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Journal of Adolescence

journal homepage: www.elsevier.com/locate/jado

Intrinsic and extrinsic motivation in early adolescents' friendship development: Friendship selection, influence, and prospective friendship quality

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ABSTRACT

Keywords:

Friendships
Adolescence
Motivation
Social network modeling

Friendships are essential for adolescent social development. However, they may be pursued for varying motives, which, in turn, may predict similarity in friendships via social selection or social influence processes, and likely help to explain friendship quality. We examined the effect of early adolescents' ($N = 374$, 12–14 years) intrinsic and extrinsic friendship motivation on friendship selection and social influence by utilizing social network modeling. In addition, longitudinal relations among motivation and friendship quality were estimated with structural equation modeling. Extrinsic motivation predicted activity in making friendship nominations during the sixth grade and lower friendship quality across time. Intrinsic motivation predicted inactivity in making friendship nominations during the sixth, popularity as a friend across the transition to middle school, and higher friendship quality across time. Social influence effects were observed for both motives, but were more pronounced for intrinsic motivation.

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Agentic perspectives on development view individuals as self-determined, active agents in their lives (Bandura, 2001; Little, Snyder, & Wehmeyer, 2006). In this view, motivational effects on human development are undeniable. Motivation has gained considerable attention in social psychology and in the academic domain in children where it is related to both school performance and well-being (Patrick, Ryan, & Pintrich, 1999; Walls & Little, 2005); however, its role in child and adolescent social development is still little understood. Research on friendships, for instance, has focused on cognitive, emotional, and behavioral correlates of friendship functioning (Espelage, Holt, & Henkel, 2003; Jones & Costin, 1995; Nangle, Erdley, Newman, Mason, & Carpenter, 2003), rather than motives for establishing and maintaining friendships. Given the great benefits of friendships on adolescent adjustment and well-being, understanding psychological factors driving the establishment of these important relationships is warranted.

In this longitudinal study, we examined the effects of early adolescents' intrinsic and extrinsic friendship motivation on the selection of friends, social influence, and prospective friendship quality. While intrinsic reasons for establishing friendships reflect inherent enjoyment of such activity, extrinsic friendship motives reflect engaging in these relationships for extrinsic reasons, such as perceived external rewards or pressure from others. In this study, we conducted longitudinal social network analysis using the Siena program (Snijders, Steglich, Schweinberger, & Huisman, 2007) to examine friendship

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selection and influence, and augmented these analyses with structural equation modeling used to estimate prospective relations among self-reported motivation and friend-reported friendship quality.

Adolescent friendships

During adolescence, the peer group as a social context becomes increasingly important (O'Brien & Bierman, 1988). Desires for closeness and influence among peers increase (Ojanen, Grönroos, & Salmivalli, 2005) and making friends becomes a core activity for personal development (Aboud & Mendelson, 1996; Marsh, Allen, Ho, Porter, & McFarland, 2006). Friendships are horizontal relationships between two peers who expect reciprocity in sharing the costs and benefits of mutual interaction (Hartup, 1979). On average, friendships also enhance well-being in the face of stressful events like victimization by peers and transition to middle school (Aikins, Bierman, & Parker, 2005; Berndt, Hawkins, & Jiao, 1999; Hodges, Boivin, Vitaro, & Bukowski, 1999). Across numerous studies, children with friends are better off in terms of adjustment and well-being than those without friends.

The quality of friendships is also a contributor to social adjustment. Encompassing intimacy, validation, having fun, and low degree of conflict (Bukowski, Hoza, & Boivin, 1994; Parker & Asher, 1993), friendship quality promotes positive development by enhancing emotional well-being, adaptive social information processing patterns, and peer acceptance (Brendgen, Bowen, Rondeau, & Vitaro, 1999; Parker & Asher, 1993). Both quantity and quality of friendships have beneficial effects on well-being by buffering against loneliness and depression (Nangle et al., 2003). Friendship quality is also found to moderate the effect of the number of friends on adjustment. For example, having a friend may not be beneficial for adjustment when the quality of the relationship is low (Brendgen et al., 1999).

There is also more to the quantitative side of friendships than the mere number of friends – the process of selecting desired friends is gaining increased attention in the literature. For example, observations of similarity between friends in behavioral and psychological characteristics (Prinstein & Dodge, 2008) have led scholars to examine friendship selection to understand how adolescents come to adopt values, behaviors, or social habits from peers that may play fundamental roles in their lives, such as alcohol or tobacco use (Urberg, Luo, Pilgrim, & Degirmencioglu, 2003). Aggression and drug abuse, for instance, may begin from some underlying factor that makes adolescents attracted to each other (e.g., sensation seeking), but over time, socialization effects may make friends increasingly alike in terms of these behaviors (Dishion, Eddy, Haas, & Li, 1997; Espelage et al., 2003). Assessing friendship selection and socialization (influence) enables us to understand the friendship-related processes of why and how adolescents display certain characteristics. In this study, our interest was to examine these processes with respect to early adolescents' friendship motivation.

Social motivation

According to Self-Determination Theory, SDT (Deci & Ryan, 1985, 2002), individuals' actions arise from a continuum of motivations, ranging from inherent enjoyment of these activities (intrinsic motivation) to influences external to the individual, such as rewards or expectations set by others (extrinsic motivation). Intrinsically motivated actions are inherently satisfying and enjoyable and, as such, promote higher well-being. Extrinsic motivation elicits lower performance and poor adjustment (Ryan, Deci, & Grolnick, 1995). For instance, whereas intrinsic motives for learning and studying at school are positively related to perceived ability and effort in these activities as well as higher grades and well-being, extrinsic motivation is related to putting less effort into school and to poorer adjustment (Walls & Little, 2005).

In the friendship domain, intrinsic motivation reflects the degree to which adolescents establish and maintain friendships for inherent enjoyment of these close relationships. The need for closeness is a fundamental human motivation (Baumeister & Leary, 1995) and is increasingly sought in friendships during early adolescence (Buhrmester, 1990). Early adolescents are thus likely to display increasing degrees of intrinsic friendship motivation over time. On the basis of the SDT framework (Deci & Ryan, 1985, 2002), we can expect that establishing friendships for intrinsic reasons is likely to forecast positive adjustment and well-being in these relationships. Engaging in friendships for inherent enjoyment is likely to promote well-being and perceived competence in sharing the costs and benefits of the relationship, thus also increasing the likelihood of being a desired friend and experiencing genuine intimacy within friendships.

However, individuals vary in how much they aim for closeness with peers (Ojanen et al., 2005). Adolescents may pursue these relationships also for extrinsic reasons, such as gaining acceptance from parents and teachers. Parents, for example, may directly urge children to make friends. Both parents and teachers are also natural authority figures in young adolescents' lives and may elicit concerns for how one appears to others. In early adolescence, the perception that others are watching and evaluating you is especially salient. Moreover, self-consciousness and social comparison orientations are elevated as compared to later adolescence (Rankin, Lane, Gibbons, & Gerrard, 2004). In short, social activities like making friends may serve extrinsic and appearance-related goals for young adolescents who are concerned with the expectations of others. However, such extrinsic motives are also likely to be perceived as superficial to the actual relationship and thus increase the risk of being an undesired friend in the eyes of others. Emotional investment in and commitment to the relationship are not likely when friendships serve extrinsic motives, which are thus likely to diminish the quality of the relationship.

Despite these theoretical reasons to expect motivation to influence friendship formation and friendship quality, the effects of intrinsic and extrinsic motivation in friendship development have not been examined. Although a considerable body of work has examined friendship selection and socialization to understand the development of problematic behaviors like

aggression and substance abuse (Poulin & Boivin, 2000; Urberg et al., 2003), we still know virtually nothing about how motivational orientations are reflected in friendship selection and influence. In this study, we examine the degree to which intrinsic and extrinsic motives predict the selection of friends and are influenced by these relationships by utilizing social network modeling. In the following, we will introduce the social network modeling perspective to the study of friendship selection and influence (for further details, see the 'Data Analytic Strategy' in the Method section).

Social network modeling of selection and influence in adolescent friendships

One window to the peer context in development is provided by actor-oriented social network modeling, which may be used to assess adolescents' choices in their friendship relations over time (Snijders, 2001). In this approach, information about friendships is collected by asking participants to name their friends in a meaningful context where individuals have repeated interactions with each other (e.g., a social network defined by a classroom, or a grade level in school). These nominations form the 'ties' in the networks that link individuals together and are modeled as unidirectional (someone nominates another person as a friend), or reciprocated ties (the target of a nomination returns the nomination).

Actor-oriented network modeling stems from the idea that in an effort to enhance well-being, actors in a network control their choices in forming, dropping, and maintaining relationships with others (Snijders, 2001). Some relationships are pursued longer as reflected by repeated nominations over time, whereas others are dropped. It is expected that nominations are repeated over time when there are relational benefits and that nominations do not recur when there are relationship costs or lack of mutual commitment. From this perspective, actors make choices that reflect actor-related changes in the network structure between any two assessment occasions. These choices contribute to changes in the internal structure of the networks over time.

In addition to the network structure as a whole, parameters related to giving and receiving friendship nominations within the networks over time may also be estimated. Selection effects reflect characteristics related to making friendship nominations, such as the degree to which individuals nominate friends with similar characteristics, or the degree to which nominations are reciprocated by others. Such selection effects may be predicted by individual-level variables like motivation. Social influence effects, in turn, reflect changes in individual-level variables based on the changes in the network structure (i.e., friendship ties) while controlling for the overall change in individuals' characteristics over time. Thus, the degree to which these characteristics (e.g., motivation) are adopted from the others in the network can be described.

Present hypotheses

In the social network analyses, we examined social selection and social influence effects associated with intrinsic and extrinsic friendship motivation over time. For selection, it was expected that intrinsic motivation would predict high activity in making and receiving friendship nominations due to its expected positive effects on adolescent friendships. In social network parlance, receiving friendship nominations reflects relative popularity (i.e., desirability) as a friend. Extrinsic motivation was also expected to predict activity in making friendship nominations. However, as extrinsic motives are likely to predict poor well-being at the individual level and may be detected by others as superficial for making friends, they were also expected to predict relative undesirability as a friend (i.e., low number of friendship nominations received from others). Both motivational styles were also expected to predict selection similarity as extrinsically and intrinsically oriented adolescents were expected to desire engagements with others who have similar motives.

We also examined social influence effects on both motivational orientations. At first blush, social transmission of motives may seem less intuitive than that of directly observable characteristics, such as aggressive acts or substance abuse. We argue, however, that motivational dispositions likely influence specific behaviors and emotional reactions within friendships. In line with the intrasubjectivity hypothesis of social influence (Dishion, Piehler, & Myers, 2008), we further suggest that shared attention and positive reactions to particular interaction experiences are important mechanisms of peer influence. In this view, influence effects on motivation would emerge because of the motivational effects on shared friendship experiences, such as valuing inherent enjoyment of the intimate relationship, or spending time together for social appearance. We expected these influence effects to be stronger in reciprocated than unilateral friendships.

To augment the social network analyses, we used structural equation modeling to examine relations among the motivational variables and friend-reported friendship quality. In accord with the SDT framework, we expected intrinsic friendship motivation to predict increases, and extrinsic motivation decreases, in friendship quality over time. Other directional effects were examined as well. Prior friendship quality, for instance, may promote subsequent increases in inherent enjoyment of friendships (intrinsic motivation). In agreement with gender differences in friendship quality and desires for closeness with peers in general (Jones & Costin, 1995; Ojanen et al., 2005), we expected girls to endorse higher levels of intrinsic friendship motivation and experience higher quality friendships than boys.

Method

Participants

The data were initially collected in grades 6 through 9 of a medium-sized urban, residential, and commercial community in the North East of the U.S. (see Walls & Little, 2005). The original sample was representative of this ethnically and

socioeconomically diverse district (64% European Americans, 17% African Americans, 6% Hispanic, and 13% Other). However, only the T1 6th grade cohort from the nine elementary schools where meaningful network structures could be identified was used for the present study. After the 6th grade, the students transitioned into a new school environment comprising the Grades 7, 8 and 9. Informed parental consent and child assent yielded a participation rate of 80%. The final sample consisted of 374 participants (180 girls).

The data were collected at three occasions across a 12-month period. The first two assessments took place within the sixth grade ($T1 =$ October, $T2 =$ April), and the third was conducted in the fall of the seventh grade ($T3 =$ October). Overall attrition across the measurement occasions was 4.01%. Missing data were imputed by using the Markov Chain Monte Carlo (MCMC) algorithm in the SAS Proc MI procedure (SAS institute).

Measures

Friendship networks

Participants were asked to nominate up to 18 friends in school at the same grade level. These nominations by school comprised the networks in the present study (i.e., due to the data structure, 'networks' are equivalent with 'schools' in the present study). The data included nine schools (i.e., networks) and were collected in one to three classes per school. The number of participants in each network varied between 21 and 59. Dichotomous friendship network matrices were constructed for each network; a friendship tie (i.e., nomination from one actor to another) was either present (rated 1) or absent (rated 0), and thus could be reciprocated or unidirectional.

Between the second and third measurement occasions, participants moved from the individual elementary schools to one large school where they were assigned to teams of about 100 students each. In this study, the original sixth grade ($T1$) networks were used as the networks across time. That is, the $T1$ participants were followed over time and their friendship nominations were examined in these original networks also at $T2$ and $T3$, even though it is possible that new friendship outside of the original networks emerged, especially across the transition to middle school. Because of the social contextual change (within versus between two school years) in our data, we conducted the data estimation separately for the two assessment intervals from $T1$ to $T2$ (early and late of 6th grade) and from $T2$ to $T3$ (across the transition to the 7th grade/new school) to evaluate potential context-related differences in adolescent friendship functioning between them.

Friendship motivation

Our measure of intrinsic and extrinsic motivation was partly adapted from the Reasons Survey (Ryan & Connell, 1989) and the Achievement Goals Questionnaire (Elliot & Sheldon, 1997), and partly developed by our research team who generated items based on the motivational constructs by Deci and Ryan (1985, 2000). The measure produces reliable and valid data (see Walls & Little, 2005).

All motivation items were assessed with respect to three frames: "Why do you make new friends", "Why do you get a friend to do something together with you", and "Why do you keep a good friend". The participants provided answers in a Likert-scale, ranging from 1 to 5 (1 = *I disagree*, 5 = *I agree*). The final scores were computed by averaging across the items for each motivational construct. Two items (with respect to the three frames, i.e., six questions altogether) were used to measure intrinsic motivation ($\alpha = 0.73$) and 4 items (with respect to the three frames, i.e., 12 questions altogether) were used to measure extrinsic motivation ($\alpha = 0.92$). An example of a frame/item combination from the intrinsic scale reads: [Frame] "Why do you make new friends? [item] "Is it because you enjoy doing it?". The other intrinsic item was: Is it because you like to do it? The extrinsic items were: Is it because you want to make your parents happy?; Is it because you want to get praise from your teachers?; Is it because you don't want your teachers to think you are no good?; Is it because you don't want your parents to be angry with you?

Previous acquaintance

In the questionnaire where adolescents nominated friends in school, they were also asked to report whether the relationship was less than 6-months long. For this dichotomous 'previous acquaintance' variable, the value 0 indicated that the duration was less than six months or that there was no friendship present at all. To control for the potentially confounding effects of the pre-existing friendships to the selection and influence parameters, this variable was used in the analysis as a network covariate (reflecting information about the ties in the networks). Because relationships among the actors in the networks exist also prior to the arbitrary first assessment point, especially social influence parameters can be inflated without this statistical control.

Friend-perceived friendship quality

Adolescents were also asked to nominate their three best friends in school in the same grade level and to think about their relationships with them. They were asked to rate their friendship quality (Brendgen, Little, & Krappmann, 2000) on a Likert-scale (*never, seldom, often, always*) in terms of perceived intimacy with a friend (e.g., Do you share secrets with each other?), likeability of the friend (e.g., How much this friend likes you?), and having fun in the relationship (e.g., Do you joke around with this friend?). To evaluate the effect of self-reported friendship motivation on friendship quality without shared method bias, the data were arranged so that friendship quality reflected the perceptions of the target child's genuine friends.

Data analytic strategy

The present data were analyzed with the Siena 3.1 module (Snijders et al., 2007) of the StOCNET 1.8 program package (Boer, Huisman, Snijders, Wichers, & Zeggelink, 2007). This program is used to assess changes in cross-level influences between the network structure (i.e., relationships among the actors) and individual-level characteristics like motivation over time (Burk, Steglich, & Snijders, 2007). It should be noted that in the present analyses, the term 'networks' is used synonymously with the term 'schools'. The estimation process uses an interactive stochastic approximation (MCMC) algorithm, based on repeated simulations of the change process in a given network. After the estimation process, the program performs a test of convergence to evaluate potential discrepancies between estimated and observed values; model convergence is reached when these deviations are close to zero.

The parameters of interest include (a) network effects reflecting structural changes in the networks themselves, (b) selection effects that reflect the degree to which individual-level characteristics like motivation affect actors' choices in their relationships, and (c) influence effects that reflect the extent to which individuals' characteristics like motivation are adopted from other actors in the network. Central parameters and their estimation are described in the Appendix (for a detailed overview of social network parameters), see (Wasserman & Faust, 1994).

The structural, selection, and influence parameters initially estimated in the individual networks separately may be further subjected to a multi-level (meta) analysis where the significance of each parameter is estimated across all the networks in the data (for details, see Snijders & Baerveldt, 2003). This procedure increases the reliability of the findings by controlling for the variation in the parameter estimates due to network-specific characteristics, such as the network size (i.e., estimates may be smaller or larger simply due to the variation in the number of participants in the networks). In addition, a variable reflecting the duration of the relationships prior to the first data point (*previous acquaintance* in the present study) may be used to control for its effects on the estimates of selection and influence (influence effects, particularly, can be inflated without such controls).

Although the relationship nominations in the networks are initially examined as unidirectional, the degree of reciprocity in these nominations is also estimated. These estimates reflect the general degree of reciprocity (i.e., structural reciprocity) and the degree of reciprocity in friendship selection as predicted by a particular individual-level variable (i.e., selection reciprocity). Interactive effects among the reciprocity and other parameters may also be examined. These are especially meaningful in the study of friendships where the difference between uni- and bi-directional nominations (i.e., between desired and genuine friends) has substantive implications. In selection analyses, a similarity \times reciprocity interaction reflects the extent to which reciprocal nominations of peers occur between participants who are similar on variables like motivation. In influence analyses, a similarity \times reciprocity interaction reflects the degree to which characteristics like motivation are adopted from reciprocated friendships.

The individual network analyses were conducted as follows. First, we estimated a basic model that only included the basic network parameters (i.e., density, reciprocity, transitivity, and 3-cycles) to ensure that the networks in the present data adhered to the expected structure of friendship networks (these models are not reported here).

Second, given the structure of our data, we examined selection and influence effects *separately* for the two six month intervals. Specifically, the first two data collections in our project took place during spring and fall of the same school year during sixth grade. The third assessment was conducted early in the subsequent school year (fall of the seventh grade). At this third occasion these young adolescents had moved from their individual elementary schools to the larger middle school. Social processes like friendship establishment may operate differently in stable social contexts such as within a school year versus a transition period where some relationships may be lost and new ones established.

Third, we conducted a condensed analysis where the selection and influence parameters were simultaneously assessed across the entire 12-month time lag, while adjusting for the potential confounding of selection and influence effects. As selection and influence operate simultaneously to produce dependencies in social relationships (see Kandel, 1978), statistical controls of these processes on each other is critically important. Our modeling strategy enables us to compare findings from interval-specific and condensed network models.

Overall, in the selection analyses, the motivation variables were used as individual-level covariates to estimate their effects on the activity of making friendship nominations, desirability as a friend (receiving nominations), and similarity in friendship selection. In the social influence analyses, the network structure was used to predict changes in the individual-level covariates (intrinsic and extrinsic motivation) over time. Because only positive and absolute values can be used in the model estimation, scores for intrinsic and extrinsic motivation were re-coded to a 20-point scale using increments of 0.25 as cut-off points.

Finally, longitudinal structural equation modeling was used to estimate the prospective relations among the motivational variables and friend-reported friendship quality in a panel model design. The analyses were performed with Lisrel 8.8 (Jöreskog & Sörbom, 1993).

Results

Descriptive statistics

Descriptive information about the individual networks (i.e., schools) is provided in Table 1. As reflected here, the average number of nominations (ties), reciprocated dyads, and the gender distribution were similar across the individual networks.

Please cite this article in press as: Ojanen, T., et al., Intrinsic and extrinsic motivation in early adolescents' friendship development: Friendship selection, influence, and prospective friendship quality, Journal of Adolescence (2010), doi:10.1016/j.adolescence.2010.08.004

Table 1

Gender composition, number of ties, density, and the percentage of reciprocal dyads per network (i.e., school) in the Three Waves of Data.

Network	N	Sex		T1			T2			T3		
		Boys	Girls	Number of ties	Density	Reciprocal dyads (%)	Number of ties	Density	Reciprocal dyads (%)	Number of ties	Density	Reciprocal dyads (%)
1	21	12	9	125	0.30	45.34	96	0.23	37.14	54	0.13	28.57
2	30	15	15	210	0.24	40.94	227	0.26	36.75	108	0.12	24.14
3	50	32	18	339	0.14	28.90	280	0.11	28.44	159	0.07	31.40
4	59	25	34	462	0.14	35.88	437	0.13	28.53	207	0.06	26.99
5	37	21	16	324	0.24	42.11	235	0.18	24.34	107	0.08	24.42
6	36	20	16	209	0.17	33.12	186	0.15	25.68	107	0.09	28.92
7	38	17	21	276	0.20	44.50	249	0.18	39.11	135	0.10	42.11
8	47	21	26	387	0.18	42.80	416	0.19	43.94	283	0.13	43.65
9	56	31	25	439	0.14	45.18	378	0.12	38.97	229	0.07	36.31
Total	374	194	180									

Correlations among the motivation and friendship quality variables across time are reported in Table 2. The sample means for the motivation variables were: intrinsic motivation $T1 = 2.91$, $T2 = 3.27$, and $T3 = 3.12$; extrinsic motivation $T1 = 1.51$, $T2 = 1.39$, and $T3 = 1.42$.

A visual representation of a friendship network across the three measurement occasions can be seen in Fig. 1. As reflected here (and in the network density parameter described below), the networks became less dense over time, suggesting that fewer friendship nominations were being made across the measurement occasions. While such development is likely during a school year where more nominations are likely at first, followed by a stabilization period where only some relationships are pursued further, the continued drop in friendship ties (nominations) toward the third measured occasion was likely, in part, affected by the present data collection method. That is, while this effect is in accord with the sociological theory of individuals trying to maximize their well-being by keeping only those relationships that provide certain benefits and dropping others, it may also reflect the fact that, at Time 3, potential new members in the adolescent friendship networks could not be assessed across the transition to middle school in our data (see also the Discussion).

In the following, we first report multi-level estimates for selection and influence separately from the interval-specific analyses (structural network effects are also reported as part of these analyses). Second, we report multi-level estimates from the condensed models where the selection and influence effects were simultaneously estimated across the 12-month surveillance period. Third, we report findings from the longitudinal SEM conducted to evaluate relations among adolescent friendship motives and friend-reported friendship quality.

Friendship selection: interval-specific multi-level analysis

Mean estimates, standard errors, and effect sizes from the meta-level analysis are reported in Table 3. Effect sizes for the parameter estimates were calculated based on the natural logarithm of the odds ratio divided by 1.81 (see Chinn, 2000). Observed variances and Chi-square statistics for the parameter estimates are also reported. A significant Chi-square indicates that a parameter estimate varied across the individual networks in the multi-level analysis.

As can be seen in Table 3, a negative density effect indicated that fewer friendship nominations were made among study participants over time (i.e., the chance of making a nomination was smaller than the chance of *not* making a nomination; see the example network in Fig. 1). However, the positive reciprocity parameter indicates that reciprocated nominations were 1.11 times more likely to persist than unreciprocated nominations. Positive transitivity effects were also observed for both measurement intervals, suggesting that adolescents tended to nominate friends who were also nominated by their other friends (although the Chi-square tests indicate differences among the individual networks in both assessment intervals).

Table 2

Zero-order correlations among the motivation variables across time.

	T1 Intrinsic motivation	T1 Extrinsic motivation	T1 Friendship Quality	T2 Intrinsic motivation	T2 Extrinsic motivation	T2 Friendship quality	T3 Intrinsic motivation	T3 Extrinsic motivation	T3 Friendship quality
T1 Intrinsic motivation	1								
T1 Extrinsic motivation	-0.01	1							
T1 Friendship quality		0.08	-0.07						
T2 Intrinsic motivation	0.51***	-0.04	0.01	1					
T2 Extrinsic motivation	-0.08	0.54***	-0.05	-0.01	1				
T2 Friendship quality	0.12	-0.07	0.34***	0.11*	-0.10 [†]	1			
T3 Intrinsic motivation	0.39***	-0.13*	0.06	0.48***	-0.03	0.16**	1		
T3 Extrinsic motivation	-0.08	0.34***	0.00	0.01	0.47***	0.01	-0.03	1	
T3 Friendship quality	0.03	-0.13*	0.29***	0.04	-0.14**	0.83***	0.09 [†]	0.03	1

[†] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

T1 --- six months during the 6th grade --- T2 --- six months across the 6th and 7th grades--- T3

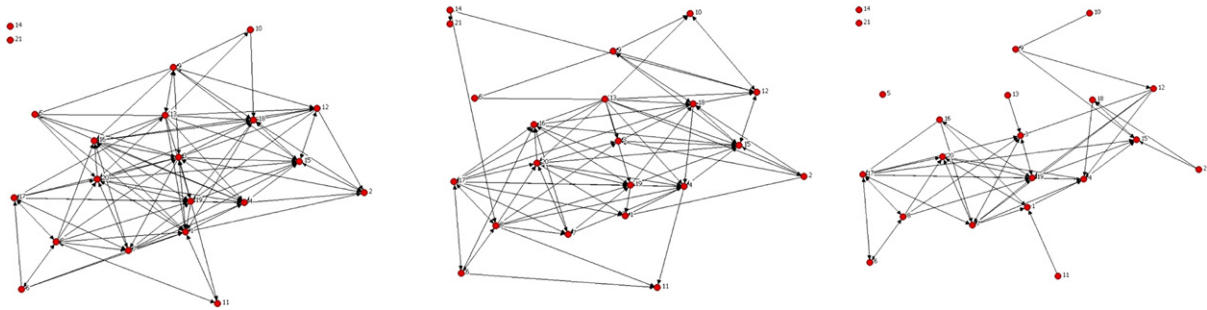


Fig. 1. Graphical presentation of a friendship network across time.

Finally, the effect of 3-cycles was negative, suggesting that there was no generalized transitivity in the friendship networks (see Table 3). That is, friendship nominations formed a hierarchy of relations at different levels of organization in the peer group.

Effects of intrinsic and extrinsic motivation on friendship selection were examined by inserting the motivation variables to the models as individual-level covariates where the selection parameters were estimated separately for the two measurement intervals. Selection effects for the motivation variables are also reported in Table 3. Because of collinearity issues, the similarity effects for unidirectional and reciprocal (similarity \times reciprocity interactive effects) relations were estimated in separate models. Given that the other parameter estimates were nearly identical between the two models, we only report the unidirectional similarity effect in Table 3, along with the similarity \times reciprocity interactive effect derived from the other model. As can be seen in Table 3, extrinsic motivation predicted high activity in making friendship nominations during sixth grade, whereas intrinsic motivation was related to low activity in making friendship nominations during this period. Also, as reflected in the significant effect of received friendship nominations in the 6th to 7th grade model, intrinsically motivated adolescents were popular as friends across the transition to middle school.

Social influence: interval-specific multi-level analysis

Table 4 summarizes the results testing social influence. In these models, friendship networks were treated as independent variables and the motivation variables as dependent variables (i.e., actors were allowed to change their values on motivational styles). These effects reflect the degree to which adolescents adjust their motivational orientations based on the friendship

Table 3

Motivation and friendship selection: multilevel estimates per assessment interval ($N = 374$).

	Estimated Mean (SE)	T1 – T2 During the 6th grade		χ^2	df	T2 – T3 Across the 6th and 7th grades		Variance	χ^2	df ^a
		Effect size	Variance			Estimated mean (SE)	Effect size			
<i>Structural network effects</i>										
Density	–1.88 (0.04)**	–	0.0219	14.20	8	–2.19 (0.04)**	–	0.0114	5.47	8
Reciprocity	1.11 (0.06)**	0.61	0.0457	12.06	8	1.33 (0.07)**	0.73	0.0442	4.75	8
Transitivity	0.18 (0.01)**	0.10	0.0010	16.63*	8	0.15 (0.02)**	0.08	0.0041	17.09*	8
3-Cycles	–0.25 (0.03)**	–0.14	0.0076	13.32	8	–0.16 (0.05)**	–0.09	0.0219	8.12	8
Previous acquaintance	0.17 (0.15)	0.09	0.2462	22.86*	8	0.32 (0.19)	0.18	0.3570	18.91*	8
<i>Extrinsic motivation</i>										
Received Friendship Nominations	0.02 (0.04)	0.01	0.0189	8.66	8	–0.13 (0.11)	–0.07	0.1645	5.00	8
Made Friendship Nominations	0.15 (0.05)**	0.08	0.0305	14.25**	8	–0.09 (0.12)	–0.05	0.2482	19.63	8
Similarity	0.14 (0.09)	0.08	0.0765	7.88	8	–0.00 (0.18)	0.00	0.1986	5.19	7
Similarity \times reciprocity	0.19 (0.18)	0.10	0.3382	10.17	8	–0.05 (0.32)	–0.03	1.0896	10.59	8
<i>Intrinsic motivation</i>										
Received friendship nominations	–0.00 (0.03)	0.00	0.0087	9.91	8	0.07 (0.04)*	0.04	0.0071	3.31	8
Made friendship nominations	–0.13 (0.03)**	–0.07	0.1163	8.34	8	0.02 (0.06)	0.01	0.0409	11.51	8
Similarity	–0.12 (0.14)	–0.07	0.2002	10.52	8	0.07 (0.18)	0.04	0.2923	13.87	8
Similarity \times reciprocity	–0.29 (0.29)	–0.16	0.8149	18.92*	8	–0.26 (0.36)	–0.14	1.3468	9.76	8

* $p < 0.05$, ** $p < 0.01$.

^a School 5 could not be included in the meta-analysis due to large (>5.00) SE's.

Table 4Motivation and friendship influence: multilevel estimates per assessment interval ($N = 374$).

	Estimated mean (SE)	T1 – T2 During the 6th grade		χ^2	df^a	T2 – T3 Across the 6th and 7th grades		Variance	χ^2	df^a
		Effect size	Variance			Estimated mean (SE)	Effect size			
<i>Structural network effects</i>										
Density	–1.83 (0.04)**	–	0.0224	14.71	8	–2.12 (0.04)**	–	0.0150	4.70	8
Reciprocity	1.13 (0.06)**	0.62	0.0397	6.80	8	1.29 (0.07)**	0.71	0.0362	4.68	8
Transitivity	0.17 (0.01)**	0.09	0.0012	14.74	8	0.15 (0.02)**	0.08	0.0031	21.41**	8
3-Cycles	–0.26 (0.03)**	–0.14	0.0093	12.57	8	–0.18 (0.03)**	–0.10	0.0154	9.52	8
Previous acquaintance	0.19 (0.12)	0.10	0.1420	17.36	8	0.20 (0.12)†	0.11	0.1471	4.91	8
<i>Extrinsic motivation</i>										
Linear tendency	–0.14 (0.04)**	–	0.0955	4.73	8	–0.03 (0.04)	–0.02	0.0101	4.91	8
Quadratic tendency	–0.03 (0.03)	–0.02	0.0380	3.87	8	–0.06 (0.03)*	–0.03	0.0121	3.03	8
Similarity	2.39 (2.46)	1.32	14.5352	1.02	2	1.34 (3.42)	0.74	24.0332	1.24	2
Similarity \times reciprocity	0.59 (1.77)	0.33	3.5465	0.72	4	1.86 (1.43)	1.03	7.8266	3.73	4
<i>Intrinsic motivation</i>										
Linear tendency	0.15 (0.03)**	–	0.0059	6.30	8	–0.01 (0.03)	–	0.0104	7.22	8
Quadratic tendency	0.04 (0.01)*	0.02	0.0045	10.62	8	–0.01 (0.02)	–0.01	0.0025	4.34	8
Similarity	2.49 (1.31)†	1.38	8.0374	2.19	5	2.23 (1.97)	1.23	3.5295	0.72	4
Similarity \times reciprocity	1.47 (0.89)†	0.81	0.7875	0.97	6	1.55 (1.14)	0.86	7.1125	3.89	7

† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.^a Some schools could not be included in the meta-analysis due to large (>5.00) SE's.

ties in the networks. As can be seen in Table 4, the effects of density, reciprocity, transitivity and 3-cycles and previous acquaintance were almost identical to the effects of in Table 3. Moreover, regarding the influence effects, the tendency effect revealed that extrinsic friendship motivation declined and intrinsic motivation increased by the end of the 6th grade. A positive quadratic tendency suggests that intrinsic motivation follows a self-reinforcing pattern where high intrinsic motivation leads to an increase in intrinsic motivation, whereas low intrinsic motivation leads to a decrease in intrinsic motivation. Extrinsic motivation, however, follows a negative quadratic pattern with a self-correcting effect across the transition to middle school (i.e., high extrinsic motivation leads to a decrease in extrinsic motivation, whereas low extrinsic motivation leads to an increase in extrinsic motivation).

Finally, as depicted in Table 4, similarity and similarity \times reciprocity effects for intrinsic motivation were marginally significant for the sixth grade model. These effects suggest that there was a small tendency for intrinsic motivation to be adopted from unilateral and reciprocal (i.e., from desired and actual) friends. However, influence effects intrinsic motivation were not found between 6th and 7th grade and influence effects for extrinsic motivation were not found in either model.

Table 5

Simultaneous selection and influence: multilevel estimates across 12 months.

	Estimated mean (SE)	Effect size	Variance	χ^2	df^a
<i>Extrinsic motivation</i>					
Selection					
Received friendship nominations	0.00 (0.02)	0.00	0.0065	2.71	8
Activity in making friendship	0.03 (0.02)†	0.02	0.0219	4.08	8
Selection similarity between actors	0.06 (0.31)	0.03	1.2177	3.28	8
Similarity \times reciprocity	–0.01 (0.63)	–0.01	2.4390	4.26	6
Influence					
Linear tendency	–0.11 (0.03)**	–	0.0134	5.79	8
Quadratic tendency	–0.05 (0.02)**	–0.03	0.0039	3.96	8
Similarity	2.27 (1.31)†	1.25	3.6701	1.69	6
Similarity \times reciprocity	0.88 (1.03)	0.49	3.8190	2.67	6
<i>Intrinsic motivation</i>					
Selection					
Received friendship nominations	–0.01 (0.01)	–0.01	0.0008	4.61	8
Activity in making friendship	–0.06 (0.03)*	–0.03	0.0089	14.05	8
Similarity	–0.23 (0.23)	–0.13	1.0591	10.90	8
Similarity \times reciprocity	–0.81 (0.64)	–0.45	5.9207	5.97	6
Influence					
Linear tendency	0.06 (0.02)**	–	0.0018	2.63	8
Quadratic tendency	–0.02 (0.01)	–0.01	0.0002	1.54	8
Similarity	2.85 (0.93)**	1.57	3.8375	2.26	8
Similarity \times reciprocity	2.30 (0.90)*	1.27	2.7118	2.34	8

† $p < 0.10$, * $p < 0.05$, ** $p < 0.01$.^a Some schools could not be included in the meta-analysis due to large (>5.00) SE's.

Simultaneous estimation of selection and influence: condensed multi-level analysis

In addition to the interval-specific analyses, we also evaluated the relative strength of the selection and influence effects across the entire 12-month observation period where information from all three measurement occasions was utilized (see Table 5). The structural network effects and the effect of the previous acquaintance were estimated in all models, but not reported here to eliminate redundancy.

In the selection parameters, the positive effect of extrinsic motivation and the negative effect of intrinsic motivation on the activity of making friendship nominations were both (marginally) significant, also when the effects of selection and influence processes on each other were controlled for (see Table 5). Furthermore, the linear and quadratic tendency effects for extrinsic motivation remained the same. That is, adolescents displayed decreasing levels of extrinsic motivation over time and this motivation was also negatively exacerbated over time (reflected in the self-corrective pattern where low extrinsic motivation led to an increase, and high extrinsic motivation led to a decrease, in this orientation over time). For intrinsic motivation, the positive linear effect suggested that adolescents displayed increasing levels of intrinsic motivation over the 12-month period, but the previously observed quadratic tendency (i.e., self-reinforcing pattern) was not significant (see Table 5). The influence effects further suggested that intrinsic motivation was adopted from both unilateral and reciprocal friends, but the effect from unilateral (desired) friends for extrinsic motivation was only marginal.

Pathways from motivation to friendship quality

The goal of the final set of analysis was to determine whether intrinsic and extrinsic motivation play a role in the development of friendship quality. Structural equation modeling was used to examine prospective relations among the motivational variables and friendship quality. We evaluated model fit with the Root-Mean-Square Error of Approximation (RMSEA), the Non-Normed Fit Index (NNFI), and Comparative Fit Index (CFI). The analyzed data are available at www.Quant.KU.edu. Prior to testing links between motivation and friendship quality, a number of preliminary analyses were undertaken to ensure the high quality measurement and equivalence between boys and girls.

Measurement model and mean comparisons

The unconstrained Confirmatory Factor Analysis, CFA, model including the motivation and friendship quality constructs across the three occasions expectedly fit the data well ($\chi^2_{(552; N = 374)} = 714.116$, RMSEA = 0.0395_(0.0304|0.0477), NNFI = 0.975, CFI = 0.981). Measurement invariance of the constructs was established by constraining the factor loadings and indicator intercepts to be equal across the three measurement occasions, as well as across gender. This constrained multigroup model fit the data well ($\chi^2_{(582, N = 374)} = 815.228$, RMSEA = 0.0446_(0.0366|0.0521), NNFI = 0.968, CFI = 0.973). These results indicate that the constructs were measured similarly across time and across gender.

The scale of the latent variables was set with the effects coding procedure where the set of factor loadings for each construct are constrained to average 1.0 and the set of indicator intercepts are constrained to average 0 (Little, Slegers, & Card, 2006), which makes the scales of the observed and latent variables identical. This scaling procedure enabled us to examine the means of the constructs in a nonarbitrary metric across time and gender (Jöreskog & Sörbom, 1993). Omnibus tests of the equality of the means indicated significant differences in the latent means between boys and girls ($\Delta\chi^2_{(9, N = 374)} = 56.13$, $p < 0.001$) for which a series of tests was conducted to evaluate these and related effect sizes in more detail. The findings indicated that girls scored higher than boys in Friendship Quality at T1, $\Delta\chi^2_{(1, N = 374)} = 15.00$, $p < 0.001$, and at T2, $\Delta\chi^2_{(1, N = 374)} = 5.05$, $p < 0.05$.

Structural relations among friendship motivation and friendship quality

Directional effects between the constructs were tested in a panel design where the auto-regressive within-constructs effects were controlled for and constructs within each measurement occasion were allowed to correlate. Multigroup model tests indicated significant differences in the latent variances between the genders, $\Delta\chi^2_{(45, N = 374)} = 81.67$, $p < 0.001$, for which we estimated the directional paths among the constructs in a standardized metric (utilizing phantom variables) in a multi-group model by gender. This approach enabled us to estimate directional effects among the constructs in a model where their equality between the genders could be appropriately evaluated. Specifically, we tested the equality of each path across genders. Paths that were similar between the genders were constrained to be equal between them, whereas the paths that were significantly different were allowed to vary freely between the gender groups. Non-significant paths in both or either genders were set to zero.

The final model is depicted in Fig. 2. This model included only significant directional paths and fit the data well ($\chi^2_{(598; N = 374)} = 793.986$, RMSEA = 0.040_(0.033|0.049), NNFI = 0.973, CFI = 0.977). As can be seen in Fig. 2, T1 intrinsic motivation had a positive effect on T2 friendship quality, whereas T1 extrinsic motivation had a negative effect on T2 friendship quality. Cross group comparisons indicated no differences in these effects between the genders. There were no significant effects from the T2 motivational constructs to the T3 friendship quality, nor were there effects from friendship quality to the subsequent motivational constructs. However, inspection of the indirect paths indicated that T1 intrinsic motivation predicted T3 friendship quality through T2 friendship quality ($\beta = 0.62$, $z = 2.887$), as did T1 extrinsic motivation ($\beta = -0.50$, $z = -2.587$).

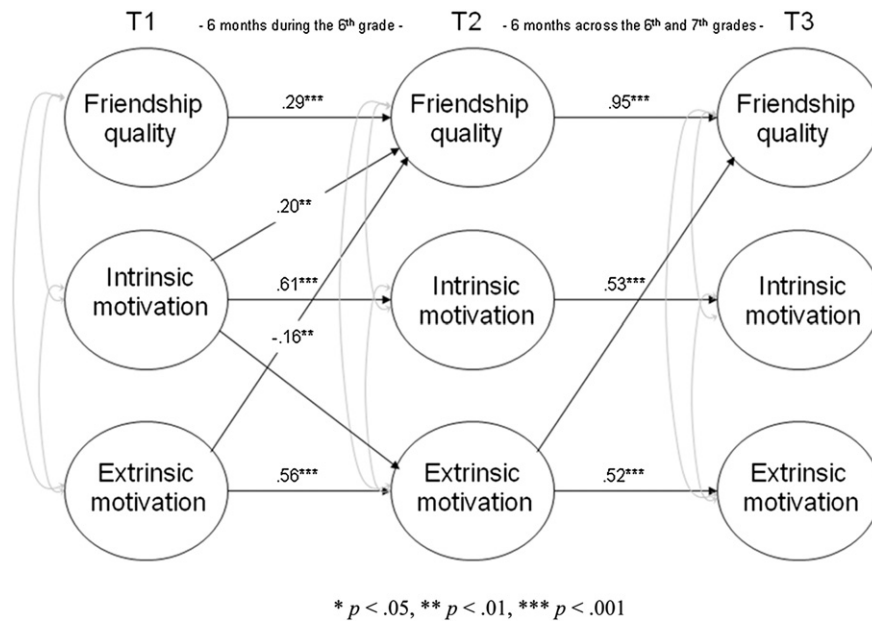


Fig. 2. Prospective effects among friendship motivation and friendship quality.

Discussion

Making friends is a core social activity and an essential marker of adjustment in early adolescence (Aboud & Mendelson, 1996; Nangle et al., 2003). In this study, we examined the similarity in intrinsic and extrinsic motivation between friends and the influence of friends on changes in motivation during 6th grade and across the transition to 7th grade. In addition, the role of motivation in friendship quality was investigated. The findings revealed several predicted effects and are among the first to provide longitudinal evidence for the roles of different motivations in early adolescent friendship development.

Adolescent friendship networks: implications from the Siena models

The friendship network effects observed in our data are congruent with existing knowledge on adolescent friendships. In agreement with the increasing importance of friendships during early adolescence (Buhrmester, 1990), we found a strong tendency among adolescents to reciprocate friendship ties over time. Consistent with the presence of friendship cliques in the overall peer group (Degirmencioğlu, Urberg, Tolson, & Richard, 1998), friendships also tended to be transitive. This transitivity suggests that most friendships were found among closely knit groups. This means that for most adolescents, their desired friends were also friends of their friends. However, there was no generalized transitivity in reciprocated relationships. That is, one or more friends within transitive clusters received more friendship nominations than others, suggesting that some adolescents were relatively more often nominated as friends than others and they were also more likely to extend friendship nominations to each other rather than to other peers. In line with findings on peer perceived popularity in general (Rodkin, Farmer, Pearl, & Van Acker, 2006), social status hierarchies may likely exist with respect to dyadic friendships in the adolescent peer group.

The negative density effect suggested that, on average, more unidirectional friendship ties were dropped than formed over time. This is consistent with the actor-oriented idea of maximizing one's well-being (Snijders, 2001) and suggests that relatively more friendship nominations were made before reciprocated relationships became salient. However, this observation should be taken with caution as it may reflect a methodological limitation in our study. Specifically, friendships were examined across time with intact networks between Time 1 and Time 2. The drop in friendship nominations during the second assessment interval (Time 2 to Time 3) is likely due to the fact adolescents were assigned to new middle school teams randomly with respect to the original friendship networks, and new participants could not be assessed for the networks in our study. Such inclusion would have been worthwhile given that new friendships are likely to be sought and only some existing relationships re-established during the transition to middle school where about 20% of pre-transition friendships become unstable (Aikins et al., 2005).

Development of adolescent friendship motivation

Consistent with previously established increases in the desires for closeness (Ojanen et al., 2005) and intimacy in friendships over the course of early adolescence (Buhrmester, 1990), adolescents reported increasing numbers of friends

over time in our sample. While not specifically indicated by our analyses, this potentially reflects inherent enjoyment of these relationships at this stage of development. The observed decreasing trend in extrinsic friendship motivation, in turn, suggests that adolescents also become less concerned about seeking friends for gaining acceptance from parents and teachers. This may reflect the diminishing role of social comparison orientation from early to later adolescence (Rankin et al., 2004) and suggests that social perceptual changes are also reflected in the motivational base of adolescent friendship functioning.

Intrinsic friendship motives followed a self-satisfying pattern (i.e., previous levels of these motives reinforced their subsequent display over time). Extrinsic motives displayed a self-corrective pattern (i.e., over time, extrinsic motives regressed to the mean). These observations fit with the tenets of the self-determination theory (Deci & Ryan, 1985, 2000). Intrinsic motives are viewed as self-satisfying, providing need satisfaction regardless of the actual success in specific activities. Extrinsic motives, in turn, are detrimental to need satisfaction and well-being. These motives may actually work against themselves in social development. However, these findings should be interpreted with caution as the specific effects in the network analyses were not observed consistently across all assessment intervals. Furthermore, the positive auto-regressive effects in the SEM framework (i.e., in the modeling of traditional individual differences in these constructs) suggest that prior levels positively predict the display of both intrinsic and extrinsic motives over time. Nevertheless, the present observations provide preliminary insights on the potential developmental patterns of adolescent friendship motives.

As expected, girls endorsed higher quality friendships than boys. However, there were no gender differences in friendship motivation. Our findings suggest that boys and girls experience equal levels of inherent enjoyment in establishing and maintaining friendships during early adolescence where these relationships become increasingly important providers of intimacy (Buhrmester, 1990; O'Brien & Bierman, 1988). Furthermore, establishing friendships for extrinsic, appearance-related concerns also appear to be equally salient motives for both genders, suggesting that self-consciousness and social comparison orientations (see Rankin et al., 2004) likely affect friendship functioning similarly.

Motivational effects on friendship quality, selection, and influence

The effects of intrinsic and extrinsic motivation on friendship development were mostly in agreement with the SDT (Deci & Ryan, 1985, 2000). Adolescents who sought friends for intrinsic reasons enjoyed the benefit of increasingly intimate and fun friendships over time, whereas extrinsic motivation predicted decreases in friendship quality over time. However, these direct effects from the motivational constructs on friendship quality were only found across the 6th grade; T2 intrinsic and extrinsic motivation were not associate with friendship quality in 7th grade. The fact that the direct effects did not reach significance in this 6th to 7th grade analyses may be partly related to the stronger within-construct stability (i.e., there was less variance left to explain) in friendship quality across the transition to middle school.

In contrast to the effects of motivation on prospective friendship quality, friendship quality did not have prospective effects on intrinsic or extrinsic motivation. Our findings thus suggest that extrinsic friendship motives stem from social reputational concerns rather than from poor quality friendships. Intrinsic motives, in turn, may be self-satisfactory in that their auto-regressive effects (stability patterns) simply exceed the effects of actual relationship experiences. However, friendship quality experienced by the adolescents themselves (rather than quality reported by their friends as examined here) may fuel intrinsic friendship motives. Clearly, future studies are needed to evaluate the prospective relations among adolescent friendship motives and friendship quality in more detail.

As observed in the social network analyses, intrinsic motivation predicted relative desirability as a friend across the transition to middle school. In line with the generally acknowledged positive well-being outcomes of intrinsic motivation (Deci & Ryan, 1985, 2000), this suggests that adolescents' intrinsic friendship motives likely translate into actions signaling genuine care and commitment to the relationship, which, in turn, are positively perceived by peers at school. The fact that this effect did not reach significance in the 6th grade and was originally observed only across the transition from 6th to 7th grade, may be due to the difference in the relative stability of the social context during sixth grade versus across the transition to seventh grade. Specifically, adolescents with high degrees of intrinsic friendship motives were attractive as friends especially in stressful and unstable contexts like transition to middle school. As intrinsic motives were also related to higher friendship quality, the overall pattern of our findings suggest that intrinsic friendship motives may be a protective factor during the transition to middle school where stable and high quality friendships themselves enhance personal and academic adjustment (Aikins et al., 2005; Berndt et al., 1999).

Contrary to our expectations, however, intrinsic motivation predicted lower instead of higher activity in making friendship nominations (at least during sixth grade). This seems counterintuitive at first, but may be understood by considering the meaning of unidirectional friendship nominations. Such nominations often reflect desired rather than reciprocated friends. As adolescents with high degrees of intrinsic friendship motives enjoyed high quality friendships and were desired as friends in the eyes of others, they might not have simply felt the need to nominate a higher number of friends in a stable context of an elementary school year.

As expected, extrinsic motivation predicted increased activity in nominating friends, at least during sixth grade and marginally also across the 12-month period. This suggests that concerns for seeking acceptance from parents and teachers motivate early adolescents to nominate more friends. However, given that 'making friends' in this context refers to extending unidirectional friendship nominations to others, this association also suggests that extrinsically motivated youth may need to

actively seek friends, potentially in the presence of lower quality friendships. As this effect was observed mostly only during sixth grade and extrinsic motives themselves decreased over time, our findings suggest that toward middle school, adolescents become less motivated to seek approval from authority figures via friendship establishment. However, on the contrary to our expectations, extrinsic motivation did not increase the risk of being an undesired friend. The overall pattern of our findings thus suggests that extrinsic friendship motives have negative implications on the qualitative rather than the quantitative features of adolescent friendships.

Contrary to our expectations, neither motivational style predicted selection similarity in friendships. This suggests that adolescents are less likely to gravitate toward each other based on motivational orientations that are private and cannot easily be observed and more based on behaviors that are easily accessible to observers (e.g., aggression, academic and non-academic activities). Overall, our findings suggest that friendship homophily in terms of the underlying motives is likely to stem from influence rather than behavioral selection. In our sample, the influence effects were generally larger than the structural network effects or the selection effects, which is noteworthy given that the length of the existing relationships at T1 was used in the network models to reduce potential inflation in the influence effects. While the selection effects in our study could have been underestimated due to the fact that our current sample composition that did not allow us to examine new friendships formed outside of the original T1 networks, it is generally plausible that social motives predict particular behaviors within friendships, which, in turn, affect friendship quality and are socially transmitted based on observed and experienced interactions (see Dishion et al., 2008).

However, the influence effects were smaller for extrinsic than intrinsic motivation (in fact, extrinsic motivation was only marginally significant across the 12-month period). The influence for intrinsic motivation came from reciprocated relationships, whereas extrinsic motivation was influenced by unilateral (i.e., desired) rather than reciprocated friendships. These findings suggest that desires for inherent enjoyment of friendships are socially transmitted in actual dyadic friendships, whereas the social learning of more superficial appearance-related friendship motives takes place in the larger peer ecology without actual reciprocated relationship experiences.

A comparison of the interval-specific and condensed network analyses suggests that motivational effects on adolescent friendships differed when examined during the 6th grade compared to between 6th and 7th grades, and slightly also between the two modeling strategies. Our findings thus suggest that the effects of individual characteristics like motivation on adolescent peer relationships may depend on the relative stability of the social context for which collecting and analyzing social network data in multiple time lags, such as within and between school years, is likely to provide relevant insights on the peer context in development. For instance, whereas extrinsic motives activated the search for friendships in a stable context and relatively earlier in adolescence, intrinsic motives attracted desirability as a friend across the transition to middle school. Some of the context-specific differences in selection and influence may be partly masked in the condensed analysis, which, in turn, provided a more complete overview of the data patterns while controlling for the potentially confounding effects of selection and influence on each other (both of which operate simultaneously in natural relationship contexts; see also Burk et al., 2007). While there are no ultimate rights and wrongs in data analytic choices, methodological considerations in social network models are timely as this method is increasingly used to examine the peer context of development (see e.g., Kiuru, Burk, Laursen, Salmela-Aro & Nurmi, in press).

Limitations and future directions



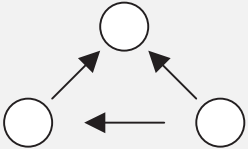
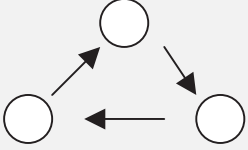




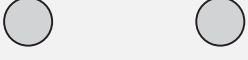
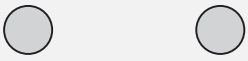
To our knowledge, the present findings are among the first to provide longitudinal evidence for how motivation may play a role in friendship development, especially with respect to friendship selection and social influence that are still relatively rarely examined (Prinstein & Dodge, 2008). However, our study was limited to friendships in the school context. Although over 80% of adolescent friendships tend to occur in school (Smith & Inder, 1990), collecting information on complete networks where all actors have the possibility to nominate each other neglects friendships outside of this specific context. Adolescents who establish friends in school for seeking acceptance from teachers and parents, for instance, may have friends outside of this context that serve different motives or quality. Such studies may be conducted by utilizing either so called ego-centered network analysis where relationship nominations are only self-reported, or network analyses where participants are allowed to leave and new participants to enter the networks across time. Moreover, future studies should examine the specific mechanisms through which motivational orientations promote, or undermine, friendship development. These may include friendship maintenance behaviors, emotional well-being, and self-regulatory processes thought to mediate motivational tendencies on action (Kuhl, 1982; see also Walls & Little, 2005). Intrinsic motives, for instance, may increase friendship quality by increasing perceived competence in friendship functioning.

Furthermore, it should be noted that the relative strength of obtained selection and influence effects may depend on the sensitivity of the estimation technique. For example, similarity in friends' delinquency is often better explained by selection than influence effects (see e.g., De Kemp, Scholte, Overbeek & Engels, 2006; Snijders & Baerveldt, 2003), but a recent study utilizing Siena modeling reported stronger social influence than selection effects in adolescent delinquency (see Burk et al., 2007). While several factors may influence the findings of a single study, increasing attention on the available software comparing data estimation techniques to evaluate the robustness of the obtained effects is warranted (see Kindermann & Gest, 2009). Moreover, although the possibility to assess both unilateral and reciprocated friendships are strengths of the current estimation technique, qualitative information on dyadic friendships cannot be (at least currently) incorporated to the models. For instance, dependencies in the perceptions of mutual friends cannot be directly estimated when relationship ties

in the networks are treated as binary variables. This binary requirement excludes the possibility to estimate different levels of affiliations in the examined relationships (e.g., to distinguish between ‘friends’ and ‘best friends’), which is considered essential for the dimensional nature of friendships (see Nangle et al., 2003).

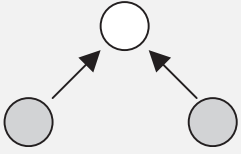
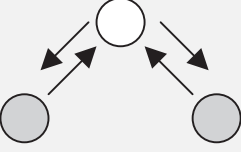
Despite these limitations, our findings extend the implications of intrinsic and extrinsic motivation (Deci & Ryan, 1985, 2000) to early adolescent friendship development. Given the significance of friendships for adaptive social development, the present findings suggest that social motivational orientations contribute to our understanding of how and why adolescents establish and maintain friendships and experience well-being within them.

Appendix. Description of the central network parameters

Effect	Description	Graphical presentation
Network effects		
Density	Preference for ties to arbitrary others, reflects the denseness of a network (positive value = increasing likelihood for ties over time; negative value = decreasing likelihood of ties over time).	
Reciprocity	Preference for mutual ties.	
Transitivity	Preference for ties with the friends of your friends. Provides a measure for network closure.	
3-Cycles	Denotes preference for hierarchical ties in the networks.	
Selection effects		
Popularity	Preferences for nominating actors who have high or low values on a certain individual characteristic (also called ‘in-degree’).	
Activity	Activity in nominating actors, based on certain individual characteristics (also called ‘out-degree’).	
Similarity	Preferences for ties with similar others (i.e., actors that have similar values on a certain individual-level covariate).	
Similarity × Reciprocity	Preferences for mutual ties with similar others (i.e., actors that have similar values on a certain individual-level covariate).	
Influence effects		
Linear Tendency	Overall propensity to have higher or lower values in a certain variable. (not a true ‘influence’ effect)	
Quadratic Tendency	Positive values indicate that high scores lead to an increase in the variable over time, whereas low scores lead to a decrease in the variable over time. Negative values indicate that high scores lead to decreases in the variable over time, whereas low scores lead to increases in the variable over time. (not true ‘influence effects’)	

(continued on next page)

Appendix (continued)

Effect	Description	Graphical presentation
Similarity	Reflects the degree to which scores in a given variable are increased or decreased based on the relationship ties. (a true 'influence' effect)	
Similarity × Reciprocity	Reflects the degree to which scores on an individual-level covariate are increased or decreased based on mutual relationship ties (i.e., whether the source of influence can be attributed to reciprocated relationships). (a true 'influence' effect)	

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