



Friends, academic achievement, and school engagement during adolescence: A social network approach to peer influence and selection effects

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ABSTRACT

Peers become increasingly important socializing agents for academic behaviors and attitudes during adolescence. This study investigated peer influence and selection effects on adolescents' emotional (i.e., flow in schoolwork, school burnout, school value), cognitive (i.e., school effort), and behavioral (i.e., truancy) engagement in school. A social network approach was used to examine students of post-comprehensive education in Finland ($N = 1419$; mean age = 16). Students were asked to nominate peers to generate peer networks and to describe their own school engagement at two time points (one year apart). Network analyses revealed that the degree to which peer influence and selection effects occurred varied by dimension of school engagement. Over time, peers influenced students' emotional, cognitive, and behavioral engagement. Similarity in behavioral engagement, but not in emotional and cognitive engagement, increased the likelihood of forming new peer relationships. Additionally, some of the peer influence and selection effects on school engagement were moderated by student academic achievement.

1. Introduction

Active engagement in school promotes the skills, knowledge, values, and social capital needed for adolescents to make a successful transition into adulthood (Wang & Holcombe, 2010). Behavioral and psychological engagement creates a motivational context that shapes how adolescents cope with both academic and social difficulties and setbacks in school (Skinner, Kindermann, Connell, & Wellborn, 2009). Engaged youth are more likely to persist and re-engage with challenging school tasks. On the other hand, disengaged youth have greater difficulty coping with school problems, leading to devaluation of their academic success and further disengagement from school (Skinner & Pitzer, 2012; Wang & Fredricks, 2014). Youth who disengage may also struggle to find a meaningful connection with school and are more susceptible to developing behavioral problems that further interfere with their schooling (Skinner, Kindermann, & Furrer, 2009; Stewart, 2003). Consequently, enhancing school engagement has been identified as a prime catalyst for boosting academic achievement and reducing dropout rates among adolescents (Fredricks, Blumenfeld, & Paris, 2004; Wang & Eccles, 2012). As developmental research indicates a significant decline in student engagement during adolescence (Fredricks

et al., 2004; Wang & Degol, 2014), understanding the contextual factors that promote or undermine student engagement in school is critical for prevention and intervention efforts targeting poor academic achievement and retention.

During adolescence, as youth spend greater amounts of time with their peers, the norms and characteristics of peer networks become increasingly important socializing agents (Ryan, 2000). The academic norms of a peer group, therefore, may be immensely influential over each individual member's own academic engagement, beliefs, and achievement (Laniga-Wijnen, Ryan, Harakeh, Shih, & Vollebergh, 2017; Rodkin & Ryan, 2012). Although researchers generally agree that adolescents within the same peer networks tend to be similar across a range of academic and behavioral outcomes (Li, Lynch, Kalvin, Liu, & Lerner, 2011; Rambaran et al., 2017), most extant studies focus on student academic achievement and disruptive behaviors. For example, a growing body of studies found that students seek out friends who are similar to themselves in regard to academic achievement and school attendance, and students are also influenced by their friends' disruptive behaviors, academic achievement, and school attendance (Flashman, 2012; Gremmen, Dijkstra, Steglich, & Veenstra, 2017; Rambaran et al., 2017). However, research of peer network effects on school

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engagement remains relatively scarce and limited in scope. Many studies have neglected to examine the underlying processes that reinforce peer similarity in academic engagement. This peer similarity may arise from youth selecting peers with similar academic values and behaviors and/or from youth conforming to be more like their peers over time. In the interest of combatting declines in student engagement during secondary school, it is important to distinguish whether peer similarities in student engagement are attributed to youth adjusting their behavior to become more comparable to their peers over time (i.e., influence effects), or actively choosing peer affiliates based on similarities in their own academic behaviors and beliefs (i.e., selection effects). This distinction between influence and selection effects is especially relevant since most peer network studies do not examine academic engagement as a multidimensional construct with behavioral, emotional, and cognitive components (Fredricks et al., 2004; Wang, Fredricks, Ye, Hofkens, & Linn, 2017). By parsing out these effects, we will have a better understanding of the positive and negative influences peers have over youth academic engagement.

The present study was carried out in the context of the Finnish educational system. The transition from basic education into either an academic track (i.e., general upper secondary education) or a vocational track (i.e., upper secondary vocational education) is a key educational transition in the Finnish educational system. Comprehensive schools are frequently referred to as ‘neighborhood’ schools, in which students spend most of their school day with one set of peers and teachers. However, in Finland, when basic compulsory education ends, students may attend upper secondary school by applying to several different programs (e.g., academic track or vocational track). As a result, adolescents’ school-based peer relationships are largely reformed during this educational transition (Salmela-Aro, Kiuru, & Nurmi, 2008), as few students will attend the same secondary school as their peers from basic/elementary school (see also Goodwin, Mrug, Borch, & Cillessen, 2012; Hardy, Bukowski, & Sippola, 2002). Since the educational transition from comprehensive to secondary school immerses Finnish students in an entirely new learning environment with a different set of experiences, expectations, and peers, the transition may pose a challenge for many students to feel connected or engaged with their new school (Salmela-Aro et al., 2008; Wang & Degol, 2016).

In this study, we highlight the role of peers in shaping academic engagement after the transition from basic education to upper secondary education by examining (a) the relative roles of peer influence and selection processes on the development of behavioral, emotional, and cognitive dimensions of school engagement and (b) how the effects of peer influence and selection vary by individual differences in academic achievement.

1.1. The multidimensionality of school engagement

According to theoretical frameworks on the development of academic engagement, schools are powerful motivational learning contexts characterized by multiple developmental processes that have the capacity to either hinder or support the academic engagement of individual students (Skinner & Pitzer, 2012; Wang et al., 2017). Positive experiences in schools are likely to enhance adolescents’ engagement, transforming them into academically capable, socially integrated, and committed learners (Fredricks et al., 2004; Wang & Degol, 2014). Thus, engagement results from an interaction between each individual student and his or her context, making student engagement highly responsive to variations in classroom and peer characteristics (Eccles, 2009). Engagement can also be conceptualized as a personal asset that helps adolescents adaptively cope with daily stressors, challenges, and setbacks in school (Skinner & Pitzer, 2012). Understandably, failure to cope with difficulties and challenges in school generates distress in adolescents. As a coping strategy for managing distress and perceived alienation in school, adolescents may turn to risky behaviors and may seek out like-minded deviant peers to associate with (Crosnoe, 2002).

School engagement, in particular, is defined as an energized action or psychological state (both observable and unobservable) that is deliberate, directed, and sustained over time to positively support student interactions with learning activities (Skinner & Pitzer, 2012). School engagement can be further broken down into behavioral, emotional, and cognitive components (Fredricks et al., 2004). Behavioral engagement refers to a student’s active participation in academic learning and the absence of behavioral misconduct. Indicators of behavioral engagement, therefore, are largely observable phenomena (e.g., raising hand to answer question; following classroom rules). On the other hand, a student’s affective reactions, such as enjoyment and valuing of school are indicators of emotional engagement, which largely manifest as unobservable psychological processes. Similarly, cognitive engagement encompasses a number of unobservable internal driving mechanisms, such as willingness to exert effort in learning and a desire to go beyond minimum course requirements to enhance learning comprehension.

These three dimensions of school engagement are dynamically embedded within the individual, and each represents a unique developmental process for adolescents. Researchers have highlighted the importance of distinguishing these three dimensions of engagement, as they are not only differentially predictive of academic outcomes, but are also likely to be uniquely shaped by peer characteristics (Fredricks et al., 2004; Wang & Eccles, 2012; Wang, Fredricks, Ye, Hofkens, & Schall, 2017). Failure to examine the multidimensionality of school engagement may undermine our ability to identify how much influence peers have over an individual’s academic engagement during secondary school. Furthermore, approaching school engagement as a multifaceted construct allows a deeper understanding of each dimension’s predictors and consequences, thus suggesting that the design of targeted interventions should be multifaceted as well.

1.2. Peer influence and selection in student engagement

Adolescence is a developmental period characterized by the desire to “fit in” with peers (Hamm, Farmer, Lambert, & Gravelle, 2014). In an effort to fit in, youth may begin to adopt the academic values and behaviors of their peers to avoid the embarrassment and rejection that frequently accompany nonconformity to peer norms. As such, adolescents often find themselves spending time with peers who possess similar beliefs and behaviors (e.g., Kindermann, 2007; Parker et al., 2015; Rambaran et al., 2017). For example, research has shown that peer groups often exhibit similar levels of deviant behavior, and that frequent contact with or aggregation of deviant peers into the same settings may exacerbate the deviant behaviors of individual members (Denault & Poulin, 2012; Keijsers et al., 2012). In addition, frequent association with deviant peers via processes such as educational tracking or intervention programs aimed at reducing problem behaviors, often leads to increases in deviant behaviors among individual group members (Dodge, Dishion, & Lansford, 2006; Li et al., 2011). Likewise, peer groups also possess similar academic behaviors and aspirations. Research on academic socialization indicates that youth are more likely to seek out peers with similar academic achievement, and that these peer affiliations also influence achievement over time (Gremmen et al., 2017; Laninga-Wijnen et al., 2017). Friendship networks have also been found to influence both academic motivation and achievement among adolescents (Blansky et al., 2013; Molloy, Gest, & Rulison, 2011).

When looking across the body of research on adolescent peer effects, it becomes clear that two processes may explain how peers achieve high similarity in academic behaviors and values: (a) peer influence and (b) peer selection (Brechwald & Prinstein, 2011; McPherson, Smith-Lovin, & Cook, 2001). The process of *peer influence* occurs when peers exert influence on students’ academic attitudes and behaviors across time, resulting in increased similarity among peers (Delay, Laursen, Kiuru, Salmela-Aro, & Nurmi, 2013). *Peer selection*, on the other hand, occurs

when adolescents choose to affiliate with peers that endorse similar academic values and behaviors (Ryan, 2001).

While research has made important strides in studying peer effects, there are still several conceptual and methodological limitations that hinder a comprehensive understanding of peer effects on school engagement. First, while researchers often conceptualize peer selection and peer influence as two independent processes that explain network similarity, the two processes may actually be operating simultaneously to contribute to the similarity of academic behaviors and values in a peer network. Despite this, the majority of earlier research on peer effects in academic engagement has focused solely on peer influence, with few studies examining both influence and selection processes simultaneously (Lomi, Snijders, Steglich, & Torlo, 2011; Steglich, Snijders, & Pearson, 2010). A study by Molloy et al. (2011), for example, examined the associations between three types of peer effects (i.e., reciprocated friendships, frequent interactions, and peer group membership) and academic effort. While this study provided useful insights into how different sets of social ties may influence academic engagement over time, selection effects may have influenced the formation of all three of these group contexts prior to the beginning of the study. Without factoring in selection, the extent to which similarity in academic engagement is solely due to peer influence is unknown. A better understanding of the relative contribution of influence and selection effects on school engagement may help develop more tailored intervention programs to buffer declining academic trajectories during secondary school.

In addition, studies of peer relationships on academic development have mainly relied upon student self-report of peer behaviors. These measures are problematic given that youth generally overestimate the degree to which peers are similar to them and often have incomplete information about their peers' lives (Rambaran et al., 2017). Asking students to report their own (as opposed to peers') behavior and attitudes in conjunction with a social network analysis approach affords researchers the opportunity to analyze intricately-patterned peer networks while minimizing biases related to students' self perceptions of others' behavior and attitudes.

Furthermore, while a growing number of studies have adopted social network analysis to study peer effects in adolescence, none have examined peer influence and selection effects across all three dimensions of school engagement simultaneously. Instead, many researchers focus on a single engagement dimension or combine items into a global scale, precluding the examination of the unique contribution of peer effects on each dimension. For example, studies focusing on either emotional or behavioral engagement have found influence effects on school burnout (i.e., an indicator of emotional engagement) and effortful and disruptive behavior (i.e., indicators of behavioral engagement) respectively, but no selection effects were found (Kiuru, Aunola, Nurmi, Leskinen, & Salmela-Aro, 2008; Molloy et al., 2011; Shin & Ryan, 2014b). Meanwhile, Kindermann and colleagues found evidence for both selection and influence effects for student engagement; yet, their aggregation of behavioral and emotional engagement into one measurement scale masked any potential differentiation of peer effects onto both dimensions (Kindermann, 2007). Without accounting for multiple dimensions of student engagement, it is difficult to determine whether peer effects for one type of engagement are more robust than for the other types of engagement. Ultimately, the study of multi-dimensional school engagement will provide a richer characterization of the construct and allow the identification of possible antecedents and outcomes for each engagement dimension (Fredricks et al., 2004; Wang & Degol, 2014).

1.3. Academic achievement as a moderator

Recent literature has indicated that peer relationships may differ in structure based on student characteristics. For instance, classroom-based peer norms for achievement goals (performance goals versus

mastery goals) were found to moderate friendship selection, maintenance, and influence processes related to academic achievement (Laniga-Wijnen et al., 2017). As such, it is informative for studies using social network analysis to investigate potential moderators of peer processes on school engagement (Gremmen et al., 2017; Kretschmer, Leszczensky, & Pink, 2018; Rambaran et al., 2017). Academic achievement in particular may play a crucial moderating role in adolescent engagement. Research has shown that high-achieving students are more likely to select similarly high-achieving peers as friends, while low-achieving students are more likely to seek out low-achieving peers as friends (Flashman, 2012; Kiuru et al., 2017; Rambaran et al., 2017). This selection process may actually be influenced by the courses that students take, since course selection is often determined by achievement levels and interests (Frank, Muller, & Mueller, 2013). Therefore, peer influence and selection processes may follow different paths for low- and high-achieving students, creating further disparities in academic engagement across these two groups over time.

Additionally, there has been little work examining how an individual's achievement interacts with their initial levels of academic engagement to moderate peer influence and selection effects on subsequent engagement. Past research has shown that association with high-achieving peers may serve a protective function against school burnout (Kiuru et al., 2008); however, it is unclear if individuals with diverse configurations of academic achievement and engagement (e.g., high achievement but low engagement) differ in the extent to which they select or are influenced by peers with high versus low engagement. We can expect that high-achieving students with high engagement will probably be more likely to select peers with high engagement, and low-achieving students with low engagement will be more likely to select peers with low engagement. This expectation may be attributed in part to students' greater access to similarly achieving and engaged peers due to course selection or course placement (Nichols & White, 2001).

It is also unclear to what extent high achievement will buffer against the detrimental effects of disengaged peers. Since engagement taps into many psychological factors regarding how youth feel about or perceive their school experiences, highly disengaged youth who regularly interact with other disengaged youth may be at an increased risk of becoming more emotionally distressed through the process of co-rumination, defined as the act of sharing negative feelings about a common experience with others (Geven, Weesie, & van Tubergen, 2013). Therefore, a low achieving and disengaged adolescent may have difficulty combating the negative influence of similarly disengaged youth. On the other hand, high-achieving youth with low engagement may be less vulnerable to these same negative peer influences given that high academic achievement is an important developmental asset for achieving long-term educational success. Along the same lines, a highly engaged youth may be more susceptible to the positive effects of other highly engaged youth through modeling, reinforcement, and positive feedback (Kiuru et al., 2008; Ryan, 2001). Past work has shown that achievement does operate as a protective factor against higher levels of school stress, at least when achievement is part of the peer context (Wang, 2012). In another study, when peer contacts are high achieving, high achieving adolescents tend to have higher self-concept, whereas low achieving adolescents tend to have lower self-concept (Molloy et al., 2011). While high achieving adolescents were more likely to feel more confident in their abilities when their peers were also high achieving, low achieving youth felt less confident in their skills when affiliating with high achieving peers. Therefore, while it is possible that achievement could operate in a similar manner in the current study, it is unclear how individual achievement may operate as a safeguard against a network of disengaged peers. Accordingly, investigating academic achievement as a mitigating factor will allow us to determine whether certain groups are more sensitive to peer effects than others.

1.4. The current study

As peers become increasingly important socializing agents during adolescence (Ryan, 2000), it is critical to investigate the extent to which peer influence and selection contribute to peer similarity in school engagement. In this study, we conceptualize school engagement as a multidimensional construct, including flow in schoolwork (emotional engagement), school burnout (emotional disengagement), school value (emotional engagement), school effort (cognitive engagement), and school truancy (behavioral disengagement). Our overarching goal is to provide insight into the extent to which peer influence or selection effects operate in emotional, cognitive, and behavioral dimensions of engagement. The use of Simulation Investigation for Empirical Network Analysis (SIENA; Snijders, van de Bunt, & Steglich, 2010) allows us to examine the dynamic, reciprocal relationships between adolescent peer relationships and school engagement over time, thereby shedding light on influence versus selection effects while controlling for a number of covariates and peer network and behavioral tendencies. We also seek to gain a greater understanding of how the impact of peer networks varies by academic achievement. Specifically, we will address the following research questions:

1. To what extent do peer influence and selection processes play a role in different dimensions of adolescents' school engagement (i.e., behavioral, emotional, and cognitive engagement)?
2. Does adolescents' academic achievement moderate the peer influence and selection processes in school engagement?

Following our conceptual framing and extant research, we hypothesize that peer influence will occur in all aspects of school engagement (i.e., behavioral, emotional, and cognitive; Hypothesis A). As the role of the peer relationship becomes more salient during adolescence, conforming to the academic norms and values of one's peers should become more prevalent during adolescence via peer influence processes, such as modeling, reinforcement, peer pressure, and co-rumination (Kiuru et al., 2008). We also hypothesize that peer selection effects will mainly emerge for behavioral engagement due to this dimension of engagement involving more external and observable indicators than cognitive and emotional engagement (Hypothesis B; see also DeKlepper, Sleeboos, van de Bunt, & Agneessens, 2010). In other words, as truancy (our measure of behavioral engagement) involves behaviors that are readily observable by peers, youth may be just as likely to select friends based on their level of truancy, as they are to become more similar to their existing friends. In addition, we hypothesize that students with high academic achievement will differ from students with low academic achievement in their likelihood to select new peers based on similarity in school engagement and in their likelihood to be influenced by their peers' school engagement (Hypothesis C). Because of the scarcity of empirical studies on the moderation role of academic achievement in the peer influence and selection effects, we do not make specific hypotheses about the direction of these moderation effects.

2. Method

2.1. Participants

Participants included 1419 adolescents (729 females, 690 males) in the Finnish Educational Transitions (FinEdu) project. Two waves of data were collected at the beginning of the spring term during two consecutive years (ends of January in 2005 and 2006). The first wave of data collection (Time 1; T1) occurred when participants were in the 10th grade (first year of upper secondary or vocational school), and the second wave (Time 2; T2) occurred when the participants were in 11th grade (second year of upper secondary or vocational school). At the onset of this study, 95% of participants were between 15 and 17 years

of age ($M = 16.36$, $SD = 1.49$), and nearly all participants (99%) were Finnish-speaking. The sample was socioeconomically diverse: for fathers and mothers, respectively, 27% and 19% reported higher white-collar occupations; 17% and 50% reported lower white-collar occupations; 36% and 17% reported blue-collar occupations; and 11% and 4% were private entrepreneurs.

Participants were drawn from nine schools (five upper secondary schools and four vocational schools) out of a total of 13 schools located in a medium-sized city in Central Finland. Four schools were omitted due to low rates of participation in peer nomination inventories. In participating schools, at least 67% of students completed peer nomination inventories at both time points (T1: range = 69–98%, $M = 85.44$, $SD = 10.92$; T2: range = 67–97%, $M = 81.00$, $SD = 9.62$), which is consistent with recommendations for minimum participation rates in peer nomination studies (Cillessen, 2009) and recommendations for non-response rates in stochastic actor-based modeling studies (Huisman & Steglich, 2008). The number of participants in these schools ranged from 74 to 470 ($M = 157.67$, $SD = 122.94$). The participants from the schools included in the sample did not differ from the participants from the excluded schools on gender, socioeconomic status, academic achievement, flow in schoolwork, school burnout, or school effort. However, compared to excluded students, those included in the sample reported slightly less truancy at both time points (T1: $d = 0.28$; T2: $d = 0.29$) and higher school value at T1 ($d = 0.30$), though the effect sizes were relatively small.

2.2. Procedure

Participants completed surveys during regular school hours. The total number of targets in the peer network was 1419 adolescents. Of this total, 1172 participants completed the questions analyzed in this study at Time 1 and 1022 participants completed the questions analyzed in this study at Time 2. All students were members of the peer network at both Time 1 and Time 2. The peer network contained no documented students joining or leaving the network. The participants with complete data at both waves did not differ from those with missing data at one wave on any indicators included in the analyses.

2.3. Measures

2.3.1. Peer nominations (T1 and T2)

Participants were asked to nominate up to three same-grade schoolmates with whom “you most like to spend time” (Coie, Dodge, & Coppotelli, 1982). Cross-gender nominations were allowed in order to gain a realistic picture of the adolescents' peer relations (Terry & Coie, 1991). However, almost 90% of nominations were same-sex. We used peer nominations to create *peer networks* separately at each time point for each school. Each network was represented as $n \times n$ directed adjacency matrix consisting of dichotomous cells. In each of the adjacency matrices, a peer tie directed from actor i (the nominator) to actor j (the nominee) is either present ($x_{ij} = 1$) or absent ($x_{ij} = 0$). Sociometric nominations have been shown to provide valid, stable, and reliable assessments of peer relationships during childhood and adolescence (Bukowski, Cillessen, & Velasquez, 2012).

2.3.2. School engagement (T1 and T2)

Students' emotional, cognitive, and behavioral engagement was measured at two time points using well-validated and reliable self-report scales. Mean scores were calculated separately at T1 and T2 to indicate the level of adolescents' engagement. As the social network analysis software RSiena (Ripley, Snijders, Boda, Vörös, & Preciado, 2013) requires ordinal dependent variables, we used mean engagement values rounded to the nearest integer.

2.3.2.1. Flow in schoolwork. Flow in schoolwork was measured as an indicator of emotional engagement by the abbreviated student version

of the *Utrecht Work Engagement Scale* (Salmela-Aro & Upadaya, 2012). This scale consists of nine items measuring vigor, dedication, and absorption in relation to school work (e.g., “When I study, I feel that I am bursting with energy”, “I am enthusiastic about my studies”, “Time flies when I’m studying”), rated on a 7-point scale (0 = *never*; 6 = *every day*). The Cronbach’s alpha reliability was .93 at Time 1 and .94 at Time 2.

2.3.2.2. School burnout. School burnout was assessed as an indicator of emotional disengagement with the *School Burnout Scale* (Salmela-Aro & Näätänen, 2005; Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009). This scale consists of ten items measuring exhaustion, cynicism, and sense of inadequacy (e.g., “I feel overwhelmed by schoolwork”, “I often think of dropping out of school”, “I used to have higher expectations of my schoolwork than I do now”) that are rated on a 6-point scale (1 = *strongly disagree*; 6 = *strongly agree*). The Cronbach’s alpha reliability was .89 at both time points.

2.3.2.3. School value. School value was measured as an indicator of emotional engagement with the *Achievement Goal Orientations and Motivation Inventory* (Niemivirta, 2002). This scale consists of three items measuring school value (e.g., “I think that going to school is a waste of time”) that are rated on a 7-point scale (1 = *does not describe me at all*; 7 = *describes me completely*). Negatively worded items were reverse coded, such that higher scores indicate a higher level of school value. The Cronbach’s alpha reliability was .70 at Time 1 and .66 at Time 2.

2.3.2.4. School effort. School effort was measured as an indicator of cognitive engagement with the *Achievement Goal Orientations and Motivation Inventory* (Niemivirta, 2002). The scale consists of four items measuring how prone an adolescent is to give up on difficult tasks (e.g., “I try to get away with making as little effort as possible with my schoolwork”) that are rated on a 7-point scale (1 = *does not describe me at all*; 7 = *describes me completely*). Negatively worded items were reverse coded, such that higher scores indicate a higher level of school effort. The Cronbach’s alpha reliability was .75 at Time 1 and .80 at Time 2.

2.3.2.5. Truancy. Truancy was measured as an indicator of behavioral disengagement by the *Finnish School Health Survey* (Rimpelä, 2003). Adolescents were asked to report the average number of school days they had been absent during the last month due to skipping classes: 1 = *none*, 2 = *1–2 days*, 3 = *3–5 days*, 4 = *over 5 days*. The test-retest reliability of this question was $r = .43$, $p < .001$.

Correlations between school engagement variables ranged from .19 to .52 and were all significant at the .001 level (see Table 1). We carried out confirmatory factor analyses to ensure that all engagement variables were empirically related but distinct constructs. Separate factors were constructed for each engagement variable and were allowed to correlate with each other. The fit of the confirmatory factor model was satisfactory: $\chi^2(310, N = 1175) = 1511$, $p < .001$, $RMSEA = 0.06$, $CFI = 0.92$, $SRMR = 0.07$. The results of the correlational and

confirmatory analyses suggested that different aspects of school engagement are related but distinct constructs. Consequently, school engagement variables were treated as separate variables in subsequent analyses.

2.3.3. Covariates (Time 1)

2.3.3.1. Academic achievement. Academic achievement was measured by students’ self-reported Grade Point Average (GPA) in their final comprehensive school report. In Finland, GPA ranges from 4 (*lowest*) to 10 (*highest*). Self-reported GPA has shown to have a correlation of .96 with actual GPA among Finnish ninth graders (Holopainen & Savolainen, 2005). Correlations between GPA and school engagement variables ranged from .01 to .27.

2.3.3.2. Gender. Gender was coded by asking adolescents to circle the correct alternative (1 = girl, 2 = boy).

2.3.3.3. Socioeconomic status (SES). Participants were asked about their parents’ occupations at Time 1. Students’ parents were classified into different socioeconomic status categories on the basis of their occupation, using a standard classification system (SES; *Sosioekonomisen aseman luokitus* [Classification of Socioeconomic Status], 1989): 1 = blue-collar professions, 2 = lower-level white-collar professions, 3 = higher-level white-collar professions (Kiuru, Nurmi, Aunola, & Salmela-Aro, 2009). All the SES coding was coded by two independent raters. Pearson’s correlation between the two raters’ codes was .99 for mothers’ occupation codes and .89 for fathers’ occupation codes.

2.3.3.4. Educational track. An educational track variable was created by contrasting academic track with vocational track. Adolescents in upper secondary school ($n = 743$) were coded “1” and adolescents in vocational school ($n = 676$) were coded “0.”

2.4. Analysis strategy

We used dynamic social network analysis (otherwise known as actor-based models of network-behavioral dynamics; Snijders et al., 2010) that was implemented with the RSiena software (Ripley et al., 2013) to assess peer selection and influence effects on adolescents’ school engagement. In the present study, the longitudinal network analyses were based on two annual observations after the transition to upper secondary education. Therefore, the analyses were based on one period of observed change (i.e., from Time 1 to Time 2). Changes in peer relationships (i.e., formation or dissolution of peer ties from Time 1 to Time 2) and changes in school engagement (i.e., increases or decreases from Time 1 to Time 2) were modelled simultaneously and were predicted by parameters representing the probabilities for specific types of changes. This analytic strategy allowed us to investigate (a) how student engagement affects the changes of peer relationships (i.e., peer selection) from Time1 to Time 2 and (b) how peer relationships affect changes in student engagement from Time 1 to Time 2 (i.e., peer influence; Sentse, Kiuru, Veenstra, & Salmivalli, 2014; Veenstra & Dijkstra, 2011).

Our use of dynamic social network analysis with the RSiena software improved upon several limitations of previous research (Rambaran et al., 2017, see Steglich et al., 2010 for more technical descriptions). First, by using information from all same-grade school-mates and their peer ties to one another, parameters for peer selection and peer influence could be estimated simultaneously while also controlling for the potential influence of each factor. Second, we were able to control for alternative peer relationship processes (Rambaran et al., 2017; Steglich et al., 2010), such as selectivity of peer nominations (density), the tendency to reciprocate friendships (reciprocity), the tendency to nominate friends (transitivity), as well as the effects of important covariates (e.g., gender, SES). Third, dynamic social network

Table 1
Pearson correlations between school engagement variables and achievement.

Variable	1.	2.	3.	4.	5.
1. Flow in schoolwork	1.00	-.35***	.48***	.47***	-.31***
2. School burnout	-.36***	1.00	-.42***	-.40***	.22***
3. School value	.45***	-.38***	1.00	.51***	-.31***
4. School effort	.47***	-.38***	.52***	1.00	-.28***
5. Truancy	-.25***	.21***	-.19***	-.19***	1.00
6. Academic achievement	.15***	.01	.27***	.11***	-.23***

Note. Correlations at T1 below the diagonal and correlations at T2 above the diagonal; *** $p < .001$.

analysis also supports simultaneous examination of multiple engagement variables (i.e., different dimensions of school engagement) while controlling for the effects of peer influence and selection on all five school engagement variables.

We conducted a multivariate longitudinal SIENA model with different engagement variables, that is, flow in schoolwork, school burnout, school value, school effort, and truancy as dependent variables, while controlling for alternative peer processes (i.e., density, reciprocity, transitivity), behavioral tendencies (i.e., linear and quadratic tendencies), and the effects of important covariates on network and behavioral dynamics. Parameters and standard errors were generated using computer simulations within a continuous-time Markov Chain Monte Carlo framework. Effects were tested using *t*-ratios (i.e., parameter estimate divided by its standard error) with an approximately standard normal distribution (Snijders et al., 2010). Participants missing sociometric and behavioral data were included in the analysis, as they passively contributed to the environment from which participants selected friends (see also Delay et al., 2013). SIENA allows the inclusion of missing sociometric and behavioral information, but missing values do not affect the statistical significance of parameter estimates.

2.4.1. Influence effects

With school engagement dynamics, we were primarily interested in the effects of peer influence. The parameter that reflects influence processes is *engagement average similarity*, which describes the degree to which students become more similar across time (from T1 to T2) in engagement to the peers they liked most at Time 1 (i.e., whether peer ties predict increased similarity across time).

2.4.2. Selection effects

With network dynamics, our primary interest was in selection effects. *Engagement similarity* parameter refers to the extent to which students select new peers at Time 2 based on similarities in engagement at Time1 (i.e., whether similarity in engagement predicts formation of new peer ties). In addition, we estimated engagement alter and engagement ego effects. *Engagement alter* represented the effect of engagement on being liked (i.e., receiving a greater number of positive nominations) by peers. A positive effect meant that higher levels of engagement increased the chance of being popular among peers in terms of the number of incoming peer nominations. In turn, *engagement ego* indicated the effect of engagement on the number of “like most” nominations given to others. A positive effect means that higher levels of engagement increase the likelihood of giving positive peer nominations.

2.4.3. Moderated influence and selection

We investigated whether student academic achievement (GPA) moderated peer influence and selection effects. This analysis was conducted by testing the significance of GPA ego x engagement similarity and GPA ego x engagement average similarity parameters. In other words, we examined whether peer selection or peer influence processes involving school engagement varied between individuals with high versus low GPA.

3. Results

3.1. Descriptive statistics

Table 2 presents descriptive statistics. Students had two peer ties on average. Approximately half of all nominations were reciprocated, and on average, about one third of peer nominations involved cohesive relational structures of at least three individuals. The Jaccard index describes the relative stability of the network, and the recommended index values are between .20 and .60 (Snijders et al., 2010). Jaccard index (.36 from Time 1 to Time 2) showed that peer networks did not

Table 2

Descriptive statistics of network structure and school engagement variables.

Network structure	Time 1	Time 2
Average number of ties per individual	1.94	1.75
Total number of ties in the network	2637	2328
% reciprocal peer relationships	0.40	0.63
Transitive triplets index (proportion of transitive friendships)	0.29	0.29
Jaccard's index (degree of network stability)	0.36	
Flow in school (Response%)		
0 (never)	1.1%	1.1%
1 (a few times a year)	5.5%	5.8%
2 (once a month)	11.1%	15.5%
3 (a few times a month)	21.4%	21.5%
4 (once a week)	30.2%	29.1%
5 (a few times a week)	27.5%	23.3%
6 (every day)	4.2%	3.7%
<i>M</i> (<i>SD</i>)	3.74 (1.24)	3.57 (1.29)
<i>Moran's I</i>	0.17	0.18
School burnout (Response %)		
1 (completely disagree)	16.7%	14.2%
2 (disagree)	40.3%	35.5%
3 (partly disagree)	31.6%	33.4%
4 (partly agree)	9.6%	13.8%
5 (agree)	1.6%	2.8%
6 (completely agree)	0.2%	0.3%
<i>M</i> (<i>SD</i>)	2.37 (0.87)	2.53 (0.94)
<i>Moran's I</i>	0.05	0.04
School value (Response %)		
1 (does not describe me at all)	3.4%	2.5%
2	10.3%	7.8%
3	26.3%	18.9%
4	31.1%	29.0%
5	20.4%	25.0%
6	6.9%	13.2%
7 (describes me completely)	1.6%	3.6%
<i>M</i> (<i>SD</i>)	5.50 (1.10)	5.55 (1.07)
<i>Moran's I</i>	0.16	0.18
School effort (Response %)		
1 (does not describe me at all)	0.5%	0.2%
2	1.0%	1.1%
3	4.1%	3.3%
4	11.6%	1.5%
5	24.6%	24.7%
6	40.0%	49.2%
7 (describes me completely)	18.2%	20.0%
<i>M</i> (<i>SD</i>)	3.95 (1.22)	3.92 (1.31)
<i>Moran's I</i>	0.15	0.15
Truancy (Response %)		
1 (none)	66%	53%
2 (1–2 days)	24%	32%
3 (3–5 days)	6%	10%
4 (over 5 days)	4%	5%
<i>M</i> (<i>SD</i>)	1.47 (0.77)	1.66 (0.84)
<i>Moran's I</i>	0.19	0.20

change too rapidly or abruptly. Observed network autocorrelation statistics (*Moran's I*; for formula and interpretation, see Steglich et al., 2010) indicated a small to average degree of similarity in school engagement between friends.

3.2. Peer influence and selection effects

Table 3 shows the results of the multivariate longitudinal SIENA models. The upper part of Table 3 shows the results of the model in regard to peer network dynamics (i.e., predicting changes in peer relationships; selection effects and network control effects) and the lower part of the table shows the results of the model in regard to school engagement dynamics (i.e., predicting changes in engagement; influence effects, the effects of covariates, and shape of change control effects). The results for all the model parameters are provided with the explanations of parameter names in brackets. All 49 classroom networks were estimated simultaneously as a meta-network with the

Table 3

Dynamic modeling of selection and socialization in peer networks: Estimates and standard errors (SE) for school engagement outcomes.

	Estimate	SE
<i>Peer network dynamics</i>		
<i>Selection effects of engagement</i>		
Flow in schoolwork similarity (tendency to select peers with a similar level of flow in schoolwork)	−0.04	0.45
Flow in schoolwork ego (tendency of outgoing peer nominations to differ as a function of flow in schoolwork)	−0.01	0.05
Flow in schoolwork alter (tendency of incoming peer nominations to differ as a function of flow in schoolwork)	−0.07	0.05
School burnout similarity (tendency to select peers with a similar level of school burnout)	−0.01	0.49
School burnout ego (tendency of outgoing peer nominations to differ as a function of school burnout)	0.01	0.07
School burnout alter (tendency of incoming peer nominations to differ as a function of school burnout)	0.01	0.09
School value similarity (tendency to select peers with a similar level of school value)	−0.09	0.56
School value ego (tendency of outgoing peer nominations to differ as a function of school value)	0.08	0.07
School value alter (tendency of incoming peer nominations to differ as a function of school value)	−0.04	0.07
School effort similarity (tendency to select peers with a similar level of school effort)	0.30	0.38
School effort ego (tendency of outgoing peer nominations to differ as a function of school effort)	−0.05	0.05
School effort alter (tendency of incoming peer nominations to differ as a function of school effort)	0.10	0.06
Truancy similarity (tendency to select peers with a similar level of truancy)	1.12*	0.62
Truancy ego (tendency of outgoing peer nominations to differ as a function of truancy)	0.07	0.11
Truancy alter (tendency of incoming peer nominations to differ as a function of truancy)	0.31*	0.12
<i>Network control effects</i>		
Outdegree (density of nominations in the social network)	−2.68***	0.07
Reciprocity (tendency to reciprocate peer nominations)	2.76***	0.15
Transitive triplets (tendency to nominate peers of peers)	1.17***	0.08
Three cycles (tendency towards hierarchy in peer nominations)	−1.09***	0.14
<i>Effects of covariates</i>		
Gender ego (tendency of outgoing nominations to differ as a function of gender)	−0.22*	0.11
Gender alter (tendency of incoming nominations to differ as a function of gender)	0.18	0.12
Gender same (tendency to nominate peers with same gender)	0.73***	0.11
GPA ego (tendency of outgoing nominations to differ as a function of GPA)	−0.01	0.07
GPA alter (tendency of incoming nominations to differ as a function of GPA)	0.03	0.07
GPA similarity (tendency to nominate peers with a similar level of GPA)	0.54**	0.28
SES ego (tendency of outgoing nominations to differ as a function of SES)	−0.02	0.07
SES alter (tendency of incoming nominations to differ as a function of SES)	0.09	0.05
SES similarity (tendency to nominate peers with a similar level of SES)	0.07	0.13
Educational track ego (tendency of outgoing nominations to differ as a function of educational track)	0.06	0.06
Educational track alter (tendency of incoming nominations to differ as a function of educational track)	0.06	0.05
Educational track same (tendency to nominate peers with same educational track)	−1.10***	0.07
<i>School engagement dynamics</i>		
<i>Influence effect of peers' engagement</i>		
Flow in schoolwork average similarity (peer influence in flow in schoolwork)	2.58*	1.39
School burnout average similarity (peer influence in school burnout)	2.24*	1.30
School value average similarity (peer influence in school value)	3.42*	1.45
School effort average similarity (peer influence in school effort)	2.36*	1.40
Truancy average similarity (peer influence in truancy)	2.41***	0.93
<i>Effects of covariates</i>		
Flow in schoolwork: Effect from gender (change in flow in schoolwork as a function of gender)	0.07	0.09
Flow in schoolwork: Effect from GPA (change in flow in schoolwork as a function of GPA)	0.17*	0.07
Flow in schoolwork: Effect from SES (change in flow in schoolwork as a function of SES)	0.04	0.07
Flow in schoolwork: Effect from educational track (change in flow in schoolwork as a function of educational track)	−0.28*	0.13
School burnout: Effect from gender (change in school burnout as a function of gender)	−0.05	0.14
School burnout: Effect from GPA (change in school burnout as a function of GPA)	−0.09	0.09
School burnout: Effect from SES (change in school burnout as a function of SES)	0.01	0.08
School burnout: Effect from educational track (change in school burnout as a function of educational track)	0.28	0.15
School value: Effect from gender (change in school value as a function of gender)	−0.12	0.12
School value: Effect from GPA (change in school value as a function of GPA)	0.17	0.09
School value: Effect from SES (change in school value as a function of SES)	0.05	0.09
School value: Effect from educational track (change in school value as a function of educational track)	−0.13	0.14
School effort: Effect from gender (change in school effort as a function of gender)	0.06	0.12
School effort: Effect from GPA (change in school effort as a function of GPA)	0.10	0.08
School effort: Effect from SES (change in school effort as a function of SES)	−0.01	0.07
School effort: Effect from educational track (change in school effort as a function of educational track)	−0.25	0.13
Truancy: Effect from gender (change in truancy as a function of gender)	0.03	0.15
Truancy: Effect from GPA (change in truancy as a function of GPA)	0.05	0.15
Truancy: Effect from SES (change in truancy as a function of SES)	−0.02	0.12
Truancy: Effect from educational track (change in truancy as a function of educational track)	0.28	0.23
<i>Shape effects</i>		
Behavior flow in schoolwork: Linear tendency (linear tendency in flow in schoolwork)	−0.11*	0.05
Behavior flow in schoolwork: Quadratic tendency (deviations from the linear tendency in flow in schoolwork)	−0.07	0.05
Behavior school burnout: Linear tendency (linear tendency in school burnout)	0.13*	0.06
Behavior school burnout: Quadratic tendency (deviations from the linear tendency in school burnout)	−0.11	0.07
Behavior school value: Linear tendency (linear tendency in school value)	0.13	0.07
Behavior school value: Quadratic tendency (deviations from the linear tendency in school value)	−0.09	0.07
Behavior school effort: Linear tendency (linear tendency in school effort)	−0.05	0.05
Behavior school effort: Quadratic tendency (deviations from the linear tendency in school effort)	−0.06	0.05
Behavior truancy: Linear tendency (linear tendency in truancy)	−0.37**	0.13

(continued on next page)

Table 3 (continued)

	Estimate	SE
Behavior truancy: Quadratic tendency (deviations from the linear tendency in truancy)	0.22**	0.08

Note. Gender coded: female = 1 and male = 2. Educational track coded: vocational school = 0, senior high school = 1. GPA = grade point average, academic achievement, rate of change in network ties and behavior is allowed to differ between schools. *** $p < .001$; ** $p < .01$; * $p < .05$.

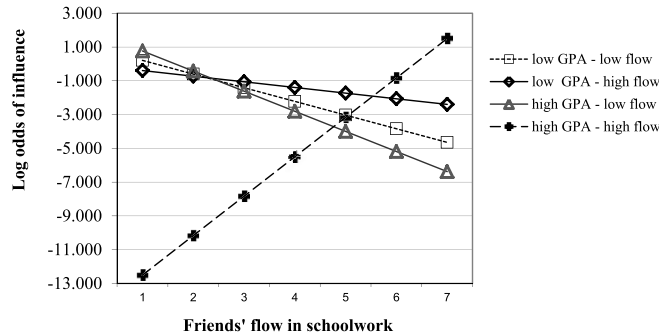


Fig. 1. Log odds of peer influence on flow in schoolwork among high- and low-achieving students with low or high flow in schoolwork.

constraint that peer ties could only be between children in the same classroom (i.e., structural zeros prevented cross-classroom ties; see also DeLay, Hanish, Martin, & Fabes, 2016; Kiuru et al., 2017). Rate of change parameters were allowed to vary between classrooms by the inclusion of classroom dummy variables in the model (i.e., an equivalent approach to multiple group analysis; see also Snijders, 2016). Below we describe the results related to peer influence and selection. The results for peer selection and influence hold even after controlling for network and behavioral tendencies and demographic and individual competence measures. The interpretations of the results for the control effects are described in more detail in the supplementary material.

3.2.1. Emotional engagement (flow in schoolwork, school burnout, school value)

Results showed that there was no overall tendency to select new peers based on similarity in emotional engagement (i.e., non-significant effects of flow in schoolwork similarity, school burnout similarity or school value similarity; peer selection). Likewise, the number of incoming and outgoing peer nominations did not depend on flow in schoolwork (alter and ego effects).

Furthermore, students became more similar across time to the average emotional engagement level of peers they liked most (average similarity; peer influence). Peer influence effect operated in flow in schoolwork, school burnout, and school value. These results held after accounting for alternative peer processes (i.e., density, reciprocity, transitivity), behavioral tendencies (i.e., linear tendency and quadratic tendency), and the effects of important covariates.

3.2.2. Cognitive engagement (school effort)

Selection effects in cognitive engagement (i.e., school effort) were also absent. That is, students showed no tendency for selecting new peers based on similarity in school effort (school effort similarity). Likewise, the number of incoming and outgoing peer nominations did not depend on school effort (alter and ego effects). However, peer influence operated in cognitive engagement. Generally, students became more similar to the average school effort level of the peers they liked most (average similarity).

3.2.3. Behavioral engagement (truancy)

Both selection and influence effects operated in behavioral engagement (i.e., truancy). Students tended to choose new peers based on similarity in truancy (truancy similarity), and they became more similar

to the average truancy level of the peers they liked most (average similarity). Although the number of outgoing nominations did not depend on truancy (truancy ego), students high in truancy had an increased chance of being popular among their peers (truancy alter).

3.3. Academic achievement as a moderator

We investigated academic achievement (GPA) as a moderator of peer selection and influence effects. These models contained the same parameters and control effects as the multivariate model (Table 3).

3.3.1. Emotional engagement (flow in schoolwork, school burnout, school value)

3.3.1.1. Flow in schoolwork. Results revealed that peer selection for flow in schoolwork was not dependent on the level of student GPA (GPA ego \times flow in schoolwork similarity = 0.26, s.e. = 0.34, $t = 0.76$, $p = .447$).

However, GPA moderated peer influence on flow in schoolwork (GPA ego \times average similarity in flow in schoolwork = 1.48, s.e. = 0.69, $t = 2.14$, $p = .033$). Fig. 1 illustrates this moderated association by showing the association between peers' flow in schoolwork and log odds of peer influence separately for high versus low levels of GPA and flow in schoolwork (see Kiuru et al., 2017; Mathys, Burk, & Cillessen, 2013; Tilton-Weaver, Burk, Kerr, & Stattin, 2013). Student GPA moderated peer influence on flow in schoolwork such that for students with high levels of flow in schoolwork, influence effects were dependent on student GPA. Students high in both flow in schoolwork and GPA were likely to be influenced by peers with high flow in schoolwork, whereas students with high flow in schoolwork combined with low GPA were unlikely to be influenced by their peers' high flow in schoolwork. Student GPA, however, did not make a difference in susceptibility to peer influence for students with low levels of flow in schoolwork. The students with low flow in schoolwork were more likely to be influenced by peers with low flow in schoolwork and less likely to be influenced by peers with high flow in schoolwork regardless of their GPA.

3.3.1.2. School burnout. Results revealed that peer selection for school burnout was dependent on the level of student GPA (GPA ego \times school burnout similarity = 0.73, s.e. = 0.36, $t = 2.03$, $p = .043$). Fig. 2 illustrates this moderated association by showing the association between school burnout and the log odds of selecting peers based on

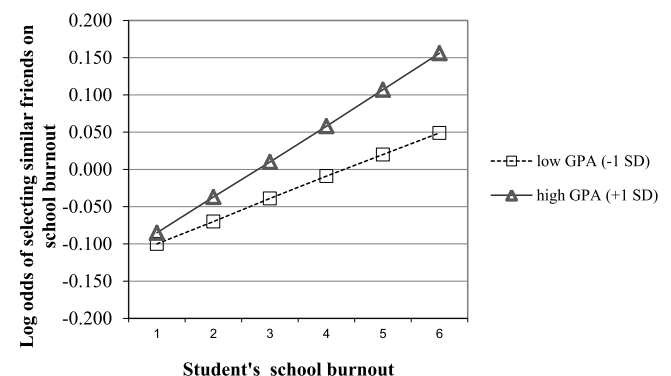


Fig. 2. Log odds of selecting similar friends on school burnout as a function of student academic achievement.

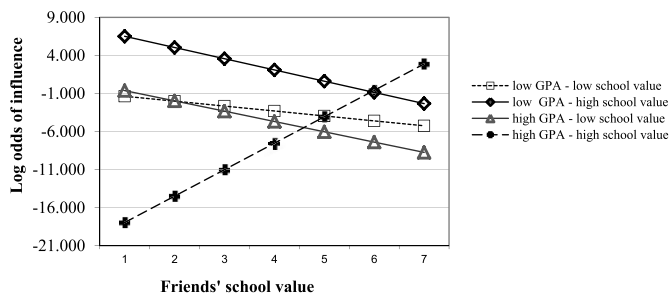


Fig. 3. Log odds of peer influence on school value among high- and low-achieving adolescents with low or high school value.

similarity in school burnout, separately for students with low GPA (-1 standard deviation) and for students with high GPA ($+1$ standard deviation) (see Tilton-Weaver et al., 2013; W. Van Zalk, N.; Van Zalk, Kerr, & Stattin, 2014). Student GPA moderated peer selection in school burnout such that compared to students with low GPA, students with high GPA were more likely to select peers with similar levels of school burnout. Peer selection on school burnout was especially pronounced for students with both high GPA and high school burnout.

In turn, peer influence on school burnout was not moderated by student GPA ($GPA\ ego \times average\ similarity\ in\ school\ burnout = -0.04$, $s.e. = 0.81$, $p = .968$).

3.3.1.3. School value. Peer selection for school value was not dependent on the level of student GPA ($GPA\ ego \times school\ value\ similarity = -0.77$, $s.e. = 0.42$, $t = 1.83$, $p = .067$).

However, GPA moderated peer influence on school value ($GPA\ ego \times average\ similarity\ in\ school\ value = 2.96$, $s.e. = 1.03$, $t = 2.87$, $p = .004$). Fig. 3 illustrates this moderated association by showing the association between peers' school value and log odds of peer influence separately for high versus low levels of students' GPA and school value (see Kiuru et al., 2017; Mathys et al., 2013; Tilton-Weaver et al., 2013). GPA moderated peer influence on school value such that for students with high levels of school value influence effects were dependent on student GPA. Students high in both school value and GPA were likely to be influenced by peers with high school value, whereas students with high school value and low GPA were unlikely to be influenced by their peers' high school value. Student GPA, however, did not make a difference in susceptibility to peer influence for students with low levels of school value. The students with low school value were more likely to be influenced by peers with low school value and less likely to be influenced by peers with high school value regardless of student GPA.

3.3.2. Cognitive engagement (school effort)

Peer selection ($GPA\ ego \times school\ effort\ similarity = -0.68$, $s.e. = 0.37$, $t = 1.84$, $p = .066$) and influence ($GPA\ ego \times average\ similarity\ in\ school\ effort = 0.29$, $s.e. = 0.57$, $t = 0.51$, $p = .610$) effects on school effort were not moderated by student GPA.

3.3.3. Behavioral engagement (truancy)

Peer selection ($GPA\ ego \times truancy\ similarity = 0.05$, $s.e. = 0.32$, $t = 0.16$, $p = .872$) and influence ($GPA\ ego \times average\ similarity\ in\ truancy = 2.26$, $s.e. = 1.27$, $t = 1.78$, $p = .075$) effects on truancy were not moderated by student GPA.

3.4. Additional analyses

The current data consisted of students from nine different schools. As additional analyses, we carried out analyses using the meta-analysis option in SIENA (Snijders & Baerveldt, 2003). Analyses were conducted separately for each of the nine schools prior to combining all school estimates. This technique provided two statistics for each estimated parameter: the mean parameter represented an unstandardized

estimate aggregated across individual school-based peer networks, and the standard deviation parameter represented the degree to which estimates varied across school-based networks. The results revealed no statistically significant differences in the strength of peer influence (all $ps > .05$) and selection effects (all $ps > .05$) between the nine schools. Moreover, the intraclass correlations for the nine schools in the sample were very small (range: 0.00–0.06).

4. Discussion

Research on adolescents has shown that peer similarity in academic beliefs, behaviors, and performance in school settings can be attributed to mechanisms of influence and selection processes (Gremmen et al., 2017; Kiuru et al., 2008; Laninga-Wijnen et al., 2017; Rambaran et al., 2017). Although both influence and selection are critical to our understanding of peer effects on academic development, no studies have simultaneously examined the roles of peer influence and selection in relation to multiple dimensions (i.e., behavioral, emotional, and cognitive dimensions) of student engagement in school.

The present study examined the extent to which youth select peer affiliates based on similar engagement or whether youth and peer engagement become similar over time. Consistent with Hypothesis A, we found that students had a tendency to choose new friends based on earlier similarity in behavioral engagement; however, students did not select new friends based on earlier similarity in emotional and cognitive engagement. Over time, students became more similar to their peers in terms of emotional, cognitive, and behavioral engagement (Hypothesis B). Additionally, some of the peer influence and selection effects on school engagement were moderated by student academic achievement (Hypothesis C).

Consistent with recent engagement literature, our findings support the importance of examining engagement as a multidimensional construct (Fredricks et al., 2004; Wang & Degol, 2014). A multidimensional perspective on student engagement allowed us to tease apart peer influence and selection processes on each dimension of school engagement. By using this perspective, we were also able to provide a richer characterization of how students act, feel, and think in school, thus furthering our understanding of how youth both select new friends and become more similar to their existing friends based on different patterns of school engagement.

4.1. Peer influence or selection?

Peer influence and selection effects varied by dimension of engagement: peer influence was most relevant for indicators of emotional (i.e., flow in schoolwork, school burnout, and school value) and cognitive (i.e., school effort) engagement, while behavioral engagement (i.e., truancy) was shaped by both influence and selection processes. Our results suggest that increased time spent with friends translates to more closely aligned school values, effort, and attitudes amongst these networks. Conversely, youth are not only more likely to select new friends based on similarity in truant behaviors (e.g., such as frequently cutting classes and missing school), but these youth are also more likely to align their truant behaviors to those of their friends over time.

Our research adds to the notion that there are multiple processes through which youth become more similar to their peers over time. For example, the emotional and cognitive engagement indicators involve internal affective and intellectual processes that may be transmitted in peer relationships, via self-disclosure, discussion, and co-rumination (Rose, 2002). According to Kiuru et al. (2008), co-rumination may be a large contributing factor to the process through which youth become more similarly disengaged with school over time; the more friends dwell on and mutually express negative feelings and attitudes toward school, the more likely they are to become more detached over time. These behaviors are mutually reinforcing as they strengthen friendships; however, they may lead to greater adjustment problems (Rose,

2002). Such processes may explain how friends with greater school burnout, lower flow in schoolwork, lower valuing of school, and lower effort are able to influence each other into becoming more disengaged with school over time.

On a positive note, the opposite effects are likely to operate for groups of highly engaged friends. Adolescents with friends who highly value school and are committed to learning are also more likely to transmit these values to each other through self-disclosure and mutual sharing, thereby creating and reinforcing positive patterns of adaptive learning behavior among friendship groups. In addition to self-disclosure, influence effects may also occur through peer pressure. Pressure to conform to the norms and standards of well-liked peers may reinforce alterations in engagement for fear of ostracism from peers (Abrams, Rutland, Ferrell, & Pelletier, 2008). In other words, youth are aware of the consequences of deviating from peer norms and may align their values and behaviors more closely with their peers to avoid rejection.

While all three dimensions of engagement were affected by peer influences, behavioral engagement was the only dimension in which peer similarity was also attributed to selection factors. Truancy is a behavior easily observed, defined, and quantified by peers; therefore, such behavior may provide adolescents with a convenient screening process to determine peer compatibility (see also DeKlepper et al., 2010 for a discussion of visible and non-visible characteristics of peers). Emotional and cognitive engagement, on the other hand, are less easily defined, observed, and evaluated by peers, potentially requiring greater disclosure and time spent with peers to properly evaluate. Another possible factor delineating truancy as the only selection effect is that high truancy may be an indication that a student has been disengaging from school for some time (Rambaran et al., 2017). Switching peer groups to find equally truant friends may be reflective of this more severe form of disengagement, which may eventually lead to dropout. In choosing highly truant friends, periodic absentees may convert to more regularly skipping school, thereby demonstrating both influence and selection effects on truancy over time.

Understanding how youth process the behaviors of their peers to determine their selection of friends has important ramifications for improving adolescent behavioral engagement in school. Consistent with prior research, our findings suggest that assembling deviant peers within the same setting might actually reinforce or worsen deviant behaviors (Gifford-Smith, Dodge, Dishion, & McCord, 2005). Highly truant students are at increased risk for continued truancy if consistently grouped with other deviant peers, which may occur in academic settings that use ability tracking or grouping methods. Alternatives to such strategies include pursuing therapeutic interventions that have an individual focus and allowing students with behavioral problems to be mainstreamed into general classroom environments (Dodge et al., 2006). By eliminating the amassing of truant peers, schools may be able to limit students' identification and selection of other truant peers as friends, thereby reducing additional negative socializing influences. For emotional and cognitive engagement (which is more likely to be influenced by peers), ensuring high-risk youth are never consistently placed in disengaged peer groups may reduce negative peer influences on beliefs and attitudes toward school. Teaching both educators and peers to reinforce positive learning beliefs and targeting peer leaders as agents of change may also foster positive peer influences on emotional and cognitive engagement (Kindermann & Vollet, 2014).

4.2. Academic achievement as a moderator

Our study suggests that peer selection and influence effects on emotional engagement are not uniform across all students, but vary based on student GPA. Across two of our three indicators of emotional engagement, only high achieving students with high engagement were more likely to be influenced by their emotionally engaged peers. Low

achieving students, on the other hand, were less likely to be influenced by emotionally engaged peers. In particular, high achieving students with high flow were more likely to be influenced by peers with high flow. The same pattern emerged with school value in which high achieving students with high school value were more likely to be influenced by peers with high school value. These findings are in line with a recent study demonstrating that academic achievement plays a moderating role on the formation of friendship networks, most notably for high achieving students. In that study, Laninga-Wijnen et al. (2017) found that in classrooms where performance goals were popularly endorsed by students, selection of peers based on similar academic performance was highest among high achieving students. While the Laninga-Wijnen et al. (2017) study focused on high achieving students' negative motivations for selecting similarly high achieving peers in the context of a performance goal classroom environment (i.e., reducing unfavorable comparisons, utilizing their peers as resources to help achieve their own goals of high performance), our findings for flow and value suggest positive effects of high emotional engagement on peer networks. Unfortunately, these positive effects appear to be limited to high achieving students.

Contrary to the results for flow and school value, we found that high achieving students with higher school burnout tend to select peers with similar levels of school burnout. In other words, high achievers with higher school burnout do not appear to be seeking out friends with lower school burnout to associate with, and are less likely to be influenced by peers with low burnout. While we cannot be entirely certain as to the cause of this selection effect, it is possible that some high-achieving students may experience school burnout due to the stress of advanced course workloads. These students may also have high expectations for success based on their past performance. By placing pressure on themselves to do well, these students may seek out peers with shared levels of emotional engagement as a coping mechanism to deal with stress and strengthen friendship ties (Rose, 2002). Negative commiseration with like-minded peers, however, may be counter-productive, as these high-achieving, high school burnout students may choose to navigate the challenges of school by dwelling on negative internalized feelings (Kiuru et al., 2008; Rice, Leever, Christopher, & Porter, 2006).

What may set school burnout apart from our other two measures of emotional engagement, school value and flow in schoolwork, is that school burnout is likely to tap into stress levels and maladaptive coping mechanisms that can operate independently of a student's achievement and enjoyment of schooling. High-achieving students who place high personal expectations or standards for performance on themselves are more susceptible to experiencing higher stress and psychological problems (Rice et al., 2006). As such, a high-achieving student with high school burnout may lack successful coping skills to deal with stress and positive approaches towards schoolwork. Accordingly, seeking out friends with similar levels of school burnout may be an attempt to cope with this stress by seeking validation for these negative feelings. This may also explain why in performance goal classrooms, students, particularly high achieving ones, are more likely to select similarly achieving students as friends (Laninga-Wijnen et al., 2017). They may choose peers with similar academic abilities to avoid unfavorable comparisons to students with higher skill sets. High achieving students may also be motivated to seek out similarly high achieving friends to take advantage of their knowledge and abilities to help further their own personal goals and interests (Laninga-Wijnen et al., 2017). Therefore, maintaining their self-image and self-interests may be an attempt to reduce the stress and fear of failure.

As a result, youth with high school burnout may also be more likely than youth with lower school burnout to endorse failure avoidance goals. One study found that youth with failure avoidance goal orientations (as opposed to mastery approach goal orientations) experienced greater anxiety, sadness, and fearfulness prior to a stressful exam (Sideridis, 2008). Likewise, another study suggested that when

adolescents possessed a more negative view of imperfection in academic pursuits, they were more likely to experience greater depression and fear of academic failure (Stoeber & Rambow, 2007). In other words, youth with higher school burnout may be experiencing the effects of stress in a more detrimental manner because they fear their skill levels do not match the demands of the environment or their approach to learning is characterized by a fear of not measuring up to a pre-determined standard (Salmela-Aro et al., 2008). It is possible, therefore, that highly stressed youth attempt to cope with this stress by seeking out and commiserating with similarly stressed and disengaged peers. Future research is needed to identify the potential mechanisms at play in determining exactly why high achieving youth with greater school burnout are attracted to similarly disengaged youth, rather than seeking out youth who are more engaged and becoming more influenced by their adaptive approaches over time.

Interestingly, while high-achieving students were more likely to select peers with similar levels of emotional engagement, they were not more likely to be influenced by their emotionally disengaged peers regardless of their level of emotional engagement. On the other hand, youth with low achievement but high school value were far more likely to be influenced by their poorly engaged peers than by their highly engaged peers. These findings align with risk and resilience research examining the protective role of inner assets and external resources in helping youth cope with adversity (Fergus & Zimmerman, 2005; Kiuru et al., 2008; Masten & Obradović, 2006). With fewer inner assets to rely on, students with lower achievement and/or lower engagement may be more vulnerable to peers with negative feelings toward school. In an effort to build affiliation, they may engage in mutual discourse regarding their discontent with school, feeding on peers' feelings of discontent and thus further decreasing school value. Conversely, high achievers' academic success and positive attitudes toward school may be reciprocal, making these students more resilient to negative peer influences (Fergus & Zimmerman, 2005).

In addition, some research has suggested that academically oriented students are socially penalized by peers, as performing well and caring about school are viewed as “uncool” (Schwartz, Kelly, & Duong, 2013). This may explain why low achieving or disengaged students were unlikely to be influenced by their highly engaged peers. Although we did find that disengaged youth were more attractive as friends and more likely to receive more “most like nominations” from peers, we did not find that engaged youth were unpopular with friend nominations. More research is needed to understand the circumstances under which youth are more vulnerable to the negative or positive effects of their peers, and how to combat the perceived popularity of disengaged youth.

4.3. Limitations and future research

While this study contributes to our understanding of peer effects on school engagement, some potential limitations should be noted. First, since conformity is often higher during early adolescence than later adolescence, our focus on older adolescents (16 years at the beginning of the study) may underestimate the magnitude of peer influence effects on adolescents (Steglich et al., 2010). Second, although the vast majority of peer relations tend to be between same-aged youth from the same school (Ennett & Bauman, 1996), targeting peer networks among same-grade peers from the same school could be restrictive. Adolescents may have friends of different ages or from other social settings (e.g., homework groups) who are important actors in their peer networks. Similarly, adolescents were asked to nominate only up to three peers. Simulation-based dynamic social network analyses would have benefited from additional information related to a larger repertoire of peer nominations (Cillessen, 2009). Third, although skipping classes or being absent are valid indicators of behavioral disengagement (Wang & Fredricks, 2014), they are not inclusive of all potential measures of behavioral participation in learning. Future studies should investigate positive indicators of behavioral engagement as well. Fourth, we

investigated peer influence and selection only after the transition to upper secondary or vocational school. In future studies, it might be interesting to contrast the magnitude of these processes prior to and after the transition. Future studies may also want to investigate whether participants lived in the same neighborhood or were involved in similar extracurricular activities. Fifth, our data is representative of only a single individual's perceptions, which may be another limitation of the use of self-reports of individual behaviors, values, and attitudes. Although these perceptions are an important component of interpersonal relationships, it is possible that concordances based on shared perceptions will yield different patterns of results. Finally, while we examined peer network selection and influence effects on engagement, we did not directly investigate the mechanisms (e.g., co-rumination, peer pressure, observational learning) underlying these processes. Future studies should consider incorporating observational studies, experimental studies, and qualitative interviews to better understand adolescent motivations for seeking out new peer groups or conforming to current peer group standards. For instance, interviews comparing motivations of highly disengaged youth versus highly engaged youth may prove useful for developing targeted school practices or interventions to combat academic failure, truancy, and dropout.

5. Conclusion

As youth progress through secondary school, they approach a critical crossroads in their academic careers, with many experiencing declines in academic motivation and engagement. Enhancing academic engagement in adolescence is a key to improving academic achievement and reducing dropout. However, adolescence is also a developmental period marked by tremendous peer influence over attitudes, beliefs, values, and behaviors. The present study demonstrated that peers are highly influential over behavioral, cognitive, and emotional engagement, highlighting the importance of schools utilizing peers to generate positive changes in adolescent values and behaviors. While peer pressure is often conceived as a negative influence, our findings support recent literature that paints a more complex picture of this phenomenon. Peers can operate as powerful positive socializing agents within classrooms, particularly when they endorse high levels of behavioral, cognitive, and emotional engagement. Increasing student exposure and access to highly engaged peers, avoiding aggregation of deviant or highly disengaged peers, and building internal assets such as higher academic achievement and adaptive coping skills will all facilitate greater academic success for youth. Since youth are predominantly being “changed” by their friends rather than seeking out new friends to match their levels of emotional and cognitive engagement, the power in improving adolescent engagement may reside within the schools and the classrooms. Increasing emotional and cognitive engagement among peer networks may even reduce behavioral disengagement, thereby, reducing both selection and influence effects over truancy. When students have supports in place and do not feel “out of place” when demonstrating high involvement and interest in learning, they will be more likely to engage in school.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.learninstruc.2018.06.003>.

References

Abrams, D., Rutland, A., Ferrell, J. M., & Pelletier, J. (2008). Children's judgments of

- disloyal and immoral peer behavior: Subjective group dynamics in minimal inter-group contexts. *Child Development*, 79, 444–461.
- Blansky, D., Kavanaugh, C., Boothroyd, C., Benson, B., Gallagher, J., Endress, J., et al. (2013). Spread of academic success in a high school social network. *PLoS One*, 8, e55944.
- Brechwald, W. A., & Prinstein, M. J. (2011). Beyond homophily: A decade of advances in understanding peer influence processes. *Journal of Research on Adolescence*, 21, 166–179.
- Bukowski, W. M., Cillessen, A. H. N., & Velasquez, A. M. (2012). The use of peer ratings in developmental research. In B. Laursen, T. Little, & N. Card (Eds.). *Handbook of developmental research methods* (pp. 211–228). New York, NY: Guilford.
- 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, NY: Guilford.
- Coie, J. D., Dodge, K. A., & Coppotelli, H. (1982). Dimensions and types of social status: A cross-age perspective. *Developmental Psychology*, 18, 557–570.
- Crosnoe, R. (2002). High school curriculum track and adolescent association with delinquent friends. *Journal of Adolescent Research*, 17, 144–168.
- DeKlepper, M., Sleebos, E., van de Bunt, G., & Agneessens, F. (2010). Similarity in friendship networks: Selection or influence? The effect of constraining contexts and non-visible individual attributes. *Social Networks*, 32, 82–90.
- DeLay, D., Hanish, L. D., Martin, C. L., & Fabes, R. A. (2016). Peer effects on Head Start children's preschool competency. *Developmental Psychology*, 52, 58–70.
- Delay, D., Laursen, B., Kiuru, N., Salmela-Aro, K., & Nurmi, J.-E. (2013). Selecting and retaining friends on the basis of cigarette smoking similarity. *Journal of Research on Adolescence*, 23, 464–473. <http://dx.doi.org/10.1111/jora.12017>.
- Denault, A.-S., & Poulin, F. (2012). Peer group deviancy in organized activities and youths' problem behaviours. *Canadian Journal of Behavioural Science*, 44, 83–92.
- Dodge, K. A., Dishion, T. J., & Lansford, J. E. (2006). *Deviant peer influences in intervention and public policy for youth* Social Policy Report. Volume 20, Number 1. Society for Research in Child Development.
- Eccles, J. S. (2009). Who am I and what am I going to do with my life? Personal and collective identities as motivators of action. *Educational Psychologist*, 44, 78–89.
- Ennett, S. T., & Bauman, K. E. (1996). Adolescent social networks: School, demographic and longitudinal considerations. *Journal of Adolescent Research*, 11, 194–215.
- Fergus, S., & Zimmerman, M. A. (2005). Adolescent resilience: A framework for understanding healthy development in the face of risk. *Annual Review of Public Health*, 26, 399–419.
- Flashman, J. (2012). Academic achievement and its impact on friend dynamics. *Sociology of Education*, 85, 61–80. <http://dx.doi.org/10.1177/0038040711417014>.
- Frank, K. A., Muller, C., & Mueller, A. S. (2013). The embeddedness of adolescent friendship nominations: The formation of social capital in emergent network structures. *American Journal of Sociology*, 119, 216–253. <http://dx.doi.org/10.1086/672081>.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research*, 74, 59–109. <http://dx.doi.org/10.3102/00346543074001059>.
- Geven, S., Weesie, J., & van Tubergen, F. (2013). The influence of friends on adolescents' behavior problems at school: The role of ego, alter, and dyadic characteristics. *Social Networks*, 35, 583–592.
- Gifford-Smith, M., Dodge, K. A., Dishion, T. J., & McCord, J. (2005). Peer influence in children and adolescents: Crossing the bridge from developmental to intervention science. *Journal of Abnormal Child Psychology*, 33, 255–265. <http://dx.doi.org/10.1007/s10802-005-3563-7>.
- Goodwin, N. P., Mrug, S., Borch, C., & Cillessen, A. H. H. (2012). Peer selection and socialization in adolescent depression: The role of school transitions. *Journal of Youth and Adolescence*, 41, 320–332.
- Gremmen, M. C., Dijkstra, J. K., Steglich, C., & Veenstra, R. (2017). First selection, then influence: Developmental differences in friendship dynamics regarding academic achievement. *Developmental Psychology*, 53, 1356–1370.
- Hamm, J. V., Farmer, T. W., Lambert, K., & Gravelle, M. (2014). Enhancing peer cultures of academic effort and achievement in early adolescence: Promotive effects of the SEALS intervention. *Developmental Psychology*, 50, 216–228. <http://dx.doi.org/10.1037/a0032979>.
- Hardy, C. L., Bukowski, W. M., & Sippola, L. K. (2002). Stability and change in peer relationships during the transition to middle-level school. *The Journal of Early Adolescence*, 22, 117–142.
- Holopainen, L., & Savolainen, H. (2005). *Unpublished raw data*. Finland: University of Joensuu and University of Jyväskylä.
- Huisman, M., & Steglich, C. (2008). Treatment of non-response in longitudinal network studies. *Social Networks*, 30, 297–308.
- Keijsers, L., Branje, S., Hawk, S. T., Schwartz, S. J., Frijns, T., Koot, H. M., ... Meeus, W. (2012). Forbidden friends as forbidden fruit: Parental supervision of friendships, contact with deviant peers, and adolescent delinquency. *Child Development*, 83, 651–666.
- Kindermann, T. A. (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., & Vollet, J. W. (2014). Peer networks and classroom ecologies: Peer group influences on students' classroom engagement depend on relationships with teachers and parents. *Zeitschrift für Erziehungswissenschaft [Journal of Education Science]*, 26, 135–151 Special Issue.
- Kiuru, N., Aunola, K., Nurmi, J. E., Leskinen, E., & Salmela-Aro, K. (2008). Peer group influence and selection in adolescents' school burnout: A longitudinal study. *Merrill-Palmer Quarterly*, 54, 23–55.
- Kiuru, N., DeLay, D., Laursen, B., Burk, W. J., Lerkkanen, M.-K., Poikkeus, A.-M., et al. (2017). Peer selection and influence in students' reading skills in early primary grades: A social network approach. *Reading and Writing*. <http://dx.doi.org/10.1007/s11145-017-9733-5>.
- Kiuru, N., Nurmi, J.-E., Aunola, K., & Salmela-Aro, K. (2009). The role of peer groups in adolescents' educational trajectories. *European Journal of Developmental Psychology*, 6, 521–547.
- Kretschmer, D., Leszczynski, L., & Pink, S. (2018). Selection and influence processes in academic achievement—more pronounced for girls? *Social Networks*, 52, 251–260.
- Laniga-Wijnen, L., Ryan, A. M., Harakeh, S., Shih, H., & Vollebergh, W. A. M. (2017). The moderating role of popular peers' achievement goals in 5th- and 6th-graders' achievement-related friendships: A social network analysis. *Journal of Educational Psychology*, 110, 289–307.
- Li, Y., Lynch, A. D., Kalvin, C., Liu, J., & Lerner, R. M. (2011). Peer relationships as a context for the development of school engagement during early adolescence. *International Journal of Behavioral Development*, 35, 329–342.
- Lomi, A., Snijders, T. A. B., Steglich, C. E. G., & Torlo, V. J. (2011). Why are some more peer than others? Evidence from a longitudinal study of social networks and individual academic performance. *Social Science Research*, 40, 1506–1520.
- Masten, A. S., & Obradović, J. (2006). Competence and resilience in development. *Annals of the New York Academy of Sciences*, 1094, 13–27.
- Mathys, C., Burk, W. J., & Cillessen, A. H. N. (2013). Popularity as a moderator of peer selection and socialization of adolescent alcohol, Marijuana, and tobacco use. *Journal of Research on Adolescence*, 23, 513–523.
- McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual Review of Sociology*, 27, 415–444.
- 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, 13–40.
- Nichols, J. D., & White, J. (2001). Impact of peer networks on achievement of high school algebra students. *The Journal of Educational Research*, 94, 267–273.
- Niemivirta, M. (2002). Motivation and performance in context: The influence of goal orientations and instructional setting on situational appraisals and task performance. *Psychologia: An International Journal of Psychology in the Orient*, 45, 250–270.
- Parker, P. D., Ciarrochi, J., Heaven, P., Marshall, S., Sahdra, B., & Kiuru, N. (2015). Hope, friends, and subjective well-being: A social network approach to peer group contextual effects. *Child Development*, 86, 642–650.
- Rambaran, J. A., Hopmeyer, A., Schwartz, D., Steglich, C., Badaly, D., & Veenstra, R. (2017). Academic functioning and peer influences: A short-term longitudinal study of network-behavior dynamics in middle adolescence. *Child Development*, 88, 523–543.
- Rice, K. G., Leever, B. A., Christopher, J., & Porter, J. D. (2006). Perfectionism, stress and social (dis)connection: A short-term study of hopelessness, depression, and academic adjustment among honors students. *Journal of Counseling Psychology*, 53, 524–534.
- Rimpelä, M. (2003). *Kouluterveyskysely [Questionnaire for school health]*. www.stakes.fi/kouluterveys.
- Ripley, R. M., Snijders, T. A. B., Boda, Z., Vörös, A., & Preciado, P. (2013). *Manual for SIENA version 4.0*. Oxford: University of Oxford, Department of Statistics; Nuffield College.
- Rodkin, P., & Ryan, A. M. (2012). Child and adolescent peer relations in an educational context. In T. Urdan, S. Graham, M. Royer, & M. Zeidner (Eds.). *Educational psychology handbook*. Washington DC: APA Publications.
- Rose, A. J. (2002). Co-rumination in the friendships of girls and boys. *Child Development*, 73, 1830–1843.
- Ryan, A. M. (2000). Peer groups as a context for the socialization of adolescents' 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, 1135–1150.
- Salmela-Aro, K., Kiuru, N., Leskinen, E., & Nurmi, J.-E. (2009). School-burnout inventory (SBI) – reliability and validity. *European Journal of Psychological Assessment*, 25, 48–57.
- Salmela-Aro, K., Kiuru, N., & Nurmi, J.-E. (2008). The role of educational track in adolescents' school burnout. *British Journal of Educational Psychology*, 78, 663–689.
- Salmela-Aro, K., & Näätänen, P. (2005). *BBI-10. Nuorten koulu-uupumusmenetelmä. [Method of assessing adolescents' school burnout]* Helsinki, Finland: Edita.
- Salmela-Aro, K., & Upadyaya, K. (2012). School engagement inventory: Energy, dedication, and absorption (EDA). *European Journal of Psychological Assessment*, 28, 60–67.
- Schwartz, D., Kelly, B. M., & Duong, M. T. (2013). Do academically-engaged adolescents experience social sanctions from the peer group? *Journal of Youth and Adolescence*, 42, 1319–1330.
- Sentse, M., Kiuru, N., Veenstra, R., & Salmivalli, C. (2014). A social network approach to the interplay between adolescents' bullying and likeability over time. *Journal of Youth and Adolescence*, 43, 1409–1420.
- Shin, H., & Ryan, A. M. (2014b). Friendship networks and achievement goals: An examination of selection and influence processes and variations by gender. *Journal of Youth and Adolescence*, 43, 1453–1464.
- Sideridis, G. D. (2008). The regulation of affect, anxiety, and stressful arousal from adopting mastery-avoidance goal orientations. *Stress and Health*, 24, 55–69.
- Skinner, E. A., Kindermann, T. A., Connell, J. P., & Wellborn, J. G. (2009). Engagement as an organizational construct in the dynamics of motivational development. In K. Wentzel, & A. Wigfield (Eds.). *Handbook of motivation in school* (pp. 223–245). Mahwah, NJ: Erlbaum.
- Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement*, 69, 493–525.
- Skinner, E. A., & Pitzer, J. R. (2012). Developmental dynamics of student engagement, coping, and everyday resilience. In S. L. Christensen, A. L. Reschly, & C. Wylie (Eds.).

- Handbook of research on student engagement* (pp. 21–44). New York, NY: Springer.
- Snijders, T. A. B. (2016). The multiple flavours of multilevel issues for networks. In E. Lazega, & T. A. B. Snijders (Eds.). *Multilevel network analysis for the social sciences* (pp. 15–46). Cham: Springer.
- Snijders, T. A. B., & Baerveldt, C. (2003). A multilevel network study of the effects of delinquent behavior on friendship evolution. *Journal of Mathematical Sociology*, 27, 123–151.
- 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, 44–60.
- Steglich, C., Snijders, T. A. B., & Pearson, M. (2010). Dynamic networks and behavior: Separating selection from influence. *Sociological Methodology*, 40, 329–393.
- Stewart, E. A. (2003). School social bonds, school climate, and school misbehavior: A multilevel analysis. *Justice Quarterly*, 20, 575–604.
- Stoeber, J., & Rambow, A. (2007). Perfectionism in adolescent school students: Relations with motivation, achievement, and well-being. *Personality and Individual Differences*, 42, 1379–1389.
- Terry, R., & Coie, J. D. (1991). A comparison of methods for defining sociometric status among children. *Developmental Psychology*, 27, 867–880.
- Tilton-Weaver, L. C., Burk, W. J., Kerr, M., & Stattin, H. (2013). Can parental monitoring and peer management reduce the selection or influence of delinquent peers? Testing the question using a dynamic social network approach. *Developmental Psychology*, 49, 2057–2070.
- Van Zalk, W., Van Zalk, N., Kerr, M., & Stattin, H. (2014). Influences between online-exclusive, conjoint and offline-exclusive friendship networks: The moderating role of shyness. *European Journal of Personality*, 28, 134–146.
- Veenstra, R., & Dijkstra, J. K. (2011). Transformations in adolescent peer networks. In B. Laursen, & W. A. Collins (Eds.). *Relationship pathways: From adolescence to young adulthood* (pp. 135–154). New York: Sage.
- Wang, M. T. (2012). Educational and career interests in math: A longitudinal examination of the links between perceived classroom environment, motivational beliefs, and interests. *Developmental Psychology*, 48, 1643–1657.
- Wang, M. T., & Degol, J. L. (2014). Staying engaged: Knowledge and research needs in student engagement. *Child Development Perspectives*, 8, 137–143.
- Wang, M. T., & Degol, J. L. (2016). School climate: A review of the construct, measurement, and impact on student outcomes. *Educational Psychology Review*, 28, 315–352.
- Wang, M. T., & Eccles, J. S. (2012). Social support matters: Longitudinal effects of social support on three dimensions of school engagement from middle to high school. *Child Development*, 83, 877–895.
- Wang, M. T., & Fredricks, J. (2014). The reciprocal links between school engagement and youth problem behavior during adolescence. *Child Development*, 85, 722–737.
- Wang, M. T., Fredricks, J., Ye, F., Hofkens, T., & Linn, J. S. (2017). Conceptualization and assessment of adolescents' engagement and disengagement in school: A multi-dimensional school engagement scale. *European Journal of Psychological Assessment*, 1, 1–15.
- Wang, M. T., & Holcombe, R. (2010). Adolescents' perceptions of classroom environment, school engagement, and academic achievement. *American Educational Research Journal*, 47, 633–662.