

**Change in School Ethnic Diversity and Intergroup Relations: The Transition from Segregated Elementary to Mixed Secondary School for Majority and Minority Students**

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## **Conflict of Interest**

All authors declare that there are no conflicts of interest.

## **Data Sharing**

Due to the sensitive nature of the research topic, the institutional ethics approval did not cover data access beyond the research team.

## Abstract

This research examined the impact of a change in school diversity on school children's intergroup relations. A longitudinal survey tracked 551 White British and Asian British students ( $M_{\text{age}} = 11.32$ ) transitioning from elementary (time 1) to secondary (time 2) school in an ethnically segregated town in the United Kingdom. We estimated a multivariate, multilevel model. A cross-sectional comparison of segregated schools and a mixed elementary school at time 1 revealed that both Asian and White British in the mixed school reported more positive intergroup relations. A longitudinal analysis found that the transition from segregated elementary to mixed secondary schools was associated with Asian British developing more positive intergroup relations. White British reported overall less positive intergroup relations, although only trust decreased, evidence from other measures remains inconclusive. The findings are important for understanding early stages of diversity exposure, and the impact of changing diversity levels on majority and minority groups.

*Keywords:* ethnic diversity, prejudice, intergroup contact, longitudinal data

Increasing levels of geographical mobility, coupled with wars and humanitarian crises, mean that many countries are now characterized by a complex combination of social, cultural, ethnic and religious identities (Cornelius & Rosenblum, 2005; Hooghe, Reeskens, Stolle, & Trappers, 2009). The consequences of coming into contact with diverse social groups have been the subject of an ongoing academic and public debate. Initial cross-race interactions can be qualitatively worse than same-race interactions (MacInnis & Page-Gould, 2015; Toosi, Babbitt, Ambady, & Sommers, 2012). This initial diversity shock can be challenging (Putnam, 2007), but over time may settle down and translate into more positive intergroup relations when ingroup and outgroup members have the chance to take up the opportunities for intergroup contact that diversity offers (Hewstone, 2015; MacInnis & Page-Gould, 2015; Toosi et al., 2012; Wagner, Christ, Pettigrew, Stellmacher, & Wolf, 2006), and get to know each other better. Although evidence regarding the effects of diversity appears mixed (Van de Meer & Tolsma, 2014), there is evidence that experiencing diversity through intergroup contact reduces prejudice (Dovidio, Love, Schellhaas, & Hewstone, 2017; Pettigrew & Tropp, 2006; Schmid, Al Ramiah, & Hewstone, 2014). To our knowledge, however, no previous work in schools has studied this initial change of ethnic diversity, from a segregated to mixed context in both majority and minority groups.

The aim of the present research was to examine the intergroup experiences of majority and minority group members in social environments characterized by differing levels of diversity (i.e., ethnically segregated versus mixed) as well as after a change of diversity environment. We tested whether there is an association between levels of school diversity and measures of intergroup relations and, of greater novelty, the impact of change in diversity on these measures. Furthermore, using a unique and novel design in the form of a naturally occurring transition from a segregated to a diverse environment, we were interested in whether this transition could be associated with an increased uptake of opportunities for

intergroup contact and thus to improved intergroup relations for members of both majority and minority groups.

### **Diversity and Contact**

While some researchers argue that experiencing positive intergroup contact on an individual level helps to improve relations between people of different ethnicity or religion (Hewstone, 2015; Plaut, 2010; Verkuyten, 2005), other researchers argue that diversity on a societal level lowers trust and tolerance between those different groups (Blalock, 1967; Putnam, 2007). A key, but often overlooked, variable in this debate is whether the experience of diversity translates into an increase in positive intergroup contact. According to contact theory, meaningful interactions between members of groups with different backgrounds, compared to merely living side-by-side, are effective in enhancing positive intergroup relations (Allport, 1954; Brown & Hewstone, 2005). This idea has been supported by Pettigrew and Tropp's (2006) meta-analysis of over 500 studies which found that social contact between conflicting groups has a small but reliable effect in reducing prejudice across different target groups, age groups, contact settings, and geographical areas. Contact reduces prejudice, especially, by building affective ties (Pettigrew & Tropp, 2008), such as reduced intergroup anxiety (Stephan & Stephan, 1985; Swart, Hewstone, Christ, & Voci, 2011; Turner, Hewstone, & Voci, 2007), enhanced empathy and perspective-taking (Swart et al., 2011; Turner, Tam, Hewstone, Kenworthy, & Cairns, 2013), trust (Cehajic, Brown, & Castano, 2008; Kenworthy, Voci, Al Ramiah, Tausch, Hughes, & Hewstone et al., 2016; Tam, Hewstone, Kenworthy, & Cairns, 2009), and contact self-efficacy (Stathi, Crisp, & Hogg, 2011), or through cognitive processes such as creating common social identities emphasizing shared membership (Pettigrew, 1998).

While claims about the impact of diversity are contradictory, they may reflect the different levels of ethno-religious interactions studied: contact theorists typically use

measures of face-to-face contact in interactions within diverse groups, whilst Putnam (2007) considered ethnic diversity at a community and societal level (cf., Hewstone, 2015). A limitation of previous research on the link between diversity and intergroup relations is to not explicitly consider intergroup contact. Recent research has shed new light on how diversity affects intergroup relations by taking into account mediating processes between diversity and intergroup outcomes, and shown the key roles played, in particular, by intergroup contact and perceived intergroup threat (Ramos, Hewstone, Barreto, & Branscombe, 2016; Schmid, Al Ramiah, & Hewstone, 2014; Schmid, Tausch, Hewstone, Hughes, & Cairns, 2008). Importantly, research has provided cross-sectional and longitudinal evidence for the positive effects of contact on prejudice on both individual level and, if people have contact in diverse settings, societal level. In other words, contact reduces prejudice not only for individuals, but can also have contextual effects on a macro-level. This means people living in diverse neighborhoods with, on average, higher levels of contact report lower prejudice, independently of their own individual contact (Christ et al., 2014).

Recently, researchers have suggested a temporal dimension of intergroup contact (Dovidio et al., 2017). In the short term, Putnam (2007) argued, diversity may have negative effects on intergroup harmony. Yet, in the long term, as he also conceded, it may provide the opportunity for positive intergroup contact (Hewstone, 2015; Thijs & Verkuyten, 2014), and have positive effects when ingroup and outgroup members take up those opportunities for contact (Hewstone, 2015; Wagner et al., 2006) and, especially, form cross-group friendships as the most effective form of positive intergroup contact (Davies, Tropp, Aron, Pettigrew, & Wright, 2011). Recently, MacInnis and Page-Gould (2015) also pointed to the temporal dimension of contact, noting that results of research on ‘intergroup interaction’ are seemingly at odds with the more positive view of literature on ‘intergroup contact’. They acknowledged that initial intergroup contact may pose significant challenges (e.g., heightened stress and

intergroup anxiety), which might account for the finding that cross-race interactions, specifically (typically studied in the lab, between people who do not know each other), are qualitatively worse than same-race interactions (for a meta-analysis, see Toosi et al., 2012). Yet, these challenges diminish with further interactions as the elements of positive intergroup contact become more influential.

### **Diversity and Child Development**

Previous research has emphasized the importance of studying prejudice in young children and adolescents (Wölfer, Schmid, Hewstone, & van Zalk, 2016). It is a period of significant socio-cognitive changes affecting not only interpersonal but also intergroup relations. Children and adolescents develop their identity, including their ethnic identity (Phinney, 1990), which is particularly challenging for minority adolescents and can result in ostracism and, in turn, in lower well-being and educational performance (French, Seidman, Allen, & Aber, 2006; Swanson, Cunningham, Youngblood, & Spencer, 2009). Furthermore, stereotype consciousness (McKown & Weinstein, 2003), group norms (Abrams & Rutland, 2008), moral beliefs and prejudice (Rutland, Killen, & Abrams, 2010), and empathy (Radke-Yarrow, Zahn-Waxler, & Chapman, 1983) develop during this period. Therefore, it is important to study the effects of diversity and contact in children and adolescents, as this is a period in which it is crucial to facilitate transitions and target interventions.

There is considerable evidence that the ethnic school environment influences children's prejudice. McGlothlin and Killen (2010) examined racial bias of European American children in homogeneous schools, and European and African American children (aged 7 and 10) in heterogeneous schools. Their results revealed that European American children in homogeneous schools displayed more ingroup bias and lower willingness for cross-group friendships than European and African American children in heterogeneous schools. In heterogeneous schools, European and African American children did not display

racial bias. Furthermore, ethnic school composition facilitates the use of stereotypes to justify social exclusion. Killen, Kelly, Richardson, Crystal, and Ruck (2010) found that the use of stereotypes to explain social exclusion was higher in less diverse compared with more diverse schools among younger children (aged 4 and 7). In high-diversity schools, children rated all types of interracial exclusion as more wrong than did students in low-diversity schools. Furthermore, Wölfer et al. (2016) demonstrated that the longitudinal effects of intergroup contact on intergroup attitudes are particularly strong in adolescent students before they stabilize in young adulthood.

In general, in an educational context, studies have shown that children who have had positive contact with outgroup members (e.g., friends in different ethnic and religious groups) hold more positive attitudes towards those groups (e.g., Turner, Hewstone, Voci, Paolini, & Christ, 2007; Turner, Tam, Hewstone, Kenworthy, & Cairns, 2013; Vezzali, Giovannini, & Capozza, 2010). The school setting offers a particular opportunity to promote better intergroup relations. It seems to provide particularly effective intergroup contact experiences, because (a) of the regular and systematic contact opportunities within a stable and supervised setting, (b) the higher likelihood of meeting Allport's (1954) optimal conditions of intergroup contact (equal status, cooperation, pursuit of superordinate goals, and institutional support), (c) the reduced likelihood of selection effects, compared for example to the neighborhood, whereby prejudiced individuals can more easily choose residential than educational settings with lower outgroup contact, and (d) fewer opportunities to 'escape' from the outgroup within the school context, especially in small school classes (see also Wölfer et al., 2018).

### **The Present Research**

Prejudice reduction is a particular challenge in areas characterized by high levels of residential and educational segregation, for example in parts of England such as the town of Oldham, Greater Manchester, which witnessed ethnically-motivated riots between White

British and Asian British residents in 2001. This pre-existing segregation becomes especially relevant when people change from a segregated to a mixed environment, for example when students change to a new school that has a more diverse ethnic makeup than their current school.

We conducted this research in Oldham, an ethnically mixed town in England. Based on the results of the most recent (2011) national census, the town has a population of 224,897, comprised largely of White British (78%) and Asian British (17%; mainly Pakistani, 10%, and Bangladeshi, 7% heritages) ethnic groups. The town and especially its elementary school system is highly segregated; Burgess and Harris (2011) reported that in 2009 more than 80% of elementary school students of Pakistani or Bangladeshi origin attended schools in which no more than 20% of the students were White; and more than 70% of White students were in "majority White" schools, in which at least 80% of students were White British. There is, however, less segregation at secondary level, in part because there are fewer schools, which are larger, and cater to broader geographical areas. We were especially interested in the transition from a segregated elementary school (which represented most students' early school experience) to either continued segregated schooling or mixed schooling at secondary level.

The present research examined the transition between contexts with different levels of diversity. In particular, we investigated the effect of changing from a segregated to a diverse context for members of both the ethnic majority and an ethnic minority group. While other researchers have examined contact experiences of children directly after the transition to secondary school (e.g., Munniksmas, Stark, Verkuyten, Flache, & Veenstra, 2013), we tested, for the first time, whether students who changed from a segregated elementary school to a diverse secondary school took up the opportunities for contact shortly after the transition, and thus experienced lower prejudice towards the outgroup.<sup>1</sup>

The study had two major aims. Firstly, in a cross-sectional comparison, we tested the following hypotheses: Attending an ethnically diverse (vs segregated) school will be associated with: (1) higher contact quantity and quality for both majority and minority group members (H1a), and more positive intergroup relations for both majority and minority group members (H1b). Secondly, in longitudinal analyses we tested the following hypotheses: Changing from an ethnically segregated to a diverse school will be associated with increased contact quantity and quality for both majority and minority group members (H2a), and therefore with more positive intergroup relations for both majority and minority group members (H2b).

## Method

### Participants and Procedure

There are 85 elementary schools in the town where the research was conducted. Almost all schools are segregated, with most students belonging to one of two ethnic groups (White British or Asian British people). By speaking at a head teachers' conference, we recruited 14 elementary schools whose head teachers volunteered to have their school participate. Of these, thirteen schools were ethnically segregated, and one school was mixed<sup>2</sup> (for school-level statistics on ethnic composition, see Figure 1).

At wave 1, 551 students (283 girls, 264 boys, 4 missing;  $M_{\text{age}} = 11.32$ , age range: 9.50–12.43 years) completed data on some or all relevant measures. Of these, 251 identified as White British, while 300 identified as Asian British (Pakistani or Bangladeshi ethnic background). At wave 2, we were able to track longitudinally<sup>3</sup> 163 students (91 girls, 72 boys;  $M_{\text{age}} = 11.28$ , age range: 10.54–12.39 years) after they had transitioned to one of six secondary schools<sup>4</sup> with various levels of ethnic diversity. Of these, 65 identified as White British, while 98 identified as Asian British.

Due to the structural challenges in tracking students after their transition to secondary schools, only 163 (30%) of 551 initial students participated in the second wave of data collection. Comparing responses of students who participated in both waves and of students who participated only in the first wave, we found no systematic differences in their responses to the outcome measures in the first wave of data collection ( $M_{\text{Cohen's } d} = -0.07, -0.18 < \text{Cohen's } d < 0.01$ ).

For the first wave, we collected data in a school-based survey that we conducted within the regular elementary-school setting with the help of a trained research assistant in July 2012. For the second wave, we contacted longitudinally tracked students via their new secondary school in winter 2012, about four months after the first wave (October/November).<sup>5</sup> A research assistant contacted cooperating secondary schools at the start of the school year (September) to distribute the second-wave questionnaire in October/November, depending on the school's availability. The school passed the questionnaires to the teachers, who passed them to the target students who then completed them individually. We collected completed questionnaires from the schools. The study received ethical approval from the local institutional ethics committee.

## **Measures**

In both waves, participants answered standardized questions that assessed relevant socio-demographics as well as the measures of intergroup relations described below that were assessed longitudinally at waves 1 and 2. All measures were assessed on five-point scales (anchors reported below); White British students reported their outgroup contact with Asian British students and vice versa. For each measured construct (with one exception<sup>6</sup>), items formed scales that were both unidirectional and internally consistent (as indicated by Cronbach's  $\alpha$ , for three or more items, or a correlation coefficient, for two-item scales).

**Contact Quantity.** Participants reported their frequency of outgroup contact on two items ("How often do you talk with [OUTGROUP] children?", "How often do you spend time with [OUTGROUP] children?"; 1 = *never* to 5 = *very often*; Voci & Hewstone, 2003). The two items were highly correlated ( $r_{w1} = .78$ ,  $r_{w2} = .73$ ).

**Contact Quality.** Participants reported the quality of their outgroup contact on two items ("How much do you enjoy spending time with [OUTGROUP] children?", "How happy are you when you spend time with [OUTGROUP] children?"; 1 = *not at all* to 5 = *very much*; Islam & Hewstone, 1993). The two items were highly correlated ( $r_{w1} = .76$ ,  $r_{w2} = .87$ ).

**Social Norms for Outgroup Contact.** Participants reported the perceived social norms for outgroup contact on three items (common stem: "My family and friends [...]"; item-specific completion: "like me to have [OUTGROUP] friends", "are happy for me to visit [OUTGROUP] friends in their homes", "are happy for me to invite [OUTGROUP] friends to my house"; 1 = *strongly disagree* to 5 = *strongly agree*; Turner, Hewstone, Voci, & Vonofakou, 2008). The mean of these three items yielded a reliable scale score of students' perceived norms for outgroup contact at each respective wave (Cronbach's  $\alpha_{w1} = .85$ , Cronbach's  $\alpha_{w2} = .90$ ).

**Intergroup Attitudes.** Participants reported their intergroup attitudes on four items (common stem: "How many [OUTGROUP] children are [...]"; item-specific completion: "nice?", "bad?", "kind?", "rude?"; 1 = *none* to 5 = *all*; Wright, Aron, McLaughlin-Volpe, & Ropp, 1997). After recoding the second and fourth items, the mean of these four items yielded a reliable scale score of students' intergroup attitudes at each respective wave (Cronbach's  $\alpha_{w1} = .80$ , Cronbach's  $\alpha_{w2} = .75$ ).

**Intergroup Anxiety.** Participants reported their level of intergroup anxiety on three items (common stem: "When you meet [OUTGROUP] children, do you feel [...]"; item-specific completion: "nervous?", "uncomfortable?", "worried?"; 1 = *not at all* to 5 = *very*

*much*; Stephan & Stephan, 1985). The mean of these three items yielded a reliable scale score of students' intergroup anxiety at each respective wave (Cronbach's  $\alpha_{w1} = .78$ , Cronbach's  $\alpha_{w2} = .80$ ).

**Intergroup Empathy.** Participants reported their level of intergroup empathy on two items ("I care about the problems [OUTGROUP] children have", "If I saw an [OUTGROUP] child upset, I would also feel upset"; 1 = *strongly disagree* to 5 = *strongly agree*; Swart, Hewstone, Christ, & Voci, 2011). The two items were highly correlated ( $r_{w1} = .63$ ,  $r_{w2} = .73$ ).

**Intergroup Perspective-Taking.** Participants reported their perceived ability to take the perspective of the outgroup on two items ("Do you find it easy to look at the world through the eyes of an [OUTGROUP] child?", "How easy is it for you to imagine being an [OUTGROUP] child?"; 1 = *not at all* to 5 = *very easy*; Batson et al., 1997). The two items were highly correlated ( $r_{w1} = .54$ ,  $r_{w2} = .65$ ).

**Intergroup Trust.** Participants reported their level of intergroup trust on two items ("I would be happy to tell an [OUTGROUP] child personal things about myself", "I can trust [OUTGROUP] children"; 1 = *strongly disagree* to 5 = *strongly agree*; Turner, Hewstone, & Voci, 2007). The two items were highly correlated ( $r_{w1} = .68$ ,  $r_{w2} = .73$ ).

**Behavioral Intentions for Outgroup Contact.** Participants reported their behavioral intentions for outgroup contact on three items (common stem: "I would like to [...]"; item-specific completion: "play with an [OUTGROUP] child", "invite an [OUTGROUP] child to my house", "spend more time with [OUTGROUP] children"; 1 = *strongly disagree* to 5 = *strongly agree*; Tam, Hewstone, Kenworthy, & Cairns, 2009). The mean of these three items yielded a reliable scale score of students' outgroup behavioral intentions at each respective wave (Cronbach's  $\alpha_{w1} = .90$ , Cronbach's  $\alpha_{w2} = .88$ ).

## **School-Level Statistics**

We obtained statistics on each school's ethnic composition from the 2012 and 2013 school censuses (Department for Education, 2012, 2013). We used the 2012 and 2013 data to describe, respectively, elementary ( $n = 14$ ) and secondary ( $n = 6$ ) schools in the sample.

Figure 1 shows the proportions of Asian British and White British students in each school.

Most participants ( $n = 506$ ; 92%) went to elementary schools with few students (< 5%) from the relevant outgroup. Figure 2 shows the changes in ethnic diversity that participants ( $n = 163$ ) experienced after transitioning from elementary to secondary school. Participants transitioned to secondary schools with, compared to their elementary schools, more (+20% and more) outgroup students (56%), with a similar proportion (-10% to +10%) of outgroup students (39%), or with fewer (-20% and less) outgroup students (5%).

## **Analysis Strategy**

We examined cross-sectionally whether attending a diverse elementary school was associated with higher contact quantity and quality (H1a) and more positive intergroup relations (H1b) among Asian British and White British participants than attending a segregated school. Moreover, we examined longitudinally whether moving from a segregated elementary school to a more diverse secondary school was associated with higher contact quantity and quality (H2a) and more positive intergroup relations (H2b) among Asian British and White British participants.

Our analyses relied on a dataset that is hierarchical (participants nested in schools), longitudinal (observations nested in participants), spans multiple outcomes, and has missing observations. To account for the complex data structure, we estimated a multivariate, multilevel model with participants' aggregated and standardized responses to each of nine measures as outcome variables.

We estimated this complex statistical model in RStan (Stan Development Team, 2018) using Bayesian methods. Bayesian inference involves choosing a likelihood function and prior distributions. The *likelihood function* links the observed data to one or more model parameters and states how likely the observed data are given different values of said model parameters. *Prior distributions* state how plausible different values of said model parameters are before considering the observed data. Bayesian inference applies Bayes' theorem to update prior distributions in light of the observed data to produce posterior distributions. *Posterior distributions* state how plausible different values of the model parameters are given the observed data.<sup>7</sup> In the present study, Bayesian methods offered numerous advantages over classical methods. First, Bayesian models are flexible and thus allowed us to estimate a multivariate regression model with varying (random) effects. Second, Bayesian models can estimate missing datapoints at the same time as other model parameters, and thus allowed us to impute missing responses within our statistical model. Third, Bayesian models produce posterior distributions that, other than  $p$ -values and confidence intervals, have a straightforward interpretation as the most plausible estimates of a model parameter given the observed data.

Our model derived the likelihood of all observed responses from a multivariate normal distribution. This means the model made distinct predictions for each outcome variable, estimated distinct residual variances for each outcome variable, and estimated the residual correlations between all outcome variables (Table 1).<sup>8</sup> Our model estimated participants' responses (in the first wave of data collection) as a function of participants' ethnic group, their elementary school's ethnic diversity (operationalized as the proportion of outgroup students), and the interaction between the two variables. Similarly, this model estimated the change in participants' responses (from the first to the second wave of data collection) as a function of participants' ethnic group, the change in ethnic diversity from

elementary to secondary school, and the interaction between the two variables. To account for the hierarchical structure of the data, the model also included varying (random) effects. That is, the model estimated responses as varying across participants and elementary schools (random intercept), and the change in responses (from the first to the second wave of data collection) as varying across secondary schools (random slope). Our model assigned weakly informative prior distributions to all model parameters (Gelman, Simpson, & Betancourt, 2017), and used the non-centered parameterization to represent all varying effects (Betancourt & Girolami, 2015).<sup>9</sup> Appendix A provides a more formal description of the statistical model.

In the next section, we summarize the posterior distributions for relevant model parameters by reporting point estimates, based on the median of the posterior distribution, as well as intervals spanning the 95% most plausible estimates, based on the highest posterior density (Plummer, Best, Cowles, & Vines, 2006). We report the estimated differences (in Cohen's  $d$ ) between those who attended a segregated elementary school (with 0% outgroup students) and those who attended a mixed elementary school (with 20% outgroup students), and the estimated differences in the change from elementary to secondary schools between those who attended a secondary school as segregated as their elementary school ( $\pm 0\%$  outgroup students) and those who attended a less segregated secondary school ( $+20\%$  outgroup students).<sup>10</sup>

To test our hypotheses, we used a procedure akin to equivalence testing (Lakens, 2017; Kruschke, & Liddell, 2018). That is, we concluded that one group is *inferior* to another if the 95% most plausible estimates fall below zero (all  $d < 0$ ); that one group is *superior* to another if the 95% most plausible estimates fall above zero (all  $d > 0$ ); that two groups are *equivalent* if the 95% most plausible estimates fall within the region of practical equivalence (all  $|d| \leq 0.2$ ); or that the comparison is *inconclusive* if the 95% most plausible estimates

include zero and extend beyond the region of practical equivalence (some  $|d| \geq 0.2$ ).<sup>11</sup> We also report  $\Pr(|d| > 0.2)$ , the posterior probability that the estimated difference is greater than the smallest effect size of interest. If  $\Pr(|d| > 0.2) < .05$ , we concluded that two groups are equivalent.

## Results

### Cross-sectional Comparison of Segregated and Mixed Elementary Schools

In this section, we report cross-sectional comparisons of Asian British and White British participants in segregated and mixed elementary schools. Figure 3 shows group-wise point estimates with highest posterior density intervals. The left panel shows estimated means for each ethnic group at a segregated school (with 0% outgroup students). The right panel shows estimated mean differences for each additional 20% of outgroup students in a school.

First, we estimated group differences between Asian British and White British participants across different schools. On average, Asian British participants reported higher contact quantity ( $d = 0.44$ , [0.20, 0.66],  $\Pr(|d| > 0.2) = .98$ ), lower contact norms ( $d = -0.56$ , [-0.78, -0.32],  $\Pr(|d| > 0.2) > .99$ ), lower behavioral intentions ( $d = -0.29$ , [-0.49, -0.09],  $\Pr(|d| > 0.2) = .83$ ), and lower intergroup trust ( $d = -0.26$ , [-0.44, -0.08],  $\Pr(|d| > 0.2) = .76$ ). Asian British and White British participants reported equivalent levels of perspective-taking ( $d = 0.01$ , [-0.20, 0.20],  $\Pr(|d| > 0.2) = .05$ ). All other comparisons were inconclusive (all  $\Pr(|d| > 0.2) > .09$ ).

Second, we tested whether, on average, Asian British participants in a mixed school (20% outgroup students) reported more positive intergroup relations than Asian British participants in a segregated school (0% outgroup members). As expected, Asian British participants in a mixed school reported higher contact quantity ( $d = 0.86$ , [0.55, 1.18],  $\Pr(|d| > 0.2) > .99$ ), higher contact quality ( $d = 0.65$ , [0.39, 0.94],  $\Pr(|d| > 0.2) > .99$ ), higher contact norms ( $d = 0.32$ , [0.02, 0.65],  $\Pr(|d| > 0.2) = .80$ ), higher behavioral intentions

( $d = 0.54$ , [0.26, 0.81],  $\Pr(|d| > 0.2) = .99$ ), and higher intergroup trust ( $d = 0.38$ , [0.12, 0.61],  $\Pr(|d| > 0.2) = .92$ ). All other comparisons were inconclusive (all  $\Pr(|d| > 0.2) > .17$ ).

Third, we tested whether, on average, White British participants in a mixed school reported more positive intergroup relations than White British participants in a segregated school. As expected, White British participants in a mixed school reported higher contact quantity ( $d = 0.64$ , [0.44, 0.87],  $\Pr(|d| > 0.2) > .99$ ), higher contact quality ( $d = 0.41$ , [0.23, 0.59],  $\Pr(|d| > 0.2) = .99$ ), higher behavioral intentions ( $d = 0.25$ , [0.06, 0.44],  $\Pr(|d| > 0.2) = .69$ ), higher intergroup empathy ( $d = 0.25$ , [0.04, 0.46],  $\Pr(|d| > 0.2) = .68$ ), and higher intergroup trust ( $d = 0.22$ , [0.04, 0.40],  $\Pr(|d| > 0.2) = .60$ ). White British participants in a more diverse school reported equivalent levels of intergroup anxiety ( $d = 0.01$ , [-0.19, 0.20],  $\Pr(|d| > 0.2) = .04$ ). All other comparisons were inconclusive (all  $\Pr(|d| > 0.2) > .05$ ).

Overall, we found that, averaged across measures, Asian British and White British participants in a more diverse elementary school reported both higher contact quantity and quality ( $M_d = 0.76$ , [0.51, 1.00] and  $M_d = 0.52$ , [0.35, 0.69], respectively) and more positive intergroup relations ( $M_d = 0.26$ , [0.11, 0.42] and  $M_d = 0.15$ , [0.05, 0.26], respectively) than participants in segregated elementary schools. Given the educational demographics of the town, however, this cross-sectional comparison extrapolates from only one mixed school, which means that conclusions should be treated with caution.

### **Longitudinal Comparison of Moving to Segregated or More Diverse Secondary Schools**

In this section, we report the longitudinal comparisons of Asian British and White British participants who moved from segregated elementary schools to more diverse secondary schools, and of participants who moved to secondary schools as segregated as their elementary schools. Figure 4 shows group-wise point estimates with highest posterior density intervals. The left panel shows estimated mean changes for participants who moved to a secondary school as segregated as their elementary school ( $\pm 0\%$  change). The right panel

shows estimated group-wise difference for each additional +20% increase in outgroup students.

First, we tested whether moving from elementary to secondary school changed students' intergroup experiences when their secondary school was as segregated as their elementary school. Asian British participants reported less intergroup anxiety after moving to secondary school ( $d = -0.64$ ,  $[-1.06, -0.19]$ ,  $\Pr(|d| > 0.2) = .97$ ). All other longitudinal comparisons were inconclusive for Asian British (all  $\Pr(|d| > 0.2) > .32$ ) and White British (all  $\Pr(|d| > 0.2) > .34$ ) participants.

Second, we tested, separately for Asian British and White British students, whether moving from a segregated elementary school to a more diverse secondary school was associated with more contact and more positive intergroup relations, relative to moving to a secondary school with a similar proportion of outgroup members. Asian British participants who moved to more diverse secondary schools reported, on average, higher contact quantity ( $d = 0.63$ ,  $[0.31, 0.95]$ ,  $\Pr(|d| > 0.2) = .99$ ), higher contact quality ( $d = 0.49$ ,  $[0.21, 0.79]$ ,  $\Pr(|d| > 0.2) = .98$ ), higher contact intentions ( $d = 0.39$ ,  $[0.11, 0.70]$ ,  $\Pr(|d| > 0.2) = .90$ ), and higher intergroup empathy ( $d = 0.27$ ,  $[0.01, 0.55]$ ,  $\Pr(|d| > 0.2) = .71$ ). White British participants who moved to more diverse secondary schools reported, on average, lower intergroup trust ( $d = -0.63$ ,  $[-1.24, -0.07]$ ,  $\Pr(|d| > 0.2) = .95$ ). All other longitudinal comparisons were inconclusive for Asian British (all  $\Pr(|d| > 0.2) > .16$ ) and White British (all  $\Pr(|d| > 0.2) > .34$ ) participants.

Overall, we found that, on average, Asian British participants who moved from segregated elementary schools to more diverse secondary schools reported more contact quantity and quality ( $M_d = 0.56$ ,  $[0.32, 0.84]$ ) and more positive intergroup relations ( $M_d = 0.20$ ,  $[0.04, 0.35]$ ) than Asian British participants who stayed in segregated schools. Contrary to predictions, White British participants who moved to more diverse secondary

schools reported, on average, *less* positive intergroup relations ( $M_d = -0.38, [-0.70, -0.07]$ ) than White British participants who stayed in segregated schools. This comparison reflects that, for most outcomes, negative values for the relevant model parameters had higher posterior probabilities (see Figure 3), though all but one (intergroup trust) individual comparisons were inconclusive. Furthermore, this comparison was inconclusive for White British participants' contact quantity and quality ( $M_d = -0.16, [-0.78, 0.41]$ ).

### **Multiple Comparisons**

Thus far, we modeled coefficients for the different outcome variables as independent effects (no pooling). This means that we estimated multiple comparisons across outcome measures, which increases the risk of “Type M” (magnitude) errors and “Type S” (sign) errors (Gelman, Hill, & Yajima, 2012). In addition, we also modeled coefficients for the different outcome variables as varying effects from a common distribution with a shared variance. This model shifts estimates across outcome variables toward each other (partial pooling) and should thus reduce Type M and Type S errors (Gelman et al., 2012) compared to earlier analyses. Our conclusions, however, did not change substantively when we used partial pooling to account for multiple comparisons. See Appendix B for a detailed comparison of effect-size estimates from the different analysis methods.

### **Discussion**

The purpose of the present research was to examine, first, the cross-sectional association between levels of school diversity, and second, the longitudinal effect of changing school diversity, on students' self-reports of various measures of intergroup relations. We discuss these results in terms of the beneficial role of diversity in an ethnically mixed school (consistent with the contact hypothesis) and the impact of a change in diversity when students make the transition from elementary to secondary school (highlighting especially the potentially puzzling differential effect favoring Asian British students moving to ethnically

mixed schools). Finally, we acknowledge some limitations of the research and highlight future directions for research of this type.

### **Diversity Levels in Elementary Schools**

The initial cross-sectional comparisons between the segregated schools and the mixed school provide evidence across the multiple measures consistent with a beneficial role of diversity in an ethnically mixed school for students' intergroup relations. Overall, we found that students who attended the ethnically mixed elementary school had more positive contact experiences and intergroup relations than students in the segregated elementary schools. Asian British and White British students at the sole mixed elementary school reported, on average, higher contact (both quantity and quality, H1a), higher contact intentions and greater intergroup trust than their counterparts at the segregated elementary schools (H1b). Asian British students also reported more positive social norms for outgroup contact, and White British students also reported greater intergroup empathy, than their ethnic ingroup counterparts at segregated elementary schools (H1b).

Although these findings are based on only one mixed elementary school, they are in line with previous research in Europe that shows positive effects of ethnic diversity on intergroup relations (Hewstone, 2015; Ramos et al., 2016; Wölfer et al., 2018). The findings are also consistent with research from the United States, showing that both prejudice and use of stereotypes are lower, and cross-group friendship intentions are higher, in ethnically diverse (vs segregated) schools (McGlothlin & Killen, 2010; Killen et al., 2010). Future research should examine whether these differences in intergroup experiences between mixed and segregated schools also apply more broadly across the United Kingdom by conducting this research in areas with greater access to mixed vs segregated schools. Our findings, albeit to be treated with caution, add to the impressive evidence of the benefits of intergroup contact in improving intergroup relations (Pettigrew & Tropp, 2006, 2011), and provide further

evidence against the view that diversity is associated with a lack of social cohesion (Putnam, 2007). Rather, diversity offers an opportunity for contact; and if that opportunity is taken up, diversity promotes social cohesion via contact (e.g., Schmid et al., 2014). Schools can be a particularly propitious setting in which to exploit the benefits of diversity, because the norms taught therein and the institutional support provided by teachers encourages contact experiences, which in this cooperative setting can approximate the optimal conditions for intergroup contact (Wölfer et al., in press).

### **Diversity Change following the Transition to Secondary Schools**

The longitudinal analysis of changes in students' intergroup relations as a function of their school transition provides a unique research design that allowed us to examine the effect of changing levels of diversity. Our findings demonstrate some general ethnicity-specific differences, particularly in interaction with the diversity of students' secondary school. That is, Asian British students' intergroup relations and contact experiences tend to improve when they move to ethnically mixed secondary schools, on average reporting more contact (quantity and quality, H2a) and higher contact intentions and intergroup empathy (H2b). In turn, White British students' intergroup relations tended to worsen overall after moving to mixed secondary schools, though this comparison seems to be driven by the decrease in intergroup trust, while the comparison for all other outcomes was inconclusive. We consider three possible explanations for this surprising finding.

First, intergroup contact appears to have an important temporal dimension. Putnam (2007) argued that diversity initially seems to provide a challenge. The positive effect of a new ethnically diverse school environment may require more time before it develops into more positive intergroup relations when students adapt to their new setting and get the chance to make new cross-group friendships (Dovidio et al., 2017). Such an initial 'diversity shock' (e.g., lower trust) or adaption phase is specifically plausible for White British students, as

they may be less used to contact with the minority outgroup than Asian British students are to contact with the majority White British outgroup. In our study, across elementary school type, White British students reported lower contact quantity than Asian British students. Because participants in this research were tested soon after they changed from a segregated to a mixed school (within four months), White British students may not have had time to reap the benefits contact provided by the new environment. Relatedly, Eller, Abrams, and Koschate (2017) showed that when German high school students (aged 15-19 years) changed from a structural segregated context (i.e., different classes within a grade) to a context characterized by integration (i.e., one single grade for years 11-13), contact quality required time to consolidate and take effect, and was only significant twelve months later (temporal consolidation hypothesis). Additionally, the effectiveness of different ways of perceiving social categorization (from salient group membership to dual identity) during contact changed over time as students adapted to the new context. Future research should investigate how majority and minority group members perceive contact at initial stages after such a profound structural change. Furthermore, White British students may not have been interested enough yet to reach out and make new friends, especially if they moved schools with some of their old same-group friends. Research shows that not taking up contact opportunities can simply reflect a lack of interest in mixing, rather than a more pernicious prejudice towards the other group, for both majority and minority group members (Al Ramiah, Schmid, Hewstone, & Floe, 2014).

Second, these longitudinal findings may arise due to perception of belonging to the majority group and perceived intergroup threat, defined as the belief that an outgroup is in some form harmful to the ingroup (Riek, Mania, & Gaertner, 2006; Stephan & Stephan, 2000; Tajfel & Turner, 1979; Voci, 2006). There is evidence showing that if the proportion of peers from an ethnic outgroup in a school becomes seen as too large (50% and above),

making outgroup friends can be considered as too threatening (for a review see Thijs & Verkuyten, 2014). Prior research has found a significant association between perceived intergroup threat and increased prejudice (e.g., Tausch, Hewstone, Kenworthy, Cairns, & Christ, 2007), and the impact of intergroup contact in reducing prejudice occurs, in part, via reduced perceived threat (Tausch, Hewstone, et al., 2007; Tausch, Tam, Hewstone, Kenworthy, & Cairns, 2007). Schmid et al. (2014) showed that neighborhood diversity was associated with more intergroup contact, which, in turn, was associated with lower perceived intergroup threat. Not only intergroup threat, but also realistic threat may be important for majority group members. According to realistic conflict theory (Sherif, Harvey, White, Hood, & Sherif, 1961), actual resources (e.g., teaching resources such as books and teachers' time) may have, or appear to have, become limited in an environment where resources need to be shared with the minority group. Such competition may be a new experience to White British but not Asian British students, who, as an ethnic minority in a White British host society, may be more used to experiencing intergroup threat.

Our cross-sectional analyses revealed that, across all elementary schools, although Asian British students, on average, reported higher contact quantity, they also reported less positive outgroup perceptions (e.g., lower contact norms, intentions, trust) than White British; in the segregated elementary schools, both White and Asian British students' views were less positive than their counterparts in the mixed school (e.g., lower intentions and trust). The outgroup perceptions of Asian British students improved after the transition to a new, mixed school. In contrast, White British students may, perhaps, have felt threatened when moving from a segregated to a new mixed school. The prospect of meeting new outgroup students may have led to less apprehension among Asian British students, who reported greater contact quantity across elementary school type than their White counterparts, because

meeting new outgroup members is a more common experience in a society in which they are the ethnic minority, both socially and numerically.

Third, schools with a higher minority proportion could be characterized as more 'problematic' schools in general. Their diversity may be confounded with lower socioeconomic status (SES), which itself may reduce the likelihood of a positive school climate (Evangelou et al., 2008; Topping, 2011), with respect to intra- and intergroup relations. In the town studied, according to the 2011 national census, socioeconomic status is linked to ethnic group, and employment is generally lower among the Asian British community. While the hypothesized confound between minority proportion and these other indices decreases from segregated to mixed schools for Asian British students, it increases from segregated to mixed schools for White British students, which could contribute to the effect favoring Asian British students moving to mixed schools. Future research should include measures of SES to explore in more detail any confounding of ethnic diversity with SES.

If this proposed diversity adaption phase receives support in future studies, this finding might indicate that we should intervene to prepare majority members transitioning to mixed environments for the new context they will experience, in order to maximize the potentially positive effect of diverse settings and encourage intergroup contact.

This research contributes to the academic and political debate concerning the relationship between diversity, contact and prejudice. It shows that attending a diverse elementary school can be beneficial for children. Both majority and minority students not only reported more contact in terms of quantity, but also in terms of quality; they also reported higher intentions for future contact as well as more positive emotions. This research is also important as, in a unique design, we examined how transitioning from an ethnically segregated to a diverse environment impacts upon children from both the majority and the

minority group. In order to reduce any potential negative experience associated with a change of diversity, several factors may need to be taken into account such as the temporal dimension of intergroup contact, socioeconomic status, intergroup threat, and ethnic group status. Early stages of diversity exposure may require different attention (e.g., targeted interventions by schools) compared to later stages of diversity exposure.

Previous research has focused on reducing prejudice in segregated contexts where direct contact is difficult or intergroup anxiety high (Dovidio, Eller, & Hewstone, 2011), for example through extended contact (Vezzali, Hewstone, Capozza, Giovannini, & Wölfer, 2014) and imagined contact (Birtel & Crisp, 2012; Miles & Crisp, 2014). The present study extends this research by examining the transition between contexts of different levels of diversity, from a segregated context to a mixed context.

### **Limitations**

Notwithstanding the value of our distinct design, studying the potential impact of this key educational transition for students from both majority and minority groups, we acknowledge some shortcomings of our research. First, the initial cross-sectional analysis included only a single mixed elementary school and a correspondingly small sample of students ( $n = 45$ ) that was compared to the 13 segregated schools ( $n = 506$ ) (due to the scarcity of such schools in the town where we conducted the research); this, of course, limits the generalizability of results for students from mixed elementary schools. Second, the longitudinal analysis was characterized by a large drop out from wave 1 to wave 2, due to the challenge of tracking students longitudinally during their school transition and the low number of secondary schools that were available to us. Although this structurally caused attrition was found to be unsystematic, based on comprehensive drop-out analyses, we still sound a note of caution regarding the generalizability of the present findings. The relatively small longitudinal sample may have resulted in a lower power to detect changes, which may

account for some of the inconclusive findings revealed. The main limitations point the way to obvious directions for replication in future research, which should involve a greater number of schools, and better panel maintenance. Ideally, such research would also include quasi-experimental designs (e.g., random allocation to type of secondary school). Other desiderata for future research include studying the adaptation to initial diversity change over a longer time period (ideally, several years) to compare initial and later stages of intergroup contact after a change from a segregated to a diverse environment. Such a design would provide a strong test of the idea that cross-race interactions may be initially qualitatively worse than same-race interactions (MacInnis & Page-Gould, 2015; Toosi et al., 2012), but that this effect may attenuate over time. This new research should, as we have done here, also include a range of other measures of intergroup relations, but notably a measure of perceived intergroup threat should be added, to test Putnam's (2007) idea that the initial threat posed by diversity may diminish over time, and to test our proposed explanation of the different results for majority and minority group members.

### **Conclusion**

This longitudinal study and its unique design contribute to the debate concerning the relationship between diversity and prejudice. Firstly, our findings suggest a beneficial impact of diversity in ethnically mixed elementary schools for students' intergroup contact and intergroup experiences. Secondly, our longitudinal analysis of the change in diversity experienced by students revealed specific differences as a function of ethnic group membership, with Asian students benefitting more from moving to ethnically mixed schools, at least at initial stages of diversity and contact. These findings are important in understanding early stages of diversity exposure, and the impact of changing levels of diversity on contact and prejudice in both majority and minority group members.

## Footnotes

<sup>1</sup> It should be noted that elementary schools are typically called ‘primary’ schools in the UK, as is evident from the titles of a number of sources cited in the bibliography.

<sup>2</sup> As the town’s elementary schools are generally segregated, the mixed elementary school was an exception. Therefore, the ethnic makeup of the educational system in the town did not allow us to recruit more mixed elementary schools. The unknown / other category usually includes 5 to 10% across all school, with the exception of the one mixed school. Given the social and demographic characteristics of the area in which this particular school is located (Oldham, Greater Manchester), it is likely that most participants in the unknown / other category are in fact White British.

<sup>3</sup> Anonymity was ensured by unlinking the data and the participants’ names. Since the study involved a longitudinal element, it was necessary to match up students’ responses across waves via the students’ names. These were then transferred into arbitrary anonymous codes and removed from the questionnaire.

<sup>4</sup> Secondary school admissions operate via an application system. Parents indicate a minimum of three preferred schools on the application form. While all preferences are considered equally by the local council, UK law does not permit the right to choose a particular school. Practically, certain elementary schools are ‘feeder schools’ for secondary schools (i.e., a high number of students tend to move from the same elementary school to a particular secondary school). Choices are usually made by the parents (not the children). While the area in which students live may affect their parents’ preference for certain schools, such preferences are not always granted. We do not have information about the reasons certain schools are chosen by parents, and how many of these preferences actually are granted.

<sup>5</sup> We believe it is plausible that four months are sufficient for positive long-term effects of intergroup contact, in particular in a school setting due to the reasons outlined in the introduction. First, MacInnis and Page-Gould (2015) argued that intergroup interactions (i.e., a single occasion, usually not longer than 10 minutes) are associated with negative outcomes, whereas intergroup contact (i.e., a longer period of time) is associated with positive outcomes. Second, in his intergroup contact theory, Pettigrew (1998) argued that it takes time for contact to have an effect, because of different longitudinal processes that need to unfold while mediating the contact-prejudice relationship.

<sup>6</sup> Intergroup self-efficacy was measured by asking participants to report their level of perceived self-efficacy with regard to engaging in outgroup contact on two items ("I am worried that I might not know how to behave when with [OUTGROUP] children" (reverse coded), "I feel confident talking to [OUTGROUP] children"; 1 = *strongly disagree* to 5 = *strongly agree*; Stathi et al., 2011). The two items were, however, effectively uncorrelated ( $r_{w1} = .06$ ,  $r_{w2} = .02$ ) and thus no further analyses were conducted considering this construct.

<sup>7</sup> For a more detailed treatment, consult McElreath (2016), Lambert (2018), and Gelman et al. (2014).

<sup>8</sup> These are *residual* correlations because they estimate the associations between outcome variables after accounting for all predictor variables and varying effects. We provide correlation coefficients for all cross-sectional and longitudinal associations between outcome measures in Appendix C.

<sup>9</sup> Specifically, we used conservative prior distributions for all fixed effects,  $\beta \sim \text{Normal}(0, 1)$ , that allocated 80% of prior probability to effect sizes for which  $-1.28 < d < 1.28$ .

<sup>10</sup> We chose 20% as the unit of comparison as this roughly reflects the changes in ethnic diversity observed in the sample (see Figure 2). We included diversity (at elementary

and secondary school) as a continuous predictor variable in our model, which means that estimating the effects of a 20% difference in diversity involved extrapolating from limited data. Still, we believe that it is valuable to use a common unit of comparison across the cross-sectional and longitudinal analyses. We report Cohen's (1988)  $d$  effect sizes. As we standardized all outcome variables, the mean differences estimated by our model are equivalent to Cohen's  $d$ . Cohen's  $d$  is defined as  $\Delta M / SD_{\text{pooled}}$  where  $\Delta M$  is the difference in means and  $SD_{\text{pooled}}$  is the pooled standard deviation (Cohen, 1988). Standardizing outcome variables involves dividing all observed values by their pooled standard deviation. As such, the mean differences estimated by our model are, by definition, equivalent to Cohen's  $d$ .

<sup>11</sup> We chose  $d = 0.2$  as the smallest effect size of interest as it corresponds to a "small" effect in Cohen's (1988) framework.

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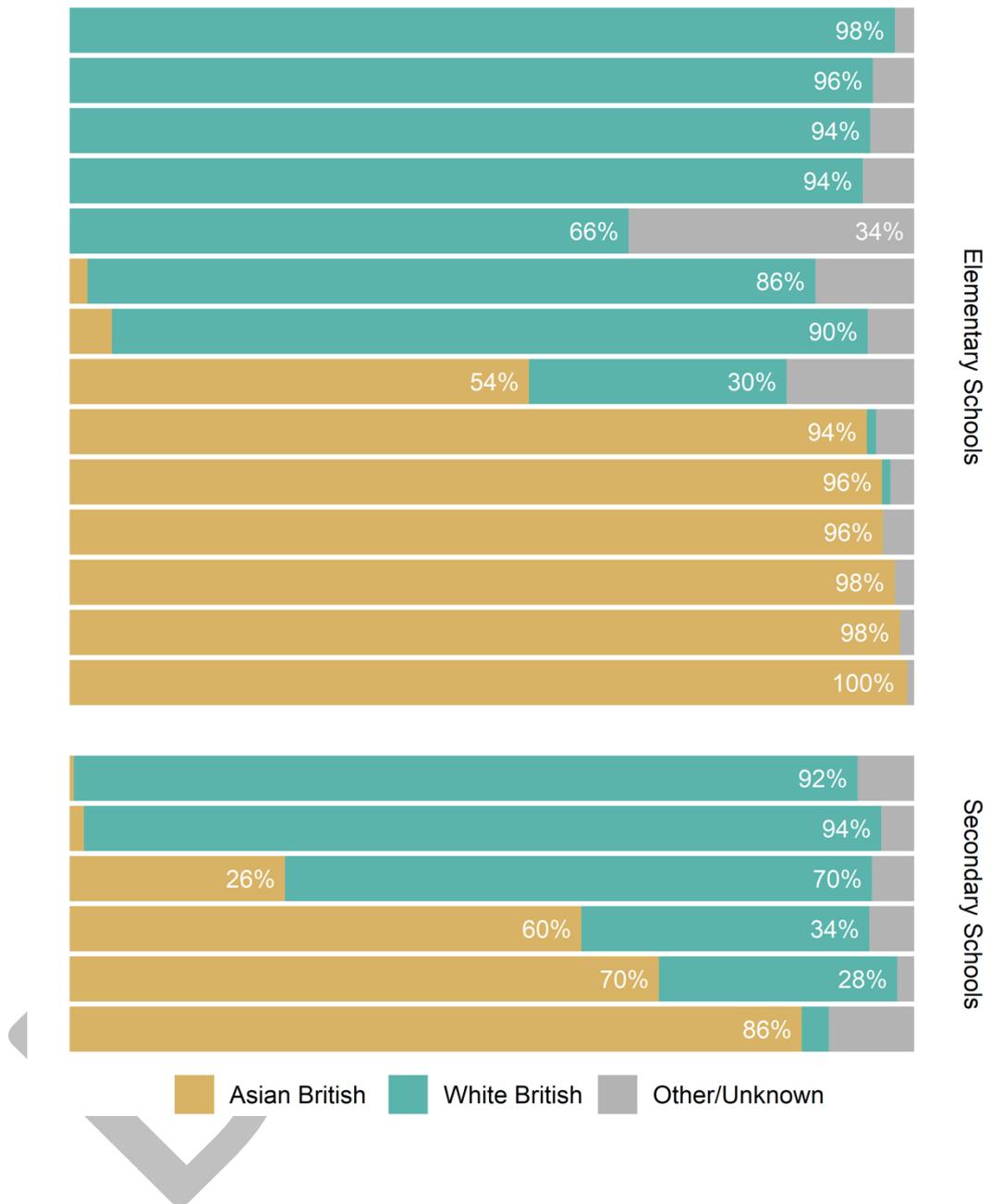
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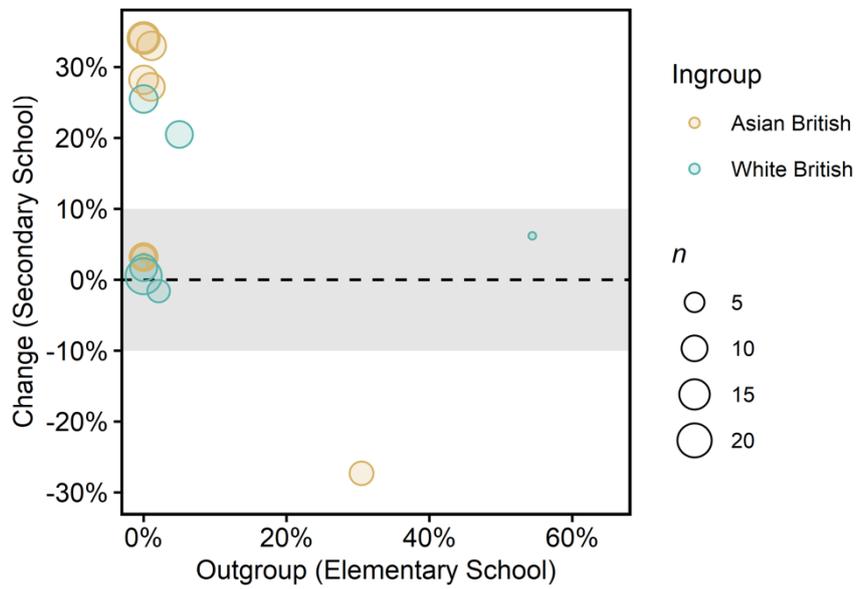
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## Figures



*Figure 1.* Percentages of Asian British and White British students in each elementary and secondary school in the sample (Department for Education, 2012, 2013).



*Figure 2.* Change in the school-wide proportion of outgroup students after transitioning from elementary school to secondary school for participants ( $n = 163$ ) in the second wave of data collection.

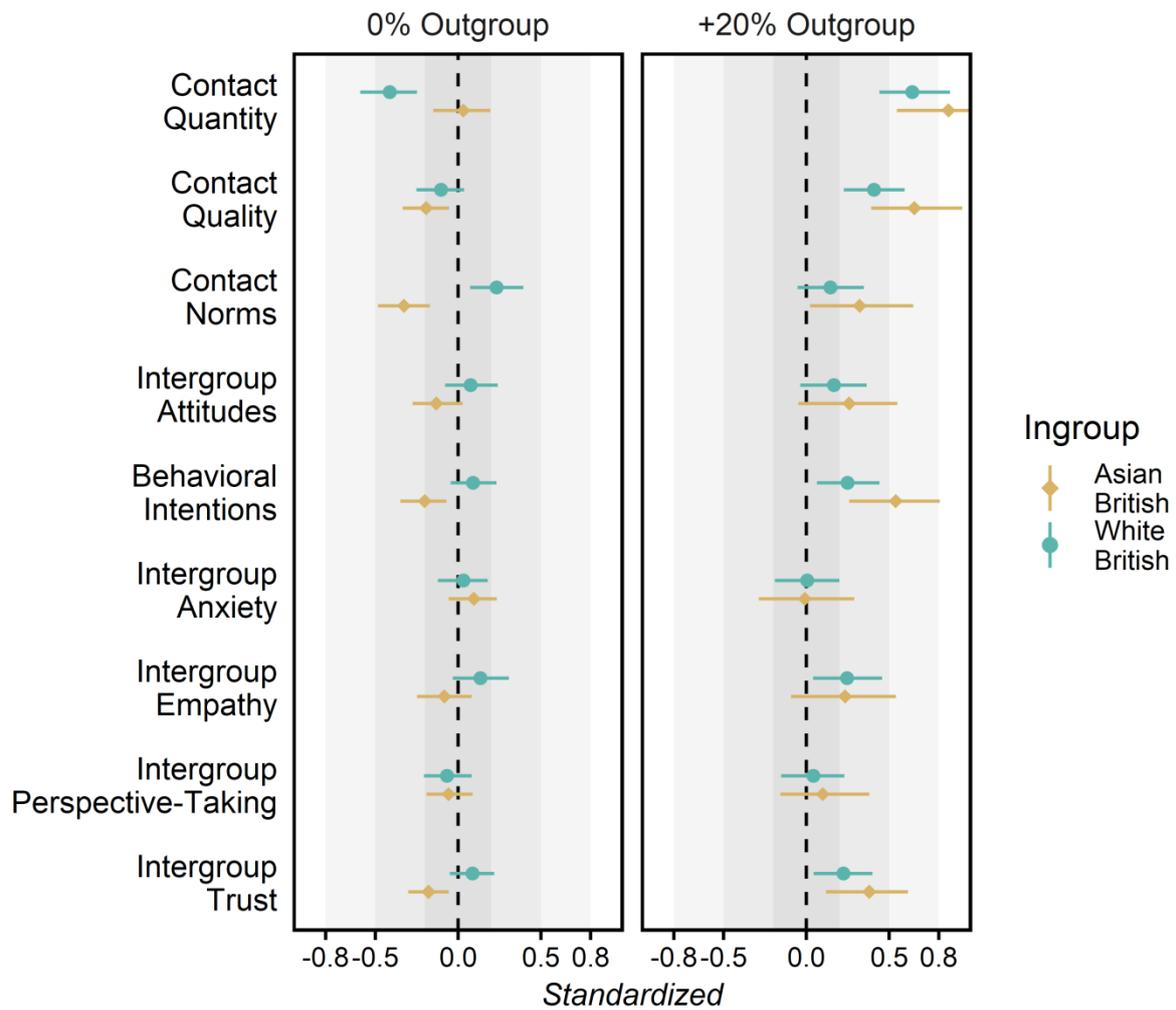


Figure 3. Estimated means for each outcome as a function of ethnicity (Asian British, White British), diversity (% outgroup students), and their interaction.

This figure shows standardized coefficients estimating outcomes *before* participants moved to secondary school. Shaded ribbons enclose estimates corresponding to “small”, “medium”, and “large” effect sizes (Cohen, 1988).

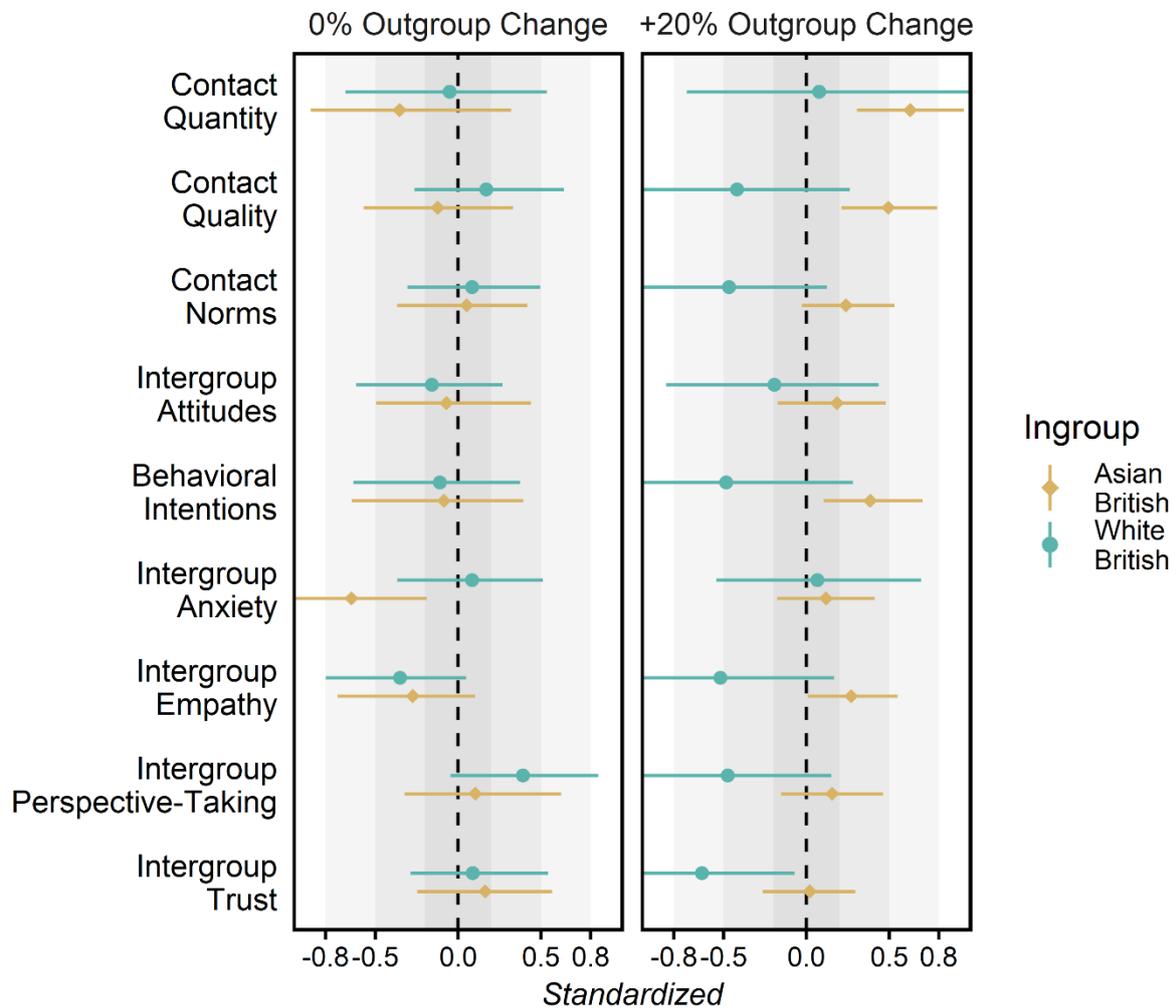


Figure 4. Estimated mean changes in each outcome as a function of ethnicity (Asian British, White British), diversity (change in % outgroup students), and their interaction. This figure shows standardized coefficients estimating changes in outcomes *after* participants moved to secondary school. Shaded ribbons enclose estimates corresponding to “small”, “medium”, and “large” effect sizes (Cohen, 1988).