

Popularity and Adolescent Friendship Networks: Selection and Influence Dynamics

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This study examined the dynamics of popularity in adolescent friendship networks across 3 years in middle school. Longitudinal social network modeling was used to identify selection and influence in the similarity of popularity among friends. It was argued that lower status adolescents strive to enhance their status through befriending higher status adolescents, whereas higher status adolescents strive to maintain their status by keeping lower status adolescents at a distance. The results largely supported these expectations. Selection partially accounted for similarity in popularity among friends; adolescents preferred to affiliate with similar-status or higher status peers, reinforcing the attractiveness of popular adolescents and explaining stability of popularity at the individual level. Influence processes also accounted for similarity in popularity over time, showing that peers increase in popularity and become more similar to their friends. The results showed how selection and influence processes account for popularity dynamics in adolescent networks over time.

Keywords: peer status, popularity, friendship networks, peer influence, longitudinal social network analyses (SIENA)

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Peer group affiliation is an important aspect of adolescents' social lives with distinct implications for development (Brown & Lohr, 1987; Kiesner, Poulin, & Nicotra, 2003; Ollendick, Weist, Borden, & Greene, 1992; Prinstein & La Greca, 2002). When children move into adolescence and enter middle school, the peer ecology in which they participate becomes much larger. In this context, affiliation with peers is important for socioemotional and identity development. The status of a peer is a highly salient determinant of attraction and avoidance. Sensitivity to status is high at this age, and peer groups become organized along dimensions of status (Adler & Adler, 1998; Corsaro & Eder, 1990). Specifically, adolescents often affiliate with peers who are similar in status to themselves (Dishion, 1990; Estell, Farmer, Cairns, & Cairns, 2002; Farmer et al.,

2002; Kandel, 1978; Kupersmidt, Derosier, & Patterson, 1995; Xie, Cairns, & Cairns, 1999). Although we know much about this end state of status similarity, we know much less about its emergence. How does status similarity in adolescent peer groups emerge? What underlying processes are responsible for this process?

Two mechanisms can explain how adolescents become similar to the peers they affiliate with. Homophilous *selection* is the mechanism by which adolescents select friends who are similar to themselves. *Influence* is the mechanism by which adolescents adopt the characteristics of their friends. Research has shown that both mechanisms play a role in adolescents' similarity, for instance in depression (Van Zalk, Kerr, Branje, Stattin, & Meeus, 2010), delinquency (Weerman, 2011), smoking (Mercken, Candel, Willems, & de Vries, 2009), and weapon carrying (Dijkstra, Lindenberg, et al., 2010; Dijkstra, Gest, Lindenberg, Veenstra, & Cillessen, 2012).

The unique role of influence and selection in the similarity in status of adolescent friends has not yet been examined. In this case, selection implies that adolescents who are similar in status select each other as friends. This further implies that adolescents' individual status remains stable, but their friendships change. Influence in status similarity implies that adolescents' individual status increases or decreases depending on the status of their friends. In this case friendships remain stable, but individual status changes depending on the status of one's friends. Unraveling selection and influence in the emergence of status similarity in adolescent peer groups requires longitudinal data on the co-occurring changes of

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individual status and friendship affiliations over time (Veenstra & Dijkstra, 2011).

The Present Study

The goal of this study was to examine selection and influence in status similarity among adolescents. Specifically, selection and influence processes were examined regarding popularity in adolescent friendship networks. Popularity is a reputation-based construct shared by the peer group at large, derived from peer nominations for who is most and least popular. As such, popularity has been identified as a unique form of status distinct from social preference (Cillessen & Rose, 2005; LaFontana & Cillessen, 1999; Lease, Kennedy, & Axelrod, 2002; Lease, Musgrove, & Axelrod, 2002; Parkhurst & Hopmeyer, 1998). Social preference is based on personal evaluations of liking and disliking of one peer about another (Cillessen & Rose, 2005). As a result, popularity may be a better measure of the hierarchical ordering in the peer group (Dijkstra, Berger, & Lindenberg, 2011).

Social preference reflects likeability and is mainly based on prosocial skills and behaviors. Popularity is more complex and is based on a combination of peer-valued characteristics, such as athletic abilities and attractiveness, often in combination with antisocial behaviors, such as overt or relational aggression (Cillessen & Borch, 2006; Cillessen & Mayeux, 2004; Cillessen & Rose, 2005; Dijkstra, Lindenberg, Verhulst, Ormel, & Veenstra, 2009; LaFontana & Cillessen, 2002). Given this delicate balance between peer-valued characteristics and antisocial behavior (Dijkstra et al., 2009; Hawley, Little, & Card, 2007; Vaillancourt & Hymel, 2006), popularity is not easy to achieve. Therefore, selection and influence processes might be quite distinct for this form of status. Hence, the current study focused on popularity, also referred to as status. But considering its overlap with popularity (Cillessen & Mayeux, 2004; Cillessen & Rose, 2005; Dijkstra, Cillessen, Lindenberg, & Veenstra, 2010b), we controlled for the effect of social preference on changes in popularity. Because changes in popularity and friendships might also be due to other factors such as gender, ethnicity, and aggression, they were also taken into account.

Background

Our theoretical perspective is a goal-framing approach (Lindenberg, 2001; Lindenberg, 2006; Lindenberg, 2008) that specifies that goals influence what people attend to, what knowledge is activated, and what information is processed. Individuals consider their behavior in the light of their goals. The goals perspective has previously been applied to peer relations (Crick & Dodge, 1994; Dijkstra, Lindenberg, & Veenstra, 2007; Heidgerken, Hughes, Cavell, & Willson, 2004; Kiefer & Ryan, 2008; LaFontana & Cillessen, 2010; Ojanen, Gronroos, & Salmivalli, 2005; Veenstra, Lindenberg, Munniksma, & Dijkstra, 2010).

Two important social goals for adults and adolescents alike are the achievement of status (popularity) and affection (friendship; Huberman, Loch, & Öngüler, 2004; Lindenberg, 2001; Ormel, Lindenberg, Steverink, & Vonkorf, 1997). Adolescents strive for status in combination with affection (cf. Coleman, 1961; Corsaro & Eder, 1990; Ojanen et al., 2005). Although adolescents differ in the value they attach to status (LaFontana & Cillessen, 2010; Ryan

& Shim, 2006) they generally strive to improve their position in the peer group (Lindenberg, 1996). High status is desirable, because it provides access to valuable resources (Hawley et al., 2007). High-status adolescents are, for instance, liked more by cross-gender peers than lower status adolescents are (Dijkstra et al., 2010b). The role of status is particularly salient for adolescents in a larger peer system, such as middle school, where it distinguishes attractive from unattractive peers.

One way to gain status is by befriending higher status peers and hanging around with them, known as “basking in reflected glory” (Cialdini & Richardson, 1980). Ethnographic studies (Adler & Adler, 1998; Eder, 1985; Short & Strodtbeck, 1963) and empirical studies (Dijkstra, Cillessen, Lindenberg, & Veenstra, 2010a) have shown that the more strongly adolescents are affiliated with higher status peers, the higher their own status.

Whereas lower status adolescents might try to gain status, higher status peers strive to maintain their current status (Haynie, 2001). For them, including lower ranked persons in their network of friends contains risks. In the same way that hanging around with higher status peers increases one’s standing, hanging around with lower status peers might decrease it, particularly when the status difference is large. In addition, lower ranked peers who benefit from their affiliation with a higher status peer may later become competitors for the higher ranked peer’s position. Eder (1985) described how girls who entered the popular crowd became a threat to the position of the original crowd members.

Therefore, it is unlikely that high status adolescents will actively select lower status adolescents as friends. If they do, they will select them in such a way that differences in status are minimized. Moreover, these affiliations are likely to be unilateral in that the lower status adolescents are more or less tolerated and kept at a distance, and not considered equal friends (see also Adler & Adler, 1998). These hypothesized mechanisms have distinct implications for selection and influence related to status (popularity).

Hypotheses

Selection Processes

There are three implications for selection. First, similarity in popularity should occur partially due to selection, emerging from adolescents’ preference for affiliating with others who are at least similar in popularity. There should be a preference for similarly popular or more popular peers as friends over less popular peers (Hypothesis 1a). This does not mean that very unpopular adolescents seek affiliation only with very popular peers but that adolescents in general prefer peers who are similar or more popular than they themselves are. Second, if less popular adolescents seek affiliation with more popular peers, highly popular adolescents become increasingly attractive. This is called *preferential attachment* (Brown, Mory, & Kinney, 1994; Merton, 1968). This process of polarization has also been described as the “cycle” of popularity (Eder, 1985). It means that higher popularity should be associated with an increase in friendship nominations received (Hypothesis 1b). In reverse, if more popular adolescents are more attractive for affiliation, they can be more selective in their friendship choices and “call the shots” with regard to whom they select for affiliation. In addition, when more popular adolescents prefer affiliation with same popular peers, ultimately the pool of potential friends de-

clines. Therefore, we expect that an increase in popularity is associated with a decrease in friendship choices given (Hypothesis 1c).

Influence Processes

If adolescents prefer similarly popular or more popular friends over less popular peers, there is an important implication for influence processes. If it is true that highly popular adolescents are more selective in their friendship choices, it is difficult for less popular peers to become friends with them. Low popular peers who do succeed in befriending higher status peers should benefit from this affiliation with increased popularity (“basking in reflected glory”). In this case, changes in popularity reflect an influence process in which less popular adolescents increase in popularity and become more similar to their more popular friends (Hypothesis 2).

From this interplay between selection and influence dynamics, two additional effects were expected. First, considering the attractiveness of popular adolescents for affiliation in combination with their reluctance to affiliate with low popular peers in view of status loss, popularity should be stable over time at the *individual level*, reflected by strong positive over-time correlations between popularity (Hypothesis 3). We consider correlations larger than .7 as strong compared to moderate ($.3 < |r| < .7$) and weak correlations ($.1 < |r| < .3$).

Second, if the happy few who gain inclusion in a higher status network adapt the status of this network, there should be high similarity among friends in popularity at the *group level*, reflected by a significant autocorrelation (Moran’s I) for popularity at all time points (Hypothesis 4).

Control Variables: Gender, Ethnicity, Social Preference, and Aggression

Gender and ethnicity are determinants of adolescent friendships (Kupersmidt et al., 1995; Poulin & Pedersen, 2007). Therefore, we included their effects on friendship nominations and friendship selection. We also explored the effects of gender and ethnicity on changes in popularity, without a priori expectations. Although popularity and social preference are distinct forms of status, they show some overlap (Cillessen & Rose, 2005). It is possible that highly preferred adolescents more easily increase their popularity in the peer group than less preferred adolescents. Therefore, we controlled for the effect of social preference on changes in popularity to gain a reliable indication of popularity change due to peer influence processes unconfounded by social preference.

Aggression is a means to maintain status and divert competitors (Card, Stucky, Sawalani, & Little, 2008; Hawley, 1999). Boys do this more through physical or overt aggression and girls through relational aggression (Dijkstra et al., 2009; LaFontana & Cillessen, 2002; Rose, Swenson, & Waller, 2004; Vaillancourt & Hymel, 2006). Therefore, we also controlled for the effects of physical and relational aggression on changes in popularity over time.

In this study we used longitudinal social network modeling (Simulation Investigation for Empirical Network Analyses [SIENA]; Snijders, Steglich, & Schweinberger, 2007; Steglich, Snijders, & Pearson, 2010) across three consecutive middle-school years (Grades 6 to 8). We examined how selection and influence deter-

mine similarity in popularity among adolescent friends, while taking into account the effects of gender, ethnicity, social preference, and physical and relational aggression.

Method

Participants and Procedure

Participants were enrolled in a larger longitudinal study on the social and academic development of youth. The data for the current study were collected in Grades 6 to 8 in two middle schools. Because we were interested in changes in popularity and best friendship networks over time, participants were only included if information was available for best friendship networks and popularity for them across all waves. This yielded a target sample of 220 students in School 1 (47% girls) and 260 students in School 2 (52% girls), representing 62% and 68%, respectively, of the total number of students in the schools.

The ethnic composition of the sample across the 3 years was 72% Caucasian, 18% African American, and 10% Hispanic in School 1 and 78% Caucasian, 12% African American, 8% Hispanic, and 2% Asian American in School 2. Ethnicity was included in the analyses as a dichotomous variable (ethnic minority = 1, majority/Caucasian = 0). The percentage of minority students was 28% in School 1 and 22% in School 2. Parental consent was obtained for all participating adolescents prior to testing; verbal assent was also obtained from the participants themselves. Of the initially approached students, less than 1% refused to participate. The schools served lower and lower middle class families in a medium-sized town in the northeastern United States.

All testing took place in the spring. Students were tested in their English classrooms in 90-min sessions. All testing was administered by trained graduate and undergraduate research assistants. In most cases, the classroom teacher remained in the room during testing. Students not participating in the study were instructed to do homework or read during testing. Prior to testing, all confidentiality procedures were explained. Students were told that the data would be entered and stored using code number instead of names. They were also told that only the researchers would see the data, that participation was voluntary, and that they could leave blank any questions they did not wish to answer.

Participants completed a sociometric measure each year consisting of a booklet in which they recorded their choices. Each page of the booklet included one sociometric question followed by the names of the students in the grade with permission to participate, sorted alphabetically by first name, and preceded by a code number. Participants were asked to read each question, think about the students who best fit the description, and then circle their code number. Nominations were unlimited. Students could choose as many or as few grademates as they wanted for each question, including same- and other-gender peers, but not themselves. Students without permission were not on the roster and could not be nominated.

Measures

Best friends. The sociometric measure included a friendship question (“The people in your grade who are your best friends”). This question was used to determine whether a best friend existed

between any pair of students. Friendship networks were identified from the total set of all friendships in each grade. Table 1 presents descriptive statistics for best friendship networks. The average number of best friend nominations decreased from Grade 6 to Grade 7 and increased somewhat between Grade 7 to Grade 8. The indices for density (proportion of relations relative to the total number of possible relations) followed a similar pattern. Reciprocity (proportion of reciprocated friendship nominations relative to the total number of relations) was stable over time in School 1 and increased somewhat in School 2.

Popularity. The sociometric instrument included two popularity questions: “The people in your grade who are most popular” and “The people in your grade who are least popular.” Nominations received for both were counted and standardized within grade. A score for popularity was computed by taking the difference between the standardized most popular and least popular votes received, and again standardizing the resulting difference score within grade. Because of the computational demands of the estimation process, SIENA requires ordered categories as dependent variables. To meet this requirement and avoid a loss of information, the continuous popularity score was transformed into an 18-point ordinal scale, using increments of .25 of the continuous z -score as cutoff points. Table 1 presents the means and standard deviations of this scale by grade. A change in status was indicated by a change on this 18-point scale. Table 1 indicates how many adolescents changed in popularity over time; 65% to 70% of the students increased or decreased.

The ordered popularity score was derived from scores that were standardized within waves. Raw scores are appropriate for the study of intrapersonal change in the absolute level of a trait such as depression or delinquency. Popularity, however, is social standing in the group relative to peers. Changes in popularity cannot be measured as absolute changes but should be measured as interpersonal changes in social position relative to others. Our score of relative popularity makes it possible to examine such interpersonal changes.

Control variables. *Social preference* was measured with two nominations: “The people in your grade you like the most” and “The people in your grade you like the least.” Again, nominations received were counted and standardized to z -scores within grades. Social preference was computed as the standardized difference between the standardized liked most and liked least nominations received. There were also nominations for *physical aggression* (“People who fight a lot”) and *relational aggression* (“People who ignore others”). For both, nominations received were also counted and standardized within grades. Although both measures of aggression were based on single items, reliable estimates still result because the scores are based on information from multiple peers (Coie, Dodge, & Kupersmidt, 1990). For the control variables social preference, physical aggression, and relational aggression, the z -standardized continuous scores were used. Because they were control variables for changes in popularity, scores for each were included for Grades 6 and 7.

Attrition Analyses

We examined if students without a popularity score, who were excluded from the analyses, differed in popularity from students with complete data. Missing students were less popular than non-

missing students in Grade 6 in School 1, $t(290) = -2.76, p < .01$. No significant differences were found for Grade 7 popularity, $t(285) = -1.51, p = .13$, or Grade 8 popularity in School 1, $t(245) = -0.65, p = .52$. In School 2, there was a tendency for missing students to be slightly less popular than nonmissing students in Grade 6, $t(314) = -1.52, p = .13$; Grade 7, $t(314) = -1.78, p = .08$; and Grade 8, $t(295) = -1.62, p = .11$.¹

Analysis Strategy

Analyses were conducted with RSIENA (Simulation Investigation for Empirical Network Analyses, Version 4). SIENA is an actor-based model for the coevolution of social networks and individual traits over time (Ripley, Snijders, & Preciado, 2011). In SIENA, predictors typically are characteristics of social networks, respondents, and members of social networks (peer groups). Dependent variables are changes in network ties (the beginning of new friendships or the ending of existing ones) and in individual traits (e.g., popularity). Changes in network ties indicate selection effects; changes in individual traits related to network friends indicate influence effects. Estimates are obtained through an iterative Markov chain Monte Carlo approach (Ripley et al., 2011; Snijders, 2005).

SIENA estimates developmental changes between time points. Changes are modeled in two types of dependent variables: network characteristics and individual traits. In the present study, the dependent variables were friendship choices (network ties) and individual popularity. Effects on friendship choices are selection effects; effects on individual popularity are influence effects. SIENA is designed to test selection and influence simultaneously, controlling for each other (Burk, Steglich, & Snijders, 2007; Snijders et al., 2007; Steglich et al., 2010; Steglich, Snijders, & West, 2006).

We estimated three selection effects. *Popularity nominations received* is the effect of popularity on being chosen as a friend. *Popularity nominations given* is the effect of popularity on choosing others as friends. The main effect of interest is the *homophilous popularity selection effect*, or the extent to which adolescents form new friendships with peers who are similar to themselves in popularity, based on the similarity-selection effect in SIENA. These effects were controlled for (a) *reciprocity*, the extent to which best friend choices are reciprocated; (b) *transitive triplets*, the tendency to be friends with the friends of one’s friends; and (c) *outdegree*, the number of outgoing ties, indicating network density. Ignoring these controls would lead to overestimated selection effects (Steglich et al., 2010). For example, two adolescents with a common friend are likely to become friends as well (transitivity). If the two are similar in popularity, the attribution of their friendship to their similarity in popularity would be inflated if the common friend was ignored.

We also controlled for a *three-cycles effect* and an *indegree-best friends effect*. A three-cycles effect indicates the likelihood that when i nominates j and j nominates h , h is likely to nominate i , resulting in cyclical triads. A negative three-cycles effect in combination with a positive transitive triplets effects can be interpreted

¹ To check the robustness of our findings, we also ran the same SIENA models in the samples with missing data. Results were largely similar to the current analyses (see the analyses in the online supplemental materials).

Table 1
Descriptive Statistics for Friendship Network, Popularity, and Popularity Change

Variable	School 1 (<i>N</i> = 220)			School 2 (<i>N</i> = 260)		
	Grade 6	Grade 7	Grade 8	Grade 6	Grade 7	Grade 8
Friendship network						
Relationships (total)	2,225	1,635	1,964	1,956	1,797	1,946
Nominations given (<i>M</i>)	10.11	7.43	8.93	7.52	6.91	7.49
Reciprocity	.21	.20	.19	.15	.18	.20
Density	.046	.034	.041	.029	.027	.029
Popularity						
<i>M</i>	9.29	9.55	9.59	9.41	9.44	9.37
<i>SD</i>	3.20	3.12	3.05	3.54	3.05	3.06
Popularity change						
		Grade 6 to 7	Grade 7 to 8		Grade 6 to 7	Grade 7 to 8
Stable <i>N</i>		64	67		64	89
Stable %		29.1	30.5		24.6	34.2
Decrease <i>N</i>		60	70		99	91
Decrease %		27.3	31.8		38.1	35.0
Increase <i>N</i>		96	83		97	80
Increase %		43.6	37.7		37.3	30.8

as a tendency to a local hierarchy (Ripley et al., 2011; Snijders, Steglich, & Van de Bunt, 2010). The indegree-best friends effect indicates the tendency for respondents who receive a high number of best friend nominations, to attract extra incoming nominations as best friends over time. This effect is usually called indegree-popularity. However, to avoid confusion in terminology we labeled this effect as indegree-best friends. These effects were included, because the indegrees of best friendship nominations may correlate with our measure of popularity. The selection effects were further controlled for the effects of gender and ethnicity on changes in friendship choices over time by including them as covariates.

With regard to the behavioral dynamics, we included the following effects. *Popularity linear shape* is an intercept expressing the average tendency to low popularity (negative value) or high popularity (positive value). *Popularity quadratic shape* is a feedback effect of popularity on itself (Snijders et al., 2010). A negative value indicates a *self-correcting effect*: When popularity increases, the push toward higher popularity decreases, and when popularity decreases, the push toward lower popularity decreases. A positive value is a *self-reinforcing effect*: When popularity increases, the push toward higher popularity increases, and when popularity decreases, the push toward lower popularity increases. The main effect of interest is the *popularity influence effect*, or whether adolescents whose friends are more popular than they are have a tendency to increase in popularity, represented by the average alter effect in SIENA. These influence effects were controlled for the effects of gender, ethnicity, social preference, physical aggression, and relational aggression on changes in popularity over time by including them as covariates.² As a result, changes in popularity of the adolescents can be attributed more reliably to the popularity of their friends (peer influences) rather than to these individual covariates.

Selection and influence effects were estimated separately for the transitions from Grades 6 to 7 and Grades 7 to 8, in order to examine developmental differences. They were also estimated separately for each school. Table 3 shows these results. To exam-

ine selection effects at different levels of popularity, we constructed ego-alter selection tables from the unstandardized estimates for homophilous popularity selection, and the effects of popularity on nominations given (ego effect) and received (alter effect) as recommended (see Appendix; Ripley et al., 2011). The tables indicate the propensity of adolescents' popularity (rows) to select peers at another level of popularity (columns), for the two transitions. We presented the selection effects for five values of popularity instead of all 18 categories.

Results

Descriptive Statistics

Table 2 gives the correlations between the main variables. Popularity correlated with social preference in both schools. Modest correlations were found between popularity and relational aggression, and between popularity and physical aggression in School 2.

Structural Network Effects

Table 3 presents the SIENA results for both transitions. The networks were sparse and remained so, leading to a significantly negative density parameter. Friendship nominations were more likely to be reciprocated than unilateral. Sharing a friend increased the likelihood of becoming friends. This positive transitive triplets effect in combination with the negative three-cycles effect suggests the existence of local hierarchies with some respondents receiving more best friend nominations than others. However, this

² In addition to these covariates we also ran models with the effect of friendship-indegree on popularity (i.e., the effect of receiving a high number of best friend nominations on popularity) and friendship-outdegree on popularity (i.e., the effect of giving a high number of best friend nominations on popularity). Both effects were, however, not significant and were left out in the final models.

Table 2
Correlations Among Popularity, Gender, Ethnicity, Physical Aggression, and Relational Aggression

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Gender (1 = boy)		.03	-.05	-.04	-.05	-.07	-.06	.26*	.18*	-.04	-.11
2. Ethnicity (1 = minority)	-.04		.11	.09	.09	.10	.13*	.30*	.26*	.14*	.12
3. Popularity Grade 6	-.05	.08		.79*	.79*	.72*	.57*	.23*	.21*	.26*	.33*
4. Popularity Grade 7	-.08	.05	.88*		.88*	.57*	.55*	.27*	.28*	.28*	.42*
5. Popularity Grade 8	-.05	.05	.82*	.90*		.58*	.55*	.23*	.23*	.26*	.37*
6. Social preference Grade 6	-.19*	-.01	.69*	.66*	.68*		.77*	-.12	-.13*	-.17*	-.08
7. Social preference Grade 7	-.16*	-.03	.56*	.63*	.69*	.78*		-.10	-.18*	-.17*	-.19*
8. Physical aggression Grade 6	.16*	.35*	.10	.02	-.03	-.24	-.38*		.79*	.73*	.53*
9. Physical aggression Grade 7	.04	.42*	.16*	.11	.04	-.18	-.38*	.75*		.64*	.69*
10. Relational aggression Grade 6	-.12	.14*	.32*	.29*	.21*	-.05	-.19*	.70*	.60*		.65*
11. Relational aggression Grade 7	-.14	.24*	.39*	.33*	.26*	.02	-.22*	.57*	.75*	.64*	

Note. School 1 data appear below the diagonal, and School 2 data appear above the diagonal.
* $p < .05$.

tendency was somewhat weakened by the indegree-popularity effect, indicating that adolescents who were frequently named as best friend did not necessarily attract extra best friend nominations over time.

Selection Effects

Adolescents were more likely to select same-gender friends than cross-gender friends. There was one school difference. In Grade 8

of School 2, boys named more friends than girls did. Selection effects for ethnicity showed that adolescents named more same-ethnicity friends than other-ethnicity friends. Minority students received more best friend nominations than majority students, except in Grade 8 in School 2, where they were more likely to name friends than majority students.

Selection effects for popularity were mostly consistent across grades and schools. The homophilous popularity selection effect indicated that adolescents were more likely to select peers as

Table 3
SIENA Estimates of Selection and Influence Effects for Popularity in Friendship Networks for School 1 (N = 220) and School 2 (N = 260) From Grade 6 to 7 and Grade 7 to 8

Variable	Grade 6 to Grade 7				Grade 7 to Grade 8			
	School 1		School 2		School 1		School 2	
	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>	<i>b</i>	<i>SE</i>
Network effects								
Density	-2.55*	0.09	-2.72*	0.09	-2.65*	0.10	-2.80*	0.07
Reciprocity	1.50*	0.06	1.64*	0.06	1.38*	0.06	1.81*	0.07
Transitive triplets	0.26*	0.01	0.36*	0.01	0.25*	0.01	0.38*	0.02
Three-cycles	-0.28*	0.03	-0.36*	0.04	-0.25*	0.02	-0.37*	0.04
Indegree-best friends	-0.05*	0.01	-0.06*	0.01	-0.03*	0.02	-0.03*	0.01
Network dynamics								
Same-gender selection	0.53*	0.05	0.56*	0.04	0.58*	0.04	0.50*	0.04
Effect gender nominations received	-0.03	0.06	0.07	0.06	0.00	0.04	-0.00	0.04
Effect gender nominations given	-0.01	0.06	-0.05	0.05	-0.03	0.04	0.12*	0.05
Same-ethnicity selection	0.51*	0.06	0.39*	0.05	0.46*	0.04	0.43*	0.05
Effect ethnicity nominations received	0.16*	0.06	0.14*	0.05	0.05	0.04	0.17*	0.05
Effect ethnicity nominations given	-0.06	0.05	0.00	0.04	0.31*	0.04	-0.07	0.06
Homophilous popularity selection	1.22*	0.22	1.84*	0.25	2.05*	0.20	1.19*	0.19
Effect popularity nominations received	0.08*	0.01	0.11*	0.01	0.09*	0.01	0.09*	0.01
Effect popularity nominations given	0.00	0.01	0.00	0.01	-0.04*	0.01	-0.05*	0.01
Popularity dynamics								
Popularity linear shape	-0.16	0.14	-0.37†	0.22	-0.43*	0.21	-0.24*	0.09
Popularity quadratic shape	-0.16*	0.07	-0.15*	0.07	-0.28*	0.12	-0.11*	0.03
Popularity influence	0.43*	0.21	0.44†	0.23	0.57*	0.28	0.27*	0.09
Effect gender on popularity	0.10	0.16	-0.06	0.11	0.23	0.15	-0.24	0.24
Effect ethnicity on popularity	0.19	0.16	-0.14	0.13	0.14	0.21	-0.07	0.12
Effect social preference on popularity	0.25	0.16	0.03	0.08	0.85*	0.34	0.24*	0.08
Effect physical aggression on popularity	-0.42*	0.16	0.16†	0.09	0.05	0.20	0.03	0.09
Effect relational aggression on popularity	0.33*	0.15	-0.03	0.07	0.23	0.14	0.07	0.08

Note. SIENA = Simulation Investigation for Empirical Network Analyses. Gender: boys = 1. Ethnicity: minority = 1.
† $p < .10$. * $p < .05$.

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friends who were similar in popularity rather than dissimilar (Hypothesis 1a). More popular adolescents received more nominations across all waves (Hypothesis 1b), but gave fewer friend nominations in Grade 8 (Hypothesis 1c).

Tables 4 and 5 confirm these results, showing preferences for peers of similar popularity. The rows list adolescents' own popularity, the columns the popularity of their friends. On the diagonal are the attractions between students with identical popularity, which was particularly strong from Grade 7 to 8 in School 1 (see Table 5). Adolescents were more likely to select peers as friends who were similar or higher in popularity than those who were less popular. At low levels of adolescent popularity, peer attraction varied little depending on peers' popularity. In contrast, at high levels of popularity these differences were strong. Stated differently, unpopular adolescents differentiated their attraction to somewhat more popular or much more popular peers less than highly popular peers, who were more selective. They were very unlikely to select friends who were less popular than they themselves were. Moreover, in both school across all grades there was a stronger tendency not to nominate lower status peers as friends than the tendency to nominate higher status peers, that is, the gradients left of the diagonals were stronger than the gradients to the right of the diagonals.

Influence Effects

The negative linear shape of popularity indicated an average tendency to low popularity. This effect in combination with the negative quadratic shape effects indicates a self-correcting effect, which is similar to a regression to the mean effect: As popularity increased the further push toward higher values of popularity becomes smaller, whereas for lower values of popularity the chances of an increase in popularity became greater.

Adolescents' popularity was influenced by the popularity of their peers. The popularity-influence effect (average alter effect) indicates that adolescents were more likely to increase in popularity and become more similar in popularity to their friends than not

Table 4
Selection Effects of Adolescent Popularity on Peer Popularity for Five Values on the Popularity Scale for Schools 1 and 2 From Grade 6 to 7

Adolescent	Peer				
	1	5	9	13	18
School 1 (<i>N</i> = 220)					
1	-0.50	-0.46	-0.41	-0.36	-0.30
5	-0.78	-0.15	-0.10	-0.05	0.01
9	-1.05	-0.42	0.20	0.25	0.32
13	-1.32	-0.69	-0.07	0.56	0.62
18	-1.65	-1.03	-0.40	0.22	1.00
School 2 (<i>N</i> = 260)					
1	-0.52	-0.53	-0.53	-0.53	-0.53
5	-0.94	-0.08	-0.08	-0.08	-0.08
9	-1.35	-0.49	0.37	0.37	0.37
13	-1.77	-0.90	-0.04	0.82	0.82
18	-2.29	-1.42	-0.56	0.30	1.38

Table 5
Selection Effects of Adolescent Popularity on Peer Popularity for Five Values on the Popularity Scale for Schools 1 and 2 From Grade 7 to 8

Adolescent	Peer				
	1	5	9	13	18
School 1 (<i>N</i> = 220)					
1	-0.01	-0.12	-0.23	-0.34	-0.49
5	-0.67	0.18	0.07	-0.04	-0.18
9	1.34	-0.48	0.37	0.26	0.12
13	-2.00	-1.14	-0.29	0.57	0.43
18	-2.83	-1.97	-1.12	-0.26	0.81
School 2 (<i>N</i> = 260)					
1	-0.10	-0.02	0.06	0.14	0.24
5	-0.58	0.06	0.14	0.22	0.32
9	-1.07	-0.43	0.21	0.29	0.39
13	-1.56	-0.92	-0.28	0.36	0.46
18	-2.17	-1.53	-0.89	-0.25	0.56

to change (Hypothesis 2). This influence effect was not further moderated by gender or ethnicity (not presented here).

Following from the selection and influence processes, we expected two additional effects. First, we hypothesized that popularity should be rather stable at the individual (Hypothesis 3) and group levels (Hypothesis 4). The correlations of popularity across grades indeed indicated relatively high stability by correlations larger than .7 (although there were changes in absolute position on the 18-point scale; see Table 1). Second, we hypothesized that adoption of the popularity of friends would result in status similarity in peer networks at the group level. To indicate the extent to which affiliated adolescents were similar in popularity, we used Moran's *I* that runs from -1 (complete dissimilarity) to +1 (complete similarity). We tested whether Moran's *I* differed significantly from zero (i.e., no similarity in popularity). Similarity in popularity was significant across all grades (all *ps* < .001). It peaked in Grade 7 and decreased in Grade 8. Moran's *I* was .55, .73, and .48 in School 1, and .37, .61, and .54 in School 2, for Grades 6 to 8.

Control Variables: Gender, Social Preference, and Aggression

Between Grades 7 and 8, social preference predicted an increase in popularity over time. Between Grades 6 and 7, physical aggression decreased popularity, whereas relational aggression increased popularity in School 1. In School 2, physical aggression increased popularity between Grades 6 and 7.

Discussion

The transition from childhood to adolescence coincides with entering larger schools and larger peer ecologies. An important challenge for adolescents is to establish new friendships and gain a sense of belonging in this larger context. Adolescents' status is highly salient for the formation of peer groups and relationships. For example, adolescent friends are often similar in status (Dish-

ion, 1990; Estell et al., 2002; Farmer et al., 2002; Kupersmidt et al., 1995; Xie et al., 1999).

Although similarity in status emerges in adolescent peer groups, the underlying mechanisms are not well understood. Two mechanisms of peer group dynamics, selection and influence, can drive status similarity in peer networks (Jaccard, Blanton, & Dodge, 2005; Popp, Laursen, Kerr, Stattin, & Burk, 2008; Veenstra & Dijkstra, 2011). Selection means that adolescents choose friends who are similar in status to themselves; influence that their status changes in accordance with the status of their friends. The current study examined how both mechanisms contributed to status similarity in adolescent networks, using popularity as indicator of relative standing in the peer group. A developmental perspective was used in which changes in friendship relations and status were modeled simultaneously. Toward this end, we used advanced longitudinal network modeling.

In the goal-framing perspective of this study, behavior is seen in light of its contribution to goals (Lindenberg, 2001, 2006). It was argued that lower status peers aim to enhance their status through affiliation with higher status peers. Higher status adolescents might be reluctant to affiliate with lower status peers as they wish to avoid losing status by hanging out with lower rank peers and because lower status peers might become a threat to their position if their status improves.

On this basis, adolescents were expected to choose friends who were similar or higher in popularity than they were, and to be reluctant to select less popular friends. The affiliative attractiveness of popular adolescents was also expected to increase the number of best friend nominations received. Together, selection and influence were expected to result in stability of popularity at the individual level and status similarity at the group level.

The results for selection were in line with these expectations. Individual popularity was indeed rather stable. Friendship selection was a function of adolescents' own popularity. Adolescents strongly preferred similarly popular or more popular peers over less popular peers. Even unpopular adolescents were unlikely to select even less popular peers. Clearly, adolescents discriminate their friendship choices along the dimension of popularity.

Popularity increased receiving best friend nominations, and tended to decrease giving them. On the one hand, adolescents become more attractive as friends when they become more popular. Being attractive for affiliation is an important aspect of popularity (Brown et al., 1994; Dijkstra et al., 2010a). On the other hand, more popular adolescents were more selective in their own friendship choices between Grades 7 and 8. More popular peers are in a position to be more selective, but the pool of their potential friends is also smaller.

Consistently across grades unpopular peers were less likely to differentiate their attractions to somewhat more or much more popular peers. These adolescents did not seem to base their friendship choices on popularity. Perhaps they wished to affiliate with anyone they could. This reminds us of the *default selection* process observed among aggressive students, who eagerly try to make friends, but end up with other nonattractive peers (Sijtsema, Lindenberg, & Veenstra, 2010). We also found a clear pattern that adolescents were less likely to nominate lower status peers than higher status peers. These findings stress the importance of popularity in shaping adolescents' peer relations, actively avoiding or approaching peers depending on their status.

We also expected that adolescents' popularity would be influenced by the popularity of their friends. As expected, adolescents changed in popularity and became more similar to friends who were higher in popularity, indicating influence.

It should be kept in mind that popularity was a peer-reported reputation measure. Changes in popularity could therefore not be attributed to a self-reported biased overestimation of similarity with friends. Our data show clearly that adolescents' status changes in accordance with the status of their peer affiliates. To our knowledge this study is the first to empirically show that hanging around with more popular peers increases one's own status, known as basking in reflected glory (Dijkstra et al., 2010a).

Our study also showed that status similarity in the peer network peaked in Grade 7 but decreased somewhat afterward. This indicates that peer groups become more heterogeneous in status over time.

Although the importance of status for peer group formation may decrease in favor of other characteristics, the preference for similar or higher status peers remained strong in all grades. Perhaps higher status peers became more willing to allow lower status peers to hang out with them. Higher status adolescents may have been less afraid of status declines when they moved from Grade 7 to Grade 8. The presence of lower status peers in a group may also have emphasized the superiority of their own status.

The selection and influence effects for popularity were found while gender and ethnicity were controlled. In general, adolescents strongly preferred same-gender and same-ethnicity friends. When these tendencies were controlled for, the effects of popularity were still found. This supports the importance of popularity in adolescent network formation, and its ability to override the otherwise powerful effects of gender and ethnicity.

We also controlled for social preference and aggression. Adolescents who were highly preferred in Grade 7 were more likely to increase in popularity. It has been argued that aggression may be an important way to maintain status, but not to achieve it (see Dijkstra et al., 2010b). If true, it is more likely that aggression increases once popularity has been achieved, and popularity predicts aggression instead of the other way. Some studies hint in that direction by showing that popularity predicts physical and relational aggression, rather than the reverse (Cillessen & Mayeux, 2004; Rose et al., 2004). However, our findings for aggression were mixed. Physical aggression did not contribute to popularity, but even decreased it in between Grades 6 and 7 in School 1, whereas relational aggression initially increased popularity in School 1. It is possible that the association between aggression and popularity is more complex and not linear. Aggression may have a curvilinear effect on popularity, flattening it out or even decreasing it when aggression increases (see de Bruyn, Cillessen, & Wissink, 2010). Alternatively, adolescents may develop other means of status maintenance. Some may use aggression, but others may maintain their status in other ways, for example, by outperforming their peers in sports. Future research should examine the effect of such interactions on popularity in the peer group.

This study had some limitations. First, other determinants of popularity were not included, such as athletic abilities or physical attractiveness. Some of these are not easily subject to change and therefore less likely to lead to changes in popularity, although they may affect popularity and peer group formation initially. Second, our friendship networks were limited to same-grade peers. Friend-

ships across grades were not measured. Further research should examine to what extent popular adolescents affiliate with older peers, whereas unpopular peers may have younger friends for whom an older friend is status enhancing. Third, we dichotomized ethnicity into minority and majority groups. This ignores the heterogeneity among ethnic groups—another important direction for future research on adolescent network formation. Fourth, our measure of relational aggression was a peer nomination about ignoring others. Although this is an important relationally aggressive behavior (Card et al., 2008), the meanings of “ignoring” can be diverse, leaving room for ambiguous responses.

In spite of these limitations, this study examined the processes underlying status similarity among adolescent friends. The findings demonstrated selection and influence processes of status similarity in adolescent peer groups, and the dynamic development of stability and change in popularity in peer networks.

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Appendix

Calculation of Ego–Alter Selection Tables

To identify selection processes, we constructed ego–alter selection tables (Ripley et al., 2011). The popularity selection process v is best understood when the following effects are considered simultaneously: ego (effect popularity on nominations given), alter (effect popularity on nominations received), and homophilous popularity similarity effects. Ripley et al. (2011) provided the following equation for this purpose:

$$\beta_{\text{ego}}(v_i - \bar{v}) + \beta_{\text{alter}}(v_j - \bar{v}) + \beta_{\text{sim}} \left(1 - \frac{|v_i - v_j|}{\Delta_v} - \widehat{\text{sim}}^v \right).$$

The equation provides the effect scores for each tie, x_{ij} , by linking it to the level on some covariate v . We used an 18-category variable to represent popularity. The equation gives the propensity for students (ego) in each of the 18 categories to select peers (alters) in each of the other 18 categories, which is tabulated in a contingency table (see Tables 4 and 5).

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