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Social network processes and academic functioning

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Conclusion and discussion

Peers seem to play an important role in students' emotional and social functioning, but also in their academic success (e.g., Crosnoe & Brenner, 2015; Ryan, 2001). School well-being, engagement and academic achievement are important to stimulate a positive social and academic development for students, with long-term consequences for their future educational and job opportunities. Students spend much time at school in the classroom context and students' social positions among peers and their academic functioning seem to be related (e.g., Altermatt & Pomerantz, 2003). But under which circumstances do certain peers matter the most?

The overarching aim of this dissertation was to gain new insights in the role of peers in students' academic engagement and achievement by using social network information. More specifically, I addressed to what extent, under which conditions, and in which directions peers can enhance or dampen students' academic functioning. I focused on the roles of primary and secondary school students' positive (e.g., friendships) and negative (e.g., bullying) relationships with classmates, the role of near-seated peers, and the role of peer norms in their school well-being, academic engagement, and academic achievement. Moreover, I examined the interplay between adolescents' and their friends' academic achievement and risk behaviors.

This concluding chapter provides a summary of the main findings, reflects on these findings, and discusses its implications. In the first part, the main findings will be summarized for each reported study in the five empirical chapters. This is followed by a general discussion of the implications of these findings for theory, practice, and future research.

MAIN FINDINGS

Students need to feel embedded in their peer group within the classroom and to have positive interactions and connectedness with peers in order to feel and achieve well (Eisenberg, Neurnark-Sztainer, & Perry, 2003; Ponzo, 2013). However, they can encounter problems within their social network, which can negatively affect their well-being and academic outcomes. In **chapter 2**, I focused on four *negative social positions* among peers for elementary school students, that is, victimization, friendlessness, peer rejection, and a lack of peer popularity. Previous studies already showed that each of these four negative social positions are negatively related to students' school well-being and academic achievement (e.g., Espelage, Sung Hong, Rao, & Low, 2013; LaFontana & Cillessen, 2009; Nakamoto & Schwartz, 2010). This study extended on current knowledge, by examining whether there was a *cumulative negative effect*

of these four negative social positions on students' self-reported academic achievement and school well-being (Study 1), and teacher-reported academic engagement and academic achievement (Study 2). Moreover, I studied whether *specific combinations* of negative peer relations were more negatively related to students' academic outcomes than others.

Mixed models in SPSS were used to analyze multilevel models with fourth to sixth grade elementary school students nested in classrooms (KiVa project). Results showed that each negative social position was uniquely negatively associated with students' academic outcomes. Moreover, the total number of negative social positions was negatively related to students' academic functioning. Results for academic engagement and school well-being were stronger than for academic achievement. Cumulative effects were found for school well-being, with each additive negative social position having stronger effects, and the strongest additive effect of four negative social positions compared to three. Finally, combinations of negative social positions that included victimization were most negatively related to students' academic functioning, followed by friendlessness. Thus, safety and affection seem to be the most basic social needs for students.

These results underscore the importance of students' social connectedness for their academic functioning. This implies that teachers and students should try to stimulate students' embeddedness among peers as much as possible to enhance their school well-being, academic engagement, and in the end their academic achievement. Teachers should not only focus on academic functioning, but should acknowledge that well-being and social relationships are crucial for academic success.

Do some specific close peers in elementary school have a particularly influential role in students' academic engagement and achievement? Teachers make a seating arrangement and in this way they determine which students interact with each other during a school day. The goal of the study in **chapter 3** was to study the importance of elementary school students' *near-seated peers* in their academic engagement and achievement, while taking into account friendship relationships. I focused on students' relationships, behaviors, and proximity to each other and applied stochastic actor-based network-behavior co-evolution models (RSiena).

Results for both academic achievement and academic engagement showed that students and their friends adjusted their behaviors to each other, regardless of their seating. However, students became less similar to near-seated peers who were not friends. The

increasing dissimilarity may imply that students get discouraged when peers who are not friends score better or encouraged when these peers score worse. Unfortunately, it was impossible to gain detailed insights in the directions of influence.

This study contributes to our understanding on the role of physically close peers in the classroom on students' academic development and advances previous studies by using a social network approach. Teachers might benefit from these findings when designing seating arrangements and to monitor ongoing processes, through active awareness of the interplay between students' friendships, their seatings in the classroom, and peer influence processes regarding academic engagement and academic achievement.

When leaving elementary school, students enter a new peer context and have to find their place in this peer group and form new friendships (Witkow & Fuligni, 2010). **Chapter 4** concerned *friendship selection and influence dynamics* in adolescents' academic achievement in the first years of secondary education (i.e., seventh and eighth grade). I studied students' average grades and their grades on different clusters of subjects (i.e., language, exact, and social cluster), as well as differences in directions for low- and high-achieving students.

Data included students who were followed in seventh and eighth grade (SNARE study) and I used longitudinal social network analyses (RSiena). Findings showed developmental differences between the first and second year of secondary education. Whereas selection processes were found in the first year on students' cluster-specific grades, influence processes were found in the second year on both students' average and cluster-specific grades. Thus, students in the first year initially tend to select friends on the basis of similar cluster-based grades, but one year later influence each other. It can be concluded that developmental differences and specific school subjects are important for understanding peer selection and influence processes in adolescents' academic achievement.

Besides the direct effect of friends on adolescents' academic achievement, the aim was to place these peer processes in context, as the broader *peer context* in the classroom might also be related to friendship dynamics regarding academic achievement (Rodkin & Ryan, 2012). Findings on friendship processes regarding academic achievement vary considerably with regard to the strength and direction, so I focused on the peer context in which these processes

take place. In **chapter 5**, I examined academic status norms in friendship selection and influence processes regarding adolescents' academic achievement.

Peer norms for academic achievement can be defined as the extent to which academic achievement is a positively valued characteristic because of its associations with a high social peer status, or instead, a negatively valued characteristic because of its associations with a low social peer status (McCormick & Cappella, 2014). The aim was to examine whether the extent to which academic achievement is positively or negatively salient in a classroom determines the strength and direction of friendship selection and influence processes related to achievement.

Using data from eighth grade students (SNARE project), longitudinal social network analyses (RSiena) indicated that the unpopularity and popularity norm moderate friendship selection processes (but not influence processes) related to academic achievement. The unpopularity norm in the classroom strengthened similarity-based friendship selection among low-achieving adolescents, rather than among high-achieving adolescents. Also, the popularity norm strengthened friendship selection among similar peers, both among low- and high-achievers. Acceptance and rejection norms did not moderate friendship processes. Hence, adolescents generally chose their friends based on similar levels of achievement and were influenced by their friends in academic achievement. Importantly, unpopularity and popularity norms within the classroom explained differences in strength and direction of friendship selection processes (but not of influence processes) for academic achievement, whereas acceptance and rejection norms did not.

Next to the focus on students' academic outcomes in secondary education, as adolescence is a time period in which academic motivation and achievement tend to decline, adolescence is also a sensitive period for the initiation of risk behaviors (Crosnoe & Brenner, 2005; Steinberg, 2007). Therefore, the main purpose of the study in **chapter 6** was to examine the *interplay* between adolescents' and their friends' *academic achievement and risk behaviors* (i.e., delinquency and alcohol use).

Using longitudinal data from seventh, eighth, and ninth grade students (SNARE study), I examined same- and cross-behavior friendship dynamics regarding academic achievement and risk behaviors. Findings indicated same-behavior selection and influence effects for both academic achievement and risk behaviors. Thus, students selected peers as friends with similar

behaviors and friends' behaviors became more similar over time. There were only some inconsistent findings for delinquency, with same-behavior effects in the higher grades but not in seventh grade.

Furthermore, cross-behavior selection effects indicated that risk-behaving students were likely to select low-achieving peers as friends and vice versa in seventh and eighth grade. Cross-behavior influence was found in seventh grade from friends' academic achievement to students' risk behaviors, indicating that having low-achieving friends increased the likelihood to engage in risk behaviors whereas having high-achieving friends might protect against engagement in risk behaviors. Overall, this study showed the importance of investigating the interplay between different behaviors with longitudinal social network analysis. By only focusing on selection and influence processes in one domain, the more complex socializing role of friends across different behaviors remains unclear.

DISCUSSION

The studies in this dissertation show that students' social relationships with peers and their embeddedness in peer networks at school are important for their academic engagement and academic achievement. By fostering positive relationships with peers, students' academic functioning can be enhanced and it is important to take into account developmental differences with regard to peer dynamics.

I take earlier research a step further by using longitudinal social network information to study different types of social networks and various academic and risk behaviors among primary and secondary school students. The focus of the five papers was on three aspects that are central in social network studies, that is, behaviors, relationships, and proximity. I especially examined interactions between these mechanisms to extend on previous studies (Rivera, Soderstrom, & Uzzi, 2010) and in order to study how and when peers matter the most. In this way, I was able to gain new insights into contextual differences in peer dynamics, the timing of peer processes, the interplay between different behaviors, and strengths and directions of selection and influence processes.

I distinguished between *different contexts* in which peer dynamics take place, by not only focusing on friendship networks, but also on the role of near-seated peers, as students mostly have opportunities to see these specific peers and interact with them in the classroom. A new effect has been developed to simultaneously examine a static network in the classroom,

students' near-seated peers as assessed by seating arrangements, and a dynamic network, their friendships as assessed by peer nominations. It turned out that especially friends play an important role in primary school students' academic functioning, but that physical proximity to peers who are not friends can result in stronger motivation or demotivation for school tasks.

Furthermore, I investigated the *timing of peer processes* in students' academic development. In primary education, students follow all school lessons in a fixed seating arrangement with the same peers and teacher. Also, parents and teachers have clear expectations to achieve well and students might be still eager to meet adults' norms. In contrast, in secondary education, adolescents spend more time with peers and attempt to explore their position within the peer group and try to find acceptance and support from them (Witkow & Fuligni, 2010). This might result in different peer processes between primary and secondary education.

Results showed that peers already play an important role in students' school well-being and engagement in primary school, but I found that they matter less for their academic achievement. The more negative social positions students have within their peer group, by being victimized, having no friends, being rejected or lacking popularity, the less engaged they are for school and the lower their school well-being. Regarding embeddedness, especially victimization can have negative consequences as well as having no friends, which both touch upon students' affection goals. Friends turned out to become more similar on their academic engagement (regardless of their seating) and to a lesser extent also their academic achievement. Overall, my studies provided insights in both positive and negative relationships with peers and the importance of positive social positions in a peer network. Thus, students' social positions in their peer network already seem important for their academic development in primary education.

In secondary education, I found timing differences between the first and second year with regard to friendship processes in academic achievement, stressing the importance to take into account developmental differences when studying adolescents. In the first year (i.e., seventh grade) students have to find their social position within a new peer context and they seem to select peers as friends based on similar interests, as they show similarity in cluster-specific grades. Students tended to become more similar to each other in their average grades in the second year of education (i.e., eighth grade). In this school year they already knew their peers better, which might thus be a necessary condition to be susceptible to their behaviors.

This timing effect may also be explained by an adolescent being influenced by pro-school behaviors of friends in an early stage, but that it takes some time to really improve school grades. Whereas it is relatively easy to become more motivated for certain school tasks and also to work harder, it is much more difficult to actually get higher grades. Overall, timing differences in selection and influence processes have thus been found, with differences across school subjects and school years.

I also studied the *interplay between different behaviors*, by examining selection and influence dynamics between adolescents' and their friends' academic achievement and risk behaviors. Adolescence is namely a time period in which risk behaviors, such as delinquency and alcohol use, become more common and normative. A new effect has been developed to study these cross-behavior effects next to same-behavior effects to provide unique insights in the complex nature of students' behaviors and relationships. My results showed that adolescents who engage in risk behaviors often have a lower academic achievement than adolescents who do not engage in risk behaviors. Especially in the first year of secondary education, compared to the second and third year, having high-achieving friends can protect against engagement in risk behaviors whereas having low-achieving friends increases chances to engage in risk behaviors. In this school year, risk-behaving students were particularly likely to select low-achieving peers as friends and vice versa, whereas this distinctive cross-behavior selection was less clear-cut in the second and third year. Hence, the interplay between adolescents' and their friends' risk behaviors and academic achievement was especially found at a young age, during which alcohol use is less normative.

Another innovative aspect of this dissertation was to examine the *strength and direction* of selection and influence processes. Similarity in academic achievement seemed to facilitate friendships for both low-achieving and high-achieving students, but especially high-achieving students avoided friendships with low-achieving peers. Influence processes by friends were mainly in an upwards direction, in the sense that students got higher grades when having high-achieving friends. This might be due to information sharing and motivating each other for involvement in school (Crosnoe et al., 2003). These findings regarding the strength and direction of selection and influence processes can have negative consequences for students' academic achievement. Low-achieving students might underachieve by having similarly low-achieving friends and in this way have limited possibilities to be positively influenced by friends.

Therefore, it seems important to stimulate and facilitate contact between low- and high-achieving students.

Next to the direct relationships with friends, adolescents are also part of a broader peer group within their classroom. Previous studies have found inconsistent results regarding the strength and direction of friendship processes in academic achievement, both within and across studies. I examined whether these strengths and directions depend on peer norms in the classroom, that is, the extent to which academic achievement is related to a high or low social peer status in a classroom (reputational salience hypothesis; Hartup, 1996). Although peer norms did not play a role in the strength and direction of friendship influence processes, selection effects partly depended on peer norms.

Differences in the strength and direction of friendship selection processes regarding academic achievement were found with regard to the unpopularity and popularity norms within the classrooms. More specifically, when popular students in a classroom had a high academic achievement, both high- and low-achieving adolescents were most likely to select each other based on similarity in academic achievement. At the same time, in classrooms where unpopular adolescents had a high academic achievement, adolescents were more likely to select each other based on similarity in low but not in high achievement. This selection of similar friends limits opportunities for low-achieving adolescents to learn from higher achieving peers. When taking into account the influence effects in every classroom, this may result in a process where similarly low-achieving friends influence each other towards even lower levels of achievement, particularly in classrooms with a high unpopularity norm for achievement. This would be a negative vicious cycle for low-achieving students and might lead to a process of polarization with increasing differences between low- and high-achieving students. High-achieving students would get even more motivated and better grades over time whereas low-achieving students show even less motivation and get worse grades.

FUTURE DIRECTIONS

Based on this dissertation's new insights into the role of within-school peers in students' academic functioning, I will specify several directions for future studies. Generally, more research should be conducted to examine in more detail the role of various contextual factors in students' academic functioning, next to individual cognitive differences. This will lead to more knowledge on how and why students perform at a certain level and which circumstances and conditions influence academic functioning.

Knowledge on interactions between students' social networks, both within and outside the school context, should be extended. For example, next to classmates, students' teachers, friends outside school (e.g., from leisure time activities), parents, and other family members can influence students' engagement and achievement (Farmer, Mcauliffe, & Hamm, 2011). It is crucial to study an individual within its broader social context, as some people in students' social networks might actively stimulate pro-school behaviors and for example help with school-related issues such as homework assignments and questions, whereas others might devalue school and rather focus on leisure activities and in this way may demotivate students, resulting in underachievement. Hence, a deeper understanding is needed on the interplay between a students' behaviors and behaviors by others in their social contexts.

Moreover, much research has focused on the role of friends in students' behaviors, as friends are important for students and students spend much time with them, especially in early adolescence. By asking students to nominate peers as friends, students' friendship networks are assessed and how these relationships change over time. These networks are linked to changing behaviors during a school year or across school years in order to examine the interplay between students' and their friends' changing behaviors. In this way, two main processes that lead to similarity between peers can be distinguished: whether students select similar peers as friends and whether students behaviors become more similar to the average behavior of friends (Veenstra, Dijkstra, & Kreager, 2018).

However, new longitudinal projects might add a more direct and deeper perspective on these processes by asking students more detailed questions. The underlying assumption of current models is that all friendships are equally important, whereas there might be differences in the quality of friendship, the type of friendships, and students' perceptions on their and their friends' behaviors.

First, students can be asked to distinguish between the peers they nominate as friends in the quality of these friendships. Students might have closer relationships and more interactions with some friends than with others. The quality of a friendship can be directly asked to a student or it can be observed. Proximity between peers can also be measured differently than by using self-report data. Recent developments make it possible to examine contact between peers more directly. Innovative technologies via Bluetooth beacons can now automatically assess physical proximity between people and thus measure social contact (Waber, Olguin, Kim, & Pentland, 2008). Using this recently developed wearable device, more knowledge can be gained on the importance of social contact characteristics in predicting students' behaviors, such as contact duration between peers, the frequency, and diversity of contact.

Second, the type of friendships might be different between friends, with particular domains being more salient within one friendship than within another friendship. Whereas students might turn to specific friends for school-related questions or study together with some friends, they might spend their social time or play sports more regularly with other friends. In future studies, students can be asked follow-up questions for each nominated friend with regard to the frequency and type of interactions with that specific friend. Also, it can for instance be asked which peers students turn to when they have a new school grade. In this way, selection and influence effects regarding specific behaviors can be more directly related to the friends with whom students actually share these interests or behaviors. For example, when examining influence effects in academic behaviors, it can particularly be examined for students' friends with whom they actively engage in school-related tasks.

In some recent studies, a first step has been made to examine students' helping networks next to their friendship relationships (Van Rijsewijk, Dijkstra, Pattiselanno, Steglich, & Veenstra, 2016). A general question has been posed about which peers help with problems (e.g., with homework, with repairing a flat tire, or when you are feeling down). A next step would be to specify more specific questions on helping behaviors by certain peers, for instance by asking per indicated friendships whether they 'help each other with homework', 'engage in sport activities together', and so on.

Third, students can be explicitly asked about their perceptions on their own behaviors and the behaviors of their friends. How do students for example perceive their own academic motivation and grades? And how do they evaluate these behaviors in comparison to the

motivation and grades of their friends and other peers? The accuracy of these ideas can be assessed by matching it to teacher-reported behaviors and school report cards. Some students might think it is cool to tell their friends that they did not spend any time on homework whereas they actually did. By assessing students' perceptions more directly, the relation between actual versus perceived behaviors can be examined more specifically.

Fourth, students can be directly asked about their perceptions on friendship selection and influence processes as well. Why did they become friends with specific peers? Is this related to certain characteristics or behaviors by these peers? Additionally, students can be asked about changes in their own and their friends' behaviors and to what extent they think their friends play a role in their development.

This more specific knowledge on the type of interactions and quality of relationships with friends can lead to another perspective on ongoing processes. As an addition to current simulation models that can provide interesting insights and take the average behavior of all friends, the more specific perceptions by students themselves and differences across friendships can also be taken into account when studying the role of peers in their behaviors.

Future studies are also encouraged to study the role of different types of static and dynamic networks on students' behaviors more extensively, as newly implemented effects in social network analyses now also provide possibilities to examine different (types of) networks simultaneously. Students' relationships, behaviors, and proximity can be assessed more directly, for example by examining the overlap in friendship and physical proximity networks and how these relate to students' (academic) behaviors. Especially with regard to near-seated peers, more research is needed.

For instance, teachers can be explicitly asked about their goals for specific groups of students in the classrooms and social network analyses can show whether goals are met. If a teacher wants to increase a student's academic motivation for school work by surrounding this student with motivated peers, analyses can show whether these near-seated peers indeed positively influenced that student. Moreover, future research can focus on specific characteristics of the seating arrangement, such as differences between classroom layouts (rows and groups), differences in sizes between subgroups in the classroom and the actual frequency of contact between a student and all his groupmates.

Also, recent advances in social network analyses allow for exploring the interplay between different behaviors by examining cross-behavior effects between students and their

peers. Instead of focusing on one single behavior, it is now possible to take the complexity of several interacting behaviors into account. Next to studying cross-behavior selection and influence effects, it would also be interesting to examine common underlying mechanisms by including mediating effects. For instance, self-control might both influence adolescents' academic achievement and engagement in risk behaviors (Tangney, Baumeister, & Boone, 2004).

Another avenue for future studies would be to focus more on gender differences in friendship processes. Friendships are mostly same-gender and friendships between boys and girls differ across several aspects. Among girls, there is for instance stronger emotional closeness than among boys, there are more dyadic interactions, there is more focus on fitting into their social context and there is more cooperation and they more often work together on school-related tasks (Rose and Rudolph, 2006). Only a few studies so far have focused on differences in strengths of selection and influence processes between boys and girls. Recently, strong selection effects regarding academic achievement were found for girls but there was no friendship selection among boys and similar influence effects for boys and girls (Kretschmer, Leszczensky, & Pink, 2018). Therefore, it seems important to study gender-specific network behavior in academic functioning and explicitly test mechanisms that can play a role in differences between boys and girls.

Additionally, it would be interesting to follow students from elementary school until they enter the job market and in this way to map students' individual school trajectories. This would result in knowledge on which circumstances and individual and contextual factors affect whether some students perform as expected, underperform, or perform better than expected. However, it is difficult to use social network information across such a long time period, as the peer group differs across and within schools but also outside school over the years.

A final and probably essential direction for future research is to examine the mechanisms behind peer selection and influence processes in behaviors and how actions by for example teachers and parents or interventions can enhance students' academic development. I encourage researchers to test underlying theories, for example by observing students' interactions and behaviors, to get more insight in the possible causes of specific peer processes.

CONCLUDING WORDS

Overall, this dissertation provides several new and interesting insights in the interaction between students' social relationships with peers and their academic functioning. It extends knowledge regarding the circumstances under which peers play a role in students' academic functioning. Peers seem to matter for students' academic functioning in both elementary and secondary education, with stronger effects on students' academic engagement and well-being than their academic achievement. It is important that students are well-embedded in their peer network, with positive social positions in order to feel good and achieve well. Moreover, it seems meaningful to distinguish between different social contexts, to take into account timing differences in peer processes, as well as differences in strength and directions of friendship selection and influence processes in academic functioning.

Future studies can increase our understanding on social network processes in students' academic functioning by gathering more specific data on their social relationships and by using recent developments in social network analyses to analyze their complex social networks and behaviors.