Article

Who is most influential? Adolescents' intergroup attitudes and peer influence within a social network

Tibor Zingora[1,2] ⓘD, Tobias H. Stark[3] ⓘD and Andreas Flache[4]

Abstract
Research has shown that adolescents' intergroup attitudes are subject to friends' influence, but it remains unknown if certain friends are more influential than others. Popular adolescents may be especially influential of their friends' intergroup attitudes because they can set peer norms. We examined several indicators of popularity in social networks as possible determinants of social influence: sociometric popularity, prestige popularity, being a clique leader, and frequency of contact with friends. Longitudinal analysis of adolescents' friendship networks (12–13 years, N = 837) allowed estimating influence of friends on adolescents' intergroup attitudes, while controlling for the tendency of adolescents to befriend peers with similar intergroup attitudes. Results showed that adolescents' intergroup attitudes changed in the direction of friends' intergroup attitudes. Only peers who are popular in terms of having many friends (sociometric popular) were especially influential of their friends' intergroup attitudes. These findings may inform future interventions aiming to reduce prejudice.

How adolescents develop attitudes toward other ethnic groups is a crucial question in a multicultural society. Answering it may provide guidance on how to efficiently fight prejudice and improve interethnic relations among youth (Thijs & Verkuyten, 2014). During childhood, parents have a strong influence on their children's attitude internalization; however, as children become adolescents, peers become an increasingly more relevant socialization factor (Biddle, Bank, & Marlin, 1980; Bukowski & Newcomb, 1984; Maguen & Armistead, 2006; Raabe & Beelmann, 2011;

Steinberg & Monahan, 2007; Steinberg & Silverberg, 1986). Social influence, especially of adolescents' friends, has been documented for the

[1]Czech Academy of Sciences, Czech Republic
[2]University of Oxford, UK
[3]Utrecht University, Netherlands
[4]University of Groningen, Netherlands

Corresponding author:
Tibor Zingora, Czech Academy of Sciences, Veveří 97, Brno, 602 00, Czech Republic.
Email: tibor.zingora@psy.ox.ac.uk

formation of attitudes toward intergroup contact (Rivas-Drake, Saleem, Schaefer, Medina, & Jagers, 2019), for various forms of behavior, such as delinquent behavior (Weerman, 2011) or drinking alcohol (Ary, Tildesley, Hops, & Andrews, 1993; Steglich, Snijders, & West, 2006), and also for intergroup attitudes (Kiesner, Maass, Cadinu, & Vallese, 2003; Poteat, 2007; Stark, 2015; van Zalk, Kerr, Kerr, van Zalk, & Stattin, 2013).

However, it remains largely unclear which characteristics of adolescents affect their ability to influence their friends' intergroup attitudes (Hjerm, Eger, & Danell, 2018). Such knowledge could help design effective and cost-efficient social interventions that aim to improve intergroup relations. Existing prejudice reduction programs typically target large groups such as whole classrooms (Houlette et al., 2004; Stathi, Cameron, Hartley, & Bradford, 2014), and are accordingly complex and expensive to implement. New intervention programs could be tailored to involve only a few but very influential individuals who subsequently influence the attitudes of their classmates (Paluck, 2011; Paluck & Shepherd, 2012). Such "network interventions" (Valente, 2012) have recently been succesfully implemented to reduce social conflict in large schools (average $M = 432$ students), by training only 20–32 students in an intervention program (Paluck, Shepherd, & Aronow, 2016).

One reason for our lack of knowledge of individuals' role in social influence processes is the complexity of these processes as they take place within social networks (van Zalk et al., 2013). Similar attitudes among friends can be a sign of social influence; however, they can also be a result of friendship homophily because people are attracted to persons from similar backgrounds, with similar behavior, and also with similar attitudes (McPherson, Smith-Lovin, & Cook, 2001). Ignoring people's tendency to select friends who are similar can lead to wrong inferences about the importance of social influence processes in the formation of intergroup attitudes (Steglich, Snijders, & Pearson, 2010; Wölfer, Faber, & Hewstone, 2015).

The present research explores whether and what form of adolescents' popularity, as a central indicator of social influence among adolescents (Adler & Adler, 1998), affects their power to influence their friends' intergroup attitudes. In response to recent calls for the use of social network analysis in the study of group processes and intergroup relations (Dovidio, Love, Schellhaas, & Hewstone, 2017; Wölfer et al., 2015; Wölfer & Hewstone, 2017), we apply stochastic actor-oriented models to social network data of a large sample of adolescents in the Netherlands. Stochastic actor-oriented models have been developed to separate social influence from social selection (homophily) with longitudinal social network data (Snijders, 2011; Snijders & Steglich, 2015; Steglich et al., 2010). These models have been used to detect social influence in intergroup attitudes (Stark, 2015; van Zalk et al., 2013) and attitudes toward intergroup contact among adolescents (Rivas-Drake et al., 2019). We extend this previous research by exploring the role of four types of popularity because it remains unclear which of a multitude of possible definitions of popularity might be the best one to localize the most influential adolescents.

The Influence of Friends on Intergroup Attitudes

Various theoretical approaches have been offered to understand why adolescents' attitudes are influenced by their friends' attitudes. According to Shared Reality Theory (Hardin & Conley, 2001), people establish and maintain their beliefs when they are socially shared. Peers represent a big part of adolescents' social world. Therefore, we can expect that adolescents' desire to establish and maintain social relationships with friends will result in internalization of attitudes prevalent in their friendship group. Group-Norm Theory adds to this perspective that individuals adopt attitudes of peers who belong to valued groups, because this allows achieving the basic human goals of affiliating with others and maintaining a positive self-concept (Cialdini & Goldstein, 2004; Crandall, Eshleman, & O'Brien, 2002; Sherif & Sherif, 1953). For adolescents, the valued group can be found in their group of

friends (Dishion, Piehler, & Myers, 2008; Paluck, 2011; Rivas-Drake et al., 2019; van Zalk et al., 2013) with whom they spend a lot of time and share relationships that are characterized by intimacy (Berndt, 1996; Flaspohler, Elfstrom, Vanderzee, Sink, & Birchmeier, 2009; Newcomb & Bagwell, 1995).

Neither Shared Reality Theory nor Group-Norm Theory specifically target intergroup attitudes. However, research suggests that intergroup attitudes are similarly subject to peer influence as many other salient attitudes. A large literature on the "extended contact hypothesis" has established that simply knowing that an ingroup friend has positive intergroup contact improves intergroup attitudes (Munniksma, Stark, Verkuyten, Flache, & Veenstra, 2013; Vezzali, Hewstone, Capozza, Giovannini, & Wölfer, 2014; Zhou, Page-Gould, Aron, Moyer, & Hewstone, 2018). Interacting with outgroup members first improves the attitudes of those adolescents who have direct contact (Pettigrew, Tropp, Wagner, & Christ, 2011). They subsequently influence the attitudes of their ingroup friends by changing their perceived ingroup norms toward the outgroup (Turner, Hewstone, Voci, & Vonofakou, 2008; Wright, Aron, McLaughlin-Volpe, & Ropp, 1997). Importantly, such influence processes do not necessarily lead to positive attitudes; friends may also influence adolescents to adopt more negative attitudes (van Zalk et al., 2013). Given this earlier evidence, we expect that social influence among friends is an important determinant of adolescents' intergroup attitudes also in our study.

> H1: Adolescents' intergroup attitudes become more similar to their friends' intergroup attitudes over time (social influence).

Moreover, research found that adolescents tend to form friendships with peers who have similar intergroup attitudes (Rivas-Drake et al., 2019; Stark, 2015; van Zalk et al., 2013). This tendency can arise due to an explicit preference for similar attitudes among friends or it can be the consequence of correlated homophilous tendencies (e.g. similar levels of religiosity or correlated music preferences and lifestyles), just as what seems to be a preference for same ethnic friends is sometimes a consequence of a preference for friends with similar interests that correlate with ethnicity (Stark & Flache, 2012). To distinguish social influence from the tendency of adolescents to form friendships based on similar intergroup attitudes (for whatever reason), it is necessary to control for this social selection tendency.

> H2: Adolescents are more likely to form friendships with peers who have more similar outgroup attitudes.

In order to provide the knowledge needed for designing network interventions (Valente, 2012) that aim at reducing prejudice among adolescents (Paluck, 2011), it is important to improve our knowledge about the characteristics of adolescents who are particularly influential when it comes to intergroup attitudes (see also Hjerm et al., 2018). Currently, there is no consensus that could guide the development of intervention programs on who are the most influential adolescents within a friendship network. In the following, we distinguish a number of alternative theoretical approaches and formulate corresponding exploratory hypotheses for empirical testing.

Identifying Most Influential Adolescents by Popularity

According to Social Identity Theory (Hogg & Reid, 2006), the ability to influence others might depend on the extent to which an individual can determine what is normative in a social setting and what is not. A failure to adopt social norms that are valued in one's peer group can lead to social exclusion (Juvonen & Galván, 2008). It is possible that popular adolescents shape group norms (Adler & Adler, 1998). Popular adolescents might be able to set up group norms and desirable patterns of behavior because they are considered to have more social capacities such as leadership roles and exerting social control

(Lease, Kennedy, & Axelrod, 2002). Adolescents, especially those craving for being accepted by a group, often imitate popular adolescents (Dijkstra, Cillessen, Lindenberg, & Veenstra, 2010; Laninga-Wijnen et al., 2017; Lease et al., 2002). Thus, adolescents can be expected to act according to norms represented by popular members of their network. Although research indicates that popularity grants the ability to influence others, it does not advise on which type of popularity affects the power to influence friends' intergroup attitudes. Therefore, we will explore the impact of four different definitions of popularity without a prior expectation that a certain type of popularity will have more impact than others.

Sociometric popularity. Having a lot of friends was suggested as a factor enhancing the social influence adolescents can exert over each individual friend's behavior, such as drinking and smoking (Osgood et al., 2013; Schaefer, Adams, & Haas, 2013). There are also reasons to expect that adolescent's intergroup attitudes are more influenced by friends who have many friends (sociometric popularity) in comparison to friends with fewer friendship ties. First, sociometrically popular adolescents are often viewed as having prosocial skills, which may grant the ability to persuasively communicate intergroup attitudes (Parkhurst & Hopmeyer, 1998). Second, to become more sociometrically popular themselves, adolescents may adopt intergroup attitudes that they view to be associated with sociometric popularity. Third, many adolescents may desire to become friends with a sociometrically popular peer. To be more likely viewed positively by sociometrically popular peers, adolescent adopt these peers' intergroup attitudes. We thus explored whether sociometric popularity moderated social influence processes among adolescents.

H3: The more friendship nominations adolescents' friends receive in a classroom (sociometric popularity), the more likely adolescents are to adopt the intergroup attitudes of their friends.

Prestige popularity. Some scholars distinguished between sociometric popularity and prestige popularity, i.e. the degree to which a person is perceived as popular by others (Sandstrom & Cillessen, 2006). An adolescent who is often considered to be a friend does not have to necessarily be the most visible, prestigious, or dominant member of the social network (Cillessen & Rose, 2005). In fact, although friendship and prestige popularity are often intuitively referred to only as popularity, they do not overlap to a large extent. For example, Parkhurst and Hopmeyer (1998) found that only 36% of sociometrically popular students were also perceived to be popular and only 29% of perceived popular students were also sociometrically popular. While adolescents with high sociometric popularity are well liked by others, prestige popular youth do not necessarily have only prosocial traits; rather to the contrary, prestige popular adolescents often act aggressively (Rubin, Bukowski, & Parker, 1998). Yet young people may often aspire to imitate peers with high prestige popularity (Adler & Adler, 1998). Hence, adolescents may adopt intergroup attitudes of friends with high prestige popularity in an attempt to become more prestige popular themselves. We thus explored the role of prestige popularity in social influence among adolescents.

H4: The more popularity nominations adolescents' friends receive in a classroom (prestige popularity), the more likely adolescents are to adopt the intergroup attitudes of their friends.

Clique leaders. A third key factor fostering an individual's social influence may be whether a friend's attitudes are considered to be relevant or representative for the friendship group. Paluck and Shepherd (2012) introduced the concept of "social referents" to characterize adolescents who have many connections in a network and who are more likely to be paid attention to than other peers (Paluck et al., 2016). There are two types of social referents: *widely known* adolescents and *clique leaders* (Paluck & Shepherd, 2012). The concept of widely known adolescents is similar to

prestige popularity (H4), as widely known adolescents are considered influential because they have high status among peers. Being a clique leader is related to sociometric popularity (H3); however, sociometrically popular adolescents are frequently selected as friends by all classmates, whereas clique leaders are frequently selected as friends in a smaller and densely interconnected group of friends. Clique leaders can thus more easily influence the members of such a clique.

In fact, clique norms may have bigger impact on attitudes and behavior than perceived norms of the whole social network. Membership in a small clique should satisfy adolescents' need for uniqueness and distinctiveness more than belonging to a big group (Blanton & Christie, 2003; Pickett, Silver, & Brewer, 2002). Consequently, clique membership may be valued more than belonging to a big group, which should motivate an adolescent to abide clique norms to avoid exclusion (Juvonen & Galván, 2008). Clique leaders may determine what is perceived to be normative behavior and attitudes within a clique because they are well connected with members of the clique, who, by the definition of a clique, are less connected with people outside the clique (Paluck & Shepherd, 2012). This is in line with Dynamic Social Impact Theory, which argues that people are influenced by the closest peers embedded within a clique and are shielded from the influence of non-clique members (Latané & Bourgeois, 2001).

Note that a clique leader is not necessarily defined as a person who is at the top of the hierarchy in a dense friendship group. Rather, a clique leader has a central position within a friendship group, is considered to be a friend by many group members, and, therefore, may attract a lot of attention from group members. Thus, the term "clique leader" defined in this sense may differ from common interpretations. However, we continue to use the term here in this way to tie our research in with the concept introduced by Paluck & Shepherd (2012). This leads to our fifth explorative hypothesis.

> H5: The more well-connected adolescents' friends are in dense cliques (clique leaders), the more likely adolescents are to adopt the intergroup attitudes of their friends.

Time spent together. As a fourth alternative, the reason why some adolescents exert more influence on friends' intergroup attitudes might lie in the nature of their ties with others. Paluck and Shepherd (2012) suggested taking the time adolescents spend together into account. Social learning theories (Bandura, 1977) suggest that peers can influence an adolescent through reinforcement (Rancourt & Prinstein, 2010; Salmivalli, Voeten, & Poskiparta, 2011). Consequently, adolescents who spend a lot of time with friends may spread social norms most effectively as they can be repeatedly observed and thus reinforce others' behavior and attitudes (Paluck et al., 2016).

Popular adolescents cannot spend time with all peers that desire to be friends with them. This implies that sociometrically popular adolescents (H3) and clique leaders (H5) can spend less time with each friend than adolescents with fewer friends. The lack of relationship quality may eventually lower their ability to influence their friends. In contrast, prestige popularity (H4) is not based on the number of friends a person has and may as such be unrelated to the amount of time prestige popular adolescents spend with each friend. Accordingly, spending time with friends reflects a unique type of popularity that can be associated with having a lot of social influence. According to this reasoning, we explored if friends with whom an adolescent spends a lot of time have a particularly big influence on that adolescent's attitudes.

> H6: The more time adolescents spend with friends, the more likely they are to adopt the intergroup attitudes of their friends.

Social Influence and Ingroup Members

Adolescents might be differently influenced by the intergroup attitudes of ingroup friends (i.e., by their outgroup attitudes) than by the attitudes of outgroup friends (i.e., by their ingroup attitudes). Social Identity Theory proposes that people are more

likely to adopt attitudes from persons that are considered ingroup members than from outgroup members (Tajfel, 1982). If adolescents are in a context where the ingroup-outgroup distinction is salient, they should perceive themselves as members of a group and adopt normative attitudes provided by ingroup members. Ethnic identity was found to be related to ingroup/outgroup formation among adolescents (Masson & Verkuyten, 1993); therefore, shared ethnic membership may facilitate social influence between friends.

According to Turner (1982), people perceive ingroup members as similar to the self and expect concordance between their own attitudes and the attitudes of other ingroup members. Agreement from other ingroup members should increase the confidence that shared attitudes reflect objective reality. In contrast, disagreement between subjective attitudes and attitudes of other ingroup members should result in uncertainty about the validity of subjective attitudes (Wood, 2000). Thus, attitudes of ingroup members create a social norm, which motivates an individual to adjust his/her own attitudes to the normative attitudes within the ingroup (Abrams & Hogg, 2011). Furthermore, Self-Categorization Theory suggests that group membership is accentuated at the cost of individuality (i.e., depersonalization) when the self and others are sorted into ingroup and outgroup (Hogg & Terry, 2000). If a person thinks about the self in terms of group membership, group phenomena occur, such as a person adopts normative behavior or attitudes. We thus tested whether social influence was stronger among friends of the same ethnic group than among friends of different ethnic groups.

> H7: The more ingroup friends adolescents have, the more likely adolescents are to adopt the intergroup attitudes of their friends.

The Study Context

The present research focuses on the social influence of attitudes toward Turkish and Moroccan ethnic minority members among adolescents in the Netherlands. For decades, the Netherlands had an image as a tolerant society that happily welcomed immigrants and offered shelter to refugees (Zorlu & Hartog, 2001). This image changed in the late 1990s and early 2000s when the political and public discourse started to blame immigrants for societal problems surrounding integration and ethnic diversity (Vasta, 2007). Negative attitudes toward immigrants became increasingly widespread, and these attitudes were particularly negative toward Muslim immigrants (Coenders, Lubbers, Scheepers, & Verkuyten, 2008).

Already by the early 2000s, the majority of Turkish (58%–70%) and Moroccan (52%–60%) children—the two largest Muslim minority groups in the Netherlands—reported to have experienced ethnic exclusion or racist name calling by their peers (Verkuyten & Thijs, 2002). In line with these results, about 30% of Christian Dutch children and children who consider themselves non-religious reported negative feelings toward Muslims (Verkuyten & Thijs, 2010). A comparative study among adults showed that in 2005, the Netherlands belonged to the European countries with the highest level of anti-Muslim attitudes (Savelkoul, Scheepers, van der Veld, & Hagendoorn, 2012). As a consequence, more than 70% of Turkish and Moroccan Muslim adults in the Netherlands say that the Dutch have too negative views about Islam, and 40% say that their ethnic group is discriminated against (Maliepaard & Gijsberts, 2012). In fact, perceptions of ethnic discrimination are higher among people with a Turkish and Moroccan background than among immigrants from any other group (Andriessen, Fernee, & Wittebrood, 2014). The processes underlying social influence of adolescents' attitudes toward Turkish and Moroccan ethnic minority members in the Netherlands may thus compare to other contexts with similarly stigmatized ethnic outgroups.

Methods

Data

To test the hypotheses, we use data from the Arnhem School Study, a longitudinal school study

in the Netherlands (Stark & Flache, 2012). This dataset mapped social networks and interethnic attitudes among adolescents in their first years of secondary education (age 12–13). We used the second (December 2008) and third (June 2009) wave of this longitudinal dataset to test our hypotheses. The second wave took place four months after the transition to secondary school so that friendships had enough time to be formed (see the online supplemental material for more information on the study design, sample size determination, and omitted variables).

Questionnaires were completed online by all students of a class simultaneously on separate computers in their school's computer lab under a teacher's supervision. Sixty-one first-year classrooms in the secondary schools of Arnhem participated in data collection (88% of all first-year classrooms). Response rates were 93% in the second wave and 88% in the third wave. Because high numbers of missing values in the network could cause problems in the model estimation (Ripley, Snijders, Boda, Vörös, & Preciado, 2019), we excluded 13 classrooms in which more than 30% of students did not participate. Two other classrooms were not included because students answered the questionnaire unsupervised which led to high nonresponse. Four additional classrooms had to be excluded due to convergence problems in the analysis. Moreover, five classes were removed at a later stage because estimates for these classes violated assumptions of the statistical model (see Online Appendix A for more details on the sample selection). The final analyses are based on the remaining 37 classrooms that included $N = 837$ students with an average of 24 students per classroom.

Measures

Intergroup attitudes. Respondents were asked to indicate their attitudes toward Moroccans and Turkish people, the largest and most stigmatized immigrant groups in the Netherlands (Andriessen et al., 2014). Specifically, respondents were asked to indicate on a scale from 1 = totally disagree to 7 = totally agree whether they believed

that Moroccans/Turks are "honest," "friendly," "smart," and "helpful." Attitudes toward the Moroccan and Turkish groups were highly correlated and thus combined into an average composite score, which showed high internal consistencies (both waves, alpha = 0.97). A small minority of our respondents (about 9%) actually belong to these two groups. For them, the variable measured an ingroup attitude rather than an intergroup attitude. These students could not be left out of the analysis because longitudinal social network analysis requires data on complete networks (Ripley et al., 2019). Potential differences between these and other students were captured by controlling for ethnicity in our analyses.

Friendship network. All adolescents saw a list with the names of all classmates on the screen and were asked to indicate whom they consider to be a "best friend." The number of friends that could be indicated was not limited, to obtain the whole friendship network of an adolescent within the school class (Stark, 2018). The average number of friends was 4.69 in the first wave, and 4.38 in the second wave.

Sociometric popularity. To test Hypothesis H3, we identify adolescents with high sociometric popularity by measuring the number of incoming friendship nominations (indegree centrality) using the igraph package implemented in R (Csardi & Nepusz, 2006).

Prestige popularity. Answers to another network question were used to test Hypothesis H4 about prestige popularity. To answer, "who do others want to associate with? (who is popular?)", students could again nominate as many classmates as they wanted on a name list (Dijkstra, Cillessen, & Borch, 2013). Similarly, as in the case of students with high sociometric popularity, we measured prestige popularity as the number of incoming popularity nominations (indegree centrality).

Clique leaders. To test Hypothesis H5 about the influence of clique leaders, we identified such

leaders following the approach of Shepherd and Paluck (2015). Adolescents who received at least three friendship nominations and whose friends were interconnected (local clustering coefficient higher than 0.35) were labeled as clique leaders. In total, 245 adolescents satisfied the criteria to be labeled as a clique leader (29.27%; on average 6.6 clique leaders per classroom).[1] As mentioned above, we used the term "clique leader" in line with Shepherd and Paluck (2015), although a clique leader in this measure is not defined as a person who is at the top of the hierarchy.

Adolescents who spent a lot of time with classmates. To identify adolescents who are not only friends but also spend time with classmates (to test Hypothesis H6), adolescents were asked in a third network question, "with whom do you spend time after school?" This way we obtained a dyadic covariate (Ripley et al., 2019), which captured whether each pair of respondents within a classroom spent time after school together. A "1" indicated that two adolescents spend time after school together, and "0" indicated that two adolescents did not spend time after school together. The interaction between the effect of this variable and friends` influence on adolescents' attitudes allowed us to test whether time spent together facilitated the social influence that friends had on adolescents.

Ethnicity. Adolescents were labeled as being Dutch if both parents were born in the Netherlands. If at least one parent was born outside the Netherlands, this parent's ethnicity was ascribed to the student in line with the definition of ethnicity of Statistics Netherlands (2017). If both parents were born outside of the Netherlands and not in the same country, the mother's place of birth was used. Because adolescents' self-perception may differ from such an objective measure, we took self-identification into account. Students were asked: "Do you feel Dutch?" and "Do you feel [ethnicity of a parent born outside the Netherlands]?" The adolescents who identified more strongly as being

Dutch than with the ethnicity of their parents were recoded to be Dutch. Adolescents indicated 46 different ethnicities.

Ethnicity Moroccan/Turk. Because the dependent variable was attitudes toward the biggest minority groups in the Netherlands, Moroccans and Turks, we controlled for differences between students who belonged to these immigrant groups and those who did not. After ethnicity was assigned to participants, a dummy variable for having a Moroccan or Turkish ethnic background was created (91 participants with Moroccan or Turkish ethnicity; 12 participants did not indicate their ethnicity).

Same ethnicity. For every classroom, we created a matrix that represented for each pair of adolescents whether they shared the same ethnic background (coded 1) or not (coded 0). On average, adolescents had 13.94 classmates with the same ethnic background. Using the same ethnicity indicator as a covariate allows testing Hypothesis H7 (whether ingroup friends are more influential than outgroup friends).

Gender. A dummy variable representing 1 = male (52.93%), 0 = female (45.76%; 1.31% respondents did not indicate gender) was created.

Analytical Approach

To test our hypotheses, we examined the co-evolution of social network dynamics and intergroup attitudes using stochastic actor-oriented models (SAOMs) implemented in the software tool RSiena in R (Ripley et al., 2019). SAOMs model the likelihood that ties between network members are created, maintained, or dissolved, taking into account the initial relationships among network members and the processes that are assumed to underlie the observed network dynamics (Snijders, van de Bunt, & Steglich, 2010). An example of a process that can influence tie formation within a network is the preference of an adolescent to choose friends with the same gender. SAOMs use simulation methods to

assess how the distribution of network relations (friendships) and actor characteristics (intergroup attitudes) would change between two time points, given "effects" that specify how strongly each of the processes guides the dynamics. SAOMs then test which effects yield the best match between observed and simulated simultaneous changes of network and actor characteristics. This provides the parameters that represent what processes played a role in network evolution and what processes influenced a change of attitudes of network members.

SAOMs require complete data, which means that all members of a classroom had to be present in the data. Therefore, data for students who were not part of the classroom during the first measurement were treated as structurally missing during the estimation process (Ripley et al., 2019). Values for students who did not participate in the data collection were imputed and treated as noninformative during the estimation process (Huisman & Steglich, 2008).

A SAOM can contain two parts—a network and a *behavioral function*. The *network function* contains effects that influence tie formation, maintenance of ties, and tie dissolution. First, we accounted for structural effects to obtain unbiased estimates for other effects (Snijders et al., 2010). Structural effects captured how the network itself can affect the formation and maintenance of friendships (e.g., a friend of a friend is a friend). The specific structural effects that were included in our models are listed in Table 2 and their description and mathematical definitions are provided in Online Appendix B.

Next to the structural effects, we added *an attitude homophily effect* that captured students' tendency to select friends with similar intergroup attitudes (Hypothesis H2). Further, we added effects to control for adolescents' preference for friends with the *same gender* and the *same ethnicity*. Ego and alter effects for attitudes and gender were included to account for potential differences in the number of friendship nominations girls (vs. boys) and those with positive (vs. negative) attitudes sent and received. The covariates

that were used in the analysis were automatically centered using global means across all groups (Ripley et al., 2019).

To avoid model misspecification in the *behavioral function* (see next paragraph), we included the ego, alter, and similarity effect of the potential determinant of influence in the network function of the model. As there are no ego, alter, and similarity effects for the dyadic covariate "adolescents that spent a lot of time with classmates," a new variable was created that counted for each adolescent the number of classmates with whom they spent time after school, "the number of classmates with whom adolescents spent a lot of time." Including ego, alter, and similarity effects accounts for the possibility that adolescents who spent a lot of time with classmates create, maintain, or receive more friendship nominations than others.

In the *behavioral function*, SAOMs allow examining how attitude change depends on the social network. We included *the linear shape effect* to control for potential trends in the data toward lower or higher values on the dependent variable (intergroup attitudes), and *the quadratic shape effect* which refers to the tendency of adolescents with very positive or very negative attitudes to develop even more extreme attitudes. To control for potential differences between ethnic groups in attitude change, we also included the effect of *being a member of the Moroccan and Turkish minority*. To control for *having Moroccan and Turkish minority member friends* (i.e., intergroup contact), we included an effect for the proportion of Moroccans and Turks among friends.

Hypothesis H1 about social influence among friends was examined with the *average similarity* effect, which tests whether students tend to adopt the intergroup attitudes of their friends. To test whether some adolescents were more influenced by certain friends compared to others (i.e., our hypotheses about the impact of popularity), we added *interaction effects between average similarity and the friends' average value on the potential determinants of influence*: sociometric popularity (H3), prestige popularity (H4), being a clique

leader (H5), and adolescents that spent a lot of time with classmates (H6) (Geven, Weesie, & van Tubergen, 2013). The main effects of these concepts were also added to the model as control variables.

To evaluate whether same-ethnic friends had more influence on adolescents' intergroup attitudes than inter-ethnic friends (i.e., Hypothesis H7), we added two interactions. First, we weighted the *average similarity* effect by *same ethnicity* to see whether having the same ethnic background facilitated adoption of intergroup attitudes from these friends. Second, we tested whether *same ethnicity* facilitated the impact of potential determinants of social influence by adding a three-way interaction and all associated two-way interactions between: *average similarity*, the friends' average value on the *potential determinant* of social influence (e.g., sociometric popularity), and the friends' average value of *same ethnicity* (dyadic covariate).

To estimate whether our model fitted the data with respect to network change, we calculated five goodness-of-fit tests (Lospinoso, 2012). Specifically, we tested for five auxiliary statistics: outdegree distribution, indegree distribution, behavior distribution, geodesic statistics, and triad census. The results showed that our model fitted the data well. For more information, see Online Appendix C.

We analyzed all 37 classrooms at once using SIENA's multi-group option (for an example, see Leszczensky, Stark, Flache, & Munniksma, 2016). This approach allows estimating interactions due to the bigger statistical power provided by a large sample. However, the multi-group option makes the crucial assumption that all parameters are the same for all classes (Ripley et al., 2019). To inspect whether heterogeneity in the parameters affected the results, we conducted robustness checks in which we analyzed school classes that were similar in ethnic composition and academic track in smaller multi-group objects and combined the results using a meta-analysis. This procedure is described in Online Appendix A.

We provide estimates, which can be interpreted as log-odds, standard errors, and p-values.

In the case of network ties, a positive effect represents the likelihood that ties were created or maintained given the particular process under consideration. In the case of social influence (average similarity), a positive effect indicates that adolescents' attitudes became more similar to those of their friends over time. The estimates and standard errors were obtained using the method of Iterated Weighted Least Square (Snijders & Baerveldt, 2003).

Models are required to converge, otherwise their estimates are not reliable. An indicator of the convergence of the algorithm is the overall maximum convergence ratio, which considers the deviations between simulated values of the statistics and their observed values. We applied the official rule of thumb to consider a model to be converged; specifically, the overall maximum convergence ratio must be smaller than or close to 0.025 (Ripley et al., 2019). Convergence ratios for specific models are provided in Tables 2 and 3.

Results

Descriptives

Intergroup attitudes became significantly worse between Wave 1 ($M = 4.18$) and Wave 2 ($M = 4.03$; $t(710) = 2.6$, $p = 0.009$), and the average number of friends decreased slightly between Wave 1 ($M = 4.69$) and Wave 2 ($M = 4.38$; $t(840) = 2.10$, $p = 0.030$). However, intergroup attitudes were still highly correlated between waves, and so were the numbers of friends (Table 1). The number of friends in both waves was positively correlated with both popularity measures. Being a clique leader significantly correlated with number of friends, but only in the first wave. As expected, intergroup attitudes were significantly associated with the dummy variable representing Moroccan/Turkish ethnic background, showing that adolescents from the Moroccan and Turkish groups had more positive attitudes toward the Moroccan and Turkish minorities.

To explore how the different measures of popularity related to each other, we calculated

Table 1. Descriptive statistics and correlations between all variables (N = 837).

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
M	4.69	4.38	4.18	4.03	0.22	0.54	4.51	2.93	2.71	0.31
SD	3.97	3.74	1.37	1.27	0.44	0.50	1.33	1.23	1.04	0.17
Range	0–26	0–26	1–7	1–7	0/1	0/1	0–12	0–20	0–10	0/1
1. Friends	–									
2. Friends T2	0.41***	–								
3. Attitudes	0.02	0.03	–							
4. Attitudes T2	0.08*	0.09**	0.49***	–						
5. Ethnicity Moroccans/Turks	–0.01	–0.05	0.23***	0.19***	–					
6. Gender	0.03	0.07	–0.09**	–0.06	0.01	–				
7. Sociometric popularity	0.39***	0.32***	0.05	0.07	–0.06	–0.03	–			
8. Prestige popularity	0.20***	0.15***	0.06	0.01	–0.01	0.04	0.48***	–		
9. Spending a lot of time with classmates	0.31***	0.25***	0.03	0.05	–0.05	–0.10**	0.70***	0.39***	–	
10. Being a clique leader	–0.31***	–0.07	–0.03	–0.05	0.01	–0.02	0.00	–0.03	–0.03	–

***p < 0.001; **p < 0.01; *p < 0.05.

partial correlations between sociometric popularity, prestige popularity, and spending a lot of time with classmates (Table 1). Sociometric popularity was positively correlated with prestige popularity, $r = 0.48$, $p < 0.001$, and even more strongly with the number of classmates with whom adolescents spend a lot of time, $r = 0.70$, $p < 0.001$. Prestige popularity was also correlated with the number of classmates with whom adolescents spend a lot of time, $r = 0.39$, $p < 0.001$, but this correlation was weaker. These findings indicate that the more friends that adolescents had, the more likely they were also perceived as being popular and the more likely they were to spend a lot of free time with classmates. To capture an association between being a clique leader (a dichotomous variable) and other types of popularity (continuous variables), we used bivariate logistic regression: sociometric popularity, $b = 0.003$, $SE = 0.006$, $p = 0.613$; prestige popularity, $b = –0.01$, $SE = 0.004$, $p = 0.021$; and the number of classmates with whom adolescents spend a lot of time, $b = –0.007$, $SE = 0.008$, $p = 0.413$. Clique leaders were less likely to be perceived as popular (prestige popularity). Moreover, they were not more sociometrically popular and they did not spend

more time with classmates in comparison to other peers.

Friendship Influence and Friendship Homophily

Friendship formation and maintenance. The stochastic actor-oriented analysis showed significant effects of several network micro-dynamics on friendship formation and maintenance in the baseline model (Model 1 in Table 2). In line with previous research on adolescents' friendship networks, the density effect was negative, showing that adolescents had few friends in the whole network (est = –3.04, $SE = 0.20$, $p < 0.001$; see Table 2), unless these friends had specific desirable properties or network positions captured by the other effects in the model. The positive reciprocity effect (est = 2.12, $SE = 0.19$, $p < 0.001$) means that adolescents tended to reciprocate friendship nominations. Just as is typically found in friendship networks (Block, 2015), the likelihood of having reciprocated ties to friends-of-friends was also found to be significant and negative (transitive reciprocated triplets; est = –0.42, $SE = 0.06$, $p < 0.001$). A positive indegree popularity parameter indicated that the

Table 2. Multi-group analysis of network and attitudes change, presenting the baseline model (Model 1) and models that involve interactions between average similarity and potential determinants of social influence: Sociometric popularity (Model 2), prestige popularity (Model 3), being a clique leader (Model 4), or spending time with friends (Model 5) (N = 837).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Network function										
(Density)	−3.04***	0.20	−1.22	3.87	−3.14***	0.21	−2.97***	0.21	−2.38***	0.37
Reciprocity	2.12***	0.19	2.51**	1.17	2.03***	0.19	2.18***	0.21	2.26***	0.28
Jaccard similarity for outgoing ties effect	5.21***	0.84	5.74*	2.90	5.03***	0.81	5.39***	0.82	5.77***	1.03
In-structural equivalence	0.21***	0.04	0.21***	0.06	0.21***	0.04	0.17***	0.04	0.19***	0.05
Transitive reciprocity triplets	−0.42***	0.06	−0.46***	0.14	−0.40***	0.06	−0.44***	0.06	−0.43***	0.07
Transitive reciprocity triplets 2	0.49***	0.14	0.67	0.44	0.45***	0.13	0.55***	0.17	0.52***	0.17
Indegree popularity	0.12**	0.04	0.10+	0.05	0.11**	0.03	0.09**	0.04	0.09+	0.04
Indegree activity	−0.35***	0.09	−0.93	1.47	−0.36***	0.10	−0.33***	0.08	−0.55**	0.18
Outdegree activity	0.10***	0.01	0.12	0.07	0.10***	0.01	0.09***	0.01	0.11***	0.02
Gender homophily	0.46***	0.07	0.60+	0.32	0.54***	0.08	0.47***	0.08	0.54***	0.10
Ego gender	0.21**	0.08	0.37	0.40	0.22**	0.08	0.21**	0.07	0.32**	0.11
Alter gender	−0.16*	0.08	−0.21	0.23	−0.13+	0.07	−0.14+	0.08	−0.17+	0.09
Ethnic homophily	0.12	0.08	0.23	0.43	0.10	0.08	0.15*	0.08	0.06	0.09
Attitude homophily	0.65*	0.30	0.93	0.89	0.70*	0.30	0.64*	0.28	0.85*	0.37
Ego attitude	0.02	0.03								
Alter attitude	−0.02	0.03								
Potential determinant of social influence homophily[a]			0.87	0.66	1.33***	0.23	−0.05	0.06	0.92***	0.25
Ego potential determinant of social influence[a]			0.51	0.93	0.06**	0.02	0.28**	0.09	0.25*	0.11
Alter potential determinant of social influence[a]					0.06***	0.01	0.38***	0.09	0.08***	0.02
Behavioral Function										
Attitude linear shape	−0.09*	0.04	−0.10*	0.04	−0.09*	0.04	−0.09*	0.04	−0.07	0.08
Attitude quadratic shape	−0.005	0.03	0.003	0.03	−0.005	0.03	−0.003	0.03	−0.004	0.03
Average similarity	4.91***	0.82	−0.85	1.97	4.89***	0.85	4.97***	0.81	5.28***	1.62
Ethnicity Moroccan/Turk	0.07	0.14	0.08	0.15	0.07	0.14	0.06	0.14	0.07	0.14
Having Moroccan/Turkish friends	0.11	0.29	0.07	0.15	0.10	0.30	0.11	0.30	0.11	0.30
Alters' average potential determinant of social influence[a]			−0.01	0.03	−0.01	0.02	0.18	0.16	−0.05	0.15
Average similarity x potential determinant of social influence[a]			1.10**	0.41	0.05	0.20	0.81	2.35	−0.34	1.24

Stochastic actor-oriented multi-group analysis. Overall maximum convergence ratios indicated that all models converged; 0.24 Model 1 and Model 2, 0.23 Model 3 and Model 4, and 0.22 Model 5. Ego and alter attitude effects were removed after Model 1 when they were insignificant.

[a]Potential determinant of social influence represents sociometric popularity in Model 2, prestige popularity in Model 3, being a clique leader in Model 4, and spending time with friends in Model 5. In Model 5, we tested the interaction between spending time with classmates (dyadic covariate) and average similarity, which enabled us to evaluate whether friends with whom adolescents spent time were particularly influential. In the network function, we used the number of classmates with whom adolescents spent a lot of time instead of a dyadic covariate.

***p < 0.001; **p < 0.01; *p < 0.05; +p < 0.10.

Table 3. Attractiveness of attitudes that adolescents could adopt depending on the attitudes of their friends (social influence).

Friends' intergroup attitudes	Intergroup attitudes that an adolescent could adopt						
	1	2	3	4	5	6	7
1	1.31	0.49	−0.33	−1.14	−1.96	−2.78	−3.60
2	0.43	1.25	0.43	−0.39	−1.20	−2.02	−2.84
3	−0.46	0.36	1.18	0.36	−0.46	−1.27	−2.09
4	−1.36	−0.54	0.28	1.10	0.28	−0.54	−1.36
5	−2.26	−1.45	−0.63	0.19	1.01	0.19	−0.63
6	−3.19	−2.37	−1.55	−0.73	0.09	0.90	0.09
7	−4.12	−3.30	−2.48	−1.66	−0.85	−0.03	0.80

more incoming friendship nominations an adolescent received in the first wave, the more likely the adolescent received additional friendship nominations in the second wave (est = 0.12, $SE = 0.04$, $p = 0.001$). A negative indegree activity parameter showed that the more incoming friendship nominations an adolescent received in the first wave, the less likely this adolescent was to send friendship nominations in the second wave (est = −0.35, $SE = 0.09$, $p = 0.001$). A positive outdegree activity effect indicated that adolescents who nominated many friends sent even more friendship nominations in the second wave (est = 0.10, $SE = 0.01$, $p < 0.001$).

A non-significant coefficient for ethnic homophily indicated that friendship ties were not more likely created or maintained between adolescents of the same ethnic background (est = 0.12, $SE = 0.08$, $p > 0.10$). In contrast, adolescents with the same gender (gender homophily; est = 0.46, $SE = 0.07$, $p < 0.001$), and with similar interethnic attitudes (attitude homophily; est = 0.65, $SE = 0.30$, $p < 0.05$), created or retained friendship ties to each other with higher probability than others. This last finding confirms Hypothesis H2, and suggests that adolescents selected friends with similar intergroup attitudes.

Attitude change. Results for the behavioral function indicated that—after controlling for simultaneous network dynamics and other attitude dynamics—adolescents' intergroup attitudes

became slightly more negative over time (see Table 2, attitudes linear shape; est = −0.09, $SE = 0.04$, $p < 0.05$). There was no indication that extreme attitudes changed differently between Wave 1 and Wave 2, as indicated by a non-significant attitudes quadratic shape effect (est = −0.005, $SE = 0.03$, $p > 0.10$). Furthermore, the non-significant ethnicity Moroccan/Turk effect shows that attitudes of adolescents with a Moroccan or Turkish ethnic background did not change differently compared to other adolescents (est = 0.07, $SE = 0.14$, $p > 0.10$). Moreover, having Moroccan and Turkish minority members as friends (i.e., intergroup contact) did not influence the change in one's attitudes toward those minorities (est = 0.11, $SE = 0.29$, $p > 0.10$).

While controlling for adolescents' tendency to select friends with similar intergroup attitudes, we found that adolescents tended to adjust their intergroup attitudes to those of their friends (average similarity; est = 4.91, $SE = 0.82$, $p < 0.001$). This is in line with Hypothesis H1, and shows that adolescents were influenced by the intergroup attitudes of their friends.

To obtain a better understanding of what the social influence effect meant, we calculated an "influence table" that shows how attractive it is according to the model for an adolescent to adjust his/her intergroup attitudes toward the average intergroup attitudes of their friends (Ripley et al., 2019). The values in each cell of Table 3 give the relative "attractiveness" of adjusting one's attitudes toward a certain value, given the average

attitudes of one's friends. Two trends can be observed. First, the highest values are on the diagonal, which means that adolescents preferred most strongly to adopt the exact same intergroup attitudes as their friends. Attitudes became increasingly less attractive for an adolescent the further away they were from the diagonal, and thus the further away from the average attitude of the friends. Second, the attractiveness values in the upper left of the table are higher than those in the lower right corner. This means that social influence was stronger among adolescents with more negative intergroup attitudes.

Influential Individuals

To examine whether certain adolescents were more influential, we estimated interactions between average similarity (social influence) and the four popularity measures. To avoid multicollinearity, each interaction was investigated separately. In Table 2, the various popularity measures are called 'Potential determinant of social influence' and the corresponding effects are included from Model 2 onwards. Potential determinant of social influence refers to sociometric popularity in Model 2, prestige popularity in Model 3, being a clique leader in Model 4, and spending time with classmates in Model 5.

Sociometric popularity. As Model 2 in Table 2 shows, the interaction between average similarity and having friends with high sociometric popularity was significant (est = 1.10, SE = 0.41, $p < 0.01$). Hence, in line with Hypothesis H3, students' intergroup attitudes were more influenced by their friends' attitudes the more friendship nominations these friends received. The conditional main effect of having friends with high sociometric popularity on intergroup attitudes was non-significant (est = –0.01, SE = 0.03, $p > 0.10$). This indicates that sociometrically popular friends affected change of intergroup attitudes only through social influence and not just because of their popularity status.

Prestige popularity. Model 3 shows that prestige popular individuals had no more influence on

friends' intergroup attitudes than less popular friends. The non-significant parameter referring to an interaction between average similarity and average alters' prestige popularity (est = 0.05, SE = 0.20, $p > 0.10$, Model 3) shows that adolescents were not particularly influenced by prestige popular friends. This leads to a rejection of Hypothesis H4. The main effect of average alters' prestige popularity centrality was also non-significant (est = –0.01, SE = 0.03, $p > 0.10$). In contrast, prestige popularity was found to affect friendship formation, as the associated ego (est = 0.06, SE = 0.02, $p < 0.01$), alter (est = 0.06, SE = 0.01, $p < 0.001$), and homophily (est = 1.33, SE = 0.23, $p < 0.001$) in the network part of the model were significant. This means that the more prestige popular adolescents were, the more likely they were to select friends and to be nominated as friends. Moreover, peers with similar levels of prestige popularity tended to select each other as friends.

Being a clique leader. Adolescents were not more influenced by their friends when these friends were clique leaders. The interaction between average similarity and friends' clique leadership position was non-significant (est = 0.81, SE = 2.35, $p > 0.10$, Model 4), which leads to rejection of Hypothesis H5. Similarly, the direct effect of having friends who were clique leaders was non-significant (est = 0.18, SE = 0.16, $p > 0.10$). In line with the definition of a clique leader, results of the network function showed that clique leaders were more likely to nominate friends (ego: est = 0.28, SE = 0.09, $p < 0.01$) and to be nominated as friends (alter: est = 0.38, SE = 0.09, $p < 0.001$) than non-clique leaders.

Time spent together. Spending a lot of time with friends also did not facilitate the social influence of those friends. The variable time spent together is based on spending time with classmates. Due to the interaction between spending time with classmates and average similarity, we evaluated whether friends with whom adolescents spent time were particularly influential. The interaction between average similarity and spending a lot of

time with classmates did not significantly predict change in adolescents' intergroup attitudes (est = –0.34, $SE = 1.24$, $p > 0.10$, Model 5). This rejects Hypothesis H6. The direct effect of average time that friends spend with classmates was non-significant also (est = –0.05, $SE = 0.15$, $p > 0.10$). However, the homophily effect of spending a lot of time with classmates was significant in the network function of the model. Not surprisingly, this suggests that adolescents who spend a lot of time with classmates tend to befriend other adolescents who also do this (Model 5, est = 0.92, $SE = 0.25$, $p < 0.01$). Spending time with classmates was also associated with nominating more friends (est = 0.25, $SE = 0.11$, $p < 0.05$) and being nominated as a friend (est = 0.08, $SE = 0.02$, $p < 0.01$).

Influence of ingroup versus outgroup friends. We tested whether adolescents were more influenced by friends with the same ethnic background (see Table 4). The interaction between average similarity and having friends of the same ethnicity was non-significant (est = 1.06, $SE = 1.08$, $p > 0.10$, Model 1), showing that shared ethnic background between friends did not facilitate social influence. In addition, non-significant three-way interactions showed that sharing the same ethnic background with friends did not facilitate the influence of sociometrically popular adolescents (est = –2.08, $SE = 1.50$, $p > 0.10$, Model 2), prestige popular adolescents (est = 0.53, $SE = 0.75$, $p > 0.10$, Model 3), or adolescents who spent a lot of time with friends (est = –1.12, $SE = 3.08$, $p > 0.10$, Model 5). In contrast, our results showed that shared ethnic background between friends reduced the influence of clique leaders on friends' intergroup attitudes (est = –18.36, $SE = 8.36$, $p < 0.05$, Model 4).

Robustness Check

We conducted additional analyses to test whether our results were robust against violations of the assumption of the multi-group analysis that all parameters were the same across classrooms. To this end, we analyzed separately groups of classrooms which were similar in that they were from the same school and were of the same academic level (see Online Appendix A for a detailed explanation). The robustness check confirmed the finding that students were more likely to adopt their friends' attitudes when these friends had high sociometric popularity (est = 0.93, $SE = 0.20$, $p^{RS} < 0.001$, Model 2). Similar to in the main analysis, interactions between prestige popularity (est = –0.05, $SE = 0.21$, $p^{RS} = 0.566$, Model 3), being a clique leader (est = –1.19, $SE = 3.36$, $p^{LS} = 0.205$, Model 4), or spending a lot of time with classmates (est = –1.69, $SE = 0.83$, $p^{LS} = 0.054$, Model 5) were non-significant.

We conducted a second robustness check to test whether friends' social influence was different for adolescents of Turkish or Moroccan ethnicity because attitudes were measured toward these students' groups (see Online Appendix D). The interaction between attitude homophily and Turkish or Moroccan background showed that these adolescents' intergroup attitudes were less strongly influenced than those of the other respondents in our sample (est = –4.33, $SE = 1.50$, $p < 0.01$, Table E1, Model 1). This suggests that the earlier finding of social influence was not due to including students with a Turkish or Moroccan background in the sample. We also found that adolescents with Turkish or Moroccan ethnicity selected friends with similar intergroup attitudes with higher probability than other students (est = 1.86, $SE = 0.90$, $p < 0.05$, Table E1, Model 1). In fact, the main effect of attitude homophily turned non-significant in the baseline model when the interaction between attitude homophily and being Turkish or Moroccan was included into the model (est = 0.60, $SE = 0.31$, $p < 0.10$, Table E1, Model 1). This significant interaction suggests that having similar (positive) attitudes toward Turks and Moroccans in general was only important for adolescents of these particular groups. Sharing similar attitudes toward Turks and Moroccans was not relevant for friendship selection or maintenance of adolescents who did not belong to these groups.

We also examined whether having the Turkish and Moroccan students in the sample affected

Table 4. Multi-group analysis of network and attitudes change, presenting the baseline model (Model 1) and models that involve interactions between average similarity and potential determinants of social influence: Sociometric popularity (Model 2), prestige popularity (Model 3), being a clique leader (Model 4), or spending time with friends (Model 5), including the role of same ethnicity(N = 837).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Network function										
(Density)	−3.04***	0.21	−1.18	2.51	−3.14***	0.21	−2.97***	0.21	−2.38***	0.37
Reciprocity	2.12***	0.19	2.52*	0.81	2.02***	0.18	2.17***	0.19	2.26***	0.28
Jaccard similarity for outgoing ties effect	5.19***	0.85	5.78**	1.90	5.06***	0.82	5.38***	0.89	5.77***	1.06
In-structural equivalence	0.21***	0.04	0.20***	0.06	0.21***	0.04	0.17***	0.04	0.19***	0.05
Transitive reciprocity triplets	−0.42***	0.06	−0.46***	0.11	−0.40***	0.06	−0.44***	0.06	−0.43***	0.07
Transitive reciprocity triplets 2	0.50***	0.14	0.68*	0.34	0.44***	0.13	0.54***	0.16	0.52**	0.16
Indegree popularity	0.12***	0.04	0.10*	0.05	0.11**	0.03	0.09**	0.03	0.09+	0.05
Indegree activity	−0.35***	0.10	−0.94	0.97	−0.36***	0.09	−0.33***	0.08	−0.55**	0.19
Outdegree activity	0.10***	0.01	0.12*	0.05	0.10***	0.01	0.09***	0.01	0.11***	0.02
Gender homophily	0.45***	0.08	0.60*	0.25	0.54***	0.09	0.47***	0.08	0.54***	0.10
Ego gender	0.21**	0.08	0.37	0.29	0.22**	0.08	0.20**	0.07	0.32**	0.12
Alter gender	−0.16*	0.08	−0.21	0.18	−0.13	0.07	−0.14+	0.08	−0.17+	0.09
Ethnic homophily	0.12	0.08	0.24	0.26	0.09	0.08	0.15+	0.08	0.06	0.09
Attitude homophily	0.66*	0.31	0.94	0.64	0.69*	0.30	0.64*	0.30	0.84*	0.39
Ego attitude	0.02	0.03								
Alter attitude	−0.02	0.03								
Potential determinant of social influence homophily[a]			0.87	0.62	1.33***	0.23	−0.05	0.06	0.92***	0.25
Ego potential determinant of social influence[a]			0.51	0.62	0.06**	0.02	0.28**	0.09	0.25*	0.11
Alter potential determinant of social influence[a]					0.06***	0.01	0.37***	0.09	0.08***	0.02
Behavioral function										
Attitude linear shape	−0.04	0.08	−0.07	0.10	−0.08	0.09	−0.01	0.09	−0.24	0.16
Attitude quadratic shape	−0.01	0.03	0.003	0.03	−0.01	0.03	−0.02	0.03	−0.01	0.03
Average similarity	4.00***	1.19	−8.15	6.04	4.11***	1.27	4.45**	1.44	4.38*	1.76
Ethnicity Moroccan/Turk	0.03	0.14	0.08	0.18	0.04	0.14	0.06	0.16	0.06	0.14
Having Moroccan/Turkish friends	0.08	0.31	0	0.35	0.08	0.31	0.02	0.34	0.04	0.32
Alters' average same ethnicity with friends	−0.09	0.13	−0.05	0.16	−0.02	0.14	−0.14	0.15	0.33	0.29
Average similarity x alters' average same ethnicity with friends	1.10	1.10	0.04	1.33	1.03	1.11	0.90	1.24	1.41	1.42
Alters' average potential determinant of social influence[a]			0.01	0.06	0.06+	0.04	−0.17	0.37	0.44	0.32
Average similarity x potential determinant of social influence[a]			2.66	1.40	−0.22	0.48	10.34+	6.00	−0.27	1.32
Alters' average same ethnicity with friends x potential determinant of social influence[a]			−0.02	0.08	−0.11*	0.05	0.63	0.53	−0.82	0.50

(Continued)

Table 4. (Continued)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Average similarity x potential determinant of social influence x alters' average same ethnicity with friends[a]			−2.08	1.50	0.53	0.75	−18.36[*]	8.02	−1.12	3.08

Stochastic actor-oriented multi-group analysis. Overall maximum convergence ratios indicated that all models converged; 0.24 Model 1, 0.23 Model 2, 0.24 Model 3, 0.23 Model 4, and 0.21 Model 5. Ego and alter attitude effects were removed after Model 1 because they were insignificant. [a]Potential determinant of social influence represents sociometric popularity in Model 2, prestige popularity in Model 3, being a clique leader in Model 4, and spending time with friends in Model 5. In Model 5, we tested the interaction between spending time with classmates (dyadic covariate) and average similarity, which enabled us to evaluate whether friends with whom adolescents spent time are particularly influential. In the network function, we used the number of classmates with whom adolescents spent a lot of time instead of a dyadic covariate.
***p < 0.001; **p < 0.01; *p < 0.25, +p < 0.10.

further findings of the potential determinants of influence (see Online Appendix D). For this purpose, we tested a three-way interaction between average similarity, being Turkish or Moroccan, and the determinants of influence of friends. Non-significant coefficients for all four three-way interactions showed that Moroccans and Turks were not more or less influenced by sociometrically popular friends (est = 2.73, SE = 2.08, p > 0.10, Model 2), prestige popular friends (est = 0.31, SE = 0.84, p > 0.10, Model 3), clique leaders (est = −3.67, SE = 7.49, p > 0.10, Model 4), or friends who spent a lot of time with peers (est = 12.99, SE = 11.05, p > 0.10, Model 5).

Discussion

The present study found that friendship influence played a significant role in the development of adolescents' intergroup attitudes. Specifically, adolescents adjusted their intergroup attitudes to the average intergroup attitudes among their friends. This is in line with earlier research on social influence with regard to adolescents' xenophobic and tolerance attitudes (Hjerm et al., 2018; Miklikowska, 2017; van Zalk et al., 2013) or intergroup contact attitudes (Rivas-Drake et al., 2019). The results also suggest that intergroup attitudes (or correlates thereof) affect the formation of friendships. This finding emphasizes the importance of using social network analysis to

study social influence: overlooking such selection processes can lead to wrong inferences about social influence (Steglich et al., 2010; Wölfer et al., 2015).

Robustness checks indicated, however, that, in the present study, this selection effect was mainly driven by the group of Turkish and Moroccan students who selected friends with similar (positive) attitudes toward their own ethnic group. Moreover, adolescents preferred friends with the same gender and of the same ethnicity (Geven et al., 2013; Leszczensky et al., 2016; van Zalk et al., 2013).

Thus far, it was unknown which adolescents in a classroom are particularly influential of their friends' intergroup attitudes. Our analyses revealed that sociometrically popular individuals were more influential of their friends' attitudes than less sociometrically popular individuals. Three other characteristics of adolescents were not indicative of social influence. These findings have important theoretical implications for our understanding of how adolescents influence each other and also practical implications for interventions aiming to improve intergroup attitudes.

Influence of Sociometrically Popular Adolescents

The results showed that friends play a critical role in the development of intergroup attitudes of

adolescents even after controlling for alternative explanations. The finding that adolescents adopted the intergroup attitudes prevalent among their friends is in line with previous research that showed that peers are a crucial socialization factor for adolescents (Bukowski & Newcomb, 1984; Raabe & Beelmann, 2011). Moreover, our results revealed that social influence was stronger among adolescents with more negative intergroup attitudes. This emphasizes the need for intervention programs, as positive intergroup attitudes seem to be less contagious than negative ones.

Although we tested for multiple possible indicators of social influence, only sociometric popularity was associated with stronger influence on friends' intergroup attitudes. The other factors examined in our study—prestige popularity, spending time with friends, and being a clique leader—did not indicate adolescents that were more influential than others. This is in line with research stressing that various indicators of popularity often do not overlap (Parkhurst & Hopmeyer, 1998), and can have distinct consequences. It is thus advisable for future research to not only focus on one type of popularity (Cillessen & Rose, 2005; Dijkstra et al., 2013; Geven et al., 2013) but to include various indicators, as their impact on social influence may be different for different attitudes and behaviors.

The possible reasons behind the exceptional social influence of adolescents with many friends may lie in three not-mutually-exclusive attributes associated with sociometric popularity. First, sociometric popularity often goes hand in hand with prosocial skills (Gest, Graham-Bermann, & Hartup, 2001), which may provide an efficient way to persuasively communicate one's own attitudes. Second, in line with Group-Norm Theory (Crandall et al., 2002; Kelman, 1958), adolescents may derive their own attitudes by adopting the group norm that may be defined particularly by popular peers. By observing adolescents with many friends, one may infer that the attitudes and behavior of a sociometrically popular adolescent are desirable within a social network. This latter explanation, however, collides with prior research

that showed that prestige popular adolescents define group norms to a bigger extent than sociometrically popular adolescents (Adler & Adler, 1998). Yet, prestige popularity did not have an especially big impact on peers' intergroup attitudes in our study.

Who the most influential is may depend on the behavior or attitude that is being influenced (Valente, 2012). In line with this notion, our results contrast with the earlier research that found that popular individuals who received many friendship nominations did not have a bigger influence on their friends' problem behavior at school than less popular peers (Geven et al., 2013). However, these conflicting results may also be a consequence of different statistical approaches. More research is needed studying characteristics of influential individuals in various domains. Such research may benefit from the distinction of various indicators of popularity and of influential network positions that we have made in the present study.

The Role of Other Popularity Measures

Prestige popularity. Contrary to our expectation, high prestige popularity was not associated with more influence on friends' intergroup attitudes. This could be a consequence of the fact that intergroup attitudes are not a salient characteristic of prestige popular adolescents. Research has shown that adolescents imitate prestige popular peers to become prestige popular themselves (Adler & Adler, 1998; Benoit-Smullyan, 1944; Dijkstra et al., 2010). Accordingly, they may adopt behavior and attitudes that are associated with prestige popularity, but not other non-salient attitudes (Rambaran, Dijkstra, & Stark, 2013). One way to capture the salience with respect to intergroup attitudes is by testing within-classroom correlation between popularity and intergroup attitudes (Veenstra, Dijkstra, & Kreager, 2017). Our data showed the average correlation across all classrooms between prestige popularity and intergroup attitudes at Time 1 was 0.074. This was significant in only two of the 37 classrooms ($p < 0.05$). These results suggest that intergroup

attitudes were not viewed by adolescents as an indicator of prestige popularity, thus intergroup attitudes may not be a desirable trait for imitation if one wants to become more prestige popular. This may be different for other attitudes or behaviors.

Clique leader. In contrast to the prior research (Paluck & Shepherd, 2012), we did not find evidence that clique leaders were exceptionally influential regarding the intergroup attitudes of their friends. This might be the consequence of studying different outcomes (Valente, 2012). Moreover, clique leaders might not be exceptionally influential due to the relatively small size of classroom social networks in the present research. Small classroom sizes enable all participants to interact without big restrictions. Thus, because of frequent social interaction among classmates, norms of a classroom and those of the subgroups within the classroom may often mirror each other. An alternative explanation is that clique leaders, as defined by Paluck & Shepherd (2012), may not be the actual leaders of a friendship group. A clique leader is not defined as a person who is at top of the hierarchy in a clique but merely as a person who is connected with many interconnected adolescents. It is thus possible that mere connections with many clique members do not measure the leadership status in our data. An alternative method may be to have members of friendship groups directly select clique leaders. However, this method should be less reliable because clique members can have different representations of how to define a clique leader. If members of various friendship groups selected clique leaders based on different rules, clique leaders would not be comparable (Mardsen, 2005).

Time spent together. Our results also suggest that students are not more influential when they actually spend time with their friends. Instead, we found that friends influence each other's intergroup attitudes regardless of the time spent together. Group-Norm Theory (Crandall et al., 2002; Kelman, 1958) offers a potential explanation for this finding. During the course of a friendship, adolescents may learn about the intergroup attitudes held by friends through discussion or even derogatory remarks. These interactions may help adolescents to form beliefs about the norms that exist in their friendship group. For this to happen, it may not matter how often friends interact. An alternative explanation is that the dichotomous character of the indicator of whether friends spent time together after school restricted the variance too much. In other words, we only observed whether adolescents spent time with friends, not how often they spent their free time together.

Social influence and ingroup members. It may seem surprising that we did not find support for the expectation that adolescents' intergroup attitudes are more affected by influence from ethnic ingroup peers than from ethnic outgroup peers. Another surprising finding is that adolescents did not prefer friends with the same ethnicity. However, adolescents preferred friends with similar attitudes toward Moroccans and Turks. Since ingroup attitudes are usually better than outgroup attitudes, we expect that adolescents holding negative attitudes toward Moroccans and Turks are less likely to be Moroccans and Turks. Because of the attitude homophily, adolescents with negative attitudes befriended peers with similarly negative attitudes who, at the same time, are less likely to be Moroccans and Turks and, consequently, more likely to be ingroup friends. As the influence table showed (Table 3), adolescents with negative attitudes are more influenced by friends than adolescents with more positive attitudes. This implies that ingroup friends were not found to be more influential of one's outgroup attitudes; however, this effect might be substituted to a certain extent by the fact that friends are selected based on their attitudes toward Moroccans and Turks. Adolescents with negative outgroup attitudes might have more ingroup friends and be more influenced by these friends than adolescents with positive outgroup attitudes. We look forward to future research that will study the influence of ingroup versus outgroup in more detail. We suggest that such research should consider various

homophily tendencies present in the social networks and the fact that adolescents with negative attitudes might be influenced differently than adolescents with positive attitudes.

Limitations

Social network analyses rarely make use of representative samples, and our study is no exception in this matter (Wasserman & Faust, 1994). Our data represent early adolescents from one city in the Netherlands. Therefore, it is not obvious how our findings can be generalized to other contexts. Future research should examine which characteristics affect social influence among older adolescents, for which intergroup attitudes may be more important. Moreover, the results indicate that the context in which our study took place was not marked by intergroup tension. The participants did not have very negative intergroup attitudes and there was no tendency for ethnic homophily in friendship formation. Social influence may look different when it concerns actual prejudice in situations of strongly segregated networks. The group pressure to adjust to such attitudes may be stronger than in our study. Furthermore, friendship selection may play a much bigger role, as the variation in intergroup attitudes among adolescents would be bigger and therefore the difference in intergroup attitudes could be more visible.

Future research could also extend our selection of indicators of popularity even more. Paluck and colleagues (2016), for instance, investigated the role that time spent together played for social influence by only focusing on the top 10% of students that were nominated in a question about time spent together. Another recent study explored the role of proximity prestige in the influence of intergroup attitudes (Hjerm et al., 2018). Just as in the present research, this study found an overall indication of social influence among adolescents. Moreover, students with high proximity prestige, who were directly or indirectly related to many classmates, exerted significantly more influence (Hjerm et al., 2018). Future research could explore various other indicators of

adolescents' positions in a social network as potential explanations of social influence.

A potential methodological limitation is the assumption underlying our statistical model that the parameters were the same in all classrooms. Robustness checks in which we were able to adjust for this assumption revealed remarkably similar results, which increases our confidence in the results. Future research may improve even further by estimating random coefficient multilevel Siena models (Ripley et al., 2019), which have been developed recently but, to the best of our knowledge, have not yet been applied in published research.

As described in the Methods section, we labelled adolescents who self-identified more strongly with the Dutch ethnicity than with the ethnicity of their parents as Dutch. This decision was made because participants who self-identified as Dutch could be differently influenced by friends' intergroup attitudes than participants who self-identified as being minority members. However, adolescents who self-identified as majority group members could be perceived as minority group members by their classmates (Boda, 2018; Boda & Néray, 2015). Adolescents who self-identified as majority but whose friends perceived them as minority members could have a different influence on friends' intergroup attitudes than adolescents who were perceived as majority members by their friends (ingroup versus outgroup influence). Since the SAOM models how individuals' attitudes change due to the influence of others instead of how an individual influences others, we favored the first approach. Future research might investigate what role ethnicity plays in how friends influence each other's intergroup attitudes, taking into account the fluidity of perceived ethnicity (Boda, 2018).

In the present study, we focused on the influence that friends in general and popular friends in particular exert on intergroup attitudes of adolescents. However, adolescents can be influenced by friends as well as by classmates who are not friends. Popular adolescents may have attitudes that are attractive or salient in the classroom and, consequently, popular adolescents could have a

bigger impact on the intergroup attitudes of non-friends in comparison to other classmates. This means that average intergroup attitudes inside the classroom may be particularly affected by popular adolescents. Although prestige popular adolescents and clique leaders did not have particular influence on their friends' intergroup attitudes, they could have an especially big influence on the intergroup attitudes of non-friends. We look forward to studies exploring these potential extensions of our approach.

Implications

This research adds to the new field of network interventions (Paluck, 2011; Steglich, Sinclair, Holliday, & Moore, 2012; Valente, 2012). Existing intervention programs to improve intergroup attitudes among adolescents typically target entire classrooms (Frederickson & Turner, 2003; Gortmaker et al., 1999; Valente et al., 2007) and are thus complex and costly. Recent research on peer conflict and harassment (Paluck et al., 2016; Shepherd & Paluck, 2015) showed that interventions can successfully transform existing norms in schools if they only target a subset of students who subsequently influence their peers. Thus, by influencing only a subset of a classroom, all adolescents might benefit from the intervention. The central question for practitioners is whom to select for such a network intervention in order to most effectively transform the existing norms (Paluck et al., 2016; Valente, 2012). The current study suggests that intergroup attitudes are most strongly influenced by sociometrically popular adolescents. These adolescents represent especially promising seeds of attitudinal change since they can influence many contacts. However, before an intervention that focuses on the improvement of intergroup attitudes in sociometrically popular adolescents is applied, the effects of such an intervention should be carefully evaluated in a specific context. We suppose that sociometrically popular students might be selected by teachers who can administer short questionnaires in the classroom. However, in big-scale interventions, experts on

such interventions should be involved. We look forward to more studies on influential positions that support the development of network interventions in other domains (Hjerm et al., 2018), and we hope that the present research can help to guide network interventions aiming to improve intergroup attitudes.

ORCID iDs

Tibor Zingora [iD] https://orcid.org/0000-0003-4063-7922
Tobias H. Stark [iD] https://orcid.org/0000-0002-3163-5776

Supplemental Material

Supplemental material for this article is available online.

Note

1. Shepherd and Paluck (2015) selected clique leaders with local clustering coefficient higher than 0.20, which identified 27.84% of adolescents as clique leaders. Due to the denser networks in our study, we chose a higher local clustering coefficient to identify a similar percentage of clique leaders (29.05%).

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