Dynamic Social Networks and Physical Aggression: The Moderating Role of Gender and Social Status Among Peers

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Abstract:

We examined three interrelated questions: (1) Who selects physically aggressive friends? (2) Are physically aggressive adolescents influential? and (3) Who is susceptible to influence from these friends? Using stochastic actor-based modeling, we tested our hypotheses using a sample of 480 adolescents (ages 11–13) who were followed across four assessments (fall and spring of 6th and 7th grade). After controlling for other factors that drive network and behavioral dynamics, we found that physically aggressive adolescents were attractive as friends, physically aggressive adolescents and girls were more likely to select physically aggressive friends, and peer-rejected adolescents were less likely to select physically aggressive friends. There was an overall peer influence effect, but gender and social status were not significant moderators of influence.

Keywords: peer influence | adolescents | aggression | friendship | gender

Article:

Early researchers often assumed that physically aggressive adolescents had few friends and that adolescents with physically aggressive friends would become more aggressive, but empirical evidence does not support these assumptions. Instead, there is consistent evidence that physically aggressive youth have friends (e.g., Cairns, Cairns, Neckerman, Gest, & Gariepy, 1988). By contrast, there is less consistent evidence that physically aggressive adolescents influence their peers: some studies find evidence of influence for physical aggression and other antisocial behaviors (e.g., Boivin & Vitaro, 1995; Dijkstra et al., 2010b; Molano, Jones, Brown, & Aber, 2013; Mrug, Hoza, & Bukowski,2004) but other studies find no evidence of influence (e.g., Dijkstra, Berger, & Lindenberg, 2011; Knecht, Snijders, Baerveldt, Steglich, & Raub, 2010; Sijtsema et al., 2010). In light of this conflicting evidence, several questions emerge.

First, given that physically aggressive youth have friends, who are these friends? Second, do adolescents with physically aggressive friends become more aggressive or is "influence" confounded with factors such as network structure, similarity-based selection, and shared context? Finally, are some adolescents more susceptible to influence from their physically aggressive friends?

Who Selects Physically Aggressive Friends?

Aggressive Adolescents May Select Aggressive Friends

When researchers first argued that physically aggressive youth had friends, they noted that these friends were often aggressive (Cairns et al.,1988). Such *similarity-based selection* may occur if physically aggressive adolescents actively select each other as friends. This possibility is consistent with interpersonal attraction theories (e.g., Byrne & Griffitt, 1973), which argue that people prefer balanced relationships that provide positive reinforcement. Because physically aggressive youth often direct their aggression outside of their friendship (e.g., Grotpeter & Crick, 1996) and deviant friends often positively reinforce deviant behavior (e.g., Dishion, Spracklen, Andrews, & Patterson, 1996), physically aggressive adolescents may be drawn to each other as friends.

Alternatively, similarity in physical aggression could reflect default selection, shared contextual factors (e.g., Cohen-Cole & Fletcher, 2008), or similarity-based selection in other domains. For example, rejected youth, who are often aggressive, may have few options but to befriend each other (Bierman, 2004). Aggressive adolescents may also be assigned to the same academic tracks, limiting their opportunities to select nonaggressive friends. In addition, aggression similarity may reflect gender similarity because most early adolescent friendships are with same-gender peers (Maccoby, 1998) and boys are more physically aggressive than girls (Card, Stucky, Sawalani, & Little, 2008).

We expected that rejection, homeroom, and gender similarity were unlikely to fully explain why physically aggressive adolescents become friends. Although rejected adolescents typically affiliate with rejected peers (e.g., Light & Dishion, 2007), not all aggressive youth are rejected and some are even popular (e.g., LaFontana & Cillessen, 2002). In addition, adolescents in middle school have increased opportunities to interact with peers in other homerooms and form cross-gender friendships. Therefore, *our first hypothesis was that physically aggressive youth would actively select other physically aggressive peers as friends*.

Physically Aggressive Adolescents May Be Generally Attractive as Friends

In contrast to the peer exclusion assumption, some physically aggressive adolescents are central or popular members of their peer networks (e.g., Farmer & Rodkin, 1996; LaFontana & Cillessen, 2002; Prinstein & Cillessen, 2003; Rodkin, Farmer, Pearl, & Van Acker, 2006). These

results suggest that physically aggressive adolescents may be appealing as friends to a broad spectrum of students.

Aggressive adolescents may be appealing as friends because they have access to social resources (Hawley, Little, & Pasupathi, 2002). For instance, "bistrategic controllers" are simultaneously aggressive and liked (Hawley, 2003) and although their friendships are high on conflict they are also high on intimacy and fun (Hawley, Little, & Card, 2007). In addition, Moffitt (1993) argues that antisocial adolescents may be appealing as friends because their peers may interpret their defiance of adult rules as evidence that they have overcome the "maturity gap" (i.e., the gap between reaching biological maturity and assuming adult roles). Therefore, our *second hypothesis was that physically aggressive adolescents would be selected as friends more often than their nonaggressive peers*.

Low-Status Adolescents May Be More Likely to Select Physically Aggressive Friends

Peer-rejected youth often have few friends (Deptula & Cohen, 2004) and youth who are rejected as children often become friends with delinquent peers in adolescence (Dishion, Patterson, Stoolmiller, & Skinner, 1991). Therefore, rejected youth may befriend popular (and potentially aggressive) peers to raise their own social status (Dijkstra, Cillessen, & Borch, 2013; Dijkstra, Cillessen, Lindenberg, & Veenstra,2010a). Alternatively, rejected, aggressive youth may lack the social skills needed to develop friendships with prosocial peers (Bierman,2004) and form relationships with other rejected, aggressive peers by default. By contrast, peer-accepted adolescents do not need to court popular, aggressive peers to increase their own status and may avoid friendships with lower status, aggressive peers. Thus, *our third hypothesis was that adolescents with lower social status (i.e., higher peer rejection; lower peer acceptance) would be more likely to select physically aggressive friends*.

Girls May Be More Likely to Select Physically Aggressive Friends

Early adolescent networks are largely segregated by gender (Maccoby, 1998). Within these segregated networks, physical aggression is less normative for girls (Card et al., 2008), girls report more intimacy (Rose & Rudolph, 2006), and girls who typically affiliate with groups that are high in physical aggression have lower social preference and self-worth than other girls (Rulison, Gest, Loken, & Welsh, 2010). Thus, girls may perceive few personal or social rewards of relationships with aggressive peers and avoid selecting them as friends.

Several studies, however, suggest that girls may be *more* likely to select aggressive boys as friends during early adolescence (e.g., Bukowski, Sippola, & Newcomb, 2000). For example, Rodkin et al. (2006) found that although few girls named any boys as "cool," those who did were more likely to nominate "tough" (physically aggressive-popular) boys than "model" (nonaggressive popular) boys; fewer boys made cross-gender nominations and among those who did, there was no preference for tough girls. Thus, *our fourth hypothesis was that after*

controlling for adolescents' preference for same-gender friends girls would be more likely to select physically aggressive friends.

Are Physically Aggressive Friends Influential?

Once high-risk adolescents are excluded by their prosocial peers, they may befriend each other and their antisocial behavior may escalate (Dishion, Patterson, & Griesler, 1994). Empirical studies provide mixed support for this confluence hypothesis. Early studies frequently used methodological strategies that overestimated the strength of peer influence (Veenstra, Dijkstra, Steglich, & Van Zalk, 2013). Still, some studies using improved methodological designs have found that youth with physically aggressive friends often become more aggressive (Molano et al., 2013). Other studies, however, have found no evidence of influence with respect to physical aggression (e.g., Dijkstra et al.,2011; Sijtsema et al., 2010).

Theoretically, there are several reasons to expect adolescents to be influenced by their physically aggressive peers. Building on social learning theories (e.g., Bandura, 1978), which argue that aggression is learned through modeling and reinforcement, Brechwald and Prinstein (2011) describe several mechanisms that facilitate influence. First, adolescents engage in behaviors linked to higher social status. Because physically aggressive adolescents are often popular (e.g., LaFontana & Cillessen, 2002) and have access to social resources (e.g., Hawley et al., 2007), adolescents may imitate their friends' aggression to improve their status. Second, adolescents engage in behaviors that match the norms of their social context. Adolescents with aggressive friends may perceive aggression as normative and become more aggressive. Third, adolescents engage in behaviors that are reinforced. Deviant friends often reinforce antisocial behavior, which can lead deviant behavior to escalate (Dishion et al., 1996). For example, Salmivalli, Huttunen, and Lagerspetz (1997) found that bullies often belonged to groups with peers who provide implicit (e.g., laughing) and explicit (e.g., joining in the bullying) support for bullying. This support could in turn lead aggressive behaviors to escalate. Thus, *our fifth hypothesis was that adolescents with physically aggressive friends would become more physically aggressive*.

Who is Susceptible to Influence from Physically Aggressive Friends?

Given that evidence of influence is not consistent across studies, it is important to identify the conditions under which it occurs. Below, we identify several potential moderators of aggressive peer influence.

Low-Status Adolescents May Be More Susceptible to Influence From Physically Aggressive Friends

Bagwell, Coie, Terry, and Lochman (2000) speculated that because rejected youth are on the periphery of the peer network, they may conform to group norms to gain entry to a group or maintain their friendships. If so, then rejected adolescents with aggressive friends may be more likely than other youth to become aggressive. Rejected youth may also receive little attention for

prosocial behavior, so they may behave aggressively to secure social reinforcement (Snyder et al., 2010). Conversely, peer-accepted adolescents are well integrated into their networks (e.g., Gest, Graham-Bermann, & Hartup, 2001) so they may not feel pressure to conform to their friends' behaviors. Although they did not look at susceptibility to influence per se, Cillessen and Mayeux (2004) did not find a link between sociometric popularity and later physical aggression. We interpret this lack of a relationship as evidence that peer-accepted adolescents may be less susceptible to influence from their physically aggressive friends. Based on these results, our *sixth hypothesis was that adolescents with lower social status (i.e., higher peer rejection; lower peer acceptance), would be more susceptible to influence from their physically aggressive friends*.

Girls May Be More Susceptible to Influence From Physically Aggressive Friends

Because physical aggression is less normative among girls than boys, girls with aggressive friends may be more vulnerable to influence from their friends. Consistent with this expectation, one study found that young girls (but not boys) who spent more time with externalizing peers became more aggressive (Hanish, Martin, Fabes, Leonard, & Herzog, 2005). The authors speculated that because exposure to externalizing peers was not normative for girls, these relationships were more salient and thus more influential. Therefore, *our seventh hypothesis was that girls would be more susceptible to influence from their physically aggressive friends*.

Present Study

Using data from a longitudinal study of early adolescents, we examine three primary research questions: (1) Who selects physically aggressive friends? (2) Are physically aggressive adolescents influential? and (3) Who is susceptible to influence from their physically aggressive friends? We extend previous research in four ways. First, much of the past research that informed our hypotheses focused either on physical aggression during childhood or on antisocial behavior more broadly. We test whether these same findings hold for physical aggression during adolescence. Second, we test our hypotheses within a single model using stochastic actor-based modeling (Snijders, van de Bunt, & Steglich, 2010; Steglich, Snijders, & Pearson, 2010), which allows us to develop a more complete understanding of how physical aggression and friendships co-evolve during early adolescence. Third, most research on selection has focused on *similarity-based selection*, but we also test moderators of *alter selection* to determine whether some nonaggressive adolescents are more likely than others to select physically aggressive friends. Finally, we test gender and social status as moderators of alter selection and influence.

Method

Procedures

We used data from the 6th and 7th grade assessments of a cohort-sequential longitudinal study. Students in three consecutive cohorts at a single middle school completed surveys in October and May each year, when they were approximately 11–13 years old. Students in each cohort

participated in different school years between 2002 and 2006 (e.g., students in Cohort 1 participated in October and May of the 2002–2003 and 2003–2004 school years). At each assessment, research assistants obtained peer nominations and self-reports through a 45-min group-administered survey. Teachers left the room while students completed the survey. The study used passive consent: youth participated only if they assented and if their parents did not return a form exempting them from the study. All study protocols were approved by the Penn State Institutional Review Board.

Participants

Participants were 480 students (45.6% girls) in a small, rural school district in the United States. Of these students, 79% (n = 380) participated at all four assessments, 17% (n = 81) participated at only 2–3 assessments, and 4% (n = 19) participated at only one assessment. At each assessment, 93%–94% of enrolled students completed the survey. Students were divided roughly equally across all three cohorts (n = 149, 171, and 160). The racial composition of the sample (99% White) reflected the community demographics. The district had similar achievement scores, but above average poverty and dropout rates compared with districts in the rest of the state. All 6th through 8th grade students in the district attended a single middle school. In 6th grade, youth switched teachers for each subject but remained with peers from their homeroom class for most of the day. In 7th grade, youth switched peers and teachers for each subject.

Measures

Friendships

The surveys included rosters of all 6th or 7th grade students and asked students to "List the names of friends you have in your grade." There was enough space for students to list 10 names, but the instructions indicated that students could name as many friends as they wanted. We provide the network characteristics at each assessment in Table 1. We used grade-wide peer nominations because adolescents have more opportunities to interact with peers outside of the classroom context in middle school. In the fall and spring of 6th grade, 59% and 48% of students' friendship nominations were to peers outside of their homeroom. In 7th grade, when students switched classes throughout the day, the percentage of outside-of-class friendship nominations increased to 79% (both fall and spring).

Table 1. Description of the Sample and the Variables per Observation Moment (Left) and Longitudinal Transitions Between Observation Moments (Right)

	Fall 6th grade: T1	**Spring 6th grade: T2**	**Fall 7th grade: T3**	**Spring 7th grade: T4**		**T1–T2**	**T2–T3**	**T3–T4**

Cohort size	450	445	454	448	Number leavers	15	11	12
Respondents missing	15	11	16	14	Number joiners	10	20	6
Percent females	44.9%	46.5%	46.5%	46.0%	Number stayers	435	434	442
Friendship					*Friendship change*			
Average outdegree	8.42	7.54	8.37	8.11	Distance	3,290	3,532	3,456
SD outdegree	3.71	4.20	4.37	4.02	Jaccard index	33.6%	28.2%	34.5%
SD indegree	5.11	4.73	5.11	5.01	*Physical aggression change*			
Density	1.8%	1.6%	1.7%	1.7%	Percent increased actors	9.3%	12.5%	8.1%
Reciprocity	44.4%	47.0%	45.3%	45.7%	Percent decreased actors	10.5%	10.6%	9.6%
Physical aggression					Percent stable actors	80.2%	76.9%	82.3%
M	1.24	1.30	1.18	1.28				
SD	3.37	3.67	3.68	3.72				
Min	0	0	0	0				
Max	36	44.5	47.5	47				
Peer rejection (liked least nominations)								
M	2.25	2.30	2.27	2.48				
SD	3.21	3.96	4.75	4.85				

Min	0	0	0	0				
Max	30	39	59	67				
Peer acceptance (liked most nominations)								
M	4.05	3.72	4.05	4.13				
SD	3.02	2.84	3.5	3.39				
Min	0	0	0	0				
Max	16	15	20	20				

Physical aggression

Students then nominated peers in their grade who "start fights" and "hit or pick on others." The number of times students were named for each item was highly correlated within assessment (median $r = .93$), so we averaged the number of nominations students received on each of the two items and divided it by the number of students in the cohort who made nominations at that assessment. On average, students received fewer than two nominations on either physical aggression item, but there was considerable variation across students. We created a three-category behavior variable by first standardizing the aggression scores within cohort then recoding *Z* scores below 0 as 1, *Z* scores between 0 and +1 as 2, and *Z* scores above +1 as 3. We used only three categories for aggression to ensure that we captured only meaningful changes in physical aggression. Aggression scores were skewed: 74%–79% of the students had scores of 1, 14%–19% had scores of 2, and the rest (6%–7%) had scores of 3.

Social status

Students also named peers in their grade whom they liked most (peer acceptance) and liked least (peer rejection). Table 1 gives the raw scores for number of liked most and liked least nominations received. These nominations were highly skewed, so we used the square root of the raw number of nominations in our analyses.

Analytic Plan

We estimated a series of stochastic actor-based models using the Simulation Investigation for Empirical Network Analyses (RSiena version 1.1-219) software program (Ripley, Snijders, & Preciado, 2012). We ran preliminary models separately by cohort but results were consistent across cohorts. Therefore, to gain power for testing interaction effects, we combined all three cohorts to estimate models with parameters constrained to be equal across cohorts (although we allowed network and behavioral rate parameters to vary across cohorts). Between-cohort

friendship ties were fixed at 0 such that friendships between students in different cohorts were not allowed. Missing data due to nonresponse (i.e., students were enrolled at that wave, but did not name any friends because they were absent or exempt) were handled within RSiena (Huisman & Steglich, 2008). Missing data that occurred when students had left or not yet joined the network were modeled as exogenous events (Huisman & Snijders, 2003). Specifically, we assumed that changes between fall and spring assessments occurred during winter break and that changes between spring and fall assessments occurred at the end of the school year.

Results

Table 2 provides the bivariate correlations among physical aggression, peer rejection, and peer acceptance at each assessment. These measures exhibited considerable stability across assessments. There were moderate positive correlations between peer rejection and physical aggression and small negative correlations between peer acceptance and peer rejection. Peer acceptance was generally uncorrelated with physical aggression.

Table 2. Bivariate Correlations Among Physical Aggression, Peer Rejection, and Peer Acceptance

	Physical aggression				**Peer rejection (liked least)**				**Peer acceptance (liked most)**			
	Fall 6th	**Sp. 6th**	**Fall 7th**	**Sp. 7th**	**Fall 6th**	**Sp. 6th**	**Fall 7th**	**Sp. 7th**	**Fall 6th**	**Sp. 6th**	**Fall 7th**	**Sp. 7th**
Physical aggression[a]—fall 6th grade	1.00											
Physical aggression—spring 6th grade	0.70	1.00										
Physical aggression—fall 7th grade	*0.56*	*0.57*	1.00									
Physical aggression—spring 7th grade	*0.54*	*0.56*	*0.69*	1.00								
Peer rejection[b] (liked	*0.4*	*0.4*	*0.3*	*0.3*	1.00							

least)—fall 6th grade	*6*	*1*	*8*	*4*								
Peer rejection (liked least)—spring 6th grade	*0.37*	*0.47*	*0.35*	*0.29*	*0.66*	1.00						
Peer rejection (liked least)—fall 7th grade	*0.37*	*0.44*	*0.50*	*0.47*	*0.62*	*0.71*	1.00					
Peer rejection (liked least)—spring 7th grade	*0.30*	*0.35*	*0.41*	*0.47*	*0.58*	*0.63*	*0.72*	1.00				
Peer acceptance[c] (liked most)—fall 6th grade	*0.11*	0.09	0.05	0.01	*−0.11*	*−0.16*	*−0.17*	*−0.22*	1.00			
Peer acceptance (liked most)—spring 6th grade	*0.12*	0.04	0.05	0.07	*−0.19*	*−0.22*	*−0.22*	*−0.26*	*0.61*	1.00		
Peer acceptance (liked most)—fall 7th grade	0.05	0.04	0.01	0.05	*−0.16*	*−0.21*	*−0.20*	*−0.21*	*0.62*	*0.63*	1.00	
Peer acceptance (liked most)—spring 7th grade	*0.10*	0.07	0.04	0.06	*−0.12*	*−0.15*	*−0.14*	*−0.22*	*0.60*	*0.60*	*0.69*	1.00

[a] *Note*. Physical aggression is the 3-category behavioral variable based on peer nominations. [b] Peer rejection = square root of liked least nominations. [c] Peer acceptance = square root of liked most nominations. All italicized correlations are significant, $p < .05$.

The first 3 columns of Table 3 provide the results from a baseline model with no interaction terms. The density of friendship ties was low (negative outdegree). Adolescents were more likely to befriend peers who named them as a friend (positive reciprocity), peers who were friends of friends (positive transitive triplets), and peers who made similar nominations as they did (positive balance). The friendship network also exhibited local hierarchy (negative three-cycles). Although the indegree popularity alter effect was significant in initial models, it was not significant once we added peer acceptance and peer rejection to the model.

Table 3. Results From SIENA Analyses

Model parameter	**Baseline model**			**Final model**		
	P.E.	***SE***	***p*-value**	**P.E.**	***SE***	***p*-value**
Friendship dynamics						
Effects of network structure						
Outdegree	−2.20	0.06	<.001	−2.20	0.06	<.001
Reciprocity	1.37	0.04	<.001	1.36	0.03	<.001
Transitive triplets	0.21	0.01	<.001	0.21	0.01	<.001
Three cycles (antihierarchy)	−0.16	0.01	<.001	−0.16	0.01	<.001
Balance	0.03	0.00	<.001	0.03	0.00	<.001
Indegree popularity alter (sqrt)	0.00	0.02	.832	−0.01	0.02	.650
Effects of covariates						
Peer rejection ego	0.01	0.01	.508	0.01	0.01	.378
Peer rejection alter	−0.08	0.01	<.001	−0.09	0.01	<.001
Similar peer rejection	0.36	0.09	<.001	0.43	0.11	<.001
Peer acceptance ego	−0.14	0.01	<.001	−0.14	0.01	<.001
Peer acceptance alter	0.11	0.02	<.001	0.11	0.02	<.001
Similar peer acceptance	0.45	0.05	<.001	0.44	0.06	<.001
Male ego	−0.16	0.02	<.001	−0.15	0.03	<.001
Male alter	0.03	0.02	.186	0.02	0.02	.446
Same gender	0.40	0.02	<.001	0.42	0.03	<.001
School transition ego (6th–7th grade)	0.07	0.03	.020	0.07	0.02	.004
Same homeroom	0.27	0.02	<.001	0.27	0.02	<.001
Effects of physical aggression						

Physical aggression ego	0.09	0.04	.028	0.13	0.04	.002
Physical aggression alter	0.16	0.04	<.001	0.21	0.04	<.001
Similar physical aggression	0.11	0.07	.140	0.24	0.09	.006
Moderators of aggressive alter selection						
Peer rejection ego × physical agg alter				−0.06	0.03	.048
Peer acceptance ego × physical agg alter				0.00	0.03	.899
Gender ego x physical agg alter				−0.22	0.05	<.001
Physical aggression dynamics						
Shape effects						
Linear shape	−2.17	0.19	<.001	−2.21	0.19	<.001
Quadratic shape	0.65	0.19	<.001	0.60	0.19	.002
Effects of individual covariates						
Peer rejection	0.45	0.10	<.001	0.55	0.13	<.001
Peer acceptance	0.23	0.09	.012	0.39	0.21	.070
Male	0.31	0.20	.113	0.50	0.28	.074
Effects of friends' behaviors (influence)						
Physical aggression average alter	1.56	0.47	<.001	2.02	0.67	.003
Moderators of influence						
Peer rejection × physical agg average alter				−0.50	0.68	.460
Peer acceptance × physical agg average alter				−0.85	0.88	.330
Male × physical agg average alter				−0.51	1.19	.668

Note. P.E. = parameter estimate. *SE* = standard error. Rate parameters were allowed to vary across cohorts, but are not reported in the table. The network rate parameters were: Cohort 1 = 18.7, 40.9, 18.0; Cohort 2 = 17.2, 23.2, 18.9; Cohort 3 = 23.6, 34.5, 21.4. The behavior network parameters were: Cohort 1 = 1.4, 1.7, 0.9; Cohort 2 = 1.4, 3.0, 1.5; Cohort 3 = 2.0, 4.2, 2.2.

In terms of covariates, students who had higher peer rejection did not differ from other students in the number of friendship nominations they made (nonsignificant peer rejection ego) but they *received* fewer friendship nominations (negative peer rejected alter) than other students. By contrast, students who had higher peer acceptance named fewer friends (negative peer acceptance ego) and received more friendship nominations (positive peer acceptance alter) than other students. There was significant similarity selection based on peer rejection (positive peer rejection similarity) and peer acceptance (positive peer acceptance similarity). Boys named fewer friends than girls (negative male ego), but there were no gender differences in the number of friendship nominations received (nonsignificant male alter). Students were more likely to name same-gender friends (positive same gender effect) and peers who were in the same homeroom as they were (positive same homeroom effect). In addition, the school transition ego effect indicated that students named more friends during the transition period from 6th to 7th grade.

In terms of behavior dynamics, there was a general pull toward lower physical aggression (negative linear effect of physical aggression), but this effect was weaker for more aggressive youth, indicating polarization (positive quadratic effect of physical aggression). Peer rejection and peer acceptance both significantly and positively predicted physical aggression.

Who Selects Physically Aggressive Peers as Friends?

H1: Other physically aggressive youth

In the baseline model, the physical aggression similarity-based selection effect was positive, but not significant. In the final model, however, this effect became stronger and significant, indicating that physically aggressive adolescents selected friends who were similarly aggressive.

H2: Physically aggressive adolescents are generally attractive as friends

Consistent with our hypothesis, physically aggressive students received more friendship nominations than other students (positive physical aggression alter effect).

H3: Low-status adolescents

Contrary to expectation, rejected adolescents were *less* likely to select physically aggressive friends (*negative* peer rejection ego by physical aggression alter interaction), whereas well accepted adolescents were neither more or less likely than other youth to select physically aggressive friends (nonsignificant peer acceptance ego by physical aggression alter interaction).

H4: Girls

Consistent with our hypothesis, girls were significantly more likely than boys to select physically aggressive friends (negative gender ego by physical aggression alter interaction). To probe this interaction, we created ego-alter selection tables (see Ripley et al., 2012 for a more detailed description of how these tables are created). These tables estimate how gender and physical

aggression contribute to the log odds that a friendship tie will form or dissolve (all else being equal). Positive values indicate an increase in the log odds of a friendship tie and negative values indicate a decrease in the log odds of a friendship tie.

To facilitate interpretation, we provide select values from the ego-alter selection tables in Figure 1. All of the values in Figure 1a (same-gender friendship nominations) are positive, reflecting the strong preference for same-gender peers. Notably, girls (regardless of their own aggression) are more likely to befriend high aggressive rather than low aggressive peers. High aggressive girls are particularly likely to befriend other high aggressive girls, reflecting the combined effect of a general pull toward aggressive peers (positive aggressive alter) and a preference for similarly aggressive peers (positive aggression similarly selection). By contrast, low aggressive boys do not strongly prefer either low or high aggressive friends. The most striking results are for other gender nominations (Figure 1b): although adolescents generally do not prefer other gender peers (most values are negative), the values for befriending high aggressive peers are *positive* for girls. Overall, girls are more likely than boys to make other gender nominations, and when they do, their preference is for high aggressive boys.

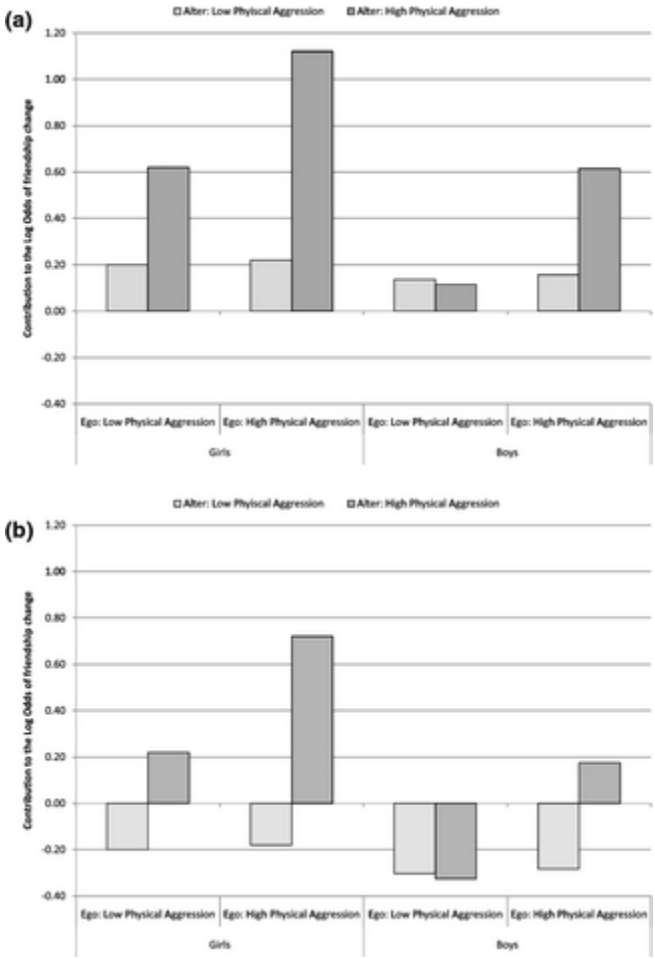

Figure 1. Values indicate the contribution of physical aggression and gender to the log odds that same gender (a) and other gender (b) friendship ties will change (see Ripley et al., 2012, for a description of how to obtain these values). We calculated the values shown based on different combinations of gender ego and alter (0 = girls, 1 = boys) and physical aggression ego and alter (1 = low physical aggression, 3 = high physical aggression) using seven parameters from the final model: male ego, male alter, same gender, physical aggression ego, physical aggression alter, physical aggression similarity, and Gender Ego × Physical Aggression Alter.

It is useful to consider these results in the context of the raw nomination data. Consistent with our actor-based modeling results, girls were more likely than boys to name aggressive other gender peers as friends: 8% of girls' nominations were to aggressive boys, whereas only 3% of boys' nominations were to aggressive girls. Within gender, however, girls named fewer aggressive peers: 14% of girls' nominations were to aggressive girls, whereas 24% of boys' friendship nominations were to aggressive boys. Notably, the results from our actor-based model indicate the likelihood of selecting an aggressive peer, *all else being equal*. Therefore, even though girls may prefer physically aggressive girls, these girls may be less attractive friends for other reasons (e.g., they may have lower peer acceptance), which may in turn limit the number of friendship nominations that they receive from other girls.

Are Adolescents Influenced by Their Physically Aggressive Friends?

H5: Adolescents with physically aggressive friends will become more physically aggressive

Consistent with our hypothesis, adolescents who had physically aggressive friends became more physically aggressive over time (positive physical aggression average alter).

Who Is Susceptible to Influence From Physically Aggressive Friends?

H6: Low-status adolescents

Contrary to expectation, social status did not moderate peer influence (nonsignificant peer rejection by physical aggression average alter and peer acceptance by physical aggression average alter interactions).

H7: Girls

Contrary to expectation, girls were not more susceptible to peer influence than were boys (nonsignificant male by physical aggression average alter interaction).

Discussion

In contrast to early assumptions about the peer experiences of aggressive youth, research has documented that physically aggressive adolescents are integral members of their peer networks (Cairns et al., 1988). This research prompted us to ask who selects physically aggressive peers as friends and whether some adolescents are particularly susceptible to influence from their

physically aggressive friends. After controlling for several other factors that drive network and behavioral dynamics, we found that physically aggressive adolescents were attractive as friends, physically aggressive adolescents and girls were more likely to select aggressive friends, and peer-rejected adolescents were *less* likely to select aggressive friends. Adolescents who had physically aggressive friends became more physically aggressive over time, but neither social status nor gender moderated this peer influence effect.

Who Selects Physically Aggressive Friends?

Our final model indicated that physically aggressive adolescents became friends through an active selection process rather than as a result of contextual effects or selection based on gender or social status. Notably, other studies that used actor-based modeling (e.g., Dijkstra et al.,2011) have not found evidence of selection based on physical aggression. These discrepancies may be due to differences in the samples (i.e., urban schools in Chile vs. a rural school district in the United States) or data collection strategies (i.e., classroom-based vs. grade-wide nominations). The discrepancies also could reflect different modeling strategies. Physical aggression–based selection was not significant in our baseline model, which was similar to the models used in past studies. We found evidence of physical aggression–based selection only after we accounted for the tendency for some youth to befriend peers who are *dissimilar* with respect to aggression (e.g., girls' tendency to select physically aggressive friends). These results highlight the importance of testing a range of social processes within a single model to fully capture the complex social dynamics that occur within adolescent peer friendship networks.

We also found evidence that factors other than aggression similarity drive selection of aggressive peers. Specifically, we found that physically aggressive adolescents were attractive as friends, even after controlling for the tendency for aggressive adolescents to select aggressive friends. This finding is consistent with other studies that have found that some physically aggressive adolescents are viewed as "popular" (e.g., LaFontana & Cillessen, 2002). This popularity may indicate that physically aggressive adolescents are perceived as having access to social resources (e.g., Hawley, 2003), as fun to be around (Hawley et al., 2007), or as having overcome the "maturity gap" (Moffitt, 1993,2006) and thus are appealing as friends.

In addition, we found that girls were *more* likely than boys to select physically aggressive friends after controlling for everything else in the model. When girls made cross-gender nominations, they were especially likely to select aggressive boys as friends, whereas only highly aggressive boys preferred aggressive girls as friends. These results are consistent with other studies which found that early adolescent girls were attracted to physically aggressive boys (Bukowski et al., 2000; Rodkin et al., 2006). Bukowski et al. (2000) suggested that girls (especially early maturing girls) may be particularly vulnerable to the "maturity gap" (Moffitt, 1993) during early adolescence. Physically mature boys—who may also be physically aggressive—may appear to have achieved adult status, thus making them more appealing as friends. Future research should test whether this attraction is even stronger for other forms of deviant behavior that may be more

closely linked to apparent adult status (e.g., substance use). In addition, future research should clarify whether the girls who befriend physically aggressive boys are at higher risk of later problems (e.g., early initiation of sex, substance use).

In terms of social status, we found that peer-rejected adolescents were excluded from normative peer relationships: they received fewer friendship nominations and they generally selected other rejected peers as friends. By contrast, peer-accepted adolescents received more friendship nominations, were more selective in their own friendship nominations, and generally befriended other peer-accepted adolescents. Contrary to expectations, peer-accepted adolescents were no more or less likely to select physically aggressive peers as friends whereas peer-rejected youth were *less* likely to select physically aggressive friends. These results do not negate the possibility that rejected adolescents become friends with aggressive peers. Instead, when this occurs, it is likely the result of a default selection process (i.e., rejected youth select rejected friends who are also aggressive) rather than an active selection process (i.e., rejected youth select higher status aggressive peers as friends to raise their own status). It is also possible that rejected adolescents do not select aggressive peers as friends because they have been victimized by them in the past or because they view higher status aggressive peers as out of their league.

Are Physically Aggressive Adolescents Influential?

We found that adolescents with physically aggressive friends became more physically aggressive. This finding is consistent with social learning theories of aggression (e.g., Bandura, 1978) and some studies that have found evidence of peer influence (e.g., Boivin & Vitaro,1995; Molano et al., 2013; Mrug et al., 2004). At the same time, this finding contradicts a few studies that have not found evidence of peer influence for physical aggression (e.g., Dijkstra et al., 2011; Sijtsema et al., 2010). As noted, these discrepancies may be due to study differences, but they could also indicate that peer influence occurs within some contexts but not others. Consistent with this possibility, evidence of peer influence can be mixed even within the same study. Light and Dishion (2007) found evidence of influence with respect to antisocial behavior in only one out of eight schools (the influence effect was positive but nonsignificant in five other schools). Therefore, certain contextual factors may promote or hinder peer influence. For example, some schools may have policies that limit opportunities for peer influence (e.g., more adult supervision in unstructured settings; separating aggressive adolescents into different classrooms). Future studies should collect peer network data from a larger number of schools to determine what types of settings facilitate peer influence.

Who Is Susceptible to Influence From Physically Aggressive Friends?

In this study, neither social status nor gender significantly impacted an adolescent's susceptibility to influence from physically aggressive friends. Taken together with our selection analyses, our results suggest that some adolescents are more likely to form friendships with physically aggressive peers, but once these friendships form, different adolescents are equally susceptible to

influence from these peers. Future studies should reexamine whether gender or social status moderate peer influence within larger samples and within different contexts to determine whether they are stronger under different conditions or during different developmental periods. Future studies should also consider whether some peers are particularly influential. For example, because some physically aggressive adolescents are disliked, their friends may be unlikely to imitate their behavior, but popular aggressive adolescents may be influential. The potential for peers to be differentially influential is particularly important for adolescents whose friends exhibit different levels of aggression. Rather than being pulled toward the average aggression across their friends, adolescents with mixed aggression friendships may be pulled more strongly toward the behavior of their high-status peers.

Limitations and Future Directions

Several design limitations should be noted. First, we focused on students who attended a single school in a rural, working-class town, so our results can only be generalized to students in similar communities. One advantage of this design is that it reduced the likelihood that similarity-based selection was solely an artifact of shared context (i.e., living in the same community or attending the same school). Unfortunately, we did not have information about the specific neighborhoods where students lived, so we were unable to control for the full gamut of contextual effects. Furthermore, because selection and socialization are not ubiquitous processes (e.g., Light & Dishion, 2007) these effects, as well as any moderating effects, may be stronger or weaker in other settings. Future studies should test our hypotheses in other settings and collect information about a wider array of contextual effects that may impact network dynamics.

Second, our study included only a measure of physical aggression, but there is some evidence that selection and influence processes may vary depending on the form and function of the aggression (e.g., Dijkstra et al., 2011; Sijtsema et al., 2010). Therefore, even though physical and relational aggression are often highly correlated (e.g., Cillessen & Mayeux, 2004), the results from our study cannot be generalized to relational aggression. Furthermore, as relational aggression becomes increasingly linked to social status during adolescence (e.g., Cillessen & Mayeux, 2004), status may play a greater role in driving selection and influence dynamics during this developmental period. Future studies should examine whether status and gender moderate alter selection and influence with respect to relational aggression.

Third, we limited friendship nominations to same-grade peers who attended the same school as the students. Because the sample was drawn from the only middle school in a relatively isolated community, we expect that the majority of students' closest friends were in the study. Some students, however, may have friends who did not attend the same school and these community-based friendships may be particularly important for some adolescents (e.g., Kiesner, Kerr, & Stattin, 2004). Further, influence processes within cross-grade friendships may differ from influence within same-grade friendships. For example, some girls may select older, more

aggressive male friends and they may be more susceptible to influence from these older male friends.

Summary

Although early theories emphasized the unidirectional association between peers and behavior by focusing on either influence (i.e., peers cause behavior) or one particular form of selection (behavior causes youth to affiliate with peers who are similar in that behavior), later research has demonstrated that both processes shape development (Veenstra et al., 2013). The strength of these associations may vary across social contexts, relationship type, and child and peer characteristics (Brechwald & Prinstein, 2011). With the continued refinement of network models, it is becoming easier to examine different forms of selection and influence against a broader backdrop of social processes that shape adolescents' development and thus develop a more complete picture of the complex processes that constrain peer experiences and physical aggression. Future work should continue to clarify the conditions under which adolescents choose to affiliate with deviant peers and be influenced by their peers' deviant behavior.

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