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The network dynamics of antiprejudice norms: A field experiment testing antiprejudice interventions in real groups

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Abstract

Individuals' attitudes toward members of ethnic and national outgroups can be shaped by peer norms within social networks. However, little is known about the interplay between such spontaneous normative influence processes within social networks and more formalized top-down norms communicated by institutions (e.g., schools). To test this impact, we conducted a longitudinal four-wave field experiment employing social network analysis among real groups. Students enrolled in Dutch and international psychology bachelor programs at a Dutch university were assigned to mentoring groups ($N = 288$ across 50 groups in the last wave). As institutional interventions, they watched an online diversity training video (vs. not, between mentoring groups) at the beginning of data collection (T1) and attended a diversity and inclusion session (within-participants) before T2. At each timepoint, participants reported attitudes toward outgroup members and friendships with students enrolled in the same program. We examined how peer norms (i.e., friends' intergroup attitudes) and institutional interventions shaped intergroup attitudes, finding that the video- and workshop-based interventions improved intergroup attitudes. However, network analyses showed limited influence of friends' intergroup attitudes on individuals' own attitudes as well as limited interactive effects of the institutional interventions and network dynamics in affecting intergroup attitudes.

KEYWORDS
diversity training, intergroup relations, norms, prejudice, social network analysis

INTRODUCTION

Globalization and migration provide people with opportunities to interact with members of other (e.g., national or ethnic) groups. While these interactions can be enriching and positive, they can also present many challenges, such as intergroup prejudice and conflict (Aberson, 2015; Esses, 2021; Stephan et al., 1999; Stephan & Stephan, 1996). In recent years, with the rise of right-wing populism around the globe, anti-immigrant norms have become increasingly salient (Bergh & Kärnä, 2021; Matthes & Schmuck, 2017). These norms relate to the recent increase in hate speech and violence against ethnic minorities (Matamoros-Fernández & Farkas, 2021; Wachs et al., 2022). This in turn has inspired scholarly efforts to develop interventions aimed at creating inclusive environments in which egalitarianism is the norm.

Among these interventions, diversity and inclusion (D&I) training has been regarded as one of the key approaches to nurturing positive attitudes toward outgroups (Nishina et al., 2019; Paluck, 2006). Such programs may refer to a variety of activities, such as lectures, brochures, videos, role-playing, and structured or unstructured group discussions, usually aimed at reducing prejudice and promoting social inclusion (Stephan & Stephan, 2001). As a result of such training programs, people may perceive social norms as more inclusive and thus become more open to welcoming and accepting outgroup members, even when their personal beliefs regarding intergroup relations are not necessarily (fully) changed (Paluck, 2009).

Nonetheless, despite the popularity of D&I programs, relatively little is known about how such top-down initiatives interact with more or less spontaneous normative dynamics regarding prejudice in predicting prejudice toward outgroups. Considering that individuals tend to accept attitudes and behaviors approved by their peers (Miklikowska, 2017; Paluck, 2011; Pehar et al., 2020), properly managed interventions may amplify this peer influence. Therefore, the main goals of the current research were to investigate how peer norms influence attitude dynamics (i.e., changes in individuals' attitudes toward outgroup members) within school networks, and the way in which diversity training programs further shape these dynamics. We focused on a cohort of undergraduate students in a Dutch university, where half underwent an online diversity training (ODT) video (between-participants factor), and all students underwent a semi-structured D&I session managed by trained tutors (within-participants factor). We measured the dynamics of students' intergroup attitudes and friendship network at different timepoints and employed a social network analysis to examine them.

Social norms and intergroup attitudes

Social norms are known to be a powerful driver of intergroup attitudes and behaviors (Crandall et al., 2002; Crandall & Eshleman, 2003). As people are strongly motivated to be accepted and liked by their fellow group members, they tend to adjust their views to the current consensus within their group (Cialdini & Goldstein, 2004; Latané, 1981). Hence, individuals' expression of prejudice should be restrained if the majority of people within their group uphold antiprejudice norms (Crandall et al., 2002; Crandall & Eshleman, 2003). Indeed, extensive cross-sectional and experimental evidence has suggested that norms stressing disapproval of prejudice or endorsement of antiprejudice values (e.g., equality, egalitarianism, multiculturalism) can reduce prejudice toward outgroup members and facilitate positive intergroup interactions (e.g., Meleady, 2021; Pereira et al., 2009; Visintin et al., 2020; Wyer, 2010). Despite these

optimistic findings, the effectiveness of antiprejudice norms in reducing prejudice is not always evidenced across contexts. For example, research shows that normative messages and videos designed to combat prejudice can work counterproductively in that they sometimes ironically increase rather than mitigate prejudice toward outgroup members (Falomir-Pichastor et al., 2017; Kauff et al., 2013; Legault et al., 2011).

While explicit, top-down, and institutionalized antiprejudice norms may thus sometimes backfire, the more or less spontaneous normative processes in peer networks of schoolmates, colleagues, or other groups are more straightforward. For example, individuals report less prejudice toward ethnic minorities when knowing their peers' disapproval of prejudice (Blanchard et al., 1994) or endorsement of diversity (Murrar et al., 2020), whereas they become more tolerant of discrimination after hearing their peers' discriminatory jokes (Ford & Ferguson, 2004). That is, people seem to adapt their own racial stereotypes based on the consensus among their peers (Sechrist & Stangor, 2001; Stangor et al., 2001). Research has even found that the beliefs of peers in one's network are stronger predictors of intergroup attitudes than one's own beliefs (Poteat & Spanierman, 2010).

In such naturally formed social networks, changes in individual attitudes can be observed over time, while the network itself can also change due to the tendency of people to seek friends with similar views (Hjerm et al., 2018; Paluck, 2011). However, this also means the causal relationship between attitudes and friendships is usually hard to discern in such network settings (Lazer et al., 2010): Do people adopt the attitudes of their friends, or do they primarily choose friends who hold similar attitudes? A recent development in network science (Snijders et al., 2010) offers opportunities for researchers to examine the coevolution of network dynamics (e.g., friendship formation, maintenance, dissolution) and behavioral dynamics (e.g., changes in attitudes and behaviors) using longitudinal data. After controlling for friendship selection (i.e., the tendency to befriend those with similar views), researchers have isolated how peer norms spread within networks and change intergroup attitudes and behaviors in the direction of those of their friends. This research has shown that friends, and in particular friends who are similar in demographic characteristics, are influential in changing individuals' intergroup attitudes (Bracegirdle et al., 2022; Hjerm et al., 2018; Zingora et al., 2019).

According to these theories and evidence, we hypothesize that individuals' intergroup attitudes should be positively correlated with friends' intergroup attitudes over time (Hypothesis 1). Furthermore, as indicated above, and as will be elaborated upon further below, we also examine how this more-or-less spontaneous development of intergroup attitudes within networks is influenced by external interventions, such as a diversity training program.

Diversity training

Previous work on social norms has suggested that individuals may not only conform to the intergroup attitudes and behaviors modeled by peers in their daily network (Miklikowska, 2017; Paluck, 2011; Pehar et al., 2020) but also to those prescribed by the organization or institution they are in, as often communicated through diversity training programs (communicating institutional norms; Kende et al., 2017). Diversity training is defined as "any discrete program, or set of programs, which aims to influence participants to increase their positive—or decrease their negative—intergroup attitudes and behaviours, such that less prejudice or discrimination is displayed toward others perceived as different in their group affiliation(s)" (Pendry et al., 2007). In this sense, diversity training seems to be a "catch-all" term encompassing wide-ranging intervention practices and activities across a variety of disciplines and settings (Devine & Ash, 2022). By definition, approaches such as diversity workshops (Cramwinckel et al., 2021), guided discussions on intergroup relations (Aboud & Fenwick, 1999), simple brochures communicating antiprejudice messages

(Legault et al., 2011), stories and videos depicting intergroup interactions (Hsieh et al., 2022; Mäkinen et al., 2022; Murrar et al., 2020), role-playing involving identifying with members of minority groups (McGregor, 1993), and experiential interactions with outgroup members (Andrews et al., 2018; Kende et al., 2017) can all be regarded as forms of diversity training. These training programs have been found to produce favorable postintervention effects such as reducing prejudice and facilitating inclusive attitudes (Bezrukova et al., 2016; Kalinoski et al., 2013).

Thus, so far, we have described two types of normative processes that may shape intergroup attitudes in groups. On the one hand, there are more bottom-up, spontaneously developed norms within a social network; on the other hand, there are more top-down institutionalized norms, as communicated, for example, through D&I trainings (Castelfranchi, 2003; Tankard & Paluck, 2016). While either or both of these two types of norms have been examined in a social network setting in previous research (e.g., Bracegirdle et al., 2022; Paluck, 2011; Zingora et al., 2019), our research extends this previous work in several ways. First, although social network analysis is not uncommon in research on the influence of peer norms (e.g., Bracegirdle et al., 2022; Zingora et al., 2019), our study attempts to integrate both spontaneous and formalized norms by combining a social network perspective (i.e., spontaneous norms) and field interventions (i.e., formalized norms). Second, although our study shares some common characteristics in theory and methodology with Paluck's (2011) work in which student leaders were trained as peer models to intervene when they witnessed prejudiced behaviors, we further extends their findings. Specifically, we adopt social network analysis to model how both attitudes and the network itself evolve over time in response to the interventions and peer influences, incorporating a four-wave longitudinal design. Finally, our work provides evidence of normative influence in a real-group setting, thus extending previous findings mostly drawn from the laboratory.

The program we examine is offered to undergraduate students enrolled in a psychology program in a Dutch university. It includes an online diversity training (ODT) video and a tutor-managed D&I session. Video-based (e.g., Hsieh et al., 2022; Murrar et al., 2020) and workshop-based (e.g., Aboud & Fenwick, 1999; Cramwinckel et al., 2021) interventions have been broadly used to improve intergroup relations, especially in the educational context. Both methods have their strengths and limitations. For example, video-based interventions can be easily applied to large groups of people, as participants can typically engage with the content at their convenience, thereby lowering the threshold for participation. Moreover, by showcasing a diverse range of minority-group members reflecting on their experiences, video-based interventions can remain emotionally engaging and impactful. At the same time, there are limitations to relying solely on video-based interventions. When people can watch the video on their own when it suits them, there is less control over whether they watch the video carefully or whether they get distracted or even stop watching it altogether.

Workshop-based interventions, by contrast, allow teachers to ensure that everyone stays focused and also to customize the training to fit the needs of the group. Moreover, such small group settings allow for interpersonal interaction and discussion, thereby providing room for normative influence. These interpersonal processes may result in an intense (emotional) group experience, further facilitating attitude change. Nonetheless, workshop-based interventions may be costly in terms of time and resources, and it may be challenging to fully standardize the workshop across sessions.

It was precisely because both types of intervention have their strengths and limitations that we combined them in the current study. For example, an intervention video preceding a workshop session may work as an "icebreaker" for change by making participants familiar with the topic and encouraging them to think through their opinions before engaging with their fellow group members in a D&I session. At the same time, the workshop session can serve as a "booster" for the video intervention by allowing participants to discuss, reflect on, and digest the intervention messages presented in the video, further strengthening its effects.

The aim of our intervention program is to raise students' awareness of diversity and to communicate institutional norms in support of it. As a consequence, first, we predict the diversity training program will nurture more positive intergroup attitudes among students (Hypothesis 2). Moreover, we expect that the pro-diversity training will make positive peer attitudes toward outgroups more salient within the network. That is, the development of positive attitudes by interactions with peers who hold more positive intergroup attitudes (than the individual at hand) is further strengthened by the diversity training program (Hypothesis 3).

Overview of the current research

The present study was designed to examine how antiprejudice norms spread (or diminish) within peer networks, and whether institutional interventions, for example, diversity trainings, can facilitate these dynamics to promote the spread of antiprejudice norms. Our interventions comprised two aspects: An online diversity training (ODT) video was offered either at the start or at the end (after the final measurements) of the semester, and a D&I session was offered in the third week of the semester to all participants. Moreover, we measured participants' attitudes toward national/ethnic outgroups (using feeling thermometer ratings) and friendship (using the peer nomination technique) four times: (1) at the beginning of the semester (immediately after half of the participants receive the ODT video); (2) after the D&I session (which is delivered to all participants); (3) three weeks after the D&I session; and (4) at the end of the semester. Individuals' nominated friends formed two types of networks, namely the whole bachelor program network and their mentoring group networks.

The current study was conducted in the form of a registered report. All materials, data, and codes can be found at https://osf.io/cnpb9.

METHODS

Participants

First-year undergraduate psychology students (*N*s = 311, 300, 291, and 288, from T1 to T4, respectively) at Leiden University participated in the current study. Within the university, where we conducted the research, there are two Bachelor's programs in Psychology: One Dutch-spoken program (consisting almost exclusively of native-Dutch students, mainly White, but some people of color and bi-racial people) and one English-spoken program in which a combination of international and Dutch students are enrolled, involving substantial ethnic variation. The two programs are similar in content, meaning that they consist of the same courses and end-terms, but have separate lectures and workgroups, as these are held in either Dutch or English, depending on the program. Because of this segregation, each program can be seen as an independent network. All psychology bachelor students in these programs were assigned to one of 50 mentoring groups (11–13 students per group) that met four times with peer mentors (i.e., senior students) during the first 2 months of their studies (although some students may have chosen not to actively participate in them). These sessions, in which the D&I session was embedded, provided us with another context for examining network dynamics, as they were the units in which the most intensive interactions among students took place.

In total, 593 first-year students were enrolled in the two bachelor programs. However, the sample size was constrained to the number of students we managed to recruit from all first-year undergraduate psychology students. Those who did not participate in our study were treated as missing data (missing *n*s = 282, 293, 302, and 305, from T1 to T4). Demographical

differences between participants and nonparticipants can be found in Appendix S2. In social network analyses, we used multiple imputations to treat the missing data.

Procedure and materials

In the first week of the semester, upon providing informed consent, participants completed a pretest questionnaire online (T1). At the beginning of the pretest and just before completing the T1 measures, half of these students, based on random assignment of their peer-mentoring group, proceeded to watch the ODT video. This training constituted our between-participants experimental treatment, with participants not viewing the video at this time constituting our control group. The third meeting of the student mentoring scheme, which took place in Week 3, concerned the D&I session. Participants completed the T2 measures in Week 4 after attending the D&I session. In Week 6, participants were invited to complete the second postsession questionnaire (T3). The final questionnaire (T4) was sent out at the end of the semester (Week 12) to examine the long-term influence of the diversity training(s) on the dynamics of peer attitudes within the network. In other words, the T4 measurement was taken about 2 months after the D&I session. For participants in the control condition, T4 included the ODT video after the measures, to ensure all participants completed the study with the same opportunities and time investment. With the exceptions detailed below, we used a similar questionnaire for each of the four waves of data collection. The procedure and timeline of data collection can be found in Figure 1 and Table 1, respectively.

The procedure and materials used in the current study were approved by the Psychology Research Ethics Committee at Leiden University. In the information letter, we made participants aware of the sensitivity of the research topic as well as the possibility of (mild) feelings of isolation for at least some students when answering questions about friendships. After each wave of data collection, we acknowledged the potential (negative) consequences of participating in the study and provided participants with contact details of university and volunteer mental health services. Participants were also informed of the contact information of the

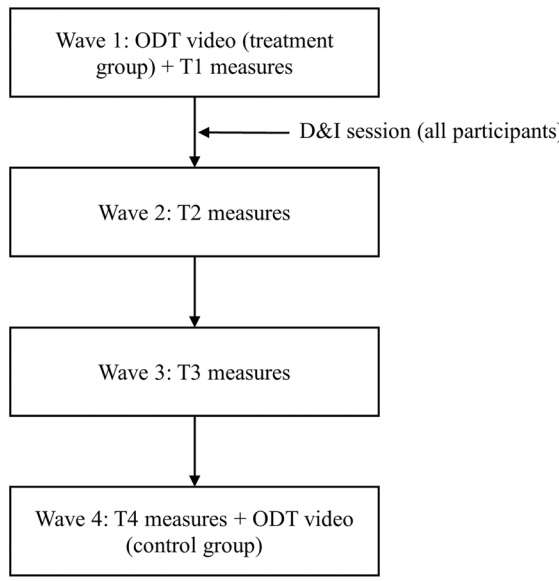

FIGURE 1 The procedure of the data collection.

TABLE 1 The timeline of the data collection.

Wave	Data collection dates	Measurements	Other
1	7–17 September 2023	T1: Friendship, intergroup attitudes (toward ethnic and national outgroups), and demographics	Before T1 measurements, participants in the ODT treatment group watched the ODT video
2	22 September–6 October 2023	T2: Friendship and intergroup attitudes (toward ethnic and national outgroups)	Between T1 and T2 measurements, all participants took part in the D&I session
3	13–27 October 2023	T3: Friendship and intergroup attitudes (toward ethnic and national outgroups as well as separate national groups)	Attitudes toward Dutch, non-Dutch Western European, Eastern European, Southern European, North African, Sub-Saharan African, East Asian, South Asian, Middle Eastern, North American, Latin American, Australian/New Zealand, Turkish, Ukrainian, and Russian groups were measured
4	20 November–3 December 2023	T4: Friendship and intergroup attitudes (toward ethnic and national outgroups as well as separate national groups)	Attitudes toward Dutch, non-Dutch Western European, Eastern European, Southern European, North African, Sub-Saharan African, East Asian, South Asian, Middle Eastern, North American, Latin American, Australian/New Zealand, Turkish, Ukrainian, Russian, Surinamese, Antillean, and Indonesian groups were measured

university's privacy office in case they had concerns regarding the protection of their privacy. At the end of Wave 4, participants were fully and carefully debriefed.

Intervention 1: ODT video

In the first week of the semester, the mentoring groups were randomly assigned to the treatment and control conditions of the ODT video intervention. Participants in groups assigned to the treatment condition were asked to watch a video before completing the questionnaire, while those assigned to the control condition only completed the questionnaire. The ODT video had a similar structure to the one used by Murrar et al. (2020), in which university students (from the ethnic majority and minority groups) shared their understandings of, and experiences with, equality, diversity, and inclusion. It was based on the rationale that social norms have a powerful impact on behavior change since people want to be socially normative and align with their peers and, as a result, are often strongly motivated to conform their behaviors and attitudes to them (Cialdini et al., 1990; Murrar et al., 2020; Tankard & Paluck, 2016). The video was originally produced by Utrecht University as part of the "Stories" video series within their Equality, Diversity & Inclusion Program. We combined several of these "Stories" videos and edited them to fit our research aim. To ensure the students would not become distracted or bored, or even stop watching the video altogether, we created a relatively short clip (1 min 54 s) that nonetheless provided the perspectives on D&I by a variety of students and employees at Dutch universities.

Intervention 2: D&I session

Every year, a D&I session is organized by the Institute of Psychology (where the research took place) in Week 3 of the semester, as the second session of the student mentoring scheme.

The scheme includes four parts, namely the introduction day, a meeting on stress and planning, a meeting on D&I, and a final meeting on exam preparation (in this exact order). Participants involved in the scheme were split into groups, and each group was assigned a mentor. All mentoring groups participated in the D&I session in the same week; therefore, there is no control group for this intervention.

The D&I session aimed to enhance students' awareness and acknowledgement of the diversity of identities in the community. The session followed a protocol (which can be found in the Appendix S8) that contained some fixed elements as well as some suggestions for further activities. For example, the session had a fixed structure with compulsory elements, including an introduction to and description of diversity, exercise questions to reveal privilege and highlight inclusion, a small-group discussion, and the mentor's experience sharing. Each element had one or two clear goals, yet the tactics that the mentors used to achieve the goals could be more flexible (e.g., they could ask different questions, share different experiences, etc.). Before the session, the program coordinator chaired a joint preparation session in which all mentors were fully briefed. In further preparation for the session, the mentors were in contact with each other, for example, via a WhatsApp group, further streamlining the session and exchanging best practices. Therefore, the session was semi-structured, retaining some freedom for the mentors to customize the session depending on the sources of diversity and the needs for specific content or discussions in their group.

In the D&I session, trained peer mentors were encouraged to use slides provided by the Institute of Psychology, but they could also add or adapt content based on their own experiences or insights, making it a semi-structured meeting. The mentors opened the session by asking about participants' own understandings of diversity and provided a short description, and followed this with an exercise aiming to raise awareness of ingroup privileges and acknowledgement of hybrid but inclusive identities using heuristic questions. Then, inclusion and social safety were introduced and discussed, as well as the mentors' own experiences with community building. The session lasted about 1 h.

Measures

Demographics

At T1, participants provided their personal information including age, gender, ethnic background, country of birth, and political ideology ("On a left-right political spectrum, how would you describe your political orientation?"; 1 = *very leftist* to 7 = *very rightist*). In addition, and to allow for multiple imputations in case of missing network nodes from students not participating in the study, we obtained basic demographic information (gender, age, and nationality) on all students in the program from the Institute of Psychology. Based on the nationality data, we categorized participants into 12 (cross-)national groups, namely Africa, Asia, Central Europe, Germany, Middle America, the Netherlands, North America, Northern Europe, Western Europe, South America, Southern Europe, and Southeastern Europe. We determined participants' (cross-)national group membership according to their self-reported country of birth (or listed nationality, for students who did not participate).

Intergroup attitudes

In each wave of the data collection, participants responded to two feeling-thermometer ratings assessing intergroup attitudes based on country of birth and ethnic background: "In general, on the following scale, how coldly or warmly do you feel toward people who are different from you in their countries of birth?" and "In general, on the following scale, how coldly or warmly do you feel towards people who are different from you in their ethnic backgrounds?" (0 = *very cold*, 50 = *neutral*, 100 = *very warm*). These two items were combined to obtain a composite

intergroup attitudes measure (r_{T1} = .95; r_{T2} = .95; r_{T3} = .96; r_{T4} = .97). At T3 and T4, additional feeling thermometers regarding specific ethnic groups were presented in order to measure participants' attitudes toward people with the following specific national backgrounds: Dutch, non-Dutch Western European, Eastern European, Southern European, North African, Sub-Saharan African, East Asian, South Asian, The Middle Eastern, North American, Latin American, Australian/New Zealand, Turkish, Ukrainian, Russian, Surinamese (only at T4), Antillean (only at T4), and Indonesian (only at T4). To complement the preregistered analyses we proposed, the inclusion of these additional feeling thermometers allowed us to further explore the network dynamics in Waves 3 and 4 and provided increased reliability and validity in assessing the long-term effect of the ODT video.

Friendship

In each wave of the data collection, participants were asked to nominate friends in their mentoring group from a list of names in response to the question, "Please consider people in your tutor group. Of these people, with whom are you likely to meet up for social activities outside your study? As you have just met these people, this may be difficult to answer, but your first impressions may already give you some indication. Please check the box for any person (except yourself) in the list below with whom you are likely to meet up for social activities outside your study. If you don't have anyone in mind, you can also leave this part open." They were also asked to name other friends in the broader bachelor program in Psychology in which they were enrolled: "Now please consider other first-year undergraduate students (outside your tutor group) enrolled in your bachelor program in Psychology. Of these people, with whom are you likely to meet up and do social activities outside your study? As you have just met most of these people, this may be difficult to answer, but your first impressions may already give you some indication. Please include the names (separated by commas ",") of other first-year undergraduate psychology students (outside your tutor group) with whom you are likely to meet up and do social activities outside your study. Indicate both first and last names, and note that small errors in spelling are not an issue, so you can list the names as you recall them. If you do not have anyone in mind, you can also leave this part blank." Each of the two bachelor programs in Psychology (i.e., the Dutch and international ones) or each mentoring group can be a meaningful network in the current context. That is, students attended classes with peers enrolled in the broader program but much between-peer interaction (including the D&I session) took place within the mentoring group.

RESULTS

We first conducted the nonnetwork part of analyses. Based on feedback received during the review of our stage-2 manuscript, we deviated from the preregistered ANOVAs by estimating multilevel linear models (MLM) examining the effect of the diversity training programs (including both the ODT video and the D&I session) on intergroup attitudes to test Hypothesis 2, along with MLMs for these effects on attitudes toward people with specific ethnic backgrounds. The problem with using ANOVAs stemmed from the fact that the assignment of participants to the ODT treatment and control conditions was based on their mentoring group rather than individual-based. By virtue of interacting, sharing the same mentor, etc., students in the same mentor group were interdependent. As a result, the assumption of independent observations required for ANOVA was compromised, making MLMs better suited to the data. Nonetheless, for transparency, we report the preregistered ANOVAs in Appendix S3.

In addition, we performed preregistered social network analyses to examine how friends' intergroup attitudes influenced individuals' intergroup attitudes (Hypothesis 1) and whether the diversity training program strengthened the influence of friends who held more positive attitudes than the self on individuals' intergroup attitudes (Hypothesis 3).

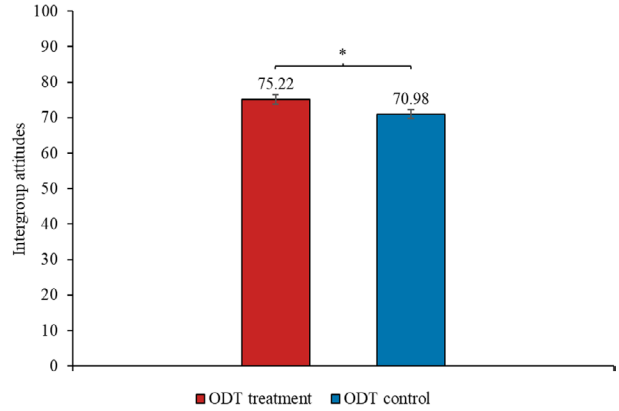

FIGURE 2 The effect of the ODT video on intergroup attitudes.

The effects of ODT video and D&I session

To examine the effects of the ODT video and D&I session interventions on intergroup attitudes, we fitted a 2 (ODT video: treatment vs. control) × 4 (wave: T1 vs. T2 vs. T3 vs. T4) × 2 (bachelor program: Dutch vs. international) MLM, with participants nested in mentor groups, and with wave as a repeated variable. As shown in Figure 2, the positive effect of the ODT video intervention on intergroup attitudes was significant, $F(1, 307.04) = 5.37$, $p = .021$, $d = .27$, with participants in the ODT condition ($M = 75.22$, $SE = 1.33$) showing more favorable intergroup attitudes than participants in the control condition ($M = 70.98$, $SE = 1.26$). Moreover, the analysis revealed a significant effect of wave, $F(3, 872.39) = 3.40$, $p = .017$. As shown in Figure 3, planned pairwise comparisons showed that intergroup attitudes were more positive at T3 ($M = 73.93$, $SE = .98$), $p = .006$, $d = .09$, and T4 ($M = 73.53$, $SE = .99$), $p = .043$, $d = .07$, compared to T1 ($M = 72.36$, $SE = .98$), indicating a potential mid- and longer-term influence of the D&I session that took place between T1 and T2. However, the difference in intergroup attitudes between T1 and T2 ($M = 72.58$, $SE = .98$) was not significant, $p = .702$, $d = .01$, indicating limited immediate impacts of the D&I session. Moreover, the interactive effect of the ODT intervention and wave was not significant, $F(3, 872.39) = 1.39$, $p = .245$.

The results also revealed a significant effect for the program on intergroup attitudes, $F(1, 307.04) = 77.68$, $p < .001$, $d = 1.05$, with participants from the international bachelor program ($M = 81.17$, $SE = 1.20$) generally holding more positive intergroup attitudes than participants from the Dutch bachelor program ($M = 65.03$, $SE = 1.38$). The interactive effect of wave and bachelor program, $F(3, 872.39) = 1.74$, $p = .157$, and that of the ODT intervention and bachelor program, $F(1, 307.04) = 1.28$, $p = .259$, were not significant, nor was the three-way interactive effect of wave, the ODT intervention, and bachelor program, $F(3, 872.39) = 1.21$, $p = .304$.

In general, the results provided support for Hypothesis 2, since the diversity training programs, and especially the ODT video, nurtured more positive intergroup attitudes. However, the lack of a control condition for the D&I session means other factors may explain the between-wave difference, so this effect should be interpreted with caution.

Exploratory analyses for additional intergroup attitude measures at T3 and T4

As exploratory analyses, we also tested the influence of the ODT video on attitudes toward people with specific ethnic backgrounds, including Dutch, non-Dutch Western European,

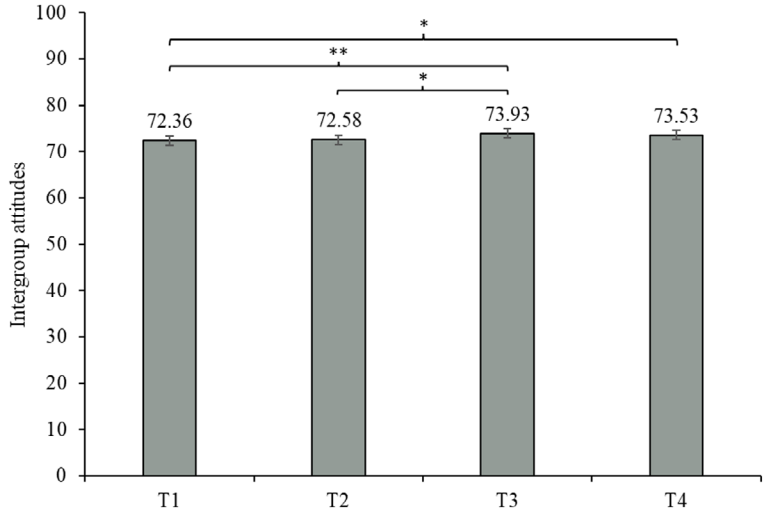

FIGURE 3 The effect of wave on intergroup attitudes.

Eastern European, Southern European, North African, Sub-Saharan African, East Asian, South Asian, Middle Eastern, North American, Latin American, Australian/New Zealand, Turkish, Ukrainian, Russian (T3–T4), and Surinamese, Antillean, and Indonesian (only at T4). Specifically, we performed a series of 2 (ODT video: treatment vs. control)×2 (wave: T3 vs. T4)×2 (bachelor program: Dutch vs. international) MLMs with participants nested in groups and with wave as a repeated variable, or 2 (ODT video: treatment vs. control)×2 (bachelor program: Dutch vs. international) MLMs with group as the cluster variable, on attitudes toward people with specific ethnic backgrounds. The latter 2 ×2 MLMs were used to test attitudes toward people with Surinamese, Antillean, and Indonesian backgrounds, which were only assessed at one timepoint (T4).

Results (see Table 2) suggested that, compared to the control condition, the ODT video intervention increased positive attitudes toward people with Eastern European, North African, Middle Eastern, North American, Latin American, Turkish, Surinamese, and Indonesian backgrounds. Interestingly—and perhaps logically—the smallest effect of the ODT video was found on attitudes toward Dutch people.

In addition to the effects described above, the effects of the bachelor program (Dutch vs. International) on attitudes toward people with different ethnic backgrounds were consistently significant, except for attitudes toward Dutch people. In general, participants from the international bachelor program held more positive attitudes toward people with different ethnic backgrounds than participants from the Dutch bachelor program. The interactive effect of the ODT video and the bachelor program did not reach significance for any of these outcome measures.

Preregistered analysis of the bachelor program networks

A limitation of traditional statistical techniques in social network studies is that the coevolution of network change and attitude change cannot be captured. Since friends' attitudes can change individual attitudes (i.e., behavioral dynamics) but individuals have different friends at different timepoints (i.e., network dynamics), the influence of peer intergroup attitudes on individual intergroup attitudes (Hypothesis 1) cannot be analyzed using linear regression. Therefore, we examined the coevolution of peer network dynamics and

TABLE 2 The effects of the ODT video and bachelor program on attitudes toward people with different ethnic backgrounds.

Attitudes	ODT video	Bachelor program	ODT video × bachelor program
Dutch	$F(1, 296.17) = 1.34$, $p = .248$, $d = .14$	$F(1, 296.17) = 1.85$, $p = .175$, $d = .16$	$F(1, 296.17) = 1.71$, $p = .192$
Western European	$F(1, 295.43) = 3.37$, $p = .067$, $d = .22$	$F(1, 295.43) = 45.66$, $p < .001$, $d = .80$	$F(1, 295.43) = .24$, $p = .626$
Eastern European	$F(1, 294.03) = 3.95$, $p = .048$, $d = .23$	$F(1, 294.03) = 103.19$, $p < .001$, $d = 1.21$	$F(1, 294.03) = .14$, $p = .713$
Southern European	$F(1, 294.30) = 2.44$, $p = .119$, $d = .18$	$F(1, 294.30) = 72.17$, $p < .001$, $d = 1.01$	$F(1, 294.30) = .19$, $p = .667$
North African	$F(1, 293.76) = 4.47$, $p = .035$, $d = .25$	$F(1, 293.76) = 66.27$, $p < .001$, $d = .97$	$F(1, 293.76) = .73$, $p = .394$
Sub-Saharan	$F(1, 295.27) = 2.67$, $p = .102$, $d = .19$	$F(1, 295.27) = 48.33$, $p < .001$, $d = .82$	$F(1, 295.27) = .86$, $p = .354$
East Asian	$F(1, 294.47) = 2.42$, $p = .121$, $d = .18$	$F(1, 294.47) = 54.54$, $p < .001$, $d = .88$	$F(1, 294.47) = .78$, $p = .378$
South Asian	$F(1, 294.09) = 3.27$, $p = .072$, $d = .21$	$F(1, 294.09) = 49.12$, $p < .001$, $d = .83$	$F(1, 294.09) = .83$, $p = .362$
Middle Eastern	$F(1, 294.41) = 5.37$, $p = .021$, $d = .27$	$F(1, 294.41) = 53.06$, $p < .001$, $d = .86$	$F(1, 294.41) = 1.66$, $p = .199$
North American	$F(1, 294.53) = 6.68$, $p = .010$, $d = .31$	$F(1, 294.53) = 58.04$, $p < .001$, $d = .90$	$F(1, 294.53) = .32$, $p = .570$
Latin American	$F(1, 295.69) = 4.61$, $p = .033$, $d = .25$	$F(1, 295.69) = 79.11$, $p < .001$, $d = 1.06$	$F(1, 295.69) = 1.35$, $p = .247$
Australian & NZ	$F(1, 294.39) = 3.36$, $p = .068$, $d = .22$	$F(1, 294.39) = 43.30$, $p < .001$, $d = .78$	$F(1, 294.39) = .46$, $p = .499$
Turkish	$F(1, 293.67) = 5.73$, $p = .017$, $d = .28$	$F(1, 293.67) = 70.44$, $p < .001$, $d = 1.00$	$F(1, 293.67) = .94$, $p = .334$
Ukrainian	$F(1, 292.82) = 2.39$, $p = .123$, $d = .18$	$F(1, 292.82) = 58.63$, $p < .001$, $d = .91$	$F(1, 292.82) = .71$, $p = .401$
Russian	$F(1, 289.91) = 1.86$, $p = .174$, $d = .16$	$F(1, 289.91) = 54.84$, $p < .001$, $d = .88$	$F(1, 289.91) = .09$, $p = .760$
Surinamese	$F(1, 284) = 4.22$, $p = .041$, $d = .24$	$F(1, 284) = 20.83$, $p < .001$, $d = .54$	$F(1, 284) = 2.26$, $p = .134$
Antillean	$F(1, 284) = 3.62$, $p = .058$, $d = .22$	$F(1, 284) = 17.41$, $p < .001$, $d = .50$	$F(1, 284) = 2.13$, $p = .145$
Indonesian	$F(1, 284) = 4.85$, $p = .029$, $d = .26$	$F(1, 284) = 19.35$, $p < .001$, $d = .52$	$F(1, 284) = 1.63$, $p = .203$

Note: Attitudes toward people with Surinamese, Antillean, and Indonesian backgrounds were only measured at T4, whereas other outcomes were measured at both T3 and T4. All significant main effects of the ODT video suggested that participants in the treatment group held more positive intergroup attitudes than those in the control group, and all significant main effects of the bachelor program suggested that participants in the international bachelor program held more positive intergroup attitudes than those in the Dutch bachelor program. Bold ethnic group labels indicate significant main effects of the ODT video.

intergroup attitudes using stochastic actor-oriented models (SAOMs; Snijders et al., 2010) implemented using RSiena in R (Ripley et al., 2019). Since individuals' attitudes are not only influenced by their friends (i.e., social influence), but individuals also tend to befriend peers who hold similar attitudes (i.e., friendship selection), we aimed to distinguish between these intertwined effects and control for the latter using SAOMs, which simulate

how network structure (i.e., friendships) and actor behaviors (i.e., intergroup attitudes) change over time. The RSiena package consists of two parts, namely *network dynamics* and *behavioral dynamics* (Snijders et al., 2010). The network dynamics part models friendship formation and maintenance and enables us to control for friendship selection, while the behavioral dynamics model predicts changes in attitudes over time and enables us to test social influence (Bracegirdle et al., 2022), that is, the influence of peer norms, in which we are interested.

As preregistered, dynamics within the bachelor program network were analyzed using SAOMs in RSiena. As there were two bachelor programs (i.e., Dutch and international ones), we treated them as two separate networks and integrated their parameters using the multigroup analysis option in RSiena (Bracegirdle et al., 2022). Friendships both within and outside the tutor group were considered. Since SAOMs are sensitive to missing data, we used multiple imputations (Krause et al., 2018) to address the missing data issue. We had at least two sources of information that we could draw on to implement the imputations. First, the Institute of Psychology provided us with some basic (demographic) information about all first-year psychology students (regardless of whether they participated in our study or not). Second, students participating in our study could nominate nonparticipating students in the network, and thus we had at least some information about nominated nonparticipating students. Hence, in the imputations, we used the following information: intergroup attitudes at all timepoints, average intergroup attitude scores among friends at all timepoints, indegree at all timepoints, belonging to a particular mentoring group, the ODT condition, nationality, and gender. The model yielded a good fit to the data (for details, see Appendix S5).

Social influence model (Model 1)

First, we built a social influence model[1] to examine the main effect of peer intergroup attitudes on individual intergroup attitudes, as predicted in Hypothesis 1.

Network dynamics

To obtain accurate estimates for the effects of interest (Snijders et al., 2010), we accounted for several structural effects that captured how the network itself influenced friendship formation and maintenance. First, we included fundamental structural effects following standard practice (Bracegirdle et al., 2022; Lospinoso & Snijders, 2019; Ripley et al., 2019), including *outdegree*, *reciprocity*, *gwespFF*, *gwespRR*, *gwdspFF*, *in-degree popularity*, and *out-degree activity*. Second, as commonly done in SAOMs, we controlled for demographics (i.e., national group membership, gender, and mentoring group membership) by including three effects tapping into preferences for friends of the same national group (*same nation*), same mentoring group (*same group*), and *same gender*, as well as gender differences in the number of friendship nominations sent (*gender ego*) and received (*gender alter*). Additionally, we controlled for the *same*, *ego*, and *alter* effects of the ODT intervention. Likewise, we controlled for the friendship selection effect by adding an *attitude similarity* effect that captured participants' tendency to select friends with similar attitudes (i.e., intergroup attitudes in the current study), as well as the *attitude ego* and *attitude alter* effects.

[1]There were several deviations from the model we preregistered. First, we removed the *alter* and *ego* effects of national group from the network dynamics part because these preregistered effects did not make much sense and undermined the statistical power by including a long list of dummy variables. Second, we added the *same (mentoring) group* effect into the network dynamics part, since we expected that participants would tend to befriend students within their mentoring group. Third, we added the effect of bachelor *program* in the behavioral dynamics part, considering foreseen structural differences between programs.

Behavioral dynamics

In the behavioral dynamics model, we first accounted for the *outgroup friends* effect to control for the tendency for participants who had more national outgroup friends to develop more positive intergroup attitudes (i.e., contact effect; Allport, 1954). Additionally, in accordance with common practice (e.g., Bracegirdle et al., 2022; Leszczensky et al., 2016; Zingora et al., 2019), we controlled for six additional effects: the *attitude linear shape* and *attitude quadratic shape* effects which indicated overall changes in intergroup attitudes in the network over time, as well as the effects of participants' national group membership (*nation*), *gender*, bachelor *program*, and participation in the *ODT* intervention on changes in intergroup attitudes. Finally, we included an *attitude average similarity* effect, examining the extent to which participants tended to adopt the attitudes (i.e., intergroup attitudes) of their friends (Hypothesis 1).

According to Model 1 in Table 3, in the network dynamics part, the selection (*attitude similarity*) effect, namely that participants with similar attitudes were more likely to befriend each other, was not significant. Nonetheless, we observed a significant tendency for people to preferentially select those who belonged to the same mentoring group or had the same gender as their friends (i.e., *same group* and *same gender* effects).

In the behavioral dynamics part, neither the social influence (*attitude average similarity*) effect, namely that friends' intergroup attitudes influenced individuals' intergroup attitudes over time, nor the contact (*outgroup friends*) effect, namely that interactions with national outgroup friends enhanced positive intergroup attitudes, reached significance. Therefore, Hypothesis 1 was not supported. Interestingly, the *ODT* effect was trending, resonating with the evidence from MLMs that the ODT video intervention (vs. control) fostered positive intergroup attitudes.

Moderation model (Model 2)

Additionally, we set up a moderation model based on the social influence model in order to test Hypothesis 3. Since we predicted that the interventions would enhance the influence of friends' positive intergroup attitudes on individuals' positive intergroup attitudes, we added an *average attraction higher* effect into the behavioral model. This effect captured the influence of connections with friends who held more positive attitudes than the self. To examine its interactive effect with ODT, we added the *average attraction higher* × *ODT* effect, representing the tendency for those who received the ODT video intervention to adopt the attitudes of friends who held more positive attitudes than the self (Hypothesis 3). As there was a second intervention that is also relevant for Hypothesis 3 (i.e., the D&I session), we included time dummies (*time2* comparing attitudinal change between T2 and T3 to that between T1 and T2, and *time3* comparing attitudinal change between T3 and T4 to that between T2 and T3) as well as their interactions with *average attraction higher* (*average attraction higher* × *time2* and *average attraction higher* × *time3*) in the behavioral model.

According to Model 2 in Table 3, the *average attraction higher* × *ODT* interactive effect was not significant, suggesting that the ODT intervention did not affect the relationship between individuals' connections with peers who held more positive intergroup attitudes (than the individual at hand) and their own intergroup attitudes. Moreover, the *average attraction higher* × *time2* and *average attraction higher* × *time3* interactive effects were not significant, suggesting that the D&I session did not condition the effect of connections with peers who held more positive intergroup attitudes on individuals' intergroup attitudes. These findings did not support Hypothesis 3.

TABLE 3 Multi-group analysis of bachelor program network and intergroup attitude change, presenting the social influence model (Model 1) and moderation model (Model 2).

	Model 1				Model 2			
	b	*SE*	*t*	*p*	*b*	*SE*	*t*	*p*
Network dynamics								
outdegree	−3.21	.21	−15.22	<.001	−3.23	.15	−21.29	<.001
reciprocity	2.14	.19	11.11	<.001	2.16	.10	21.16	<.001
gwespFF	2.16	.19	11.62	<.001	2.17	.11	20.45	<.001
gwespRR	−1.10	.35	−3.12	.002	−1.12	.17	−6.44	<.001
gwdspFF	−.05	.03	−1.45	.147	−.05	.01	−3.82	<.001
in-degree popularity	−.13	.06	−2.01	.045	−.13	.05	−2.33	.020
out-degree activity	.03	.03	1.34	.182	.04	.03	1.37	.170
same group	1.28	.24	5.44	<.001	1.28	.07	18.01	<.001
same nation	.26	.19	1.35	.176	.23	.06	4.18	<.001
gender alter	−.31	.07	−4.23	<.001	−.31	.07	−4.63	<.001
gender ego	−.34	.15	−2.24	.025	−.36	.08	−4.47	<.001
same gender	.38	.06	5.89	<.001	.39	.06	6.30	<.001
ODT alter	.01	.16	.05	.960	.01	.06	.20	.842
ODT ego	−.04	.07	−.63	.532	−.04	.06	−.60	.549
same ODT	−.12	.15	−.77	.443	.01	.06	.20	.842
attitude alter	<.01	<.01	−.68	.497	<.01	<.01	−.75	.455
attitude ego	<.01	<.01	−1.07	.286	<.01	<.01	−1.95	.052
attitude similarity	.12	.33	.36	.717	.07	.18	.41	.678
Behavioral dynamics								
attitude linear shape	.02	.01	1.60	.109	.06	.15	.38	.705
attitude quadratic shape	<.01	<.01	.46	.644	<.01	<.01	.46	.648
outgroup friends	<.01	<.01	−.78	.437	<.01	<.01	−.18	.854
program	.03	.02	1.67	.096	.03	.02	1.77	.077
nation	<.01	<.01	.18	.858	<.01	<.01	−.09	.931
gender	<.01	.02	.07	.948	<.01	.02	.05	.958
ODT	.02	.01	1.76	.078	.07	.05	1.51	.131
attitude average similarity	1.65	2.83	.58	.559	5.32	13.88	.38	.701
average attraction higher					−6.89	26.77	−.26	.797
time2					.01	.03	.28	.783
time3					−.02	.03	−.51	.611
average attraction higher × ODT					−6.34	5.44	−1.17	.244
average attraction higher × time2					4.63	5.50	.84	.401
average attraction higher × time3					1.02	4.41	.23	.818

Note: Models 1 and 2 were based on 20 imputations. Average overall maximum convergence ratio: .19 (Model 1) and .21 (Model 2).

Parallel analysis of the mentoring group networks

We performed parallel analysis to examine the network and behavior dynamics within the mentoring group networks, ignoring the connections outside the mentoring groups. The mentoring

groups in which the D&I training was delivered were likely to vary on many characteristics (e.g., gender ratio, engagement of the mentor in delivering the training, ethnic background of the trainer) that may have influenced not only the effectiveness of the training, but also the development of friendships as well as intergroup attitudes. Such between-mentoring-group nuances were not accounted for in the analysis of the bachelor program network analysis described above, although the clear advantage of that particular analysis was that it also took into account friendships beyond the mentoring group. Therefore, in this part of the analysis, we used mentoring group (rather than bachelor program) as the network boundary. As the mentoring program included a D&I session in which students in the same mentoring group could engage in discussions about their intergroup attitudes, each mentoring group could be a meaningful network through which peers' intergroup attitudes easily spread.

Regarding the social influence model presented in Table 4 (Model 3), in the network dynamics part, the selection (*attitude similarity*) effect was not significant. As in the bachelor program networks, we found a significant effect indicating that people were more likely to befriend those who belonged to the same gender group (i.e., *same gender*). In the behavioral dynamics part, neither the social influence (*attitude average similarity*) effect nor the contact (*outgroup friends*) effect was significant, yielding no support for Hypothesis 1. Additionally, the significant *program* effect suggested that participants from the international bachelor program held more positive intergroup attitudes than those from the Dutch bachelor program. However, the effect of the *ODT* video on intergroup attitude evolution was not significant in this model.

Regarding the moderation model (Model 4) in Table 4, the *average attraction higher* × *ODT*, *average attraction higher* × *time2*, and *average attraction higher* × *time3* interactive effects were not significant, again providing no evidence to support Hypothesis 3.

Exploratory cross-lagged panel analysis

Due to the substantial proportion of missing data, we were worried that the preregistered SAOMs may yield unstable estimates, especially for the interaction analyses. This was evidenced by the large standard errors found in the interaction models (Models 2 and 4), but not in the simpler models (Models 1 and 3). Therefore, and following suggestions in the Stage 2 review process, we conducted additional, nonpreregistered analyses using cross-lagged panel modeling (CLPM) to test Hypotheses 1 and 3. Sample sizes, means, and standard deviations per wave, along with pairwise correlations of the variables used in CLPM are displayed in Table 5.

To test Hypothesis 1, we modeled the relationship between individuals' intergroup attitudes (i.e., Attitude) and averaged friends' intergroup attitudes (i.e., Friend) over time. As shown in Table 6 and Figure 4, Friend at T2 was associated with an increase in Attitude at T3, while Attitude at T2 was also associated with an increase in Friend at T3. The former relationship suggests a socialization effect between T2 and T3, indicating a tendency for individuals' attitudes to become increasingly similar to their friends. The latter, converse relationship suggests a selection effect between T2 and T3, such that individuals tended to choose friends who had more similar attitudes to themselves. However, we did not find any associations between Friend and Attitude across T1 and T2, or T3 and T4, yielding weak evidence for Hypothesis 1.

To test Hypothesis 3, we first calculated the difference between individuals' intergroup attitudes and averaged attitudes of their friends who had more positive intergroup attitudes (i.e., Higher) by subtracting the former from the latter. All those who did not have friends with more positive intergroup attitudes than themselves were assigned 0 scores on Higher. Then we modeled the relationship between Attitude and Higher over time, including ODT (treatment vs. control) as a multi-group variable. As shown in Table 7 and Figure 5, in the ODT treatment condition, Higher at T1 was associated with an increase in Attitude at T2, suggesting that individuals tended to have more positive intergroup attitudes when exposed to peers with more

TABLE 4 Multi-group analysis of mentoring group network and intergroup attitude change, presenting the social influence model (Model 3) and moderation model (Model 4).

	Model 3				Model 4			
	b	*SE*	*t*	*p*	*b*	*SE*	*t*	*p*
Network dynamics								
outdegree	−1.37	.40	−3.44	.001	−1.41	.42	−3.34	.001
reciprocity	1.74	.14	12.45	<.001	1.75	.14	12.54	<.001
gwespFF	2.00	.28	7.08	<.001	1.99	.29	6.98	<.001
gwespRR	−.87	.27	−3.24	.001	−.89	.24	−3.65	<.001
gwdspFF	−.13	.05	−2.45	.015	−.13	.05	−2.56	.011
in-degree popularity	−.67	.21	−3.17	.002	−.65	.22	−2.99	.003
out-degree activity	.07	.09	.74	.461	.07	.08	.86	.389
same nation	.14	.12	1.11	.268	.13	.09	1.46	.145
gender alter	−.36	.14	−2.59	.010	−.37	.22	−1.69	.091
gender ego	−.41	.15	−2.84	.005	−.42	.19	−2.21	.027
same gender	.57	.13	4.26	<.001	.57	.22	2.59	.010
ODT alter	.01	.14	.08	.938	.01	.12	.07	.943
ODT ego	.17	.13	1.33	.184	.17	.13	1.31	.190
same ODT	.01	.13	.09	.929	.01	.12	.12	.902
attitude alter	<.01	<.01	.39	.696	<.01	<.01	.38	.701
attitude ego	<.01	<.01	−.15	.879	<.01	<.01	−.20	.844
attitude similarity	<.01	.27	.01	.989	.01	.25	.03	.972
Behavioral dynamics								
attitude linear shape	.02	.01	3.21	.001	.01	.06	.19	.852
attitude quadratic shape	<.01	<.01	1.32	.186	<.01	<.01	.91	.362
outgroup friends	<.01	<.01	−.49	.624	<.01	<.01	−.34	.734
program	.04	.02	2.23	.026	.04	.02	1.89	.059
nation	<.01	<.01	.27	.790	<.01	<.01	.26	.799
gender	<.01	.02	−.02	.986	<.01	.02	−.05	.963
ODT	.01	.01	1.09	.275	<.01	.05	.06	.952
attitude average similarity	.28	1.56	.18	.858	−.75	5.40	−.14	.890
average attraction higher					1.76	9.72	.18	.856
time2					.03	.04	.64	.524
time3					<.01	.04	.05	.957
average attraction higher × ODT					1.17	4.93	.24	.812
average attraction higher × time2					.37	4.45	.08	.933
average attraction higher × time3					−1.34	4.36	−.31	.759

Note: Model 3 was based on 20 imputations, whereas Model 4 was based on 19 imputations. Average overall maximum convergence ratio: .22 (Model 3) and .22 (Model 4).

positive intergroup attitudes than their own. Moreover, there was an indication that the D&I session might have bolstered the influence of interacting with peers with more positive intergroup attitudes on individuals' own attitudes: among those who received the ODT treatment, Higher at T1 predicted an increase in Attitude at T2, while Higher at T2 was not associated

TABLE 5 Sample sizes (*N*), means (*M*), standard deviations (*SD*) for the main variables and Pearson correlations (*r*) between the main variables across four waves (T1–T4).

Variable/pair		T1	T2	T3	T4
Attitude	*N*	311	302	292	288
	M (*SD*)	73.23 (18.45)	73.65 (18.95)	74.85 (18.88)	74.45 (19.37)
Friend	*N*	275	271	265	261
	M (*SD*)	74.54 (14.39)	74.59 (12.90)	76.05 (13.84)	74.93 (14.11)
Higher	*N*	275	271	263	261
	M (*SD*)	11.42 (12.29)	11.33 (11.96)	11.49 (12.30)	11.60 (13.07)
Attitude—Friend	*r*	.38	.34	.33	.27
Attitude—Higher	*r*	−.63	−.73	−.70	−.72
Friend—Higher	*r*	.33	.21	.24	.29

Note: Attitude, intergroup attitudes; Friend, friends' intergroup attitudes; Higher, intergroup attitudes of friends who have higher scores than the self. All correlations are significant at $p < .001$.

TABLE 6 Results of the four-wave CLPM between friend and attitude.

Dependent	Predictor	*b*	*SE*	*z*	*p*
Attitude T2	Attitude T1	.84	.04	19.40	< .001
Attitude T2	Friend T1	.05	.06	.77	.441
Attitude T3	Attitude T2	.88	.03	29.11	< .001
Attitude T3	Friend T2	.12	.05	2.58	.010
Attitude T4	Attitude T3	.91	.03	29.47	< .001
Attitude T4	Friend T3	.01	.05	.14	.887
Friend T2	Attitude T1	.02	.03	.74	.461
Friend T2	Friend T1	.73	.04	19.69	< .001
Friend T3	Attitude T2	.06	.02	2.77	.006
Friend T3	Friend T2	.86	.04	24.52	< .001
Friend T4	Attitude T3	.01	.03	.21	.833
Friend T4	Friend T3	.80	.05	16.57	< .001

Note: Attitude, intergroup attitudes; Friend, friends' intergroup attitudes.

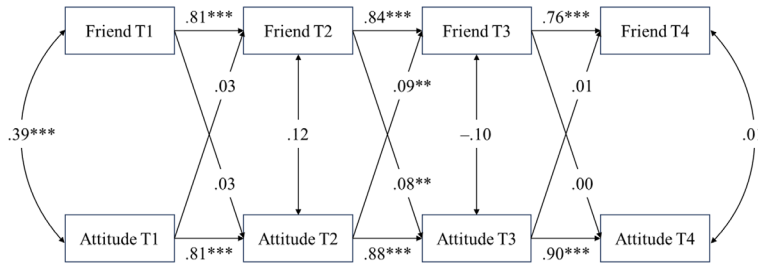

FIGURE 4 Path diagram of the four-wave CLPM between friend and attitude. Path coefficients are βs. **$p < .010$; ***$p < .001$.

with Attitude at T3, nor was Higher at T3 with Attitude at T4. In contrast, in the ODT control condition, Higher was not associated with Attitude over time. These findings, together, provided weak evidence for Hypothesis 3.

TABLE 7 Results of the four-wave multi-group CLPM between higher and attitudes.

Dependent	Predictor	*b*	*SE*	*z*	*p*
Group: ODT treatment					
Attitude T2	Attitude T1	1.10	.08	13.03	<.001
Attitude T2	Higher T1	.37	.11	3.30	<.001
Attitude T3	Attitude T2	.95	.09	10.49	<.001
Attitude T3	Higher T2	.13	.14	.90	.368
Attitude T4	Attitude T3	.87	.10	9.05	<.001
Attitude T4	Higher T3	−.04	.14	−.32	.752
Higher T2	Attitude T1	−.25	.07	−3.68	<.001
Higher T2	Higher T1	.38	.09	4.16	<.001
Higher T3	Attitude T2	−.17	.08	−2.18	.029
Higher T3	Higher T2	.62	.13	4.93	<.001
Higher T4	Attitude T3	−.04	.09	−.47	.642
Higher T4	Higher T3	.83	.12	6.68	<.001
Group: ODT control					
Attitude T2	Attitude T1	.80	.07	11.33	<.001
Attitude T2	Higher T1	−.02	.11	−.19	.846
Attitude T3	Attitude T2	.96	.04	21.69	<.001
Attitude T3	Higher T2	.11	.07	1.67	.095
Attitude T4	Attitude T3	.92	.05	20.30	<.001
Attitude T4	Higher T3	.01	.07	.11	.914
Higher T2	Attitude T1	−.04	.06	−.76	.449
Higher T2	Higher T1	.65	.09	6.90	<.001
Higher T3	Attitude T2	−.05	.05	−.91	.363
Higher T3	Higher T2	.68	.08	8.60	<.001
Higher T4	Attitude T3	−.09	.05	−1.88	.061
Higher T4	Higher T3	.68	.08	8.85	<.001

Note: Attitude, intergroup attitudes; Higher, intergroup attitudes of friends who have higher scores than the self.

DISCUSSION

Our research provides insights into the dynamics of norm development within peer networks and the role of institutional norm-based interventions in shaping intergroup attitudes. Our findings revealed the effectiveness of our diversity training programs, especially the ODT video, in nurturing more positive intergroup attitudes among students, thus supporting Hypothesis 2. Nonetheless, the evidence that the D&I session had this impact was less stable and should thus be interpreted with some caution. In addition to our predictions, our exploratory analyses suggested that the ODT video intervention (vs. control) improved students' attitudes toward a wide variety of different national groups. Moreover, students in the international bachelor program consistently reported more positive attitudes toward different national groups (except for Dutch) than those in the Dutch bachelor program.

Nonetheless, in analyses of dynamics within networks, we found no evidence in support of Hypotheses 1 and 3. In contrast, the exploratory analyses using CLPM (conducted to supplement the network analyses, which yielded unstable results due to a high proportion of missing data) suggested that individuals' attitudes became increasingly similar to their friends'

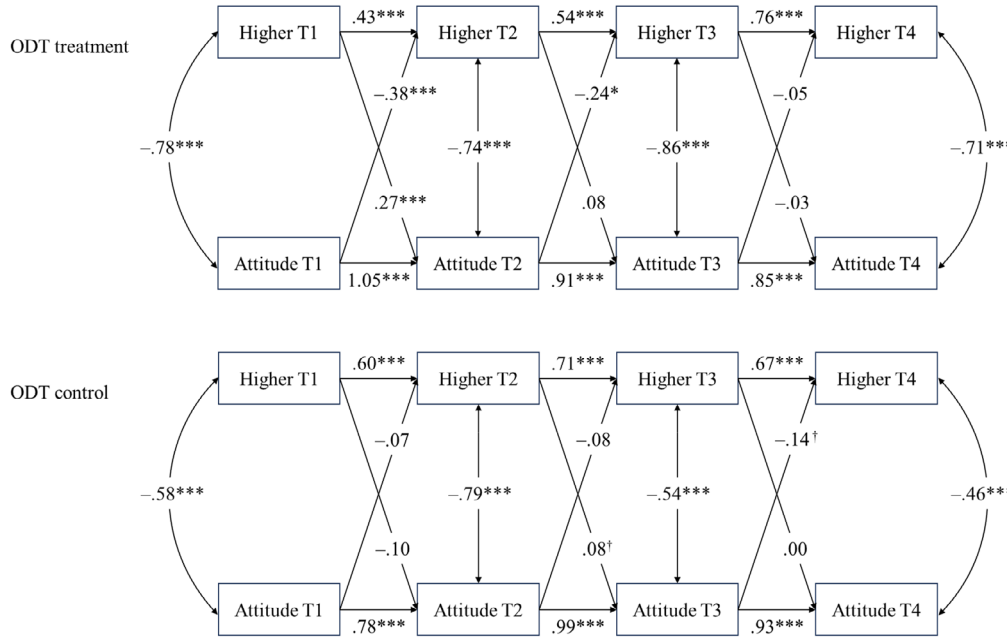

FIGURE 5 Path diagram of the four-wave multi-group CLPM between higher and attitude. Path coefficients are βs. $^{\dagger}p < .100$, * $p < .050$, ***$p < .001$.

between T2 and T3, partially supporting Hypothesis 1. In addition, in the ODT treatment condition, individuals tended to have more positive intergroup attitudes at T2 when exposed to peers with more positive intergroup attitudes than their own at T1, indicating that the ODT video (treatment vs. control) and D&I session (T2–T1 vs. T2–T3/T3–T4) might have amplified the influence of interacting with peers with more positive intergroup attitudes on individuals' own attitudes, partially supporting Hypothesis 3. However, we should not be overly positive about the findings from CLPM, as these were not preregistered.

Implications

First, our research sheds light on norm dynamics over time and within peer networks, underscoring the importance of institutional interventions in facilitating the spread of norms within networks. Findings from the nonpreregistered CLPM show peer influence on intergroup attitudes within the network between T2 and T3. Moreover, this part of the analyses suggested that our intervention program somewhat strengthened the facilitative impact of connections with peers with favorable intergroup attitudes on individuals' intergroup attitudes. However, it should be noted that these findings were not replicated in preregistered network analyses—but this may be due to the limited suitability of these models to the large proportion of missing data in our studies (Huisman & Steglich, 2008; Ripley et al., 2019). These findings are seemingly opposite to previous research showing a strong spontaneous process of normative influence (e.g., Bracegirdle et al., 2022; Poteat & Spanierman, 2010; Zingora et al., 2019). Instead, there was only a weak indication that positive norms can naturally spread within networks, and this occurs particularly when institutionalized support exists, as the CLPM analyses suggested. Specifically, the intervention programs (i.e., the ODT video and the D&I session) may have interacted with network dynamics (e.g., connections with students who held more positive intergroup attitudes than the self) in affecting intergroup attitudes. Remarkably, this indicates

that even a short, depersonalized ODT video can have a positive effect on intergroup attitudes when employed in contexts that also allow for interactions with peers holding positive attitudes. These findings underscore the importance of creating a supportive and interactive environment when implementing D&I interventions.

In this sense, our research further extends Paluck (2011)'s work, which adopted a network perspective to examine the top-down, institutionalized process of norm development within peer networks. Specifically, they communicated anti-prejudice norms by training "peer trainers" who were selected by the institution to intervene in incidents of prejudice and provide support for targets of prejudice. Our research distinguished between bottom-up (i.e., more spontaneous network dynamics) and top-down (i.e., norms formally communicated by interventions) antiprejudice norms. Examining both processes helps us to better understand why normative information affects individuals with different friend circles in different ways. For example, literature has shown the tendency for people to befriend others with similar political views and even geographical self-segregation between ideological leftists and rightists (Kashima et al., 2021; Motyl et al., 2014). Intragroup communication and social network dynamics entrench polarization, forming echo chambers in which individuals amplify their preexisting beliefs and reject opposing perspectives (Barberá et al., 2015; Kashima et al., 2021). Our examination of both bottom-up and top-down processes of antiprejudice norms resonates with findings from previous research that people who belong to a certain ideological group may only attend to, and accept, normative messages that validate the preexisting beliefs of their group (Bouguettaya et al., 2023; Long et al., 2024).

In addition to the influence of the ODT video on norm dynamics in the networks, the current findings highlight the direct impact of the intervention program on intergroup attitudes, as the ODT video improved intergroup attitudes in general and facilitated positive attitudes toward people from a wide range of regions and ethnic backgrounds. The interactive D&I session also seems to have had some impact in improving intergroup attitudes, although this effect should be interpreted cautiously due to the quasi-experimental nature of the design. Interestingly, although the D&I session took place between T1 and T2, intergroup attitudes differed only between T1 and T3 and between T1 and T4, rather than between T1 and T2. One possible reason that the D&I session did not have an immediate impact is that its contents required digestion as well as opportunities for elaboration in discussion with others and implementation of the workshop's messages. However, this impact may diminish over time, as we observed that it weakened (but was still significant) 10 weeks after the session, at T4. In addition, we acknowledge that there may be other unexpected, exogenous factors apart from the D&I session that may have caused these prejudice reductions between T1 and T3 and between T1 and T4 (or the lack of reduction between T1 and T2), such as other activities organized by the university and ongoing developments related to diversity and equality. Nonetheless, our findings resonate with a large body of research that suggests diversity training programs in the forms of videos depicting peer attitudes (e.g., Murrar et al., 2020), diversity-oriented workshops (e.g., Cramwinckel et al., 2021), and guided discussions on intergroup relations (e.g., Aboud & Fenwick, 1999) produce favorable postintervention effects in terms of reducing prejudice and facilitating more inclusive attitudes.

Our study also reveals significant differences in intergroup attitudes between students in the international bachelor program and those in the Dutch bachelor program, with students in the international program consistently reporting more positive attitudes toward different national groups. This aligns with literature suggesting that international travel and personal immigration experiences can enhance empathy and reduce prejudice (Benet-Martínez & Haritatos, 2005; Pettigrew, 1998; Sirin et al., 2016). Exposure to diverse cultures and the experience of being a minority-group member can foster a greater understanding and acceptance of outgroups. These findings underscore the positive role of international experiences and cross-cultural interactions in nurturing inclusive attitudes. That said, they should be interpreted with caution, as additional demographic differences exist between students in the two programs that we may not have accounted for in our measurement and analyses.

Moreover, our research points to a promising prospect for prejudice-reduction practices. First, the integration of multimedia elements such as ODT videos into diversity training programs may be conducive to reinforcing positive messages and maximizing engagement. As we mentioned, in-person workshops can serve as a "booster" for the intervention video by leading participants to discuss, reflect on, and digest the intervention messages presented in the video. Second, institutional interventions that convey top-down norms and peer models who spread bottom-up norms within social networks can benefit each other in promoting inclusive attitudes. In addition to the school setting examined in our study, this approach may be applied in various contexts, such as workplaces, neighborhoods, and community organizations, to reduce prejudice and promote inclusivity. Practitioners may consider combining both top-down and bottom-up strategies in prejudice-reduction practices, intervening in the longitudinal development of norms in different settings. Third, understanding the structural differences between target groups, such as differences between domestic and international students, can help tailor interventions to specific needs and contexts. In light of these insights, our research can inform education practitioners, community leaders, and policymakers about effective strategies to address intergroup prejudice in diverse communities.

Limitations

Although the current studies yielded novel results that help understand how peer norms evolve within school networks and how institutional interventions facilitate the spread of pro-diversity norms, several limitations should be noted. First, the large portion of missing data constitutes a major limitation. In the current study, because our attrition rates were low, the main source of missing data was students who did not participate in the study at all. One initial concern was that SAOMs are sensitive to missing data and the estimated models might not converge (Zandberg & Huisman, 2019). Due to this concern, we performed multiple imputations to replace missing data. This attempt partially eased our concern, as we had sufficient data to allow all models to converge. Additionally, large amounts of missing data could also create issues with parameter bias and parameter coverage, and indeed the large standard errors in some of our models suggested that they were unstable. Since we only employed one approach for dealing with our missing data (i.e., multiple imputations), future research may employ different methods to deal with missing data (e.g., complete cases, single imputation procedures) and compare parameter bias and parameter coverage of the models generated by different methods, thus ensuring the robustness of the estimations (Zandberg & Huisman, 2019). Aiming to validate the results of SAOMs, we conducted additional, nonpreregistered CLPM analyses, which were less sensitive to missing data. Nonetheless, in addition to model convergence and parameter issues, we acknowledge that missing data may also lead to other issues, such as low representativeness of the sample due to potential self-selection bias among participants.

Second, the within-participants design of the interactive D&I intervention also entailed some limitations. As the D&I session was the third meeting of the institute-administered mentoring scheme, which had a fixed structure and a strict timeline, we were not able to experimentally manipulate this factor or its timing between participants, or control for other changes in the networks and environment between the pre- and postmeasurements. Unlike a fully randomized control trial, the within-participants design may be subject to confounding variables that could influence the outcomes. For instance, events that happened between our pre- and posttests might have changed participants' attitudes toward outgroups, independent of the intervention effect. One element that may have such an impact is mere exposure to outgroup members over time, which likely happened in the international program, but not in the Dutch program. As the program did not condition the within-participants effect, we are cautiously confident that the results hold above and beyond this potential confound. Nonetheless, the countless other potential confounds present

underscore the need for caution when interpreting the findings and highlight the importance of using more rigorous experimental designs in future research, wherever possible.

Another limitation can be the semi-structured nature of the D&I session. While such a semi-structured training session is not uncommon in this type of intervention, we acknowledge that a not-fully-standardized intervention may also generate questions regarding the specific working ingredients of the intervention in specific groups. For example, different mentoring groups may have gone over different topics, complicating evaluation of the intervention across groups. In addition, some teachers may have taken the D&I session less seriously, thus weakening its effectiveness in nurturing an inclusive normative climate. Therefore, follow-up research could use more structured training sessions and more systematically examine the effectiveness of different elements within the training. Nonetheless, the semi-structured nature of the D&I session can also be seen as a strength since it allows mentors to customize the session content to what the group needs (Cramwinckel et al., 2021). Furthermore, indications of this training's effectiveness emerged despite the noise created by its semi-structured nature, granting us some additional confidence in our findings.

It should also be noted that the effect sizes of the interventions found in the current study were not large. Although we found a significant difference in intergroup attitudes between T1 and T3 and between T1 and T4, the effect sizes (ds = .09 and .07) were small. The effect of the ODT video on intergroup attitudes was larger (d = .27), but also not large. Nonetheless, this effect size was much larger than the average effect (d = .19) found in large-scale ($N \geq 78$) experimental studies on prejudice reduction interventions documented in the literature, suggesting a "meaningful but modest" shift in intergroup attitudes (see Paluck et al., 2021, p. 541 and p. 553). While Paluck et al. (2021) pointed out the caveat of small effect sizes in non-preregistered, small-scale intervention studies, our study's preregistered and large-scale nature increases our confidence in the effectiveness of the interventions, and particularly that of the ODT video.

Last, the nature of our sample poses additional limits to the generalisability of our findings. The sample consisted predominantly of psychology students who were mostly female and from WEIRD (Western, Educated, Industrialized, Rich, and Democratic, per Henrich et al., 2010) backgrounds. As students and female participants might hold more positive baseline attitudes toward diversity than other groups in society, they may have approached pro-diversity peer norms more openly and actively (Holladay et al., 2003). In addition, it is well documented that individuals from WEIRD backgrounds respond differently to psychological interventions compared to those from non-WEIRD backgrounds (Henrich et al., 2010). Therefore, future research should aim to include more diverse samples in terms of gender, age, socioeconomic status, and cultural background to enhance the external validity of the findings.

CONCLUSION

The present research conveys a promising message that even depersonalized interventions, such as an ODT video, can be effective in reducing intergroup prejudice. The spontaneous spread of antiprejudice peer norms within networks can also be enhanced by such interventions. The complexity of our findings highlights the complex dynamics of intergroup attitudes within communities—as these shape and are shaped by friendships, interventions, and temporal dynamics. The approach in this paper allows us to begin untangling these complex reciprocal effects—a step that may be necessary for both the scientific understanding of these phenomena and for attempts to positively intervene within their complex dynamics.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in OSF at https://osf.io/cnpb9.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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