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Social Networks of Adolescent Sexual Violence Perpetrators: Peer Friendship and Trusted Adult Characteristics

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Abstract

The current study tested differences in social network characteristics of high school students who report perpetrating sexual violence (SV) versus those who do not. $N = 4554$ students (49% male, 49% female, 2% another gender identity; 45% Hispanic, 43% white, 12% another racial identity) from 20 high schools reported how often they had perpetrated 13 sexually violent behaviors. Using their responses, students were classified as follows: non-perpetrators, sexual harassment perpetrators, low contact perpetrators, or high contact perpetrators. Students named up to 7 close friends and up to 7 trusted adults at their school and answered questions about other behaviors and attitudes. This information was used to assess (1) students' connections with peers, (2) students' connections with trusted adults, and (3) friends' characteristics. Multilevel models indicated that compared to their peers, high contact perpetrators were less involved in the peer networks, less connected to trusted adults, and more likely to have friends who were involved in risky behaviors (e.g., sexual violence, homophobic name-calling, substance use). Low contact perpetrators were as connected to peers and trusted adults as non-perpetrators but were more likely to have friends engaged in sexual violence and homophobic naming-calling perpetration. By contrast, sexual harassment perpetrators were more involved and held higher status in the peer network (e.g., received more friendship nominations) but otherwise had similar friendship characteristics and similar connections to trusted adults as non-perpetrators. Building on these results, social network-informed SV prevention should use opinion leaders to change SV norms throughout the network and encourage new relationships between low- and high-risk students so as to disseminate norms that do not tolerate SV. Promoting connections to trusted adults also may be a useful avenue, especially for isolated adolescents.
Trial Registration This study is registered at www.clinicaltrials.gov NCT01672541. Syntax code is available from the authors upon request.

Keywords Sexual violence · Adolescents · Social network · Friendships · Rape

Sexual violence (SV) causes harm to many adolescents in the USA (Basile et al., 2014). In a nationally representative sample, 23% of male and 17% of female adolescents reported sexual harassment perpetration in the last year, and 4% of males and 2% of females reported penetrative rape perpetration (Ybarra & Thompson, 2018). Some adolescents use SV perpetration to gain or maintain social dominance (Robinson, 2005), and SV perpetrators tend to be friends with each other (Jewell et al., 2015). These findings suggest that the peer context is linked to SV perpetration, yet little is known about the characteristics of SV perpetrators' peer networks or their connections to trusted adults. Further, SV includes a range of behaviors from verbal sexual harassment to unwanted touching to rape (Basile et al., 2014), which may serve different functions and be differentially linked to the peer context. Because adolescents spend so much time in school, their school-based social networks are important contexts that can shape—and be shaped by—their behavior. The goal of this study is to compare the characteristics of school-based social networks (with peers and trusted adults) across three types of

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SV perpetrators: sexual harassment perpetrators, low sexual contact perpetrators, and high sexual contact perpetrators. Describing the social context of SV perpetrators may help prevention scientists use school-based networks to deliver interventions and help identify targets for future school-based SV interventions. We use data from a large sample of high school students to test hypotheses about the link between SV perpetration and social network characteristics.

Connections with Peers and Adults

There are multiple ways that SV perpetration may shape—or be shaped by—the peer context. First, SV is a form of aggression, and some aggressive youth are popular (Prinstein & Cillessen, 2003). Indeed, sexual harassment is often used to gain and maintain social dominance among adolescent peer groups (Robinson, 2005). For example, Jewell et al. (2015) found that 9th graders who had more connections within their peer network perpetrated more physical, verbal, and homophobic violence than less connected students. Conversely, aggression can undermine relationship strength, and many aggressive and antisocial youth are unpopular (Ettekal & Ladd, 2015). Further, penetrative rape is far from normative, and in the USA, there has been a recent cultural decline in beliefs that rape is acceptable (Edwards et al., 2011), suggesting that some forms of SV may not lead to peer acceptance and may even reduce the popularity of SV perpetrators. Therefore, we expected that the peer context would vary across SV perpetrators. Specifically, we hypothesized (H1) that sexual harassment perpetrators would be more engaged in the network (e.g., make and receive more friendship nominations; be more central to their network), but that their friendships would be weaker (e.g., less likely to have mutual friendships or friends who are connected to each other). By contrast, we expected that adolescents engaged in more extreme forms of SV (e.g., rape) would be less engaged in the network and have weaker friendship ties.

Adults are another important social context during adolescence. At school, adolescents often spend time around adults with whom at least one peer has a trusting relationship (Claessens et al., 2017). Relationships with adults or mentors could decrease adolescent risky behaviors (Beier et al., 2000) and provide opportunities for adults to talk with young people about topics such as consent and personal boundaries, and intervene when they overhear conversations or observe SV behaviors. Therefore, our second hypothesis (H2) was that students who perpetrate any form of SV would be less connected to trusted adults at school.

Peer Group Behavioral and Demographic Characteristics

Adolescents often select friends who are similar to themselves across a range of demographic and behavioral characteristics, including delinquency and aggression, and they are then influenced by their friends' behaviors (Sijtsema & Lindenberg, 2018) leading to a high degree of similarity (i.e., homophily) in the peer network. There is some evidence that homophily exists for sexual violence as well (Jewell et al., 2015). Therefore, our third hypothesis (H3) was that SV perpetrators would have friends who were also perpetrators.

Other peer characteristics may also be linked to SV perpetration. For example, bullying, homophobic name-calling, dismissiveness of SV (e.g., failing to view SV as serious; tolerating harassment as a natural characteristic of heterosexual interactions), and drug use have all been linked to gender-based aggression and SV (Espelage et al., 2015; Tharp et al., 2013). For several reasons, we expected that SV perpetrators would have more friends who engage in these behaviors than their peers. First, a tendency toward homophily—whether the result of selection or influence—means that perpetrators' friends might also engage in other risk behaviors (e.g., bullies are more likely to be friends with other bullies, so SV perpetrators who are bullies may have other bullies as friends). Second, friends who model and reinforce behaviors such as bullying may convey that these behaviors are acceptable. Further, friends who use alcohol might pressure others to drink (Fisher et al., 2007), or present more opportunities to do so, which may in turn lead to SV (Espelage et al., 2018; Tharp et al., 2013). Therefore, our fourth hypothesis (H4) was that SV perpetrators, compared to non-perpetrators, would have more friends who bully, dismiss sexual violence, use homophobic name-calling, and use drugs.

Further, rates of SV behavior are greater among male and older students (Ybarra & Thompson, 2018). Thus, adolescents who have more friends with these identities may be more likely to view SV perpetration as normative or acceptable, and be more likely to engage themselves. Therefore, our final hypothesis (H5) was that all types of SV perpetrators would have higher proportions of male and older friends compared to non-perpetrators.

Method

Participants

Data are from the baseline (i.e., pre-intervention) survey of a trial evaluating *Sources of Strength*, a universal peer-led school-based mental and behavioral health program that

targeted risk and protective factors associated with multiple outcomes (e.g., suicide, sexual violence). In Fall 2017, we invited all 9th–11th grade students at 20 high schools in Colorado to participate in the study. Eligible schools agreed to school-level random assignment and to use a waiver of active parental consent. Of the 6051 9th–11th grade students who were in the school, 4817 (79.6%) completed a survey. We excluded 265 students who were missing SV data, resulting in a sample of 4552 students in analyses that used measures based on nominations received. Of these students, 1626 made no friendship nominations and 160 did not nominate friends that we could match to school rosters, resulting in a sample of 2766 students in analyses that used measures based on nominations made. Table 1 provides the descriptive information about these two samples. We also present information comparing students excluded from analyses for different reasons in Supplemental Table 1 and Supplemental Fig. 1 presents a flow diagram with reasons for exclusion and inclusion in the study.

Table 1 Descriptive statistics

	Inclusion in analyses for indegree		Inclusion in analyses for outdegree	
	N = 4552		*N* = 2766	
	Count	(%)	Count	(%)
Sexual violence perpetration				
No perpetration	3528	(77.5%)	2174	(78.6%)
Sexual harassment only	733	(16.1%)	450	(16.3%)
Low sexual contact	226	(5.0%)	125	(4.5%)
High sexual contact	65	(1.4%)	17	(0.6%)
Grade				
9th grade	1944	(42.7%)	1226	(44.3%)
10th grade	1778	(39.1%)	1070	(38.7%)
11th grade	830	(18.2%)	470	(17.0%)
Gender				
Male	2240	(49.2%)	1215	(43.9%)
Female	2200	(48.3%)	1494	(54.0%)
Transgender	50	(1.1%)	28	(1.0%)
Reported as other, both, or missing	62	(1.4%)	29	(1.0%)
Sexual orientation				
Straight	3820	(83.9%)	2303	(83.3%)
Bisexual	323	(7.1%)	226	(8.2%)
Gay or lesbian	85	(1.9%)	60	(2.2%)
Questioning	117	(2.6%)	71	(2.6%)
Other sexual orientation	153	(3.4%)	93	(3.4%)
Missing sexual orientation	54	(1.2%)	13	(0.5%)
Race and ethnicity				
Hispanic	2407	(52.9%)	1412	(51.0%)
Non-Hispanic White	1769	(38.9%)	1152	(41.6%)
Other race or missing	376	(8.3%)	202	(7.3%)

Measures

SV Perpetration Students indicated how often in the past 6 months they perpetrated 13 unwanted behaviors toward other students (0 = *Never* to 4 = *7 + times*). These items, from the American Association of University Women Sexual Harassment Survey – Perpetration Scale (Espelage et al., 2015), assessed: (1) sexual harassment (4 items, e.g., made sexual comments, jokes or looks), (2) low contact sexual violence (5 items, e.g., pulled at clothing in a sexual way), and (3) high contact sexual violence (4 items, e.g., forced sexual acts). Using their responses, we classified students into four mutually exclusive groups: *non-perpetrators* (i.e., answered "never" to all 13 items), *sexual harassment perpetrators* (i.e., perpetrated 1 + sexual harassment behaviors, but no sexual contact behaviors), *Low contact perpetrators* (i.e., perpetrated 1 + low sexual contact, but no high sexual contact, behaviors), and *high contact perpetrators* (i.e., perpetrated 1 + high contact sexual behaviors). We classified students according to the most severe form of SV they reported (e.g., we classified students who reported perpetrating both sexual harassment and low sexual contact behaviors as low contact perpetrators). We classified students who skipped more severe items as missing if they did not report other severe behaviors because the student may have perpetrated that behavior. For example, we classified students who perpetrated at least one high contact behavior as high contact perpetrators, but we classified students who skipped at least one high contact items (while reporting "never" to all high contact items that they did answer) as "missing" because we could not determine their highest level of SV perpetration. Across schools, the median number of non-perpetrators per school was 158 (IQR = 38–294.5), the median number of harassment perpetrators was 46.5 (IQR = 11.5–58), the median number of low contact perpetrators was 4 (IQR = 3–19), and the median number of high contact perpetrators was 1 (IQR = 0.5–6).

Social Network Measures Students provided the first and last name of up to 7 of their closest friends at their school. We only allowed 7 nominations so as to focus on students' close friendships and to be consistent with other studies of adolescents' school-based networks which also have used 5–10 friendship nominations (e.g., Haas et al., 2010; Mercken et al., 2010; Osgood et al., 2013). Among those who made any nominations, the median number of friendship nominations (Median = 4.00; IQR = 3.00–7.00) was below the limit of 7, as was the median number of trusted adult nominations (Median = 1.00, IQR = 0.00–3.00). A team of 10 research assistants (RAs) used an online relational database software program (Ninox, 2020) to search each school's roster and match friends' names with an anonymous student ID. RAs met weekly for quality control. Of the 13,397 nominations

made, 75.1% were successfully matched to school rosters; 11.1% were not matched because not enough information was provided to differentiate between students (e.g., same first name and no last name provided), and 13.7% of the names could not be matched to the roster (e.g., friends in 12th grade who were not in the study).

Connections with Peers We used the sna (Butts, 2019) and igraph (Csárdi, 2020) packages in R to compute five measures based on the friendship nominations: (1) *Number of friendship nominations received* (i.e., indegree) captures the student's popularity, (2) *Number of friendship nominations made* (i.e., outdegree) captures how engaged the student is in the school-based peer network, (3) *Coreness* uses the indegree nominations to capture how integrated the student is in the network (Batagelj & Zaversnik, 2002), (4) *Reciprocation rate* captures relationship strength, and (5) *Egocentric density* captures whether the student's friends were tightly connected (Wasserman & Faust, 1994). Finally, *number of outside of school friends*, a self-report measure, captures how engaged the student is with peers outside of school. All six measures are described in more detail in Table 2.

Connections to Trusted Adults Students also nominated up to 7 adults in their school who they would go to for help for themselves or for a peer (Wyman et al., 2019). We used this information to compute: (1) *total number of trusted adults named* and (2) *total number of trusted adults within 1 step* (i.e., total number of different adults named by the student and their friends; if a student and a friend named the same person, this was only counted as one adult).

Friends' Behavioral Characteristics Using friends' self-reports of their own behaviors, we computed measures to capture the behavioral characteristics of each student's friends.

Sexual Violence Perpetration We computed the proportion of each student's friends who were any type of sexual violence perpetrator, as well as the proportion of friends who were each specific type of perpetrator. We also created an indicator variable to capture whether each student had any friends who engaged in a specific type of perpetration (1) or not (0).

Average Bullying We measured self-reported bullying using the 9-item Illinois Bully Scale (Espelage et al., 2003, 2015) in which students reported how often they bullied their peers at school in the past 30 days (e.g., teased other students; excluded others from their group of friends; threatened to hit or hurt another student) from 0 = *Never* to 4 = *7 or more times* (α = .87). We computed the average bullying scale score for each student and then computed the average bullying across all of the peers that a student named as a friend.

Average Homophobic Name-Calling Perpetration We measured homophobic name-calling perpetration using the 5-item Homophobic Content Agent Scale (Poteat & Espelage, 2005), which asks students "How many times in the last 30 days did YOU say homo, gay, lesbo, or fag to the following individuals?": (1) a friend, (2) someone you did not know well, (3) someone you did not like, (4) someone you thought was gay or lesbian, and (5) someone you did not think was gay or lesbian. Response options ranged from 0 = *Never* to 4 = *7 or more times* (α = .80). We computed the average homophobic name-calling perpetration scale score for each student and then computed the average score across the student's friends.

Average Dismissive Attitudes Toward Sexual Harassment We measured this construct with the National Institute of Justice Survey of Attitudes and Behaviors Related to Sexual Harassment (Taylor et al., 2011). Students report how much they agree with each statement (e.g., "Girls are asking to be harassed when they wear short skirts and tight clothes"; "sexual harassment isn't a serious problem in school"), from 0 = *Strongly disagree* to 3 = *Strongly agree* (α = .78). We computed the average across all 10 items and then computed the average score across the student's friends. Higher scores indicated that the student's friends held a higher level of dismissive attitudes toward sexual harassment.

Average Likelihood of Future Substance Use We assessed likelihood of future substance use with four questions that asked, "How likely are you in the next six months to …": (1) "smoke cigarettes"; (2) "get drunk or very high on alcohol"; (3) "use marijuana"; and (4) "use prescription drugs to get high." Response options were 0 = *Not at all likely*; 1 = *Somewhat likely*; and 2 = *Very likely* (α = .76). Previous studies indicate that intent to use predicts later drug use (e.g., Maddahian et al., 1988). We computed the average across all 4 items and then computed the average score across the student's friends.

Friends' Demographic Characteristics Using student's (outdegree) friendship nominations, we computed the proportion of friends that a student named who fell into different demographic groups. Specifically, we examined: (1) gender identity (proportion male, female, other gender/missing), (2) racial/ethnic identity (proportion white, Hispanic, other race/missing), (3) sexual orientation (proportion straight, bisexual/gay/lesbian, other orientation/missing), and (4) grade (proportion younger grade, computed as the proportion of 9th and 10th grade friends for 11th grade students, and the proportion of 9th grade friends for 9th and 10th grade students, and proportion older grade, computed as the

proportion of 10th and 11th grade friends for 9th grade students, and the proportion of 11th grade friends for 10th and 11th grade students).

Control Variables Students reported *gender identity* (recoded into male, female, transgender, and other/missing), *racial/ethnic identity,* (recoded into Hispanic, non-Hispanic White, and other/missing), *sexual orientation* (recoded into straight, bisexual/lesbian/gay, and other/missing) and *grade* in school (from roster).

Procedure

Four institutional review boards (IRBs) approved the study and a waiver of documentation of parent permission. For more information on the informed consent process, see the study's primary outcomes paper (Espelage et al., in prep). Data collection occurred during regular class times under the supervision of two researchers in each classroom. Most students completed the survey online in English (98.5%), although we also offered Spanish and braille translated surveys to meet student needs. Following survey completion, researchers provided all students a list of health, wellness, and helping resources.

Analytic Plan

We conducted multilevel modeling analyses in SAS 9.4 (SAS Institute, 2020) to account for nesting of students (level 1) within grade-cohort (level 2) and schools (level 3). Each model used a different social network variable as an outcome and indicators for SV perpetration group as the key predictor variables. Each model also included indicators to control for gender identity (reference = male), racial/ethnic identity (reference = white), sexual orientation (reference = straight), and grade. We report the adjusted least squares means for each group and test the differences between each group. With six comparisons per model, we conducted a total of 186 comparisons, increasing the possibility of a type I error; therefore, we focus our interpretation on broad patterns of significant results instead of individual comparisons.

Results

Network Connections (Hypotheses 1 and 2)

Table 3 shows the adjusted means separately for each perpetration group (left side) and the mean difference between each of the perpetration groups (right side). Consistent with H1, sexual harassment perpetrators received *more* friendship nominations and had *higher* coreness compared to non-perpetrators. Further, high contact perpetrators were less engaged in the peer network: they *made* and *received* fewer friendship nominations than other students. High contact perpetrators also had lower coreness compared to sexual harassment perpetrators. Despite being less connected to peers, high contact perpetrators did not report weaker connections with the friends they did have (i.e., no differences across groups in terms of egocentric density or reciprocation rate). Furthermore, high contact perpetrators reported *more* friends outside of school compared to non-perpetrators and harassment perpetrators.

Consistent with H2, high contact perpetrators were less engaged with adults at their school. They named fewer trusted adults compared to low contact sexual perpetrators, and they had fewer trusted adults within one step (i.e., named by themselves or their friends) compared to all other groups. Notably, sexual harassment perpetrators and low contact perpetrators were no less connected to adults at their school compared to non-perpetrators.

We illustrate these key results in Fig. 1a, b showing friendship connections among students at one school. As shown in Fig. 1a, sexual harassment perpetrators (green circles) were well integrated in the network and received more friendship nominations on average than students in any other group. By contrast, high contact perpetrators (red circles) were much less central to the network, with all five of them at this school being more on the periphery of the network. As shown in Fig. 1b, high contact perpetrators had fewer adult connections on average than students in any other group.

Friendship Characteristics (Hypotheses 3–5)

Table 4 compares friends' characteristics across all four groups. As expected, perpetrators—particularly low and high contact perpetrators—generally had riskier friends compared to their peers. For example, consistent with H3, almost half of the friends of high contact perpetrators were themselves SV perpetrators, which was more than any of the other groups. Low contact perpetrators in turn were more likely to have other SV perpetrators as friends than either non-perpetrators or sexual harassment perpetrators. Compared to all other groups, high contact perpetrators had a higher proportion of friends who were sexual harassment perpetrators and were more likely to have at least one sexual harassment perpetrator as a friend. Further, compared to all other groups, low contact perpetrators had a higher proportion of friends who were also low contact perpetrators and were more likely to have at least one low contact perpetrator as a friend. Although all groups had a low proportion of friends who were high contact perpetrators—likely due to the low number of these students overall—high contact perpetrators had a higher proportion of these friends compared to non-perpetrators and were more likely to have at least one high contact perpetrator as a friend compared to all other groups.

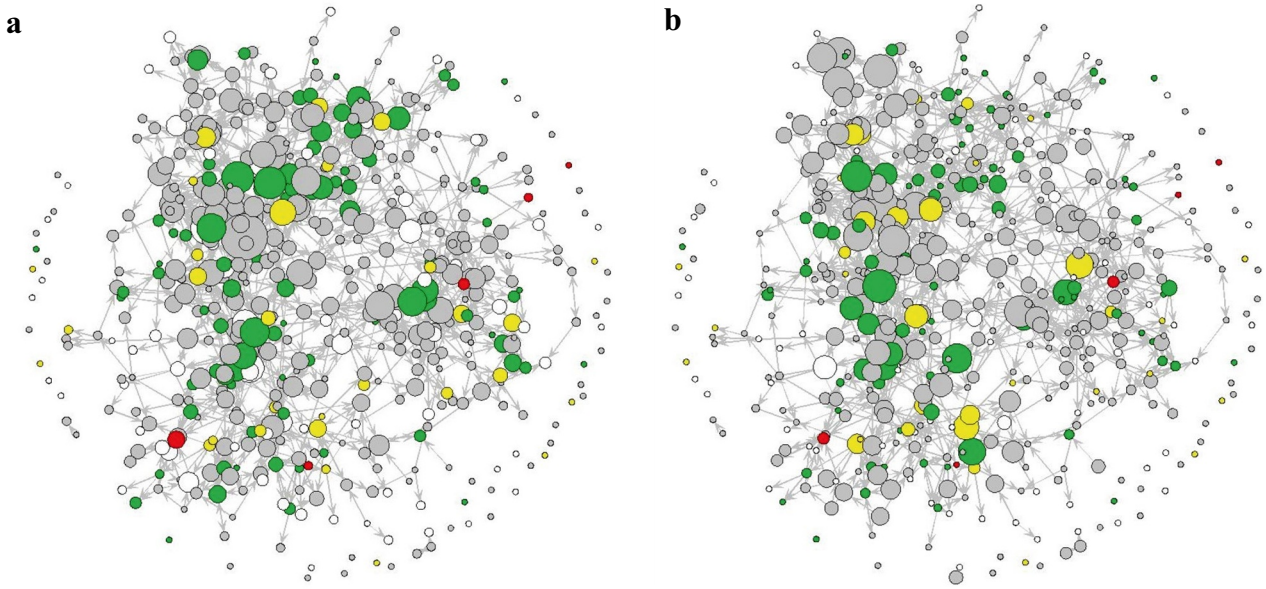

Fig. 1 **a** Friendship network, obtained from plot.network in R, showing indegree as a function of sexual perpetration category for all students present at baseline in one school. Each circle indicates a student at the school and directional arrows indicate the direction of friendship nominations. The size of each circle is scaled by the number of friendship nominations received (larger = more nominations received). The color of each circle indicates the student's sexual perpetration category. Gray = no perpetration (average indegree = 2.36, $n = 317$); green = sexual harassment only perpetration (average indegree = 2.81, $n = 89$); yellow = low sexual contact perpetration (average indegree = 2.12, $n = 33$); red = high sexual contact perpetration (average indegree = 1.60, $n = 5$); white = in the school at this wave but did not complete the sexual perpetration items ($n = 69$). **b** Network for the same school, showing the number of adults within one step of the student as a function of sexual perpetration category. The same network with the size now scaled by the number of unique adults within 1 step of the student (larger = student and/or student's friends named more adults). Color indicates the student's sexual perpetration category. Gray = no perpetration (average no. of adults = 2.96, $n = 317$); green = sexual harassment only perpetration (average no. of adults = 2.74, $n = 89$); yellow = low sexual contact perpetration (average no. of adults = 3.30, $n = 33$); red = high sexual contact perpetration (average no. of adults = 1.20, $n = 5$); white = In the school at this wave but did not complete the sexual perpetration items ($n = 69$)

Consistent with H4, the average amount of bullying among friends was higher for low contact perpetrators than either sexual harassment perpetrators or non-perpetrators. By contrast, the average amount of homophobic name-calling perpetration among friends was higher for high contact perpetrators than all other groups. The average amount of substance use among friends was also higher for high contact perpetrators compared to non-perpetrators and sexual harassment perpetrators. Notably, however, there were no differences in average dismissiveness among friends across any of the groups. Contrary to H5, all four groups were generally similar in terms of friends' demographic characteristics (bottom of Table 4).

Discussion

In this cross-sectional study of social networks in 20 high schools, students who reported different types of sexual violence (SV) perpetration had distinctly different patterns of network connections. Overall, we found considerable support for our hypotheses, with some exceptions.

Connections with Peers and Adults

As expected (H1), sexual harassment perpetrators were well integrated in the friendship network and high contact perpetrators were *less* integrated (see Table 3 and Fig. 1). Compared to non-perpetrators, sexual harassment perpetrators received *more* friendship nominations (i.e., indegree) and were *more* central to the networks (i.e., coreness), suggesting that these students hold high status and potential for influence within their networks (e.g., Garcia et al., 2017; Valente, 2012). By contrast, high contact perpetrators made and received fewer friendship nominations than all other groups and had lower coreness than harassment perpetrators. Given that these data were collected in the wake of the #MeToo movement, these results may reflect high-severity perpetrators becoming socially outcast (i.e., their behavior shaped their network position). Alternatively, high-severity perpetrators' lack of integration into the network may reflect maladaptive social and emotional development including peer and adult relationships that increases risk for SV and other

Table 2 Description of peer network measures

Measure	Definition/calculation	Interpretation
No. of nominations received (indegree)	No. of friendship nominations a student received from other students in the network	Captures one form of popularity
No. of nominations made (outdegree)	No. of (identifiable) friendship nominations that a student made. We assigned a score of 0 to students who completed a survey but did name any friends	Captures engagement in the school-based peer network—students with higher values view themselves as having many friends at school
Coreness	Degree to which a student is located close to the core or center of a network. A student's coreness value *k* is the largest value that satisfies the following: the student has been named by at least *k* friends who also have been named by at least *k* friends	Captures how embedded the student is in the school peer network. Higher values indicate that the student is closer to the center of the network
Reciprocation rate	Proportion of nominations that a student made where the nominated peer also named the student as a friend. This measure could only be calculated for students who named one or more friends; we treated students who did not name any friends as missing	One indicator of strength of the relationship, as mutual relationships tend to be stronger
Egocentric density	No. of friendship ties that exist among a student's friends, divided by the total possible number of ties. This measure could only be calculated for students who named at least 2 friends; we treated students with 0–1 friends as missing	Another indicator of relationship strength. Higher values indicate that the student is in a tighter-knit friendship group (i.e., their friends are well connected to each other)
No. of outside of school friends	Self-reported number of friends who did not attend the same school. We transformed the original ordinal scale (0, 1, 2, 3 or 4, 5 or 6, 7 + friends) into an interval scale by using the midpoint value (e.g., we recoded 3 or 4 friends into 3.5)	Captures engagement in out-of-school peer networks—students with higher values view themselves as having many friends outside of school

Table 3 Results from connections with peers and connections with trusted adults

		Adjusted means[a]				Mean difference					
						Harass perp vs	**Low contact**	**Low contact**	**High contact**	**High contact**	**High contact**
	N	No perp	Harass perp	Low contact	High contact	**No perp**	**No perp**	**Harass perp**	**No perp**	**Harass perp**	**Low contact**
Connections with peers											
No. of nominations received	4552	1.81	2.01	1.95	1.36	**0.20****	0.14	−0.07	**−0.45***	**−0.65****	**−0.59***
No. of nominations made	4552	2.12	2.26	2.17	1.36	0.15	0.05	−0.10	**−0.76****	**−0.91****	**−0.81****
Coreness	4552	0.86	0.95	0.88	0.74	**0.09****	0.02	−0.07	−0.12	**−0.22***	−0.14
Reciprocation rate	2766	0.32	0.32	0.29	0.24	0.01	-0.03	−0.03	−0.08	−0.08	−0.05
Egocentric density	2352	0.19	0.18	0.17	0.18	−0.01	−0.02	−0.01	−0.01	0.00	0.01
No. of outside of school friends	4345	3.54	3.68	3.77	4.39	0.14	0.23	0.09	**0.85***	**0.72***	0.63
Connections with trusted adults											
No. of trusted adults named	4552	1.56	1.56	1.74	1.10	0.00	0.18	0.18	−0.46	−0.46	**−0.64***
No. of adults within 1 step	2766	2.83	2.89	2.74	1.71	0.06	−0.10	−0.16	**−1.13****	**−1.19****	**−1.03***

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

[a]These means are from a three-level model (students nested within grade, which in turn was nested within school) and have been adjusted for gender identity (reference = male), racial / ethnic identity (reference = white), sexual orientation (reference = straight), and grade in school

Table 4 Results from friends' behavioral and demographic characteristics

		Adjusted means[a]				Mean difference					
						Harass perp vs	**Low contact**	**Low contact**	**High contact**	**High contact**	**High contact**
	N	No perp	Harass perp	Low contact	High contact	**No perp**	**No perp**	**Harass perp**	**No perp**	**Harass perp**	**Low contact**
Friends' behavioral characteristics											
Prop SV perp	2703	0.22	0.23	0.29	0.47	0.01	**0.07****	**0.06***	**0.25*****	**0.23*****	**0.18***
Prop SV harassment perp	2703	0.16	0.17	0.17	0.43	0.01	0.01	0.01	**0.27*****	**0.26*****	**0.26*****
Prop SV low contact perp	2703	0.04	0.04	0.10	0.00	0.00	**0.05*****	**0.06*****	−0.04	−0.04	**−0.09****
Prop SV high contact Perp	2703	0.01	0.01	0.01	0.04	0.00	0.00	0.00	**0.03***	0.02	0.02
Any SV harassment perp	2703	0.39	0.40	0.40	0.80	0.01	0.01	0.00	**0.41*****	**0.41*****	**0.40****
Any SV low contact perp	2703	0.12	0.13	0.25	0.04	0.01	**0.13*****	**0.13*****	−0.08	−0.09	**−0.21***
Any SV high contact perp	2703	0.02	0.04	0.04	0.16	**0.02***	0.02	0.01	**0.14*****	**0.12****	**0.11****
Average bullying	2686	0.19	0.18	0.25	0.24	−0.01	**0.05***	**0.06****	0.05	0.06	−0.01
Average homophobic perp	2684	0.41	0.41	0.43	0.69	0.00	0.03	0.02	**0.28***	**0.27***	**0.25***
Average dismissiveness	2680	0.55	0.56	0.57	0.62	0.01	0.02	0.01	0.06	0.06	0.04
Average substance use	2677	0.23	0.22	0.26	0.37	0.00	0.03	0.03	**0.15***	**0.15***	0.12
Friends' demographic characteristics											
Prop male	2766	0.37	0.40	0.38	0.35	0.02	0.00	−0.02	−0.02	−0.04	−0.02
Prop female	2766	0.47	0.47	0.45	0.44	0.00	−0.02	−0.02	−0.03	−0.03	−0.01
Prop other gender	2766	0.17	0.14	0.18	0.20	**−0.03***	0.01	0.04	0.04	0.07	0.02
Prop White	2766	0.40	0.42	0.42	0.28	0.02	0.02	0.01	−0.12	**−0.14***	**−0.14***
Prop Hispanic	2766	0.40	0.40	0.36	0.48	0.00	−0.04	−0.04	0.08	0.08	0.12
Prop other race	2766	0.20	0.18	0.21	0.24	−0.02	0.01	0.03	0.04	0.06	0.03
Prop straight	2702	0.75	0.75	0.71	0.82	0.00	−0.04	−0.05	0.07	0.06	0.11
Prop bisexual, gay, lesbian	2702	0.13	0.12	0.15	0.06	−0.01	0.02	0.03	−0.07	−0.06	−0.09
Prop other sexual orient	2702	0.12	0.12	0.14	0.12	0.00	0.02	0.02	0.00	0.00	−0.02
Prop younger grade	2766	0.38	0.38	0.37	0.27	0.00	0.00	0.01	**−0.11***	−0.11	−0.10
Prop older grade	2766	0.35	0.37	0.39	0.45	0.01	0.03	0.02	0.10	0.08	0.06

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

[a]These means are from a three-level model (students nested within grade, which in turn was nested within school) and have been adjusted for gender identity (reference = male), racial/ethnic identity (reference = white), sexual orientation (reference = straight), and grade in school

problem behaviors (i.e., their network position shaped their behavior). Those two processes may be complementary and intertwined. Finally, low contact perpetrators were as well integrated into the network as non-perpetrators. This pattern, combined with our findings for sexual harassment perpetrators, suggests that only students who engage in the most violent SV likely pay a social cost, in terms of status and position in the network.

Contrary to expectation, indicators of relationship strength (e.g., reciprocal nominations) were comparable among high contact SV perpetrators and non-perpetrators. These results could suggest that severe SV behaviors are accepted—and even reinforced—within perpetrators' own friendship groups, even if these behaviors are rejected by the broader peer group, making attitudes about SV, and SV practices, more challenging to modify among these students.

Examining the association between SV perpetration and students' access to trusted adults—both directly and indirectly through their friends at school—was an innovative aspect of this study. We expected that all SV perpetrators would have weaker connections with trusted adults at school (H2), but we found that only high contact SV perpetrators named fewer trusted adults (compared to low contact SV perpetrators) and had less access indirectly to trusted adults through their friendship ties (compared to all other groups). These findings are consistent with prior work showing that strong relationships with adults can reduce risky sexual behaviors among adolescents (Beier et al., 2000). Indirect ties to trusted adults are protective for several health behaviors, particularly if connections to specific adults are shared by friends (Wyman et al., 2019). Thus, high contact SV perpetrators' lack of access to trusted adults may mean fewer opportunities for mentorship, compassionate care, and adult engagement that can interrupt risky SV and pathways to other risky behaviors (Ball et al., 2009).

Peer Group Behavioral and Demographic Characteristics

We found mixed support for our hypotheses about the demographic and behavioral characteristics of SV perpetrators (H3–H5). Contrary to H3 and H4, sexual harassment perpetrators were *not* clustered together in the network nor were they more likely than non-perpetrators to be friends with high-risk students. Rather, sexual harassment perpetrators tended to be connected to students throughout the network. By contrast, high and low contact SV perpetrators were friends with other SV perpetrators (H3) and had more friends who engaged in bullying (H4). Additionally, high contact perpetrators were more likely than other groups to affiliate with high-risk students, including those who engaged in homophobic name-calling and had higher intentions to use drugs. After controlling for student's own gender, however, we did not find support for our hypothesis that SV perpetrators would have more male friends (H5) and we found no differences across groups in terms of dismissiveness toward sexual violence (H4).

Taken together, our findings suggest that sexual harassment perpetrators experience few negative social costs, and there even may be widespread normative approval for their behavior. Although we did not assess social motivations, our findings lend indirect support to prior work showing sexual harassment is a strategy used by some adolescents to maintain social dominance (Robinson, 2005). By contrast, disinhibition, maladaptive coping, and high propensity for risk taking may be co-occurring risk factors for more severe antisocial behaviors (Tharp et al., 2013), but not for harassment. Friendship affiliations with other SV perpetrators and bullies may also contribute to normalizing aggression and SV and reducing social consequences.

Study Limitations

The current study has many strengths, but the findings must be interpreted within the context of several limitations. These data on networks and SV perpetration were collected contemporaneously, which precludes drawing conclusions about whether SV is a cause or a consequence of network characteristics. Future work should use longitudinal data to determine whether perpetrators *selected* different types of friends or whether friends' behavior or attitudes *influenced* students to perpetrate sexual violence, using modeling approaches that account for other network characteristics. Second, we did not use information about frequency of SV perpetration, which may further differentiate perpetrators. Third, we focused on school-based networks, as these networks are important for understanding the context in which school-based interventions are implemented, but future work should study students' friendship networks outside of school. Fourth, the amount of missing data suggests caution should be used when interpreting the results. For example, although we were able to identify at least one friend for almost everyone who made nominations, we were unable to match about 25% of friendship nominations to our school rosters; this rate of unmatched nominations could reflect that our study (and thus our rosters) only included 9^{th}-11^{th} graders, even though we allowed schoolwide nominations. Further, although 75% of the population was included in our analyses that relied on friendship nominations received, only 46% of the population was included in analyses that relied on friendship nominations made (e.g., outdegree; friends' behavioral and demographic characteristics), as 37% of students who completed a survey did not make any friendship nominations (and 3% did not make any identifiable friendship nominations). On the one hand, this lower participation rate may explain the lack of support for some of our hypotheses, as

some of the excluded students likely had friends (i.e., older or out-of-school friends) but either chose not to report them, perhaps due to privacy concerns, or their friendship nominations could not be matched to school rosters. On the other hand, measures that were available for all students indicated that the excluded students were truly less engaged in the network (e.g., they received fewer friendship nominations; they reported fewer friendships outside of school). Finally, SV perpetration may have been underreported due to lack of knowledge and self-awareness regarding SV perpetration and victimization, especially among youth (Coy et al., 2013).

Future Research Needs

Future work with longitudinal data is needed to clarify the dynamic, reciprocal processes between networks and SV behaviors and yield the most actionable knowledge for prevention. Additionally, school culture and individual and peer socio-cultural identities such as gender, sexual, racial, and disability should serve as context for understanding how this phenomenon, long known as an enactment of social dominance across power dynamics, manifests in various unique environments (Robinson, 2005). One study suggests that SV is more common in mixed-sex peer networks given the opportunity to interact with the cross-sex peers (McMaster et al., 2002). Finally, in a time where youth and societal attitudes surrounding sexual assault and violence are radically shifting, it will be important to continue to understand how sexual assault is manifesting across high school social networks to highlight targets for intervention.

Prevention Implications and Future Directions

Our study has implications for developing network-informed interventions (Valente, 2012; Wyman et al., 2019) to prevent SV. First, identifying opinion leaders throughout the social network and preparing them to disseminate healthy norms and practices has been effective for prevention of multiple health problems, such as HIV risk behaviors (Kelly, 2004). Future work is needed to identify opinion leaders who can reach students throughout the network and change their peers' SV norms and practices. Given our findings that high contact perpetrators are less integrated into their networks, it will be important to identify peer leaders who are connected to these adolescents and thus in a position to influence them. Although high contact perpetrators also have a high proportion of SV perpetrators in their networks, in general about half of their friends are not perpetrators, and it will be important to find ways to promote the potentially positive influence from these non-perpetrator friends. Alternatively, interventions could promote ways to encourage the formation of new relationships between high contact perpetrators and non-perpetrators, perhaps capitalizing on the transition to high school as an important period of change, to further tip the balance of social influences within the peer group. Importantly, our findings also suggest that many students identified as friends by their peers are likely to engage in sexual harassment perpetration or view harassment as acceptable. Whether such students can be engaged as effective prevention agents may depend both on shifting their own behaviors and providing students with alternate, prosocial strategies to maintain popularity and social influence.

Second, although we cannot make causal conclusions based on our cross-sectional results, another possible avenue for sustained prevention impact may be to leverage adult connections among low sexual contact and sexual harassment perpetrators, and equip adults to intervene constructively with students engaged in SV. Our findings also point to the need for adults to build connections with students who are currently connected to few, if any, adults, as these students are at elevated risk of engaging in severe SV. These recommendations stem from robust research evidence that suggests the presence of trusted adults is associated with lower levels of behavior problems including misconduct, drug abuse, and engaging in sexual activity (Pringle et al., 2018; Sterrett et al., 2011). Further, Doty and colleagues (2017) found that students who reported connections with caring adults at school community were less likely to be engaged in sexual harassment—as perpetrators and victims. Nonetheless, longitudinal research is needed to identify the protective aspects of trusted adults on SV perpetration over time, so that prevention programs can be developed to foster these relationships between adults and youth.

In conclusion, SV is a difficult behavior to target directly, given its often private nature, among other reasons. Our findings suggest that different sub-groups of perpetrators may have different roots or facilitators underlying their SV, calling for varied and holistic prevention methods (Schneider & Hirsch, 2020), targeting both the peer groups and adults. For example, universal interventions could target well-connected individuals who have high social capital, and thus may be able to widely disseminate intervention messages and change social norms, although care must be taken as these same students may be perpetuating norms of sexual harassment.

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Declarations

Ethics Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the University of Florida (#2016-U-0436), the University of North Carolina at Chapel Hill (#19–1954), and the University of Rochester (RSRB #32551).

Consent to Participate Parents received study information with waiver of documentation of parent permission. Informed assent/consent was obtained from all participating students and school staff.

Conflict of Interest The authors declare no competing interests.

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