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Social Network Implications of Normative School Transitions in Non-Urban School Districts

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Abstract

This article expands research on normative school transitions (NSTs) from elementary to middle school or middle to high school by examining the extent to which they disrupt structures of friendship networks. Social network analysis is used to quantify aspects of connectedness likely relevant to student experiences of social support. Data were drawn from 25 communities followed from sixth to ninth grades. Variability in timing of NSTs permitted multi-level longitudinal models to disentangle developmental effects from transition effects. Results indicated that friendship networks were most interconnected in smaller schools and among older students. Beyond these effects, transitions from a single feeder school to a single higher level school were not associated with changes in friendship patterns. Transitions from multiple feeder schools to a single higher level school were associated with diminished friendship stability, more loosely connected friendship networks, increased social distance between students, and friendship segregation between students who formerly attended different schools.

Keywords

school transitions; friendship networks

Normative school transitions (NSTs) from elementary to middle school and from middle to high school involve changes in instructional and social organization that have important implications for individual adjustment (Benner, 2011; Eccles, Midgley, & Adler, 1984; Rice, 2001). For example, students may experience expanded opportunities for peer interaction in a context that provides less support for stability in peer relations, while also negotiating a more evaluative curriculum taught by teachers with whom they have distant relationships (Eccles, Wigfield, & Schiefele, 1998; Feiner et al., 1994). The present study tests the extent to which NSTs disrupt the nature and fabric of social ties among students. If NSTs are

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detrimental to the stability and structure of friendship networks, it may help to account for the negative effects of NSTs on individual adjustment.

Although most studies of NSTs focus on individual outcomes, the present study expands our understanding of NSTs by attending to their impact on friendship networks at two levels: the "local," individual level (e.g., stability of friendships) and the broader structure of students' social relations at the "global" level (e.g., average social distance between students). To explore these effects, we capitalize on natural variation in timing and structures of NSTs, where some communities follow a middle (Grades 6–8) and high school (Grades 9–12) pattern, whereas others follow a junior high (Grades 7–9) and senior high school (Grades 10–12) pattern or other formulations. Districts also vary in student composition changes across transitions, a component often not distinguished in research on NSTs (Benner, 2011). A grade cohort of students may move from one school to become the full grade cohort at the next level, or grade cohorts from multiple schools may feed into a single school.

Although we focus on the impact of NSTs on friendship networks, NSTs also have the potential to create challenges arising from discordance between previous academic experiences and new academic demands (Benner, 2011; Rice, 2001). Students feel more anonymous following transitions, putting them at risk for disengagement from school and poor academic performance (Benner, 2011; Eccles et al., 1984). It is no surprise, then, that NSTs are linked to increases in both internal psychological problems such as anxiety or depressed mood, and externalizing behaviors such as delinquency or class disruption (Blyth, Simmons, & Bush, 1978; Feiner et al., 1994).

The importance of school-based friendship networks, the significant social challenges posed by NSTs, and evidence that friendships play a role in post-transition adjustment provide a strong justification for studying the potentially disruptive impact of NSTs on friendship networks. Most generally, peer relationships provide unique opportunities to enhance social skills, self-worth, and identity in ways that have long-term developmental significance (Hartup & Stevens, 1997; Newcomb & Bagwell, 1995; Vitaro, Boivin, & Bukowski, 2009). Indeed, most adolescent friendships are among students from the same school and grade, even in today's online social networking environment, and adolescents often consider social relations at school as important as academic success (Hartup & Stevens, 1997; Reich, Subrahmanyam, & Espinoza, 2012; Wentzel, 2009).

Both single-school and multi-school transitions may disrupt friendship networks, as both involve institutional discontinuities (Rice, 2001) related to both school structure (e.g., changes in school schedules) and the organization of peer relationships. The typical elementary school maximizes stability of peer relationships with students spending their day with a single teacher and set of peers that remains fixed throughout the year. In contrast, middle and high schools typically involve increasing social flux in which students change teachers, classrooms, and student groupings more frequently throughout the day and year. These changes provide opportunities not only to interact with a wider range of peers but also entail less contact with any one peer. Such diminished opportunities for sustained interaction with specific peers may undermine friendship formation and stability (Eccles et al., 1998; Epstein, 1983).

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These challenges are amplified following multi-school transitions because students face (a) a larger peer network (further reducing contact time with any given peer) and (b) many unfamiliar peers (with no history of past interaction to support friendship formation). Thus, we expect both single-school and multi-school transitions to disrupt friendship networks, but we expect the effects for multi-school transitions to be substantially stronger.

Some evidence supports the key role of friendship experiences across NSTs. Youth with close friendships have better outcomes following an NST than those who do not have friends (Kurita & Janzen, 1996); high perceived social support reduces risk for psychological symptoms following an NST (Hirsch & DuBois, 1992); and close friendships across transitions are associated with increases in self-esteem, sociability, and leadership skills (Berndt, Hawkins, & Jiao, 1999). Berndt and Hawkins (1985) found no significant relation between the stability of friendships and adjustment following transition, but did find a significant relation between adjustment and self-reported closeness and support from current friendships. This finding suggests that transitions may interrupt individual friendship ties, but key social provisions of friendship networks may persist if new friendships are of high quality.

As Benner (2011) highlighted in a recent review article, most studies on peer relations and school transitions do not take into account the structures of the sending and receiving environments, which may be central to explaining the observed impact of peers during NSTs. We identified only three empirical studies that address whether friendship networks change following NSTs. Cantin and Boivin (2004) asked 200 French-speaking adolescents to identify their friends before and for 2 years following the transition to junior high school. Students nominated fewer friends immediately following transition but rebounded by the second year. Indices of friendship quality, however, were unaffected by transition. In Hardy, Bukowski, and Sippola's (2002) study of the transition from six elementary schools to a single middle school, two thirds of friendship nominations were unstable, but rates of reciprocated friendships and the average number of friendship nominations remained stable across the transition. Thus, despite a great deal of change in particular friendship ties, students formed a similar number of close (reciprocated) friendships before and after the transition (Hardy et al., 2002). Similarly, in Pellegrini and Bartini's (2000) study of five primary schools transitioning into two middle schools in a rural school district, rates of reciprocal friendships were not significantly different from fifth to sixth grades. However, other indices representing peer status and connectedness significantly decreased.

These studies are limited in several important ways. First, they do not compare schools that undergo NSTs with those that do not, potentially confounding age-related changes and transition effects. As with broader research on NSTs (Benner, 2011), they do not distinguish single-school and multi-school transitions, and they do not clarify the features of multi-school transitions that account for their effects. Finally, in focusing on individual-level friendship networks, they do not consider features of the broader, setting-level peer network, which may affect individuals' sense of connectedness to the broader school community (Valente, Gallaher, & Mouttapa, 2004).

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We consider both individual-level ("local") friendship patterns and setting-level ("global") friendship patterns because the same local patterns can result in differing global patterns, and global patterns could have unique significance for student adjustment and could constrain the longer term implications of local dynamics. Local friendship patterns summarize the connectedness between and among an individual and his or her friends. These indices include the stability of friendship ties over time, rates of reciprocation (i.e., if A names B, does B name A), the degree to which an individual's friends are friends with one another ("transitivity"), and the degree to which possible friendship ties are present in an individual's network ("density"). Each of these local structures has been shown to uniquely reflect the quality and support available in the friendship networks of youth (Mendelson & Aboud, 1999; Newcomb & Bagwell, 1995). For example, high levels of transitivity reflect social closure, which should lead to greater capacity for local friendship groups to provide support to their members. In the Add Health study, higher rates of transitivity were associated with lower rates of suicidal ideation (Bearman & Moody, 2004). Density, too, facilitates support with higher levels of local friendship density enabling efficient information sharing and more efficient problem solving (Mehra, Dixon, Brass, & Robertson, 2006).

Global friendship patterns, in contrast, characterize an entire social network in a way that cannot be reduced to an average of measures at the individual or local level. Key global measures of the tight-knittedness of the network include average geodesic distance (or average "degrees of separation"), centralization (or degree to which friendship nominations are centered on few individuals or more dispersed throughout the network), and segregation (or degree to which friendships cluster around a specific common characteristic, for instance, feeder school). When average geodesic distance is relatively large, information, attitudes, and behaviors travel slowly through the network. In the school setting, higher average geodesic distance is associated with feelings of distance from others and decreased school attachment (Moody & Bearman, 2001). A highly centralized network reflects agreement about a leading crowd, and, at the same time may reflect a greater agreement around the norms and values held in the network (Gould, 1993). For students experiencing a multi-school transition, segregation can quantify the degree to which friendships are concentrated within (rather than between) students who formerly attended the same school.

Overall, in a tightly knit, cohesive friendship network, one would expect to find high levels of reciprocity, transitivity, and density at the local level, and lower average geodesic distance, high centralization (indicating a unified status hierarchy), and low segregation at the global level. However, tight-knit local friendship patterns could also exist in networks that are not well integrated at the global level, such as being relatively decentralized and segregated. In such a case, tight-knittedness at the local level may provide proximal sources of social support, but low centralization and high average geodesic distance at the global level may affect perceptions of the school climate (Brand, Felner, Shim, Seitsinger, & Dumas, 2003) and limit students' abilities to interact and communicate with others who are more socially distant (Moody & Bearman, 2001).

Understanding how NSTs affect friendship patterns at both the local level and global level could have important implications for school policy, especially in the United States, where

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there is considerable variability in the timing and nature of NSTs. Programs designed to prevent negative outcomes from NSTs often include components designed to foster peer support and ameliorate weakened peer relationships (Feiner et al., 1994; Lochman & Wells, 2002; Reyes, Gillock, & Kobus, 1994). A stronger understanding of how the structure of friendship networks changes across NSTs could inform prevention programs by clarifying the nature of the risks to social ties and guiding efforts to maximize supports for them in a preventive manner (Gest, Osgood, Feinberg, Bierman, & Moody, 2011).

Present Study

The present study uses data from 25 communities participating in the PROSPER Peers study across Grades 6 to 9. The study provides a strong quasi-experimental research design for examining the impact of NSTs because communities vary in both the timing of NSTs and whether the transitions involve single or multiple schools.

Using social network analysis to assess the impact of transitions on the stability and cohesion of students' friendship networks, we address two questions about the impact of transitions. Our first research question is whether single-school transitions decrease stability and cohesiveness of friendship ties. Because single-school transitions do not introduce new peers to the social network, this result would arise if social network changes were due to the multiple institutional discontinuities in school organization and structure that accompany transitions or from the shift in students' status from the oldest to youngest cohort at their school (Rice, 2001).

Our second research question is whether multi-school transitions affect friendship stability and network cohesion. Multi-school transitions may have unique bearing on friendship networks because they greatly expand the pool of potential friends. In this regard, Hardy and colleagues (2002) found that multi-school transitions did not affect the average number of friendships or rate of reciprocation ("local" network features), but they found relatively few friendships among students from different feeder schools, suggesting possible effects on average geodesic distance, centralization, and segregation ("global" network features).

Data and Methods

The data derive from five waves of the PROSPER (PROmoting School-community-unversity Partnerships to Enhance Resilience) study, which examined whether community teams organized by the university cooperative extension systems in two states could facilitate dissemination of evidence-based prevention programs targeting adolescent substance use (Spoth, Clair, Greenberg, Redmond, & Shin, 2007; Spoth, Redmond, et al., 2007). Participating in the evaluation was limited to communities with (a) a total K-12 enrollment of 1,300 to 5,200 students and (b) at least 15% of the student population eligible for free or reduced-cost school lunches (though 1 exception was made, resulting in a range of 10%–48%). All selected communities were predominately White (61%–96%). The communities are small towns and surrounding rural areas, with total populations ranging from 7,000 to 45,000. Fourteen matched pairs of communities ($n = 28$) were randomly assigned to control and intervention conditions. Although the communities had varying numbers of elementary

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and junior high/middle schools, each had one high school. Spoth, Clair and colleagues (2007a) provided more detailed information about these communities.

All students in two successive grade cohorts in each community were asked to complete a questionnaire in the fall of sixth grade and each subsequent spring through ninth grade for a total of five waves of data. Students were asked to write the names of their two best friends and five additional friends from their current grade and school. Written names were matched to class rosters. The overall response rate to the questionnaire was 87.2%, yielding a sample of more than 11,000 students per wave. Friendship nomination data were available for 93.9% of those respondents. Of the friends named, 83.0% were successfully matched to students on the class roster, for an average of 3.7 matched names per respondent. Of the unmatched nominations, 1.9% could not be identified due to multiple plausible matches, 0.4% were inappropriate choices (e.g., celebrities), and the remaining 14.7% matched no name on the grade rosters. This percentage of complete data is high relative to other network studies (e.g., Add Health), and recent work on missing data in networks suggests only minimal distortion or bias from such moderate levels of missing data; network level indices remain robust even with higher levels of network missingness (Borgatti, Carley, & Krackhardt, 2006; Smith & Moody, 2013). One district declined to participate in the network portion of the study, and 2 other communities were omitted for the current analyses because of interruptions in their normal transition patterns, leaving 25 communities for analysis.

Research Design

Our quasi-experimental research design capitalizes on both longitudinal variation within communities (comparing years students change schools with years they do not) and differences between communities at each time (comparing schools that do and do not transition each year). The two grade cohorts for each school within each of the 25 communities were assessed at five waves, yielding a total of 328 wave-specific friendship networks. The sample contains 27 schools that two successive cohorts entered via single-school transitions (a total of 54 networks) and 20 schools that two cohorts entered via multi-school transitions (40 networks). Multi-school transitions combined students from between 2 and 8 feeder schools from the previous wave. Students in the remaining 234 networks had not experienced a transition upon entering their current grade (i.e., these students had attended the same school the prior year). The transitions occurred at Wave 1 (Fall of sixth grade: 26 multi-school and 6 single-school transition networks), Wave 3 (seventh grade: 8 multi-school and 10 single-school transition networks), or Wave 5 (ninth grade: 6 multi-school and 38 single-school transition networks). The longitudinal progression for these networks is detailed in Table 1. A particular strength of this natural experiment is that, at different times, each community serves as both “treatment” and “control” because the timing of their transitions varies.

Dependent Variables

The dependent variables detailed below were calculated for each network using standard social network methods (see Wasserman & Faust, 1994). Table 2 reports descriptive statistics for each measure.

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Individual-level (local) network measures—*Stability* is the proportion of directed friendship ties at time *t* that were also present at time $t-1$. Because stability is dependent on data from previous waves, this variable is calculated only for Waves 3, 4, and 5. *Reciprocity* is the proportion of all friendship ties that are reciprocated out of all ties in the network. A tie is reciprocated if Person A nominates Person B and Person B also nominates Person A. *Transitivity* measures the extent to which friends of friends are also friends. Ties are transitive if, given that Person A names Person B and Person B names Person C, then Person C also names Person A. *Constrained Density* is the proportion of possible friendship ties that actually occur, corrected for our data's restricted maximum of seven nominations.

Setting-level (global) network measures—*Average Geodesic Distance* is the average number of links on the shortest path between every pair of students. If A is connected to B, who is connected to C, who is connected to D, then A is three steps from D by this path. Searching over all possible paths, the path with the fewest number of steps is the geodesic distance. Pairs that cannot be reached are excluded from the calculation. *Degree Centralization* captures inequality in the number of named friends. High centralization indicates a network in which ties are concentrated among relatively few students, whereas low centralization characterizes a network with a more equal distribution of friendship ties across students. This index is computed as the standard deviation across network members of their total number of friendships (either incoming or outgoing). We use the Freeman *Segregation* Index to quantify the degree to which ties are concentrated among students who were in the same previous school. The segregation index is calculated as $(E(X) - O(X))/E(X)$; where $E(X)$ is the expected number of cross-group ties and $O(X)$ is the observed number of cross-group ties. The expected value is computed from the marginal distributions of ties sent from each group. A value of 0 indicates that the number of ties between students from different feeder schools is what we would expect if ties were distributed randomly, and a value of 1 indicates that all ties fall within feeder-school groups.

Analytic Strategy

Our interest is in the effects of NSTs on friendship network structure and stability in non-urban communities. Accordingly, the friendship network specific to a school, cohort, and wave is our unit of analysis. We assess the effects of transitions through multi-level models with time-varying dummy-coded indicators for single-school and multi-school transitions, thereby contrasting each with schools that did not undergo a transition in that wave. To ensure that our estimates were not confounded with the grades at which transitions occurred, we controlled for wave of data collection with a set of dummy variables. Noting that racial and gender composition of the networks may also affect network indices (Graham, Taylor, & Ho, 2009), we also include controls for the percentage of male students and the percentage of White students in the networks. The analyses also included network size (as a quadratic function) so that estimates of the impact of multi-school transitions are independent from accompanying changes in school size.

By including separate terms for network size and multi-school transitions, we are disaggregating the overall effect of multi-school transitions, which involve both increases in network size and other processes (e.g., the introduction of unfamiliar peers). Consequently,

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in interpreting effects, we will attend to the relative size of effects for network size and for multi-school transitions to clarify the unique contributions of these two facets. We use a hypothetical multi-school transition involving two schools of 80 students transitioning into a school of 160 students, which is approximately the mean size of multi-school transition networks.

Based on the study design, we used a four-level nested model (wave within school and cohort within district), with the unusual feature that school and cohort are cross-classified (both cohorts attended each school and transitioned between schools across time). We include mean level (or intercept) variance terms at all these levels to capture error dependence due to repeated measures from each of these sources. To accommodate the cross-classification, we estimated models using Markov chain Monte Carlo (MCMC) sampling via the MLwiN software (Browne, 2009).

Results

Measures of Stability

Table 3 presents results from a multi-level model testing the relation between transitions and friendship stability. Stability was not affected by single-school transitions. Multi-school transitions result in decreased stability, with 3.8% fewer stable ties. Increasing the network size from 80 to 160 would decrease stability by 8%, meaning that about two thirds of the decrease in stability would be a result of increased network size with the remainder a result of other aspects of the multi-school transition (e.g., introduction of unfamiliar peers).

Measures of Local-Level Network Connectedness

Increases in network size were associated with decreases in friendship reciprocity. Increasing network size from 80 to 160 students reduced reciprocity by 8%. Reciprocity also increased with grade level: ninth-grade reciprocity rates were 5% higher than sixth-grade rates. Similarly, transitivity was lower in larger networks (reduced by 16% when networks increased from 80 to 160) and increased with grade level (5% higher for ninth graders). After taking these effects into account, single-school transitions had no effect and multi-school transitions only approached significance ($p < .08$) with a very small decrease of 2% —This difference is only one tenth of the individual-level standard deviation for this variable ($SD = 0.21$). The small standard error coefficients indicate that our research design provides sufficient statistical power to detect even modest effects of school transitions. Thus, these results suggest that neither type of transition has a substantively important impact on reciprocity or transitivity.

Density of friendships, conversely, is significantly lower after multi-school transitions, even controlling for accompanying increases in the size of the student body. Constrained density was .05 lower following multi-school transitions compared with non-transition networks. This result indicates that for a student with seven friends and 42 possible ties among those friends, 2 to 3 fewer ties are made in multi-school transitions. Single-school transitions have no significant impact on constrained density.

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Global Measures of Network Connectedness

Table 4 presents results from the multi-level models for geodesic distance and centralization. Network size had a substantial impact on these indices: Average geodesic distance increased by 2.00 when network size increased from 80 to 160. After controlling for this effect, a multi-school transition was associated with an additional increase of .36. Centralization decreased with larger network size (by 8%) and decreased by an additional 1% with multi-school transitions, indicating that ties are more evenly distributed across students after multi-school transitions.

We tested interactions between wave and transition to detect whether the relations between transition and network features differed as a function of grade. These interactions yielded no significant results, but trends ($p < .1$) were apparent for three variables: Grade 9 multi-school transitions, compared with Grade 7, increased geodesic distance, decreased centralization, and decreased density. These interaction tests had limited statistical power because only 14 networks of the 328 tested fell into either category.

Segregation based on feeder school was calculated for each of the eight 7th-grade and the six 9th-grade networks that had undergone multi-school transitions. The mean segregation index ($M = 0.37$, $SD = 0.13$) was compared with zero (the value for random assortment) using a one-sample t test, which revealed that previous school is a significant segregating factor in the year following a multi-school transition $t(13) = 11.22$, $p < .001$. There was significant segregation following multi-school transitions at both grade levels, seventh grade, $t(7) = 11.55$, $p < .001$; ninth grade, $t(5) = 14.19$, $p < .001$. However, post-transition segregation was significantly greater for ninth-grade transitions: two-sample $t(12) = 5.06$, $p < .001$.

Discussion

The purpose of this article was to test whether NSTs had a disruptive impact on the cohesiveness and stability of students' friendship networks in non-urban school settings. Such disruptive effects could help to account for previous findings of negative effects of NSTs on individual adjustment. NSTs are marked by institutional discontinuities (Rice, 2001) that have direct implications for students' relationships with peers (e.g., increased opportunities for peer interaction; less organizational support for peer network stability) and teachers (e.g., increasing emphasis on academic evaluation and fewer opportunities to form close relationships). We capitalized on natural variations in transition patterns in a sample of 25 communities from sixth to ninth grades to determine whether transitions affect features of friendship networks at both local (individual) and global levels. We found no significant effects associated with single-school transitions but several effects associated with multi-school transitions.

Single-school transitions had no significant impact on friendship stability or on reciprocity and transitivity of friendship ties. This suggests that when youth experience such transitions, they are able to maintain their existing friendships as if they had not transitioned, and experience no disruption to the quality of their friendships (evidenced by reciprocity; Newcomb & Bagwell, 1995) or triad-level systems of friendship support (evidenced by transitivity of friendship ties among their friends; Bearman & Moody, 2004).

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The absence of effects for single-school transitions indicates that relations with same-grade peers are not sensitive to changes in school organization that do not also involve increases in network size or the introduction of unfamiliar peers. This is noteworthy given that even single-school transitions provide opportunities for more varied and extensive peer contact (e.g., more frequent changes in instructional groupings). Thus, any effects of single-school transitions on academic success and individual adjustment likely do not stem from disruption of same-grade peer relations, but rather other institutional discontinuities (Benner, 2011; Rice, 2001).

In contrast, multi-school transitions were associated with changes in both local and global friendship structures. At the dyad level, multi-school transitions resulted in decreased stability of friendship ties but no change in levels of friendship reciprocity. It appears that multi-school transitions undermine friendship quality by disrupting ongoing friendships (Mendelson & Aboud, 1999), but youth are able to establish new, high-quality friendships by the end of the post-transition year (Newcomb & Bagwell, 1995). These new friendships may lack some of the positive qualities that would have emerged in longer term relationships (Mendelson & Aboud, 1999), but may nonetheless provide critical proximal support in coping with transition stress (Berndt & Hawkins, 1985). These results are consistent with previous research (Cantin & Boivin, 2004; Hardy et al., 2002) that included smaller samples and no controls for school size or grade level. It should be noted, however, that given the relatively small communities used in the present study, and our restriction to naming friends within the same grade and school, students in multi-school transitions may have already been familiar or friends with students from other feeder schools. Further exploration is needed to understand this pattern of stability and reciprocity.

There was stronger evidence of the disruptive effects of multi-school transitions at the level of friendship triads and the larger friendship group. There was a non-significant trend ($p < .10$) for multi-school transitions to diminish the transitivity of friendships. In the Add Health data set, higher rates of friendship transitivity were associated with lower rates of suicidal ideation (Bearman & Moody, 2004), suggesting that greater transitivity among friends facilitates more effective social support. There was a much more robust and negative effect on friendship network density, indicating that friendship networks were generally looser knit following a multi-school transition. More densely interconnected friendship networks are thought to facilitate information sharing and problem solving (Mehra et al., 2006) and may also exert more potent peer influence on behavior (Haynie, 2001); these processes may be weaker following multi-school transitions. This could occur, for example, when youth make different friends in different classes and these friends have fewer opportunities to coalesce into a larger cohesive group.

At the global-level, multi-school transitions were associated with an increase in average social distance between students and a decrease in the centralization of the overall network. In the Add Health study, higher social distance was associated with feelings of distance from others and decreased school attachment (Moody & Bearman, 2001). To the extent that such feelings are risk factors for academic disengagement, this finding suggests that multi-school transitions may contribute to individual adjustment problems through increasing the average social distance among youth (Benner, 2011). Similarly, multi-school transitions decreased

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the overall centralization of friendship networks, indicating a less unified friendship hierarchy. In other network contexts (Gould, 1993), network centralization is associated with the degree of agreement around norms and values and facilitates collective action. Thus, lower centralization following multi-school transitions suggests it may be more challenging for schools to generate consensus among students or for students to formulate a unified voice (Mitra & Gross, 2009).

One factor that could contribute to both increased social distance and decreased centralization is the continued segregation of friendship networks based on feeder-school attendance. In the year following a multi-school transition, we found substantial segregation based on feeder-school attendance. This effect was substantially stronger in ninth grade than in seventh grade, possibly reflecting developmental increases in friendship stability and in processes of network closure. The greater capacity of older students to sustain friendships combined with their stronger tendency to reciprocate existing friendship ties and to make friends with friends-of-friends could account for their greater level of feeder-school segregation after multi-school transitions.

A particular strength of this study is the ability to clarify whether the effects of multi-school transitions are due to increases in peer network size or to other processes associated with such transitions. Across all local and global friendship indices, effects of network size were substantially larger than other effects of multi-school transitions. For example, in our hypothetical transition from two 80-person schools to a 160-person school, friendship stability would decrease by about 12%, with two thirds of this decline due to the increased network size and one third due to other aspects of the multi-school transition. For other indices, the effects of network size predominated to an even greater degree: For example, average geodesic distance following the hypothetical multi-school transition would increase by 2.36, with 83% of this increase caused by the increased network size. These results partially replicate and greatly extend the work of Hardy et al. (2002), which was based on transition into a single school and made no comparison with schools without transitions. Effects attributed to multi-school transitions may thus be due primarily to increases in network size and secondarily to the relatively unfamiliar peer group in post-transition schools.

Taken together, these findings on the disruptive effects of transitioning to a larger school network with a sizable number of unfamiliar peers provide evidence of resilience of friendship processes at the local level but new developmental risks at the global level. Efforts to mitigate the disruptive effects of multi-school transitions must strive to balance support for valuable local friendship processes while working toward more cohesive global network structures. For example, efforts to promote integration of friendship across prior feeder schools could inadvertently undermine the stability of supportive friendships from prior years. An optimal strategy may involve providing ample opportunities to maintain old friendships (even if it results in some prior-school segregation) while also providing opportunities to build meaningful connections throughout the broader peer community. The dominant role of network size in driving the effects of multi-school transitions lends some support to strategies that focus on creating “schools within a school” to shrink the effective

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peer network size (Feiner et al., 1994), but also suggests the importance of preserving ways to maintain connections to friends assigned to different “sub-units.”

These findings must be considered in the context of four limitations of our research design. First, our data consisted entirely of non-urban communities that are predominately White. Further research is needed to understand the generalizability of our findings to urban settings with more racial and socioeconomic diversity. For instance, our findings on segregation of post-transition networks by feeder school may be affected by the racial composition of those feeder schools. Second, with the exception of the first wave of data (fall sixth grade), friendship networks were measured during the spring, 6 to 9 months following any transitions. Friendships measured at the beginning of the school year might reveal larger transition effects (Cantin & Boivin, 2004; Hardy et al., 2002); multiple assessments per year could clarify how network structures evolve following school transitions. Third, we lacked statistical power and data to track how segregation in multi-school transitioned networks changed in subsequent years. Assessing such networks for multiple time-points following transition would clarify how networks integrate over time. Finally, we limited friendship networks to ties between students in the same grade. This strategy recognizes that most school-based friendships are within grade and was well suited to our primary interest in changing friendship of students undergoing school transitions, but research including cross-grade friendships might provide a more complete understanding. For example, there is evidence that cross-grade friendships may serve a protective function during middle school (Bowker & Spencer, 2010). Cross-school friendships, particularly in our sample of small communities, may also help further explain our findings of decreased friendship stability but null effects on friendship reciprocity.

Future research could advance our understanding of school transition effects in three additional ways. First, we studied two common forms of NSTs (single-school and multi-school), but other types of transitions also deserve attention. For example, school choice policies create complex transition processes in which students from a single feeder school may transition to several different schools. This distinct transition pattern may have unique implications for friendship processes by diminishing the opportunity for students to sustain prior friendships after the transition. Second, there may be individual differences in the degree to which students’ local friendship networks are affected by school transitions. For example, some students may be particularly vulnerable to harmful disruptions in friendship processes, whereas others may thrive amid the new social opportunities of post-transition schools. Previous research has also shown that the impact of school transitions may vary by gender (Hardy et al., 2002), and network structures may be affected by the individual composition of ties, that is, those between girls versus those between boys. New approaches to the dynamic modeling of changing social networks represent one promising way to explore such varying transition effects (Steglich, Snijders, & Pearson, 2010). Finally, our data were limited to social networks at school. Although adolescents’ “friends” on online social network sites tend to also be their friends in real life (Reich et al., 2012), the online environment may provide new opportunities to facilitate friendships beyond the bounds of the school walls and change the potential impact of school transitions on students’ friendship networks. Further exploration into the impact of technology on friendship networks in the context of transitions could be particularly useful in understanding the impact of NSTs.

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References

Bearman PS, Moody J. Suicide and friendships among American adolescents. American Journal of Public Health. 2004; 94:89–95. DOI: 10.2105/AJPH.94.1.89 [PubMed: 14713704]

Benner AD. The transition to high school: Current knowledge, future directions. Educational Psychology Review. 2011; 23:299–328. DOI: 10.1007/s10648-011-9152-0 [PubMed: 21966178]

Berndt, TJ., Hawkins, JA. The effects of friendships on students' adjustment after the transition to junior high school. Paper presented at the Annual Meeting of the American Education Research Association; Chicago. 1985.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Berndt TJ, Hawkins JA, Jiao Z. Influences of friends and friendships on adjustment to junior high school. Merrill-Palmer Quarterly. 1999; 45(1):13–41.

Blyth DA, Simmons RG, Bush D. The transition into early adolescence: A longitudinal comparison of youth in two educational contexts. Sociology of Education. 1978; 51:149–162. DOI: 10.2307/2112661

Borgatti SP, Carley KM, Krackhardt D. On the robustness of centrality measures under conditions of imperfect data. Social Networks. 2006; 28:124–136. DOI: 10.1016/j.socnet.2005.05.001

Bowker JC, Spencer SV. Friendship and adjustment: A focus on mixed-grade friendships. Journal of Youth and Adolescence. 2010; 39:1318–1329. DOI: 10.1007/s10964-009-9474-0 [PubMed: 19916041]

Brand S, Felner R, Shim M, Seitsinger A, Dumas T. Middle school improvement and reform: Development and validation of a school-level assessment of climate, cultural pluralism, and school safety. Journal of Educational Psychology. 2003; 95:570–588. DOI: 10.1037/0022-0663.95.3.570

Browne, WJ. MCMC Estimation in MLwiN v2.1. Bristol, UK: Centre for Multilevel Modeling, University of Bristol; 2009.

Cantin S, Boivin M. Change and stability in children's social network and self-perceptions during transition from elementary to junior high school. International Journal of Behavioral Development. 2004; 28:561–570. DOI: 10.1080/01650250444000289

Eccles, JS., Midgley, C., Adler, TF. Grade-related changes in the school environment: Effects on achievement motivation. In: Nichols, JG., editor. The development of achievement motivation. Greenwich, CT: JAI Press; 1984. p. 283-331.

Eccles, JS., Wigfield, A., Schiefele, U. Motivation to succeed. In: Eisenberg, N., editor. Handbook of child psychology: Vol 3. Social, emotional, and personality development. New York, NY: Wiley; 1998. p. 1017-1096.

Epstein, JL. Choice of friends over the life span: Developmental and environmental influences. Baltimore, MD: Center for Social Organization of Schools, The Johns Hopkins University; 1983.

Feiner RD, Brand S, Adan AM, Mulhall PF, Flowers N, Sartain B, Dubois DL. Restructuring the ecology of the school as an approach to prevention during school transitions: Longitudinal follow-ups and extensions of the School Transitional Environment Project (STEP). Prevention in Human Services. 1994; 10(2):103–136. DOI: 10.1300/J293v10n02_07

Gest SD, Osgood DW, Feinberg ME, Bierman KL, Moody J. Strengthening prevention program theories and evaluations: Contributions from social network analysis. Prevention Science. 2011; 12:349–360. DOI: 10.1007/s11121-011-0229-2 [PubMed: 21728069]

Gould RV. Collective action and network structure. American Sociological Review. 1993; 58:182–196. DOI: 10.2307/2095965

Graham, S., Taylor, AZ., Ho, AY. Race and ethnicity in peer relations research. In: Rubin, KH.Bukowski, WM., Laursen, B., editors. Handbook of peer interactions, relationships, and groups. New York, NY: Guilford Press; 2009. p. 394-413.

Hardy CL, Bukowski WM, Sippola LK. Stability and change in peer relationships during the transition to middle-level school. The Journal of Early Adolescence. 2002; 22:117–142. DOI: 10.1177/0272431602022002001

Hartup WW, Stevens N. Friendships and adaptation in the life course. Psychological bulletin. 1997; 121:355–370. DOI: 10.1037/0033-2909.121.3.355

Haynie DL. Delinquent peers revisited: Does network structure matter? American Journal of Sociology. 2001; 106:1013–1057. DOI: 10.1086/320298

Hirsch BJ, DuBois DL. The relation of peer social support and psychological symptomatology during the transition to junior high school: A two-year longitudinal analysis. American Journal of Community Psychology. 1992; 20:333–347. DOI: 10.1007/bf00937913 [PubMed: 1415031]

Kurita, JA., Janzen, HL. The role of social support in mediating school transition stress. Paper presented at the annual meeting of the American Psychological Association; Toronto. 1996 Aug.

Lochman JE, Wells KC. Contextual social-cognitive mediators and child outcome: A test of the theoretical model in the Coping Power program. Development and Psychopathology. 2002; 14:945–967. DOI: 10.1017/S0954579402004157 [PubMed: 12549711]

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Mehra A, Dixon AL, Brass DJ, Robertson B. The social network ties of group leaders: Implications for group performance and leader reputation. Organization science. 2006; 17:64–79. DOI: 10.1287/orsc.1050.0158

Mendelson MJ, Aboud FE. Measuring friendship quality in late adolescents and young adults: McGill Friendship Questionnaires. Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement. 1999; 31:130–132. DOI: 10.1037/h0087080

Mitra DL, Gross SJ. Increasing student voice in high school reform: Building partnerships, improving outcomes. Educational Management Administration & Leadership. 2009; 37:522–543. DOI: 10.1177/1741143209334577

Moody J, Bearman PS. Attachment to school. 2001

Newcomb AF, Bagwell CL. Children's friendship relations: A meta-analytic review. Psychological Bulletin. 1995; 117:306–347. DOI: 10.1037/0033-2909.117.2.306

Pellegrini AD, Bartini M. A longitudinal study of bullying, victimization, and peer affiliation during the transition from primary school to middle school. American Educational Research Journal. 2000; 37:699–725. DOI: 10.3102/00028312037003699

Reich SM, Subrahmanyam K, Espinoza G. Friending, IMing, and hanging out face-to-face: Overlap in adolescents' online and offline social networks. Developmental Psychology. 2012; 48:356–368. DOI: 10.1037/a0026980 [PubMed: 22369341]

Reyes O, Gillock K, Kobus K. A longitudinal study of school adjustment in urban, minority adolescents: Effects of a high school transition program. American Journal of Community Psychology. 1994; 22:341–369. DOI: 10.1007/BF02506870 [PubMed: 7879746]

Rice JK. Explaining the negative impact of the transition from middle to high school on student performance in mathematics and science. Educational Administration Quarterly. 2001; 37:372–400. DOI: 10.1177/00131610121969352

Smith JA, Moody J. Structural effects of network sampling coverage I: Nodes missing at random. Social Networks. 2013; 35:652–668. DOI: 10.1016/j.socnet.2013.09.003

Spoth R, Clair S, Greenberg M, Redmond C, Shin C. Toward dissemination of evidence-based family interventions: Maintenance of community-based partnership recruitment results and associated factors. Journal of Family Psychology. 2007; 21:137–146. DOI: 10.1037/0893-3200.21.2.137 [PubMed: 17605536]

Spoth R, Redmond C, Shin C, Greenberg M, Clair S, Feinberg M. Substance-use outcomes at 18 months past baseline: The PROSPER Community–University Partnership Trial. American Journal of Preventive Medicine. 2007; 32:395–402. DOI: 10.1016/j.amepre.2007.01.014 [PubMed: 17478265]

Steglich C, Snijders TAB, Pearson M. Dynamic networks and behavior: Separating selection from influence. Sociological Methodology. 2010; 40:329–393. DOI: 10.1111/j.1467-9531.2010.01225.x

Valente TW, Gallaher P, Mouttapa M. Using social networks to understand and prevent substance use: A transdisciplinary perspective. Substance Use & Misuse. 2004; 39:1685–1712. DOI: 10.1081/JA-200033210 [PubMed: 15587948]

Vitaro, F., Boivin, M., Bukowski, WM. The role of friendship in child and adolescent psychosocial development. In: Rubin, KH.Bukowski, WM., Laursen, B., editors. Handbook of peer interactions, relationships, and groups. New York, NY: Guilford Press; 2009. p. 568-588.

Wasserman, S., Faust, K. Social network analysis: Methods and applications. Vol. 8. Cambridge, UK: Cambridge University Press; 1994.

Wentzel, KR. Peers and academic functioning at school. In: Rubin, KH.Bukowski, WM., Laursen, B., editors. Handbook of peer interactions, relationships and groups. New York, NY: Guilford Press; 2009. p. 531-547.

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Table 1

Overview of Normative School Transition Patterns in the Studied Communities.

	6th-grade fall		6th-grade spring		7th-grade spring		8th-grade spring		9th-grade spring		
	Cohort 1	**Cohort 2**	**Cohort 1**	**Cohort 2**	**Cohort 1**	**Cohort 2**	**Cohort 1**	**Cohort 2**	**Cohort 1**	**Cohort 2**	**Total**
Single-school transition	3	3	0	0	5	5	0	0	19	19	54
Multi-school transition	13	13	0	0	4	4	0	0	3	3	40
No transition	26	26	41	41	19	19	28	28	3	3	234
Total networks	42	42	41	41	28	28	28	28	25	25	328

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Table 2

Descriptive Statistics for Network Variables by Transition Type.

	No transition networks (*n* = 234)			**Single-school transition networks (*n* = 54)**			**Multi-school transition networks (*n* = 40)**		
	Range	***M***	***SD***	**Range**	***M***	***SD***	**Range**	***M***	***SD***
Network size	5–443	124.28	86.32	68–437	169.7	84.48	60–357	166.7	69.68
% male	33.33–71.43	49.99	5.80	41.67–60.28	50.09	3.70	42.31–56.18	49.47	3.23
% White	45.57–100.00	85.98	11.08	59.53–97.89	88.20	7.82	46.31–95.47	81.81	11.63
Reciprocity	0.18–0.81	0.35	0.07	0.26–0.44	0.34	0.04	0.23–0.40	0.31	0.04
Transitivity	0.17–0.86	0.35	0.11	0.19–0.44	0.31	0.06	0.20–0.41	0.28	0.05
Constrained density	0.24–0.74	0.55	0.09	0.40–0.65	0.51	0.06	0.24–0.70	0.49	0.12
Average geodesic distance	1.23–7.16	4.41	1.19	3.91–7.07	5.35	0.78	3.30–8.78	5.52	1.10
Degree centralization	0.02–0.50	0.10	0.06	0.03–0.12	0.06	0.03	0.03–0.16	0.06	0.03

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Table 3

Effects of Single- and Multi-School Transitions on Stability and Local Network Structure.

	Stability		Reciprocity		Transitivity		Constrained density	
	Coefficient	***SE***	**Coefficient**	***SE***	**Coefficient**	***SE***	**Coefficient**	***SE***
Fixed effects								
Intercept	0.518***	0.034	0.444***	0.069	0.470***	0.075	0.222***	0.087
Size of network	−0.001***	0.000	−0.001***	0.000	−0.002***	0.0002	0.001***	0.000
Size of network squared/10,000	0.002***	0.000	0.002***	0.000	0.003***	0.0006	−0.001	0.001
% male	−0.002	0.002	0.000	0.001	−0.001	0.001	−0.001	0.001
% White	−0.001	0.001	0.000	0.001	0.000	0.001	0.004***	0.001
Wave 2	—	—	0.022***	0.009	0.006	0.009	0.031**	0.011
Wave 3	—	—	0.031**	0.011	0.014	0.012	0.066***	0.014
Wave 4	0.038**	0.014	0.052***	0.012	0.036**	0.013	0.039*	0.015
Wave 5	0.072***	0.017	0.053***	0.015	0.049**	0.017	−0.023	0.019
Single-school transition	−0.022	0.018	−0.011	0.012	−0.013	0.014	−0.027†	0.014
Multi-school transition	−0.038**	0.011	−0.001	0.012	−0.022†	0.013	−0.045***	0.013
Variance components								
District	0.0007	0.0004	0.0006**	0.0003	0.0009**	0.0004	0.0034*	0.0019
School	0.0008***	0.0003	0.0008***	0.0003	0.0013***	0.0005	0.0016*	0.0007
Cohort	0.0007***	0.0002	0.0007***	0.0002	0.0007***	0.0002	0.0007*	0.0002
Wave	0.0024***	0.0002	0.0024***	0.0002	0.0029***	0.0003	0.0032***	0.0003
Deviance (MCMC)		−863.2		−1,043.6		−984.8		−919.3

Note. All models included a control for treatment effect. This term was never significant. MCMC = Markov chain Monte Carlo.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

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Table 4

Effects of Single- and Multi-School Transitions on Global Network Structures.

	Average geodesic distance		Degree centralization (all ties)	
	Coefficient	***SE***	**Coefficient**	***SE***
Fixed effects				
Intercept	3.292***	0.597	0.196***	0.013
Size of network	0.025***	0.002	−0.001***	0.0001
Size of network squared/10,000	−0.042***	0.005	0.002***	0.0003
% male	−0.005	0.007	0.001**	0.0004
% White	−0.009†	0.005	0.000	0.0003
Wave 2	−0.132	0.091	−0.001	0.004
Wave 3	−0.160	0.111	−0.005	0.005
Wave 4	0.036	0.123	−0.012*	0.005
Wave 5	0.212	0.148	−0.016*	0.007
Single-school transition	0.203	0.127	−0.002	0.006
Multi-school transition	0.362**	0.120	−0.011*	0.005
Variance components				
District	0.0356	0.0348	0.0004***	0.0002
School	0.0718	0.0423	0.0006***	0.0002
Cohort	0.0467	0.0326	0.0002***	0.0001
Wave	0.2755***	0.0295	0.0004***	0.0000
Deviance (MCMC)		504.09		−1,629.89

Note. All models included a control for treatment effect. This term was never significant. MCMC = Markov chain Monte Carlo.

† $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$.