Examining Peer Selection and Influence Processes on Early Adolescents' Academic

Adjustment with Longitudinal Social Network Analysis

by

Huiyoung Shin

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
(Education and Psychology)
in the University of Michigan
2014

Doctoral Committee:

    Associate Professor Allison M. Ryan, Chair
    Associate Professor Kai Cortina
    Associate Professor Scott Gest, Pennsylvania State University
    Professor Stuart A. Karabenick

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

The overall objective of this dissertation is to advance understanding of peer relationships and early adolescents' adjustment at school. Peer relationships are a salient part of the classroom context and important for students' adjustment at school. Despite the progress that has been made understanding early adolescents' peer relationships and adjustment at school in recent years (see Rodkin & Ryan, 2012 for a review), there is much we do not know about the peer associations and peer selection and influence processes in regards to academic beliefs and behaviors in the classroom. Further, we do not know how peer selection and influence processes vary by classroom and are associated with teaching practices. This dissertation addresses these questions applying recent developments in Social Network Analysis. Advances and application of Social Network Analysis has provided many insights into social networks and behavior in a variety of settings but has not yet been fully applied to classroom beliefs and behaviors of early adolescent students.

This dissertation aims to advance understanding of peer selection and influence processes on early adolescents' academic motivation, engagement, and achievement using recently developed longitudinal Social Network Analysis. In Study 1, I examine the extent to which friendship selection and influence processes are occurring in regards to early adolescents' academic adjustment. I examine three facets of academic adjustment outcomes: motivation (intrinsic value and academic self-efficacy), engagement (effortful and disruptive behavior) and achievement (report card grades). Study 1 provides the foundation for Study 2. In Study 2, I examine how peer selection and influence processes vary by classrooms and may be associated with different levels of emotional support provided by the teacher. Such connections between the classroom context and peer relationships and how they operate together and influence student

adjustment have received scant attention. Such an approach has important implications as it illustrates how classroom contexts can affect peer relationships and students' learning.

The present research expands the use of longitudinal social network analysis techniques to early adolescents' academic adjustment. Using longitudinal social network analyses in both studies, this dissertation aims to provide insights into how friendship networks are organized, how friendship networks impact changes of students' academic beliefs and classroom behaviors, and how classroom contexts are associated with early adolescents' peer network and behavior changes.

CHAPTER 1

INTRODUCTION

Young adolescents' motivation, engagement, and achievement in school are important issues (Juvonen, Le, Kaganoff, Augustine, & Constant, 2004). As most opportunities in contemporary society are linked to success in school, motivation, engagement, and achievement during early adolescence can have far-reaching consequences. Much research has sought to understand the factors that contribute to motivation, engagement and achievement during this stage of life (Anderman & Maehr, 1994; Eccles, 2004; Pomerantz & Wang, 2009; Simmons & Blyth, 1987). Historically, research focused on the family and school context as the key influences on academic adjustment (Ryan, 2000). However, there are a growing number of studies that indicate that friends and peer groups are an important context where students' academic beliefs and behaviors are socialized (Rodkin & Ryan, 2011). Hanging out with friends who are themselves highly motivated, engaged and achieving promotes motivation, engagement and achievement whereas hanging out with friends who are themselves unmotivated, disengaged and low achieving dampens motivation, engagement and achievement over time. Using longitudinal data and controlling for initial similarity, several studies indicate that friends and peer groups do influence each other over time in their academic motivation, engagement and achievement (e.g., Altermatt & Pomerantz, 2003; Berndt & Keefe, 1995; Kindermann, 2007; Ryan, 2001).

However, there are several important methodological issues and limitations that characterize current research on this topic that preclude a comprehensive understanding of the nature and importance of friends for academic development (Cillessen, 2009; Kindermann & Gest, 2009; Fabes, Martin, & Hanish, 2009). Due to the complexity of the nature of peer social

1

networks, most research has focused on one best friend, three closest friends or assigned students to one peer group despite the fact that such restrictions are arbitrary and too simplistic and do not capture the larger, interconnected and overlapping nature of friendships and peer groups. Further, using the characteristics of friends and peer groups at one point in time as a predictor of change in student outcomes treats peer relationships as static when we know they are far more dynamic. Finally, research in this area has overly focused on peer influence and controlled for initial similarity when in fact selection of friends is an important process in its' own right and crucial for a full understanding of friends, peer groups and academic adjustment.

Due to these limitations, research has not fully explicated the nature of peer associations, and the process of friendship selection and influence. It is one of the aims of this dissertation to advance understanding of peer selection and influence processes on early adolescents' academic motivation, engagement, and achievement. To address these questions, I examine the extent to which friendship selection and influence processes are occurring in regards to early adolescents' academic adjustment in Study 1. I examine three facets of academic adjustment outcomes: motivation (intrinsic value and academic self-efficacy), engagement (effortful and disruptive behavior) and achievement (report card grades). Study 1 provides the foundation for Study 2.

In Study 1, I examine how early adolescents' friends influence on their academic adjustment through examining peer selection and influence processes. Results advance our understanding of how friends associate each other, how students select their friends, and influence of friends on academic beliefs and behaviors. However, Study 1 does not take into account that elementary school age students' peer relationships are nested within classrooms. The classroom context varies greatly between classrooms, and this variability matters for students' academic and social adjustment (Hamre & Pianta, 2005; Chang, 2004; Jonkmann, Trautwein, & Lüdtke, 2009; Sentse, Scholte, Salmivalli, & Voeten, 2007; Stormshak et al.,

2

1999). It is highly likely that variations between classroom contexts would also matter for peer selection and influence processes. In Study 2, I examine how peer selection and influence processes vary by classrooms and may be associated with different levels of emotional support provided by the teacher. Such connections between the classroom context and peer relationships and how they operate together and influence student adjustment have received scant attention. Such an approach has important implications as it illustrates how classroom contexts can affect peer relationships and students' learning.

Social Network Analysis provides a nice way to represent peer social networks and analyze the features of peer associations. Due to the methodological difficulties and complex issues, social network analysis has not been used widely in education and developmental psychology until recently. However, Social Network Analysis has undergone much growth and development and provided insight into social networks and behaviors in a variety of settings. I take advantage of recent developments of stochastic actor-based modeling (Mercken, Snijders, Steglich, Vartiainen, & de Vries, 2010; Snijders, van de Bunt, & Steglich, 2010) which overcomes the limitations of prior research in peer relationships. Such an approach allows explicating peer influence process by simultaneously attending to both selection and influence effects, and examining changes of network features and individual characteristics over time incorporating information at multiple time points. Such analytic techniques have recently been applied to understanding selection and influence processes in regards to a variety of adolescents' beliefs and behaviors, including alcohol and other substance use (De la Haye, Green, Kennedy, Pollard, & Tucker, 2013; DeLay, 2013; Osgood, 2013), social goals (Ojanen, 2013) and health behaviors (De la Haye, Robins, Mohr, & Wilson, 2013; Simpkins, 2013). The present research expands the use of longitudinal social network analysis techniques to early adolescents' academic adjustment. Using longitudinal social network analyses in both studies, this

dissertation aims to provide insights into how friendship networks are organized, how friendship networks impact changes of students' academic beliefs and classroom behaviors, and how classroom contexts are associated with early adolescents' peer network and behavior changes.

Conclusion

Peer relationships play an important role in early adolescents' classroom adjustment. Even though previous research indicates the significance of peer relationships for adolescents' academic motivation, engagement, and achievement, there is much we do not know about the nature of peer social relationships and peer influence processes on students' adjustment. The goal of this dissertation is to advance understanding of peer relationships and early adolescents' adjustment at school. Incorporating recent advances of longitudinal social network analysis, two studies will explicate the process of peer associations and peer influence processes on early adolescents' academic motivation, engagement, and achievement (Study 1), and variations of classroom contexts and the associations of classroom contexts with early adolescents' peer selection and influence processes in regards to disruptive behavior (Study 2).

Chapter 1. References

Altermatt, E. R., & Pomerantz, E. M. (2003). The development of competence-related and motivational beliefs: An investigation of similarity and influence among friends. *Journal of Educational Psychology, 95*(1), 111-123. doi: 10.1037/0022-0663.95.1.111

Anderman, E. M., & Maehr, M. L. (1994). Motivation and schooling in the middle grades. *Review of Educational Research*, 64, 287-309.

Berndt, T. J., & Keefe, K. (1995). Friends' Influence on Adolescents' Adjustment to School. *Child Development, 66*(5), 1312-1329. doi: 10.1111/j.1467-8624.1995.tb00937.x

Chang, L. (2003). Variable Effects of Children's Aggression, Social Withdrawal, and Prosocial Leadership as Functions of Teacher Beliefs and Behaviors. *Child Development, 74*(2), 535-548. doi: 10.1111/1467-8624.7402014

Cillessen, A. H. N. (2009). Sociometric methods. In K. H. Rubin, W. M. Bukowski, & B. Laursen (Eds.), *Handbook of peer interactions, relationships, and groups.* (pp.82-99). New York: Guilford Press.

Crosnoe, R., & Needham, B. (2004). Holism, Contextual Variability, and the Study of Friendships in Adolescent Development. *Child Development, 75*(1), 264-279. doi: 10.1111/j.1467-8624.2004.00668.x

De la Haye, K., Green, H. D., Kennedy, D., Pollard, M., & Tucker, J. (2013). Selection and influence mechanisms associated with marijuana initiation and use in adolescent friendship networks. *Journal of Research on Adolescence*(3).

De la Haye, K., Robins, G., Mohr, P., & Wilson, C. (2013). Adolescents' intake of junk food: Processes and mechanisms driving consumption similarities among friends. *Journal of Research on Adolescence*(3).

DeLay, D., Laursen, B., Kiuru, N., Nurmi, J.-E., & Salmela-Aro, K. (2013). Selecting and
retaining friends on the basis of cigarette smoking similarity. *Journal of Research on
Adolescence*(3).

Eccles, J. (2004). Schools, academic motivation, and stage-environment fit. In R. M. Lerner & L.
Steinberg (Eds.), *Handbook of Adolescent Psychology* (2nd ed., pp. 125-153). New York:
Wiley.

Fabes, R. A., Martin, C. L., & Hanish, L. D. (2009). Children's behaviors and interactions with
peers. In K. H. Rubin, W. M. Bukowski, & B. Laursen (Eds.), *Handbook of peer
interactions, relationships, and groups* (pp. 45-62). New York: Guilford.

Hartup, W. W., & Stevens, N. (1997). Friendships and adaptation in the life course.
Psychological Bulletin, 121(3), 355-370. doi: 10.1037/0033-2909.121.3.355

Jonkmann, K., Trautwein, U., & Lüdtke, O. (2009). Social dominance in adolescence: The
moderating role of the classroom context and behavioral heterogeneity. *Child
Development,* 80 (2), 338-355.

Juvonen, J., Le, V., Kaganoff, T., Augustine, C., & Constant, L (2004). *Focus on the Wonder
Years: Challenges Facing the American Middle School*. Santa Monica: Rand
Corporation.

Kindermann, T. A. (1993). Natural peer groups as contexts for individual development: The case
of children's motivation in school. *Developmental Psychology, 29*(6), 970-977. doi:
10.1037/0012-1649.29.6.970

Kindermann, T. A. (2007). Effects of Naturally Existing Peer Groups on Changes in Academic
Engagement in a Cohort of Sixth Graders. *Child Development, 78*(4), 1186-1203. doi:
10.1111/j.1467-8624.2007.01060.x

Kindermann, T. A., & Gest, S. D. . (2009). Assessment of the peer group: Identifying naturally occurring social networks and capturing their effects. *Handbook of peer interactions, relationships, and groups*, 100-117.

Klima, T., & Repetti, R. (2008). Children's peer relations and their psychological adjustment. *Merrill-Palmer Quarterly 54*(2), 151-178.

Larson, R., & Richards, M. H. (1991). Daily Companionship in Late Childhood and Early Adolescence: Changing Developmental Contexts. *Child Development, 62*(2), 284-300. doi: 10.1111/j.1467-8624.1991.tb01531.x

Mercken, L., Snijders, T. A. B., Steglich, C., Vartiainen, E., & de Vries, H. (2010). Dynamics of adolescent friendship networks and smoking behavior. *Social Networks, 32*(1), 72-81. doi: http://dx.doi.org/10.1016/j.socnet.2009.02.005

Molloy, L. E., Gest, S. D., & Rulison, K. L. (2011). Peer Influences on Academic Motivation: Exploring Multiple Methods of Assessing Youths, Most influential Peer Relationships. *The Journal of Early Adolescence, 31*(1), 13-40. doi: 10.1177/0272431610384487

Newcomb, A. F., & Bagwell, C. L. (1995). Children's friendship relations: A meta-analytic review. *Psychological Bulletin, 117*(2), 306-347. doi: 10.1037/0033-2909.117.2.306

Ojanen, T., Sijtsema, J. J., & Rambaran, J. A. (2013). Social goals and adolescent friendships: Social selection, deselection, and influence. *Journal of Research on Adolescence*(3).

Osgood, D. W., Ragan, D. T., Wallace, L., Gest, S. D., Feinberg, M. E., & Moody, J. (2013). Peers and the emergence of alcohol use: Influence and selection processes in adolescent friendship networks. *Journal of Research on Adolescence*(3).

Sentse, M., Scholte, R., Salmivalli, C., & Voeten, M. (2007). Person-group dissimilarity in involvement in bullying and its relation with social status, *Journal of Abnormal Child Psychology, 35*, 1009-1019.

Ryan, A. (2012). Peer relationships and adjustment at school: An introduction. In A. Ryan, & G. Ladd (Eds). *Peer relationships and adjustment at school*, 1-10.

Ryan, A. M. (2001). The Peer Group as a Context for the Development of Young Adolescent Motivation and Achievement. *Child Development, 72*(4), 1135-1150. doi: 10.1111/1467-8624.00338

Simmons, R. G., & Blyth, D. A. (1987). *Moving into adolescence: The impact of pubertal change and school context*. Hawthorne, NY, US: Aldine de Gruyter.

Simpkins, S. D., Schaefer, D. R., Price, C. D., & Vest, A. E. (2013). Adolescent friendships, BMI, and physical activity: Untangling selection and influence through longitudinal social network analysis. *Journal of Research on Adolescence*(3).

Stormshak, E. A., Bierman, K., Bruschi, C., Dodge, K. A., & Coie, J. D. (1999). The relation between behavior problems and peer preference in different classroom contexts, 70 (1), 169-182.

Snijders, T. A. B., van de Bunt, G. G., & Steglich, C. E. G. (2010). Introduction to stochastic actor-based models for network dynamics. *Social Networks, 32*(1), 44-60. doi: http://dx.doi.org/10.1016/j.socnet.2009.02.004

Urdan, T., & Schoenfelder, E. (2006). Classroom effects on student motivation: Goal structures, social relationships, and competence beliefs. *Journal of School Psychology, 44*(5), 331-349. doi: http://dx.doi.org/10.1016/j.jsp.2006.04.003

CHAPTER 2

EARLY ADOLESCENT FRIENDSHIP AND ACADEMIC ADJUSTMENT:
EXAMINING SELECTION AND INFLUENCE PROCESSES
WITH LOGITUDINAL SOCIAL NETWORK ANALYSIS

The focus of the Study 1 is to examine the process of selection and influence in relation

to academic adjustment in early adolescent friendship networks. Adopting a stochastic actor-

based model of social network analysis (Snijders et al., 2010, Steglich et al., 2010), I apply

statistical techniques specifically designed to delineate these processes in longitudinal data

collected in the fall and spring of a school year. With such an approach I examine the extent to

which selection and influence processes are occurring in regards to early adolescents' academic

adjustment in school. I examined three facets of academic adjustment outcomes: motivation

(intrinsic value and academic self-efficacy), engagement (effortful and disruptive behavior) and

achievement (report card grades). Intrinsic value concerns the extent to which students enjoy and

find their schoolwork interesting and academic self-efficacy concerns students' beliefs about

whether they can be successful at their schoolwork. Examining motivation, engagement and

achievement together is important because prior research has focused on one or two of these

facets but not all three in a single study. The range of academic variables, in tandem with

analytic method for examining friendship networks, will provide a more comprehensive

understanding of selection and influence among early adolescent friends in the academic domain.

Selection and Influence Processes on Academic Adjustment

At the beginning of the year, students forge relationships and find their social role in the

complex and multi-faceted peer ecologies within classrooms and schools (Farmer, Lines &

Hamm, 2011). In the classroom, teachers dictate much of the setting as they decide seating

arrangements, assign students to work groups, set rules and communicate expectations about social behavior (Gest & Rodkin, 2011; Hughes, 2011). However, within these constraints, students make choices about how to behave and who to interact with that affect the formation of friendships and groups in the classroom. Social interactions and the negotiation of friendships and groups are ongoing and dynamic processes in classrooms (Farmer et al., 2011; Tenney, Turkheimer & Oltmanns, 2009).

Emerging out of these interactions and negotiations is a tendency for students to be friends with similar peers. This phenomenon of similarity amongst friends is known as homophily and is seen on a variety of characteristics including academic characteristics (Brown, Bakken, Ameringer & Mahon, 2008). Contributing to homophily is both *selection*, the extent to which peers with similar attitudes and behavior seek one another as affiliates, and *influence*, the degree to which affiliates become more alike in attitude and behavioral tendencies because of their frequent interaction (Veenstra & Steglich, 2012). Students may select friends who are similar to them academically as it may meet their goals and be consistent with their prior behavioral tendencies. Or it could be that there is not the tendency for students to select friends with similar academic characteristics, perhaps because friends cannot be similar in all ways and academic similarity is not important for early adolescents.

Whether or not students select similar friends they may become more similar over time via socialization. Friends are theorized to socialize adolescents' motivation, engagement, and achievement through such processes as information exchange, modeling, and reinforcement of peer norms and values (Kindermann & Gest, 2009; Ryan, 2000). Observing others perform a particular behavior or voice a certain belief can introduce an individual to new behaviors and viewpoints and also inform an individual of the consequences of such behaviors and opinions. Depending on the consequences, observation of a model can strengthen or weaken the likelihood

that the observer will engage in such behavior or adopt such beliefs in the future (Bandura, 1971; Masters & Mokros, 1975, Sagotsky & Lepper, 1982; Altermatt & Brody, 2009). Social reinforcement is presumed to be a mechanism (Berndt, 1992; Prinstein & Dodge, 2008). Beliefs and behaviors that are discouraged or received negatively by friends are less likely to be displayed again by an individual. Conversely, beliefs and behaviors that are encouraged or positively received by the friends are more likely to surface again in the presence of one's friends. While these processes are thought to play a role, research has rarely examined the processes directly. I review extant studies on selection and influence and note the methods used to infer selection and influence among friends and peer groups in regards to academic adjustment.

Studies of Selection and Influence Processes on Academic Adjustment

Initial work on the processes of friendship selection and influence on academic adjustment focused on best friend dyads in high school (Kandel, 1978b). By distinguishing best friend dyads that remained stable (70%) and those that changed across the school year (30%), Kandel examined selection and influence processes in friendship maintenance, formation and dissolution. Kandel concluded that both processes contributed to the similarity in best friends' college aspirations.

Despite the fact Kandel (1978) concluded that both selection and influence processes contributed to similarity between friends, subsequent work focused on the extent to which influence explained similarity between friends. Selection was treated as a threat to be eliminated in accurate estimates of peer influence. In Cohen's (1983) words "Without controls for initial similarity the portion of eventual similarity due to influence is overestimated. This problem …" (p. 728). To distinguish between selection and influence processes, subsequent research predominantly relied on short-term longitudinal designs to predict changes in student outcomes

(time one – time two) based on initial friend or peer group characteristics (time one). With such an approach, characteristics of one's best friend were found to predict changes in high school student's college aspirations across the school year (Cohen, 1983).

Following this initial focus on best friends, subsequent research expanded the scope to students' three closest friends. Combined together, the characteristics of closest friends were found to predict changes in middle and high school students' achievement and affect in school (Epstein, 1983). That is, controlling for their initial levels of achievement (grades and test scores), students' with high achieving friends showed greater increases in achievement over time compared to students with lower achieving friends. Using a similar approach (three close friends) and analyses (multiple regressions) several other studies found evidence for friend influence of academic outcomes, spanning motivation (Altermatt & Pomerantz, 2003; Berndt, Hawkins & Jiao, 1999), engagement (Berndt & Keefe, 1995) and grades (Altermatt & Pomerantz, 2003; Berndt & Keefe, 1995). The magnitude of the effects documented in such studies was quite modest and not found for all aspects of motivation, namely perceptions of academic competence (Altermatt & Pomerantz, 2003; Berndt et al., 1999).

Kindermann (1993) examined naturally-occurring peer groups and academic adjustment in 4th and 5th grade children. Using social composite mapping, the peers that each child tended to interact with the most within the classroom were identified. As described by the author "individuals were assigned to groups using a 50% decision rule…students could be members of several groups at the same time" (p. 973). Students' peer group characteristics were calculated separately for each individual child. With multiple regression, Kindermann (1993) found that peer group engagement scores predicted changes in students' engagement across the school year. These findings were replicated with 6th graders with additional controls for parental influence (Kindermann, 2007).

Ryan (2001) used multi-level modeling to address the fact individuals are nested in peer groups and provide estimates of shared peer group influence on academic outcomes. Social network analysis was used to identify peer groups from students' lists of friends. Peer groups were overlapping but to allow for multi-level analyses (which requires independent groups), students were assigned to their primary peer group and dropped if they had equal ties to multiple peer groups. Students' peer group characteristics in the fall predicted changes in students' intrinsic value for school and grades, but not utility value or expectancies for success, during their first year in middle school. Also using multi-level modeling, Kiuru, Aunola, Nurmi, Leskinen and Salmela-Aro (2008) found students' primary peer group characteristics (derived from their list of three most liked peers) predicted changes in ninth grade Finnish students' feelings of school burnout across the school year.

Molloy, Gest & Ruilson (2011) examined the characteristics of both friends and peer group characteristics on changes in 5th and 7th graders academic adjustment. From students' unlimited nominations of friends, reciprocated friendships were determined. Using social composite mapping (similar to Kindermann, 1993) peer groups were determined. Friendships were embedded in peer groups (70%) but many groups had members without a reciprocated friendship tie (33%). For 5th graders, characteristics of friends (but not peer groups) predicted changes in effort. Neither friend nor peer groups predicted changes in academic self-concept. For 7th graders, both friends and peer group characteristics predicted changes in effort. Friends but not peer groups predicted changes in academic self-concept. Thus, although both were important, evidence for influence was more consistent for friends compared to peer groups and more consistent for effort compared to academic self-concept.

Methodological Limitations of Research on Friends and Academic Adjustment

There are several important methodological issues and limitations that characterize most of the current research that preclude a comprehensive understanding of the nature and importance of friends for academic development (Cillessen, 2009; Fabes, Martin, & Hanish, 2009; Kindermann & Gest, 2009). First, due to the complexity of the nature of peer social networks, most research has focused on one best friend, three closest friends or assigned students to one peer group despite the fact that such restrictions are arbitrary and too simplistic and do not capture the often larger, interconnected and overlapping nature of friendships and peer groups. However, when given unlimited options early adolescent students typically list between four and eight friends and about 50% of those are reciprocated (e.g., Ryan, 2001: Molloy et al., 2011). Thus, limiting students to three friends is problematic because it does not align with the reality of their friend and peer group networks for many students. Recent work has moved beyond such limitations (e.g., Kindermann, 2007; Molloy et al, 2011) but the bulk of work on friends and academic adjustment is problematic in this regard (e.g., Altermatt & Pomerantz, 2003; Berndt & Keefe, 1995).

A second methodological issue with much extant research on friendship relationships and academic adjustment is the practice of using the characteristics of friends and peer groups at one point in time as a predictor of change in student outcomes. This practice is problematic for two reasons. First, it treats friendship relationships as static when we know they are far more dynamic. For example, as described by Ryan (2001) in her study of early adolescent friendships almost all students experienced the addition and loss of peer group members over the school year (90% and 95%, respectively). Second, this practice only attends to academic characteristics of the friends or peer group members (e.g., average G.P.A. of friends) and ignores the structural characteristics of friend and peer group networks that could also contribute to changes in academic adjustment across time. Several scholars have called for attention to network structural

characteristics for more accurate estimates of friends' influence on development (Gest,

Davidson, Rulison, Moody, & Welsh, 2007; Ahn, Garandeau, & Rodkin, 2010; Huitsing,

Veenstra, Sainio & Salmivalli, 2012). Friendships and individuals are both developing and

information about both should be incorporated and treated as interdependent and changing over

time (Veenstra & Stegligh, 2011).

A third limitation of much extant research on friends and academic adjustment is over

emphasis on friends' influence and treatment of potential selection effects on similarity between

friends and group members as a nuisance or a threat to be controlled for but not estimated.

Selection of friends is an important process in its' own right and crucial for a full understanding

of friends, peer groups and academic adjustment. Whether early adolescents are selecting their

friends based on academic characteristics is important theoretically and practically. A focus on

influence only could miss an important part of the social dynamic that could either be the driving

force behind similarity in academic characteristics between friends or aid in understanding of

important antecedent processes that set the stage for influence to occur. When we do not estimate

selection in tandem with influence in regards to academic adjustment, the extent to which

similarity is due to selection, influence or both is not known.

Advantages of Stochastic Actor-based Modeling

A recent study by Flashman (2012) used stochastic actor-based modeling to overcome

many of these limitations of research on peer selection and influence in the domain of academic

adjustment. Stochastic actor-based modeling (Snijders, 1996, 2001, 2005; Steglich et al., 2010)

allows dyadic friendships to be embedded within cohesive and overlapping peer group structures.

Using all of the students' friendship nominations, this approach incorporates information about

social networks and individual characteristics at multiple time points and simultaneously

estimates structural network features (e.g., size and reciprocity), selection and influence.

Feedback processes between the dynamics of behavior and selection, which are unobserved between two measurement points, are taken into account (Veenstra & Steglich, 2011). Selection and influence effects on behavior are estimated simultaneously while controlling for each other in a methodologically sound way. Flashman (2012) analyzed high school students' friend nominations and their G.P.A. across time and found evidence for both selection and influence in large urban high schools. I build on Flashman's (2012) study by examining additional academic outcomes in a younger sample in the classroom setting.

Overview

I use actor-based social network analysis and examine the processes of selection and influence in relation to early adolescents' friendship networks and academic adjustment encompassing motivation (academic self-efficacy and intrinsic value), engagement (effortful and disruptive behavior) and achievement (report card grades) across the school year. Based on existing theory and results I expect that both selection and influence processes occur amongst friends in all aspects of academic adjustment. Regarding selection effects, my hypotheses are tentative because as we have noted most studies have not examined selection but rather assumed it contributed to similarity between friends. Regarding influence effects, the one exception is academic self-efficacy as peer influence effects have often not been found on similar perceptions of academic competence variables (e.g. Altermatt & Pomerantz, 2003; Molloy et al., 2011; Ryan, 2001). Given the methodological limitations of most prior work on this topic, this study will contribute more accurate estimates of selection and influence in regards to academic adjustment and friends.

Method

Participants

The participants were sixth grade students (average age 11-12) from ten public elementary schools in 24 classrooms (N = 587 at wave 1 and 576 at wave 2). In these elementary schools, children were in self-contained classrooms with one teacher and the same peer group for the majority of the day. The schools serve non-metropolitan small urban communities and reported 66% of their students were eligible for free or reduced-fee lunch. The sample was about half female (50% at wave 1 and 52% at wave 2) and ethnically diverse (52% African American, 37% European American, 5% Hispanic and 6% other ethnic groups at wave 1 and 50% African American, 40% European American, 5% Hispanic and 5% other ethnic groups at wave 2).

Procedure

Letters describing the project were given to all students to take home to their parents two weeks prior to each data collection. We recruited students new to the school at wave 2. If parents did not want their children to participate in the study, they were instructed to have their child return an attached form to the teacher, call the school, or call the researchers at the university number provided on the letter. All teachers were given two copies of the letter for each student and teachers checked with students that the letters were delivered home. Less than 5% of the parents declined to have their child participate at either wave.

Surveys were administered to students in their classrooms. Instructions and items were read aloud while students read along and responded. Students were told that the purpose of the survey was to find out about students' beliefs and behaviors and that the survey was not a test and that there were not right or wrong answers. Students were assured that the information in the survey would be kept confidential. In addition, students were told that filling out the survey was voluntary. We visited the schools one additional day to administer make-ups for students who were absent for survey administration.

Measures

    Friendship Networks. Adolescents' friends within classrooms were measured by asking students to nominate their closest friends, further described to students as "the friends you hang around with and talk to the most". Embedded in each child's survey was a class list and students were told they could nominate as many or as few friends as they wanted by putting a check next to names of their friends. On average, students nominated 6.59 friends at wave 1, and 6.38 friends at wave 2. Friendship networks were calculated for each classroom. A value of 1 equaled a given friendship nomination, whereas a value of 0 depicted an absent nomination. The number of participants in each of the twenty-four friendship networks ranged from 16 to 29. There was some turn-around in the participants across time so I analyzed the networks including 587 participants present at wave 1 as well as actors that joined or left the networks at wave 2 (by coding the missing values as structural 0). This enabled us to control for actors leaving and joining the networks over time (Snijers et al., 2010).

    Intrinsic value. We used an established measure of intrinsic value developed by Eccles (1983; see also Fredricks & Eccles, 2002; Watt, 2004). Intrinsic value refers to adolescents' interest and enjoyment in their schoolwork. The format for all items in the survey was a 5-point scale. (e.g., "How much do you like doing schoolwork?" 1 = a little 5 = a lot). Another sample item is "In general, I find working on school assignments…1=very boring, 3= o.k. and 5=very interesting). This 3 item scale was found to be reliable in the present sample at both time points (Cronbach's alpha = .74 and .77 for waves 1 and 2, respectively).

    Academic self-efficacy for schoolwork. We used an established measure of self-efficacy taken from the Patterns of Adaptive Learning Survey (Midgley et al., 1996). Self-efficacy refers to students' judgments of their capability to complete their schoolwork successfully. Sample items are "I'm certain I can figure out how to do even the most difficult schoolwork" and "I can

18

do even the hardest schoolwork if I try". All items were rated on a five point scale ranging from 1 (not at all true of me) to 3 (somewhat true of me) to 5 (very true of me). This 5 item scale was found to be reliable in the present sample at both time points (Cronbach's alpha = .73 and .77 for waves 1 and 2, respectively).

Classroom engagement. Students reported on two facets of engagement in the classroom: effortful and disruptive behavior. Items from the Rochester Assessment of Intellectual and Social Engagement (RAISE) were used to assess effortful behavior in school (see Miserandino, 1996; Skinner & Belmont, 1993). Sample items are "I try very hard in school" and "I listen carefully in class". Students' disruptive behavior in class was assessed using a measure developed by Kaplan (e.g., Kaplan & Maehr, 1999). Sample items are "I disturb the lesson in class" and "I get into trouble in class". All items were rated on a five-point scale (1 = not at all true of me, 3 = somewhat true and 5 = very true of me). Each of the scales had 4 items and were found to be reliable in our sample (Cronbach's alpha for effortful behavior = .77 and .81 for waves 1 and 2, respectively and Cronbach's alpha for disruptive behavior = .74 and .78 for waves 1 and 2, respectively). The validity of the RAISE has been demonstrated in research showing concordance between student and teacher reports of student effort (Skinner & Belmont, 1993). The validity of the disruptive behavior measure has been demonstrated in research finding that the more children report their behavior as disruptive, the more official discipline referrals children received (Kaplan & Maehr, 1999).

Grade Point Average. Students' semester grades in Reading, Math, Science, English and Social Studies were collected from their school records. The grades were coded F = 1 through A+ = 13. The overall semester G.P.A. was computed by taking the mean of the five subject grades.

All items for each attribute were averaged, and then rounded down to the nearest integer to receive the original scale with 5 categories (1 = not at all true, 5 = very true) for academic self-efficacy, intrinsic value, effortful behavior, and disruptive behavior, and 12-point scale (1=F, 12=A; original scale include 13=A+ but dropped in the analyses since there was 0 student who recorded 13=A+) for G. P. A.

Analytic Strategy

Analyses were conducted with stochastic actor-based models to estimate the friendship selection and influence processes (SIENA 4.0 R version 2.15.3; Snijders et al., 2012). Missing data due to non-response were handled through the SIENA missing data method (Huisman & Steglich, 2008), and participants who joined and left friendship network in-between time points were treated using the method proposed by Huisman and Snijders (2003). I examined preliminary models separately by sub-groups of classrooms but results did not differ significantly. Because the size of classrooms was rather small to obtain well-converged estimates when analyzed individually, classrooms were combined and analyzed simultaneously using the multi-group option (Ripley, Snijers, & Preciado, 2012). Although this approach assumes that parameters are identical across classroom networks, it yields more statistical power than when multiple classroom networks are analyzed separately (Ripley et al., 2011). Since goal was examining the general pattern of selection and influence effect of academic adjustment attributes rather than examining variance between classrooms, I applied the multi-group option to gain sufficient power to detect influence effects.

Models were specified to simultaneously estimate the relative contributions of selection and influence on early adolescents' academic belief and behavior changes, controlling for various network structure effects. We describe in greater detail below the key aspects of what the models specified and estimated.

20

Friendship network structure. To examine the network structural features, we included four endogenous network effects: density, reciprocity, transitive ties, and balance. *Density* describes the overall tendency of adolescents to nominate classmates as friend. *Reciprocity* describes the tendency for adolescents to reciprocate a relationship. *Transitive ties* describe the tendency for dyadic friendships to be embedded within triadic patterns of relations (e.g., my friend's friend is my friend). *Balance* describes the structural equivalence with respect to outgoing ties. These are basic network structural features that are commonly examined to understand the nature of the social networks (Logis, Rodkin, Gest, & Ahn, 2013; Osgood, Ragan, Wallace, Gest, Feinberg, & Moody, 2013)

Effects predicting friend selection. In the selection analyses, academic adjustment attributes, gender, and race are used as individual level covariates to estimate the extent that similarity in academic adjustment attributes, gender, and race in friendship is due to selection (selection similarity effect). In addition, information is provided about the effects of academic adjustment attributes, gender, and race on making friendship nominations (ego effect) and receiving nominations (alter effect).

Effects predicting academic adjustment. In the influence analyses, network ties are used as the predictor variable whereas individual level covariates (academic adjustment attributes, gender, and race) are used as dependent variables. The *behavioral similarity* parameter is of primary interest and represents tendencies for adolescents to adopt the behaviors of their friends. A positive behavioral similarity effect represents a tendency for adolescents to adopt friends' behavior and become similar over time (influence). In addition, the behavior tendencies of each of the academic adjustment attributes were included to examine students' overall academic belief and behavior changes across the school year. The *behavioral tendency* parameter

21

(linear and quadratic shape effects) models the overall tendency towards higher or lower values on academic adjustment attribute variable.

In summary, using stochastic actor-based modeling, I examined changes in friendship networks and behaviors. I controlled for *endogenous network structures* including density, reciprocity, transitive ties, and balance. I examined network similarity effects (selection effects) for gender and race, academic self-efficacy, intrinsic value, effortful behavior, disruptive behavior, and G. P. A., along with ego and alter effects for these variables. I examined behavior similarity effects (influence effects) along with behavioral tendencies (linear and quadratic effects) for academic self-efficacy, intrinsic value, effortful behavior, disruptive behavior, and G.P.A.

Results

Descriptive Statistics

Table 2.1 provides descriptive information about the changes in friendship networks from wave 1 to wave 2. On average, across classes from wave 1 to wave 2 85 friendship ties dissolved or ended, 84 friendship ties emerged or were formed and 86 ties of existing friendships were maintained or stayed the same. The Jaccard index indicates the amount of stability and change and should be more than 0.3 to permit complex selection dynamic modeling in SIENA with adequate statistical power. As shown in Table 2.1, the Jaccard index in our networks was 0.34 so there was sufficient stability and change.

Table 2.1. shows the average number of friend nominations at wave 1 and 2. On average, across classes there were 163 and 153 friendship ties for waves 1 and 2, respectively. The average out-degree was 6.59 and 6.39 at waves 1 and 2, respectively, indicating that the average number of nominations was between 6 and 7 at both waves. The mean density was 0.28 at both wave 1 and 2. The networks were characterized by high reciprocity and transitivity, indicating

22

that over 50% of the friendship nominations were reciprocated and over 50% were part of a transitive.

Table 2.1 includes the means of academic adjustment attribute at wave 1 and 2; trends which will be accounted for in the behavioral dynamics in the SIENA models (linear shape effect). To determine whether assessment of the co-evolution of academic adjustment attributes and friendship nominations is feasible, I calculated Moran's I (the network autocorrelation coefficient) which assess the degree to which friends display similarity in academic adjustment attributes (Veenstra & Steglich, 2012). The positive Moran's I values in our data show that friends tend to exhibit similarity in academic adjustment attributes.

Table 2.2 presents the correlations among academic adjustment attributes. As expected, intrinsic value, self-efficacy, effortful behavior, and G. P. A. were positively correlated. Intrinsic value, self-efficacy, and effortful behavior were somewhat highly correlated ($.26 \leq r \leq .48$ at wave 1, and $.40 \leq r \leq .50$ at wave 2). Disruptive behavior was negatively correlated to intrinsic value, self-efficacy, effortful behavior, and G. P. A. at both waves 1 and wave 2. Stability coefficients for intrinsic value, self-efficacy, effortful behavior, disruptive behavior, and G. P. A. were moderate to large ($.45 \leq r \leq .81$).

Network Structure, Gender, and Race

The results associated with network structures can be found in Tables 2.3-2.4. Endogenous network dynamics are represented by four parameters: density, reciprocity, transitive ties, and balance. As expected, the density parameter was significantly negative, indicating that adolescents do not tend to nominate just anyone as a friend. The positive reciprocity parameter indicates that adolescents prefer to reciprocate friendship nominations and the positive transitive ties parameter indicates that adolescents have a tendency to befriend the friends of their own friends, representing these dyadic relationships are embedded within

cohesive, triadic (and larger) peer group structures (peer group, cliques). The *balance* parameter was either negative or not significant indicating that peers did not make similar nominations as their friends did. Taken together, the network effects imply that participants had a tendency to reciprocate friendship, keep the friendship networks closed and form peer group structures in friendship networks.

Regarding the parameter estimates of network tendencies involving gender and race, similarity effects were significant for both adolescent gender and race. For gender, the positive alter effect indicates that female adolescents tend to be nominated more often than male adolescents as friends. The positive gender similarity effect indicates a preference for adolescents to nominate friends who are of the same gender. For race, the positive ego effects indicate that European American adolescents tend to nominate more friends than African American adolescents. The race similarity effect indicates a preference for adolescents to nominate friends who are of the same race.

Friendship Selection for Motivation, Engagement, and Achievement

The results associated with friendship selection and academic adjustment attributes can be found in Tables 2.3-2.4.

Alter Effects. The significant and positive alter effects for effortful behavior and G.P.A. indicates that adolescents with high levels of effortful behavior and G. P. A. tend to be nominated more as friends. The significant and negative alter effects for self-efficacy and disruptive behavior indicates that adolescents with high levels of self-efficacy and disruptive behavior tend to be nominated less as friends. There was no significant alter effect for intrinsic value.

Ego Effects. The significant and negative ego effect for G.P.A. indicate that adolescents with higher G. P. A. tend to make less nominations than those with lower G.P.A. There were no

24

other ego effects indicating that students' motivation and engagement was unrelated to the number of nominations made.

Selection Similarity Effects. The marginally significant positive selection effect for G.P.A. and significant positive effect for self-efficacy indicates that adolescents tend to nominate friends with similar level of G.P.A. and self-efficacy.

Friendship Influence for Motivation, Engagement, and Achievement

The results associated with behavior tendencies and friend influence on academic adjustment attributes can be found in Tables 2.3-2.4.

Behavioral Tendency Parameters. The behavioral tendency parameters for intrinsic value and effortful behavior were both statistically negatively significant. The behavioral tendency parameter for G. P. A. was positively significant. This indicates that across the school year intrinsic value and effortful behavior were declining while G.P.A. was increasing. There was a negative quadratic effect detected for academic self-efficacy, which meant that students who had high self-efficacy in the beginning of the year were more likely to decrease their self-efficacy over time.

Influence Similarity Effects. The parameters representing social influence on G. P. A., intrinsic value, effortful behavior and disruptive behavior were all positive and significant. Students were estimated to have 1.87 times the odds of changing their achievement, 1.95 times the odds of changing their intrinsic value, 2.08 times the odds of changing their effortful behavior, and 2.01 times the odds of changing their disruptive behavior in accordance with the average behavior of their friends' than to not change it at all across the school year. The parameter for self-efficacy was not significant. This indicates that across the school year, there was a tendency for students to adopt the values and behaviors of their friends. With the exception

25

of academic self-efficacy, friendships are influential on early adolescents' motivation, engagement and achievement in the classroom.

Discussion

A long-standing question in the area of adolescent social development has been the extent to which selection versus influence contribute to the observed similarity amongst friends (Prinstein & Dodge, 2008). Prior research on friends and peer groups has found modest but consistent evidence for influence effects for most aspects of academic adjustment and assumed selection was playing a large role in the similarity seen amongst friends (e.g., Altermatt & Pomerantz, 2003; Kindermann, 1993; Molloy, Gest & Ruilson, 2011; Ryan, 2001). By applying stochastic actor-based modeling to longitudinal data on early adolescent friendship networks, Study 1 advanced current understanding on selection and influence processes in friendship networks in regards to academic adjustment. The results indicate that selection effects were not as pervasive as influence effects in explaining similarity amongst friends across the school year.

Selection effects were found for academic self-efficacy and a similar trend was found for G.P.A. This was not found for the other facets of academic adjustment. Early adolescent students tend to select friends with similar grades and level of confidence to themselves in the classroom. G.P.A is influenced by friends over time indicating a reciprocal relation in which students select friends with similar grades and then over time become more similar to their friends. Being friends with a high achiever is likely to bolster a student's grades and being friends with a low achiever is likely to dampen a student's grades. Current finding in early adolescents is similar to Flashman's (2013) finding with older adolescents in the high school setting. In contrast, there was no evidence for friends' influence on students' academic efficacy. Despite the influence friends exert on actual achievement, they do not become more similar in terms of their beliefs about whether they can do their work. This finding is consistent with prior

26

research on perceived academic competence (Altermatt & Pomerantz, 2003) and expectancies for success (Ryan, 2001). It may be that teachers or parents are more influential than peers for perceptions of academic competence. Or it may reflect peer processes not measured here such as social comparison (e.g., a student's sense of efficacy may increase around peers who are less competent, see Dijkstra, Kuyper, van der Worf, Buunk, & van der Zee, 2008).

Influence but not selection effects were found for intrinsic value, effortful and disruptive behavior. Students do not seek out others who are similar to themselves in terms of liking and behavior in the classroom. Thus, students are selecting friends with similar grades and confidence level in the classroom and then as a result their behavior becomes more similar to their friends. Across the school year having friends who like school, try hard and follow the rules will facilitate value and positive behavior in school. Having friends who find school boring, give little effort and misbehave will dampen value and encourage poor behaviors. Friends do become more similar despite the fact that these attributes are not a strong attraction. An interesting question is what is driving selection processes in the classroom. Teachers may play a role in which students develop friendships as they have control over possibilities for interaction like whether or not students sit near each other (Gest & Rodkin, 2013). The findings for selection effects for G.P.A. but not behaviors in the classroom could reflect that teachers tend to pair together students with similar academic talent and knowledge and separate students who tend to get distracted or engage in off-task behavior when near each other.

In addition to estimating both selection and influence processes, current analytic technique allowed us to estimate and control for structural features of friendship networks. This contributes to knowledge about the nature of early adolescents' friendships in the classroom setting. There was a significant tendency among early adolescents to create reciprocated friendship ties and cohesive transitive ties structures, meaning that early adolescents prefer

reciprocated friendships rather than unilateral ones and cohesive peer group structures rather than dyadic structures. This is similar to SIENA studies that have analyzed early adolescents' school-based friendship networks (e.g., Ojanen, Sijtsema & Rambaran, 2013; Osgood, Ragan, Wallace, Gest, Feinberg & Moody, 2013). Consistent with much theory (Maccoby, 1998; Graham, Taylor & Ho, 2011) as well as recent SIENA studies (e.g., de la Haye, Green, Kennedy, Pollard & Tucker, 2013; Mathys, Burk, & Cillessen, 2013; Osgood et al., 2013), I found that gender and race played a role in early adolescents' friendship networks. Girls received more nominations compared to boys. European American students nominated more friends than African American students. Friendship was more likely between students of the same gender and race. Collectively, these results suggest that early adolescents' friendship networks are characterized by reciprocity, transitivity, and homogeneous tendencies to nominate friends with same gender and race. Importantly, these features were controlled in our analyses, ruling out the possibility that changes in structural features of friendships could account for the selection and influence effects on similarity in academic adjustment of early adolescents.

There were several limitations of our research. Our measure of friendship networks was limited to students' classrooms. While this is a reasonable choice given that students in elementary school spend most of the day with the students in their classroom, it is still likely to miss some of students' friends that are not in their class (e.g., friends in another class at the school or friends from activities that do not go to their school). Our results cannot be generalized beyond students classroom based friendships. The fact our study was classroom based yielded networks that were too small in size to analyze our SIENA results with meta-analysis which would have enabled us to examine whether classroom network characteristics and selection and influence effects vary by classroom. Another limitation of our design is that we assessed students' friendships at two time points (in the fall and spring) which does not capture much of

the change that occurs during the school year. Future work with more frequent assessments could be informative about the fluctuations in friendships as well as possible relations to changes in academic adjustment. Further, our measure of friend does not attend to the fact that friendships vary in strength and quality. We treated each friendship tie as equivalent in our analyses. Future work that incorporates the duration and quality of friendships would be helpful in understanding the nature and extent of peer influence on academic adjustment

In conclusion, by taking advantage of recent developments in longitudinal social network analysis Study 1 contributed new information about the extent to which selection and similarity occur in relation to academic adjustment for early adolescents. Selection, while an important process driving similarity between friends in regards to self-efficacy and G.P.A., was not found to explain similarity in values or behaviors. Because it has been assumed, but not examined, in most studies of friends, peer groups and academic adjustment this is a novel finding. Influence, plays a more expansive role in similarity between friends. Influence from friends is important to changes in academic adjustment across the school year in regards to value, engagement and achievement in the classroom setting.

Chapter 2. References

Ahn, H-J., Garandeau, C. F., & Rodkin, P. C. (2010). Effects of classroom embeddedness and density on the social status of aggressive and victimized children. *Journal of Early Adolescence, 30,* 76-101

Altermatt, E. R., & Brody, E. F. (2009). Coping with achievement-related failure: An examination of conversations between friends. *Merrill-Palmer Quarterly,* 55(4), 454-487.

Altermatt, E. R., & Pomerantz, E. M. (2003). The development of competence-related and motivational beliefs: An investigation of similarity and influence among friends. *Journal of Educational Psychology, 95,* 111-123.

Anderman, E. M., & Maehr, M. L. (1994). Motivation and schooling in the middle grades. *Review of Educational Research*, 64, 287-309.

Bandura, A. (1971). Vicarious and self-reinforcement processes. In R. Glaser (Ed.), *The nature of reinforcement*. New York, NY: Cambridge University Press.

Berndt, T. J. (1992). Friendships and friends' influence in adolescence. *Current Directions in Psychological Science*, 1, 156-159.

Berndt, T. J., & Keefe, K. (1995). Friends' influence on adolescents' adjustment to school. *Child Development, 66,* 1312-1329.

Berndt, T. J., Hawkins, J. A., & Jiao, Z. (1999). Influences of Friends and Friendships on Adjustment to Junior High School. *Merrill Palmer Quarterly*, 45.

Blyth, D. A., Simmons. R. G., & Bush, D. (1978). The transition into early adolescence: A longitudinal comparison of youth in two educational contexts. *Sociology of Education, 51, 149-162.*

Brown, B. B., Bakken, J. P., Ameringer, S. W., & Mahon, S. D. (2008). A comprehensive

  conceptualization of the peer influence process in adolescence. In M. J. Prinstein, & K.A.

  Dodge (Eds.), *Understanding peer influence in children and adolescents* (pp. 17-44).

  New York: Guilford Press.

Buhs, E. S., Ladd, G. W., & Herald, S. L. (2006). Peer exclusion and victimization: Processes

  that mediate the relation between peer group rejection and children's classroom

  engagement and achievement. *Journal of Educational Psychology,* 98, 1-13.

Burk, W. J., Kerr, M., Stattin, H. (2008). The co-evolution of early adolescent friendship

  networks, school involvement, and delinquent behaviors. *Revue Française de Sociologie*,

  49, 499-522.

Cairns, R., Leung, M. C., Buchana, L., & Cairns, B. D. (1995). Friendships and social networks

  in childhood and adolescence: Fluidity, reliability, and interrelations, *Child Development*,

  66(5), 1330-1345.

Cillessen, A. H. N. (2009). Sociometric methods. In K. H. Rubin, W. M. Bukowski, & B.

  Laursen (Eds.), *Handbook of peer interactions, relationships, and groups.* (pp.82-99).

  New York: Guilford Press.

Cohen, J. M. (1983). Peer influence on college aspirations with initial aspirations controlled.

  American Sociological Review, 48, 728-734.

DeLay, D., Laursen, B., Kiuru, N., Nurmi, J. E., & Salmela-Aro, K. (2013). Selecting and

  retaining friends on the basis of cigarette smoking similarity, *Journal of Research on

  Adolescence, 23, 464-473*.

De la Haye, K., Green, H. D., Kennedy, D., Pollard, M., & Tucker, J. (2013). Selection and

  influence mechanisms associated with marijuana initiation and use in adolescent

  friendship networks, *Journal of Research on Adolescence, 23, 474-486*.

Dijkstra, P., Kuyper, H., van der Werf, G., Buunk, A.P., & van der Zee, Y. G. (2008). Social

    comparison in the classroom: A review. *Review of Educational Research, 78*, 828-879.

Eccles, J. (1983). Expectancies, values and academic behaviors. In J.T. Spence (Ed.), *The*

    development of achievement motivation (pp. 283-331). Greenwich, CT: JAI.

Eccles, J. (2004). Schools, academic motivation, and stage-environment fit. In R. M. Lerner & L.

    Steinberg (Eds.), *Handbook of Adolescent Psychology* (2nd ed., pp. 125-153). New York:

    Wiley.

Epstein, J. L. (1983). The influence of friends on achievement and affective outcomes. In J.L.

    Epstein and Karweit, N. (Eds.), *Friends in school: Patterns of selection and influence in*

    *secondary schools (*pp. 177-200). New York: Academic Press.

Fabes, R. A., Martin, C. L., & Hanish, L. D. (2009). Children's behaviors and interactions with

    peers. In K. H. Rubin, W. M. Bukowski, & B. Laursen (Eds.), *Handbook of peer*

    interactions, relationships, and groups (pp. 45-62). New York: Guilford.

Farmer, T.W., Lines, M.M., & Hamm, J.V. (2011). Revealing the invisible hand: The role of

    teachers in children's peer experiences. (Introduction to the special issue*). Journal of*

    Applied Developmental Psychology, 32(5). 247-256.

Flashman, J. (2012). Academic achievement and its impact on friend dynamics, *Sociology of*

    Education, 85(1), 61-80.

Gest, S. D., Moody, J., & Rulison, K. L. (2007). Density or distinction? The roles of data

    structure and group detection methods in describing adolescent peer groups. *Journal of*

    Social Structure.

Gest, S. D. & Rodkin, P. (2011). Teaching practices and elementary classroom peer ecologies,

    Journal of Applied Developmental Psychology, 32, 257-265.

Giletta, M., Burk, W. J., Scholte, R. H. J., Engels, R. C. M. E., & Prinstein, M. J. (2013) Direct and indirect peer socialization of adolescent nonsuicidal self-injury, *Journal of Research on Adolescence,23, 450-463.*

Graham, S, Tayloer, A. Z. & Ho, A. Y.(2009). Race and ethnicity in peer relations research. In K. H. Rubin, W. M. Bukowski, & B. Laursen (Eds.), *Handbook of peer interactions, relationships, and groups.* (pp.394-413). New York: Guilford Press.

Huitsing, G., Veenstra, R., Sainio, M., & Salmivalli, C. (2012). "It must be me" or "It could be them?": The impact of the social network position of bullies and victims on victim's adjustment. *Social Networks.*

Hughes, J. (2012). Teachers as Managers of Students' Peer Context Peer Relationships and Adjustment at School. In A. M. Ryan and G. W. Ladd (Eds.) *Peer Relationships and Adjustment at School (pp. 189-218).* Charlotte: Information Age Press.

Ide, J. K., Paerkerson, J., Haertel, G. D., & Walberg, H. J. (1981). Peer group influences on educational outcomes: A quantitative synthesis. *Journal of Educational Psychology*, 73, 472-484.

Juvonen, J., Le, V., Kaganoff, T., Augustine, C., & Constant, L (2004). *Focus on the Wonder Years: Challenges Facing the American Middle School.* Santa Monica: Rand Corporation.

Kandel, D. B. (1978a). Similarity in real-life adolescent friendship pairs. *Journal of Personality and Social Psychology, 36,* 306-312.

Kandel, D. B. (1978b). Homophily, selection and socialization in adolescent friendships. *American Journal of Sociology, 84,* 427-436.

Kaplan, A. & Maehr, M. L. (1999). Achievement goals and student well-being. *Contemporary Educational Psychology, 24,* 330-358.

Kindermann, T. A. (1993). Natural peer groups as contexts for individual development: The case

    of children's motivation in school. *Developmental Psychology, 29*, 970 – 977.

Kindermann, T. (2007). Effects of naturally existing peer groups on changes in academic

    engagement in a cohort of sixth graders. *Child Development, 78*, 1186-1203.

Kindermann, T. A., & Gest, S. D. (2009). Assessment of the peer group: Identifying naturally

    occurring social networks and capturing their effects. In K. H. Rubin, W. M. Bukowski,

    & B. Laursen (Eds.), *Handbook of peer interactions, relationships, and groups.* (pp.100-

    120). New York: Guilford Press.

Kiuru, N., Aunola, K., Vuori, J., & Nurmi, J. (2007). The role of peer groups in adolescents'

    educational expectations and adjustment. *Journal of Youth and Adolescence*, 36, 995-

    1009.

Kiuru, N., Aunola, K., Nurmi, J., Leskinen, E., & Salmela-Aro, K. (2008). Peer group influence

    and selection in adolescents' school burnout: A longitudinal study. *Merrill-Palmer*

    Quarterly, 54(1), 23-55.

Ladd, G. W. (2005). *Children's peer relations and social competence: A century of progress*.

    New Haven, CT: Yale University Press.

Logis, H., Rodkin, P. C., Gest, S. D., & Ahn, H.-J.(2013). Popularity as an organizing factor of

    preadolescent friendship networks: Beyond pro-social and aggressive behavior, *Journal*

    of Research on Adolescence, 23, 413-423.

Maccoby, E. E. (1998). *The two sexes: Growing up apart: Coming together*. Cambridge:

    Harvard University Press.

Masters, J. C., & Mokros, J. (1995). Children's friendship relations: A meta-analytic review.

    Psychological Bulletin, 117, 306-347.

Mathys, C., Burk, W. J., & Cillessen, A. H. N. (2013). Popularity as moderator of peer selection and socialization of adolescent alcohol, marijuana, and tobacco use, *Journal of Research on Adolescence, 23*, 513-523.

Midgley, C., Maehr, M. L., Hicks, L., Roeser, R., Urdan, T., Anderman, E. M., & Kaplan, A. (1996). *Patterns of Adaptive Learning Survey (PALS) Manual.* Ann Arbor: University of Michigan.

Miserandino, M. (1996). Children who do well in school: Individual differences in perceived competence and autonomy in above-average children. *Journal of Educational Psychology, 88*, 203–214.

Molloy, L., Gest, S., & Ruilson, K. (2011). Peer influences on academic motivation: Exploring multiple methods of assessing youth's most "influential" peer relationships. *Journal of Early Adolescence*, 31(1), 13-40.

Ojanen, T., Sijtsema, J. J., Hawley, P. H., & Little, T. D. (2010). Intrinsic and extrinsic motivation in early adolescents' friendship development: Friendship selection, influence, and prospective friendship quality. *Journal of Adolescence*, 33(6), 837-851.

Ojanen, T., Sijtsema, J. J., & Rambaran, J. A. (2013). Social goals and adolescent friendships: Social selection, deselection, and influence, *Journal of Research on Adolescence, 23*, 550-562

Osgood, D. W., Ragan, D. T., Wallace, L., Gest, S. D., Feinberg, M. E., & Moody, J. (2013). Peers and the emergence of alcohol use: Influence and selection processes in adolescent friendship networks, *Journal of Research on Adolescence, 23, 500-512*.

Patrick, H., Mantzicopoulos, P. & Sears, D. (2010). Effective classrooms. In K. Harris, S. Graham and T. Urdan (Eds.) *Educational Psychology Handbook, Vol. 2* Washington DC: American Psychological Association Publications.

Patrick, H., Turner, J. C., Meyer, D. K., & Midgley, C. (2003). How teachers establish psychological environments during the first days of school: associations with avoidance in mathematics. *Teachers College Record, 105,* 1521-1558.

Prinstein, M. J., & Dodge, K. A. (Eds.). (2008). *Understanding peer influence in children and adolescents*. New York: Guilford.

Rubin, K. H., Bukowski, K. H., & Laursen, B. (Eds.). (2009). *Handbook of peer interactions, relationships, and groups*. Mahwah, NJ: Guilford.

Rubin, K. H., Bukowski, W., & Parker, J. G. (2006). Peers interactions, relationships, and interactions. In W. Damon, & R. Lerner (Series Eds.) & N. Eisenberg (Vol. Ed.), *Handbook of child psychology: Social, emotional, and personality development* (6th ed., vol. 3, pp. 571–645). New York: Wiley.

Rulison, K. L., Gest, S. D., & Loken, E. (2013). Dynamic peer networks and physical aggression: The moderating role of gender and social status among peers, *Journal of Research on Adolescence, 23*, 437-449.

Ryan, A.M. (2000). The peer group as a context for the socialization of adolescent's motivation, engagement, and achievement in school. *Educational Psychologist, 35*, 101-111

Ryan, A. M. (2001). The peer group as a context for the development of young adolescent motivation and achievement. *Child Development, 72*, 135-1150.

Ryan, A.M., & Patrick, H. (2001). The classroom social environment and changes in adolescents' motivation and engagement during middle school. *American Educational Research Journal, 38,* 437-460.

Sagotsky, G., & Lepper, M. R. (1982). Generalization of changes in children's preferences for easy or difficult goals induced through peer modeling. Child Development, 53, 372-375.

Simpkins, S. D., Schaefer, D. R., Price, C. D., & Vest, A. E. (2013). Adolescent friendships, BMI, and physical activity: Untangling selection and influence through longitudinal social network analysis, *Journal of Research on Adolescence,23, 537-549.*

Simmons, R. G., & Blyth, D. A. (1987). *Moving into adolescence: The impact of pubertal change and school context*. Hawthorne, NY, US: Aldine de Gruyter.

Skinner, E.A & Belmont, M.J. (1993). Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology, 85, 571-581.*

Ripley, R. M., Snijders, T. A. B., & Preciado, P. et al. (2012). *Manual for RSiena*, University of Oxford: Department of Statistics, Nuffield College.

Snijders, T. A. B., Steglich, C. E. G., & Van de Bunt, G. G. (2010). Introduction to actor-based models for network dynamics. *Social Networks*, 32, 44-60.

Snijders, T. A. B. (2005). Models for longitudinal network data. In P. C. J. Scott, & S. Wasserman (Eds.), *Models and methods in social network analysis*. New-York: Cambridge Univeristy Press.

Snijders, T. A. B. (2001). The statistical evaluation of social network dynamics. In M. E. Sobel., & M. P. Becker (Eds.), *Sociological Methodology* (pp.361-395)*.* Boston and London: Basil Blackwell

Snijders, T. A. B. (1996). Stochastic actor-oriented dynamic network analysis, *Journal of Mathematical Sociology,* 21, 149-172.

Steglich, C., Snijder, T. A. B., & Perason, M. (2010). Dynamic networks and behavior: seperating seletion from influence, *Sociological Methodology*, 40(1), 329-393.

Tenney, E. R., Turkheimer, E., & Oltmanns, T. F. (2009). Being liked is more than having a good personality: The role of matching. Journal of Research in Personality, 43, 579–585.

Van Workum, N., Scholte, R. H. J., Cillessen, A. H. N., Lodder, G. M. A., & Giletta, M. (2013).
Selection, deselection, and socialization processes of happiness in adolescent friendship
networks, *Journal of Research on Adolescence, 23*, 563-573.

Veenstra, R., and Dijkstra, J.K. (2011). Transformations in Peer Networks. In *Relationship
Pathways: From Adolescence to Young Adulthood* (pp. 598-618). New York: Sage.

Veenstra, R., and Steglich, C. (2012). Actor-based model for network and behavior dynamics: A
tool to examine selection and influence processes. In B. Laursen, T. D. Little, and N. A.
Card (Eds.), *Handbook of developmental research methods*. New York: Guilford Press.

Watt, H. M. G. (2004). Development of adolescents' self-perceptions, values, and task
perceptions according to gender and domain in 7th- through 11th-grade Australian
students, *Child Development*, 75(5), 1556-1574.

Wentzel, K. (2009). Peers and Academic functioning at school. In K.H. Rubin, W.M Bukowski
and B. Laursen (Eds.), *Handbook of Peer Interactions, Relationships and Groups*
(pp.531-547), New York: Guilford.

Wilson, T., & Rodkin, P. C. (2011). African American and European American children in
diverse elementary classrooms: Social integration, social status, and social behavior.
Child Development, 82, 1454-1469.

Table 2. 1. Friendship Networks, Motivation, Engagement, and Achievement: Changes from Fall to Spring

Changes from Fall to Spring	W1-W2	
Friendship Tie changes		
Average number of Ties dissolved	85	
Average number of Ties emerged	84	
Average number of Ties maintained	86	
Network change		
Hamming Distance (change)	169	
Jaccard Index (stability)	0.34	
Within each wave	*W1*	*W2*
Friendship networks		
Average Ties	163	153
Average Outdegree	6.59	6.39
Density index	0.28	0.28
Reciprocity index	0.58	0.57
Transitivity index	0.53	0.53
Academic Self-Efficacy		
Mean (SD)	4.14 (0.72)	4.09 (0.73)
Moran's I	0.025	0.002
Achievement (G. P. A.)		
Mean (SD)	7.33 (2.95)	7.52 (2.97)
Moran's I	0.019	0.030
Intrinsic Value		
Mean (SD)	3.01 (1.02)	2.83 (1.04)
Moran's I	0.025	0.044
Effortful Behavior		
Mean (SD)	4.05 (0.84)	3.84 (0.90)
Moran's I	0.025	0.044
Disruptive Behavior		
Mean (SD)	2.68 (1.04)	2.77 (1.08)
Moran's I	0.055	0.089

Table 2. 2. Correlations among Motivation, Engagement, and Achievement across the School Year

	W1 Academic self-efficacy	W1 G. P. A.	W1 Intrinsic value	W1 Effortful behavior	W1 Disruptive behavior	W2 Academic self-efficacy	W2 G. P. A.	W2 Intrinsic value	W2 Effortful behavior
W1 Academic self-efficacy									
W1 G. P. A.	.13**								
W1 Intrinsic value	.38**	.11*							
W1 Effortful behavior	.40*	.18**	.48**						
W1 Disruptive behavior	-.19**	-.23**	-.28**	-.54**					
W2 Academic self-efficacy	.45**	.01	.38**	.25**	-.13**				
W2 G. P. A.	.19**	.81**	.11**	.20**	-.24**	.14**			
W2 Intrinsic value	.26**	-.04	.53**	.27**	-.22**	.40**	.02		
W2 Effortful behavior	.30**	.13**	.32**	.48**	-.34**	.46**	.16**	.50**	
W2 Disruptive behavior	-.16**	-.19**	-.22**	-.33**	.51**	-.19**	-.19**	-.33**	-.51**

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

Table 2. 3. SIENA Estimates of Academic Efficacy and G.P.A. for Selection and Influence Effects (Wave 1 and Wave 2)

	Academic Efficacy		Achievement (G. P. A.)	
	Estimate (b)	SE	Estimate (b)	SE
Network Effect				
Outdegree (density)	**-3.34***	0.10	**-3.00***	0.07
Reciprocity	**0.90***	0.04	**0.88***	0.07
Transitive ties	**1.84***	0.09	**1.47***	0.06
Balance	-0.01	0.01	0.01	0.01
Selection Effects				
Sex (F) alter	**0.07***	0.03	**0.02***	0.04
Sex (F) ego	0.01	0.03	-0.02	0.04
Same sex	**0.46***	0.02	**0.53***	0.04
Race (W) alter	0.02	0.02	0.02	0.02
Race (W) ego	**0.04***	0.01	**0.05***	0.02
Same race	**0.40***	0.03	**0.43***	0.04
Alter	**-0.09**	0.04	**0.05***	0.01
Ego	0.04	0.04	**-0.04***	0.01
Similarity (selection)	**0.50**	0.22	**0.39†**	0.25
Influence Effects				
Linear shape	-0.06	0.05	**0.05***	0.03
Quadratic shape	**-0.53**	0.15	-0.01	0.01
Average similarity (influence)	0.41	1.37	**2.53***	1.42

Note. † *p* < .10, * *p* < .05, ** *p* < .01, *** *p* < .001 (two-tailed tests).

Table 2. 4. SIENA estimates of Intrinsic Value, Effortful Behavior, and Disruptive Behavior for Selection and Influence Effects (Wave 1 and Wave 2)

	Intrinsic Value		Effortful Behavior		Disruptive Behavior	
	Estimate (b)	SE	Estimate (b)	SE	Estimate (b)	SE
Network Effect						
Outdegree (density)	**-3.32***	0.10	**-3.31***	0.09	**-3.31***	0.09
Reciprocity	**0.90***	0.03	**0.90***	0.03	**0.91***	0.04
Transitive ties	**1.84***	0.08	**1.83***	0.08	**1.83***	0.08
Balance	**-0.02***	0.01	**-0.02***	0.01	**-0.02***	0.01
Selection Effects						
Sex (F) alter	**0.07***	0.03	**0.06***	0.03	**0.06***	0.03
Sex (F) ego	0.02	0.03	0.01	0.03	0.02	0.03
Same sex	**0.46****	0.03	**0.46***	0.03	**0.46****	0.03
Race (W) alter	**0.02***	0.01	**0.02***	0.01	0.01	0.01
Race (W) ego	**0.04***	0.01	**0.04***	0.01	**0.04***	0.01
Same race	**0.40***	0.03	**0.40***	0.03	**0.40***	0.03
Alter	-0.01	0.02	**0.05***	0.03	**-0.07***	0.02
Ego	0.01	0.02	**0.04†**	0.03	-0.01	0.03
Similarity (selection)	0.01	0.16	0.11	0.18	-0.14	0.16
Influence Effects						
Linear shape	**-0.05***	0.04	**-0.10***	0.06	-0.01	0.04
Quadratic shape	-0.02	0.06	-0.04	0.07	0.08	0.05
Average similarity (influence)	**2.69***	0.89	**2.92***	0.98	**2.82***	0.85

Note. † *p* < .10, * *p* < .05, ** *p* < .01, *** *p* < .001 (two-tailed tests).

42