POPULARITY IN FIFTH-GRADE FRIENDSHIP NETWORKS: SELECTION AND INFLUENCE PROCESSES

BY

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THESIS

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ABSTRACT

This study investigated the role of popularity in selection and influence processes in friendship networks. A longitudinal social network analysis (SIENA) was utilized to study 613 fifth grade students in 26 classrooms in two study sites. Results showed that youth chose their friends based on similarity in popularity more than similarity in aggressive or prosocial behavior. Friendship between popular-aggressive (tough) and popular-prosocial (model) youth occurred at chance levels. Early adolescents varied in their selection of tough and model youth, but influence effects were consistently significant for popular status, aggression, and prosocial behavior. Implications of susceptibility to the influence of tough and model peers is discussed, with reference to peer focused intervention programs that aim to reduce hostility in school settings.

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CHAPTER 1

INTRODUCTION

Aggressive youth are often characterized as having high levels of homophily, congregating in deviant peer groups far from the mainstream of peer social life. Missing from this portrayal, however, is a clear sense of the social relations of children who are both aggressive and popular. Do popular-aggressive youth affiliate mainly with other aggressive children, as the leaders of deviant peer groups, or are they more likely to affiliate with other, non-aggressive popular children who are leaders of the classroom peer ecology as a whole? Our interest in studying the role of popularity in friendship selection and influence stems from Farmer, Leung, Pearl, Rodkin, Cadwallader, and Van Acker's (2002) study which shows that aggressive youth in primary school (4^{th}-6^{th} grade) are dispersed across a diverse array of peer groups. Farmer et al. (2002) found that while a third of aggressive youth affiliated with aggressive peer groups, a majority of aggressive youth affiliated with nonaggressive or behaviorally mixed groups. This finding is intriguing because based on homophily theory one might expect aggressive youth to befriend other aggressive peers. It suggests that attributes other than behavioral similarity, such as perhaps peer social status (i.e., perceived popularity), helps peer group formation.

The present research expands on the Farmer et al. (2002) report, using a sample of 26 fifth-grade classrooms sampled three times (twice in fall, once in spring) over the course of an academic year. First we analyzed whether young adolescents selected their friends based on similarity in popularity more than similarity in aggressive or prosocial behaviors. If so, we then asked whether popular-aggressive (tough) and popular-prosocial (model) youth befriend one another at rates greater than chance levels. Stemming from increased work on peer influence

mechanisms associated with high social status (Brechwald & Prinstein, 2011; Cohen and Prinstein, 2006; Shi & Xie, 2011), this study examined who was the most susceptible to the influence of tough and model youth in the peer network.

CHAPTER 2

SELECTION AND INFLUENCE PROCESSES

For many decades, researchers studying friendship in children and adolescents have repeatedly observed an intriguing phenomenon: friends are remarkably similar to one another. As elaborated in Veenstra and Dijkstra (2011), similarity in friendship groups can be explained by both selection and influence processes. One well-known selection process originates from the homophily principle, which states that children sort themselves to be among similar others (Lazarsfeld & Merton, 1954; McPherson, Smith-Lovin, & Cook, 2001). Meanwhile, influence or socialization processes refer to children's tendency to change their behavior in accordance with their friends' characteristics. Current advances in social network analysis, such as SIENA, have enabled researchers to begin to disentangle selection and influence (e.g., Knecht, Snijders, Baerveldt, Steglich, & Raub, 2010; Knecht, Burk, Weesie, & Steglich, 2011; Sijtsema, et al., 2010a; Steglich, Snijders, & Pearson, 2010), allowing us to investigate which individual characteristics contribute most to friendship formation and which characteristics are being socialized among friends.

Selection of Popular Youth

Recent examinations of peer relationships have shown that popularity is an important factor in peer group formation (Brechwald & Prinstein, 2011; Dijkstra, Berger, & Lindenberg, 2011). Selection mechanisms based on similarity in popularity may remain significant even after social network structure, gender segregation, and selection based on similarity in aggression are taken into account (Dijkstra, et al., 2011). Witvliet, Olthof, Hoeksma, Goossens, Smits, & Koot (2010) found similar evidence in which affiliated youth were more similar in terms of their status than behavior. Together, these findings inform our initial prediction that popularity is one of the

crucial aspects in determining friendship formation among youth; early adolescents might choose their friends based on similarity in popularity more than similarity in behaviors (Hypothesis 1). There are different types of popular peers, including those who are highly aggressive (tough) and those who are highly prosocial (model; see Rodkin, Farmer, Pearl, & Van-Acker, 2000). Based on previous findings that similarity in status is more important for friendship formation than similarity in behaviors (Dijkstra, et al., 2011; Witvliet, et al., 2010), it seems possible that tough and model youth might befriend one another (Hypothesis 2).

In addition to examining this possibility, the present study investigated whether aggressive, prosocial, and popular youth varied in selecting tough and model peers as their friends. The role of status in peer groups becomes especially salient when children reach adolescence (LaFontana & Cillessen, 2010). An empirical study using longitudinal social network analysis showed that young adolescents in sixth to eight grade strongly preferred popular peers as their friends, and that the more popular, the more attractive were these peers (Dijkstra, Cillessen, & Borch, 2012). Preference towards popular youth may come from the motivation to advance one's own status. After all, high status comes with the privilege to set peer norms (Dijkstra, Lindenberg, & Veenstra, 2008), to exert influence on others (Ellis & Zarbatany, 2007; Shi & Xie, 2010), and to gain access to resources (Hawley, 1999). One of the ways for youth to improve their status is by friending popular peers. Studies have shown that being a popular peer's best friend increased one's own status (Dijkstra, et al., 2010), and this was not simply due to changes in one's aggressive and prosocial behavior (Marks et al., 2012).

Of the two types of popular peers, highly aggressive youth might choose to approach tough than model peers since they value the same norms as tough individuals do (aggression); it might be easier for highly aggressive youth to build relationships with tough than model peers

with this common ground. Based on the same rationale, highly prosocial youth might select model more than tough peers as friends, while highly popular youth might equally select as friends tough, model, and popular peers who are neither aggressive nor prosocial (Hypothesis 3).

Understanding Influence of Popular Youth from Selection Dynamics

Farmer et al. (2002)'s findings indicate that peer groups are comprised of heterogeneous individuals. Some groups even consist of both tough and model youth. While much has been done to understand peer influence processes (Brechwald & Prinstein, 2011; Cohen & Prinstein, 2006; Shi & Xie, 2011), less is known regarding the influence of tough and model peers in peer groups. Considering they are both highly popular, who exerts more influence in the peer group? In other words, who is the most susceptible to the influence of tough and model youth?

In a study of socialization of physical and social aggression, Shi and Xie (2011) found that adolescents were more likely to conform to the behaviors endorsed by high status peers. An experimental study further showed that adolescents not only imitated aggressive behavior endorsed by popular peers but internalized it (Cohen & Prinstein, 2006). One possible explanation for adolescents' modeling of behavior performed by popular peers is that they are driven by a desire to obtain popular peers' approval and to be accepted. Acting in accordance with popular peers' behavior may bring adolescents closer to becoming their friends, which could be a stepping-stone towards improving their social status (Dijkstra, et al., 2010).

The consistency of influence of aggression (Dijkstra, et al., 2011; Sijtsema, et al., 2009), prosocial behavior (Barry & Wentzel, 2006; Wentzel, Barry, & Caldwell, 2004), and popularity (Dijkstra, et al., 2010; Marks et al., 2012) in previous studies suggests that youth may become more like their friends, no matter who these friends are, in terms of behaviors and status. Accordingly, peer influence seems to be affected by early adolescents' friendship selection in the

first place. Based on this rationale, the present analyses focus more on selection than influence part in the modeling. Expecting that influence effects should be significant in behavior and popularity (Hypothesis 4), the selection dynamic would indicate who might potentially be more susceptible to the influence of tough and model peers. If, as we proposed in the previous section, highly aggressive youth are more likely to select tough than model peers as friends, then they might potentially be more susceptible to the influence of popular aggressive peers. Similarly, if highly prosocial youth are more likely to select model than tough peers, then they might potentially be more susceptible to the influence of popular prosocial peers.

Present Study

In sum, the goal of our study is to examine selection and influence processes of popular youth in young adolescent friendship networks sampled three times over a school year. With regards to selection processes, we were interested in whether popularity was a driving factor in friendship formation, and if so, whether tough and model youth befriend one another at rates significantly higher than chance levels. We expected that (1) young adolescents would choose their friends based on similarity in popularity more than on similarity in aggressive or prosocial behavior, and as such (2) tough and model youth might often choose one another as friends. To understand individual differences in susceptibility to the influence of popular peers, we examined whether aggressive and prosocial youth varied in their selection of tough and model peers. We predicted that (3) highly aggressive youth, who were not necessarily popular, would find tough peers most attractive and thus, tend to select them as friends, while highly prosocial youth, who were not necessarily popular, would find model peers most attractive. Finally, we expected (4) significant influence effects of aggression, prosocial behavior, and popularity.

CHAPTER 3

METHODOLOGY

Participants

This study is part of a larger longitudinal study of teaching practices, classroom peer ecologies, and youth outcomes with two developmental components: a cross-sectional comparison between first, third, and fifth grade classrooms and three repeated assessment waves within a school year. Since the focus of the current study is on early adolescents' friendship, only data from fifth grade classrooms are included in the analyses. The surveys were conducted early in the 2nd or 3rd week of school (Time 1) to obtain a critical baseline of the classroom peer ecology. The second assessment was conducted two months later (Time 2) and the third assessment was done near the end of the school year (Time 3). The timing for data collection points were designed to appropriately model the development of peer social networks within a school year. This design is especially suitable for SIENA modeling as it will be able to capture enough changes between time points, but also enough stability to meet the assumption that changes are gradual between consecutive observations (Snijders, van de Bunt, & Steglich, 2010; Veenstra & Steglich, 2012; Veenstra, Dijkstra, Steglich, Van Zalk, 2013).

Students received parent consent at the beginning of the school year and were required to return the signed consent before participating. Students who had their parent's permission also provided a signed assent to indicate their agreement to be part of our study. Of 764 total students across two years of data collection in 34 fifth-grade classrooms in 13 schools from two study sites (Illinois/Indiana, and Pennsylvania), 585 participated in our study at Time 1, 602 at Time 2, and 591 at Time 3 (53% of boys and 47% of girls; M age = 10.71 years, SD = 0.42). The ethnic

composition of this sample was 57% European American, 26.5% African American, 6.8% Hispanic, 2.9% Asian, and 2.2% classified as "Other."

Measures

Participants were asked to nominate their classmates on a variety of behaviors and characteristics. Each peer nomination statement was followed by a list of all students' names enrolled in the classroom. Participants could circle as many names as they wanted including their own names, or skip the question if no one fit the description.

Friendship networks. Participants responded to the question, "Some kids have a number of close friends, but others have just one best friend and still others don't have a best friend. What about you? Do you have any friends? Please circle the names of your friends." On average, participants nominated 7.19 friends at Time 1, 7 at Time 2, and 7.45 at Time 3. Friendship data were converted into dichotomous adjacency matrices; cell entries were coded as one or zero, depending on the presence or absence of friendship nominations. Each data matrix represented the classroom friendship network at one observation point. Thus, there were 102 friendship networks (34 classrooms x 3 time points) with the size of these matrices varying among classrooms, ranging from 15 to 28 students. Row entries for non-participants were coded as nine so that their absences in friendship nominations could be distinguished as the results of not having the chance to provide nominations rather than not wanting to nominate anyone.

Table 1 presents descriptive statistics of classrooms' network structure included in the analyses. On average, classrooms have typical network characteristics: low density (around .40), which refers to the proportion of friendship ties, high reciprocity (.65 – .66), referring to the proportion of mutual friendship ties, and high transitivity (.70 – .87), referring to the proportion of friendship ties between friends of a friend. The low fractions of missing information (< 20%),

the small number of students leaving or joining the network, and the high number of stayers across time points indicate there are a reasonable number of stable students per classroom from whom changes could be analyzed. Stability in the data is also shown by the Jaccard indices between consecutive time points which are higher than 0.30. The Hamming distance indicates high number of changes in friendship nomination between time periods, allowing us to have a complex selection dynamic modeling in SIENA with adequate statistical power (see Snijders, et al, 2010; Veenstra & Steglich, 2012; Veenstra, et al., 2013).

Popularity. Participants responded to an item, "These are the most POPULAR kids in my class." The number of received nominations from this item was standardized within classroom to create proportion scores of peer status. These proportion scores were subsequently standardized within gender across the sample.

Aggressive behavior. Aggressive behavior measured in this study was meant to capture overall forms of aggression. It was derived from two peer nomination items at Time 1 and an additional item at both Time 2 and Time 3 (α =.91 at Time 1, α =.92 at Time 2, α = .94 at Time 3). Across all three time points, participants responded to the items, "These kids start FIGHTS," and "These kids SAY MEAN THINGS about other kids." At both Time 2 and Time 3 they responded to an additional item, "These kids MAKE FUN of people." For each item, counts of received nominations were computed and standardized within classroom to create proportion scores of aggression. These proportion scores were then standardized within gender across the sample.

Prosocial behavior. Prosocial behavior was obtained by combining two peer nomination items (α =.90, α = .80, and α = .91, at Time 1, 2, and 3, respectively): "These kids COOPERATE" and "These kids are always willing to do something NICE for somebody else." For each item,

counts of received nominations were counted and standardized within class, and subsequently standardized within gender across the sample.

In examining influence effects, popularity, aggression, and prosocial behavior were treated as dependent variables. Because SIENA requires dependent variables in discrete ordinal scales, standardized scores of these three measures were transformed to a 3-point scale, using a ±0.5 z-score as a criterion. Students who scored below or equal to – 0.5 were coded as 1 (i.e., low in popularity, aggression, or prosocial behavior), those between – 0.5 and + 0.5 were coded as 2 (i.e., average on popularity, aggression, or prosocial behavior), and those who scored above or equal to +0.5 were coded as 3 (i.e., high in popularity, aggression, or prosocial behavior). Most of the changes between time points occurred between adjacent categories. Between Time 1 to Time 2, students who changed their behaviors mostly became more popular (47 students changed from category 1 to 2), less aggressive (57 students changed from category 2 to 1), and less prosocial (57 students changed from category 3 to 2). From Time 2 to Time 3, Students became more popular (55 students from category 2 to 3), more aggressive (53 students from category 1 to 2), and more prosocial (56 students from category 2 to 3).

Table 2 presents descriptive statistics for behavior changes on all three dependent variables. The low values for distance (6.15 – 7.85), representing the number of behavioral and status changes within a period, indicate that the behavior dynamics modeling needs to be more parsimonious than the selection dynamics. The fraction of stable actors show a high proportion of students (around 70%) who do not change their behaviors or status within a period (see Veenstra & Steglich, 2012; Veenstra, et al., 2013). In separate analyses, we transformed popularity, aggression, and prosocial behavior variables to a 4-point scale using ±0.5 z-score as a

criterion (i.e., ≤ -0.5, between -0.5 and 0.0, between 0.0 and 0.5, and ≥ 0.5), and obtained similar findings as presented in the results.

Tough, model, and popular-only. Configurations of different types of popular youth were based on 0.5 z-scores as cut off points at Time 1, Time 2, and Time 3. We classified students with both popular and aggressive z-scores above 0.5 standard deviation as "tough," those with popular and prosocial z-scores above 0.5 standard deviation as "model," and those whose popularity z-scores were above 0.5 standard deviation but z-scores for both behaviors were below 0.5 standard deviation as "popular-only." Fifty four students were categorized as tough at Time 1, 70 at Time 2, and 78 at Time 3; 93 students were categorized as model at Time 1, 89 at Time 2, and 97 at Time 3; and finally 64 students were categorized as popular-only at Time 1, 64 at Time 2, and 52 at Time 3. Tough, model, and popular-only were treated as changing individual covariates in SIENA analyses, meaning that changes between time points for these variables are allowed, but not within period. For example, students classified as tough at Time 1 are assumed to stay tough for the whole first period, but they are allowed to change their profile at Time 2 (see Ripley, Snijders, & Preciado, 2011).

Procedure

At all measurement occasions, participants completed the survey as a group in their classroom during a regular class period that took approximately 45 minutes. Non-participants were given an activity sheet with a cover page that looked the same as the survey so that students would not know who participated and who did not. To protect everyone's privacy, students put standing folders around their desk to cover their responses. We also assured them that their answers would be kept confidential and that participation in the study was voluntary. They were allowed to skip questions that they found uncomfortable to answer. A graduate research

assistant read aloud instructions and questions in front of the classroom while the students followed along and responded to the questions. At least two other trained graduate or undergraduate research assistants were present in the classroom to assure privacy and to assist participants in completing the survey.

Analytic Strategy

Analyses were conducted with stochastic actor-based models to estimate co-evolution of networks and behaviors over time (Snijders, Steglich, & Schweinberger, 2007; Snijders, et al., 2010) through RSIENA version 1.1-213 (Ripley, et al., 2011). There are two major parts in the co-evolution model: selection and influence effects. In our study, selection effects represent friendship selection processes, in which all the effects estimate how individual characteristics predict friendship selection. Meanwhile, influence effects estimate changes in aggression, prosocial behavior, and popularity given the current friendship condition; hence, they denote socialization processes. Model estimation is obtained through an iterative simulation procedure following a stochastic algorithm. Changes from one observation point to another are assumed to be the results of a Markov Chain process. The Method of Moments estimation was implemented (Snijders, 2001; Snijders et al., 2007) with an unconditional simulation procedure for all the SIENA analyses.

Because the size of our classroom level network is rather small to obtain well-converged estimates, classrooms were combined into a multi-group analysis. The multi-group option binds small individual data sets into a large multi-group project, assuming that different data sets are unrelated with one another except for having the same parameter values. In other words, each classroom network is assumed to follow the same rule to evolve. We first attempted to combine all 34 classrooms, but some of the classrooms did not converge (i.e., t-statistics > 0.1) and some

others appeared to have more than 30% missing values, which was mostly due to a combination of high mobility levels between observation points and low participation rates within those classrooms. Those classrooms were eventually excluded to avoid problems in getting good estimates. As a result, we retained 26 out of 34 classrooms. Compared to classrooms included, excluded classrooms had a lower mean of popularity at Time 3 ($t(716) = 4.00$, $p < .001$), lower mean of aggression level at Time 1 ($t(721) = 2.75$, $p < .01$) and Time 3 ($t(716) = 3.18$, $p < .01$), higher mean of prosocial behavior at Time 2 ($t(180) = -2.66$, $p < .01$) but lower mean of prosocial behavior at Time 3 ($t(716) = 2.56$, $p < .05$). The final sample consisted of 613 students who had been enrolled across any time points within the 26 classrooms included for the analyses.

Model Specification

Five models were run separately to test the hypotheses. The main difference among the models is in regards to the selection effects part. Model 1 tested the first hypothesis, while Models 2-5 tested the second and third hypotheses. The same influence effects and control variables were included across all models to test the fourth hypothesis.

Control variables. To avoid biased estimation of other parameters, particularly those related to selection mechanisms, each model included four structural network effects: *Outdegree*, *Reciprocity*, *Transitive ties*, and *Balance* in all models (see Veenstra, et al., 2013, for a detailed interpretation of each of these effects). Gender segregation was also taken into account by including a *same gender* effect in the models, which expresses students' preference to be friends with same-gender peers. *Gender alter* and *Gender ego* were included to control for the effect of gender on friendship nomination activity (i.e., whether boys are more likely to send or receive friendship nominations than girls are, or vice versa).

Selection effects. Model 1 tested the first hypothesis regarding whether popularity drives friendship formation. To have reliable parameter estimates for the similarity effects, ego and alter effects for popularity, aggression, and prosociality were included in the model. Of particular interest here were the *Popular similarity*, *Aggressive similarity*, and *Prosocial similarity* effects. The inclusion of these three effects in the same model enabled us to determine homophily in one behavior while controlling for the others. If young adolescents chose their friends based on similarity in popularity more than similarity in aggressive and prosocial behavior, the popularity similarity effect should be positive and significant, with a larger parameter estimate as compared to other similarity effects in the model (Hypothesis 1).

Model 2 included ego and alter effects for tough, model, and popular-only, as well as two interaction terms. The inclusion of these three Alter effects (i.e., *Tough alter*, *Model alter*, and *Popular-Only alter*) showed youth's tendency to select tough, model, and popular-only peers as friends. The inclusion of ego effects for each type of popular youth showed differences in their tendency to send out friendship nominations. Although these effects are not directly related to our hypotheses, the inclusion of these effects is important. From a practical perspective, the inclusion of alter and ego effects allows for unbiased estimations of selection dynamics. From a theoretical perspective, the inclusion of alter effects reflects how attractive tough, model, and popular-only peers are for other youth in general. Our main interests here were the two interaction terms: *Tough ego* × *Model alter* and *Model ego* × *Tough alter*. These interactions tested the second hypothesis of whether tough and model youth chose one another as friends. The first interaction term denotes the tendency of tough youth to select model peers as friends, while the second interaction term denotes the tendency of model youth to select tough peers as

friends. If tough and model youth were friends at above chance level, both interaction terms should be positive and significant (Hypothesis 2).

Models 3 – 5 included three sets of interaction terms to examine whether different types of popular peers attracted different groups of youth (Hypothesis 3). The first set of interaction terms estimated the tendency of aggressive youth to select tough, model, or popular-only peers. These interaction terms were: *Aggressive ego* × *Tough alter*; *Aggressive ego* × *Model alter*; and *Aggressive ego* × *Popular-Only alter* (Model 3). If aggressive youth favored tough peers more than other types of popular peers, then interaction effects *Aggressive ego* × *Tough alter* should be positive and significant. Similar sets of interaction terms were included to examine the attractiveness of tough, model, and popular-only peers to prosocial (Model 4) and popular youth (Model 5). We hypothesized that parameter estimates for *Prosocial ego* × *Model alter* and all interaction terms that interacted with *Popular ego* to be positive and significant.

Influence effects. Both linear and quadratic shape effects for popularity, aggression, and prosocial behavior were included across all models. These basic shape effects give a good estimation of behavior distribution over time (see Veenstra, et al., 2013). The main effect of interest in this part of the model was the *influence effect*, which was based on the *average similarity* effect option in SIENA. This influence effect presumes changes in an individual's behavior in accordance with the average behavior endorsed by their friends. We incorporated influence effects in all models to estimate the socialization of popularity, aggressive behavior and prosocial behavior, and expected that these influence effects would be all positive and significant across models (Hypothesis 4).

CHAPTER 4

RESULTS

Descriptive Statistics

Table 3 presents correlations among the main variables from 26 classrooms included in the analyses. Correlations between popularity and aggressive behaviors appeared positive and significant at each time point ($.04 \leq r \leq .18$). Similarly, correlations between popularity and prosocial behaviors were positive and significant at each time point ($.17 \leq r \leq .32$). Thus, in our sample, both aggression and prosociality were associated with high status. In particular, prosocial behavior had stronger correlations with popularity compared to aggressive behavior (Fisher's $Z = 2.42$, $p < .05$ at Time 1, Fisher's $Z = 1.89$, $p = .06$ at Time 2, and Fisher's $Z = 2.46$, $p < .05$ at Time 3). Correlations within popularity, aggressive and prosocial behaviors are also positive and significant ($.77 \leq r \leq .88$), indicating stability of individual status and behaviors over time.

Control Variables

Table 4 presents the results of the control variables for network dynamics across models. As expected from any network in general, there was a significant negative effect for *Outdegree* across models ($-1.92 \leq$ estimate ≤ -1.97), indicating that most young adolecents are not friends with most other youth. Positive parameter values on *Reciprocity* across models ($0.50 \leq$ estimate ≤ 0.52) shows that friendships tend to be reciprocated, consistent positive *Transitive ties* ($1.41 \leq$ estimate ≤ 1.46) express the tendency for friends of friends to be considered as friends, and positive *balance* ($0.04 \leq$ estimate ≤ 0.06) indicates that youth formed friendships with those who have the same set of outgoing ties as them. In terms of gender, the positive *Same gender* parameter estimates ($0.30 \leq$ estimate ≤ 0.36) indicate that youth are more likely to select same-

gender rather than cross-gender friends. The negative *Gender alter* estimates (-0.05 ≤ estimate ≤ -0.07) and the positive *Gender ego* estimates (estimates = 0.08) together suggest that girls received fewer, but sent more friendship nominations than boys did.

Selection Effects

Hypothesis 1. Table 5 presents the results of the first hypothesis regarding the extent to which popularity drove friendship formation. As expected, the popularity similarity effect was positive and significant (estimate = 0.48, $t(588) = 8.71$, $p < .001$). However, similarity effects for both aggressive and prosocial behavior were also positive and significant (estimate = 0.13, $t(588) = 2.03$ $p < 0.05$ and estimate = 0.20, $t(588) = 3.35$, $p < .001$, respectively). Nevertheless, the parameter estimate for similarity in popularity was over twice as large as other estimates of similarity, and these differences were larger than the standard error of these parameters. This suggests that homophily in popularity has a larger effect than homophily in aggressive or prosocial behavior in friendship selection.

Table 6 presents results related to our second and third hypotheses.

Hypothesis 2. Model 2 shows that neither of the interaction terms involving tough and model ego and alter were significant. This suggests that model and tough youth may have sometimes chosen one another as friends, although in our sample this occurred at chance or expected levels. *Tough ego* was consistently positive and significant across models (0.18 ≤ estimate ≤ 0.19), suggesting that tough youth had the tendency to nominate many friends. In regards to the alter effects, parameter estimates for *Tough alter* were consistently negative and significant across models (-0.09 ≤ estimate ≤ -0.12), indicating that tough youth received relatively few friendship nominations. In contrast, parameter estimates for both *Model alter* and *Popular-only alter* were positive and significant across models (0.21 ≤ estimate ≤ 0.23 and 0.13

≤ estimate ≤ 0.14, respectively for model and popular-only alter), indicating that these two types of popular youth tended to receive many friendship nominations. Together, these alter effects demonstrate that model and popular-only peers received more friendship nominations than did tough peers. Comparisons among the three parameter estimates of these alter effects also suggest that model youth were selected the most as friends among the three configurations of popular youth.

Hypothesis 3. Model 3 presents how aggressive youth select tough, model, and popular-only peers as friends. As expected, the parameter estimate for *Aggressive ego* × *Tough alter* was positive and significant (estimate = 0.15, $t(588) = 2.03$, $p < .05$), indicating that highly aggressive youth tended to nominate tough classmates as their friends. The interaction between *Aggressive ego* × *Popular-only alter* was also positive and significant (estimate = 0.23, $t(588) = 3.08$, $p < .01$), indicating that highly aggressive youth tend to nominate popular-only classmates as friends.

Model 4 shows how prosocial young adolescents choose tough, model, and popular-only peers as friends. As expected, the parameter estimate for *Prosocial ego* × *Model alter* was positive and significant (estimate = 0.25, $t(588) = 3.25$, $p < .01$), suggesting that highly prosocial early adolescents tended to nominate model youth as their friends. Interestingly, the parameter estimate for *Prosocial ego* × *Popular-only alter* was negative and significant (estimate = -0.17, $t(588) = -2.22$, $p < .05$), indicating that highly prosocial young adolescents were less likely to nominate popular-only peers as their friends at greater than chance levels.

Finally, Model 5 presents selection of tough, model, and popular-only peers to popular youth in general. As hypothesized, all of the interaction terms in this model were significant (estimate = 0.27, $t(588) = 4.06$, $p < .01$ for *Popular ego* × *Tough alter*, estimate = 0.33, $t(588) =$

5.09, $p < .001$ for *Popular ego* × *Model alter*, and estimate = 0.25, $t(588) = 3.76$, $p < .001$) for *Popular ego* × *Popular-Only alter*), demonstrating that popular youth had similar tendencies to nominate tough, model, and popular-only peers as friends.

Influence Effect

Across all models shown in Tables 5 and 6, only the *Linear shape* effects for prosocial behavior was significant ($-0.28 \leq$ estimate ≤ -0.29), suggesting that the majority of youth scored below the mean on prosocial behavior. The *Quadratic shape* effects were positive and significant across all models for aggressive ($0.64 \leq$ estimate ≤ 0.67) and prosocial behavior ($0.48 \leq$ estimate ≤ 0.50) as well as popularity ($0.86 \leq$ estimate ≤ 0.93), indicating that changes in these variables were self-reinforcing. That is, students with higher values on those attributes would further increase, whereas those with lower values on those attributes would further decrease.

Hypothesis 4. As expected, the influence effects for aggressive behavior, prosocial behavior, and popularity were positive and significant across models ($3.81 \leq$ estimate ≤ 3.90 for aggressive behavior, $2.97 \leq$ estimate ≤ 3.04 for prosocial behavior, and $4.25 \leq$ estimate ≤ 4.45 for popularity). Thus, young adolescents who were friends with aggressive peers were more likely to become aggressive themselves. Similarly, friendship with prosocial youth increased one's prosocial behavior over time. Finally, friendship with popular peers increased one's popularity over time as well. The high values of these influence effect estimates suggest strong peer influence on aggression, prosocial behavior, and popular status.

CHAPTER 5

DISCUSSION

Heterogeneity in aggressive peer groups (Farmer et al., 2002) raised the issue of whether other attributes, such as perhaps individual popularity, drive friendship formation more strongly than similarity in behavioral characteristics. Farmer et al.'s (2002) findings that tough and model youth tended to be in the same group, and the current knowledge that popular youth exert strong influence in peer groups (Brechwald & Prinstein, 2011; Cohen & Prinstein, 2006; Shi & Xie, 2011), motivated the present study to examine whether tough and model youth exerted similar influence in promoting aggressive and prosocial behavior among their peers.

The results supported most study hypotheses. In line with previous findings, young adolescents were more likely to choose their friends based on similarity in popularity than behaviors. Although there was evidence that early adolescents choose their friends based on similarity in aggressive and prosocial behaviors, these similarity effects were not as strong as the similarity effect for popularity. Moreover, friendship among aggressive youth has sometimes been found to be due to *default selection* (Sijtsema, Lindenberg, & Veenstra, 2010). That is, aggressive youth choose other aggressive peers as friends due to their lack of alternatives to befriend non-aggressive peers, rather than because of their active preference towards aggressive counterparts.

If young adolescents choose their friends based on status, tough and model peers might befriend one another. Farmer and colleagues (2002) also suggested that tough boys affiliated with model boys because of their similarity on key social characteristics, such as popularity. Results were not conclusive on this point, indicating that tough and model youth selected one another at chance levels. To our knowledge, this is the first empirical study that examines

friendship among popular-aggressive and popular-prosocial young adolescents longitudinally using social network analyses. More work needs to be done with other samples using a larger network context, such as grade level or school level friendship networks.

As hypothesized, there were consistent influence effects for aggression, prosocial behavior, and popularity across models, indicating that young adolescents become more like their friends than their non-friends over time in terms of behaviors and status. Consequently, whom one chooses as friends affects one's susceptibility to peer influence later on. Highly aggressive young adolescents could potentially be more susceptible to the influence of tough than model youth as the results suggested that they preferred friendship with tough classmates. The influence of model classmates could be especially salient to highly prosocial youth who preferred friendship with model peers. Since highly popular youth selected both tough and model peers as friends, they might be the most susceptible to the influence of other popular peers.

Results also showed that aggressive youth selected popular peers who were neither highly aggressive nor highly prosocial as friends, but this was not the case with prosocial youth. Possibly, aggressive and prosocial early adolescents have different motivations when choosing friends. Aggressive youth might be driven by their goal to obtain high-status when selecting friends, but this might not be the case for prosocial youth. Perhaps having good friendship quality is perceived as more important than having high status for prosocial youth. To a certain extent, this mechanism can be a protective factor for prosocial youth from becoming aggressive over time. It also may give room for aggressive youth to become prosocial over time. Given a classroom where all popular peers are highly prosocial, it is possible that some aggressive youth will eventually come to endorse and enact prosocial behaviors in order to gain status. A short intervention study among eight- and nine-year olds in Minnesota shows some promising results

that moderately aggressive children can become less aggressive after being paired with a non-aggressive peer (Hektner, August, & Realmuto, 2003). This study provides hope for peer-mediated intervention programs aimed at reducing aggressive behavior in school. One challenge for future studies is to examine whether status differences between aggressive and prosocial youth moderate the direction of socialization, with more aggressive young adolescents being influenced by more prosocial youth, and vice versa.

The term popularity or social status that we used throughout this study referred to perceived popularity, not sociometric popularity. Although both perceived and sociometric popularity have been used to measure status, they have different meanings. Perceived popularity reflects one's visibility in a network and is based on social consensus (Marks, Cillessen, & Crick, 2012), whereas sociometric popularity reflects one's acceptance in a network and is often based on individuals' evaluations of whom they like most and like least (Cillessen & Rose, 2005; Cillessen & Borch, 2006). These two measures can overlap (see Cillessen & Mayeux, 2004; Rose, Swenson, & Carlson, 2004). In fact, correlations between perceived popularity and sociometric popularity were very strong in our data ($.50 < r < .70$). One study shows that children form friendships based on similarity in perceived and sociometric popularity (i.e., likeability), and that having popular versus likeable friends differentially impact one's own aggressive and prosocial behavior (Peters, Cillessen, Riksen-Walraven, & Haselager, 2010). Although the focus of this study is on perceived popularity, it would be worthwhile to check whether the inclusion of sociometric popularity affects study results. Therefore, we ran separate analyses with sociometric popularity included in all our models, but did not find any significant differences in results. Thus, we decided to drop sociometric popularity from current analyses to keep models parsimonious. The present study is also different from Rose et al. (2004), in which

the focus is not on the quality of interaction among aggressive youth given their sociometric or perceived popularity, but on the friendship formation of aggressive, prosocial, and popular youth.

Limitations

The major caveat in this study was our inability to include all classrooms in the analyses. Classrooms excluded from analyses were significantly different from those included, and thus, results may only generalize to classrooms with higher than average levels of aggression and popularity. The small classroom level network prevents us from analyzing SIENA results using meta-analysis, which would have taken into account variability among classrooms and enabled us to examine whether certain classroom network characteristics, such as density or classroom ethnic composition, contribute to socialization and selection mechanisms (Haynie, 2001). Nevertheless, utilization of multi-group analyses is simpler and gives more power than meta-analysis (Ripley et al., 2011). The current sample also is not large enough to demonstrate differences according to study site or the demographics of classrooms and schools. However, classroom friendship processes as revealed by SIENA have been shown to sometimes be highly sensitive to school-level differences (Light & Dishion, 2007).

Another limitation regards time heterogeneity. When working with two or more time periods, it is important to examine whether parameters vary across the periods. In supplementary analyses, we ran the first model separately from Time 1 to Time 2 and Time 2 to Time 3, and consistently found that young adolescents chose their friends based on similarity in popularity more than similarity in aggressive and prosocial behaviors. Friendship selection based on similarity in aggression and prosocial behaviors that did not occur between Time 1 and Time 2, started to emerge between Time 2 and Time 3 as students began to know each other better. Differences in parameter estimates for similarity effects suggested that friendship selection

mechanisms might vary over time. Unfortunately, we were not able to use the same approach to test other models that involved tough, model, and popular-only variables (i.e., Models 2-5) because they were treated as changing individual covariates which required at least three time points (Ripley, et al., 2011). It is possible that early adolescents' perception towards tough and model peers change between fall and spring, which may affect their friendship selection.

In this study, we assumed that friendship with popular youth was driven by young adolescents' goal to obtain status. However, it is also possible that young adolescents befriend popular peers to protect themselves from bullying or victimization. Still other youth may be more concerned with developing quality relationships than with demonstrating their social status (Ryan & Shin, 2008). Future studies that incorporate measures of children's goals in friendship selection will give better insight into how children make decisions in choosing their friends (Dijkstra, Lindenberg, & Veenstra, 2007; Ojanen, Sijtsema, Hawley, & Little, 2010; Ojanen, Sijtsema, & Rambaran, 2013).

The fact that friendship nominations were limited to classrooms also restricted our understanding of selection and influence processes that occur outside classroom settings. Future studies that examine selection and influence of tough and model youth would benefit from using the whole school as the network sample. Aside from being able to examine how salient their influence is in larger peer networks, future studies could also analyze whether there is selection based on homophily in the tough and model profiles. We were unable to tackle this question with our sample because in some classrooms there were only two tough and two model youth, hence it would not be meaningful to include homophily effects in the model. We also did not have information related to relationship history among the students, which might have influenced

friendship selection. Young adolescents who have been friends since fourth grade would most likely select one another as friends when asked again in the fifth grade.

CHAPTER 6

CONCLUSIONS

Aside from these limitations, our study supports and advances current understanding in friendship selection and influence processes. Specifically, given the presence of tough and model youth in a classroom, it seems that the influence of aggressive behavior from tough youth will be salient mostly to the aggressive young adolescents, while the influence of prosocial behavior from model youth will be especially salient mostly to prosocial young adolescents. Meanwhile, popular early adolescents could become either aggressive or prosocial over time since they may be the most susceptible to the influence of both tough and model youth. The next step for future study would be to examine the direction of influence between tough and model youth in the peer group. When tough and model youth affiliate with one another as suggested by Farmer and colleagues (2002), do tough adolescents become more prosocial, or do model adolescents become more aggressive over time?

Current advances in social network analysis have allowed peer relations researchers to examine youths' individual characteristics and their role in contributing to friendship formation and social influence. With SIENA, we are able to ask what are some of the important shared attributions among children that trigger friendship formation, and how having certain characteristics makes one individual more appealing than others. While this analytical technique is still novel in the field of peer relationships, the future of its application can contribute to broader knowledge of possible mechanisms of peer mediation. Knowledge of whether and how social status might moderate peer selection and influence may help psychologists and educators design effective peer-focused intervention programs that reduce hostility in the classroom and promote prosocial socialization.

TABLES

Table 1. Means of Friendship Network Characteristics and Changes across Three Observation Points

	Time 1	Time 2	Time 3
Density	.40 (.12)	.39 (.10)	.41 (.08)
Reciprocity	.65 (.06)	.66 (.06)	.65 (.05)
Transitivity	.70 (.19)	.75 (.32)	.87 (.47)
Number of Ties	185 (71.70)	180 (54.43)	188 (59.58)
Number of Pupils	22.23 (3.56)	22.23 (3.40)	22.31 (3.53)
Missing fraction	12% (8%)	10% (6%)	12% (8%)
Network Changes	Time 1-Time 2	Time 2 - Time 3	Time 1 - Time 3
Number of Leavers	0.54 (0.95)	1.15 (1.83)	1.50 (2.42)
Number of Joiners	0.54 (0.95)	0.85 (1.32)	1.54 (2.28)
Number of Stayers	21.69 (3.00)	21.08 (3.19)	20.65 (3.01)
Jaccard Index	0.59 (0.07)	0.57 (0.07)	-
Hamming distances	93.23 (35.37)	98.62 (35.82)	-

Note. The values in this table were based on 26 classrooms included in SIENA analyses. Values in parentheses are standard deviations. A total of 14 students left the network between Time 1 and Time 2, which means less than one leaver on average within a classroom (M = 0.54). A total of 14 students joined the network between Time 1 and Time 2, which means less than one joiner on average within a classroom (M = 0.54).

Table 2. Means of Behavior Distribution and Changes across Three Observation Points

	Time 1	Time 2	Time 3
Mean of Behaviors			
Aggression	1.84 (0.27)	1.83 (0.35)	1.88 (0.33)
Prosociality	2.00 (0.27)	1.94 (0.33)	2.03 (0.31)
Popularity	1.92 (0.27)	1.92 (0.21)	2.00 (0.18)
	Time 1 – Time 2	Time 2 – Time 3	Time 1 – Time 3
Tough	.07 (.08)	.09 (.11)	.08 (.09)
Model	.12 (.12)	.11 (.11)	.11 (.10)
Popular-only	.09 (.06)	.09 (.07)	.09 (.06)
Distance			
Aggression	6.27 (2.62)	6.65 (2.54)	
Prosociality	7.85 (4.25)	7.27 (3.85)	
Popularity	6.96 (2.88)	6.15 (2.80)	
Fraction Stable Actors			
Aggression	71% (11%)	68% (13%)	
Prosociality	66% (17%)	67% (17%)	
Popularity	68% (12%)	72% (11%)	
Similarity Indices			
Aggression			.61 (.07)
Prosociality			.59 (.06)
Popularity			.57 (.05)
Tough			.82 (.14)
Model			.79 (.12)
Popular-only			.82 (.09)

Note. The values in this table were based on 26 classrooms included in SIENA analyses. Values in parentheses are standard deviations.

Table 3. Correlations, Mean, and Standard Deviation of Main Variables Based On Proportion Scores

	1	2	3	4	5	6	7	8	9
1. Popularity Time 1	-								
2. Popularity Time2	.84**	-							
3. Popularity Time3	.80**	.82**	-						
4. Aggressive behavior Time 1	.11**	.07	.04	-					
5. Aggressive behavior Time 2	.18**	.15**	.11*	.88**	-				
6. Aggressive behavior Time 3	.17**	.10*	.13**	.82**	.84**	-			
7. Prosocial behavior Time 1	.25**	.24**	.29**	-.63**	-.61**	-.57**	-		
8. Prosocial behavior Time 2	.17**	.25**	.22**	-.55**	-.54**	-.57**	.77**	-	
9. Prosocial behavior Time 3	.22**	.29**	.32**	-.54**	-.54**	-.57**	.78**	.80**	-

Note. The values in this table were based on 26 classrooms included in SIENA analyses.

* $p < .05$. ** $p < .01$.

Table 4. SIENA Results for Control Variables across Models (N = 613)

	Model 1		Model 2		Model 3		Model 4		Model 5	
Effects	Est.	SE	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Outdegree	-1.97***	0.13	-1.97***	0.13	-1.92***	0.12	-1.92***	0.13	-1.95***	0.13
Reciprocity	0.50***	0.04	0.52***	0.03	0.52***	0.03	0.52***	0.03	0.51***	0.03
Transitive ties	1.42***	0.13	1.46***	0.13	1.41***	0.12	1.41***	0.13	1.44***	0.12
Balance	0.04***	0.00	0.06***	0.00	0.06***	0.00	0.06***	0.00	0.05***	0.00
Gender ego	0.08*	0.03	0.08*	0.03	0.08*	0.03	0.08*	0.03	0.08*	0.03
Gender alter	-0.07*	0.03	-0.05*	0.03	-0.05*	0.03	-0.05*	0.03	-0.05*	0.03
Same gender	0.36***	0.03	0.30***	0.03	0.30***	0.03	0.30***	0.03	0.31***	0.03

Note. * $p < .05$. *** $p < .001$.

Table 5. SIENA Results for Selection and Influence Effects: Model 1 (N = 613)

	Model 1	
	Est.	SE
Selection Effects		
Ego Effects (Whether actors with the higher attribute tend *to nominate* more friends):		
Aggressive Ego	0.17***	0.04
Prosocial Ego	0.11**	0.04
Popular Ego	0.00	0.03
Alter Effects (Whether actors with higher attribute tend *to be nominated* as friends):		
Aggressive Alter	-0.12***	0.03
Prosocial Alter	0.03	0.03
Popular Alter	0.16***	0.02
Similarity Effects (Whether actors with similar attributes tend to become friends):		
Aggressive behavior	0.13*	0.06
Prosocial behavior	0.20***	0.06
Popularity	0.48***	0.05
Socialization Effects		
Aggressive Behavior:		
Linear Shape	-0.06	0.10
Quadratic Shape	0.64***	0.17
Influence Effects	3.81***	0.74
Prosocial Behavior		

Table 5 (cont.)

	Model 1	
	Est.	SE
Linear Shape	-0.29**	0.10
Quadratic Shape	0.48***	0.13
Influence Effects	2.97***	0.64
Popularity		
Linear Shape	-0.14	0.09
Quadratic Shape	0.86***	0.15
Influence Effects	4.25***	0.71

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

Table 6. SIENA Results for Selection and Influence Effects: Model 2 - Model 5 (N = 613)

	Model 2		Model 3		Model 4		Model 5	
	Est.	SE	Est.	SE	Est.	SE	Est.	SE
Selection Effects								
Ego Effects (Who tends to nominate more friends?)								
Tough ego	0.19***	0.06	0.19***	0.06	0.19***	0.06	0.18***	0.05
Model ego	-0.01	0.05	-0.01	0.05	-0.02	0.05	-0.02	0.05
Popular-Only ego	-0.04	0.05	-0.05	0.06	-0.05	0.05	-0.04	0.05
Alter Effects (Who tends to receive more friendship nominations?)								
Tough alter	-0.10**	0.04	-0.09**	0.05	-0.10**	0.04	-0.12**	0.05
Model alter	0.23***	0.04	0.23***	0.04	0.22***	0.04	0.21***	0.04
Popular-Only alter	0.13**	0.05	0.14**	0.05	0.14**	0.04	0.13**	0.04
Are tough and model kids friends with one another?								
int: Tough ego × Model alter	0.14	0.13						
int: Model ego × Tough alter	0.19	0.14						
Who did aggressive children nominate?								
int: Aggressive ego × Tough alter			0.15**	0.07				
int: Aggressive ego × Model alter			-0.08	0.08				
int: Aggressive ego × Popular-Only alter			0.23**	0.08				
Who did prosocial children nominate?								
int: Prosocial ego × Tough alter					0.00	0.08		
int: Prosocial ego × Model alter					0.25**	0.08		

Table 6 (cont.)

int: Prosocial ego × Popular-Only alter					-0.17**	0.08		
Who did popular children nominate?								
int: Popular ego × Tough alter							0.27**	0.07
int: Popular ego × Model alter							0.33***	0.06
int: Popular ego × Popular-only alter							0.25***	0.07
Socialization Effects								
Aggressive behavior								
Linear Shape	-0.09	0.09	-0.09	0.09	-0.09	0.09	-0.10	0.10
Quadratic Shape	0.67***	0.17	0.66***	0.18	0.67***	0.17	0.67***	0.18
Influence Effect	3.90***	0.75	3.88***	0.76	3.90***	0.78	3.88***	0.78
Prosocial Behavior								
Linear Shape	-0.28**	0.11	-0.28**	0.10	-0.28**	0.11	-0.28**	0.11
Quadratic Shape	0.50**	0.15	0.50**	0.15	0.49**	0.16	0.49**	0.15
Influence Effect	3.04***	0.78	3.04***	0.74	3.02***	0.83	3.03***	0.79
Popularity								
Linear Shape	-0.11	0.09	-0.11	0.09	-0.11	0.09	-0.10	0.09
Quadratic Shape	0.93***	0.18	0.93***	0.17	0.93***	0.16	0.89***	0.15
Influence Effect	4.45***	0.87	4.45***	0.82	4.44***	0.76	4.37***	0.72

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

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