

Threat Inoculation: Experienced and Imagined Intergenerational Contact Prevents Stereotype Threat Effects on Older People's Math Performance

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The authors hypothesized that experienced and imagined intergenerational contact should improve older people's math test performance under stereotype threat. In Experiment 1 ($N = 51$, mean age = 69 years), positive prior contact with grandchildren eliminated stereotype threat, which was mediated partially by reduced test-related anxiety. In Experiment 2 ($N = 84$, mean age = 72 years), the effect of threat on performance was significantly improved when participants merely imagined intergenerational contact, a situation again mediated by reduced anxiety. Previous research established that intergroup contact improves intergroup attitudes. The findings show that intergroup (intergenerational) contact also provides a defense against stereotype threat.

Keywords: intergenerational contact, stereotype threat, test performance, imagined contact

With the present research, we investigate how intergenerational contact may ameliorate stereotype threat in the context of older people's math performance. Both older and younger people are aware that older people are stereotyped as being less capable than younger people (Abrams & Houston, 2006; Ray, Sharp, & Abrams, 2006). Research with older people has found that stereotype activation affects a range of cognitive abilities consistent with this negative stereotype, in particular, memory test performance (Hess, Hinson, & Statham, 2004). Stereotype threat can be defined as being at risk of confirming that a negative stereotype of one's group applies to oneself. It is experienced as a self-evaluative threat that can have disruptive effects. For example, African American college students exhibited inferior intellectual performance when reminded of the cultural stereotype that Black people were intellectually inferior to White people (Steele & Aronson, 1995). One reason for this effect is the potential for the situation to raise anxiety levels (Steele, 1997). There is a significant risk that negative stereotypes about the competence of older people may become self-fulfilling as a result of stereotype threat (Abrams, Eller, & Bryant, 2006).

Methods for reducing the effects of stereotype threat (e.g., McFarland, Lev-Arey, & Ziegert, 2003) include reducing the self-relevance of the threat (Marx & Stapel, 2005), increasing control beliefs (Blanchard-Fields & Horhota, 2006), or reducing the sa-

lience of differences between groups (Rosenthal & Crisp, 2006). Such interventions may be less feasible outside the laboratory. Thus, alternative ways to inoculate older people against threatening stereotypes need to be considered. In particular, we consider the benefits of intergroup contact. Intergenerational contact should reduce the threat from intergroup comparisons for several reasons (see Abrams et al., 2006). Close positive relationships that span intergroup boundaries create the potential for better understanding, tolerance, and positive attitudes (Pettigrew, 1998) and reduce intergroup anxiety about encountering members of outgroups (Stephan & Stephan, 2000). In addition, the formation of close interpersonal relationships across intergroup boundaries creates the potential for recategorization such that the ingroup and outgroup share a common identity (e.g., "our family," "our team"), thereby reducing the likelihood that intergroup differences will be salient or regarded as important (Gaertner & Dovidio, 2000). Extended contact—that is, mere awareness that an ingroup member has a close relationship with an outgroup member—is also thought to reduce prejudice through a recategorization process that facilitates inclusion of the other group within the boundaries of the self-concept (Wright, Aron, McLaughlin-Volpe, & Ropp, 1997). Construing comparisons as threatening is the basis for performance decrements in stereotype threat. We contend that intergenerational contact should ameliorate stereotype threat by changing the affective consequences of intergroup comparisons, thus reducing anxiety and sustaining performance.

Abrams et al. (2006) examined the effect of stereotype threat on older people's performance on a general test of cognitive performance (including recall, comprehension, and verbal facility). The effect was eliminated among those who had positive intergenerational contact and was mediated by retrospective reports of anxiety during the test. The present research focuses on the math component of cognitive performance, a domain that has been the focus of much stereotype threat research with other groups and is relevant

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to the competence dimension of stereotyping. Survey and pilot work demonstrated that math (in)competence is part of the stereotype of older but not younger people (Age Concern England, 2008; cf. Cuddy, Norton, & Fiske, 2005). Stereotype threat should therefore affect older people's math performance.

Contact with children can sometimes be conflictual (Fingerman, Hay, & Birditt, 2004), but contact with grandchildren is generally positive (Harwood, Hewstone, Paolini, & Voci, 2005). One of the most accessible sources of older people's contact with younger people is younger relatives. Thus, knowing whether contact with grandchildren can reduce threat is potentially important for intergenerational policy initiatives (Sánchez et al., 2007). Abrams et al. (2006) did not specifically focus on contact involving grandchildren, and so we examine this in Study 1. Moreover, Abrams et al. (2006) measured anxiety following performance, meaning it was possible that self-reports were in part serving as post hoc justifications for performance (Stone, 2002). Therefore, in Study 1, we measured anxiety prior to performance to test the mediation hypothesis more robustly. Study 1 was designed to test the hypotheses that stereotype threat will adversely affect older people's math performance, that intergenerational contact with grandchildren can ameliorate this effect, and that situational anxiety will mediate the effects of threat and contact on performance.

Study 1

Method

Participants were assigned randomly to condition (high vs. low stereotype threat). Intergroup contact (ranging in valence from relatively less positive to relatively more positive) was a continuous self-report measure operationalized as the amount of positive contact with grandchildren. Twenty-six male and 25 female retired adults were recruited from various social groups and organizations for retired people within the county of Kent, United Kingdom. All were physically well and were cognitively and socially active. They lived independently in their own homes, in assisted living facilities, or in a residential setting. Responses to postexperiment questions showed their ages ranged from 58 to 84 years ($M = 69.14$ years, $SD = 4.70$). Seventy-three percent were living with a spouse or partner and the remainder lived alone. Preretirement, 6% had been unskilled workers, 26% had been semi-skilled workers, 28% had held clerical or administrative positions, and 38% had held supervisory or professional jobs (2% did not provide preretirement occupation information). The age at which participants left school averaged 15.98 years ($SD = 2.56$). The number of children they had ranged from 0 to 6 ($M = 2.25$, $SD = 1.26$), and the number of grandchildren they had ranged from 0 to 12 ($M = 2.88$, $SD = 2.93$). The oldest grandchild was 43 years old, and the average age was 10.32 years ($SD = 8.75$).

The session was introduced as a study of attitudes, experiences, and skills. Participants, tested individually by a 21-year-old female experimenter, were informed that their responses were confidential and that they were free to withdraw from the study at any time. Audio-recorded instructions informed participants that they would be given a short test and complete a brief questionnaire. We used the stereotype threat manipulation from Abrams et al. (2006). In the threat condition, participants were informed that

It is widely assumed that intellectual performance declines with age, so the purpose of this study is to see whether old people do perform

more poorly on intellectual tasks than young people. Both older and younger people will be taking part in this research.

In the control condition, there was no reference to groups, and the purpose of the study was purportedly "to see how people differ in their responses on different tasks. Different types of people will be taking part in this research." Participants completed the measure of anxiety and then the math test.

Anxiety was measured using items from Abrams et al. (2006). Participants were asked to think about how they felt about the upcoming test and to rate on a scale from 1 (*not at all*) to 7 (*very much*) the extent that they felt under pressure, tense, nervous or jittery, confident, uneasy, calm, afraid of not doing well, and uncomfortable. The composite scale, scored such that a higher number represented greater anxiety, was highly reliable ($\alpha = .76$).

Test performance was measured via written answers to 15 arithmetic items, on which participants were not allowed to use a calculator. The math required to solve these problems ranged from addition to simple algebra. An addition item with a 100% pass rate was dropped from the calculated total score. Scores on the remaining 14 items ranged from 3 to 14 ($M = 10.58$, $SD = 2.33$). The test had good internal reliability ($\alpha = .88$).

Contact with grandchildren was measured after the test by asking participants to indicate the frequency with which they saw any grandchildren during the past year, from *never* (1) to *every day* (8), and to rate the quality of the relationship with the grandchildren they saw most often (from 1 = *very negative* to 7 = *very positive*). These items were devised to address principles outlined by Brown and Hewstone (2005; see also Hewstone & Brown, 1986), who asserted that high quality of contact is likely to provide a basis for more positive intergroup relationships. Ten participants had no grandchildren and hence were assigned a score of 1 to indicate that they had no positive contact with grandchildren. The decision to code 1 for people with no grandchildren ensured they had a score that was lower than the scores of all participants who had contact. Aside from these participants, the frequency of contact score averaged 4.92 ($SD = 1.48$), which represents once per month on the scale. All but 1 participant rated quality of contact at 4 or above, meaning that the range was effectively from neutral to positive ($M = 6.34$, $SD = 1.07$). A weighted index was computed by multiplying frequency scores by positivity scores (divided by 7 so that the variable was scaled on the same 1–7 range as the other measures). The weighted contact scores among those with contact ranged from 1.71 to 7.00. The mean across all participants was 3.62 ($SD = 2.13$), indicating a reasonable distribution across participants. None of the background variables were significantly associated with performance or frequency of contact with grandchildren, so they are omitted from the analyses below.

Results and Discussion

Descriptive statistics and correlations are in Table 1. Moderated regression analysis was used to assess the interaction of our continuous contact variable with the manipulation of stereotype threat (Aiken & West, 1991).

For test performance, there were significant effects of threat, $\beta = -.35$, $t(46) = 2.56$, $p = .014$, and contact, $\beta = .29$, $t(46) = 2.07$, $p = .044$. However, these main effects were qualified by the predicted Threat \times Contact interaction, $\beta = -.50$, $t(45) = 4.42$,

Table 1
Study 1: Correlations Among Variables and Means and Standard Deviations

Variable	1	2	3	4	M	SD
1. Age	—	.10	.04	-.14	69.14	4.70
2. Performance		—	-.48***	.21	10.58	2.33
3. Anxiety			—	.07	3.41	1.52
4. Contact				—	3.62	2.13

Note. Maximum score for performance is 14. Pretest anxiety is averaged scores on a scale from 1 to 7, where higher values mean higher levels of the measure.

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

$p < .001$. For Step 1, $R^2 = .17$; for Step 2, $R^2 = .42$; R^2 change = .25. Overall, $F(3, 45) = 10.77, p < .001$; see Figure 1. The simple slope (see Preacher, Curran, & Bauer, 2006) for the effect of threat on performance was significant for people with less positive contact with grandchildren, $B = -2.01, t(45) = 5.27, p < .001$, but not for people with more positive contact, $B = 0.41, t(45) = 1.03, p = .307$ (point-biserial correlations between condition and performance were $-.70$ for lower contact and $.21$ for higher contact participants).

For anxiety, effects of threat, $\beta = -.19, t(46) = 1.26, p = .213$, and contact, $\beta = .02, t(46) = 0.16, p = .873$, were nonsignificant, but the predicted Threat \times Contact interaction, $\beta = -.38, t(45) = 2.77, p = .008$, was significant. For Step 1, $R^2 = .037$; for Step 2, $R^2 = .178$; R^2 change = .141. Overall, $F(3, 45) = 3.24, p = .031$. As predicted, the simple slope for the effect of threat was significant for people with less positive contact with grandchildren, $B = 0.86, t(45) = 2.87, p = .006$, but not for people with more positive contact, $B = -0.313, t(45) = 1.05, p = .301$ (see Figure 1; point-biserial correlations = $.59$ and $-.36$ among lower and higher contact participants, respectively). Including age as a covariate in the regression analyses did not alter these significant effects.

To test for moderated mediation (Preacher & Hayes, 2004) with test performance as the dependent variable, we added anxiety as a predictor and examined the decrease in the Threat \times Contact interaction and the independent effect of anxiety. The Threat \times Contact interaction effect reduced from $\beta = .50, t(45) = 4.42, p < .001$, to $\beta = .39, t(44) = 3.36, p = .002$, while the effect of anxiety remained significant, $\beta = -.30, t(44) = 2.50, p = .016$. The test of the indirect (mediated) effect of Threat \times Contact was significant, $t(44) = 2.19, p < .05$. The overall effect of threat, contact, and anxiety accounted for 49% of the variance in math performance, $R^2 = .49, F(4, 44) = 10.59, p < .001$. Analyses using frequency of contact as the independent variable revealed comparable Threat \times Contact interactions for performance, $t(45) = 3.91, p < .001$, and anxiety, $t(45) = 2.34, p < .05$. Performance was similarly affected by Threat \times Contact when we only examined participants who had grandchildren, $\beta = .56, t(35) = 3.78, p = .001$, and the effect of anxiety was also significant, $\beta = -.27, t(35) = 2.05, p = .048$.

In summary, the findings from Study 1 support and extend the proposition that intergroup contact will alleviate stereotype threat effects and do so via reduced anxiety. This is encouraging news for those trying to reduce the negative impact of stereotypes on older people's abilities. It is important to acknowledge, however, that

although highly effective, higher levels of intergenerational contact may sometimes be difficult to achieve in practice. Brown and Hewstone (2005) noted that in many of the most problematic cases of intergroup prejudice, there is simply no opportunity for meaningful intergroup contact. Direct intergenerational contact may not be available to many older people (Ray et al., 2006) even within their own family. For example, 10 participants in Study 1 had no grandchildren.

How might one capitalize on the benefits of intergenerational contact when there is very little or no opportunity for such direct or indirect contact? One possibility is a new implementation of contact theory: imagined intergroup contact (Crisp, Stathi, Turner, & Husnu, in press). The idea is that simply imagining intergroup contact can harness the benefits of contact even when there are high levels of social segregation. Empirical evidence has supported

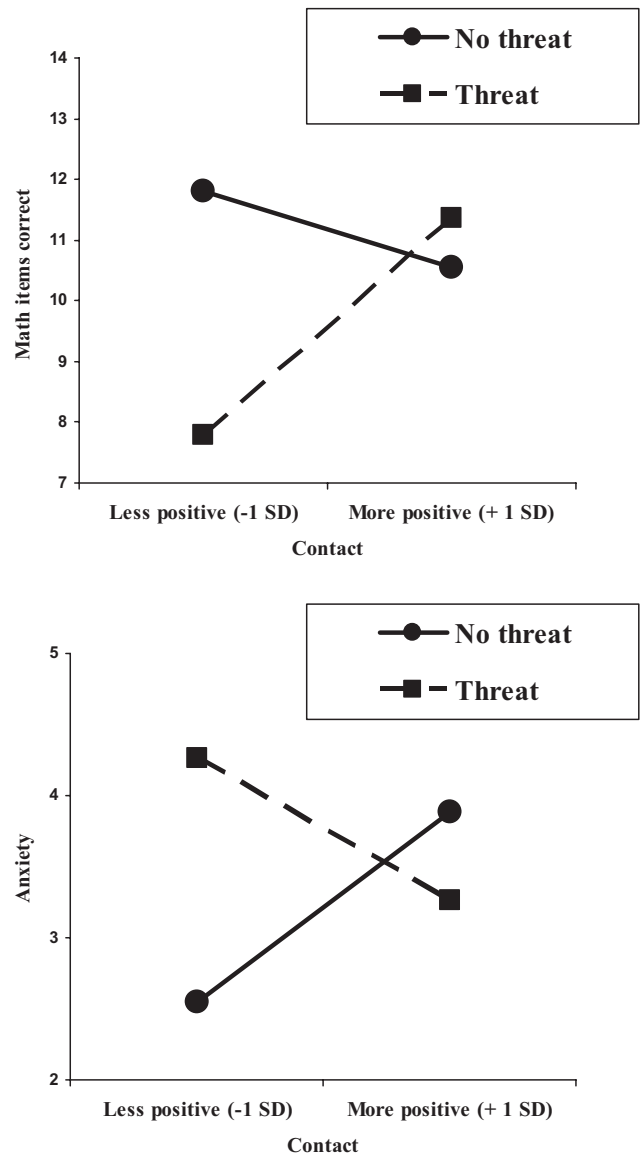


Figure 1. Study 1: The effect of stereotype threat on math performance and anxiety as a function of intergenerational contact.

this proposition. For example, Turner, Crisp, and Lambert (2007) found that young people who imagined intergenerational contact showed improved attitudes toward older people (see also Stathi & Crisp, 2008). This may be an extremely versatile technique for altering group-based judgment because it requires only that perceivers can envision outgroup members. Study 2 tested the hypothesis that imagining intergenerational contact can also reduce stereotype threat effects experienced by older people and that anxiety would also mediate this relationship.

Study 2

Method

In the control condition (no threat), the instruction was the same as the instruction in the no threat condition in Study 1. Two other conditions included a threat manipulation and asked participants to imagine either meeting a young stranger (contact) or an outdoor scene (no contact). We measured anxiety and math test performance on a 24-item test. Thirty-four male and 50 female predominantly White British participants over the age of 60 years ($M = 72.22$ years, $SD = 8.23$) were recruited from local senior citizen groups and approached individually to take 15 min to complete a brief questionnaire. Participants were tested individually in secluded locations to avoid any distractions. The experiment was described as a study of social attitudes and learning. Participants completed a consent form. Then, on the basis of Turner et al. (2007), participants in the imagined contact condition were told,

We would like you to take one minute to imagine yourself meeting a young stranger for the first time. Imagine their appearance, the conversation that follows and, from what you learn, all the different ways you could classify them into different groups of people.

After the minute, participants were asked to “list the different ways in which you could classify the younger stranger following the conversation you imagined.” In the outdoor scene instructions, participants were told, “We would like you to take a minute to imagine an outdoor scene. Try to imagine aspects of the scene about you (e.g., is it a beach, a forest, are there trees, hills, what’s on the horizon?”); after the minute, they were asked to “list the different things that you saw in the scene you just imagined” (see Turner et al., 2007). In the control condition, the audio instructions informed the participant that “the purpose of this study is to see how people differ in their responses on different tasks. Different types of people will be taking part in this research.” In the imagination conditions, stereotype threat was induced as in Experiment 1. In addition to the anxiety measure, participants answered a set of 24 math items, ranging from simple addition to more complex algebraic and problem-solving questions, without using a calculator. Finally, participants provided background information about themselves before being thanked and debriefed.

Results and Discussion

There were no significant effects involving gender or other background variables; therefore, these are not considered in further detail. Planned contrasts were used to test our theoretically derived and specific predictions (see Rosenthal, Rosnow, & Rubin, 2000). In the context of a significant overall effect of condition, $F(2,$

$81) = 6.90, p = .002$, performance was significantly worse in the outdoor scene + threat condition ($M = 10.00, SD = 5.94$) than in the contact + threat condition ($M = 13.03, t(81) = 1.99, p = .050$, and the control condition ($M = 16.14, t(81) = 3.69, p < .0005$). The contact + threat condition ($M = 13.03, SD = 6.48$) did not differ significantly from the control condition ($M = 16.14, SD = 5.35, t(81) = -1.84, p = .07$). These results confirm our predictions and demonstrate that imagined intergenerational contact can sustain performance in the context of stereotype threat.

Anxiety was significantly affected by condition, $F(2, 77) = 3.99, p = .023$. Mediation analysis using these contrasts together (see Hewstone, Islam, & Judd, 1993) showed that condition affected anxiety, $\beta = -.283, t(77) = -2.60, p = .011$; that anxiety had an independent effect on performance, $\beta = -.463, t(76) = -4.76, p < .0005$; and that the total effect of condition on performance, $\beta = .382, t(77) = 3.74, p < .0001$, was reduced when anxiety was accounted for, $\beta = 2.36, t(76) = 2.43, p = .017$. The Sobel test was significant, $Z = 2.28, p = .02$, showing that imagined contact mitigated age-related threat by reducing anxiety.

General Discussion

With this research, we tested the hypothesis that intergenerational contact should counteract stereotype threat on older people’s math performance. We tested how actual contact with grandchildren (Study 1) and a completely psychological manipulation of (imagined) contact with a younger person (Study 2) affected the impact of stereotype threat on math performance. We hypothesized that reduced anxiety would mediate between contact and performance. Both hypotheses were confirmed in both studies. Note that the math tests were not particularly challenging but even a simple statement implying comparison was sufficient to induce substantial threat-related performance decrements. This underscores the importance of this research for understanding and attenuating age-related stereotype threat.

Study 1 showed for the first time that contact with grandchildren can be sufficient to prevent performance decrements under stereotype threat conditions. It is likely that relationships with grandchildren are chronically accessible for older people and therefore it makes sense that they could have an impact in other areas of a person’s life. Consequently, if intergenerational comparisons are potentially salient, older people’s math performance should not be taken at face value. Raising the question of stereotypes may itself create a stereotype threat, so it may be useful to consider other ways of evaluating whether a person is experiencing such threat and what psychological armory exists to fend it off.

The Potential of Imagined Contact

Previous research demonstrated that imagined contact can improve younger people’s intergroup attitudes and stereotypes (Turner et al., 2007). It is possible that imagined contact could sometimes be negative or could activate a contrasting ingroup stereotype. However, the facts that none of the transcripts for imagined contact revealed any negative instances and that the manipulation reduced anxiety and improved performance suggest otherwise. This is also in line with the broader intergroup contact literature, which shows contact generally has positive effects (Pettigrew & Tropp, 2006). Moreover, Turner et al. (2007) showed that

positive effects were only obtained when participants thought about interacting with a group member, not when they thought simply about the group generally. Stathi and Crisp (2008) also showed that thinking about being with people generally does not have these positive effects.

The present findings significantly extend previous work by confirming that imagined contact reduces the effect of stereotype threat on older people's performance. This adds considerable weight to the asserted causal direction specified by our contact model. It also seems plausible that improved performance may increase confidence, decrease self-stereotyping further, and trigger a greater willingness to seek and engage in further intergenerational contact, thereby creating a virtuous circle. Exploring the longer term relationship between contact and performance in stereotype threat situations will be an interesting endeavor for future work (for a detailed model of the relationship between contact, category salience, and self-stereotyping, see Crisp & Abrams, in press).

The Role of Anxiety in Stereotype Threat

According to stereotype threat theory, threat may adversely affect performance through anxiety and associated effects such as increased load and narrowing of attentional resources (Easterbrook, 1959; Schmader & Johns, 2003; Steele, 1997; Wilder, 1993). People who have little positive contact may be more likely to bring to mind negative stereotypic expectations (Cuddy et al., 2005), which can increase anxiety. The present findings fit with previous research (e.g. Hess et al, 2004) showing that when age stereotypes are primed, older people's cognitive performance suffers. The findings also clarify and corroborate Abrams et al.'s (2006) conclusion that the effects of stereotype threat on performance can be mediated by test-related anxiety. Given our evidence on the role of anxiety, it may be useful for clinicians and occupational testers to measure anxiety levels in the testing situation with older clients as a potential indicator of the presence of stereotype threat.

Conclusion

Taken together, the present studies suggest that both actual and imagined contact can psychologically inoculate older people against stereotype threat. Proactive programs to foster intergenerational friendships, as well as institutional support for grandparent-grandchild relationships (e.g., through taxation policies, leisure arrangements, and the physical design of spaces), could bring benefits for both intergenerational understanding and attitudes and optimize older people's performance in situations where stereotype threat is a possibility.

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13. Publication Title: Psychology and Aging
 14. Issue Date for Circulation Data Below: September 2008

15. Extent and Nature of Circulation

		Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
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		2500	2400
b. Paid Circulation (By Mail and Outside the Mail)			
(1)	Mailed Outside-County Paid Subscriptions Stated on PS Form 3841 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies)	1871	1894
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f. Total Distribution (Sum of 15c and 15e)		2312	2347
g. Copies not Distributed (See Instructions to Publishers #4 (page #3))		188	53
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i. Percent Paid (15c divided by 15f times 100)		90%	91%

16. Publication of Statement of Ownership
 If the publication is a general publication, publication of this statement is required. Will be printed in the December 2008 issue of this publication. Publication not required.

17. Signature and Title of Editor, Publisher, Business Manager, or Owner
 Signature: Barbara Spruill
 Title: Dir. Service Center Operations
 Date: 10/6/08

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