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ORIGINAL ARTICLE

Exploring the Relations Among Knowledge, Contact, and Transgender Prejudice

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Abstract

Over the last few years there has been an increase in anti-trans rhetoric and violence towards transgender individuals, the consequences of which continue to adversely affect transgender people's lives. Given these societal ramifications, it is crucial to explore how transprejudice (prejudice against transgender people) might be ameliorated. Research within social psychology has repeatedly shown intergroup contact to reduce various forms of outgroup prejudice, but little extant research has tested this association for prejudice related to transgender identity. We conducted three cross-sectional studies which tested the relation between contact (quantity and quality) with transgender people, trans-related knowledge (i.e., participants' self-reported level of knowledge about experiences of transgender people), and transprejudice (cognitive and affective). Across the three studies, we found that contact quantity and contact quality significantly mediated the negative relationship between knowledge and transprejudice (although contact quality was a more consistent mediator). Those with more trans-related knowledge had more frequent and better-quality contact with trans people, and in turn showed less prejudice towards transgender people. We found less consistent support for an alternative mediation model with prior knowledge mediating the contact to transprejudice link. These findings demonstrate the importance of the role of both knowledge about and contact with transgender people as a means of transprejudice reduction, with wide-reaching implications for creating environments that are diverse, equitable, and inclusive.

Keywords Intergroup contact · Knowledge · Transgender prejudice · Prejudice reduction

In recent years, there has been increased public focus on societal harm to transgender individuals related to transprejudice (Axt et al., 2021; Flores et al., 2018; Hayes & Reiman, 2021). Transgender individuals in the UK and overseas experience risks to their physical health and mental well-being (Amnesty International, 2023; Dickey & Budge, 2020; McLean, 2021). The LGBT rights charity, Stonewall, reports that transgender (vs. cisgender) people in the UK experience higher levels of poverty and unemployment (Stonewall, 2018). Moreover, legislation that detrimentally impacts transgender individuals exists in dozens of countries around the world, including over 40 United Nations member states that criminalise various aspects of transgender identity (United Nations, 2024). Despite this, research on transprejudice (prejudice against transgender people) is still in its infancy. In the current research, we set out to explore means by which negative attitudes towards transgender individuals might potentially be ameliorated, specifically by exploring the links between knowledge about transgender people, contact with transgender people, and transprejudice.

Contact and Prejudice

Research on intergroup contact can be traced back to the classic work of Gordon Allport who asserted that under optimal conditions, an individual who experiences positive contact with a member of an outgroup is likely to develop a more positive attitude towards that outgroup, referred to as the contact hypothesis (Allport, 1954). A wealth of research studies has supported the contact hypothesis, including a series of classic field experiments known as the Jigsaw Classrooms (Aronson & Bridgeman, 1979). In

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these experiments, school children worked with others from various social group categories, including those belonging to minoritized racial groups, and found that the academic performance of the school children improved, and more importantly for the context of this research, there was a reduction in racial prejudice amongst the school children, thereby illustrating the utility of Allport's contact effect for prejudice reduction.

Social psychologists have continued to explore the contact effect among various kinds of social groups. For example, Zagefka et al. (2017) found that non-native Chileans who reported having more contact with native Chileans showed more positive attitudes towards them; Vázquez et al. (2023) explored the contact effect in the context of social class and found that middle and upper class individuals who had more frequent and better contact with working-class individuals contributed less to social inequality; and Miller et al. (2004) found that contact with Black university students was associated with lower levels of self-reported racial prejudice from White students. The contact effect has been observed in a myriad of other social group contexts including attitudes towards those with ill mental health (Giacobbe et al., 2013; Maunder et al., 2019; Stathi et al., 2012; West et al., 2011, 2014), physical disabilities (Barr & Bracchitta, 2015; Cocco et al., 2023; Kalyva & Agaliotis, 2009; McDougall et al., 2004; Seo & Chen, 2009), people of different religions (Paolini et al., 2004; Schmid et al., 2009), sexual orientations (Hodson et al., 2009; Vonofakou et al., 2007; West & Hewstone, 2012), and ethnicities (Husnu et al., 2024; Ng et al., 2023).

As highlighted thus far, a lot of work in the contact literature relies on self-reported and cross-sectional data, which limits the ability to make causal inferences about the directional effects of contact. However, the contact effect has been shown to occur under experimental conditions as well. Indeed, a meta-analysis of 69 field experiments showed intergroup contact to be an effective tool for prejudice reduction in various social group contexts (Hsieh et al., 2022). For example, West et al. (2015) conducted an experimental study where participants (heterosexual men) were randomly assigned either to imagine having a positive interaction with a gay man or no contact. Participants in the positive contact condition reported more positive attitudes towards gay men compared to the control. Lee and Chen (2023) conducted a study with three experimental conditions wherein participants had contact with a virtual Syrian refugee within an online game where participants interacted with the virtual refugee either through the course of a week or approximately one hour (under lab conditions). They found that the more contact participants had with the refugee, the closer they felt to the target outgroup member. Similarly, Branham (2024) conducted an experiment using virtual reality (VR) to facilitate contact with a Muslim person living in the Central African Republic. Participants in the contact condition were presented with a narrative documentary of said person talking about their experiences of conflict in the country or no such contact. Branham (2024) found that participants in the contact condition exhibited lower levels of prejudice against Muslims compared to those in the control condition. Moreover, the VR intervention seemed to act as a buffer against participants' self-reported previous negative contact with Muslim people. These experimental studies provide evidence to support a causal link between contact and prejudice.

It is worth noting at this juncture an important distinction in the contact literature: the distinction between contact quantity and contact quality. There is evidence that both the amount of contact one has (i.e., contact quantity), but also the nature and quality of this contact, have prejudice reducing effects, and some studies suggest that contact quality is a more potent predictor than contact quantity. For example, Voci and Hewstone (2003) measured Italian participants' attitudes towards immigrants and found contact quality to be a better predictor of reduced prejudice compared to contact quantity. Specifically, they found that those who reported experiences of good contact quality with immigrants (vs. poor contact quality) showed higher support for legislative rights for immigrants, whereas contact quantity did not. Similarly, Stephan et al. (2000) tested American participants' attitudes toward Mexicans (and vice-versa) and found a direct relationship whereby contact quality predicted a better attitude towards the outgroup. However, the authors found only an indirect relationship between contact quantity and outgroup prejudice, suggesting that contact quantity does not always have a direct influence on intergroup relations. To best understand intergroup contact as a potent prejudice reduction tool in different intergroup contexts, it is important to distinguish between the effects of contact quality and quantity—in the current research, we measure both.

Contact and Transprejudice

One intergroup contact context that remains understudied includes transgender and cisgender people. In one meta-analysis of 515 intergroup contact studies, 51% of those studies were related to race or ethnicity, and none of the studies related to gender identity (Pettigrew & Tropp, 2006). In a more recent meta-analysis by Zhou et al. (2019), approximately 46% of the 248 studies included were related to interracial/interethnic contact and less than 4% of the studies were coded as being related to LGBT intergroup contact, illustrating that the research on intergroup contact related to transgender identity remains scarce. Given that transgender people frequently experience violence, as well as risks to their mental health and general well-being (Amnesty

International, 2023; Dickey & Budge, 2020; McLean, 2021), it is vital to examine whether the contact effect would be helpful for reducing intergroup prejudice in this context and lessen these negative consequences.

Indeed, recent research on transgender prejudice suggests that positive effects of contact can be observed in this context as well. For instance, Boccanfuso et al. (2021) found that cisgender participants showed lower levels of anti-trans stigma after having online contact with an ostensibly transgender counterpart. Earle et al. (2021) conducted a cross-national study looking at attitudes towards LGBTQ + individuals and found that contact with transgender people was negatively associated with transprejudice—an effect that was strongest in countries with fewer pro-trans rights and legislation. Another study by Rani and Samuel (2019) found that both direct contact and indirect contact (i.e., contact with a person who has contact with a member of an outgroup; Wright et al., 1997) with transgender people were associated with lower levels of transprejudice. Finally, Moss-Racusin and Rabasco (2018) found that likeability and employability ratings for transgender job applications were significantly higher (compared to a control condition) following an imagined intergroup contact intervention. These findings illustrate that intergroup contact can be an effective means by which transprejudice is reduced.

Effects of Knowledge on Prejudice

According to Pettigrew and Tropp (2008), intergroup contact can reduce prejudice in one of three ways: through enhancing knowledge about a target outgroup; by reducing any anxieties regarding contact with outgroup members; or by increasing empathy towards outgroup members. We focus on knowledge in the current research for two main reasons. First, knowledge about the target group has been found to be an important determinant of intergroup outcomes (for review see Molina et al., 2016; Pettigrew & Tropp, 2008). For example, Zagefka et al. (2017) examined prejudice against Non-Indigenous Chileans and found that outgroup knowledge (i.e., self-reported awareness of the experiences of Non-Indigenous Chileans) was significantly inversely related to prejudice. Schumann and Moore (2022) tested the effectiveness of an online intergroup contact intervention aimed at reducing anti-Muslim prejudice and found that self-reported knowledge about Western-Muslim relations was significantly negatively associated with prejudice.

One possible explanation for why knowledge yields positive attitudes toward outgroup members is that being informed about the experiences and/or cultures of others not only reduces the anxiety surrounding intergroup contact (thus increasing motivation to engage in intergroup contact), but outgroup knowledge also increases awareness of cues that might help guide behaviour during intergroup contact (Zagefka et al., 2017). Knowledge is also of interest because it is a variable that potentially lends itself to the design of interventions – one might be able to imagine how an intervention can improve knowledge about the outgroup more easily than an intervention that is aimed at reducing intergroup anxiety, for example. It is important to note that the study findings highlighted here are based on participants' own assessment of their outgroup knowledge – which might not always be accurate. Insights from Kruger and Dunning (1999) have demonstrated that in various domains, people often misjudge their level of skills or knowledge on any given subject matter.

Current Study

Building on past work on intergroup contact and extending it to transgender prejudice (Binder et al., 2009; Paolini et al., 2016; Pettigrew & Tropp, 2008), the current research examines whether better and/or more contact would predict more knowledge about transpeople, which then would predict lower transprejudice, or alternatively, whether more knowledge would predict better and/or more contact, which in turn would predict less transprejudice. We present three studies in which we tested whether prior knowledge about transgender individuals was inversely associated with transprejudice, and whether this relationship was mediated by contact. We also tested the opposite sequence of events, i.e., whether contact (both in terms of quantity and quality) was inversely associated with transprejudice, and whether this relationship was mediated by knowledge about trans people. We chose to operationalise transprejudice using one cognitive and one affective measure to assess different dimensions of prejudice (Tropp & Pettigrew, 2005). Data and analysis code, as well as any additional information for all three studies can be found on the Open Science Framework (OSF) (https://osf.io/xkmh2/).

Study 1

Method

Participants

We recruited a total of 150 first year undergraduate students at a British university in exchange for course credit. Four of these participants were excluded for submitting incomplete data. This left a final sample of 146 participants aged between 17 and 47 years ($M_{age} = 19.52$ years, $SD = 3.31$; 79.5% ($n = 116$) cisgender female, 11.6% ($n = 17$) cisgender male, 6.2% ($n = 9$) non-binary, 0.7% ($n = 1$) transgender

female, 2.1% ($n = 3$) unreported gender identity; 67.1% ($n = 98$) heterosexual, 9.6% ($n = 14$) bisexual, 7.5% ($n = 11$) gay/lesbian, 6.8% ($n = 10$) reported multiple sexual orientation, 3.4% ($n = 5$) pansexual, 0.7% ($n = 1$) asexual, 4.8% ($n = 7$) unreported sexual orientation; 54.8% ($n = 80$) White/Caucasian, 13% ($n = 19$) South Asian, 4.8% ($n = 7$) Black/African, 4.1% ($n = 6$) East Asian, 4.1% ($n = 6$) Southeast Asian, 3.4% ($n = 5$) Middle Eastern, 3.4% ($n = 5$) mixed race, 1.4% ($n = 2$) Hispanic/Latinx, 11% ($n = 16$) unreported or unspecified race/ethnicity. To determine what effect size could be detected given the final sample size, we conducted a post-hoc sensitivity power analysis in Gpower (Erdfelder et al., 1996). Assuming 80% power and $\alpha = .05$, this sample size enabled us to detect a small effect size of $r = .25$ in a linear regression test with two predictors.

Measures

Knowledge of Transgender People

We operationalised perceived knowledge of trans people using a self-report measure adapted from Zagefka et al. (2017). The scale contained two items: "In general, how much do you know about transgender people?" and "In general, how much do you know about the experiences of transgender people?" Responses ranged from 1 (*nothing at all*) to 5 (*a great deal*). The two items were significantly correlated ($r = .67$) and averaged to create a knowledge score, with higher scores indicating more self-reported knowledge about transgender people.

Contact Quantity

Using a measure from past research (Boccanfuso et al., 2021), contact quantity was assessed by asking participants to give a numerical response to the question: "How many transgender people do you know personally?" The item had an open-ended response format with higher numbers representing more contact.

Contact Quality

Using a measure from past research (Boccanfuso et al., 2021), contact quality was assessed by asking participants the following two questions: "How close do you feel to the transgender people you know personally?" and "How often do you spend time with transgender people?" The response scale for the two items ranged from 1 (*not close at all/never*) to 5 (*extremely close/always*). However, participants who reported 0 contact quantity with trans people ($n = 57$) were assigned a score of 0 for the first contact quality question. As the items were significantly correlated ($r = .76$), we averaged across both contact quality items to create an overall mean score for contact quality. Of note, we kept the latter item of the contact quality measure as is, but it is possible there is some overlap whereby this question taps into contact *quantity* rather than contact *quality*. As such, we checked to see whether excluding the second question would change our pattern of results. While the bivariate correlations remained unchanged, there were some subtle but important differences in the mediation analyses. We discuss this further in the General Discussion.

Transprejudice

Cognitive transprejudice was measured with three items: "Participation in female sports should be based on sex and not gender;" "People should be excluded from female-only spaces based on sex and not gender;" and "Gender neutral toilets are unnecessary in a facility as long as there are both male and female labelled toilets" ($\alpha = .64$). All items were completed using a response scale ranging from 1 (*completely disagree*) to 5 (*completely agree*). Responses were averaged to create a mean score, with higher scores indicating more cognitive transprejudice. *Affective transprejudice* was measured with two feeling thermometers, one asking about transgender women and the other asking about transgender men: "Please indicate how positively you feel towards transgender women/men." As such, each feeling thermometer was a single-item measure. Responses ranged from 1 (*extremely negative*) to 5 (*extremely positive*). Responses to the items were reversed so that higher scores would indicate more affective transprejudice. Responses to the two items were highly correlated ($r = .99$), and therefore we averaged across the two items to create one overall measure of affective transprejudice.

Procedure

We created this study online using web-based survey software, Qualtrics. Participants accessed the study through the university experiment management system. At the start of the study, participants were informed that the study was looking at how attitudes and beliefs influence the way in which individuals relate to others. After giving informed consent, participants completed the prior knowledge measure, followed by the contact quantity and contact quality measures. Participants were then asked to complete the cognitive and affective transprejudice measure in that order. Finally, we asked participants to report their demographic information, including age, gender, sexuality, and ethnicity, after which they were debriefed at the end of the study. We did not implement any attention checks in this study. All aspects of this and the subsequent studies adhered to the

ethical standards of the British Psychological Society and received ethical clearance prior to data collection, from the ethics committee at the first authors' institution. This study was part of a larger pilot study preregistered for a different purpose, which included variables that are not relevant to the research questions and hypotheses presented here. However, none of these measures were alternative outcome measures, and the full list of items measured for Study 1 can be found on the OSF (https://doi.org/10.17605/OSF.IO/6KEWF).

Results and Discussion

There were 73 data points missing for total scores across the five target variables (10.8% of the full data). This was handled using pairwise deletion and full information maximum likelihood. A test of multivariate normality was conducted using the MVN package in R (Korkmaz et al., 2014), which indicated that the data were not normally distributed, $H = 150.74$, $p < .001$. As an initial step, we conducted zero-order correlation analyses, alongside means and standard deviations for the study variables (see Table 1). The results reported in Table 1 are based on Pearson correlations but note that Spearman correlations showed the same overall pattern of results. Our zero-order correlation analyses showed that only contact quality was significantly negatively correlated with affective transprejudice; and knowledge, contact quantity, and contact quality were all significantly negatively correlated with cognitive transprejudice.

We then conducted two sets of mediation analyses using the Lavaan package in R 4.2.2 (Rosseel, 2012). The first set of models included knowledge as the independent variable, contact quantity or quality as the mediator variable, and cognitive or affective transprejudice as the dependent variable (note that including contact quantity and quality as parallel mediators fit the data poorly, so we opted to test them in separate models). The second set of models included knowledge as the mediator between contact quantity or quality and transprejudice. See Fig. 1 for an illustration of the mediation analyses.

Cognitive Transprejudice

Models with Contact as Mediator

In the first model, we found that contact quantity significantly mediated the link between knowledge and cognitive

Table 1 Means, Standard Deviations, and Zero-Order Correlations for Knowledge, Contact, and Transprejudice Variables in Study 1

Study Variables	*M* (*SD*)	1	2	3	4
1. Knowledge	2.71 (0.78)	-			
2. Contact Quantity	1.38 (1.74)	0.51***	-		
3. Contact Quality	1.57 (1.10)	0.48***	0.73***	-	
4. Cognitive Transprejudice	2.61 (0.92)	-0.24**	-0.35**	-0.32***	-
5. Affective Transprejudice	1.44 (0.68)	-0.11	-0.17	-0.22*	0.37***

Note. * $p < .05$. ** $p < .01$. *** $p < .001$.

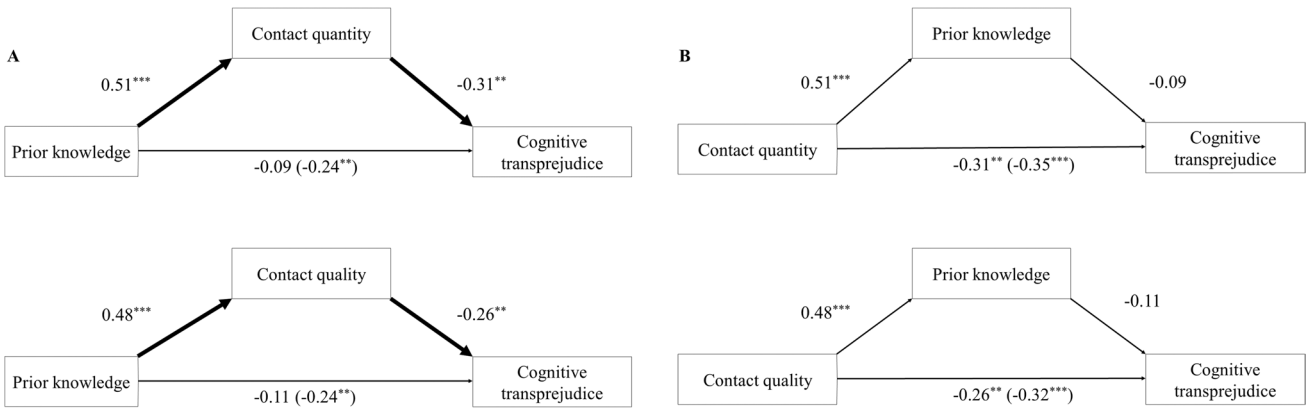


Fig. 1 Study 1 Models with (**a**) Contact as a Mediator Between Knowledge and Cognitive Transprejudice, and (**b**) Knowledge as a Mediator Between Contact and Cognitive Transprejudice. *Note*. ** $p < .01$. *** $p < .001$. Path coefficients are standardized. Bold lines indicate a significant mediation

transprejudice, $ab = -.15$, $p = .01$, 95% CI [-0.33, -0.05]. The total effect was significant, $c = -.24$, $p = .003$, 95% CI [-0.46, -0.08], whereas the direct effect of knowledge on cognitive transprejudice was no longer significant when contact quantity was included in the model, $c' = -.09$, $p = .36$, 95% CI [-0.32, 0.13]. This finding suggests that less contact with transgender people explains the link between less knowledge about transgender people and higher cognitive transprejudice.

In the second model, we found that contact quality significantly mediated the link between knowledge and cognitive transprejudice, $ab = -.13$, $p = .01$, 95% CI [-0.28, -0.05]. The total effect was significant, $c = -.24$, $p = .003$, 95% CI [-0.46, -0.09], whereas the direct effect of knowledge on cognitive transprejudice was no longer significant when contact quality was included in the model, $c' = -.11$, $p = .22$, 95% CI [-0.34, 0.08]. This finding suggests that less contact quality explains the link between less knowledge about transgender people and higher cognitive transprejudice.

Models with Knowledge as Mediator

In the first model, knowledge did not emerge as a significant mediator between contact quantity and cognitive transprejudice, $ab = -.05$, $p = .35$, 95% CI [-0.08, 0.03]. Both the total effect, $c = -.35$, $p < .001$, 95% CI [-0.26, -0.10], and the direct effect were significant, $c' = -.31$, $p = .001$, 95% CI [-0.25, -0.06]. Similarly, knowledge did not emerge as a significant mediator between contact quality and cognitive transprejudice, $ab = -.06$, $p = .24$, 95% CI [-0.13, 0.03]. Both the total effect, $c = -.32$, $p < .001$, 95% CI [-0.40, -0.14], and the direct effect were significant, $c' = -.26$, $p = .01$, 95% CI [-0.38, -0.07].

Affective Transprejudice

Models with Contact as Mediator

The bivariate correlations showed that affective transprejudice only correlated with contact quality. However, because indirect effects can still be significant even in the absence of direct effects, mediation was tested with affective transprejudice as an outcome across all mediation models (see Fig. 2). In the first model, contact quantity emerged as a significant mediator, $ab = -.07$, $p = .08$, 95% CI [-0.14, -0.002]. Neither the total effect, $c = -.11$, $p = .21$, 95% CI [-0.24, 0.07], nor the direct effect were significant, $c' = -.04$, $p = .69$, 95% CI [-0.21, 0.16]. This finding suggests that individuals with more knowledge about trans people tend to have more frequent contact with trans people, which in turn is linked to lower levels of affective transprejudice. In the second model, contact quality also emerged as a significant mediator, $ab = -.09$, $p = .07$, 95% CI [-0.18, -0.006]. Neither the total effect, $c = -.12$, $p = .20$, 95% CI [-0.25, 0.07], nor the direct effect were significant, $c' = -.03$, $p = .84$, 95% CI [-0.21, 0.21]. This finding suggests that individuals who have more knowledge about trans people tend to experience more quality contact with trans people, which in turn is linked to lower levels of affective transprejudice.

Models with Knowledge as Mediator

In the first model, knowledge did not emerge as a significant mediator between contact quantity and affective transprejudice, $ab = -.03$, $p = .66$, 95% CI [-0.05, 0.04]. Both the total effect, $c = -.16$, $p = .003$, 95% CI [-0.10, -0.02] and the direct effect were significant, $c' = -.13$, $p = .05$, 95% CI [-0.11, -0.003]. In the second model, knowledge also did not emerge

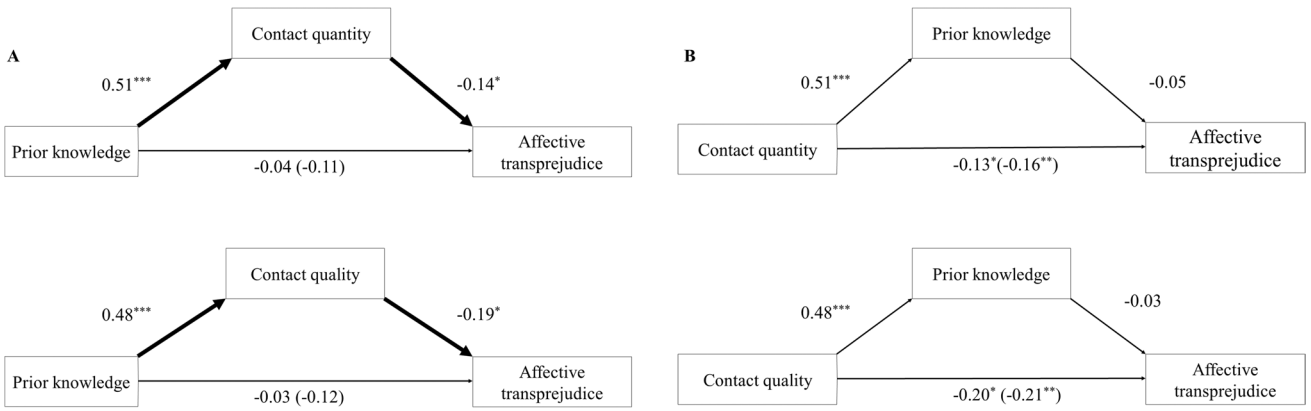


Fig. 2 Study 1 Models with (**a**) Contact as a Mediator Between Knowledge and Affective Transprejudice, and (**b**) Knowledge as a Mediator Between Contact and Affective Transprejudice. *Note.* *$p < .05$, **$p < .01$, ***$p < .001$. Path coefficients are standardized. Bold lines indicate a significant mediation

as a significant mediator between contact quality and affective transprejudice, $ab = -.01$, $p = .84$, 95% CI [-0.08, 0.08]. Both the total effect, $c = -.21$, $p = .001$, 95% CI [-0.21, -0.06] and the direct effect were significant, $c' = -.20$, $p = .04$, 95% CI [-0.25, -0.01].

Summary

In Study 1 we found a general pattern whereby contact quantity and quality each emerged as significant mediators linking knowledge and both measures of transprejudice. Specifically, when transprejudice was operationalised via cognitive transprejudice, we found that higher knowledge about transgender people predicted less transprejudice, and this was explained by more frequent and better quality contact with transgender people. The same pattern emerged for affective transprejudice, although the pattern was less strong (only the indirect path was significant). The reverse order of variables did not hold whereby knowledge would mediate the link between contact quantity/quality and transprejudice. Thus, this pattern suggests that more knowledge about trans people may foster more frequent and quality contact with trans people, which in turn may reduce transprejudice. When we tested these hypotheses using only data from cisgender participants ($N = 133$), the pattern of findings remained largely unchanged with one exception: neither contact quantity nor contact quality emerged as significant mediators between knowledge and affective transprejudice.

Study 2

Given the pattern of findings of our first study that contact emerged as a more effective mediator than knowledge, we sought to test whether this pattern would replicate. We also wanted to preregister and test our hypotheses using a non-student sample. Thus, we conducted our second study through an online participant recruitment platform and preregistered this study on the OSF (https://doi.org/10.17605/OSF.IO/UEP62).

Method

Participants

We recruited a total of 201 UK-based cisgender participants online through Prolific. The focus on cisgender participants was informed by the desire to investigate the effects of intergroup contact between non-trans and trans people. We excluded two participants who reported their gender identity as non-binary. This left a final sample of 199 participants aged between 18 and 80 years ($M_{age} = 38.67$ years, $SD = 13.52$). This sample comprised of 44.7% ($n = 89$) cisgender women, 47.7% ($n = 95$) cisgender men, 5.5% ($n = 11$) reported their gender identity as 'other', 2% ($n = 4$) unreported or unspecified gender identity; 87.4% ($n = 174$) heterosexual, 4% ($n = 8$) bisexual, 5% ($n = 10$) gay/lesbian, 1% ($n = 2$) asexual, 0.5% ($n = 1$) reported multiple sexual orientation, 0.5% ($n = 1$) pansexual, 1.5% ($n = 3$) unreported or unspecified sexual orientation; 90.5% ($n = 180$) White/Caucasian, 1% ($n = 2$) South Asian, 3% ($n = 6$) Black/African, 1% ($n = 2$) mixed race, 1% ($n = 2$) Southeast Asian, 1.5% ($n = 3$) East Asian, 2% ($n = 4$) unreported or unspecified race/ethnicity. Note that participants who reported their gender identity as 'other' used the textbox provided to specify their gender identity. This indicated a general trend of opposition/rejection of the term 'cisgender' as a descriptor for their gender identity (an example text entry reads, '*I am a woman. A woman born as a woman. I don't like the term cisgender*'). As such, we kept the data of these participants in the analysis as they appear to have met the gender identity criterion for participation.

The sample size was determined a-priori using a sensitivity power analysis in GPower. In a linear regression test with two predictors, assuming 80% power and $\alpha = .05$, a sample size of 200 participants would enable us to detect a small effect size of $r = .22$.

Measures

The same measures from Study 1 were used to assess knowledge ($r = .67$), contact quantity, contact quality ($r = .76$; with those who reported not knowing any trans people ($n = 118$) assigned a 0 for quality), and cognitive transprejudice ($\alpha = .77$).

Affective Transprejudice

As in Study 1, we also operationalised affective transprejudice with a feeling thermometer for transgender women and transgender men. Participants were asked, "Please indicate how you feel about transgender women/men." Responses ranged from 0 (*very cold or unfavourable feeling*) to 100 (*very warm or favourable feeling*). Scores were then reversed, such that higher scores indicated more negative feelings toward trans people. As the scores for

transgender women and men targets were highly correlated ($r = .93$), we averaged across the scores to create one overall score of transprejudice.

Procedure

We recruited cisgender participants through the online recruitment platform Prolific. Participants were identified as cisgender using the platforms' in-built screening tools. The study was described as a study looking at individuals' opinions and beliefs. At the start of the study after giving informed consent, participants read definitions for transgender and cisgender (wo)men, stating that a transgender (wo)man is someone whose sex assigned at birth was different to their current gender identity, whereas a cisgender (wo)man is someone whose sex assigned at birth is congruent with their current gender identity. Following this, participants completed measures of knowledge, contact quantity, and contact quality in a randomised order. Next, participants completed the measures of transprejudice. Finally, participants provided their demographic information (e.g., gender, age, race/ethnicity, sexuality) before debriefing. Participants received £0.40 compensation for their participation.

Results and Discussion

There was one data point missing (0.1%) across the five variables, and missing data was handled through pairwise deletion and full information maximum likelihood. We performed a test for multivariate normality which showed that the data was not normally distributed, $H = 227.51$, $p < .001$. We then calculated bivariate correlations along with the means and standard deviations for all study variables (see Table 2). The results reported in Table 2 are based on Pearson correlations, but Spearman correlations revealed a consistent pattern of results. Zero-order correlations demonstrated that contact quantity, contact quality, and knowledge were all significantly negatively correlated with both cognitive and affective transprejudice. Thus, participants who reported lower levels of contact with and knowledge about transgender people indicated higher levels of transprejudice.

As in Study 1, we then carried out mediation analyses using the Lavaan package in R 4.2.2 (Rosseel, 2012) with knowledge as the independent variable and contact quantity or quality as the mediator variable in the first model, and contact quantity or quality as the independent variable and knowledge as the mediator in the second model (see Figs. 3 and 4).

Table 2 Means, Standard Deviations, and Zero-Order Correlations for Knowledge, Contact, and Transprejudice Variables in Study 2

Study Variables	*M* (*SD*)	1	2	3	4
1. Knowledge	2.30 (0.72)	-			
2. Contact Quantity	0.71 (1.20)	0.42***	-		
3. Contact Quality	1.25 (1.00)	0.45***	0.68***	-	
4. Cognitive Transprejudice	3.20 (1.12)	-0.29***	-0.29***	-0.30***	-
5. Affective Transprejudice	36.85 (26.57)	-0.34***	-0.19**	-0.29***	0.50***

Note. ** $p < .01$. *** $p < .001$.

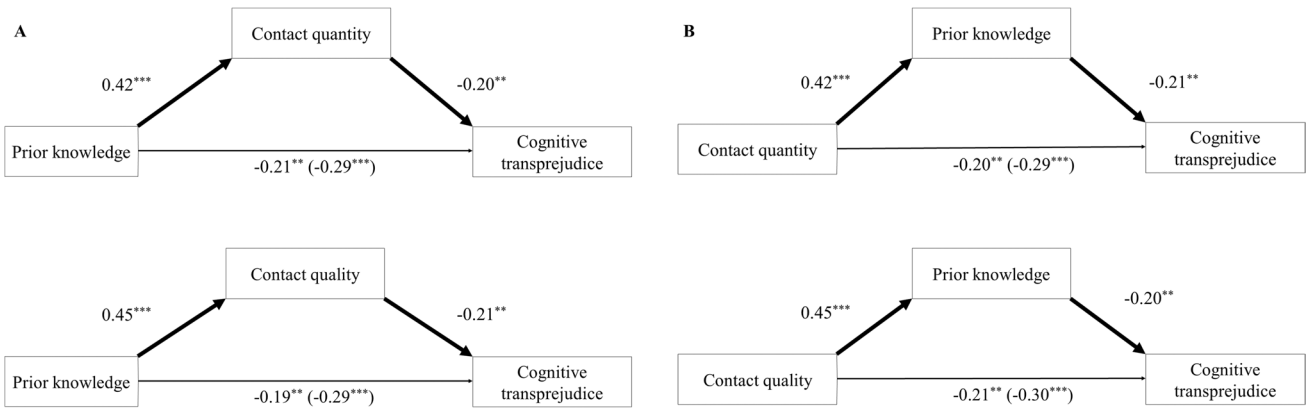


Fig. 3 Study 2 Models with (**a**) Contact as a Mediator Between Knowledge and Cognitive Transprejudice, and (**b**) Knowledge as a Mediator Between Contact and Cognitive Transprejudice**.**

Note. *$p < .05$. **$p < .01$. ***$p < .001$. Path coefficients are standardized. Bold lines indicate a significant mediation

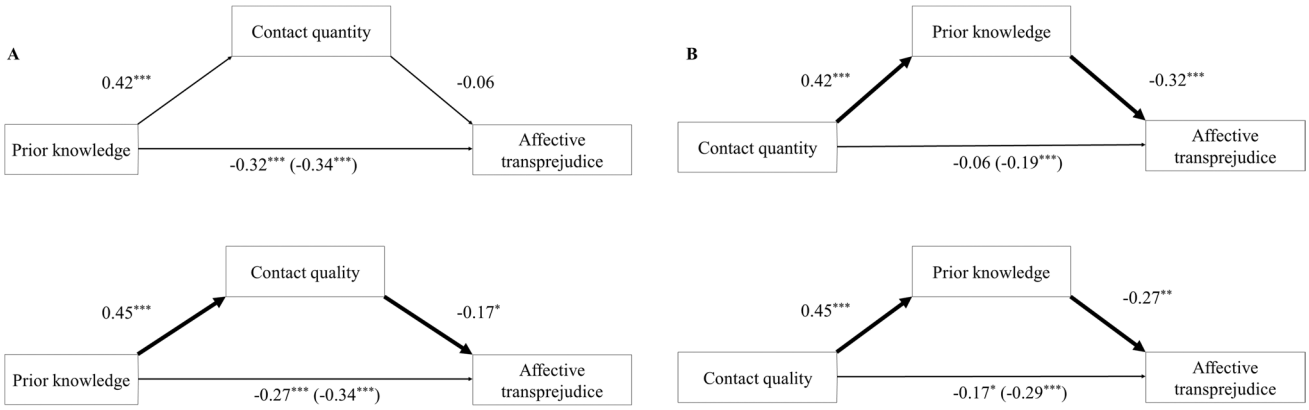


Fig. 4 Study 2 Models with (**a**) Contact as a Mediator Between Knowledge and Affective Transprejudice, and (**b**) Knowledge as a Mediator Between Contact and Affective Transprejudice**.**

Note. *$p < .05$, ** $p < .01$, ***$p < .001$. Path coefficients are standardized. Bold lines indicate a significant mediation

Cognitive Transprejudice

Models with Contact as Mediator

In the first model, we found that contact quantity was a significant mediator between knowledge and cognitive transprejudice, $ab = -.08$, $p = .02$, 95% CI [-0.25, -0.04], such that less knowledge predicted greater cognitive transprejudice through less contact. The total effect, $c = -.29$, $p < .0001$, 95% CI [-0.65, -0.23], and direct effect, $c' = -.21$, $p = .01$, 95% CI [-0.54, -0.08] were both significant, indicating that contact quantity did not fully explain this association (see Fig. 3a). In the second model, we found that contact quality emerged as a significant mediator between knowledge and cognitive transprejudice, $ab = -.09$, $p = .01$, 95% CI [-0.27, -0.04], such that less knowledge predicted higher cognitive transprejudice via lower quality contact. Both the total effect, $c = -.29$, $p < .001$, 95% CI [-0.66, -0.23], and the direct effect, $c' = -.19$, $p = .01$, 95% CI [-0.53, -0.07] were significant, indicating partial mediation (see Fig. 3a).

Models with Knowledge as Mediator

In the first model, knowledge emerged as a significant mediator between contact quantity and cognitive transprejudice, $ab = -.09$, $p = .02$, 95% CI [-0.15, -0.02], indicating that individuals with less frequent contact with trans people showed higher levels of cognitive transprejudice through less knowledge. Both the total effect, $c = -.29$, $p < .001$, 95% CI [-0.40, -0.16], and the direct effect, $c' = -.20$, $p = .004$, 95% CI [-0.32, -0.06] were significant, indicating partial mediation. (See Fig. 3b). In the second model, knowledge again emerged as a significant mediator between contact quality and cognitive transprejudice, $ab = -.09$, $p = .02$, 95% CI [-0.19, -0.03], indicating that poorer quality contact with trans people was linked to higher cognitive transprejudice through less prior knowledge. Both the total effect, $c = -.30$, $p < .001$, 95% CI [-0.49, -0.19], and the direct effect, $c' = -.21$, $p = .003$, 95% CI [-0.40, -0.08], were significant which again, indicates partial mediation (see Fig. 3b).

Affective Transprejudice

Models with Contact as Mediator

In the first model, we found that contact quantity was not a significant mediator between knowledge and affective transprejudice, $ab = -.02$, $p = .36$, 95% CI [-2.77, 1.06]. The total effect, $c = -.34$, $p < .001$, 95% CI [-17.41, -7.81], and direct effect, $c' = -.32$, $p < .001$, 95% CI [-17.37, -6.04] were both significant, however. Thus, contact quantity did not help to explain the relationship between knowledge and affective transprejudice (see Fig. 4a). In the second model, contact quality emerged as a significant mediator between knowledge and affective transprejudice, $ab = -.07$, $p = .02$, 95% CI [-5.21, -0.49]. Both the total effect, $c = -.34$, $p < .001$, 95% CI [-17.21, -7.91], and the direct effect, $c' = -.27$, $p < .001$, 95% CI [-15.44, -4.37], were significant. This finding suggests that individuals with less knowledge about transgender people tended to have poorer contact quality, which in turn was linked to higher affective transprejudice (see Fig. 4a).

Models of Knowledge as Mediator

In the first model, knowledge emerged as a significant mediator between contact quantity and affective transprejudice, $ab = -.14$, $p = .001$, 95% CI [-4.89, -1.43]. The total effect of contact quantity on affective transprejudice was significant, $c = -.19$, $p = .001$, 95% CI [-7.11, -2.11]. However, the direct

effect was no longer significant when the mediator, contact quantity, was considered, $c' = -.06$, $p = .39$, 95% CI [-4.43, 1.39]. This finding suggests that participants with infrequent contact with trans people showed higher levels of affective transprejudice by way of having less knowledge about trans people (see Fig. 4b). In the second model, knowledge emerged as a significant mediator between contact quality and affective transprejudice, $ab = -.12$, $p = .002$, 95% CI [-5.63, -1.36]. Both the total effect, $c = -.29$, $p < .001$, 95% CI [-11.10, -4.62], and direct effect, $c' = -.17$, $p = .02$, 95% CI [-8.35, -0.67], were significant, thereby indicating partial mediation (see Fig. 4b).

Summary

These findings suggest that having less knowledge about transgender people predicts higher levels of transprejudice which can be explained, at least in part, by poor contact quantity and quality. As such, this finding confirms those of our first study, and suggests that better knowledge about trans people is associated with more and better-quality contact with trans people, which in turn is linked to less transprejudice. Interestingly, and in contradiction to Study 1, the reverse mediation analyses showed that knowledge also was a significant mediator. Having less contact with transgender people predicted higher transprejudice through less knowledge about transgender people. So, in these data at least, the effect of knowledge on prejudice was not only explainable by contact, but the effect of contact on prejudice was also explainable by knowledge. As both mediation models were significant, we sought to statistically test which model was a better fit for the data. Inspection of the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) for each model showed that the best fit for the data was achieved by having contact quantity/quality as the predictor, and prior knowledge as the mediator (see Table 3 for the comparative fit indices). Notably, this model with knowledge as the mediator is consistent with the pattern of findings found in classic research on intergroup contact and prejudice (Brown et al., 2007; Stephan et al., 2009; Voci & Hewstone, 2003).

Study 3

Given the inconsistent findings across the first two studies, we tested knowledge and contact again in a series of mediation models in a third study. We note at this point that Study 3 was initially preregistered with different research intentions that included an experimental design. We randomly assigned participants to one of seven conditions where they watched a video of a transgender woman talking about experiences related to university accommodation. We had two independent variables: contact (implicit vs. transgender explicit vs. lesbian explicit) and knowledge (identity relevant topic vs. identity irrelevant topic). We varied contact experimentally by having the woman in the videos mention her trans identity, her lesbian identity, or nothing about her gender identity or sexual orientation. In a similar vein, knowledge was varied by whether the woman spoke about a topic that was relevant to her mentioned identity (i.e., trans identity or lesbian identity) or not. We analysed the results from this study in a two-way factorial ANOVA design but found no significant effects. Because our experimental manipulation appeared to have no effect on our outcome measures, we felt it reasonable and appropriate to utilise this dataset for the purpose of correlation and mediation analyses. The original preregistration and summary of the experimental results for Study 3 can be found on the OSF (https://osf.io/xkmh2/).

Method

Participants and Procedure

A total of 204 first year undergraduates at a British university took part in this study in exchange for course credit.

Table 3 Comparative Fit Indices for Study 2

Model fit index	Knowledge → contact quantity → cognitive transprejudice	Contact quantity → knowledge → cognitive transprejudice	Knowledge → contact quality → cognitive transprejudice	Contact quality → knowledge → cognitive transprejudice
AIC	1207.42	1005.01	1114.95	998.509
BIC	1230.55	1028.13	1138.07	1021.63
Model fit index	Knowledge → contact quantity → affective transprejudice	Contact quantity → knowledge → affective transprejudice	Knowledge → contact quality → affective transprejudice	Contact quality → knowledge → affective transprejudice
AIC	2469.93	2267.52	2373.59	2257.154
BIC	2493.06	2290.64	2396.72	2280.278

Note. AIC = Akaike Information Criterion. BIC = Bayesian Information Criterion

Participants were informed that this was a study exploring interpersonal beliefs and attitudes. We excluded 17 participants who submitted incomplete data. We further excluded 16 participants who failed to meet the criteria for the experimental study (i.e., reported issues watching the video contained in the study, recognised the person in the video, or belonged to a gender identity other than cisgender). This left a final sample of 171 participants aged between 17 and 36 years (M_{age} = 19.01 years, SD = 2.26; 83% (n = 142) cisgender women, 11.1% (n = 19) cisgender men, 5.8% (n = 10) unreported or unspecified gender identity; 62.6% (n = 107) heterosexual, 19.9% (n = 34) bisexual, 7% (n = 12) reported multiple sexual orientation, 2.9% (n = 5) gay/lesbian, 2.9% (n = 5) pansexual, 0.6% (n = 1) asexual, 4.1% (n = 7) unreported or unspecified sexual orientation; 57.9% (n = 99) White/Caucasian, 12.9% (n = 22) South Asian, 8.2% (n = 14) mixed race, 7% (n = 12) Black/African, 3.5% (n = 6) Middle Eastern, 2.3% (n = 4) Southeast Asian, 1.7% (n = 3) East Asian, 1.7% (n = 3) Hispanic/Latinx, 4.7% (n = 8) unreported or unspecified race/ethnicity).

A post hoc sensitivity analysis determined that assuming 80% power and α = .05, this remaining sample size would enable us to detect a small effect size of r = .23 in a linear multiple regression test with two predictors. Participants completed the two transprejudice measures (i.e., cognitive, affective) in counterbalanced order, and then the measures of knowledge, contact quantity, and contact quality in a randomized order. Finally, participants provided their demographic information before being debriefed at the end of the study.

Measures

The same measures from Study 1 and 2 were used to assess knowledge (r = .65), contact quantity, and contact quality (r = .82; with those who reported not knowing any trans people (n = 47) assigned a 0 for quality).

Cognitive transprejudice was measured with six new items completed separately for transgender women and transgender men. The items were as follows: "Transgender women/men should be protected under the law as women/men;" "Transgender women/men should be allowed access to women/men-only spaces;" "I would find it easy to think of transgender women/men as women/men;" "Transgender women/men may identify as women/men but they should not have access to women/men-only spaces;" "I would struggle to think of transgender women/men as women/men;" and "Transgender women/men should only have access to gender-neutral spaces." Items were completed using a response scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), with the first three items reverse scored. Responses were averaged to create separate mean scores for prejudice toward transgender women (α = .91), transgender men (α = .91), and combined (α = .95). The mean total scores for trans women and men were highly correlated (r = .96) and thus we averaged the scores for use in the analyses.

Affective transprejudice was again measured with feeling thermometers but used a slightly different response scale. Participants were asked to indicate their feelings towards transgender women and men separately, using a response scale ranging from 1 (*extremely cold*) to 7 (*extremely warm*). Responses were then reverse scored, such that higher scores indicated more affective transprejudice. As the scores for transgender women and men targets were highly correlated (r = .93), we averaged across the responses to create a single affective transprejudice score.

Results and Discussion

There were 184 data points missing for total scores across the five variables (27.4%), which was handled using pairwise deletion and full information maximum likelihood. A test of multivariate normality indicated that the data were not normally distributed, H = 91.34, p < .001. We calculated bivariate correlations alongside means and standard deviations, which showed that contact quantity and contact quality were significantly negatively correlated with *both* cognitive and affective transprejudice. Notably, knowledge was significantly negatively correlated with affective transprejudice but not cognitive transprejudice (see Table 4). Again, the results reported in Table 4 are based on Pearson correlations, but the overall pattern of results remained unchanged when Spearman correlations were conducted. As in the first two studies, we conducted mediation analyses to test whether contact would mediate the association between knowledge and transprejudice. We also tested the reverse order whereby knowledge would mediate the association between contact and transprejudice. We conducted the mediation analyses using the Lavaan package in R (Rosseel, 2012).

Cognitive Transprejudice

Models with Contact as Mediator

In the first model, we found that contact quantity significantly mediated the association between knowledge and cognitive transprejudice, ab = -.17, p = .01, 95% CI [-0.42, -0.09]. The total effect of knowledge on cognitive transprejudice was not significant, c = -.07, p = .63, 95% CI [-0.44, 0.22], nor was the direct effect, c' = .11, p = .47, 95% CI [-0.27, 0.44]. As such, participants with less knowledge about transgender people reported less contact quantity,

Table 4 Means, Standard Deviations, and Zero-Order Correlations for Knowledge, Contact, and Transprejudice Variables in Study 3

Study Variables	*M* (*SD*)	1	2	3	4
1. Knowledge	3.92 (1.03)	-			
2. Contact Quantity	1.73 (2.80)	0.41**	-		
3. Contact Quality	2.61 (2.05)	0.66***	0.73***	-	
4. Cognitive Transprejudice	2.39 (1.23)	-0.07	-0.33***	-0.28**	-
5. Affective Transprejudice	2.37 (1.25)	-0.30**	-0.28**	-0.38***	0.67***

Note. ** $p < .01$. *** $p < .001$.

which in turn predicted higher levels of cognitive transprejudice (see Fig. 5a). In the second model, we found that contact quality significantly mediated the association between knowledge and cognitive transprejudice, $ab = -.31$, $p = .01$, 95% CI [-0.72, -0.17]. Neither the total effect, $c = -.07$, $p = .63$, 95% CI [-0.44, 0.22], nor the direct effect, $c' = .24$, $p = .16$, 95% CI [-0.12, 0.73], on cognitive transprejudice was significant. Thus, participants who reported having less knowledge about transgender people also reported having poor contact quality, which in turn predicted higher levels of cognitive transprejudice (see Fig. 5a).

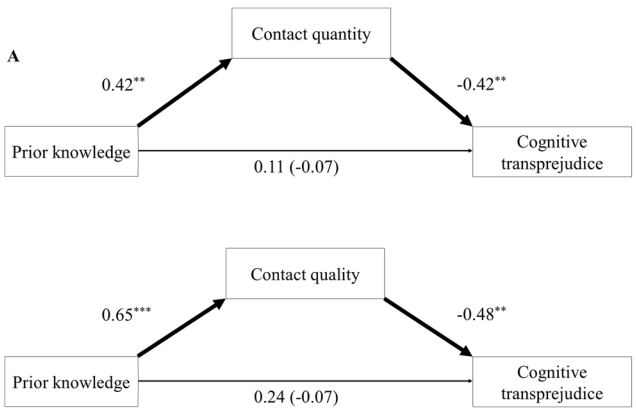
Models with Knowledge as Mediator

In the first model, knowledge did not emerge as a significant mediator between contact quantity and cognitive transprejudice, $ab = .11$, $p = .27$, 95% CI [-0.05, 0.13]. The total effect of contact quantity on cognitive transprejudice was significant, $c = -.33$, $p < .001$, 95% CI [-0.24, -0.10]. The direct effect was also significant, $c' = -.44$, $p = .001$, 95% CI [-0.32, -0.09] (see Fig. 5b). In the second model, knowledge did not emerge as a significant mediator between contact quality and cognitive transprejudice, $ab = .26$, $p = .08$, 95% CI [-0.02, 0.34]. Both the total effect, $c = -.28$, $p = .01$, 95% CI [-0.28, -0.05] and the direct effect, $c' = -.54$, $p < .001$, 95% CI [-0.48, -0.17], on cognitive transprejudice were significant (see Fig. 5b).

Affective Transprejudice

Models with Contact as Mediator

In the first model, contact quantity did not emerge as a significant mediator between knowledge and affective transprejudice; $ab = -.08$, $p = .18$, 95% CI [-0.29, 0.003] (see Fig. 6a). The total effect of contact quantity on affective transprejudice was significant, $c = -.30$, $p = .004$, 95% CI [-0.59, -0.09], but the direct effect was not significant, $c' = -.21$, $p = .10$, 95% CI [-0.53, 0.09] (see Fig. 6a). In the second model, contact quality significantly mediated the effect of knowledge on affective transprejudice, $ab = -.25$, $p = .03$, 95% CI [-0.66, -0.12]. The total effect of knowledge on affective transprejudice was significant, $c = -.30$, $p = .01$, 95% CI [-0.60, -0.10], but the direct effect was not significant, $c' = -.04$, $p = .79$, 95% CI [-0.34, 0.38]. Thus, participants with more prior knowledge about transgender people reported less affective transprejudice, which was mediated by better contact quality (see Fig. 6a).



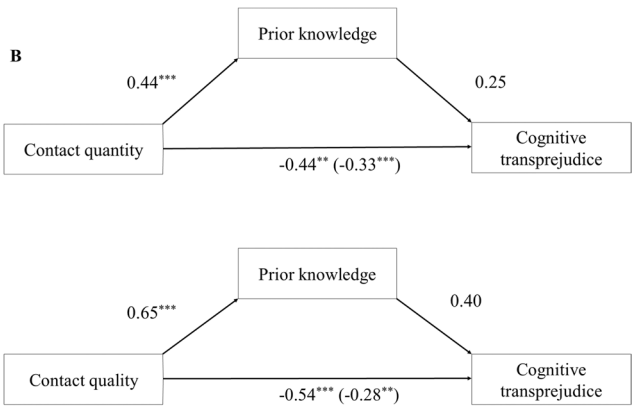


Fig. 5 Study 3 Models with (**a**) Contact as a Mediator Between Knowledge and Cognitive Transprejudice, and (**b**) Knowledge as a Mediator Between Contact and Cognitive Transprejudice**.**

Note. **$p < .01$, ***$p < .001$. Path coefficients are standardized. Bold lines indicate a significant mediation.

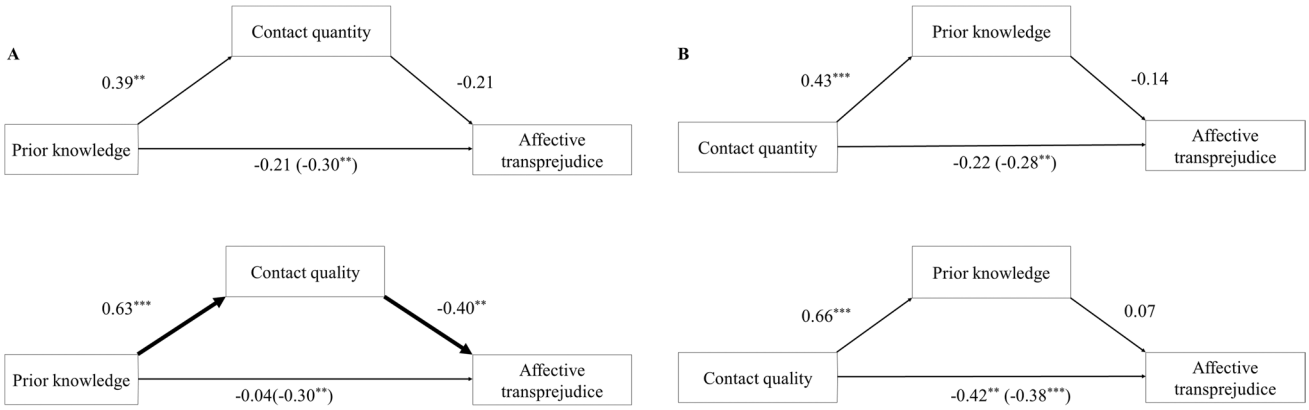


Fig. 6 Study 3 Models with (**a**) Contact as a Mediator Between Knowledge and Affective Transprejudice, and (**b**) Knowledge as a Mediator Between Contact and Affective Transprejudice**.**

Note. $^{**}p < .01$, $^{***}p < .001$. Path coefficients are standardized. Bold lines indicate a significant mediation.

Models with Knowledge as Mediator

In the first model, knowledge did not emerge as a significant mediator between contact quantity and affective transprejudice, $ab = -.06$, $p = .55$, 95% CI [-0.12, 0.05]. The total effect was significant, $c = -.28$, $p = .001$, 95% CI [-0.23, -0.08]; however, the direct effect of contact quantity on affective transprejudice was not significant, $c' = -.22$, $p = .08$, 95% CI [-0.22, -0.005] (see Fig. 6b). In the second model, knowledge did not emerge as a significant mediator between contact quality and affective transprejudice, $ab = .05$, $p = .77$, 95% CI [-0.14, 0.23]. Both the total effect, $c = -.38$, $p < .001$, 95% CI [-0.34, -0.13] and direct effect, $c' = -.42$, $p = .01$, 95% CI [-0.46, -0.08], on affective transprejudice were significant (see Fig. 6b).

Summary

In Study 3, we found that both contact quantity and quality emerged as significant mediators between knowledge and cognitive transprejudice; whereas only contact quality emerged as a significant mediator between knowledge and affective transprejudice. When we tested an alternate mediation model with knowledge as the mediator, none of the mediation models were significant. This pattern of findings is consistent with those of Study 1, but somewhat contradicts the results from Study 2, where both contact and knowledge emerged as significant mediators.

General Discussion

We present the findings of three studies in which we tested the relations among knowledge, contact, and transprejudice, with knowledge and contact examined alternatively as mediators. Table 5 presents a summary of the significant and non-significant mediation models across all three studies. In Study 1, we found that both contact quantity and contact quality significantly mediated the relationship between knowledge and cognitive transprejudice as well as affective transprejudice. When we tested knowledge as the mediator it did not significantly mediate between contact and either measure of transprejudice. In Study 2, both contact quantity and contact quality again mediated the relationship between knowledge and cognitive transprejudice. However, only contact quality mediated the relationship between knowledge and affective transprejudice. Also, in contrast to Study 1, the alternative models we tested emerged as significant. That is, prior knowledge significantly mediated the relationship between contact quantity/quality and both measures of transprejudice. Finally in Study 3, we once again found that contact quantity and quality significantly mediated the relationship between prior knowledge and cognitive transprejudice, though only contact quality significantly mediated the relationship between prior knowledge and affective transprejudice (as was the case in Study 2). Mirroring Study 1, the alternative models we tested in Study 3 did not emerge as significant: Knowledge did not mediate between contact and transprejudice. Thus, we see that across all three studies there was a general pattern whereby contact emerged as a significant mediator between knowledge and transprejudice, and only in Study 2 did the alternative mediation models emerge as significant.

These findings provide some interesting insights into the fundamental effects of knowledge and contact as they relate to transprejudice. We see a general pattern across our studies where contact consistently emerges as a significant mediator between knowledge and transprejudice. In contrast, our alternative analyses show that knowledge only emerges as a significant mediator in one out of the three studies. This

Table 5 Summary of Significant Mediation Models Across all Three Studies

Study number	Knowledge → contact quantity → transprejudice	Knowledge → contact quality → transprejudice	Contact quantity → knowledge → transprejudice	Contact quality → knowledge → transprejudice
Study 1				
Cognitive Transprejudice	Significant	Significant	Not Significant	Not Significant
Affective Transprejudice	Significant	Significant	Not Significant	Not Significant
Study 2				
Cognitive Transprejudice	Significant	Significant	Significant	Significant
Affective Transprejudice	Not Significant	Significant	Significant	Significant
Study 3				
Cognitive Transprejudice	Significant	Significant	Not Significant	Not Significant
Affective Transprejudice	Not Significant	Significant	Not Significant	Not Significant

suggests that contact plays a more proximal role in reducing transprejudice compared to prior outgroup knowledge – though stronger inferences cannot be made based on cross-sectional data.

Our Research in Context

Our findings are in line with the extensive research on intergroup prejudice showing contact as an effective means of prejudice reduction. Though still in its infancy, there has been emerging research looking at the contact effect in the context of (trans)gender identity. This too, shows contact emerging as an effective means of transprejudice reduction (Boccanfuso et al., 2021; Moss-Racusin & Rabasco, 2018; Rani & Samuel, 2019). Our findings build on this to indicate that individuals who have a higher level of prior knowledge about transgender people and their experiences tend to have more frequent and better-quality contact with transgender people, which in turn is linked to less transprejudice.

To better understand the contact effect in this context, we can draw insights from the wider literature on intergroup relations. One avenue worth exploring is the role played by anxiety in intergroup relations. Findings demonstrate that when anxiety about intergroup contact is low, it tends to yield more positive outcomes including a reduction in prejudice (Çakal et al., 2021; Turner et al., 2007; Zagefka et al., 2017). Presumably, individuals who are better informed about the lived experiences of members of an outgroup, in this case transgender people, are likely to feel less apprehensive about interacting with members of said outgroup. This, in turn, is likely to result in lower levels of prejudice towards that outgroup. Indeed, in their meta-analysis on how intergroup contact reduces prejudice, Pettigrew and Tropp (2008) found intergroup anxiety to have the strongest mediating effect, with knowledge having the weakest effect. The findings from our alternative analyses appear to bolster this assertion. Given that in said findings, prior knowledge did not consistently emerge as a significant mediator, it lends credence to the conclusion that, comparatively speaking, contact is the more effective tool by which transprejudice can be reduced.

Of course, this is apart from Study 2 where both contact and prior knowledge did emerge as significant mediators of lower transprejudice. As such, it is worth disentangling this finding to explore why this might have been the case. One clear difference between our second study and the other two is the participant population. In Studies 1 and 3 the participants were all first-year undergraduate students. Compared to the general population, university students are more likely to be aware of the lived experiences of transgender people, especially given that the university experience often creates means for students to engage with members from various social group categories (Bowman, 2013; Campbell & Horowitz, 2016; Tadmor et al., 2012). As highlighted above, this increased prior knowledge is likely to yield more frequent and better-quality contact with transgender people, which is then likely to result in less transprejudice. Perhaps university students are more likely to have increased contact with transgender people *because* of their prior knowledge of trans people and their experiences. Put a different way, university students may be less likely to rely on first having contact with trans people to then increase their trans-related knowledge.

On the other hand, in Study 2 we recruited participants from the survey platform Prolific. This allowed for the recruitment of general members of the public who may not necessarily be in higher education and are also more likely to hold conservative views about transgender identity (Flores, 2015; Flores et al., 2020; Kimberly, 2016). Moreover, general members of the public are also less likely to have contact with transgender people. Indeed, this was the case for our final participant sample in Study 2, where 59.3% of participants reported not knowing any trans people – this is

in comparison to 39.0% and 27.5% of student participants in Study 1 and Study 3 respectively, who reported not knowing any trans people. This being the case, it is quite possible that for general members of the population, having increased contact with transgender people creates means by which knowledge about transgender experiences is obtained or perhaps bolsters their motivation to seek out said knowledge. This is then likely to yield lower levels of transprejudice. However, we cannot draw strong conclusions to this effect without more robust testing and replication.

An alternative possibility for our finding of a *knowledge mediation effect* in Study 2 is that individuals who are more likely to exhibit prejudice are also more likely to show the biggest effects of prejudice reduction. For instance, when analysing attitudes towards LGBTQ + people across 77 countries, Earle et al. (2021) found that the contact effect was strongest in countries with the least pro-trans rights. This suggests that for those who hold more conservative views about transgender people, any engagement with the subject of transgender identity is likely to have an effect – whether that be through knowledge or contact. Whilst general members of the population might have less opportunity for direct contact with transgender individuals, they are likely to have indirect contact, for example, through social media, television, or even extended contact, i.e., simply knowing that a member of ones' ingroup has contact with a transgender person (Crisp & Turner, 2009; Hoffarth & Hodson, 2018; Solomon & Kurtz-Costes, 2018; Zagefka, 2019). This is then likely to increase their knowledge about transgender people and/or experiences, which in turn is likely to result in lower levels of transprejudice. This might explain knowledge as a mediator between contact and prejudice in this sample. This bidirectional relationship between contact and knowledge is an interesting avenue worth exploring further.

Limitations and Future Directions

This research has several limitations. The most fundamental of which is the inability for us to make causal inferences from our cross-sectional data. The use of cross-sectional data has its advantages, including the fact that it allows the researcher to observe intergroup attitudes and relations that occur naturalistically, outside of experimental manipulation. However, an important limitation of cross-sectional designs is that they do not provide the researcher the ability to make causal links about the data being tested. Indeed, this is the case with the results we present here – though we tested alternative mediation models, we are limited in the level of certainty that we can attach to these models. An experimental or longitudinal study design would be needed to draw stronger conclusions about the relations between knowledge, contact, and transprejudice. As a next step, researchers could build upon our findings by experimentally testing whether manipulating knowledge more effectively lowers transprejudice. An alternative step would be to test trans-related attitudes longitudinally. Not only might this provide insights into how attitudes toward transgender people change over time, but it might also help to ascertain the extent to which any such changes are directly influenced by cultural and societal changes. A longitudinal design might also help to establish whether an individuals' knowledge at a given time point can predict their level of contact at a later point (and vice-versa), and how this predicts transprejudice over time.

As noted earlier, the contact measure we adapted does have some overlap between contact quantity and contact quality. When we excluded the frequentist item from the contact quality measure across all three studies (i.e., "*How often do you spend time with transgender people?*"), contact quality no longer emerged as a significant mediator when transprejudice was operationalized via affective transprejudice. Excluding this item did not affect the pattern of results when transprejudice was operationalised via cognitive transprejudice.

On the other hand, our findings for contact quantity were less consistent; contact quantity emerged as a significant mediator in only four out of the six mediation models we analysed. Contact quantity failed to emerge as a significant mediator in Studies 2 and 3, when transprejudice was operationalised via anti-trans feelings (i.e., affective transprejudice). However, it is possible that this finding speaks more to the nature of anti-trans feelings as a measure of transprejudice. Specifically, prejudice-related research has illustrated that different measures of prejudice are associated with varying effect sizes, depending on whether the measure falls along an affective or cognitive dimension of prejudice (Tropp & Pettigrew, 2005). Tropp and Pettigrew (2005) describe the affective dimension of prejudice as relating to emotions or favourability, while the cognitive dimension relates to stereotypes and beliefs about outgroup members. It has also been suggested that cognitive dimensions of prejudice are more stable compared to affective dimensions (Aberson, 2015). This might explain why anti-trans opinions (as a cognitive outcome measure) seems to have a competitive advantage over anti-trans feelings (as an affective outcome measure).

It is important to acknowledge the potential for confounds in this research, especially in our third study. As the third study was initially intended to be experimental in nature, several participants engaged in some form of trans-related contact prior to answering questions about their own trans-related knowledge and contact. Though our experimental conditions showed no effect on the outcome variables, we cannot dismiss the possibility that the results from the mediation analyses may have been influenced by the design in Study 3. Thus, it would be useful to test the pattern of findings from the cross-sectional data under experimental conditions. An experimental

design would be crucial to advancing our understanding of the knowledge-contact-transprejudice relationship. Moreover, it would provide some useful and much-needed insights into the effectiveness of future contact-based interventions aimed at transprejudice reduction.

Another limitation of our research is that there are some inadequacies to the measure of knowledge that was used. As the knowledge measure was self-reported, it is possible that rather than collecting an accurate representation of participants' prior knowledge, what we captured was their *confidence* regarding their knowledge of trans identity and experiences. This creates some reservations, especially given that people tend to have a biased view of their skills and knowledge (Kruger & Dunning, 1999; West & Eaton, 2019). One way to tackle this inadequacy would be to measure both subjective and objective knowledge. For example, Mansouri and Vergani (2018) asked participants to give a self-report rating of their knowledge about Islam, but also asked participants factual knowledge about the religious practices of Islam, e.g., the associated book of worship, revered prophets, etc. Future researchers exploring prejudice in the context of transgender identity could implement a similar design.

In a similar vein, it would have been even more informative to ascertain the nature of participants' trans-related knowledge. Specifically, whether their knowledge painted transgender people in a positive or negative light. Further still, it would be useful to explore whether participants' knowledge about transgender people was based on a stereotypical representation of transgender people. Research on intergroup contact has typically shown endorsements of stereotypes to be positively associated with higher levels of prejudice such as racism and homophobia (Fairlamb et al., 2022; Zagefka et al., 2017). While we can speculate that participants' prior knowledge about transgender people in this case is likely to have been positive (based on the inverse association of knowledge and transprejudice), we cannot draw firm conclusions beyond this inference without further testing.

Another limitation of our research is that we did not test the contact effect with regard to direct versus indirect contact, sometimes referred to as extended or vicarious contact (Imperato et al., 2021; Turner et al., 2007). We have been able to demonstrate the contact effect across our three studies with a focus on direct contact (i.e., participants with personal contact with transgender people). However, research has shown that even indirect contact with outgroup members can yield lower levels of prejudice or negative affect towards outgroup members. For example, Rani and Samuel (2019) tested the effects of both direct and indirect contact on transprejudice. They found that even though direct contact had the strongest and longer lasting effect, participants in the indirect contact condition still showed reduced levels of transprejudice compared to their baseline. Thus, it would be informative to compare these two forms of contact as mediators between knowledge and transprejudice.

It is also worth acknowledging the potential limitations of the cognitive measures of transprejudice that we used. For instance, it is possible that participants in our study might not be knowledgeable about the differences between sex and gender (i.e., gender identity). Indeed, sex and gender are often conflated (Bittner & Goodyear-Grant, 2017). As such, we might not have captured participants' accurate opinions on scale items asking about access to spaces/sports based on sex and not gender. Additionally, it is important to consider whether the recent politicization of trans-related issues may have influenced participants' responses to some of the items in the cognitive transprejudice measures. Politicization is the practice of viewing previously non-political issues using a political lens (Zürn, 2019). Though politicization of social groups can sometimes yield sympathetic or favourable responses, it can also result in blatant or uninhibited expressions of prejudice (Kende & McGarty, 2019). It is worth considering whether this might have been the case here.

Practice Implications

Issues related to transgender identity have shown to be contentious, with a marked increase in anti-trans rhetoric. The findings from our research provide some important practice implications for stakeholders looking to improve the lived experiences of transgender people within our society. For example, social activists could build a campaign strategy disseminating information to address potential knowledge gaps that members of the public might have when it comes to transgender identity. For instance, members of the public might be hesitant to seek out contact with trans people for fear of inadvertently causing offense. Social activists may find that dispersing accurate information regarding highly politicized trans-related issues might help to bridge these gaps, particularly if this strategy included contributions from transgender individuals. Given our finding that trans-related knowledge can improve attitudes towards transgender people through contact, an information campaign strategy of this nature has the potential to curtail prejudice against transgender individuals.

Another crucial next step would be to establish means of facilitating contact, given that contact appears to be the more proximal predictor. One promising new avenue is through virtual reality (VR) technology. Given that VR software has become increasingly immersive (Wilson & Soranzo, 2015), it makes an effective substitute for face-to-face contact in prejudice reduction interventions. This is especially useful in studies where direct contact might not easily be achieved. Indeed, VR has been used in experimental psychology to create various simulated environments and scenarios

(Yaremych & Persky, 2019). The use of VR technology would be a relatively accessible means of facilitating trans contact for the purpose of a prejudice reduction intervention.

Conclusion

The studies presented here provide novel insight into prejudice toward an under researched social group, transgender individuals. Building on recent research, we demonstrated that the contact effect, extensively researched and well documented within other spheres of intergroup prejudice, is observable in the context of transprejudice, and moreover helps explain the relation between outgroup knowledge and prejudice. Specifically, we found the most support for a model whereby having more personal transgender-related knowledge may lead to increased and better-quality contact with transgender individuals, which may improve attitudes towards transgender people in general. These findings can help inform future research and guide strategies aimed at inclusivity and transprejudice reduction.

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Declarations

Conflict of interest The authors declare that there is no conflict of interest.

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