as friends by the respondent plus the number of non-duplicated individuals who nominated the respondent as a friend.

Network Density: Density is the degree of inter-relatedness and nominating reciprocity between all members in a network, and was calculated as the number of actual ties between individuals in an entire network divided by the number of possible ties, adjusted for the maximum amount of nominations each respondent could make.

Gender Ratio: The peer network gender ratio was calculated as the percentage of the social network comprised of girls (range 0–100%).

Friends' Delinquency: Levels of friends' delinquency is an index computed as the mean frequency with which peer group members (excluding the target youth) reported an index of five behaviors; doing something dangerous on a dare, alcohol use, skipping school, lying to parents, and fighting. Possible responses on the first four of these items were recoded to range from 1 "never" to 7 "nearly every day", and responses to the item regarding fighting were rescaled from a 0 to 4 response range to match the scale of the first four items. These items were averaged to create a mean network delinquency score.

Childhood Individual-level Risk Factors for Intimate Partner Violence—Two types of abusive experiences perpetrated by parents or other adult caretakers in the respondent's childhood were each assessed through a single retrospective item administered

during Wave 3 interviews. The two items asked about the frequency of experiences prior to the sixth grade. Responses for each variable were re-coded on a 6-point scale ranging from "never" to "more than 10 times."

Physical Abuse: The physical abuse item assessed the frequency with which the respondent was "hit or kicked" by a parent or other adult caretaker.

Sexual Abuse: Childhood sexual abuse was defined as "being touched in a sexual way, forced to touch a parent or adult caregiver in a sexual way, or being forced into sex" prior to the sixth grade.

Concurrent Individual-Level Risk Factors for Intimate Partner Violence—These constructs are those identified in previous literature to correlate with intimate partner violence, and were measured concurrently with social network characteristics. They were included to describe their distribution across social network subgroups and were all taken from the first wave of data collection. In an attempt to aid interpretability, scales and indices described below were averaged across corresponding items to create an overall scale score in the same metric as the original items.

Adolescent Delinquency: Participation in adolescent delinquency was assessed as a 12-item index evaluating the frequency with which respondents engaged in a range of behaviors in the previous 12 months including property damage, stealing, selling drugs and car theft. Items were measured on a 4-point scale ranging from 0 "never" to 3 "5 or more times" and were averaged to create a mean adolescent delinquency score.

Committing Serious Violence: Engaging in serious violence was assessed as an index composed of four items asking about carrying a weapon, pulling a knife or weapon on someone, getting into a physical fight and shooting or stabbing someone within the past 12 months (these items were mutually exclusive of delinquency items). Questions had a 3-point range from 0 "never" to 2 "more than once", and were averaged to create a mean "committing violence" score.

Frequency of Alcohol Use: Alcohol use was measured with a single item asking about how many days the respondent drank over the past 12 months. This item was recoded to range from 1 "never" to 7 "every day or almost every day."

Problems Because of Alcohol: Problems associated with alcohol use were measured through a nine-item scale (alpha = .83) gauging the past year frequency of difficulties such as being hung over, getting in trouble with family, or having problems at school. Response categories ranged from 0 "never," to 4 "five or more times" and were averaged to create a 'problems with alcohol' score.

Aggressive All-Male Sports: Participation in aggressive sports was calculated as the sum of four sports in which respondents participated (football, ice hockey, basketball and wrestling), resulting in scores ranging from 0 to 4. The sports were those identified in

previous literature as "aggressive," or as "contact" sports (e.g. Brown et al. 2002; Forbes et al. 2006).

Peer Rejection: Respondents' perceptions of peer rejection were measured via a single question assessing the degree to which respondents felt that their "friends care" about them. The item was coded to range from 1 "very much" to 5 "not at all."

Depressive Symptoms: Current depressive symptoms were based on nineteen items from the CES-D scale (Radloff 1997) (alpha for this sample = .83). Each item's possible responses ranged from 0 "never" to 3 "most of the time or all of the time." Scores were summed across all items for a possible range of 0–57, with higher scores indicating more and more frequent depressive symptoms.

Subsequent Intimate Partner Violence—At the final (Wave 3) assessment, participants responded to items assessing physical violence with intimate romantic partners that occurred subsequent to the first data collection point. Thus, although the data were collected nearly 6 years after Wave 1, the measures reflect behaviors in relationships through adolescence and early adulthood. IPV was assessed via 3 items constructed by the Add Health team. These items asked about the frequency with which respondents a) slapped, hit or kicked their partner, b) threatened partner with violence, pushed or shoved partner, or threw something at their partner that could hurt or c) caused an injury such as a sprain, bruise or cut. Possible responses mirrored response categories from the Revised Conflict Tactics Scale (Straus et al. 1996) and included "never", "once", "twice", "3 to 5 times", "6 to 10 times", "11 to 20 times", "more than 20 times", and "this hasn't happened in the past year, but it did happen before then" (for current relationships). A mean IPV score was created by averaging responses to these three items across all relationships. Because the resulting measure was highly skewed, the final IPV score was dichotomized to reflect any physical aggression with an intimate partner (1) versus no history of IPV perpetration (0).

Analytic Strategy

All analyses were performed using Mplus. Analytical strategies accounted for the complex structure of Addhealth data in accordance with recommendations from the Addhealth research team (see for review, Chantala and Tabor 1999). This included accounting for the stratified, clustered (youth in schools) nature of the data, as well as for the sample weights for each participant. Maximum likelihood estimation was used.

Analyses proceeded in three stages. First, latent class analysis (LCA) was used to identify distinct peer network "types". LCA assesses for the existence of categories of individuals who share similar profiles across a series of variables. These categories, called "latent classes" are derived such that members within a class are similar to one another, but different from members of other classes. Indicator variables entered in the LCA here reflected the size, density, gender breakdown and delinquent behaviors of each respondent's Wave 1 social network. Thus, resulting classes for this analysis represent unique "types" of networks to which youth might generally belong, based on the combination of the four indicator variables.

LCA procedures were those recommended by McCutcheon (1987) and Muthén and Muthén (2000). First, LCA models were estimated iteratively, each time increasing the number of classes specified by one. The selection of the number of classes was based on several factors (Muthén and Muthén 2000): the interpretability and conceptual meaningfulness of the classes given the study purpose, strong class membership probabilities, and entropy score. The latter two reflect the ability to distinguish membership in the latent classes given the model and the data, with higher scores representing higher likelihood that individuals' most likely class membership was correctly identified. An additional tool for choosing the optimal number of classes is the Bayesian Information Criterion (BIC; Schwartz 1978). Lower BIC values typically reflect better fit to the data, and reductions of 6 or greater are considered 'strong' (Raftery 1995). Although Mplus offers a likelihood ratio test statistic for determining whether a solution is a better fit to the data than a solution with one less class, this option is not available for weighted data such as those in Addhealth (Muthén and Muthén 1998–2007).

Once the model with the optimal number of classes was identified, between-class comparison of class indicators and other Wave 1 variables (those representing demographic and non-network variables) were conducted. These tests were conducted in re-estimations of the model, either computed as optional, additional analyses available in Mplus or by fixing scores to be equal across classes and conducting tests of changes in model fit. Bonferonni corrections were applied to all between-class tests, with a resulting alpha cut-off level of .008 (.05 divided by 6, the number of pairwise comparisons). Finally, the between-class tests were conducted to determine whether classes differed in rates of subsequent IPV perpetration (occurring after Wave 1 and reported at Wave 3).

Results

Two, three, four and five-class models were estimated for peer networks using information about the size, density, gender breakdown and delinquency in respondents' friendship groups. The four class model was chosen as the optimal solution, using all available and relevant fit criteria. This model had a high class probability for each class (.91 for class 1, .90 for class 2, .89 for class 3 and .92 for class 4), and the greatest conceptual meaningfulness of any of the models. The four-class solution had a significantly improved BIC value (16,910.14) than the 2 or 3-class solutions (18,408.13 and 17,549.08, respectively). Although the 5-class solution produced an improved BIC value over the 4-class model, the characteristics of the classes in this solution were less conceptually clear and meaningful than those of the classes in the 4-class solution. (The additional class appeared to be a small subset of one of the classes in the 4-class solution, with only minor differences from the larger class). Entropy did not differ meaningfully between the 4 and 5-class solutions (.86 and .87, respectively). Based on the totality of these considerations, the 4-class solution was selected as the optimal model for the purposes of this study.

The 4-class model resulted in distinct types of peer networks. These are summarized in Table 2, and can be roughly characterized as a "dense male network" (27% of respondents) comprised of a small, densely connected number of almost exclusively male friends who had the highest level of delinquent behavior; a "dense female network" (6% of respondents),

comprised of respondents who were friends with a small, dense group of mostly girls with lower levels of delinquency, an "average network" (60% of respondents), made up of a medium-sized, less dense, gender-balanced group and a moderate amount of delinquent behavior, and a "popular network" (7% of respondents), comprised of respondents with sizeable extended networks comprised of a slight majority of female friends (58%) with lower levels of delinquent behavior. Termed "popular" because of its size and density, the characteristics of this network indicated that "popular" respondents in this sample were nominated as close friends by a large number of peers who were not necessarily themselves densely interconnected. All indicators (network size, network density, gender makeup and delinquent activities of friends) differed significantly across all classes, with one exception. The degree of peer delinquency in the dense female class did not differ from the popular and average classes, although the popular and average classes were significantly different than each other. Effect sizes ranged widely among the individual comparisons, from relatively small to very large. For network size, the smallest was for the comparison of the dense male and dense female classes (Cohen's d = .38) and the largest was for the comparison of the dense female and popular classes (d = 4.74). These same pairwise comparisons were the smallest (d = .31) and largest (d = 2.41) for network density. Friend's delinquency effect sizes had a smaller overall range, from d = .25 for the comparison of the popular and average classes to d = .40 for the dense male vs. popular classes. Finally, the proportion of female friends effects ranged from d = .74 for the popular vs. average classes to d = 5.81 for the dense male vs dense female classes. (Generally accepted interpretation of Cohen's d is .20 = small effect, .50 = medium effect, and .80 = large effect).

Between-class differences in demographic and non-network factors are summarized in Table 3. Classes differed in age, except for the dense male group compared to the popular group. The dense female and average groups were comprised of the oldest participants (mean age = 16.62 and 16.01 years, respectively), followed by the dense male group (15.80 years) and the popular group (15.66 years). The racial composition of groups also differed significantly. African American and Latino youth were over-represented in the dense female group, and White youth were over-represented in the popular group. Although Asian/Pacific Islander youth were slightly over-represented in the dense male group, this group's overall racial composition did not differ significantly from other peer network types.

In terms of IPV risk factors, only the respondents' own reports of delinquency, use of serious violence and childhood experiences of sexual abuse did not differ significantly between classes (although the omnibus tests for respondent delinquency and use of serious violence were significant, subsequent post-hoc tests did not reach the level of significance required under the applied Bonferonni correction). Pairwise class comparisons revealed that the dense male network was characterized by higher levels of depressive symptoms and perceptions of peer rejection than the average and popular groups, less drinking or problems with alcohol than all other groups, and less participation in aggressive sports than the average or popular groups. Although this group also reported the highest levels of physical child abuse, this difference was only significant in comparison to the popular group. The dense female group also appeared to be characterized by areas of risk, including higher numbers of depressive symptoms than the average and popular groups, higher perceived

peer rejection than any other group, and more drinking and problems with alcohol than the dense male or average peer networks. In contrast, the popular group reported less depressive symptoms than the dense male or dense female groups, lower perceptions of peer rejection than any other group, and less physical abuse in childhood than the dense male group. This group was also more likely than any other group to participate in aggressive sports.

As seen in Table 3, rates of adolescent and early adult IPV perpetration differed such that the dense male class had a higher likelihood of IPV compared to the popular class (Odds Ratio = 1.57). No other between-class differences were significant.

Discussion

These analyses identified distinct adolescent social network subtypes in this national sample of adolescents. Consistent with hypothesis 1, four peer groups with differing network structures were found. The "average" group, so named because of its larger size and mid-range averages on most network characteristics, comprised 60% of the sample. In contrast, the "popular" subgroup members (7% of respondents) had a network size roughly twice that of the average group, but with less density, a higher proportion of female friends and lower levels of delinquency among peers. The final two groups were both characterized by relatively greater density and smaller network size than the aforementioned groups. The more common of these, the "dense male" group (27% of respondents) was composed almost exclusively of very small groups of males with the highest peer delinquency scores. The least common network type (6%), the "dense female" group, was populated by young men reporting lower levels of peer delinquency and ties with mostly females for friends. In terms of race/ethnicity, the most striking finding was the differential greater representation of White participants in the popular class, and the greater representation of African American and Latino participants in the dense female class. Small but statistically significant differences in age were seen, with the dense female and average classes being slightly, but not meaningfully, older.

Non-Network Risk Factors for IPV and Class Membership

Findings both supported and contradicted Hypothesis 2, that individual and family of origin factors known to be associated with IPV would be over-represented in a class characterized by a dense male network. Although the dense male class was among the highest on some risk factors for IPV, other risk factors were spread among the remaining peer network types. Specifically, dense male network respondents had higher levels of depressive symptoms and perceived peer rejection than the average and popular groups, and higher rates of childhood physical abuse than the popular group. However, members of the dense male class were no more likely to commit serious violence or delinquent acts than other groups, and were actually less likely to drink frequently or have problems with alcohol than any other group. Dense female network members were also more depressed and felt more rejected by peers than other groups, while popular network members engaged in significantly more aggressive sports than any other group.

Peer Network Types and Associations with Risk Factors and Subsequent IPV

The findings only partially support Hypothesis 3. On one hand, the dense male class had higher IPV perpetration rates than the popular class. On the other hand, they did not differ from the other two classes, Although members of the dense male class reported slightly higher rates of subsequent IPV (19.3%) than the dense female and average groups (16.7 and 16.6%, respectively), these differences were not statistically significant. It is also worth stressing that no peer group type was in any way free of risk for subsequent IPV perpetration.

It may be that variations in the social network characteristics of the dense male, average and dense female network types were not substantial enough to foster environments marked by differential risk for future IPV perpetration between these classes. For example, while the dense male group was characterized by higher levels of peer delinquency than the average group, the average group also reported significantly greater peer delinquency than the popular group. Members of both groups may have been exposed to a level of rule-breaking behavior that rendered other types of aggressive or disrespectful behavior more acceptable. Similarly, the members of the dense male and dense female network types were both relatively isolated in small networks with limited numbers of interconnected peers, perhaps restricting exposure to different kinds of friends, to diverse relationship behaviors and attitudes, or to more varied resources for social support. These groups also shared a stronger sense of peer rejection, which is both a correlate of IPV perpetration (Linder and Collins 2005) and which may have rendered these groups more similar in their overall profile of IPV risk.

Indeed, the aforementioned distribution of antecedents and correlates of IPV perpetration between the peer network types may have contributed to the non-significant differences in IPV, rendering risk for perpetration more diffuse than hypothesized. In other words, the presence of IPV-related risk factors across the dense male, dense female and average groups (albeit slightly different combinations of risks for each group) may have somewhat equalized their overall association with later relationship aggression. It is also possible that the number of peer nominations available to participants (up to 5 male and 5 female friends), along with the lack of some other theoretically relevant variables such as peer attitudes, may have attenuated the degree to which the network types detected here are both fully described and related to IPV risk.

In contrast, the dense male and popular groups, who did differ in IPV rates, had substantially different peer network characteristics and structures (as evidenced by the larger effect sizes for comparisons between these groups). Compared to the popular group, young men in the dense male group likely had vastly fewer opportunities to interact with and relate to young women, and may have been more redundantly exposed to rule-breaking behavior, given the smallness and density of their friendship group. Previous research suggests that small tightly-knit groups may hold more influence over members because of the potential homogeneity of and repeated exposure to the particular behaviors, expectations and norms within the group (Back 1990).

In addition to these two network types being the most starkly different from each other, they also differed in the presence of associates of IPV. As previously noted, compared to the popular group, members of the dense male class reported significantly more depressive symptoms, and were more likely to perceive peer rejection and to have experienced physical abuse as a child. It may be that the combination and concentration of these related correlates of IPV rendered the dense male group a qualitatively different environment relative to relationship behaviors than that of the popular group. Further, the popular group appeared to be characterized by potentially protective factors that were not available to members of dense male networks, including peer acceptance and less childhood adversity. These attributes may work in combination with a large, open network structure to reduce the influence of other possible risk factors for perpetrating IPV for "popular" youth. In contrast, it may be that young men in the dense male class shared a sense of isolation from other peers, and were at slightly elevated risk for IPV perpetration both because of the closed, interdependent, delinquent structure of their network and because of their shared internalizing symptoms.

It is interesting to note that although the members of the popular network had the lowest rates of subsequent IPV perpetration, they were most likely to participate in aggressive all-male sports, an activity found by previous researchers to constitute a risk factor for relationship aggression (e.g. Forbes et al. 2006). This suggests that sheer membership on all-male sports teams may itself not always constitute a risk factor, but may depend on the presence of other correlates of aggression, such as violence-supportive norms within the team, a closed peer network structure or exposure to delinquent peers. Indeed, in a study of male college students, Humphrey and Kahn (2000) found that membership itself in all-male groups did not differentiate sexual assault perpetrators from non-perpetrators, but that norms of hostility towards women and peer support for aggression within specific groups were associated with rates of perpetration. It may be that among popular respondents in this study, any exposure to violence-related attitudes or behaviors within all male, aggressive sports teams was offset by simultaneous involvement with a large group of both male and female peers who likely displayed a broader range of attitudes and behaviors.

Taken together, the composition, structure, correlates and rates of subsequent IPV of the four network types both reflect and complicate the notion of homophily (i.e. Thornberry et al. 1994) described earlier. While some variables appeared to cluster by peer network, including levels of peer delinquency, levels of depressive symptoms, participation in aggressive sports, and perceived peer rejection, other factors were distributed among the networks in less clear patterns, such as respondent commission of serious violence and alcohol use. Thus, in addition to the processes of peer selection and socialization potentially at play, other forces are likely at work. On a basic level, it is likely that across a fairly wide range of characteristics such as those examined here, members of peer networks will be more similar to one another on some variables than on others. In the same vein, some behaviors may appear in similar rates across peer networks, but be associated with different factors within each network. For example, alcohol use has been associated with membership in "popular" peer groups (Allen and Antonishak 2008), as well as with depression and childhood physical abuse (e.g. Clark et al. 2003), factors which clustered in different network types in these analyses.

It may also be that the *structure* of the dense male network rendered it a more powerful, or redundant reinforcer of some behaviors, including IPV, than the much larger, more diffuse popular network. This would be consistent with social network theory, and with findings related to adolescent smoking (i.e. Ennett and Bauman 2006) and delinquency (Haynie 2001), in which network closeness and the position of teens within particular social network structures contributed to the degree of peer influence. These findings also support the Brown et al. (2008) contention that a multiplicity of factors determine the strength of peer influence and similarity, including individual characteristics, the structure of networks, and normative processes within groups. Further research is needed that examines the role of both network structure and internal peer group processes in relation to peer influence on relationship aggression.

Limitations

As a secondary data analysis, the study was limited by available measures, most notably the lack of variables related to peer attitudes regarding violence and aggression. It is likely that normative attitudes within peer groups play a role in encouraging or suppressing mistreatment of partners, and that these attitudes may interact with network structure to determine the relative strength of peer group influence. Research is needed that captures a wide range of peer network-level characteristics specific to risk for IPV so that mechanisms of influence can be more clearly specified. Other well-established risk factors for IPV perpetration, such as witnessing family violence as a child, were also not available in the data. Finally, the measure of peer rejection was limited to a single item that assumed membership in some sort of friendship group.

The peer network data utilized in this study also came with limitations. Data used to re-construct social networks were collected only at Wave 1, prohibiting an examination of whether similarities within networks were a result of selection (young men self-selecting into groups similar to themselves), socialization of peers over time or a combination of the two. Additionally, this snapshot of peer membership prohibits an examination of how or whether youth change peer groups over time, and whether peer network trajectories are differentially related to risk for violence. The prompt for youth to identify up to five close friends of both genders may also have led students to name friends of the opposite sex who were not, in reality, as close to the participants as other same-sex friends. Additionally, the descriptive nature of these findings should be stressed; the cross-sectional nature of the peer network data and IPV correlates as well as the analytical approach utilized here prevent strong causal inferences about peer networks, risks for IPV and perpetration itself. Finally, the finding that peer network structures with higher levels of peer delinquency were not also characterized by significantly higher rates of delinquent and violent behavior by respondents was unexpected. It may be that the somewhat limited range of available peer delinquency variables attenuated the link between friends' delinquent behavior and that of the respondents.

Implications

Several implications emerge from these findings. It is worth reiterating that although the members of dense male network group had higher rates of subsequent IPV perpetration than members of the popular network, all peer network types were characterized by some level of later involvement in relationship aggression. This finding emphasizes the complex nature of IPV etiologies and suggests the need for continued attention to how risks at individual, family and peer levels intersect. Further, the finding supports the continued use and refinement of universal violence prevention approaches, as propensity for later IPV perpetration was not limited to easily identifiable "high-risk" adolescent groups in this analysis.

At the same time, some peer-level factors did emerge as relevant to IPV perpetration, which suggests that selected prevention programming targeting specific risk factors at the peer level may be warranted. Specifically, depressed, socially isolated youth in small, dense male networks appeared to be at greater risk of future perpetration than youth with much more numerous, gender-balanced, pro-social ties. It may be that structural prevention programs that aim to reduce some teens' social isolation, build social competencies and generate positive opportunities for exposure to variety of peers may expand the range of behaviors, attitudes and relationship expectations to which youth are exposed. Such efforts are reflected in programs such as Boys and Girls Clubs (Pope et al. 1995), Life Skills Training Curriculum (Botvin and Griffin 2004) and school-based cooperative learning programs (Johnson and Johnson 1994), although their impact on risk for IPV is not known. These findings support the examination of these approaches' impact on youth's subsequent intimate relationship behaviors.

Interventions within peer groups themselves may also be relevant. Certainly, caution must always be taken in considering peer network-based interventions in "at-risk" groups, because of the potential for iatrogenic effects. In the past, concentrating "high-risk" youth into group interventions has resulted in negative outcomes such as increased antisocial behavior (Dodge and Sherrill 2006) and higher rates of smoking (Poulin et al. 2001). However, there is also evidence that carefully planned interventions in naturally occurring peer networks can generate strong positive outcomes. For example, Popular Opinion Leader (POL) approaches, which recruit and train natural peer network leaders to proactively model and initiate conversations about health-promoting behaviors, have been shown to increase knowledge about sexually transmitted infections and to increase condom use among rural adolescents (Smith et al. 2000), as well as to decrease smoking among British teens (Campbell et al. 2008). Such an approach may be relevant to violence-related attitudes and behaviors among adolescents, and could be used to expand the range of behaviors, attitudes and norms present within bounded peer groups as well as to enhance the visibility of respectful approaches to intimate relationships. Relevant approaches specific to dating and sexual violence have been implemented at the college level (i.e. the "Bringing in the Bystander" program at the University of New Hampshire; Banyard et al. 2007), and in high schools (i.e. Men of Strength clubs (Hawkins 2005)). These programs may serve as models that can be adapted to younger audiences and to more bounded peer groups.

Conclusion

This study provides an initial description of adolescent social network types and their association with IPV correlates and IPV itself. Most notably, distinct profiles of adolescent peer groups were detected based on structure and composition, suggesting that structural variables are important considerations in determining the nature and influence of youth social networks. Further, respondents who reported membership in small, dense, delinquent and mostly male peer networks also reported higher rates of subsequent IPV perpetration than men in larger, diffuse, pro-social and more gender balanced peer groups, suggesting that some "types" of peer networks may differentially foster conditions that support or perhaps fail to inhibit IPV-related factors and behavior. At the same time, correlates of IPV perpetration and IPV perpetration itself were found to some degree in all peer network profiles, reinforcing the notion that approaches to preventing, intervening in, and ultimately ending IPV perpetration must address factors at multiple levels. The nature of peer influence relative to intimate partner violence remains a topic that is ripe for inquiry and that has promise for creating knowledge that can fruitfully be used in violence prevention activities. Promising areas for future research include greater specification of social network characteristics potentially associated with violence, focus on predictive models, and delineation of possible mediating mechanisms.

Acknowledgments

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Table 1

Variable descriptives and correlations ($n = 3,030$)

	M	SD	2	3	4	5	6	7	8	9	10	11	12	13
1. Network size	8.72	4.48	−.54***	−.10***	.35***	−.06*	−.04	−.10**	−.15***	.01	−.03	.05	.07*	.17***
2. Network density	0.29	0.14		.06	−.25***	.03	−.03	.05	.07*	.01	.01	−.02	−.02	−.04
3. Friends' delinquency	2.07	0.52			−.12**	.05	.03	.12***	.02	.17***	.12***	.21***	.19***	−.02
4. % female friends	0.40	0.26				−.02	−.03	.01	−.03	.00	.02	.08*	.01	.00
5. Physical abuse	0.75	1.41					.15***	.09***	.02	.12***	.07**	.09**	.06*	.02
6. Sexual abuse	0.07	0.44						.05*	.04	.01	.06	.00	.00	.03
7. Depressive sx.	9.62	6.54							.29***	.26***	.20***	.15***	.23***	.08**
8. Peer rejection	1.83	0.76								.07*	.01	−.02	.02	−.05
9. Delinquency	0.33	0.40									.41***	.41***	.44***	.01
10. Serious violence	0.21	0.30										.31***	.32***	.04
11. Freq. alcohol use	2.29	1.55											.64***	−.03
12. Problems with alc.	0.20	0.40												−.01
13. Aggressive sports	0.68	0.84												

*
p<.05,

**
p<.01,

***
p<.001

Table 2

Characteristics of the four classes and between class significance tests (n = 3,030)

LCA indicator	Classes								Omnibus, χ^2 (df = 3)
	Dense male (n = 808)		Dense female (n = 177)		Popular (n = 228)		Average (n = 1,818)		
	M	SD	M	SD	M	SD	M	SD	
Network size	4.94$_a$	1.95	4.21$_a$	1.83	18.00$_a$	3.53	9.53$_a$	2.93	11644.24[***]
Network density	0.40$_a$	0.16	0.45$_a$	0.16	0.18$_a$	0.05	0.25$_a$	0.09	4390.36[***]
Friends' delinquency	2.18$_{a,b}$	0.66	1.99$_a$	0.60	1.94$_b$	0.31	2.05$_b$	0.45	262.66[***]
Proportion of female friends	0.08$_a$	0.13	0.87$_a$	0.16	0.58$_a$	0.13	0.47$_a$	0.15	17325.41[***]

Means/percentages in a row that share the same subscripts differ at least at $p < .008$ (Bonferroni-corrected: .05 divided by 6)

[***] $p < .001$

Table 3

Between-class comparisons on demographic, antecedent, concurrent, and subsequent factors (n = 3,030)

	Class								Omnibus, χ^2 (df)
	Dense male (n = 805)		Dense female (n = 171)		Popular (n = 231)		Average (n = 1,823)		
	M or %	SD	M or %	SD	M or %	SD	M or %	SD	
Demographic variables[1]									
Age	15.80_a	.04	$16.62_{a,b}$	0.10	15.66_b	0.09	$16.01_{a,b}$	.03	$203.69(3)$***
Race									$33.29(12)$***
African American	12.4%		$23.9\%_a$		$10.1\%_a$		$13.7\%_a$		
Asian American	$5.4\%_{a,b}$		$2.3\%_a$		0.7%		$3.6\%_b$		
Latino/a	$9.3\%_a$		$15.7\%_{a,b}$		$0.9\%_{a,b}$		$10.1\%_b$		
Native American	3.0%		0.2		$2.2\%_a$		$1.5\%_a$		
White	$68.6\%_a$		$54.8\%_{a,b}$		$86.1\%_{a,b}$		$69.1\%_b$		
Other	$1.3\%_a$		$3.1\%_{a,b}$		$0.0\%_{b,c}$		$1.9\%_c$		
Antecedent early risk factors[1]									
Physical abuse	0.82_a	0.03	0.74	0.08	$0.57_{a,b}$	0.06	0.75_b	0.02	$30.73(3)$***
Sexual abuse	0.08	0.01	0.06	0.02	0.06	0.02	0.07	0.01	3.94(3)
Concurrent risk factors[1]									
Depressive symptoms	$10.08_{a,b}$	0.16	$10.92_{c,d}$	0.35	$9.00_{a,c}$	0.34	$9.37_{b,d}$	0.10	$33.63(3)$***
Peer rejection	1.91_a	0.02	2.01_b	0.04	$1.62_{a,b}$	0.04	$1.81_{a,b}$	0.01	$152.86(3)$***
Delinquency	0.33	0.01	0.29	0.02	0.33	0.02	0.33	0.01	$10.81(3)$*
Serious violence	0.20	0.01	0.23	0.02	0.19	0.01	0.21	0.01	$14.27(3)$**
Frequency alc. use	$2.12_{a,b,c}$	0.04	2.45_a	0.08	2.40_b	0.08	2.33_c	0.02	$30.86(3)$***
Problems with alcohol	$0.16_{a,b,c}$	0.01	0.23_a	0.02	0.26_b	0.03	0.21_c	0.01	$37.58(3)$***
Aggressive sports	0.60_a	0.02	0.37_a	0.04	0.98_a	0.05	0.70_a	0.01	$277.03(3)$***
Subsequent factors[1]									
Interpersonal violence	$19.3\%_a$	–	16.7%	–	$13.2\%_a$	–	16.6%	–	$19.05(3)$***

When the omnibus test is significant, values in a row that share the same subscripts differ at least at $p < .008$. No pairwise difference tests between classes for the "delinquency" and "serious violence" variables were significant at $p < .008$ (Bonferroni-corrected: .05 divided by 6) ***[1] Demographic, and concurrent factors are measured at Wave 1; antecedent factors are measured retrospectively at Wave 3 and subsequent factors are measured at Wave 3 and reflect behaviors that occurred after Wave 1

[*] $p < .05$,

[**] $p < .01$,

[***] $p < .001$