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SOCIAL DEVELOPMENT AND GROUP PROCESSES

A social network application to bullying and network interventions

Gijs Huitsing, Jan K. Dijkstra, and René Veenstra

Youth spend a large part of their time in classrooms and schools, which form therefore an important environment for youth's social development. Especially relationships with peers are of great importance. Important questions are therefore how do relationships between students emerge? Who is connected to whom? Who is attractive for affiliation? Why are some youth bullied? And how does behavior affect the establishment of relations among students, or how do relations with peers affect students' behavior?

For understanding the role of peers in youth's development, this chapter introduces a social network approach to the study of the dynamics of peer relationships. Crucial is the usage of longitudinal data to assess the development of relationships and behavior simultaneously over time. Bidirectional influences between behavior and networks form theoretically the foundation of social development, and it is important to investigate these processes bidirectionally. This means that it is necessary to investigate to what extent friends have a role in the development of behavior (influence), as well as to what extent behavior affects the development of relationships (selection). Longitudinal network analysis provides a unique approach to map such bidirectional influences, and thus allows us to gain insight into the complexities of social development. Because both selection and influence result in similarity between affiliated persons, a longitudinal network approach is needed to investigate which of these mechanisms account for this similarity. The bidirectionality, the focus on interacting networks, and the repeated assessment (iterativity) are clear characteristics of a dynamic systems approach. Social network analysis tests the interdependence of behavior and the context, which constitutes here relationships. Individual-based (micro-level) decisions lead to a (unintended) structure of relationships at the group (macro level), which, in turn, affects individual-based decisions. As such, there is a process of self-organization in which network structures determine to some extent the behavioral choices individuals can make.

This chapter describes how and why (longitudinal) social network information is valuable for understanding youth's social development. The networks discussed are about positive relationships (such as friendships, helping behaviors) and negative relationships (such as disliking, bully–victim relationships). First, we describe how social network information is valuable for understanding the classroom position of students, for example, the number of friends they have, or how well liked or popular they are. With social network information a complete network can be examined, because it contains information on all relationships in a classroom (but also outside it, such as a school grade or an entire school). This allows the investigation of who is friends with whom, who dislikes whom, or who is being bullied by whom. Second, we describe the method of longitudinal social network analysis and the data requirements for analyzing the dynamics in peer relationships. Longitudinal social network analysis is vital to disentangle selection and influence processes in relationships and behavior. The simultaneous investigation of the dynamics of networks and behavior allows deeper understanding of the complexity of peer processes in youth's social development. Third, we discuss social network research on a specific type of peer relationship: bullying and its associated group processes. This requires the simultaneous investigation of positive (defending) and negative (bullying) relationships. Finally, we discuss the potential of social network insights for developing interventions. The outcomes of research with a social network perspective on peer relations can form the basis for both general network interventions as well as specific advice for single classrooms.

A social network approach to social development

Peers play an important role in youth's social development. To understand the role of peers, we discuss two aspects of peer dynamics. First, we focus on students' social success among peers, referring to the position of students within the peer group. Second, we elaborate on the interplay between peer relations and behaviors, covering selection and influence processes.

Social success and social network position

Social success is an important human goal (Lindenberg, 2013). Specifically, social status is an important component of social success (see for example Barkow, 1989; Huberman et al., 2004). Social status is the relative position a person has in a group, and therefore, the increase of status of one person in a group is at the expense of the status of another group member. In peer research, social status is often measured with perceived popularity. Students who are perceived as popular are socially dominant and others want to be associated with them. Popular students often achieve their social position through the combination of both prosocial and antisocial relationships (Dijkstra et al., 2009; Hawley, 1999). Because popular students also use aggressive behavior to achieve their goals, they are not necessarily well liked (i.e., accepted) by their peers, and have an ambiguous position in the

peer group. There are indications that in the long term popular students may be at risk for adverse outcomes. For example, popular students often have conflicts in their relationships and score higher on substance abuse and criminal behavior (Allen et al., 2014).

Next to social status, affection is an important social goal (e.g., Buhrmester, 1990; Bukowski et al., 2009). Affection concerns warm and close relationships that humans aim for with others, such as friends. Contrary to the competitive nature of social status, affection is primarily about good relationships with others, where the formation of a friendship with one person will not be at the expense of friendships with others. Affection is often measured by students' levels of acceptance (i.e., being liked) or their number of friendships. Accepted students often show prosocial or helping behavior, whereas rejected students are often characterized by aggressive behavior and lack of helping or prosocial behavior.

Youth differ in the degree to which they pursue social status and affection. For some it is more important to be popular, but others attach more value to friendships (Rudolph et al., 2011). Social network information can play a crucial role in understanding students' social success (i.e., social status and affection) by obtaining their network position among peers in, for instance, classrooms or schools.

The interplay between peer relationships and behavior

Next to identifying students' position in the peer group, network questions can be used to gain insight into who students associate with. Information about students' connections in combination with their behaviors allows for understanding how both mutually influence each other. An important and common phenomenon is that individuals are inclined to associate with people who are similar to them (McPherson et al., 2001). There are three explanations for the emergence of this similarity principle: selection, influence, and opportunity.

First, people form friendships on the basis of selecting similar others, which can already be found in classical sociological studies (Homans, 1961; Lazarsfeld & Merton, 1954). People select similar others as friends because agreement in shared behavior, characteristics, or beliefs facilitates understanding, makes communication easier, and contributes to faith in each other (Byrne, 1971). Similarity between friends is therefore an important basis for initiating or maintaining friendships.

Second, similarity can be the result of influence or socialization processes in which individuals adopt behaviors of others in their network. Influence processes involve the tendency of people to become more similar in behavior. The importance of social relations as a socialization factor can also be traced back to classical sociological work (Durkheim, 1897); social norms influence all forms of behavior and participation in social groups enforces that members adhere to the social norms.

Third, also the availability of persons as potential friends determines friendship selection, and subsequently, influence processes. There must be an opportunity to meet each other. That is, the composition of the peer group determines opportunities

for initiating relationships (Blau, 1977; George & Hartman, 1996). Certainly in secondary schools, there is a great degree of homogeneity between students. Students from the same school often resemble each other in terms of intelligence, socioeconomic status, and ethnicity. The homogeneous composition of students in schools increases the chance of associating with similar others (Frankenberg & Orfield, 2012). Such social settings structure people's interactions and increase the likelihood of similarity in behavior (Feld, 1981). In other words, similarity in behavior can be the result of opportunity structures to encounter similar others, also known as "propinquity" (Osgood & Andersen, 2004).

These three mechanisms can lead to similarity in relationships and behavior. When interventions aim to address problem behaviors, or when parents, teachers, or students want to change behavior, it is important to know which mechanism drives the development of behavior. The investigation of these interwoven social processes puts a high demand on the research design and associated methodology. Network analysis is particularly suitable to untangle these interwoven processes by studying the development of relationships and behaviors over time.

Investigating the dynamics of networks

Social networks are representations of relations between actors (see for introductory handbooks: Carrington et al., 2005; Wasserman & Faust, 1994). An important feature of social networks is that actors and their relations are interdependent, rather than autonomous. Actors within a network interact with each other, which in turn influences their relationships as well as their behaviors. The investigation of these interwoven network-behavior dynamics requires the use of specific longitudinal network data that needs to be analyzed by longitudinal social network analysis.

Data requirements for longitudinal social network analysis

The investigation of selection and influence processes, while accounting for opportunity structures, requires first of all the use of longitudinal data. With cross-sectional data it can only be determined to what extent students are similar to each other, but it would not be possible to distinguish selection from influence effects. With longitudinal data it can be examined whether similarity in behavior occurs because students who already had similar characteristics became friends with each other (selection) or that friends became more similar in their behavior over time (influence).

In addition, it is necessary for all students in the network to report on their own behavior. Students often know best in what way and how often they exhibit specific behavior. This sounds obvious, but in many studies behavior of friends is measured by asking respondents to report on their friends' behavior. However, this approach leads to more similarity in behavior compared with the situation when all persons in the network report independently about their own behavior. Friends

estimate each other as more similar than they really are, which is also known as assumed similarity or false consensus bias (bias because of projection of their own behavior onto their friends). Rectifying this bias requires objective behavioral measures provided by peers themselves.

Next to students' reports on their own behavior, it is also important that they report on their own relationships. Network questions on friendships ("Who are your best friends?") or bullying ("By whom are you victimized?") provide students' own perspective on the relations they have with the others in the classroom (or school), and together they provide information on all the relations in a classroom. These network questions are in contrast to reputational peer nominations that are often used in peer research, in which students are asked, for example, "Which classmates are popular?" or "Which classmates bully others?" Such peer nominations provide insights into the perceived behavior of students, but a disadvantage is that no information is acquired about the relational nature. For example, when students are nominated as bullies, it is not known which and how many classmates they bully.

Furthermore, it is necessary to take structural network processes into account. For example, one-sided friendships often become mutual. This is the principle of reciprocity. Friendships are also more often established between people who already share a mutual friend (Davis, 1970). This is the principle of transitivity: a friend of a friend is also my friend. Taking into account structural network effects avoids the overestimation of the effects of behaviors on formation of relations (selection effects) (Steglich et al., 2010). For instance, if two students who both smoke share a friend, the establishment of a friendship between both smokers could erroneously be attributed to their smoking behavior instead of the fact that they share a same friend (transitivity). Finally, to obtain an accurate impression of the relationships and behaviors within the network, it is important to use complete networks. This means that information about relationships and behavior is obtained by all members of the network under study, such as a classroom.

RSiena for longitudinal social network analysis

The required longitudinal, self-reported network data can be analyzed with stochastic actor-based models, incorporated in the RSiena program (Ripley et al., 2016; Snijders et al., 2010). The RSiena program (Simulation Investigation for Empirical Network Analysis, in the R-package) simultaneously models changes in relationships and behavior over time. This allows to assess the effect of behavior on the formation of relationships (selection effects) and the effect of behavior of affiliated peers on individual behavior (influence effects), while controlling for structural network effects (e.g., reciprocity and transitivity) and behavioral tendencies (for example, the tendency of actors in the network to regress to the mean or to polarize in behavior, see Figure 12.1). For instance with regard to smoking, it is possible to examine whether smokers select each other as friends or that friends influence students' smoking behaviors. At the same time, structural network effects

FIGURE 12.1 Schematic overview of testing selection and influence effects in longitudinal social network analysis. The solid lines indicate that the behavior of individuals influences changes in relationships over time (selection) and that relationships influence changes in individual behavior over time (influence). The dotted lines indicate that selection and influence effects are estimated under control for endogenous network effects (e.g., reciprocity and transitivity) and endogenous behavioral tendencies (e.g., the tendency to shift to the average or the tendency that polarization occurs in behavior).

are controlled for that partially explain the formation of friendships (e.g., reciprocity, transitivity), whereas behavioral tendencies are modeled to assess the likelihood of change in behavior (i.e., either to the mean or the extremes of the scale). The latter is often the case with smoking; people do not smoke or smoke regularly whereas occasionally smoking is relatively rare.

Longitudinal social network analysis allows to separate selection and influence processes by estimating how both processes contribute to the observed similarity among connected students (Veenstra & Steglich, 2012). Many social network studies using stochastic actor-based models have separated selection and influence processes, for example, for school performance, substance use (alcohol, tobacco, drugs), internalizing problems (anxiety, depression, loneliness), and externalizing problems (aggression, delinquency), of which an overview can be found elsewhere (Veenstra et al., 2018; Veenstra et al., 2013). Many of these behaviors can be seen as individual characteristics. For example, substance abuse or having internalizing problems can occur in the absence of others. Some behaviors, however, have

a relational nature and cannot be understood properly without investigating the direction of action. An example of behavior with a clearly relational nature is bullying, of which we will discuss network research in more detail in the next section.

Bullying, victimization, and social networks

Bullying can be defined as systematic, abusive, and goal-directed behavior characterized by an imbalance of power between bullies and victims (Olweus, 1993; Volk et al., 2014). Bullying is a complex phenomenon that takes place in a broader context. Bullying occurs by nature at the level of relationships, where a bully targets one or more specific victims. Moreover, bullies and victims are embedded in a larger peer group, where other students, albeit not directly involved, influence the bullying process (Salmivalli, 2010); they assist or reinforce bullies, defend victims, or observe the situation, but remain silent. Hence, bullying is in essence a group process, in which influence and selection play an important role. Investigations into bullying should account for these processes.

Dynamics in bullying networks

Recently, several studies were published about selection and influence processes regarding bullying and victimization. For victimization in general, it appeared that victims tended to select each other as friends, but, at the same time, friends of victims also ran the risk of becoming victimized (Lodder et al., 2016). Zooming in on specific forms of victimization and bullying, one study documented that victims of physical victimization tended to form friendships with each other over time (selection), whereas the severity of physical victimization was not influenced by their friends' level of victimization (Sentse et al., 2013). For relational victimization, such as being the target of gossiping, however, the researchers found an influence effect: when students had friends who experienced gossiping or rumor spreading, it was also more likely that these students became relational victims. Another study documented influence processes for both physical and relational victimization, but found selection effects (becoming friends) only for relational victimization, and de-selection effects (breaking a relationship) for physical victimization (Sijtsema et al., 2013). Selection effects in friendship networks were also found for bullying, showing that bullies were likely to become friends (Sentse et al., 2014; Sijtsema et al., 2014). Another study found influence processes to account for students' similarity in moral disengagement, but no further moderating effects of bullying (Caravita et al., 2014). A limitation of these studies was, however, that bullying and victimization were considered as individual characteristics, omitting relational information about bullying.

The relational perspective on bullying relationships was addressed in a series of other studies. In these studies, bullying was investigated by the question "By whom are you victimized?" (Rodkin et al., 2014; Veenstra et al., 2007). Bullying relationships were investigated together with positive relationships, such as general liking

or defending relationships (Huitsing & Monks, 2018; Huitsing & Veenstra, 2012; Huitsing et al., 2012). These studies generally found that students with a similar position in the bullying network (being a bully or a victim) tended to form a positive relation more often. For example, victims who were victimized by the same bullies were more likely to defend each other (see part C of Figure 12.2). This also applied to bullies; when bullies targeted the same students, these bullies also had a larger tendency to defend each other (see part C of Figure 12.3). A limitation of these studies is, however, that their cross-sectional nature did not allow statements about the networks dynamics.

This problem was solved in a longitudinal social network study using RSiena to investigate simultaneously the development of bullying/victimization and defending relationships (Huitsing et al., 2014). That longitudinal study found that defending between victims originated both from victims seeking support for protection

FIGURE 12.2 Defending between *victims* sharing the same bullies (box C), originating from the *social support hypothesis* (box A) or the *retaliation hypothesis* (box B). Bullying relationships have a straight line (“By whom are you victimized?”), with victims nominating bullies, defending relationships have a dotted line (“Who defends you when you are victimized?”), with victims nominating defenders.

against bullies (*social support hypothesis*, Figure 12.2: $A \rightarrow C$) and defenders of victims running the risk to become victimized by the bully of the defended victims (*retaliation hypothesis*, Figure 12.2: $B \rightarrow C$). Defending between bullies originated both from bullies seeking other bullies to collectively target victims (*defending among bullies hypothesis*, Figure 12.3: $A \rightarrow C$) and defenders of bullies who first assisted bullies, but then turned their aggression also to the victims (*initiating bullying hypothesis*, Figure 12.3: $B \rightarrow C$). Other studies on negative relations (general dislike: “Who do you dislike?”) found that, over time, friends had a tendency to agree about who they dislike (Berger & Dijkstra, 2013; Pál et al., 2016; Rambaran et al., 2015). Recent developments focus on additional individual characteristics that may influence positive relationships between victims and between bullies. An example is gender, where the threat of bullying might lead victims to cross gender boundaries in friendship networks (Hooijsma et al., 2018). These developments

FIGURE 12.3 Defending between *bullies* targeting the same victims (box C), originating from the *defending among bullies hypothesis* (box A) or the *initiating bullying hypothesis* (box B). Bullying relationships have a straight line (“By whom are you victimized?”), with victims nominating bullies, defending relationships have a dotted line (“Who defends you when you are victimized?”), with victims nominating defenders.

on the investigation of multiple networks are important to gain new insights into the mechanisms underlying bullying.

Descriptive insights of bullying networks

Social network information can also be used for a descriptive network analysis of classrooms. Figure 12.4 provides an example. Students were first asked to mention their best friends. A solid line is drawn in in Figure 12.4 when two students mention each other as friends (reciprocal nominations). It becomes clear that there are several friendship groups in this classroom; these are circled. The group of Ezra, Atticus, Felix, and Jack is an example of a group of boys (top left of the network).

The students were also asked: “By whom are you victimized?” The network for initiating bullying is shown in Figure 12.4 with dashed lines. For example, Jack sends a bullying nomination to Daniel; the arrow goes from Jack as victim to Daniel as his bully. Figure 12.4 shows that Jason, Daniel, and Liam are mentioned by several classmates as their bully, whereas Henri and Eli are both mentioned

FIGURE 12.4 Graphical representation of a friendship and bullying network of a classroom with 23 students. Solid lines represent mutual friendship relationships, the dashed lines represent bullying relationships where the senders mention receivers as their bullies. The lines show subgroups of friends. Boys are gray, girls are black. Self-reported victims are indicated with a square.

once (by Alex). In a comparable way, the students were questioned about assistants and reinforcers of the bullies by asking them who usually joins in the bullying when they are victimized (these lines cannot be seen in the network). Also for this question, the students mention Daniel, Liam, Henry, and Eli. These students can therefore be seen as assistants of bullies, in addition to their bullying roles.

Finally, the students were asked: “Which classmates are popular?” For this question the four bullies and followers (Joel, Fabian, Kyan, Julius) were mentioned, plus a group of girls (Emma, Thea, Claire, Alicia – on the left-hand side in Figure 12.4). The knowledge about the friendship network, bullying relationships, and students’ social status provides insights into youth’s relationships and generates new ideas on how bullying problems can be solved in a group.

The combination of these relationships shows that some roles are related. Bullies as well as victims (see the group of Miles, Rose, Ivy, and Ales) are often part of the same subgroup (Huitsing & Veenstra, 2012). This indicates that in-group and out-group processes can help to explain bullying (Tajfel & Turner, 1979): students have preferences for members of their own group (e.g., friendships, defending) and an aversive stance to students of other groups (e.g, bullying, disliking; Gini, 2007; Ojala & Nesdale, 2004). This also helps to understand why students are mentioned for different and sometimes conflicting behaviors, for example for both bullying and defending.

The network information also offers solutions for this classroom. A number of students have an interest in showing their disapproval of bullying. Felix and Jack, for example, are being bullied by Jason and Daniel. Their group (together with Ezra and Atticus) can show a clear anti-bullying signal, for example by clearly disapproving the bullying. Alicia, a popular girl, also suffers from the bullies. The other popular girls are not involved in bullying and they can become defenders of Alicia, which makes it increasingly unattractive for the bullies to continue as the bullies run the risk of losing good relationships with the popular girls. Popular students determine to a large extent what behavior is accepted in the classroom (Dijkstra et al., 2008); if they act against bullying, bullies would receive more disapproval from the group, which will motivate them to stop bullying.

Toward network interventions

Increased understanding of group processes and social mechanisms about the development of relationships and behaviors can provide guidelines for the development of interventions. It makes a difference if selection processes, influence processes, or both play a role in the development of behavior. For example, smoking similarity for students younger than 15 years is more driven by an influence process in which students imitate their peers than by selection processes in which smoking students select each other as friends (Delay et al., 2013). Interventions that aim to reduce smoking through targeting influence processes may therefore be most effective with younger children.

Furthermore, social network information can be used to formulate advice for individual groups, such as classrooms (Hamm et al., 2011; Huitsing & Veenstra, 2012). With advice on the network structure, teachers can gain insight into the social climate of the classroom. Such network advice can help to understand group processes in bullying and the conditions under which the group fails to prevent bullying. It also helps to detect students who are at risk for a problematic development because of their marginalized network position. It can also identify potentially important students who might function as role models for changing negative classroom dynamics.

In the future, new developments are expected in the field of specific network interventions (Valente, 2012). The peer context has great potential for interventions (Gest et al., 2011; Rulison et al., 2015). The power of peers is used in peer-based interventions, which consist of an umbrella of approaches (e.g., peer support, peer leadership, peer-group programs). Social network analysis can strengthen these interventions, because in theory, interventions do not have to be targeted at all group members, but can be directed toward specific students with the most influential network position (Paluck et al., 2016; Steglich et al., 2012). Also the evaluation of interventions may benefit from the network perspective, because it can be investigated if and how changes in relationships explain the intervention's effectiveness.

Network interventions can be applied at different levels (Valente, 2012). The first is the individual level, by identifying individuals with a central or influential position in the network. The second is the identification of groups, for example, groups with popular students or groups with many connections. Third, relationships between individuals could be activated. For example, a relationship between two students without friends and who, according to the network information, would like each other. Fourth, strategies can be developed to change the network as a whole, for example, by adding or removing actors or relationships. These theoretical insights on network interventions may in the coming years be translated in research that will stimulate novel approaches in research on understanding youth's social development.

Conclusion

Research on social networks has shown the importance of the social network position for students' social status and has tested long-held claims of selection and influence processes and opportunity structures. Furthermore, multiplex network analysis involving the investigation of several networks simultaneously allows understanding of the complex interdependencies between multiple positive and negative relationships. Disentangling of selection and influence processes and investigating the simultaneous development of multiple relationships requires the use of longitudinal data on both relationships and behavior. The power of peers is further used in peer-based interventions (e.g., in anti-bullying programs focusing on peer support or the peer group). Future research should examine if social

network processes such as selection and influence can be the target of interventions. Social network insights may benefit research into the effectiveness of peer-based interventions because it can investigate detailed relational processes.

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