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A longitudinal test of secondary transfer effects of negative intergroup contact and mediating processes

Mathias Kauff[1] | **Patrick F. Kotzur[2]** | **Jasper Van Assche[3,4]** | **Sarina J Schäfer[5]** | **Maarten H. W. van Zalk[6]** | **Ulrich Wagner[7]**

[1]Department of Psychology, Medical School Hamburg, Hamburg, Germany

[2]Department of Psychology, Durham University, Durham, UK

[3]Department of Developmental, Personality and Social Psychology, Ghent University, Ghent, Belgium

[4]Center for Social & Cultural Psychology (CESCUP), Université Libre de Bruxelles, Bruxelles, Belgium

[5]Faculty of Psychology, FernUniversität in Hagen, Hagen, Germany

[6]Institute of Psychology, Universität Osnabrück, Osnabruck, Germany

[7]Department of Psychology, Philipps-University of Marburg, Marburg, Germany

Correspondence
Mathias Kauff, Department of Psychology, Medical School Hamburg, Hamburg, Germany.
Email: mathias.kauff@medicalschool-hamburg.de

Mathias Kauff and Patrick F. Kotzur shared the first authorship.

Abstract

Positive intergroup contact has not only been shown to be positively associated with favourable attitudes towards members of the contacted group but also with attitudes towards members of secondary outgroups (secondary transfer effect, STE). Only a few studies have addressed a potential STE of negative intergroup contact (i.e., a generalization of negative contact experiences to secondary outgroups). Furthermore, longitudinal studies on STEs and on underlying mediation processes are lacking. In the present research, we investigated the existence of a STE for negative (and positive) intergroup contact in four longitudinal samples with three (Studies 1a and 1b) and two waves (Studies 2 and 3; $N_{overall} = 2052$, time lags between waves 2 to 12 months). Our studies did not provide robust evidence for a STE of negative (and positive) contact, nor for indirect STEs via attitude generalization, ingroup identification or diversity beliefs. We discuss implications and suggest avenues for future research.

KEYWORDS
attitude generalization, deprovincialization, intergroup contact, outgroup attitudes, secondary transfer effect

1 | INTRODUCTION

In his seminal book 'The nature of prejudice', Allport (1954) underpinned the idea of generalized prejudice by referring to research by Hartley. In one of Hartley's (1946) studies, participants were asked to reveal their attitudes towards a number of outgroups—among them three fictitious ethnic groups, the Daniereans, Pireneans and the Wallonians. Interestingly, participants' attitudes towards outgroups, including the aforementioned non-existing groups, were highly correlated. As such, participants who disliked Jews or Black Americans also tended to devalue Daniereans, Pireneans or Wallonians. In line with

this finding, Allport (1954) argued that individuals who reject a certain outgroup are likely to reject other outgroups as well.

Building on this idea of generalized prejudice (e.g., Akrami et al., 2011), Pettigrew (2009) argued that positive intergroup contact should not only improve attitudes towards the respective outgroup, but could also advance attitudes towards other non-contacted outgroups. Supporting this idea, positive contact with certain outgroups related positively to favourable attitudes towards outgroups that are not present in respondents' countries (Pettigrew, 1997). Research on the Secondary Transfer Effect (STE) of intergroup contact has further tested this relation (e.g., Lolliot et al., 2013). In the present article, we

build on this work and extend it by studying a STE not only of positive but also of *negative* intergroup contact. Negative contact gained a lot of attention in the recent intergroup contact literature (Schäfer et al., 2021)—partly because it has been speculated that effects of negative contact are of higher magnitude than those of positive contact (e.g., Barlow et al., 2012). It would be of high practical relevance if occasional negative contact experiences would worsen attitudes not only towards members of the contacted group but also towards members of other outgroups. We therefore consider it important to study a STE of negative contact.

While most of the extant studies are based on cross-sectional data, we used longitudinal designs, which allowed us to additionally investigate potential mediating processes and the direction of effects (Granger, 1969) between contact, mediators and attitudes over time (e.g., the relationship of primary-group-contact and secondary-group-attitudes and vice versa).

2 | THE SECONDARY TRANSFER EFFECT OF POSITIVE INTERGROUP CONTACT

A plethora of research has investigated the relationship between positive contact and primary outgroup attitudes (e.g., Pettigrew, 2016; Al Ramiah & Hewstone, 2013). Pettigrew and Tropp's (2006) meta-analysis based on 713 independent samples and over 250,000 individuals demonstrated that intergroup contact can now be considered as one of the most relevant approaches to prejudice reduction (Brown & Hewstone, 2005; Pettigrew & Tropp, 2011). Positive contact has also been shown to influence other constructs related to favourable intergroup relations, such as trust (Tam et al., 2009), prosocial behaviour (Nai et al., 2018) or forgiveness (Hewstone et al., 2006).

Positive contact between two individuals of different groups not only generalizes from the contacted member of an outgroup to the whole group (primary transfer effect) but has also been suggested to generalize to other outgroups uninvolved in the encounter (STE; Pettigrew, 2009). Given that intergroup settings in modern societies become increasingly fractionalized (Vertovec, 2007) with groups often co-existing in segregated contexts (e.g., McKeown & Dixon, 2017), the STE entails a huge potential to improve societal intergroup attitudes. However, comparably little work has been devoted to the study of a STE of positive contact (and even fewer research addresses a STE of negative contact). Accordingly, Vezzali and Stathi (2020) describe STE as a 'surprisingly under-studied topic in contact research despite its theoretical and practical relevance' (p. 91).

Most cross-sectional (e.g., Pettigrew, 1998; Weigert, 1976) and longitudinal (e.g., Eller & Abrams, 2004; Shook et al., 2015; Van Laar et al., 2005) studies investigating the STE provided support for the idea that positive contact with one group is associated with attitudes towards secondary groups (for an overview, see Vezzali & Stathi, 2020). Some of these studies, however, did not control for levels of contact with the secondary outgroup, making it difficult to disentangle effects of contact with the primary and the secondary outgroup (Ünver et al.,

2022). One study that did control for previous contact with secondary outgroups found evidence supporting the idea of a STE of positive contact across different intergroup contexts (i.e., relations between Greek and Turkish Cypriots, White and Black Americans, and Protestants and Catholics in Northern Ireland) as well as in cross-sectional and longitudinal data of around 4000 participants (Tausch et al., 2010; see also Schmid et al., 2013, Study 2).

3 | MEDIATORS OF THE SECONDARY TRANSFER EFFECT OF POSITIVE INTERGROUP CONTACT

Most of the aforementioned studies at least implicitly addressed the question of *how* prejudice-reducing effects of contact with a primary group translate into favourable attitudes towards secondary groups. In our view, the three most promising suggested mediating mechanisms are attitude generalization, ingroup reappraisal and attitudes towards diversity (see also Lolliot et al., 2013). The aforementioned idea of generalized prejudice (Akrami et al., 2011) suggests that attitude generalization could function as a mediator. Not surprisingly, attitude generalization is the most studied mediator in the STE literature (Vezzali et al., 2021; see also Table 1). Pettigrew (1997) and other researchers (e.g., Hodson et al., 2018) argue that intergroup contact does not only reduce prejudice but can also lead to changes in individuals' broader view of the society and the ingroup's position within society. Ingroup reappraisal as well as attitudes as mediators of the STE reflect this idea.

3.1 | Attitude generalization

Attitude generalization is based on the idea that after having developed a specific attitude towards one object this attitude can generalize to other novel objects (Fazio et al., 2004). In line with this notion, positive contact with immigrants generalized to attitudes towards gay and homeless people via more favourable attitudes towards immigrants in a cross-sectional German sample (Pettigrew, 2009). In other words, the relationship between intergroup contact with immigrants and attitudes towards gay and homeless people was mediated by attitudes towards immigrants. Subsequent studies, most of them of cross-sectional nature, provided further support for this process (e.g., Schmid et al., 2012, 2013, Tausch et al., 2010; Vezzali & Giovannini, 2012).

3.2 | Ingroup reappraisal

Pettigrew (1997) coined the term deprovincialization and argued that intergroup contact also changes attitudes towards the ingroup (see also, Pettigrew, 1998; Verkuyten et al., 2022). Deprovincialization captures the idea that positive contact can lead to a new perspective on ingroup norms and customs and the insight that these norms are not 'the only ways to manage the social world' (Pettigrew, 1997; p. 72).

TABLE 1 Overview of studies addressing a STE of negative intergroup contact.

Authors	Study design	Ingroup(s) under study	Primary outgroup	Secondary outgroup(s)	Main results regarding negative contact STE
Brylka et al. (2016)	Cross-sectional survey (controlled for initial contact with secondary outgroups)	Estonian and Russian immigrants in Finland ($N = 351$)	Non-immigrant Finns	Estonian and Russian immigrants respectively	- STE of negative contact on outgroup attitudes - Indirect STE of negative contact (i.e., mediation) via attitude generalization - Indirect STE of negative contact (i.e., mediation) via reduced collective self-esteem (only for low-status immigrants from Russia, but not for Estonian immigrants)
Henschel and Derksen (2022)	Cross-sectional survey (controlled for initial contact with secondary outgroups)	Non-immigrant Germans ($N = 2593$)	Foreigners	Refugees	- STE of negative contact on outgroup attitudes - Indirect STE of negative contact (i.e., mediation) via attitude generalization - Indirect STE of negative contact (i.e., mediation) via acceptance of diversity
Henschel and Kötting (2023)	2-wave longitudinal survey (controlled for initial contact with secondary outgroups)	Non-immigrant Germans ($N = 390$)	Foreigners	Refugees	- STE of negative contact on outgroup attitudes - Indirect STE of negative contact (i.e., mediation) via attitude generalization - Indirect STE of negative contact (i.e., mediation) via multiculturalism
Jasinskaja-Lahti et al. (2020)	Cross-sectional survey (controlled for initial contact with secondary outgroup)	Non-Immigrant Finns ($N = 299$)	Somali or Russian immigrants	Somali or Russian immigrants respectively	- STE of negative contact on outgroup attitudes - Mediation via attitude generalization
Lissitsaa and Kushnirovich (2018)	Cross-sectional survey (not controlled for initial contact with secondary outgroup)	Israeli Jews ($N = 450$)	Israeli Palestinians	Non-Israeli Palestinians	- No STE of negative contact on outgroup attitudes - Indirect STE of negative contact (i.e., mediation) via attitude generalization (Note: Study did not focus on face-to-face but online contact)
Meleady and Forder (2018, Study 3)	Cross-sectional survey (controlled for initial contact with secondary outgroups)	White British ($N = 206$)	Muslim immigrants	Eastern European, Indian or Black African immigrants	- No STE of negative contact on outgroup attitudes or outgroup avoidance - Indirect STE of negative contact (i.e., mediation) via attitude generalization for outgroup attitudes or outgroup avoidance
Mähönen & Jasinskaja-Lahti (2016)	2-wave longitudinal survey (not controlled for initial contact with secondary outgroups)	Ingrian Finns in Finland ($N = 85$ for both waves)	Non-immigrant Finns	Other immigrants	- No STE of negative contact on outgroup attitudes

(Continues)

TABLE 1 (Continued)

Authors	Study design	Ingroup(s) under study	Primary outgroup	Secondary outgroup(s)	Main results regarding negative contact STE
Ünver et al. (2022)	Cross-sectional survey (controlled for initial contact with secondary outgroup)	Turks (N = 300) and Kurds (N = 127) in Turkey	Turks and Kurds respectively	Syrian refugees	- Indirect STE of negative contact (i.e., mediation) via attitude generalization for outgroup attitudes and support for outgroup rights
Zingora & Graf (2019)	Cross-sectional survey (controlled for initial contact with secondary outgroup)	Heterosexual Slovakians (N = 232)	Roma	Gay people	- STE of negative contact on discriminatory intentions - Indirect STE of negative contact (i.e., mediation) via attitude generalization

In line with this reasoning, studies have operationalized deprovincialization as different forms of ingroup distancing, such as a reappraisal of the ingroup (e.g., less positive attitudes towards the ingroup, Verkuyten et al., 2010), reduced ingroup identification (Pettigrew, 2009) or reduced collective self-esteem (Brylka et al., 2016; Tausch et al., 2010). Extant research using these operationalizations as a mediator of the STE yielded mixed results. While some cross-sectional studies suggest that the STE is mediated by reduced ingroup identification or altered ingroup appraisal (Brylka et al., 2016; Pettigrew, 2009; Tausch et al., 2010, Study 1), others did not find evidence for an indirect effect of primary outgroup contact on secondary outgroup attitudes via ingroup distancing (Eller & Abrams, 2004; Schmid et al., 2013, Studies 1 & 2; Tausch et al., 2010, Studies 2–4). In the present study, we used (reduced) ingroup identification as a proxy for ingroup reappraisal.

3.3 | Attitudes towards diversity

For some authors (e.g., Lolliot et al., 2013; Vezzali & Stathi, 2020; Verkuyten et al. 2022), deprovincialization implies an updated perspective not only on the ingroup but also on diversity in general. Given that deprovincialization can 'lead to a less provincial view of outgroups in general' (Pettigrew, 1997, p. 72), one could argue that an exclusive focus on ingroup-related process might be too narrow. In line with this reasoning, Verkuyten et al. (2010) operationalized deprovincialization as endorsement of multiculturalism. Multiculturalism implies acceptance and appreciation of different group identities (Wolsko et al., 2000). Individuals holding multiculturalist attitudes typically believe in a benefit of diversity for groups and society (e.g., Levin et al., 2012). Verkuyten and colleagues (2010) showed that intergroup contact, in general, positively relates to multiculturalist attitudes. A German cross-sectional study used beliefs in the value of diversity as an operationalization of deprovincialization and found that it mediated the relationship between contact and prejudice towards the primary outgroup (Asbrock et al., 2011). Moreover, a cross-sectional study with British participants showed that multiculturalist attitudes mediated the relationship between positive contact with Asians and attitudes

towards gay men and women (Lolliot et al., 2013). In the present study, we operationalize attitudes towards diversity as diversity beliefs (see Kauff et al., 2021)—a concept that captures the value placed in diversity as the most relevant aspect of multiculturalism. Compared to attitude generalization, attitudes towards diversity (e.g., diversity beliefs) are independent of processes related to specific outgroups but represent a broader positive view on the instrumentality of diversity in general (Kauff et al., 2021).

Among the three proposed mediators, attitudes towards diversity are the least established mediator. Whereas ingroup distancing has produced inconsistent results, attitude generalization received the most consistent support. In the present research, we aimed for an additional test of these mediators as well as their relative importance. So far, there are only a few longitudinal studies that studied more than one mediator of the STE (e.g., Eller & Abrams, 2004, Study 2; Tausch et al., 2010, Study 4)—but no study has addressed the three mentioned mediators simultaneously. Furthermore, we extend previous work by not only investigating the role of these three mediators for a STE of positive contact, but also examining whether these mediators play a role in a potential STE of *negative* contact.

4 | IS THERE A SECONDARY TRANSFER EFFECT OF NEGATIVE INTERGROUP CONTACT?

In recent years, intergroup contact theory has been criticized for focusing too much on ideal forms of contact, thereby neglecting negative contact experiences (e.g., Dixon et al., 2005). Addressing this critique, an increasing number of studies now deal with the consequences of negative contact (for an overview, see Schäfer et al., 2021). While in most contexts, negative contact is less frequent than positive contact (e.g., Graf et al., 2014; Pettigrew & Tropp, 2011; Schäfer et al., 2021), research considering positive and negative intergroup contact provides reliable evidence that negative contact is related to negative outgroup attitudes (e.g., Graf & Paolini, 2018; Paolini & Mcintyre, 2019). Furthermore, research on attitude generalization indicates that generalization is more likely for negative attitudes than for positive ones (e.g., Shook et al., 2007). Accordingly, it is likely that negative

experiences with a member of one outgroup might reduce favourable attitudes towards other outgroups as well (Barlow et al., 2012; Tausch et al., 2010).

Yet, surprisingly little work has addressed a potential STE of negative contact (for an overview see Table 1). Of the few examples that have, most did find evidence for a STE of negative contact (Meleady & Forder, 2018; see also Henschel & Derksen, 2022; Jasinskaja-Lahti et al., 2020; Lissitsaa & Kushnirovich, 2018; Ünver et al., 2022). However, all these studies built on cross-sectional data. Only two single studies addressed a STE of negative contact building on longitudinal data (i.e., Henschel & Kötting, 2023; Mähönen & Jasinskaja-Lahti 2016). Hence, despite some initial evidence for a STE of negative intergroup contact (for an overview, see also Vezzali et al., 2021), the field can only draw on a limited amount of mostly cross-sectional single-study articles with mixed evidence. Up to now, we do not know whether negative contact predicts attitudes towards non-contacted outgroups over time (and whether attitudes towards these groups predicts negative contact over time). In the present article, we systematically study a potential STE of negative intergroup contact with longitudinal designs across a variety of contexts.

Moreover, the majority of (cross-sectional) studies so far focused on attitude generalization as a potential mediator of a STE of negative contact—sometimes yielding inconclusive results (e.g., Zingora & Graf, 2019). We therefore consider it important to investigate additional alternative mediating processes—that is, ingroup identification as an operationalization of ingroup reappraisal and diversity beliefs as an operationalization of attitudes towards diversity. Both variables have been studied as mediators of a STE of positive contact, but research has not yet addressed these variables simultaneously as mediators of a STE of negative contact in longitudinal designs. Although our assumption that these variables might function as mediators of a STE of negative contact is exploratory, there are some reasons to believe so. In line with research on coping with negative intergroup experiences, such as feelings of devaluation (e.g., Leach et al., 2010), we suggest that certain negative contact experiences can increase the importance of ingroup identification. Moreover, negative contact has been shown to increase the salience of group categories (Paolini et al. 2010). Also, given that negative contact has been shown to have the opposite effects of positive contact, it is likely that negative experiences with outgroup members might lead people to lose their faith in diversity (Verkuyten et al., 2010, Kauff et al., 2020). Thus, we argue that negative contact with primary outgroups might lead to reprovincialization or *more* 'provincial view of outgroups in general' (Pettigrew, 1997, p. 72), which in turn might impair attitudes towards secondary groups.

5 | THE PRESENT RESEARCH

The present research addresses three gaps in research on secondary transfer effects that have also been discussed in a recent review (Vezzali et al., 2021). First, ample evidence for a negative STE is still missing: only a few studies addressed the combined effects of positive and negative contact. Second, most research so far used cross-sectional data or suffers from other methodological limitations (such as lack of control for contact with secondary outgroups; see also Ünver et al., 2022). Third, the majority of studies did not investigate various mediators at the same time but focused exclusively on attitude generalization. From the aforementioned theorizing, we hypothesized that negative contact with a primary outgroup is related to more negative attitudes towards a secondary outgroup (H1) and that this relationship is mediated by worsened attitudes towards the primary outgroup (i.e., attitude generalization; H2), increased ingroup identification (H3) and decreased pro-diversity beliefs (H4).

Given the longitudinal designs of our studies, we also explored whether alternative models might be apt to capture the relationships between our constructs of interest. As such, we also examined a 'reversed' STE, that is, we tested whether attitudes towards a secondary outgroup at the first wave relate to the frequency of positive, and frequency of negative, intergroup contact with a primary outgroup at a later wave. Given that most STE studies so far are cross-sectional and in light of the theoretical discussion about the directionality of the relationship between contact and attitudes (e.g., Binder et al., 2009; Kotzur & Wagner, 2021), we consider it important to study the relationship of primary-group-contact and secondary-group-attitudes (and vice versa) over time as thoroughly as possible. We tested whether forward paths are significantly different from corresponding backward paths. We acknowledge, however, that these analyses are exploratory.

We present three longitudinal studies that complement each other. In Studies 1a and 1b, we analysed three-wave large-scale data from two German probability samples. Each wave was about 6 months apart. We were able to test for direct and indirect effects via all three mediators in these studies. Two-wave Study 2 built on highly ecologically valid community samples of neighbours of initial reception centres for asylum seekers in two small- to middle-sized German towns. The waves were about a year apart. The occupation rates increased drastically between the two waves in both towns, which provides us with the unique opportunity to study potential STEs in a time period in which individuals are likely to acquaint new contacts with outgroup members. In this study, no measures of the proposed mediators' ingroup identification and pro-diversity beliefs were included. We therefore only tested a direct effect and an indirect effect via attitude generalization. In Studies 1a, 1b and 2, we were unable to control for contact with the secondary outgroups. This limitation is addressed in Study 3, building on a two-wave data set gathered among Belgian students. The waves were about 2 months apart. In this study, we tested all three mediators and controlled for contact with the secondary outgroups.

There is an ongoing debate about the role of similarity of groups for transfer effects of intergroup contact (Vezzali et al., 2021). While Pettigrew (2009) argued that STEs are more pronounced among outgroups that are similar (e.g., Harwood et al., 2011), other research indicates that generalization occurs for similar as well as dissimilar outgroups (e.g., Tausch et al., 2010). Aiming at testing whether a STE occurs in longitudinal studies, we decided to investigate the most obvious form of the STE—that is, transfer effects among relatively similar outgroups.

In the presented studies, we mainly focused on ethnic, national or religious outgroups. For practical reasons, we used groups that were especially prevalent in the respective contexts as the primary outgroup and similar outgroups that were less likely to be regularly contacted as secondary outgroups. However, in Study 3, we included an additional dissimilar secondary outgroup to explore whether STEs differs for similar and dissimilar secondary outgroups.

For all studies, we report how we determined our sample size, all data exclusions and all measures in the study (Simmons et al., 2012). Data from Studies 1a and 1b are publicly available at https://www.gesis.org/gesis-panel, data of Study 2 are available on request (given that in some cases it includes participants' identifying information), and data from Study 3 are available on this project's OSF page. Scripts and outputs of analyses as well as online Supplementary materials (OSM) are also available on OSF (https://osf.io/u9g26/).

All studies adhere to the ethical guidelines specified in the APA Code of Conduct as well as the guidelines of the German Psychological Society.

6 | STUDIES 1A AND 1B

Data for Studies 1a and 1b stem from the 'attitudes towards ethnic minority' module (Wagner et al., 2016) in the GESIS Panel, provided by the Leibniz Institute of Social Sciences (Bosnjak et al., 2018).[1] The panel consists of a probability sample of German-speaking adults with permanent residence in Germany. The Leibniz institute attempts to hold the sample composition close to representativeness for the German population (see https://www.gesis.org/gesis-panel). The time of the data collection (October 2016–November 2017) was characterized by the immigration of higher rates of refugees, many of them from countries that are predominantly Muslim, which implies changes in contact with these groups for many in the sample and thus makes this an interesting context to address our research questions. Given these societal changes, we used data with half-yearly intervals between waves, which should provide enough time for contact and attitude levels to have changed (see also Kotzur & Wagner, 2021; Schmidt et al., 2019).

In this set of studies, we tested H1, according to which negative contact with a primary outgroup is negatively related to attitudes towards a secondary outgroup. We also tested H2–H4, according to which this relationship is mediated by worsened attitudes towards the primary group, increased ingroup identification and decreased pro-diversity beliefs, respectively. We included Muslims as the primary outgroup in Study 1a and refugees in Study 1b, as these were the groups for which a large increase in migration could be observed at that time (Worldbank, 2019). We included Sinti and Roma as the secondary outgroup for both studies as this group represents a very small ethnic minority

group in Germany, which makes intergroup contact unlikely (Asbrock et al., 2013).

6.1 | Method

6.1.1 | Sample, design and procedure

The sample size was determined by the number of participants in the respective data sets. In both studies, 1641 German-born adults participated—half of them in each of the separate subsamples of Studies 1a ($N = 827$; 45.5% female, 47.8% male; $M_{age} = 51.52$, $SD_{age} = 14.21$) and 1b ($N = 814$; 44.7% female, 47.2% male; $M_{age} = 51.50$, $SD_{age} = 13.68$). The time intervals between waves were about 6 months: Wave 1 of both studies took place October 2016–November 2016, Wave 2 April 2017–May 2017 and Wave 3 October–November 2017. For Study 1a, $n = 697$ participants participated in all three waves ($n_{W1} = 802$, $n_{W2} = 818$, $n_{W3} = 818$). For Study 1b, $n = 685$ participated in all three waves ($n_{W1} = 799$, $n_{W2} = 740$, $n_{W3} = 714$). For more details on the sample, design and procedure, see https://www.gesis.org/gesis-panel/documentation. We tested how likely it was to observe an effect, given our sample size and expected effect sizes extrapolated from previous studies. Power analysis using pwrSEM version 0.1.2 (Lakens, 2022; Wang & Rhemtulla, 2022) with α-level = .05 and $N_{Replications} = 1000$ for the most complex mediation models revealed that power = 1.00 for cross-lagged paths at an estimated |.3| for both studies (for further details on the power analysis, see OSM-Table S34).

6.1.2 | Measures

A full list of items used in all studies can be found in OSM-Table S1.

Frequency of positive and negative contact
These constructs were measured using the 2-item scales by Wagner et al. (2002). On a scale ranging from 1 = *never* to 4 = *frequently*, participants were asked: 'How frequently do you have positive or pleasant contact with [Muslims (Study 1a)/refugees (Study 1b)] in your neighbourhood/at your place of work or study?' for positive contact with the primary outgroup. Correlations among positive contact items within waves ranged $rs = .41$ to $.49$, $p < .001$ in Study 1a and $rs = .35–.41$ $p < .001$, in Study 1b. To measure negative contact with the primary group, participants were asked 'How frequently do you have negative or unpleasant contact with [Muslims (Study 1a)/refugees (Study 1b)] in your neighbourhood/at your place of work or study?' (Study 1a: $rs = .45–.57$, $p < .001$, Study 1b: $rs = .41–.44$, $p < .001$).

Attitudes
On a scale from 1 = *very negatively* to 5 = *very positively*, participants were asked 'How would you assess [group] in general'? and 'How would you describe your feelings towards [group] in general?' for the primary

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[1] The respective data sets have also been used in other research (Bohrer et al., 2019; Kotzur & Wagner, 2021; Schmidt et al., 2019). As data are publicly available, it is impossible to make sure that we cite all studies here. To the best of our knowledge, however, all studies investigated primary contact effects. As such, no published studies we know have used these data to address research questions related to secondary transfer effects, diversity beliefs and/or ingroup identification.

group 'Muslims' (Study 1a)/'refugees' (Study 1b) and the secondary group 'Sinti and Roma' (Wagner et al., 2008). Attitude items for each of the groups correlated highly across waves in both studies (Study 1a: Muslims $rs = .74–.80$, $p < .001$, Sinti and Roma $rs = .81–.83$, $p < .001$; Study 1b: refugees $rs = .74–.79$ $p < .001$, Sinti and Roma $rs = .84–.86$, $p < .001$).

Diversity beliefs

Diversity beliefs were measured with items adapted from Asbrock et al. (2011). On a scale from 1 = *fully disagree* to 4 = *fully agree*, participants were asked to indicate their agreement with two statements, for example: 'I value cultural diversity in Germany because it is useful for the country'. Items correlated highly across waves in both studies (Study 1a: $rs = .75–.78$, $p < .001$; Study 1b: $rs = .71–.79$, $p < .001$).

Ingroup identification

Ingroup identification was measured using a scale built on items used in Becker et al. (2007) and Haddock et al. (1993). On a scale from 1 = *fully disagree* to 4 = *fully agree*, participants were asked to indicate their agreement with these two statements: 'I am proud to be German' and 'Being German is an important part of my personality'. Items correlated highly in all waves in both studies (Study 1a: $rs < .65–.67$, $p < .001$; Study 1b: $rs = .65–.69$, $p < .001$).

6.1.3 | Analytic strategy

To address H1, we fitted a series of cross-lagged panel models (CLPM; Christ & Wagner, 2013).[2] These models included negative (and positive) contact towards the primary outgroup and attitudes towards secondary outgroups to test the direct longitudinal links between the contact and attitude variables, which corresponds to the longitudinal c-path in mediation terminology (Jose, 2013).

Following Swart et al. (2011), we built up our final bidirectional model in a step-wise procedure. This procedure allowed us to optimize model parsimony. We started with a parsimonious first-order autoregressive model as a baseline, and worked our way up to bidirectional cross-lagged panel models, in the following order (for details, see OSM Text 1): first-order autoregressive models without (Model 1a) and with stationarity assumption (i.e., testing 'the degree to which one set of variables produces change on another set remains the same over time', Cole & Maxwell, 2003, p. 560) (Model 1b), cross-lagged panel model with empirically plausible non-focal cross-lagged paths without (Model 2a) and with stationarity assumption (Model 2b), forward

unidirectional longitudinal model without (Model 3a) and with (Model 3b) stationarity assumption, backward unidirectional model without (Model 4a) and with (Model 4b) stationarity assumption and finally, a bidirectional model composed of the most parsimonious forward and backward model (Model 5). All model comparisons can be found in the OSM. For simplicity, we only report on the bidirectional model in the result section.

To test whether the STE is mediated by our theorized mediators, attitudes towards the primary outgroup (i.e., attitude generalization; H2), diversity beliefs (H3) and ingroup identification (H4), we introduced the three mediators simultaneously in the next set of models. This was done to estimate the longitudinal a-path, b-path and c'-path in mediation terminology (Jose, 2013). We followed the same steps as described above, starting with a parsimonious first-order autoregressive model, forward mediation model, backward mediation model or reciprocal mediation model. Finally, we tested for the significance and size of the indirect effects to probe our mediation hypotheses of the final reciprocal mediational model. To test whether forward paths were significantly larger, and thus more substantial, compared to corresponding backward paths, we created new parameters by subtracting unstandardized forward paths from backward paths and testing them for significance using the model constraint function. Results of these analyses for all studies are summarized in OSM-Table S33 and mentioned in-text when significant.

6.2 | Results

6.2.1 | Preliminary analysis

ANOVA and chi-square tests using IBM-SPSS 28.0 showed that those who dropped out between Wave 1 and 2 and Wave 2 to Wave 3 differed significantly from those who continued to take part at a Bonferroni-corrected $p_{two-tailed} < .004$ in terms of age in Study 1a.[3] More than 5% of values of some variables were missing. To investigate missingness patterns within waves, we created binary missing indicators (0 = participant score present, 1 = participant score absent) and correlated these indicators with substantial variables and missingness indicators of other items. Missingness was systematically related to substantial variables and non-response in both studies ($p < .001$). Some variables were also slightly skewed. Therefore, we used robust full-information maximum likelihood estimator in Mplus 8.5 and above in all subsequent analyses (MLR; Muthén & Muthén, 1998–2017) to account for the missing values and non-normally distributed data and report adjusted estimates. We present STDYX standardized values whenever we present standardized values.

We ran a series of confirmatory factor analyses to check the reliability and validity of the multi-item scales. A prerequisite of longitudinal latent variable analysis is that factor loadings must be equal across

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[2] There is currently a methodological debate on whether random intercept cross-lagged panel models (RI-CLPM; Hamaker et al., 2015; O'Donnell et al., 2021), which separate between-person variance from within-person variance, should be preferred over CLPM, which do not. We used CLPM in this study for the following reasons. First, it is still being discussed whether the RI-CLPM is indeed the go-to method when researchers want to make causal inferences, especially if the goal is to estimate the effect of increasing the exposure by one unit, and if the goal is to also investigate potential effects of causes that explain differences between individuals (Luedtke & Robitzsch, 2021). Thus, we used CLPM as an established technique to test for longitudinal change in rank-orders in one variable that are related to the rank-order in another variable that has been measured previously, controlling for the rank-order in the same construct that has been measured previously (Christ & Wagner, 2013).

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[3] Study 1a: Wave 1 to Wave 2: $F_{age}(1, 743) = 11.924$, $p < .001$, $M_{continued} = 52.11$, $SD_{continued} = 13.989$; $M_{dropout} = 44.67$, $SD_{dropout} = 14.406$; Wave 2 to Wave 3: $F_{age}(1, 714) = 12.844$, $p < .001$, $M_{continued} = 52.36$, $SD_{continued} = 13.957$; $M_{dropout} = 42.86$, $SD_{dropout} = 14.459$.
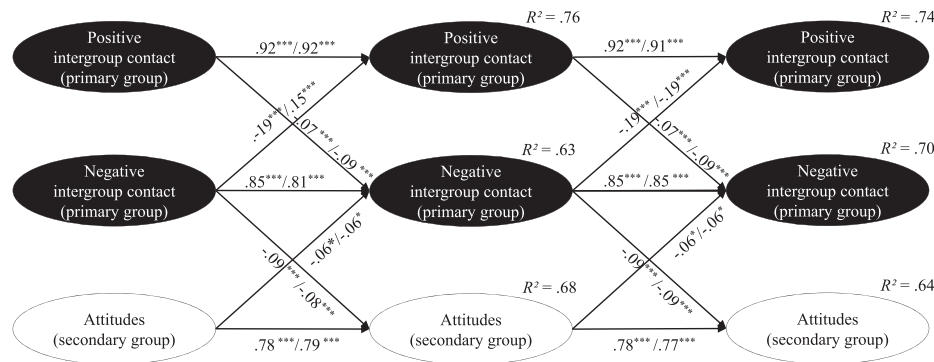
FIGURE 1 Study 1a: Final bidirectional direct model, including positive and negative intergroup contact with primary group (Muslims, depicted in black ellipses), and attitudes towards secondary group (Sinti and Roma, depicted in white ellipses). Full model specification not shown for simplicity. Only significant autoregressive and cross-lagged paths are shown. Relationships between variables within one wave are not displayed. We present unstandardized bs (first value) to illustrate stationarity across waves and $βs$ (second value) for comparisons of effect sizes across studies. All variables were defined as latent variables. $p \leq .10$, $^*p \leq .05$, $^{***}p \leq .001$.

waves (metric measurement invariance; Vandenberg & Lance, 2000). This prerequisite was met for all scales in both studies using the ΔCFI < .01 criterion (Cheung & Rensvold, 2002). Correlations between constructs within and across waves of Study 1a are shown in the OSM (Tables S2–S3). Results from measurement invariance testing are also summarized in the OSM (Tables S4–S5).

6.2.2 | Main analyses

All standardized and unstandardized model parameter estimates can be found in the outputs in the OSM folder 'scripts Study 1a' for Study 1a and 'scripts Study 1b' for Study 1b.

Study 1a
To address H1, we fitted a series of nested 'direct' CLPMs, only including negative and positive contact towards the primary outgroup (Muslims) and attitudes towards secondary outgroups (Sinti and Roma), according to the procedure outlined above. Model fits and nested model comparisons are summarized in the OSM (Tables S6–S7). We inspected the full stationary bidirectional model including both forward and reverse paths to inspect the significance of relevant cross-lagged paths (see also Figure 1). As hypothesized, the cross-lagged path of negative contact on attitudes was negative and significant, $b = −.09$, $SE = .03$, $p = .001$, $βs = −.08$ to $−.09$[4], suggesting a negative STE. The cross-lagged path of attitudes predicting negative contact was significant, $b = −.06$, $SE = .03$, $p = .024$, $βs = −.060$ to $−.061$, providing evidence for a reversed negative STE.

We also inspected the role of positive contact in this model. Positive contact neither significantly predicted nor was predicted by attitudes towards the secondary group, suggesting neither a 'regular' nor reversed positive STE, when controlling for negative contact.

To test H2–H4, we fitted a series of nested 'indirect' CLPMs, in which we additionally included all proposed mediators following the previously described procedure (figures for indirect models of all studies can be found in OSM, Figures 1–5). Model fits and nested model comparisons are summarized in the OSM (Tables S8–S9). The full stationary bidirectional model including both forward and reverse paths showed that none of the hypothesized indirect effects of negative contact at Wave 1 on attitudes towards Sinti and Roma at Wave 3 via any of the hypothesized mediators emerged as significant, suggesting that our mediation hypotheses were not confirmed.[5]

Inspecting the reversed relationship between constructs, none of the indirect effects of attitudes towards the secondary group Sinti and Roma at Wave 1 on negative contact at Wave 3 via any of the hypothesized mediators emerged as significant, suggesting no conducive evidence for such a mechanism. We also inspected the indirect effects of positive contact on attitudes towards the secondary group via the proposed mediators over time, and vice versa. None of the indirect effects involving negative or positive contact were significant.

Comparing path strengths, positive contact predicted attitudes towards the primary group and secondary group as expected, whereas the reversed paths were non-significant. The comparison between the forward and reverse paths showed that the former was significantly larger, both for the secondary group, $p = .015$, and marginally so for the primary group, $p = .060$.

Study 1b
To test H1, we again fitted a series of nested 'direct' CLPMs, only including contact towards the primary outgroup (refugees) and attitudes towards secondary outgroups (Sinti and Roma). Model fits and nested model comparisons are summarized in the OSM (Tables S10–S11).

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[4] Estimates are set to be equal across waves based on the previously tested and consecutively introduced stationarity assumption. Whereas unstandardized estimates are of equal size when constrained to be equal, standardized estimates can vary. We thus always report ranges of standardized estimates when reporting results of our three-wave studies.

[5] Although Mplus produced a warning message concerning a potential Heywood case for this model, a close inspection of variances, residual variances and standardized estimates showed that model parameters were within range. Moreover, attitudes towards the primary group were surprisingly significantly and negatively related to cross-lagged attitudes towards the secondary groups. As the editor has kindly pointed out, this is probably a suppressor effect given the large positive correlation between both attitudes.
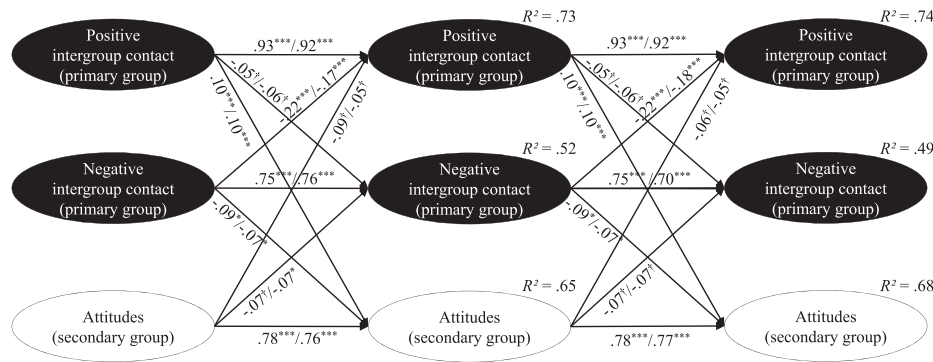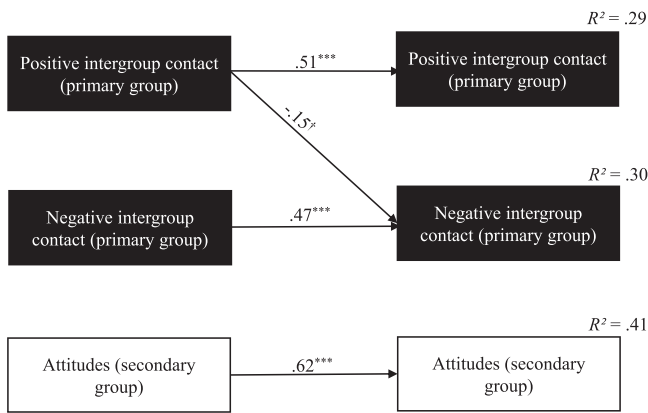
FIGURE 2 Study 1b: Final bidirectional direct model, including positive and negative intergroup contact with primary group (refugees, depicted in black ellipses), and attitudes towards secondary group (Sinti and Roma, depicted in white ellipses). Full model specification not shown for simplicity. Only significant autoregressive and cross-lagged paths are shown. Relationships between variables within one wave are not displayed. We present unstandardized bs (first value) to illustrate stationarity across waves and βs (second value) for comparisons of effect sizes across studies. All variables were defined as latent variables. $^\dagger p \leq .10$, $^* p \leq .05$, $^{***} p \leq .001$.

FIGURE 3 Study 2: Final bidirectional direct model, including positive and negative intergroup contact with primary group (refugees, depicted in black boxes), and attitudes towards secondary group (Turks, depicted in white boxes). Full model specification not shown for simplicity. Only significant autoregressive and cross-lagged paths are shown. All regression weights are standardized βs. $^\dagger p \leq .10$, $^{**} p \leq .01$, $^{***} p \leq .001$.

FIGURE 4 Study 3: Final bidirectional direct model, including positive and negative intergroup contact with primary group (Turks, depicted in black boxes), attitudes towards secondary group (refugees, depicted in white boxes), and positive and negative contact with secondary group (refugees, depicted in dark grey boxes). Full model specification not shown for simplicity. Only significant autoregressive and cross-lagged paths are shown. Relationships between variables within one wave are not displayed. All regression weights are standardized βs. $^\dagger p \leq .10$, $^{**} p \leq .01$, $^{***} p \leq .001$.

Inspecting the forward paths of the full stationary bidirectional model including both forward and reverse paths (see also Figure 3) revealed that, as hypothesized, the cross-lagged path of negative contact on attitudes was negative and significant, $b = -.09$, $SE = .04$, $p = .030$, $\beta s = -.071$ to $-.073$, suggesting a negative STE. The cross-lagged path of attitudes predicting negative contact was marginally significant, $b = -.07$, $SE = .034$, $p = .052$, $\beta s = -.070$ to $-.074$, providing marginally significant evidence for a reversed negative STE.

Positive contact did significantly predict attitudes towards the secondary group, $b = 1.00$, $SE = .03$, $p = .011$, $\beta s = .103$ to $.104$, but the reversed path was not significant, $b = -.06$, $SE = .03$, $p = .086$, $\beta s = -.053$ to $-.054$. Positive contact effects on attitudes were larger than attitude effects on positive contact, $p < .001$.

To address H2–H4, we again fitted a series of nested 'indirect' CLPMs, in which we additionally included all proposed mediators following the previously describe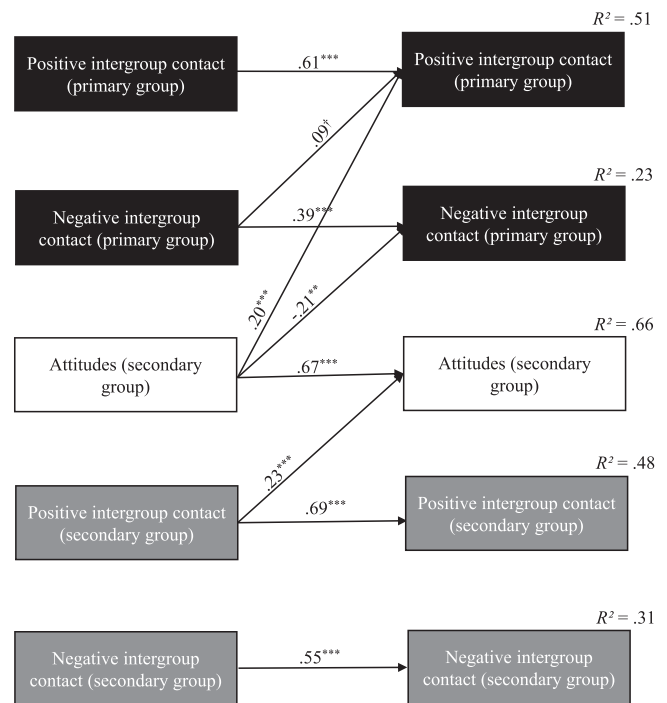d procedure. Model fits and nested model comparisons are summarized in the OSM (Tables S12–S13). None of the hypothesized indirect effects of the full bidirectional model of negative contact at Wave 1 on attitudes towards Sinti and Roma at Wave 3 via any of the hypothesized mediators emerged as significant, providing no support for H2–H4.
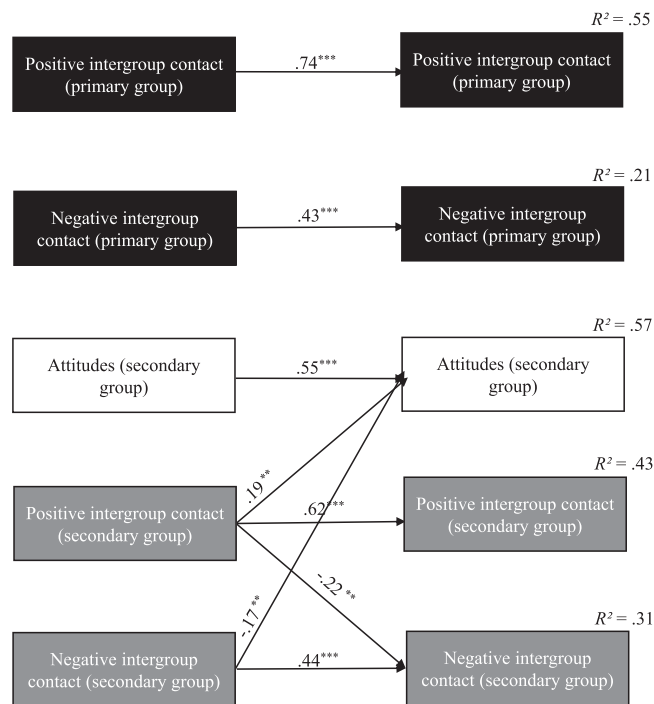
FIGURE 5 Study 3: Final bidirectional direct model, including positive and negative intergroup contact with primary group (Turks, depicted in black boxes), attitudes towards secondary group (gay people, depicted in white boxes), and positive and negative contact with secondary group (gay people, depicted in dark grey boxes). Full model specification are not shown for simplicity. Only significant autoregressive and cross-lagged paths are shown. Relationships between variables within one wave are not displayed. All regression weights are standardized βs. **$p \le .01$, ***$p \le .001$.

Inspecting the reversed relationship between constructs, none of the indirect effects of attitudes towards the secondary group Sinti and Roma at Wave 1 on negative contact at Wave 3 via any of the hypothesized mediators emerged as significant, suggesting no conducive evidence for a reversed STE via these routes. Moreover, we did not find any significant indirect effects involving positive contact.

Comparing path strengths, negative contact predicted attitudes towards primary and secondary outgroups (forward paths), whereas the reversed paths were non-significant. The forward path was significantly larger than the reversed path, $p = .036$. Positive contact significantly predicted more positive attitudes towards primary and secondary outgroups (forward paths), whereas the reverse paths were not significant. The comparison between the forward and reverse paths showed that the former was significantly larger, both for the secondary group, $p = .004$, and for the primary group, $p = .008$.

6.3 | Discussion

We found evidence for a STE of negative intergroup contact in both studies as hypothesized. However, no indirect effects via our proposed mediators occurred. Also, we only found evidence for a STE of pos-

itive intergroup contact in Study 1b but not in Study 1a. Moreover, we did not find any indirect effects of positive intergroup contact. Furthermore, evidence for a reversed STE was missing. Whenever we found significant results comparing forward and corresponding backward paths, forward paths emerged as stronger—more so for positive than for negative contact.

Studies 1a and 1b advanced previous work by using a large three-wave data set and investigating three mediator candidates for a negative STE simultaneously. However, these studies are based on general population data. It is unclear how much participants in the respective surveys were actually confronted with changing opportunities for intergroup contact. Study 2 adds to the results from Studies 1a and 1b by focusing on a context with increasing contact opportunities. That is, in Study 2, we investigate a particularly relevant population, namely inhabitants of two neighbourhoods of reception centres for asylum applicants. Given that the initial reception centre in one neighbourhood was opened after the start of data collection and the number of refugees being hosted in the other increased drastically, Study 2 is situated within contexts of massively changing contact opportunities.

7 | STUDY 2

Data for Study 2 stem from a larger project which was conducted in two neighbourhoods of initial reception centres for asylum applicants in Germany. Participants were interviewed three times in 4-month intervals between April 2015 and March 2016 in both neighbourhoods. In this study, we included data from Waves 1 (April–May 2015) and 2 (February–March 2016). The data collection included another wave in-between Waves 1 and 2. However, this wave did not contain constructs relevant to address our hypotheses.

In Study 2, we tested H1, according to which negative contact with a primary outgroup is negatively related to positive attitudes towards a secondary outgroup. We also tested H2, according to which this relationship is mediated by worsened attitudes towards the primary group. We used asylum seekers as the primary outgroup, since this was the group that was introduced in the neighbourhood, and included Turks as the secondary outgroup. Whereas opportunities for contact with asylum seekers emerged on a large scale in a small to midsized town context between waves by design, contact opportunities with Turks can be assumed to be much more constant within the sampling period. Given the massive changes in contact opportunities in participants' neighbourhoods, we deemed a time interval of almost 1 year enough for intergroup contact and attitude levels to change.

Some aspects from this project have been reported elsewhere (Kotzur & Wagner, 2021), including a detailed description of the study's context, design and partial results based on the intergroup contact variables and attitudes towards the primary group (asylum seekers). However, the attitude measures towards secondary groups have not been analysed and reported on before. A data transparency table displaying which items have been used in which write-up is available in the OSM (Table S14).

7.1 | Method

7.1.1 | Sample, design and procedure

The sample size was determined by the number of participants in the respective data sets. N_{W1} = 183 German-born adults (45.4% female; age: M = 46.43, SD = 20.31; walking distance from the centre (in metres): M = 1030.45, SD = 374.54; neighbourhood A: n = 120, neighbourhood B: n = 63), who lived within 0–1500 metres' walking distance of the initial reception centre took part in structured face-to-face interviews between April and May 2015. The face-to-face interviews at Wave 1 were followed up with structured telephone interviews with those participants who provided their consent to be recontacted a little less than a full year later (N = 114 for Wave 2, February–March 2016). Participants were offered small incentives to take part in Wave 1 (five Euros) and to continue to take part in further waves (a three Euro donation on the participants' behalf to a charity for each additional wave). Power analysis based on our sample size using pwrSEM with α-level = .05 and $N_{Replications}$ = 1000 for the most complex mediation model revealed that power was .83 to .85 for cross-lagged paths at an estimated |.3| (see OSM-Table S34).

7.1.2 | Measures

Frequency of positive and negative contact
These constructs were measured using an adapted single-item version of Wagner et al.'s (2002) scale ranging from 1 = *never* to 4 = *frequently* to ask 'How frequently do you have positive or pleasant contact with asylum seekers in your neighbourhood?' for positive contact with the primary outgroup, and 'How frequently do you have negative or unpleasant contact with asylum seekers in your neighbourhood?' for negative contact with the primary outgroup.

Attitudes
This construct was measured using an adapted version of Asbrock's (2010) scale ranging from 1 = *not at all* to 4 = *very much* to ask to what extent the primary group 'asylum seekers' and the secondary groups 'Turks', are perceived as, for example, 'warm'. Internal consistencies for the four-item scales were: asylum seekers neighbourhood A, ωs = .91 to .98, neighbourhood B, ωs = .89 to .92, Turks neighbourhood A, ωs = .947 to .954, Turks neighbourhood B, ωs = .96 to .97.

7.1.3 | Analytic strategy

We followed the same analytic strategy as in Study 1, with three notable exceptions. Given the smaller sample size, we used manifest variable modelling. Because we had two instead of three waves at our disposal, we tested our hypotheses using a half-longitudinal design, which does not allow to test but assumes stationarity to be given (i.e., that the processes observed between the two waves remains the same over time; Cole & Maxwell, 2003; Little, 2013). Thus,

whereas the fully bidirectional direct model contained the c-path in mediation terminology (contact at Wave 1 on attitudes towards the secondary group at Wave 2; Jose, 2013), the fully bidirectional indirect model included the longitudinal a-path (Wave-1 contact on Wave-2 primary attitudes), b-path (Wave-1 primary attitudes on Wave-2 attitudes towards secondary group) and c'-path (Wave-1 contact on Wave-2 attitudes towards secondary group), as well as reversed relationships. Because we collected data from two sites and sample sizes were rather small, we tested whether multi-item constructs were comparable (measurement invariant) between the sites. This was to check whether we can create one joint data set to increase power.

7.2 | Results

7.2.1 | Preliminary analysis

ANOVA and chi-square tests using IBM-SPSS 28 showed that those who dropped out between Wave 1 and 2 in neighbourhood A and B (n = 63, n = 36) did not differ significantly from those that continued to take part at a Bonferroni-corrected $p_{two-tailed}$ = .004. However, missingness was systematically related to substantial variables and non-response. Therefore, we used robust full-information maximum likelihood estimator in Mplus 8.5 and above in all subsequent analyses (MLR; Muthén & Muthén, 1998–2017) to account for the missing values and report adjusted estimates. We ran a series of confirmatory factor analyses to check the reliability and validity of the multi-item attitude scales and to determine whether we can collapse items across data collection sites to create one joint data set and use manifest variables. A prerequisite for this is that factor loadings and intercepts must be equal across neighbourhoods and waves (partial scalar measurement invariance; Steinmetz, 2013). This prerequisite was met for all attitude scales after some adjustments (for details, see OSM-Table S16). Thus, we created one joint data set from data of both neighbourhoods and averaged the items for scales measuring attitudes towards asylum seekers and Turks for each wave to composite scores. Means, standard deviations and correlations between constructs within and across waves are shown in OSM (Table S15).

7.2.2 | Main analyses

All model parameter estimates can be found in the outputs in the OSM folder 'scripts Study 2'. To address H1, we tested the direct longitudinal links between the contact and attitude variables following the procedure of the previous studies. Model fits and model comparisons of this series of 'direct' CLPMs are summarized in the OSM (Tables S16–S17). Inspecting the full bidirectional model (Figure 3) suggested no significant cross-lagged paths between negative contact and attitudes towards the secondary group in either direction, indicating no evidence for an STE nor a reversed STE. We also inspected the results

for positive contact and, again, found non-significant results for positive contact as well. Testing H2, we fitted a series of nested 'indirect' CLPMs again, which also included attitudes towards the primary group as a mediator. Model fits and nested model comparisons are summarized in the OSM (Tables S18–S19). Inspecting the bidirectional model, we did not find the hypothesized indirect effects of negative contact with the primary group on attitudes towards the secondary groups via attitudes towards the primary group in the full bidirectional model. We also did not observe an indirect STE for positive contact. Inspecting the reversed relationship between constructs, we found none of the indirect effects of attitudes towards the secondary groups at Wave 1 on negative contact at Wave 2, suggesting no conducive evidence for a reversed STE. Comparing path strengths, positive contact predicted attitudes towards the primary group positively and significantly (forward path), as did attitudes towards the primary group predict positive contact (reversed path). Positive contact effects on attitudes towards the primary group were stronger than the reversed effects, $p = .033$.[6]

7.3 | Discussion

In Study 2, we did not find any longitudinal evidence for a direct positive or negative STE nor for an indirect effect via attitude generalization. Contrary to findings from Studies 1a and 1b, results of Study 2 did not provide evidence for a generalizing effect of contact to non-contacted secondary outgroups. Primary positive contact effects on attitudes were substantially larger than primary attitude effects on positive contact, though, which did not extend to negative contact.

A major shortcoming of Studies 1a, 1b and 2 was that we were unable to control for (negative) contact with the secondary groups in our models because we used secondary data. Robust evidence for the existence of STEs, however, would require that contact with the secondary group is controlled for (Tausch et al., 2010). In Study 3, therefore, we also measured secondary intergroup contact. Moreover, hypotheses and analyses conducted were pre-registered. Given that Study 3 built on primary data, we were also able to use broader measures of the relevant constructs. Finally, in Study 3 we studied a potential STE of contact with a primary outgroup (Turks) not only on a relatively similar secondary outgroup (refugees) but also on a rather dissimilar outgroup (gay people), thereby touching upon the research question whether the STE also occurs for dissimilar groups (e.g., Harwood et al., 2011).

8 | STUDY 3

Data for Study 3 were collected as part of a larger data collection effort among first-year Bachelor students at a Belgian University. Hypotheses and procedures were pre-registered on OSF before data collection (https://osf.io/8dj36). Data were collected October–December 2019.

We used Turkish immigrants as the primary outgroup. Turks and Turkish Belgians are among the largest and most-visible non-European immigrant groups in Belgium (StatBel, 2021), which makes contact relatively likely. We used refugees who are relatively new to the country, and hence not that well represented in various aspects of public life, as a similar secondary outgroup. As a non-similar, non-ethnic outgroup, we chose gay people. Study 3 is based on a student sample in their first term, where students tend to make many new acquaintances over the first weeks of term, including acquaintances with members of large ethnic minority groups. The items used in Study 3 focus on contact experiences in the university context. Other contact work in the education sector has shown that little time needs to elapse for attitudes and contact levels to change after institutional changes (Van Zalk et al., 2021). We thus deemed a time interval between waves of 2 months at the beginning of term sufficient time for contact to emerge and attitudes to change.

8.1 | Method

8.1.1 | Sample, design and procedure

Students participated in the two-wave study in return for partial course credit. We recruited as many participants as possible from this participant pool. Participation in Wave 1 was online (October 2019) at the beginning of participants' first term at university, whereas data for Wave 2 (December 2019) was collected in lab sessions, in which groups of participants simultaneously completed a series of questionnaires and experiments, including ours. To ensure that participants evaluated outgroups when filling in our survey, we only included those who were born in Belgium in our analyses related to refugees ($N = 219$, 70.30% female, 29.70 % male; $M_{age} = 18.70$, $SD_{age} = 2.00$), and those who identified as heterosexual in our analyses related to gay people ($N = 228$, 70.60% female, 29.40% male; $M_{age} = 18.72$, $SD_{age} = 1.980$). $N = 165$ Belgium-born subjects ($n_{W1} = 165$, $n_{W2} = 219$) participated in both waves, whereas this was the case for $n = 176$ heterosexual participants ($n_{W1} = 176$, $n_{W2} = 228$).[7] Power analysis based on our sample size using pwrSEM with α-level $= .05$ and $N_{Replications} = 1000$ for the most complex mediation models revealed that power $= .92$ to $.99$ for cross-lagged paths at an estimated $|.3|$ in the model including refugees as the secondary outgroup, power $= .98$ to $.99$ in the model including gay people as the secondary outgroup (see OSM-Table S34).

8.1.2 | Measures

All measures were administered on a scale from 1 = *completely disagree* to 7 = *completely agree*. If not indicated otherwise, items in Study 3 were based on those used in Studies 1a and 1b.

Frequency of positive and negative contact

We measured these constructs using an adapted 2-item version of the scales by Wagner et al. (2002). Participants were asked to indicate their agreement with items such as 'I often have positive or friendly contact with [group] in my school' for positive contact with all outgroups, and 'I often have negative or unpleasant contact with [group] in my school' for negative contact with all outgroups. Contact items correlated highly in both waves (positive contact: $rs = .74$ to $.62$, $ps < .001$ for Belgium-born subsample, $rs = .69$ to $.79$, $ps < .001$ for heterosexual subsample; negative contact: $rs = .64$ to $.66$, $ps < .001$ for Belgium-born subsample, $rs = .65$ to $.72$, $ps < .001$, for heterosexual subsample).

Attitudes

Participants were asked to indicate their agreement with three statements for all groups, for example: 'I feel warm towards [group]'. Internal consistencies were: Turks, $\omega s = .91$ for Belgium-born subsample, $\omega s = .91$ to $.92$, for heterosexual subsample; refugees $\omega s = .91$ to $.93$ in Belgium-born subsample; gay people $\omega s = .92$ to $.93$ in heterosexual subsample.

Diversity beliefs

As in Studies 1a and 1b, we measured diversity beliefs using items used by Asbrock et al.'s (2011), but added items from Kauff et al. (2021). Participants were asked to indicate their agreement with six statements, for example: 'A society with a high degree of cultural diversity will be able to solve new problems'. Internal consistencies across both waves were $\omega s = .871$ to $.874$ in the Belgium-born subsample, $\omega s = .86$ to $.89$ in heterosexual subsample.

Ingroup identification

Participants were asked to indicate their agreement with five statements, for example: 'In general, my self-image is largely determined by my Belgian nationality'. Internal consistencies were $\omega s = .65$ to $.73$ in the Belgium-born subsample, $\omega s = .766$ to $.773$ in heterosexual subsample.

8.1.3 | Analytic strategy

We used the same analytic strategy as in the previous studies, fitting two series of nested CLPMs (one with refugees as the secondary group, one with gay people as the secondary group), with the following to note. Given the rather small sample size, we used manifest variable modelling. As in Study 2, we tested our hypotheses using a half-longitudinal design. Lastly, because our study now included contact with the secondary group, we controlled for its effects in our models.

8.1.4 | Preliminary analysis

Those who joined at Wave 2 did not significantly differ on age, gender or relevant Wave 2 items from those who continued across both

waves for both Belgium-born and heterosexual participants after Bonferroni correction ($p_{two-tailed} = .002$), except that those Belgium-born subjects who joined reported less negative contact with Turks in their neighbourhood than those who continued across waves ($F_{Welch}(1, 127.38) = 12.03$, $p = .001$, $M_{continued} = 2.70$, $SD_{continued} = 1.41$, $M_{join} = 2.09$, $SD_{join} = 1.00$). We ran a series of confirmatory factor analyses again to examine the reliability and validity of the multi-item scales. A prerequisite for longitudinal manifest variable analysis is that factor loadings and intercepts must be equal across waves (at least partial scalar measurement invariance; Vandenberg & Lance, 2000). This prerequisite was not met for negative intergroup contact with Turks and national identification. Consequently, single-item measures were used in both instances. For negative contact with Turks, we used the item 'I often have negative or unpleasant contact with Turks in my neighbourhood'. For national identification, we used the item 'In general, my nationality has little to do with how I see myself' (reverse coded). Moreover, poor model fit and a non-significant factor loading led us to drop one unsatisfactorily performing diversity beliefs item. Means, standard deviations and correlations between constructs within and across waves of both studies are shown in OSM-Table S21 for refugees as the secondary group, and OSM-Table S22 for gay people as the secondary group. Results of measurement invariance tests are reported in OSM-Table S23 for refugees as the secondary group, and OSM-Table S24 for gay people as the secondary group.

8.1.5 | Main analyses

All model parameter estimates can be found in the outputs in the OSM folder 'scripts Study 3'. Model fits and model comparisons of nested 'direct' CLPMs to address H1, including negative and positive contact towards the primary outgroup (Turks), attitudes towards secondary outgroups (refugees in one set, gay people in a separate set), and negative and positive contact with the secondary outgroup (refugees and gay people, respectively), are summarized in OSM-Tables S25–S26 for refugees, and OSM-Tables S27–S28, for gay people respectively. The most parsimonious model with refugees as the secondary outgroup was a unidirectional backward paths only model (Model 4), suggesting that a reverse STE might be more substantial than the one in the hypothesized direction. We inspected the full stationary bidirectional models including refugees as secondary outgroup (Figure 4) and gay people as secondary outgroup (Figure 5), including both forward and reverse paths to inspect the significance of relevant cross-lagged paths. Contrary to our hypothesis, the cross-lagged path of negative contact on attitudes was not significant in either model. The cross-lagged path of attitudes predicting negative contact was significant in the model including refugees as secondary outgroup, $b = -.20$, $SE = .07$, $p = .006$, $\beta = -.21$, yet not in the model including gay people as secondary outgroup, providing evidence for a reversed negative STE in the model including refuges as secondary outgroup only.

We also probed the role of positive intergroup contact again. Whereas there was no evidence for a 'regular' STE in both models, attitudes towards refugees predicted more positive contact with Turks

over time, $b = .21$, SE $= .06$, $p = .001$, $\beta = .20$, suggesting a reversed STE. Attitudes towards the secondary group refugees, but not gay people, related to negative contact ($p = .055$) and positive contact ($p = .005$) towards the primary group (marginally) significantly more than the other way around.

To test H2–H4, we fitted a series of nested 'indirect CLPMs, which also included mediators (again for each of the secondary groups separately). Model fits and nested model comparisons are summarized in OSM-Tables S29–S30 for the models including refugees as secondary outgroup, and in OSM-Tables S31-S32 for the models including gay people as secondary outgroup, respectively. Indirect effects based on the full bidirectional model with refugees and gay people as secondary outgroups showed that none of the hypothesized indirect effects of negative contact with the primary group on attitudes towards the secondary groups via any of the hypothesized mediators emerged as significant, suggesting that our hypotheses were not confirmed. Turning to the reversed relationship between constructs in both models, none of the indirect effects of attitudes towards the secondary groups at Wave 1 on negative contact at Wave 2 via any of the hypothesized mediators emerged as significant. Moreover, we did not find any significant indirect effects involving positive contact. Comparing path strengths, negative contact did not predict attitudes towards the primary group Turks significantly (forward path), whereas attitudes towards the primary group did predict negative intergroup contact. The reversed path was stronger in both models than the forward path, $ps = .005$ to .009.

8.2 | Discussion

In Study 3, we did not find evidence for a direct STE of negative and positive intergroup contact nor for indirect effects via attitude generalization, ingroup identification and diversity beliefs. It is important to note that—in contrast to some previous studies—we controlled for negative and positive contact with the primary outgroup in all analyses in Study 3. This—as well as the short time interval of 2 months between waves—could explain why—compared to previous studies—we did not find any evidence for a STE of negative or positive contact (Ünver et al., 2022).

Some scholars have raised the question whether the STE works for similar as well as dissimilar groups (Vezzali & Stathi, 2020). Some studies showed an STE independent of the similarity of the secondary outgroup (e.g., Pettigrew, 2009; Schmid et al., 2013; Vezzali & Giovannini, 2012) while others provided evidence that generalization is limited to similar secondary outgroups (Harwood et al., 2011; Joyce & Harwood, 2014). In Study 3, we had the opportunity to test this assumption by including a dissimilar and non-ethnic secondary outgroup, namely gay people. We did not find a STE either for the similar (refugees) or the dissimilar outgroup (gay people). However, results of the comparison of forward and backward paths of the direct model suggest that in this study context, attitudes towards the secondary group refugees might have exerted a stronger effect on later negative and positive contact towards Turks as the primary group—a finding that did not extend to gay people.

9 | GENERAL DISCUSSION

Across three longitudinal studies situated in different intergroup contexts, we investigated the existence of a STE of negative (and positive) intergroup contact—that is, we studied whether intergroup contact with members of a certain outgroup relates to attitudes towards other non-contacted outgroups longitudinally. Moreover, we examined potential mediators of a STE, namely attitude generalization, ingroup identification and diversity beliefs.

Summarizing the findings across studies, our results provide mixed evidence for a STE of negative contact. While we found a STE of negative contact in Studies 1a and 1b and some evidence supporting the assumption of positive STE in Study 1b, no significant relations between negative (or positive) contact with primary groups and attitudes towards secondary groups emerged in Studies 2 and 3 (H1). Moreover, no indirect effects could be observed for the proposed mediators attitude generalization, ingroup identification and diversity beliefs in any of the studies (H2–H4). Some previous work has shown that negative contact has stronger implications for outgroup attitudes than positive contact because, among other influences, negative intergroup contact has been shown to increase the salience of group categories (Paolini & McIntyre, 2019; Paolini et al. 2010; but see Schäfer et al., 2021, for a discussion of contradictory evidence). Consequently, one would have expected that negative contact is at least equally likely to generalize to secondary outgroups as positive contact (Vezzali et al., 2021). However, we did not find support for this assumption.

Also, results for reversed STEs, that is, a relationship of attitudes towards the secondary outgroup on the frequency of negative and positive contact with the primary outgroup over time, were inconclusive. While we found some evidence for a reversed STE of negative contact in Studies 1a, 1b and 2, we only found a reversed effect of positive contact in the proposed direction in Study 1b. A summary of results can be obtained from Table 2.

Interestingly, all supportive evidence for STEs stems from Studies 1a and 1b. On the one hand, one could argue that the methodological set-up of these studies provides the best preconditions to find effects. Given their sample sizes, these studies have higher statistical power than the others. Moreover, analyses built on latent variables. It might be that STEs are rather modest in size and can only be found in sufficiently large samples. On the other hand, we were unable to control for contact with the secondary outgroup in these studies. This limitation, however, is somewhat set off by the fact that the secondary outgroup in Studies 1a and 1b was Sinti and Roma—a comparably small ethnic outgroup in this study's context. It is unlikely that participants in both studies experienced substantial changes in contact with this group over the sampling period. In fact, analyses of another subsample of the GESIS panel revealed that 82% to 87% of the participants reported no positive or negative contact in the neighbourhood or workplace with Sinti and Roma at all. Only 1% to 2% reported to have frequent contact with Sinti and Roma (Wagner et al., 2016). Independent of the concrete intergroup setting in Studies 1a and 1b, it could be that there is something like generalized contact, much like

TABLE 2 Overview of results.

Study	Sample	Groups	Main results	Notes
Study 1a	Three-wave German online/face-to-face probability sample (N = 697)	Prim. og.: Muslims; Sec. og.: Sinti and Roma	- STE of negative contact - no STE of positive contact - no indirect effects via mediators - reversed STE of negative contact - no reversed STE of positive contact	- analyses based on latent variables (i.e., structural equation modelling) - no control for initial contact with Sec. og.
Study 1b	Three-wave German online/face-to-face probability sample (N = 685)	Prim. og.: Refugees; Sec. og.: Sinti and Roma	- STE of negative contact - STE of positive contact - no indirect effects via mediators - reversed STE of negative contact - reversed STE of positive contact (in unexpected direction)	
Study 2	Two-wave face-to-face and telephone interviews in a sample of Germans living in close proximity to reception centres for asylum seekers (N = 183)	Prim. og:. asylum seekers; Sec. og.: Turks	- no STEs of negative contact - no STEs of positive contact - no indirect effects via mediators - no reversed STE for negative and positive contact	- analyses based on manifest variables - no control for initial contact with Sec. og.
Study 3	Two-wave online and laboratory sample of Belgian students (N between 165 and 176)	Prim. og.: Turks; Sec. og.: refugees and gay people	- no STEs of negative contact - no STEs of positive contact - no indirect effects via mediators - reversed STE of negative and positive contact (for refugees but not for gay people)	- analyses based on manifest variables - control for initial contact with Sec. og.

Note: Prim. og.: primary outgroup. Sec. og.: secondary outgroup.

generalized prejudice. Open-minded people have contact with any outgroup with which they can interact, so when we control for secondary group contact, we reduce much of the variance that can be explained.

Given that conducive evidence for a STE is lacking in most of our studies, it is important to note that we found some evidence for an effect of contact on attitudes towards the contacted outgroups (i.e., a primary transfer effect). While negative contact was negatively associated with attitudes towards the same group in Studies 1a and 1b, positive contact was positively related to outgroup attitudes in all studies. In other words, data of our studies provide evidence for effects of intergroup contact on outgroup attitudes over time, suggesting that in principle the data quality is sufficient to demonstrate such effects. However, we did not find robust evidence for a generalization of these effects to non-contacted outgroups.

How do our findings relate to previous work demonstrating STEs of negative and, more consistently, positive contact? We can only speculate about this. It could be that previous work has overinterpreted the role of contact for attitudes towards secondary outgroups. Vezzali and Stathi (2020) state that 'the STE literature is still in its infancy' (p. 106). In general, longitudinal research on STE is scarce. Longitudinal research on a STE of negative contact is quasi non-existent: to our knowledge, only two longitudinal studies on an STE of negative contact have been published so far. Interestingly, one of these studies also fails to find a STE (Mähönen & Jasinkaja-Lahti, 2016), while the other shows an effect (Henschel & Kötting, 2023). However, in the latter study, the groups are not completely distinct from each other, that is the primary (foreigners) and secondary group (refugees) are partially overlapping. Likewise, evidence from research addressing *indirect* forms of

negative contact tend to speak against the existence of a STE. Negative portrayals of ethnic and religious outgroups in the media seem not to generalize to other outgroups (Boer & van Tubergen, 2019; Jacobs & van der Linden, 2016).

Moreover, a substantial number of studies providing evidence for a STE for positive contact are 'loosely controlled' (Tausch et al., 2010, p. 298) in a way that they do not control for initial levels of contact with the secondary outgroup, which could lead to an overestimation of the STE (for a similar critique, see Pettigrew, 2009). We believe that in our studies, we addressed some of the methodological shortcomings of previous work. We used large probability samples (Studies 1a and 1b) as well as ecologically valid community samples (Study 3 and, more importantly, Study 2), controlled for initial levels of contact with the secondary group (Study 3), and utilized two-(Studies 2 and 3) and three-wave (Studies 1a and 1b) longitudinal samples. Most importantly, however, we provide the first longitudinal study that addresses a STE of negative contact and investigates several potentially mediating processes simultaneously.

Nevertheless, we acknowledge some limitations of our own research that future research building on ours could address. First, the results regarding the fully bidirectional model in Study 1a should be interpreted with caution due to a Heywood case warning. Also, because most of our research built on secondary data, some of the measures we used were suboptimal (e.g., contact scales with rather low reliability in Studies 1a and 1b; single-item measures of contact in Studies 2 and 3), which might have increased measurement errors and hence decreased the chance to find significant results. It is important to note, however, that longitudinal research requires participants

to participate multiple times, which means that researchers need to select the number of items carefully so as not to overburden participants. For the same reason, we were unable to control for intergroup contact with the secondary outgroup in Studies 1a, 1b and 2. Although we were able to test whether changes were stationary over time in our three-wave Studies 1a and 1b, this was an assumption we had to make in Studies 2 and 3 utilizing a half-longitudinal design (Cole & Maxwell, 2003; Little, 2013). Moreover, it is important to keep in mind that the time intervals between waves varied between a couple of months to almost a full year, which affects the extent to which individuals' contact experiences and attitudes can change between waves. A fruitful line of future work building on ours would be to examine whether shorter (e.g., experience sampling) or longer intervals (beyond yearly) may produce different effects from ours.

Furthermore, although our work constitutes one of the rare examples of longitudinal research on STEs allowing studying relationships over time, we urge researchers to consider experimental studies on STE in their future work. Such studies would allow getting a clearer idea of causal relationships that go beyond Granger's (1969) conceptualization of causality (i.e., addressing the 'third-variable-problem'). However, it is important to note that from an ethical standpoint, experimental studies on a STE of negative contact might be challenging or even inappropriate when using non-minimal groups given the potential to damage intergroup relations.

Finally, one could criticize our operationalization of mediating constructs. While attitude generalization can be regarded as an established mediator of the STE, others have criticized ingroup identification and diversity beliefs as operationalizations of deprovincialization and multiculturalism. Although reduced identification with the ingroup has often be used as a proxy of deprovincialization-associated processes, Pettigrew suggested that reduced ingroup identification at best presents 'a crude test' (Pettigrew, 2009, p. 59) of his assumptions. He argues that deprovincialization does not necessarily imply an emotional distancing from the ingroup but a more general reappraisal of the importance of the ingroup for oneself and when it comes to evaluate others. Likewise, diversity beliefs focusing on the instrumental value of other groups (Kauff et al., 2021) might not sufficiently capture the idea of a general openness towards other groups. Future studies could tackle this aspect by measures of complexity and type of categorization of groups (Lolliot et al., 2013). Moreover, it might be a good idea to address additional potentially mediating variables, such as intergroup threat (Henschel & Derksen, 2022; Mähönen & Jasinskaja-Lahti, 2016; Zingora & Graf, 2019), in future research.

10 | CONCLUSION

The set of studies presented in this article constitutes a contribution to the still very small but growing body of literature on the STE of negative intergroup contact. In the research at hand, we used longitudinal data and applied sophisticated methods across different intergroup contexts to test our predictions. In contrast to previous cross-sectional work, we did not find reliable STEs. Also, no indirect effects via one of the potential mediating variables, namely attitude generalization, reduced ingroup identification and diversity beliefs, occurred. Although we do not want to question the idea of a STE, we believe that our field needs more robust evidence for its existence. Hopefully, the results of our studies will stimulate more research of high quality on this topic.

ORCID
Mathias Kauff https://orcid.org/0000-0003-3803-3521
Jasper Van Assche https://orcid.org/0000-0002-2570-2928
Sarina J Schäfer https://orcid.org/0000-0003-1159-111X
Maarten H. W. van Zalk https://orcid.org/0000-0002-0185-8805
Ulrich Wagner https://orcid.org/0000-0001-6716-9212

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SUPPORTING INFORMATION

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