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Transformations in Adolescent Peer Networks

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Transformations in peer networks concern the dynamics of both the network and behaviors. Beginning in early childhood, children sort themselves nonrandomly into friendships, selecting peers who are similar to themselves in important ways. In turn, the processes of creating and keeping friendships influence the behavior and attitudes of individuals. Thus, the interplay between dynamics in behaviors and networks is captured by two distinct processes: (1) selection processes and (2) influence processes.

Selection processes comprise the formation and dissolution of relationships and, thus, changes in the network. The best-known example of a selection process may be the assortative pairing process: the formation of a relationship based on the similarity of two individuals (McPherson, Smith-Lovin, & Cook, 2001), also known as preferential attraction.

Influence processes refer to the observation that individuals change their behavior or attitudes in accordance with the peers they affiliate with. A prominent example is the assimilation process, by which socially connected individuals become increasingly similar over time (Friedkin, 1998). Because assortative pairing and assimilation result in the same empirical phenomenon (similarity of connected individuals), developmental

researchers have known for a long time that the study of influence requires consideration of selection and that the study of selection requires consideration of influence (Billy & Udry, 1985; Cohen, 1977; Ennett & Bauman, 1994; Kandel, 1978).

In this chapter, we discuss the importance of social networks for understanding selection and influence processes in behaviors. If selection results in similarity, it suggests that behavior remains similar but relationships change. By contrast, influence processes suggest that relations remain stable but behavior changes. The sequence of changes in the network and in the behavior, reacting on each other, generates a mutual dependence between the network dynamics and the behavior dynamics. It is thus necessary to examine behavior and network dynamics simultaneously. For that reason, we focus in this chapter on research into selection and influence as joint or co-occurring processes.

◆ THEORETICAL OVERVIEW

Selection and Influence Processes

The idea that people acquire friends on the basis of preexisting similarities can be traced back to the work of Lazarsfeld and Merton (1954) and Homans (1961), among others. People select similar others because those who are similar in behaviors, characteristics, and attitudes understand each other better. The similarity-attraction theory (Byrne, 1971) states that similarity increases trustworthiness and predictability, enabling individuals to communicate with less effort and with shared feelings of understanding and belongingness, which makes these relationships more rewarding and stable. This increased predictability and these positive feelings are suggested to enhance selection of similar friends and reduce conflicts. In addition to providing a basis for mutual approval, shared characteristics provide a source of validation for development and reinforcement of social identity (Hallinan, 1980).

The selection of peers is not only steered by preferences but also depends upon the social composition of the pool of available others (Blau, 1977; George & Hartman, 1996; Verbrugge, 1977). The composition of such a pool structures and restricts choices among possible friends. For instance, within a school, the network members tend to have much more in common, such as socioeconomic status, ethnicity, or intelligence, than

in society at large. As schools tend to be more homogenous in composition, the chances of meeting and affiliating with similar peers are considerably higher than in places where people have distinct backgrounds. Feld (1982) has noted that social settings that structure a person's actions and interactions increase the likelihood of similarity in behavior. Thus, similarity may be a result of the opportunity to meet similar others, also called propinquity (see also Osgood & Anderson, 2004).

Opportunities for affiliation also have an impact on the idea that similarity between actors in networks is due to influence processes in which actors adopt behaviors and attitudes of their peers in the network. The importance of social relationships as socializing agents can be traced back to Durkheim (1897). He argued that all types of behavior are influenced by social norms and that norm conformity is enforced through membership and integration in social groups. Thus, similarity may be a result of influence or socialization, referring to the tendency of individuals to grow more similar to one another in response to behaviors or attitudes of others in the network.

Shortcomings of Most Studies on Selection and Influence

A large number of studies have documented substantial similarity between adolescents' behavioral repertoires and those of their friends. However, most research initially relied on cross-sectional data, which did not allow researchers to disentangle selection from influence effects. These processes can only be untangled using longitudinal data that allow researchers to examine whether similarity results from a mutual selection process based on preexisting similarity or an influence process in which already connected individuals become more similar. Another limitation of both cross-sectional and longitudinal studies has been that the assessments of peer characteristics usually came from the focal respondent (referring to that respondent's report on characteristics of his or her friends), a strategy that potentially inflates the magnitude of peer effects owing to exaggeration of similarity to friends in behavior, the so-called assumed similarity or false consensus bias.

Until the recent development of statistical models to examine co-occurring network and behavior processes, studies that included data provided by focal respondents as well as their friends also suffered several limitations. These limitations restricted the ability to make firm statements about the underlying process responsible for similarity among

befriended peers (Steglich, Snijders, & Pearson, 2010). First, changes in behavior and social relations that occurred between observations were not modeled. For example, at the first observation, the focal respondent (ego) might consider another network member (alter) as a friend. If at the second observation, the focal respondent had changed his or her behavior and became similar to alter, this change was considered to be influence. However, what happened between the two observations was unobserved and, therefore, remained unclear. It is possible that after the initial friendship between the two peers the relationship ended and ego changed his or her behavior in the absence of a relationship with alter. After ego changed his or her behavior, ego might again have formed a friendship with alter, which was observed at the second observation. Based on the two observations, changes in the behavior of ego were attributed to the friendship with alter and as such were considered to reflect influence. However, as is clear in this example, the change in behavior occurred when the relationship between ego and alter was absent. As a consequence, the influence of alter on the behavior of ego might be overestimated. Therefore, a true test of selection and influence effects should take such unobserved changes into account to avoid overestimation of both effects.

A second limitation of previous models is a failure to control for the effect of the network structure on both network and behavior dynamics. Several structural (network-inherent) selection processes are known to play a role in the dynamics of friendship networks (Steglich et al., 2010). For example, friendships are more likely to be established when persons share a common friend (Davis, 1970). Hence, such a transitivity effect rather than similarity in behavior might account for friendship formation between network members. Thus, when friendship formation between two smoking adolescents occurs via a third shared friend (transitivity), leaving out an estimate for transitivity for this friendship selection would cause one to incorrectly attribute it to their smoking behavior. Not controlling for such structural network tendencies in the analyses can lead to overestimation of selection effects, which, in turn, affects the estimates for influence by failing to rule out selection effects in a statistically sound way (Steglich et al., 2010).

A third limitation is the failure to use complete networks. In order to identify the determinants of selection, it does not suffice to know who was selected as network partner; it is also necessary to know who was not selected. Likewise, for identifying peer influence effects, it needs to be known what the absence of influence looks like, referring to how behavior changes in the absence of opportunities for influence. In earlier studies

(Ennett & Bauman, 1994; Kandel, 1978), this was typically acknowledged by comparing a sample of dyads in which the individuals were (and stayed) connected to each other in the network with a matched sample of dyads in which the individuals were (and stayed) unconnected. However, use of the crucially important control for selection processes is impossible in this approach (Veenstra & Steglich, 2011). To unravel selection and influence processes, network data have to be used. Because many dependencies exist between actors in networks, it is not warranted to apply many commonly used statistical procedures. It is necessary to apply special procedures in which network dependencies are explicitly acknowledged and part of the modeling.

Longitudinal Social Network Analysis

To overcome these shortcomings, the Simulation Investigation for Empirical Network Analyses (SIENA) program was developed (Snijders, Steglich, & Schweinberger, 2007). Within the SIENA program (see http://stat.gamma.rug.nl/siena.html), the estimations of behavioral changes and network changes (changes in the absence or presence of a relation) are modeled simultaneously. Therefore, the program allows researchers to test both selection and influence effects while controlling each for the other (Burk, Steglich, & Snijders, 2007; Steglich et al., 2010). SIENA was used in most of the recent empirical studies reported on in this chapter (these studies are asterisked in the reference list).

The model in Figure 7.1 expresses that, in response to the current network structure and the current behavior of the other individuals in the network, individuals can change either their peer network (make a new friend or break a relationship) or their behavior (increase or decrease in behavior) between two time points. It is assumed that changes may occur continuously between discrete time points. A simulation procedure is used to estimate the likelihood of changes in behavior and networks in response to the current network structure and behavior of others. The longitudinal social network model interprets discrete time series of data as the cumulative result of an unobserved sequence of elementary changes, resulting from decisions taken by the actors between observation moments. The unobserved change process is assumed to take place as gradually as possible, in so-called microsteps that consist of either a network tie being broken or created or a unit change in behavior

(Veenstra & Steglich, 2011). The dependencies at the beginning of an unobserved period are taken as the starting value of the change process, and later changes naturally depend on these and the occurrence of earlier changes in the sequence. By repeatedly imputing sequences of microsteps, the model allows differentiation of the strengths of multiple contributing mechanisms to observed longitudinal patterns. Due to the unobserved nature of the exact sequence of changes connecting observation moments, simulation-based inference is necessary for estimating the model parameters (Snijders, 2001, 2005; Snijders et al. 2007, 2010).

Figure 7.1 Representation of Selection and Influence Effects
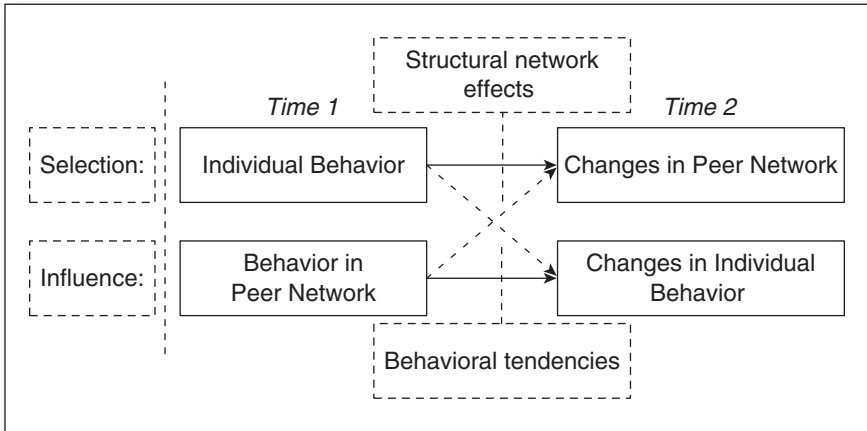
NOTE: The solid lines in Figure 7.1 express that individuals can change their peer network (selection) and behavior (influence) between two time points. The dashed lines express that selection and influence effects are estimated while the network structure and behavior at Time 1, the structural network effects (e.g., reciprocity, transitivity), and behavioral tendencies are taken into account.

Analyses using the actor-based model yield different types of parameters. First, *structural network effects* such as reciprocity and transitivity are controlled to avoid overestimation of other network-related estimates and influence effects; see Figure 7.1. In addition to these structural network effects, changes in the peer network represent *selection effects:* the extent to which individuals tend to form new friendships on the basis of preexisting similarities in behavior; see Figure 7.1.

Another set of estimates indicates the extent to which behavior changes over time, referred to as behavior dynamics. Most important is the *influence effect,* which indicates the extent to which participants change their behavior in accordance with their friends' behavior. Influence effects manifest themselves in behavioral change; see Figure 7.1. Finally, *behavioral tendencies* are taken into account to model the distribution and likelihood of changes in the behavior under investigation; see Figure 7.1. These tendencies provide a valuable insight into the likelihood of low or high values of the behavior occurring and into whether the behavior of respondents tends to regress to the mean (self-correcting mechanism) or to the extremes of the scale (polarization or self-reinforcing mechanism).

〰 RECENT EMPIRICAL ADVANCES

A growing body of researchers use longitudinal social network data to simultaneously investigate network and behavior dynamics among adolescents (Snijders et al., 2007; Veenstra & Steglich, 2011). Social network data have been used to examine a range of behaviors among adolescents, such as externalizing problems (e.g., aggression, delinquency, weapon carrying), internalizing problems (e.g., anxiety, depression, loneliness), and substance use (e.g., alcohol, cannabis, cigarettes). The main research questions of these studies were whether adolescents *select* friends based on similarity in behavior and whether adolescents are *influenced* (socialized) by their friends' behavior.

Selection and influence processes have been investigated with respect to, for example, externalizing problem behavior. Dishion, Patterson, and Griesler (1994) have described the operation of peer selection processes through preferential attraction for children who also display antisocial behavior as well as through peer rejection of antisocial youth by others (see also Baerveldt, Völker, & Van Rossem, 2008; Burk, Kerr, & Stattin, 2008). Consequently, antisocial adolescents may have fewer opportunities to establish friendships. In addition, peer influences toward higher rates of antisocial behavior have been found to occur through an active process in which antisocial behavior is reinforced by antisocial peers. Using longitudinal social network modeling, Sijtsema et al. (2010) found that adolescents with relationally or instrumentally aggressive friends became, respectively, more relationally and instrumentally aggressive

themselves over time. In addition, the influence effect of delinquency was absent in studies that looked at the effects of classmates (Knecht, Snijders, Baerveldt, Steglich, & Raub, 2010; Light & Dishion, 2007) but was found in studies that looked at the effects of grade-mates or town mates (Baerveldt et al., 2008; Burk et al., 2008). This suggests that the behavior of out-of-class friends influences delinquency more than the behavior of classmates.

Mercer and DeRosier (2010) argued that similar selection and influence mechanisms contribute to similarity in anxiety, depression, or loneliness. The findings of previous studies have shown that young people with such characteristics are more likely to experience peer rejection and engage in solitary play (Altmann & Gotlib, 1988; Connolly, Geller, Marton, & Kutcher, 1992; Gazelle & Ladd, 2003; Joiner, 2001). Consequently, children with internalizing problems have fewer opportunities to establish friendships. In a test of preferential attraction, Mercer and DeRosier (2010) reported that lonely children were more likely to select other lonely children as friends. Van Zalk, Kerr, Branje, Stattin, and Meeus (2010) found the same for depressed adolescents. Thus, there is support for a greater likelihood of friendship formation among children with similar levels of internalizing problems. However, the greater likelihood may be the result of fewer overall opportunities for friendship formation due to peer rejection and of active searching for similar friends.

Application of the longitudinal social network model has yielded insight into transformation in peer networks. The default in models of network dynamics is that breaking a tie is simply the opposite of creating one. This is not always a good representation of reality. It is conceivable, for example, that the loss when terminating a reciprocal tie is greater than the gain in creating one. Van Zalk and colleagues (2010) tested hypotheses about deselection processes in relation to adolescent depressive symptoms. Based on the theory of social corrosion (Coyne, 1976), they hypothesized that individuals prone to depressive symptoms lack the social skills necessary to provide support and closeness, which, in turn, triggers dissatisfaction and even deselection by the nondepressive dyadic partner in the relationship and therefore increases the chances of a close relationship ending (see also Borelli & Prinstein, 2006). In contrast, they hypothesized that interactions between two depressive friends are characterized by mutual feelings of understanding and high self-disclosure, which seem to increase closeness and intimacy between these friends (Rose, 2002). This, in turn, is suggested to lead to fewer endings of relationships between two depressive friends. The findings of Van Zalk et al. (2010) were in line with

these ideas. Deselection offered an alternative explanation for why adolescents tend to be similar to their peers.

Influence processes offer an alternative explanation for why adolescents are similar to their peers in internalizing symptoms. Anxious and depressive feelings and thoughts may increase through reinforcement of negative cues in interactions with friends with internalizing symptoms (Prinstein, Cheah, & Guyer, 2005; Rudolph, Hammen, & Burge, 1994). This may be an active process in which adolescents with internalizing symptoms engage in co-rumination, referring to the tendency of such youth to dwell on negative affect and repetitively discuss, rehash, and speculate about problems (Rose, 2002). Mercer and DeRosier (2010) indeed reported that friends' anxiety, depression, and loneliness influenced children's own internalizing problems. These peer influence processes regarding depressive symptoms turned out to be stronger for girls than boys (Van Zalk et al., 2010). The underlying mechanism may be that girls are more sensitive than boys to stressful events occurring within peer relationships. Further, girls may experience, encode, and interpret negative exchanges within friendships more than boys do (Hankin & Abramson, 2001).

All studies on network dynamics report clear sex similarity in friendships. Voluntary sex segregation begins in early childhood, peaks in middle childhood, and is to some extent still present in adolescence (see also Maccoby, 1998). Several studies also report selection similarity for age and ethnicity and thus a preference for same-age and same-ethnic friends.

Beyond the question of whether similarity is due to selection or influence, application of these models has given greater insight into the *mechanisms* underlying network and behavior dynamics. In an exemplary study, Kiuru, Burk, Laursen, Salmela-Aro, and Nurmi (2010) compared selection and influence mechanisms for alcohol use and smoking. It turned out that selection played a greater role than influence for explaining similarity in the smoking behavior of friends (see also Mercken, Snijders, Steglich, & De Vries, 2009), whereas both selection and influence played a significant role in explaining similarity in drinking behavior. This finding is consistent with the idea that tobacco use is addictive and that once adolescents have started smoking the social influence on smoking may become less important for smoking progression. Thus, peer influence plays less of a role for dynamics in smoking behavior. Spatial segregation of smokers may provide an explanation for the selection effect: Society separates smokers from nonsmokers (referring to smoking designated areas), creating an opportunity structure in which smokers are

more likely to establish new contacts with other smokers and then affiliate with each other. In addition, Kiuru et al. (2010) found that adolescents with a high level of smoking tended to receive more peer nominations than those who did not smoke, and smoking was accordingly seen as cool.

In another exemplary study, Dijkstra and colleagues (2010) compared selection and influence mechanisms for weapon carrying. They found that in early adolescence, weapon carrying was quite stable over a 1-year period. Using social network data of 207 Latino male adolescents in New Jersey, they found no support for a selection mechanism on the basis of weapon carrying. However, associating with friends who carry weapons increased the level of weapon carrying over the course of a year. Thus, selection plays no role, whereas influence does for the development of weapon carrying. In addition, Dijkstra et al. (2010) found that adolescents with a high level of problem behavior tended not only to be more popular, referring to the number of nominations received, than others with a low level of problem behavior but also to be more restrictive in the number of friendship nominations they gave to others. Thus, weapon carriers were seen by others as popular and were more selective than others in the number of friendships that they mentioned.

Moderating Effects

Examining moderating effects in peer influence processes also adds to our understanding of dynamics in the peer context. Influence effects can be moderated by characteristics of individuals (e.g., impulsivity), peers (e.g., status), the dyadic relationship (e.g., friendship quality), and the context (e.g., density of the network) (Prinstein, 2007). As far as we know, it has not been tested whether influence effects depend on contextual characteristics. The empirical evidence for the other types of moderation is scarce, too.

Moderating effects of individual characteristics have been tested in some studies. It was found that boys are more sensitive to the influence of delinquent friends (Burk et al., 2007) and that girls are more sensitive to the influence of depressed friends (Van Zalk et al., 2010). Impulsive youth were found to be more susceptible to the influence of friends' alcohol use (Burk et al., 2008; see also Snyder et al., 2010). With regard to involvement in externalizing behaviors, the role of self-control has been considered essential (Gottfredson & Hirschi, 1990). Although it has been shown that self-control is directly linked to involvement in externalizing

behaviors (Pratt & Cullen, 2000), it has also been revealed that low self-control increases the chances of affiliation with deviant peers (Creemers et al., 2010). This suggests that individuals with low self-control are more likely to select deviant peers as friends, which can lead to contagion effects.

Other interesting moderating effects may be that adolescents who are intelligent may be low in susceptibility to certain influence attempts or that adolescents who are anxious and unassertive may be more susceptible to friends' influence (Caspi, 2006; Cohen & Prinstein, 2006). Furthermore, the importance of the group to the individual may also moderate sensitivity to the influence of friends (Kiesner, Cadinu, Poulin, & Bucci, 2002). In addition, parental characteristics may affect susceptibility to peer influence. For instance, the positive impact of a friend's academic achievement is stronger among adolescents whose parents are more authoritative, whereas the negative impact of friends' drug use is stronger among adolescents whose parents are less authoritative (Mounts & Steinberg, 1995).

It is also relevant to examine who is more influential when referring to the influence of peer characteristics. So far, this has not been examined in longitudinal social network models. It is likely that people will be more influenced by high-status peers (Dijkstra, Lindenberg, & Veenstra, 2008). For example, Cohen and Prinstein (2006) found that peer influence was more likely to occur when peers' status ranked high (see also Harvey & Rutherford, 1960). In an experimental study, participants believed they were interacting with fellow students in a chat room, but in reality they were e-confederates. The status of the focal e-confederate was manipulated in the study. When the focal e-confederate was given a high status, participants were more likely to exclude a fellow student without any apparent personal benefit other than the opportunity to obtain the approval of high-status peers.

It is also possible that popular adolescents become more trapped in deviant behaviors in order to maintain their status in the peer group. A cross-sectional study by Haynie (2001) showed that centrality and popularity in the peer network strengthened similarity in delinquency, suggesting that these adolescents are more prone to resemble their peers' behavior.

It is also likely that relative age moderates influence processes. Popp, Laursen, Kerr, Stattin, and Burk (2008) found that older peers in a network influence drinking behavior more than younger peers do.

Research on how relationship characteristics affect influence processes is scarce. On the one hand, it is possible that influence effects are stronger for close, intimate friends because frequent interaction and communication

create numerous opportunities for influence (Piehler & Dishion, 2007; Stevens & Prinstein, 2005). On the other hand, adolescents with unreciprocated friendships may feel greater pressure to adapt their behavior in an attempt to persuade a disinterested peer or to gain additional emotional intimacy (see also Sandstrom, 2011). Overall, there is no consistent evidence in social network models that mutual friends have a stronger influence than unilateral friends (see for two exceptions Burk et al., 2007; Ojanen, Sijtsema, Hawley, & Little, 2010). Other measures for closeness or intimacy of friendships have not been included in actor-based models of behavior dynamics so far. For now, there is no evidence that the more adolescents value particular affiliations, the more they are willing to accede to influence attempts in order to maintain or enhance their friendships.

Age Effects

It is also important to examine whether selection and influence processes differ according to age. Monahan, Steinberg, and Cauffman (2009) suggested that the early years of adolescence are marked by young people selecting themselves into peer groups. If peer groups are better established by the time people have entered late adolescence, it stands to reason that changes in similarity among friends would have to be due to the impact that friends have on each other (Monahan et al., 2009). The influence of friends might wane in adulthood, because individuals' ability to resist peer influence is stronger in (emerging) adulthood than in adolescence (Gardner & Steinberg, 2005; Steinberg & Monahan, 2007). However, Berndt and Murphy (2003) consider it a myth that friends' influence peaks in middle adolescence. They argue that consistent age changes in the strength of friends' influence have not been found. Hypotheses about developmental changes in friends' influence may deserve consideration if future research reveals consistent age changes in influence effects on behavior dynamics.

Mediation Effects

Longitudinal social network models also allow researchers to examine mediation processes that help explain why adolescents change their network or their behavior. For instance, with regard to internalizing problems, the process of co-rumination might account for the influence processes in which adolescents contaminate their peers.

Potential influence mechanisms on externalizing problem behavior may involve encouragement, mutual participation, and attention (Dishion & Tipsord, 2011). The concept of deviancy training, introduced by Dishion, Spracklen, Andrews, and Patterson (1996), might also provide an understanding of the mechanisms underlying peer influence processes. In an experimental setting, they showed that involvement in deviant behavior was predicted by positive reactions of peers to deviancy. This suggests that the influence of peers can (partially) be explained by reinforcement processes.

The idea of social reinforcement of deviant behaviors also relates to the role of cognitions in peer influence processes (Scheier & Botvin, 1997). Adolescents might imitate their peers for expected outcomes, such as status and social bonding. Incorporating concepts such as deviancy training and expectancies in a longitudinal social network design might enhance our understanding of why and how peers influence each other.

〰 FUTURE DIRECTIONS

Observations of similarity between friends in behaviors or attitudes have led scholars to examine friendship selection and influence processes. Examination of both network and behavior dynamics enables us to understand the processes of why and how adolescents display certain characteristics.

Future research on similarity in behaviors needs to incorporate not only selection and influence processes but also deselection processes. Van Zalk et al. (2010) were the first to show that nondepressive adolescents "filter out" depressive peers from their peer relationships. As a result, adolescents with high levels of depression mainly remained friends with other depressed adolescents.

Future research should also examine the extent to which not only similarity but also complementarity underlies the formation and continuation of relationships (Farmer, 2007), referring to people's seeking not only friends with similar characteristics but also friends who complement their own characteristics. The findings of some studies have shown that similarity is important during the initial phase of friendship formation—when individuals choose potential friends (Aboud & Mendelson, 1996). In later phases, when long-lasting friendships are established, the provision of social and emotional resources such as companionship, emotional support, help, and self-validation becomes more important and may allow for more dissimilarity in behavior.

The findings of other studies have also shown that similarity is only half the story. For example, a landmark study by Kupersmidt, DeRosier, and Patterson (1995) revealed that the likelihood of being friends increased linearly with the number of similar attributes. Still, even when children had seven similar attributes, the chances of being best friends were only 10% and of being school friends 50%. This suggests that a substantial part of peer affiliations remains unexplained by similarity in characteristics. The question is whether a lack of similarity reflects complementarity. Bukowski, Sippola, and Newcomb (2000) argued from a features perspective that certain characteristics are seen as valuable by peers and, therefore, attract peers who lack these characteristics. A striking example is that of popular adolescents who are considered attractive due to behaviors and characteristics that deviate from those of "normal" peers and signal maturity (Dijkstra, Lindenberg, Verhulst, Ormel, & Veenstra, 2009). However, attraction to certain peers does not necessarily imply complementarity. Future research is needed to reveal under what conditions similarity, attraction, and complementarity are helpful to understanding the formation of peer relations.

In a unique study with preschool children, Schaefer, Light, Fabes, Hanish, and Martin (2010) aimed to observe the principles that drive social network development. They argued that for many children the preschool classroom is the first opportunity to interact regularly with a large number of age-mates. Moreover, the diverse array of classmates allows children to exercise choice in their regular play partners. It was found in that study that reciprocity effects peaked early in the school year. As children began to sort themselves into relationships, the effects of reciprocity remained constant while other network processes became relatively more important. As relationships strengthened and their distribution solidified, children became more likely to seek and maintain relationships with popular peers. Popularity peaked in importance midway through the school year. From that point on, children became increasingly likely to form relationships with the most socially involved peers in the classroom. Unlike popularity, triadic closure increased in importance over the entire course of the school year, peaking in the final period. Presumably, as the interactions underlying relationships became more consistent, children were increasingly exposed to other children with whom their friends were playing. Beyond mere propinquity, this selective exposure may provide children with the opportunity to learn to infer relationships between other children in the class (Schaefer et al., 2010). Future research should also examine the principles that affect social

networks in adolescence. An ideal case for that is the period after the transition to secondary education.

Broadening the focus of research on processes in peer networks has provided a more complete picture of the social landscape that children are part of (Gifford-Smith & Brownell, 2003). Beginning in early childhood, children sort themselves nonrandomly into friendships, selecting peers who are similar to themselves in important ways. In turn, the processes of creating and keeping friendships influence the behavior and attitudes of individuals. We have recently seen a growth in the number of studies in which network and behavior dynamics were examined simultaneously. These findings are very promising. To build a solid knowledge base of selection and influence processes, it is necessary for these findings to be replicated and tested in different contexts, with different age groups, and with different behaviors. It has to be made clear in which contexts, at which ages, and for which behaviors selection and influence play a role.

⧉ SUMMARY

Transformations in peer networks, referring to the dynamics of both the network and behaviors, are key elements in understanding development in adolescence. Advances in social network techniques enable researchers to address adequately selection and influence processes as mechanisms that steer these transformations. Social network models allow the examination of selection and influence processes simultaneously, while taking into account network and behavioral tendencies. Building on pioneering work on peer relations as well as valuable insights from experimental studies, a growing number of longitudinal social network studies have enhanced our understanding of the extent to which selection and influence contribute to (dis)similarity in peer networks and also of the mechanisms underlying these processes.

Despite this progress, a lot of work still needs to be done. The theoretical underpinning of the dynamics in networks and behaviors by specific mechanisms—and its integration in longitudinal social network modeling—has only just started. Questions about mediation and moderation effects that shed light on why and under what conditions adolescents change their behaviors and networks are open to investigation.

Empirically, social network analysis puts high demands on data. Not only do data need to comprise complete networks with information about

the behaviors and characteristics of all participants but the same data are also required over time in order for changes in behaviors and networks to be modeled. Moreover, the questions to be addressed using longitudinal social network analyses define the type of data to be collected. Information on networks in classrooms is easily collected but does not provide the opportunity to examine peer influence effects from grade-mates, schoolmates, or town mates. The collection of network data on out-of-school friendships is challenging but probably needed (Kiesner, Poulin, & Nicotra, 2003).

The theoretical incorporation of mechanisms that explain why and under what conditions behaviors and networks change as well as the collection of the rich data necessary to address these processes will be a challenge for years to come.

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