What reduces prejudice in the real world? A meta-analysis of prejudice reduction field experiments

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Abstract

Despite advances to promote acceptance and equity in many countries, prejudice remains a significant social problem. Promoting intergroup harmony requires knowledge about what works to reduce prejudice in community settings. This meta-analysis of field experiments reveals the most effective intervention types and conditions for reducing negative attitudes towards minority groups in real-world settings. Across 69 intervention arms and 24,378 participants, results reveal that prejudice reduction interventions are effective at improving attitudes towards minority groups in real world settings ($d = 0.51$, 95% CI [0.33; 0.68]). Subgroup analyses indicate that less commonly explored approaches, such as perceived variability, may have larger effect sizes than contact-based interventions, but more research is needed to confirm the effects of these less-researched approaches. Additionally, results show that interventions are more effective for school and college cohorts than for adults, and that the effects of prejudice reduction interventions endure over time.

Keywords: prejudice, meta-analysis, field experiments, systematic review, effectiveness

Introduction

Fractured intergroup relations and prejudicial attitudes based on ethnic, religious, sexuality and gender-identity differences are a regular feature of social life across many countries (Edelman, Luca, & Svirsky, 2017; Jetten & Esses, 2018; Pedersen & Hartley, 2012; Quillian, Pager, Hexel, & Midtbøen, 2017; Ramsay & Pang, 2017). In the social and behavioural sciences, a significant body of scholarship is concerned with prejudice reduction. However, a 2009 review of this research found that most studies relied on non-experimental methods and laboratory experiments, rather than on field experiments (Paluck & Green, 2009). While these approaches provide valuable information about the types of interventions available, and their effectiveness in abstract laboratory settings, field experiments provide the clearest evidence on what works in real-world settings (Green & Gerber, 2012; Paluck & Green, 2009).

Field experiments can potentially demonstrate the causal mechanisms in a real world setting where broader political and economic influences are at play. Interventions tested in artificial settings may not necessarily yield the same results in the real world where the context is vastly different (Levitt & List, 2007). For the purposes of designing a prejudice reduction intervention, with the goal of real-world application, testing in field environments is critical. Without evidence of interventions that reduce prejudice in real world settings, academics and practitioners are faced with a difficult task of trying to identify the causal mechanisms that work outside of highly controlled and often contrived laboratory settings.

One of the most comprehensive reviews of prejudice reduction interventions was published over a decade ago. Paluck and Green (2009), reviewed 985 published and unpublished prejudice reduction studies. Their review identified a lack of field experiments, leading them to conclude that little was known about which interventions were effective outside of laboratory

settings. Paluck and Green's 2009 review did not include any meta-analysis, thus the average effect sizes of various interventions and the moderating factors were not identified.

More recently, Paluck et al. (2021) conducted a broadly-defined meta-analysis of 418 prejudice reduction experiments from 2007 to 2019. That review covered studies with a broad range of experimental designs (including laboratory experiments) and target outcomes (including not just attitudes but also behaviour and behavioural intentions). While the breadth of this review is certainly a clear strength, measures that span both attitudinal and behavioural outcomes are treated as interchangeable. Furthermore, the classification of interventions by form (e.g. entertainment, diversity training etc.) rather than by theoretical foundations, while perhaps of practical interest, does not allow for insights on the mechanisms most proximate to attitude and/or behavior change. To better understand which theoretical mechanisms are supported by evidence it is necessary to categorise interventions by mechanism rather than form. Moreover, the inclusion of laboratory and other experiments not conducted in real-world settings limits the extent to which is possible to draw conclusions about what works in applied settings.

Other reviews that contain meta-analysis are more limited in scope. They have either focused on one particular approach – specifically, contact theory only (Lemmer & Wagner, 2015; McIntyre, Paolini, & Hewstone, 2016; Paluck, Green, & Green, 2019; Pettigrew & Tropp, 2006; Zhou, Page-Gould, Aron, Moyer, & Hewstone, 2019), considered particular types of field settings (such as schools only (Ülger, Dette-Hagenmeyer, Reichle, & Gaertner, 2018)), included laboratory studies in addition to field (Lee, Ata, & Brannick, 2014; McIntyre et al., 2016; Pettigrew & Tropp, 2006) or limited their enquiry to specific forms of target prejudice, for example racism (Lee et al., 2014; Lemmer & Wagner, 2015). Certainly, these meta-analyses lend support to the effectiveness of prejudice reduction interventions, yet their scope does not

address whether prejudice reduction interventions are in fact effective across a broad range of intervention approaches, field settings, participant groups and prejudice targets. Given the ongoing demand for prejudice reduction research in applied settings, there is a need to take stock of the current tools across approaches, settings, participants and targets in order to identify promising lesser researched approaches.

In addition to understanding the mechanisms of prejudice reduction, it is also important to identify what interventions are likely to have a sustained impact over time. Again, there is a lack of review-level evidence about the long-term impacts of prejudice reduction interventions in the field. Only one meta-analysis addressed the issue of persistence, albeit only for contact interventions. It found that there was evidence that contact interventions have sustained impact over time (Lemmer & Wagner, 2015). While this study focused on field settings, it included randomised and non-randomised experimental approaches. Another study attempted to consider persistence for “light touch” interventions but found that there were very few studies that measured outcomes more than a day after treatment (Paluck et al., 2021).

The purpose of this systematic review and meta-analysis is to identify the characteristics of successful prejudice reduction interventions in real world settings, across all types of intervention approaches, participants, and prejudice targets. In doing so, this research helps to highlight promising lesser researched approaches that warrant greater focus by the academy.

The key questions guiding this meta-analysis are:

Q1: Do prejudice reduction interventions have causal effect in the field?

Q2: Are some approaches more effective than others?

Q3: Does effectiveness vary across a) participant groups and b) prejudice types?

Q4: What is the persistence of any prejudice reduction effect?

This review builds on the Paluck and Green (2009) review by adding the period since 2009 using a systematic review and meta-analysis approach. Using a broader time period, this review provides the most comprehensive meta-analysis of prejudice reduction field experiments to date. Field experiments are the focus as they are only research design that allows causation to be attributed in real world settings. While non-randomised designs can be valuable, meta-analyses of randomised control trials are typically considered to be the highest standard of evidence about the effect of interventions in applied contexts, as such the research questions can only be answered by focusing on field experiments (Merlin, Weston, & Tooher, 2009).

Method

A systematic review is a well-defined and transparent approach to synthesising the findings of a body of literature. In comparison to narrative reviews, systematic reviews have the benefit of being less susceptible to selection bias (Uman, 2011). Furthermore, transparent inclusion and exclusion criteria help to overcome the potential for bias in the selection of studies.

Preregistered methods

A protocol describing our review methodology was preregistered on Open Science Framework ([link](#)). The initial pre-registered review protocol focused only on studies published after 2009, which is when Paluck and Green (2009) published their seminal review of prejudice reduction methods. At the suggestion of reviewers, we deviated from the preregistered method by including studies published prior to 2009 that were identified by Paluck and Green (2009). A version of the review conducted only with post-2009 papers is available for interested readers (<https://psyarxiv.com/jkn8c>), however the average effects of prejudice reduction interventions were significant and in the same direction those as reported in this article.

Search strategy

For studies published post 2009, we used a search strategy based on terms used by Paluck and Green (2009), including: prejudice, attitude, racism, experiment, random*, control*, reduc*, intervention and program. The search covered the time period from 1 January 2009 to 3 November 2018. Three databases were examined: Proquest (n=1428), Web of Science (n=758) and PsychINFO (n=476). The databases and search terms were determined based on advice from a specialist librarian and pilot testing by the first author. In addition, other unpublished works and grey literature were uncovered through searches on Open Science Framework pre-prints and Google Scholar. The Google Scholar search was limited to results that cited Paluck and Green (2009) in order to increase likelihood of relevance. All results were screened by two reviewers with interrater agreement at 94 per cent for title and abstract screening, and 83 per cent agreement for full text screening. Conflicts were resolved between the two reviewers through discussion.

For studies published prior to 2009 both reviewers screened the full-text of the list of field experiments identified by Paluck and Green (2009) as published in their Supplementary Table 1. Interrater agreement was 82 per cent. Once again, conflicts were resolved through discussion.

Fifty studies remained after full text screening (Figure 1). The full list of included studies can be found in the Supplementary Materials.

[Figure 1 here]

Inclusion criteria

The inclusion criteria for the meta-analysis were as follows. First, to be included in the meta-analysis, a paper needed to detail an intervention specifically designed to reduce prejudice.

For the purposes of this review, and in line with a significant body of literature, prejudice was defined as negative attitudes towards one group (Allport, 1954; Curseu, Stoop, & Schalk, 2007; Paluck & Green, 2009). Specifically, we focused on prejudice indicators that focus on cognitive (beliefs and stereotypes) and affective (emotions and disliking) aspects, which are considered to be core components of prejudice (Jackson, 2019). We excluded any behavioural indicators, including conative measures as they are indicators of intended behaviour. Following the approach of Paluck and Green (2009), we excluded studies about sexism because of the distinct theoretical explanations for this form of prejudice and the substantial separate body of literature, namely, gender studies and feminist studies that has largely developed separately from prejudice research in social psychology (Koenig, Eagly, Mitchell, & Ristikari, 2011; Paluck & Green, 2009). Second, papers needed to feature field experiments, that is, have a randomised allocation into a control or treatment group, and be set in a field setting. We followed the definition used by Paluck and Green (2009) that states field experiments are those that are conducted in naturalistic settings in a largely unobtrusive manner that aim to test more context-specific hypotheses. Further, following Gerber and Green (2012) consideration was given to a) the identity of participants, b) the intervention and its target, c) the obtrusiveness of intervention delivery, and d) the assessed response to the intervention. The more borderline cases tended to involve university students, especially psychology students. In those cases, studies that were run with students in a non-curriculum context e.g. for extra credit and / or where the intervention was not specific to their student identity were not considered to be field experiments. In contrast, studies that were run with the aim of understanding whether a program was effective for students e.g. cultural competence training for nursing students, were considered to be a field experiment. Studies included in the meta-analysis did not need to conduct measurements at more than one

time-point. Third, studies needed to present enough quantitative information to allow standard effect sizes and variances to be calculated. For the two post-2009 studies where there was insufficient quantitative information, efforts were made to contact the corresponding authors twice but further information was unable to be obtained. Fourth, we included all population groups, intervention approaches and control groups. Fifth, papers needed to be in English.

Coding procedure

We coded information on several study features including: what and when post-intervention measures were collected; participant type (e.g. students, adults); country that the intervention was tested in; sample size; target prejudice type (e.g. racism, homophobia); intervention approach (e.g. contact, perspective taking); effect size and standard error, and details on the prejudice measure used. Coding was completed by the first author (full sample) and an independent reviewer (92 per cent of sample), with conflicts resolved through discussion.

Our classification of intervention types centered on the underlying theoretical foundations of the intervention in each study. *Contact* interventions were those that relied on contact theory as the mechanism for change in prejudice (Allport, 1954). This included all forms of contact such as direct / face-to-face, extended contact (e.g. contact is through a form of media such as film or books) and virtual contact (e.g. contact is through non-face-to-face channels, such as instant messaging).¹ *Awareness* interventions were those that sought to reduce prejudice through cognitive processes (Tajfel, 1969). These awareness interventions sought to improve a participant's understanding of prejudice and discrimination by emphasising the negative consequences of prejudicial views or address the errors associated with stereotypical views or common assumptions. *Categorisation* approaches drew on cognitive recategorisation theories

¹ See Lemmer & Wagner (2015) for further details on the types of contact interventions.

that postulate that the cognitive process of recategorising ingroup and outgroup members as members of an overarching and inclusive superordinate group can reduce prejudice (Dovidio, Gaertner, & Saguy, 2009). Categorisation is often considered along with the dual identity approach whereby both the superordinate category and the original subgroup identity is activated (Dovidio, Gaertner, Pearson, & Riek, 2005). *Perspective taking* approaches focused on drawing parallels to a subject's own experiences, creating an experience by which the subject experiences life as an outgroup member and creating empathy with outgroup members as a mechanism for reducing prejudice (Batson et al., 1997; Faulkner, 2018). *Social norm* approaches aimed to challenge norms by creating role models in a community or by highlighting non-prejudiced behaviour through media (Crandall, Eshleman, & O'Brien, 2002). Lastly, *perceived variability* interventions highlighted heterogeneity within an outgroup, that is, that outgroup members have diverse characteristics and are not all 'the same' (Brauer & Er-rafy, 2011).

During the data extraction process, we clarified additional details related to data extraction. For example, some studies reported on multiple outcomes, included multiple treatment arms or measured outcomes at multiple times. We established the following rules for selecting the main outcome measure to represent each study's overall findings: (a) Where effects were split into majority versus minority groups, only majority group participants were included; where it was not clear which group was the majority, both groups were included; (b) where there were multiple post-tests, we used the interaction of time x group where available or chose the last possible post-test; (c) where there were multiple intervention arms (i.e. there was more than one treatment group and each treatment group received a different treatment), each intervention arm was included separately. In addition, where groups received varied dosage of the same treatment, the highest dosage was selected. Similarly, where there was an interaction of

treatments (2x2) but it was possible to split effects into two treatments, both treatments were included; (d) Where there were multiple prejudice outcomes, the most general measure, such as one that did not focus on a particular minority was used, or the measure that was closest to “negative attitude towards one group” definition. Where there was a choice between explicit and implicit measures, the explicit measure was used. A preference was given for explicit measure as only one study solely used an implicit measure. The sensitivity to the preference towards explicit measures was tested and will be discussed below.

To facilitate meta-analytic comparison, effect sizes were converted into Cohen’s d , which represents the standardised difference between two means (Borenstein & Hedges, 2019).² A number of studies had multiple relevant treatment arms with a shared control group. To avoid effect size multiplicity issues, we reduced the control group sample size e.g. where there were two treatment arms and one control group we halved the control group sample size for each treatment arm (Higgins, Eldridge, & Li, 2021).

Publication bias

Assessing publication bias is recommended by established systematic review reporting standards (Moher, Liberati, Tetzlaff, & Altman, 2009). We used three different approaches to identify publication bias. First, we plotted standard errors against effect size. Second, we used a contour-enhanced funnel plot (Peters, Sutton, Jones, Abrams, & Rushton, 2008). Finally, because it can be difficult to detect publication bias through visual inspection methods alone (Egger, Smith, Schneider, & Minder, 1997), we used the Egger metabias test. The Egger metabias test is based on a linear regression of normalised effect estimates (estimate divided by its standard error) against precision (reciprocal of the standard error of the estimate) (Egger et al., 1997).

² Cohen’s d were calculated using Practical Meta-Analysis Effect Size Calculator [Online Calculator] (Wilson, n.d.).

Evidential value (p-curve)

We also considered whether there was evidential value in the set of studies – that is, whether these studies indicated a true effect on prejudice or whether the effect may be the result of selective reporting or “p-hacking” (Simonsohn, Nelson, & Simmons, 2014). This was tested through p-curve analysis to assess the distribution of statistically significant p values for a set of independent findings. A right-skewed distribution indicates that there is evidential value in the set of findings, whereas a p-curve skewed to the left suggests intense “p-hacking” or that published results are not representative of the true effect.

Testing for heterogeneity

We expected that effects would be heterogeneous and therefore used a random effects meta-analysis approach. This approach was particularly suitable as it pooled the effects of studies using multiple different prejudice reduction approaches and targeted an outcome, prejudice, which is known to be complex and multidetermined (Cook et al., 1992; Pettigrew & Tropp, 2006). Both Cochran’s Q-test (Cochran, 1954; Hedges & Olkin, 1985) and Higgins’ and Thompson’s I^2 test (Higgins & Thompson, 2002) indicated high degrees of heterogeneity ($Q = 640.53$, $df = 68$, $p < 0.0001$; $I^2 = 89.4\%$), providing additional support for the use of the random effects meta-analysis approach.

Results**Study characteristics**

The meta-analytic dataset contained 69 intervention arms. Study sample sizes ranged from 24 to 1480 ($M = 208$, $SD = 231$, $Mdn = 128$). The dataset included 24,378 participants across all treatment arms.

Location.

Studies were spread across the world but predominantly in Europe and US (Europe, 36 per cent of studies; the US, 39 per cent). Asia and Middle East accounted for 14 per cent (Table 1). This masks that distributional shift away from US studies in the past decade with only 15 per cent of field experiments conducted in the US since 2009.

[Table 1 here]

Study participants.

The vast majority of studies ($n = 57$, 83%) were conducted using school or college student participants. Only 16 per cent of field experiments were run entirely with non-school samples.

Target prejudice.

Race-, religion- or ethnicity-based prejudice was investigated in 27 (78%) studies. Disability was the next most studied form of prejudice (9 studies, 13%). Other types of prejudice considered in the field experiments included sexuality and gender identity including homophobia and transphobia, and obesity. Studies on these other types of prejudice have only arisen in the past decade.

Intervention approach.

Contact was the most widely-used intervention approach, accounting for 49 per cent of studies. Of the 34 studies that used contact, 16 featured a form of face-to-face contact, while 18 used non-face-to-face contact approaches through imagined contact in an online game, extended contact through narrative stories, or media and virtual contact through online chat. The next most common intervention approach was awareness, which was used in 41 per cent of studies. Other approaches used included categorisation (dual identity, recategorisation), perspective taking,

social norms, perceived variability and role models. Seventeen studies used multiple approaches in one intervention condition (e.g. contact and categorisation simultaneously), hence the total under “Approach” exceeds the total studies.

Time period.

Nearly half of the 69 treatment arms were from studies completed in the past decade (Table 2).

[Table 2 here]

Preliminary analyses**Publication bias.**

Visual inspection of contour-enhanced funnel plots (Figure 2) revealed some missing studies in the lower left region, that is, small studies with non-significant results. However, the extent of the asymmetry was minimal, suggesting that publication bias was not a material issue for this meta-analysis (Peters et al., 2008).

[Figure 2 here]

On the plot of standard errors against effect size there appeared to be a positive relationship between smaller standard errors (larger studies) and smaller effect size (i.e. small study effect) suggestive of possible publication bias (Figure 3). This was confirmed in the formal metabias test which rejected the null hypothesis of symmetry at the 10 per cent significance level, indicating some evidence of small study effects ($t = 1.79$, $df = 67$, $p\text{-value} = 0.079$). When the sample is restricted to studies post-2009, there is no evidence of small study effects ($t = 0.192$, $df = 32$, $p\text{-value} = 0.85$).

[Figure 3 here]

Evidential value (p-curve).

Across the studies, there were 36 statistically significant results with p-values less than 0.05 and 33 studies with p-value more than 0.05 (Figure 4). Both full and half p-curve tests were right skewed with $p < 0.001$, indicating that there was evidential value (Simonsohn et al., 2014; Simonsohn, Simmons, & Nelson, 2015).

[Figure 4 here]

Effect size analyses

Results from the random effects meta-analysis indicated that the average effect of prejudice reduction field experiments was 0.51, with a 95 per cent confidence interval of 0.33 to 0.68 ($p < 0.001$; Figure 5).³ On average, prejudice scores were 0.51 standard deviations lower in the intervention group compared with the control. This is considered to be a medium effect size. To put this effect size into context, a feeling thermometer measure of prejudice ranges from 0 (cold feelings towards a minority group) to 100 (warm feelings towards a minority group). If someone assigned a score of 40 (slightly negative feeling towards a group) then based on $d = 0.51$, after the intervention their prejudice score would be 51 which is neutral – this is based on a standard deviation of 21.2 reported in the American National Election Survey (2016) feeling thermometer towards Black people.

The prediction interval was -0.90 to 1.92. This is the range that if a new study was conducted, there would a 95 per cent chance that the Cohen's d from that study would fall within (Higgins, Thompson, & Spiegelhalter, 2009). In this case the prediction interval was particularly wide because of the high degree of heterogeneity detected in effect size.

³ Positive Cohen's d indicates an improvement in attitudes i.e. a reduction in prejudice.

When we limit the sample to studies completed from 2009 onwards, the average effect size was 0.37 (95%CI 0.19-0.56; prediction interval -0.66 to 1.40).

[Figure 5 here]

Sensitivity test.

We considered whether these results were sensitive to the rules that were used for choosing the relevant prejudice measure, especially our preference for explicit measures. This was only relevant for the post-2009 sample as implicit measures did not appear prior to this. When the meta-analysis was run with a preference for implicit prejudice measures over explicit measures, the average effect size was higher ($d = 0.42$, compared to $d = 0.37$) and remained statistically significant (95% CI [0.220; 0.615], $p < 0.001$), suggesting that focusing on explicit measures was the more conservative approach to this analysis.

Relative effectiveness of approaches.

To compare effect sizes across intervention approaches we ran subgroup analyses. While there is no strict minimum number of studies required per group, there is greater power to test for subgroup differences the more studies there are in each subgroup. Conclusions based on groupings with very few studies should be interpreted with caution.

When we grouped the studies by approach, the most common approaches were contact and awareness (contact, $n = 20$; awareness, $n = 18$). Seventeen studies used a combination of multiple approaches (Table 3).

[Table 3 here]

Based on the sub-group analyses, it appears that all approaches and combinations thereof used in field experiments indicated improved trends in attitudes on average. However, the 95 per cent confidence interval for many subgroups spanned zero, indicating that many of these effects

were not statistically significant. Tests for subgroup differences suggested that the differences in effect sizes across approaches was significant ($Q = 123.20$, $df = 11$, $p < 0.001$).

Of the single approach studies, the largest effect size was for the perceived variability approach (0.908) but this was based on only one study. Contact only (0.612), on average, had a larger effect size than awareness only (0.442).

Comparing studies using multiple approaches to studies using single approaches suggested that effects were not significantly different when multiple (vs single) approaches were used (0.635 vs 0.459 respectively), ($Q = 0.38$, $df = 1$, $p\text{-value} = 0.537$).

Relative effectiveness across participant groups.

Subgroup analysis by participants type (primary/elementary school students, secondary/high school students, college, and adults) suggested that prejudice reduction interventions result in an improvement in attitudes for all participant groups (average effects are all positive; Table 4). The only cohort with non-significant effects was adults. The difference in average effect size across the subgroups was significant ($Q = 10.73$, $df = 4$, $p\text{-value} = 0.030$). Of note, is the particularly large effect size for the college cohort ($d = 1.1$) which was driven by three studies prior to 2009. Overall these results suggested that prejudice reduction interventions are most effective for student cohorts, and least effective for adults.

[Table 4 here]

Relative effectiveness across prejudice types.

We also considered whether the effects of prejudice reduction interventions varied across target prejudice types. The largest effect size was for interventions tackling disability (0.944) followed by racism / religious prejudice (0.492) and subgroup analysis suggested that the difference in effect size across target prejudice types was significant ($Q = 24.83$, $df = 3$, $p\text{-value}$

< 0.001 ; Table 5). Eight of the 9 studies relating to disability was completed prior to 2009 and of those six studies reported effect sizes of $d > 0.5$.

[Table 5 here]

Relative effectiveness by publication status.

The vast majority of studies included in the meta-analysis were published. Of the 69 treatment arms only eight were unpublished (12 per cent). Published studies reported larger average effects (0.542) compared to unpublished studies (0.207) and this difference was significant ($Q = 6.22$, $df = 1$, $p\text{-value} = 0.0126$). Unpublished research were typically doctoral theses, with only two out of the eight treatment arms completed after 2009.

Persistence of any prejudice reduction effect.

To examine if the impact of these interventions persisted beyond the immediate context of the intervention, we compared average effects across studies grouped by time of post-measurement. The vast majority of interventions were tested immediately (or within a week) following the experiment ($n = 39$). Many studies were tested within 1 month of the intervention ($n = 15$). The number of studies tested two months or longer after the intervention dropped off notably (Figure 6).

[Figure 6 here]

The average effect size at all three timepoints was positive indicating that there was an improvement in attitudes, regardless of when the post-test was run (Table 6). The average effect size was highest for studies tested more than two months after the intervention, and subgroup analysis showed that the difference in average effect sizes across the three time periods was significant at the 5 per cent level ($Q = 9.54$, $df = 3$, $p\text{-value} = 0.02$). This finding provides evidence that interventions may take time to become maximally effective in reducing prejudice.

[Table 6 here]

Discussion

This systematic review and meta-analysis contributes to knowledge by identifying the average effects of prejudice reduction interventions in real world settings, across all types of interventions, participants, and prejudice targets. To our knowledge, no other review has focused on field experiments across such a broad range of approaches, prejudice targets, and time periods. The results of this review indicate that prejudice reduction interventions are effective, on average, at improving attitudes towards minority groups in real world settings. We found that less commonly tested approaches, such as perceived variability, had larger effects on average than commonly tested approaches like contact (but note below the need for further research to confirm these effects). Interventions also appeared more effective when involving students. There was strong indication that the impact of interventions tended to be enduring. Additionally, we found some tentative indication that the effects of prejudice reduction intervention may become stronger over time. These findings are discussed in more detail below.

Studies since 2009 better facilitate analysis of effect size

In comparing the studies completed since 2009 to those completed prior to 2009, we find that the earlier studies had a greater tendency to fail to report key statistical details that would enable them to be included in meta-analyses. In the 50 years prior to 2009 we only found 30 relevant field experiments (an average of four per decade), while in the decade following 2009 there were 27 relevant studies. Of the 27 studies uncovered in the systematic review covering post-2009 only two studies did not report enough data for meta-analysis. In contrast, of the 30 relevant studies prior to 2009, seven studies either did not present sufficient quantitative information about the effect size and variance to be included in the meta-analysis. We observed

signs of publication bias in the full sample, which was not observed when we restricted the sample to just the post-2009 period. This suggests that research practices in prejudice reduction field experiments have improved since 2009. However, in the discussion that follows we highlight some of the material gaps that remain.

The relative effectiveness of intervention approaches

Subgroup analysis of the various intervention approaches suggested that some approaches were likely to be more effective than others. Between the two most commonly tested approaches, contact and awareness, the meta-analysis results point to stronger effects from contact-based interventions. This difference is not surprising as there were different theories and mechanisms at play in each approach (Brewer, 1999; Hässler et al., 2020; Tajfel, 1969). Contact evokes a number of processes, such as reduced anxiety and increased empathy, in reducing prejudice (Pettigrew, Tropp, Wagner, & Christ, 2011). It could be that contact interventions influence a broader range of mediating causal processes than awareness interventions, which are focused solely on cognition.

Beyond the commonly-tested approaches of contact and awareness, this review has identified a promising avenue for theoretical innovation that needs to be the focus of further research – perceived variability. Perceived variability is considered to be a relatively cheap and simple approach to prejudice reduction in the real world as there are few practical pre-conditions to implementation (Er-rafiy & Brauer, 2012). Further, like contact, perceived variability interventions may also trigger multiple mechanisms associated with prejudice – cognitive, affective and behavioural – potentially resulting in greater impact (Er-rafiy & Brauer, 2013). The results of this review show that the only field trial using a perceived-variability approach had a larger effect size than the average effect of contact or awareness interventions. Given that

research has found that papers reporting novel effects tend to overestimate the size of those effects (Klein et al., 2018), more research is needed to identify the average effect of perceived variability interventions. As such, while the intervention appears promising, more research is needed to investigate its effects in real-world settings.

Targeting students may be more effective than targeting adults

The vast majority of prejudice reduction experiments have been conducted in educational settings. We found that interventions targeting students were more effective than interventions targeting adults. This finding is broadly consistent with the findings of other meta-analyses on specific interventions types (Pettigrew & Tropp, 2006).

There are at least three plausible reasons for this finding. First, there are higher degrees of control of the environmental conditions in school settings and this may lead to greater intervention effectiveness. This is supported by prior research that finds environmental conditions enhance the impact of contact on prejudice (Pettigrew & Tropp, 2006). First, the original form of contact theory specified four conditions that needed to be met for contact to be effective (Allport, 1954): equal status; common goals; institutional support; and intergroup cooperation. Educational environments are more likely to meet these requirements as students tend to be in fairly egalitarian environments, the curriculum may involve working together in groups, and schools tend to maintain authority, although this cannot be assumed in all instances (Ülger et al., 2018). Second, younger participants may be more receptive to interventions. Developmental psychology research suggests that prejudice is more entrenched among adults than for younger cohorts (Rutland & Killen, 2015; Sears, 1986). Third, it could also be that as much research has been focused on students in school settings, at the expense of research on adults, less is known about what makes an effective community-based adult targeted

intervention. While school settings technically meet the definition of a field setting, it is a more controlled environment compared to general community settings, thus, there is greater likelihood of intervention robustness in schools. The smaller effect size for adults could reflect nascent research on how to effectively shift prejudice in less structured communities. Future work should be directed towards a richer understanding of what works in general community settings with adult participants.

Interventions most effective for disability-based prejudice, but further research is needed

The largest effect size was for studies tackling disability-based prejudice. This finding is consistent with a previous meta-analysis, focusing only on contact interventions, that also found notable difference in effects for disability (Paluck et al., 2019). However, both that meta-analysis and the present study are contrary to an earlier meta-analysis that found that effect size was not significantly different across categories (Pettigrew & Tropp, 2006). Our findings regarding disability-based prejudice appeared to be attributable to a small number of studies conducted prior to 2009 that reported particularly high effect sizes. When we limited the sample to the time period after 2009, we found that studies addressing race-based prejudices had the largest effect size. As such, we suggest that further research on disability-based prejudice is needed to confirm the possibility that interventions may be more effective for reducing disability-based prejudice than other types of prejudice.

Sustained impact of prejudice reduction interventions

We looked at field experiments because we wanted to examine what works in the real world to inform practical efforts to reduce prejudice. Thus, it was critical to know whether

effects endured over time. Promisingly, results indicate that the impact of prejudice reduction interventions endured overtime. This finding is consistent with Lemmer and Wagner (2015), who found that contact effects persisted over time. However, caution should be exercised in interpreting this conclusion as the analysis showed that few studies were tested two months or more after the intervention, presenting a significant gap in the literature on what happens after this period. The gap was also recently noted in the context of prejudice reduction interventions in school contexts (Ülger et al., 2018) and for “light touch interventions” (Paluck et al., 2021).

Not only did the effects of prejudice reduction interventions persist over time, we also found the impact of these interventions was largest when it measured 3 months after the intervention occurred. This result adds richness to what we understand about persistence from single studies. Looking at single studies suggested that the persistence of prejudice reduction interventions was mixed. Multiple studies found a significant but smaller impact on prejudice over time – ranging from 4-6 weeks to 15 months after the intervention (Berger, Benatov, Abu-Raiya, & Tadmor, 2016; Murrar & Brauer, 2018; White, Abu-Rayya, & Weitzel, 2014). While other studies found a significantly stronger effect over time periods of three months to two years after the intervention (Berger, Brenick, Lawrence, Coco, & Abu-Raiya, 2018; Neto, Da Conceição Pinto, & Mullet, 2016) or a non-significantly stronger effect over time (Broockman & Kalla, 2016). These mixed results could reflect a number of different mechanisms at play.

The increase in the effects on prejudice over time might be due to changes in how individuals interpret new information about the relevant outgroup. Research has indicated that prejudice against an outgroup increases the likelihood of relying on misinformation about that outgroup (Ecker, Lewandowsky, Fenton, & Martin, 2014). As such, reducing prejudice could

lead to further reductions in prejudice over time because it changes subsequent interpretation of information about the relevant outgroup. Further research is needed to investigate this possibility.

More generally, the strengthening of the impact of prejudice reduction intervention over time warrants further investigation in future studies. A larger sample of studies with outcomes measures at multiple points is necessary to give a clearer picture of whether the effect size of prejudice reduction interventions changes over time and the relevant mechanism at play.

Scalability of prejudice reduction interventions

Given the pernicious problem of prejudice in the community, we note that discussions pertaining to the scalability of interventions, or the capacity of programs and interventions to increase in reach and impact, were almost universally absent in published literature. Of the studies that we considered in this meta-analysis, there was no explicit and detailed consideration of how scalable effective interventions may be to larger populations. For interventions to have a sustained impact in the real world, implementation science research indicates that it is not enough to just consider effectiveness, it is also necessary to consider scalability (Milat, King, Bauman, & Redman, 2013). Consideration of scalability is also essential for practitioners who may be interested in replicating the intervention in other contexts. Future research is needed to identify the characteristics that prejudice reduction interventions need to be scalable, and consideration should also be given as to whether particular prejudice reduction interventions meet those criteria.

Limitations

The primary limitation of this review is that some of the subgroup analyses relied on a small number of studies. For example, there were a relatively small number of studies that: tested

interventions other than contact and awareness; used adult participants; or, focused on prejudice based on factors other than race, ethnicity, or religion. There are differing views as to minimum sample size for subgroup analysis, ranging from 2 to 4 studies (Fu et al., 2010; Valentine, Pigott, & Rothstein, 2010). We have presented subgroup analysis even for small samples with caveats to interpretation in order to highlight areas where there is a need for subsequent research on these topics so that average effects can be more accurately estimated.

We tried to comprehensively uncover research across all forms of prejudice in this review. The term ‘racism’ was specifically included in our search terms as we knew that many studies considered this type of prejudice. However, we acknowledge that this may have also weighted results towards this type of prejudice.

Conclusion

This systematic review and meta-analysis shows that research on prejudice reduction has matured substantially since Paluck and Green’s 2009 review identified a dearth of field experiments on the topic. Our meta-analysis of 50 field experiments (69 intervention arms) indicates that prejudice reduction interventions are effective on average in reducing prejudice in real world settings. Moreover, their effects tend to persist over time. However, our review identifies that the effectiveness of prejudice reduction interventions varies across intervention types and participant types. Prejudice reduction interventions have larger effect size when using contact rather than awareness approaches, and a larger effect for school cohorts as opposed to adults.

Notwithstanding these advances, there is still a need for more research using field experiments if researchers and practitioners want to successfully tackle prejudice in the real world. While it is heartening to see that in the past decade there are more studies that are

designed and reported to allow for a better understanding of what works to reduce prejudice, it is necessary to continue to build evidence in a way that helps understand the effectiveness of the suite of theories and methods available. Future work should consider the relative effectiveness of different approaches and theories especially those approaches that have had promising initial findings but relatively little research, such as perceived variability. Similar focus should be placed on the relatively unexplored participant group of adults in community settings.

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Tables

Table 1 Description of included interventions

Subgroup	<i>n</i>	%
<i>Regions</i>		
Europe	25	36
North America	27	39
Asia and Middle East	10	14
Other (inc. Australia, Africa)	7	10
Total	69	100
<i>Participants</i>		
Adults	11	16
Primary and pre-school	32	46
Secondary	16	23
College	9	13
Adult/students	1	1
Total	69	100
<i>Approach</i>		
Contact	34	49
Awareness	28	41
Categorisation	5	7
Perspective taking	12	17
Social norms	4	6
Perceived variability	1	1

Total	84*	100
<i>Target</i>		
Race/religion/ethnicity	54	78
Obesity	4	6
Sexuality and gender identity	2	3
Disability	9	13
Total	69	100

* Some studies used multiple intervention approaches

Table 2 Description of included interventions by year

Year of study	<i>n</i>	%
1959-1968	2	3
1969-1978	10	14
1979-1988	3	4
1989-1998	5	7
1999-2008	15	22
2009-2018	34	49
Total	69	100

Table 3 Comparison of approaches

Approach	Number of studies (<i>n</i>)	Average effect	Confidence interval
Contact only	20	0.612***	[0.298; 0.927]
Awareness only	18	0.442**	[0.153; 0.731]
Categorisation only	6	0.264	[-0.083; 0.610]
Social norms only	3	0.154	[-1.535; 1.842]
Perceived variability only	1	0.908***	[0.778; 1.037]
Perspective taking only	4	0.236	[-0.400; 0.872]
Contact and Categorisation	4	0.296	[-1.060; 1.651]
Contact and Awareness	4	0.939	[-2.739; 4.617]
Contact, Awareness and Perspective taking	3	1.090	[-0.786; 2.967]
Contact and Perspective taking	2	0.708*	[0.450; 0.966]
Contact and Social norms	1	0.010	[-0.129; 0.148]
Awareness and Perspective taking	3	0.539	[-0.922; 2.000]
Total	69	0.51***	[0.33;0.68]

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4 Subgroup analysis by participants

Participants	Number of studies (<i>n</i>)	Average effect	Confidence interval
Primary	32	0.517***	[0.302; 0.733]
Secondary	16	0.581**	[0.266; 0.895]
College	9	1.100*	[0.045; 2.156]
Adults	11	0.029	[-0.311; 0.370]
Adults / students	1	0.439**	[0.119; 0.759]
Total	69	0.51***	[0.33;0.68]

*p<0.05, **p<0.01, ***p<0.001

Table 5 Subgroup analysis by target prejudice type

Prejudice types	Number of studies (<i>n</i>)	Average effect	Confidence interval
Race/religion /ethnicity	54	0.492***	[0.290; 0.694]
Obesity	4	0.015	[-0.187; 0.218]
Sexuality / gender identity	2	0.197	[-2.158; 2.552]
Disability	9	0.944**	[0.340; 1.549]
Total	69	0.51***	[0.33;0.68]

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6 Subgroup analysis by time of measurement

Duration	Number of studies (n)	Average effect	Confidence interval	Minimum / maximum duration in group (weeks)	Mean (weeks)	Median (weeks)
A – immediately after	39	0.512***	[0.282; 0.742]	0 / 1	0.4	0
B – up to two months	16	0.151	[-0.178; 0.480]	2/ 6	3.9	4
C – over two months	9	0.733**	[0.290; 1.175]	12 / 104	40.4	40
Total	69	0.51***	[0.33;0.68]	--	--	--

*p<0.05, **p<0.01, ***p<0.001

Figures

Figure 1. PRISMA flow diagram

Figure 2. Contour-enhanced Funnel plot

Figure 3. Standard error and effect size

Figure 4. *P*-curve (*P*-curve App 4.06 <http://www.p-curve.com/app4/>, authors' data)

Note: The observed *p*-curve includes 36 statistically significant ($p < .05$) results, of which 29 are $p < .025$. There were 33 additional results entered but excluded from *p*-curve because they were $p > .05$.

Figure 5. Forest plot of standard errors and effect sizes

Figure 6. Distribution of duration for post-tests