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To cite this article: Elisabeth S. Noland , Christopher R. Agnew & Margo J. Monteith (01 Oct 2026): Immersion Matters: Virtual Reality Influences Personal and Systemic Bias Outcomes, Media Psychology, DOI: [10.1080/15213269.2026.2736734](https://doi.org/10.1080/15213269.2026.2736734)

To link to this article: <https://doi.org/10.1080/15213269.2026.2736734>



Published online: 01 Oct 2026.



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Immersion Matters: Virtual Reality Influences Personal and Systemic Bias Outcomes

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ABSTRACT

Social psychological research has used traditional empathy-inducing strategies (e.g. reading, listening to, or watching narratives) to heighten recognition of and motivation to combat personal and systemic bias. We investigated whether a non-embodied 360° virtual reality (VR) experience increased recognition of and motivation to combat both personal and systemic racial bias and examined empathy as an underlying mechanism. Non-Black undergraduates in the United States ($N=313$) were randomly assigned to (a) a non-embodied immersive 360° VR experience depicting racial discrimination, (b) an audio-only version of the same experience, or (c) a race-unrelated audio (control). VR exposure (vs. audio-only and control) heightened recognition of systemic bias, motivation to combat both systemic and personal bias, and perceptions of racism in isolated incidents. Emotional empathy, but not cognitive empathy, was a significant mediator. In contrast, the audio-only condition did not differ from the VR or control condition on personal and systemic bias outcomes or recognition of racism. These findings highlight the theoretical and practical value of non-embodied 360° immersive VR as a tool for combating personal and systemic bias.

Despite decades of civil rights advocacy and educational initiatives, racism remains a pervasive issue in the United States. A central challenge in addressing this problem lies in fostering empathy that heightens motivation to combat racial bias among individuals who might not experience racism directly. Although psychological research has long emphasized the role of empathy in reducing prejudiced attitudes and promoting prosocial behavior (e.g., Batson, Polycarpou, et al., 1997; Dovidio et al., 2004; Galinsky & Moskowitz, 2000; Vescio et al., 2003), relatively little research has examined empathy's role in fostering recognition of, and motivation to combat, personal and systemic racial bias. Traditional empathy-inducing methods involve reading, listening to, or watching narratives that describe disadvantaged group members' experiences of discrimination (e.g., Dix & Devine, 2024; Moss-

Racusin et al., 2018; Pietri et al., 2019). Although these approaches can be effective, they are passive and thus may only minimally engage participants. Furthermore, when applied to real-world intergroup encounters and sharing first-hand accounts of discrimination experiences, disadvantaged group members must be willing to share their emotionally difficult personal experiences, which can be psychologically taxing and painful (Brondolo et al., 2009; Pietri et al., 2019; Sue et al., 2007).

To address these limitations, researchers have turned to mediated forms of intergroup contact that do not require direct interaction. Immersive technologies, such as virtual reality (VR), allow people to witness discrimination in simulated environments, potentially fostering empathy in a powerful manner. The present research investigated whether exposure to race-related discrimination experiences through a type of VR (i.e., immersive 360° VR) produced stronger effects on empathy, recognition of and motivation to combat personal and systemic bias, and racism perceptions compared to a more traditional approach.

Traditional Approaches

Prior research demonstrates that compelling narratives from Black individuals describing their experiences of discrimination promote non-Black people's recognition of and motivation to combat *personal* bias (i.e., people's biased thoughts, feelings, and behaviors) and *systemic* bias (i.e., written and unwritten laws, practices, and procedures in institutions that promote group-based disparities; e.g., Rucker & Richeson, 2021). For instance, White participants who read multiple rather than a single account of discrimination experienced by Black people reported greater recognition of racial inequality (Carter & Murphy, 2017). Similarly, participants who listened to a short history lesson about discriminatory housing policies in the creation of Black U.S. ghettos, versus a race-unrelated topic, reported greater acknowledgment of systemic racism (Bonam et al., 2019). Reading multiple accounts of discrimination across institutional contexts (e.g., policing, healthcare) elicited greater recognition of and motivation to combat personal and systemic bias relative to a race-unrelated control condition (Noland & Monteith, 2025). Videos highlighting Black people's actual discrimination experiences have produced similar effects, with White viewers reporting greater awareness of their privilege and support for policy changes such as police reform (Bart-Plange & Trawalter, 2025; Uluğ & Tropp, 2021).

Taken together, this research demonstrates that various mediums of sharing Black people's experiences with discrimination across institutional contexts promote recognition of and motivation to combat personal and systemic biases. Central to the effectiveness of these interventions is their capacity to elicit empathy.

The Role of Empathy

A key mechanism underlying the effectiveness of exposure to disadvantaged group members' discrimination experiences is heightened empathy. Empathy is broadly defined as the ability to understand and share the feelings of others and includes emotional and cognitive empathy. Emotional (or affective) empathy involves experiencing the emotions of another person (Batson, Early, et al., 1997; Jolliffe & Farrington, 2006), whereas cognitive empathy (or perspective-taking) involves intellectually understanding another person's thoughts, feelings or mental state (Batson, Early, et al., 1997; Decety & Jackson, 2004).

Research has demonstrated that inducing empathy, particularly through perspective-taking interventions, fosters positive attitudes toward marginalized groups (e.g., Batson, Polycarpou, et al., 1997). For example, encouraging perspective-taking reduced the automatic activation of stereotypes and improved evaluations of outgroup members (Galinsky & Moskowitz, 2000; Todd et al., 2011). Other research showed that a written message fostering empathic concern for targets of racism caused greater outgroup affection, egalitarianism, recognition of racism, and antiracist intentions relative to non-empathy-based messages (Legault et al., 2025).

Beyond demonstrating the benefits of empathy interventions, research has established empathy as the mechanism through which exposure to discrimination experiences promotes anti-racist outcomes. For example, exposure to historical captioned photographs about medical injustices experienced by Black Americans heightened White Americans' cognitive empathy, which was in turn associated with greater recognition of bias and support for anti-racist healthcare policies (Martin & Johnson, 2024). Similarly, White people – especially those low in symbolic racism – who viewed a video of police shooting a Black man reported greater emotional empathy than those who viewed a race-unrelated video, and empathy was, in turn, associated with greater support for police-reform policies (Bart-Plange & Trawalter, 2025). In addition, reading about multiple Black individuals' discrimination experiences fostered White participants' emotional empathy, which mediated greater recognition of and motivation to combat personal and systemic racial bias (Noland & Monteith, 2025).

Empathy in Direct and Mediated Intergroup Contact

Empathy's role as a mechanism underlying bias reduction and motivating social change can be explained by Allport's (1954) seminal work on the contact hypothesis. Intergroup contact theory posits that interaction between different social group members can reduce prejudice, particularly when contact is positive, cooperative, and occurs under conditions of equal status, although

these conditions are not essential (Pettigrew et al., 2011). Extensions of this theory have identified key mechanisms through which contact exerts such positive effects. In a meta-analysis of 515 studies, intergroup contact reduced prejudice by increasing empathy and perspective-taking and lowering intergroup anxiety (Pettigrew & Tropp, 2008). A more recent meta-analysis yielded similar findings (Beelmann & Heinemann, 2014). Despite the positive impact of contact on intergroup attitudes, people often lack the opportunity to engage in intergroup contact, or it is intentionally avoided (e.g., Richeson & Shelton, 2007; Sanchez et al., 2022; Shelton et al., 2010).

Researchers have found alternatives to direct contact that are similarly useful in reducing prejudice (e.g., Dovidio et al., 2011; Harwood et al., 2013; Vezzali et al., 2017). Parasocial contact, which involves one-sided interactions with outgroup members through media, can activate many of the same psychological processes as direct interpersonal contact (Schiappa et al., 2005). Parasocial contact fosters more favorable attitudes toward racial minorities (Murrar & Brauer, 2018; Tassinari et al., 2024), sexual minorities (Bond, 2021), people with disabilities (Ruggs & McGonagle, 2023) and women in STEM fields (Moss-Racusin et al., 2018; Pietri et al., 2017). Highlighting the role of empathy, parasocial interaction with a transgender character on an online television reduced prejudice toward transgender people in general via heightened empathy for the character (Massey et al., 2021).

Extending this logic, exposure to mediated portrayals of people's experience with bias and discrimination may enable viewers to better understand outgroup members' lived experiences, feel concern for their suffering, recognize the personal and broader social and institutional forces that sustain inequality, and be motivated to produce change. Crucially, the empathic impact of parasocial contact depends on the degree to which the mediated experience is emotionally vivid, engaging, and personally involving, with more immersive and affectively rich portrayals expected to elicit stronger empathic responses (Cummings et al., 2022).

Virtual Reality and Empathy

Virtual reality (VR) can be understood as a particularly powerful form of parasocial contact because it intensifies the empathic processes highlighted by intergroup contact theory. VR enables researchers to combine experimental control with ecological validity by immersing participants in realistic, interactive virtual environments where they can directly experience or witness discrimination (Blascovich et al., 2002; Lui et al., 2023, see; Tassinari et al., 2026). Described as the "ultimate empathy machine" (Milk, 2015), VR allows individuals to virtually "step into another's shoes," heightening identification with others in the virtual space and strengthening their sense of physical and emotional presence (Slater & Sanchez-Vives, 2016). More broadly, the extent

to which an audience identifies with a media character has implications for empathy. Cohen's (2001) theorizing suggests that character identification is accompanied by heightened awareness of another person's cognitive and emotional state. By strengthening identification, VR may therefore amplify empathic responses.

Prior research examining VR and racial bias has used embodied perspective-taking paradigms in which participants inhabit the body of an outgroup member through a virtual avatar. This research, which has examined implicit racial bias as the outcome (i.e., relatively unintentional favoritism for White over Black people assessed with reaction-time tasks; see Greenwald et al., 1998), has yielded mixed findings. While some research found that embodying a Black avatar reduced implicit racial bias among White participants (Peck et al., 2013), other research revealed increased implicit racial bias (Groom et al., 2009). Reflecting on these inconsistencies, Higgins et al. (2024) concluded that differences in study design, embodiment procedures, social context, and measurement approaches likely contribute to conflicting results. Importantly, this literature has focused exclusively on whether embodying an outgroup member changes implicit racial bias. Consequently, less is known about whether immersive VR can promote broader anti-racist outcomes, such as recognizing personal and systemic bias, perceiving racism, and increasing motivation to combat racial inequality. These outcomes may depend less on experiencing life "as" an outgroup member and more on understanding and empathizing with their lived experiences.

One promising approach is non-embodied immersive VR. Rather than placing participants in the body of an outgroup member, non-embodied 360° documentaries immerse participants in another person's experiences while allowing them to remain observers. In *Clouds Over Sidra*, for example, participants experience a day in the life of a 12-year-old child named Sidra, a young Syrian girl living in a refugee camp (Arora & Milk, 2015). Although participants maintain their own identity as observers and have limited control over the virtual environment, they become immersed as events unfold around them. Indeed, a non-embodied 360° immersive experience in which participants watched a distressed Black man interacting with law enforcement heightened participants' empathy (Timmer-Murillo et al., 2026). These findings are consistent with Harwood's (2010) contact space model, which posits that intergroup contact varies along two dimensions: (1) involvement of the self in the contact, and (2) richness of the communication context. Immersive VR scores highly on both dimensions by placing the self in vivid, engaging contact with outgroup members, regardless of whether the experience involves embodiment.

Evidence also suggests that immersive VR can promote empathy more effectively than traditional narrative-based perspective-taking. Herrera et al. (2018), for example, found that participants who experienced homelessness

through VR perspective-taking, rather than imagining homelessness through a traditional narrative, reported greater emotional empathy, stronger support for affordable housing policies, and a greater likelihood of signing a petition advocating affordable housing.

Building on this work, we reasoned that non-embodied immersive VR may be well-suited for fostering empathy for discrimination experiences because it allows viewers to become immersed in another person's lived experiences without requiring them to embody that individual. Consequently, we expected that learning about anti-Black racism through a non-embodied immersive 360° VR experience would elicit stronger cognitive and emotional empathy relative to listening to an audio narrative presenting the same content. Moreover, whereas previous VR research has examined implicit racial bias, we investigated whether this form of immersive VR would increase recognition of and motivation to combat personal and systemic bias and perceptions of racism via heightened empathy.

Current Research and Hypotheses

Guided by research on the parasocial contact hypothesis and empathy-based prejudice reduction, we tested whether the modality through which people learn about race-related discrimination experiences (i.e., non-embodied 360° immersive VR versus audio, plus a race-unrelated audio control condition) affects their empathy, recognition of and motivation to combat personal and systemic bias, and perceptions of racism.

Hypothesis #1

We expected that exposure to race-related discrimination experiences through non-embodied 360° VR would elicit greater recognition of and motivation to combat personal and systemic bias, greater perceptions of racism, and greater cognitive and emotional empathy compared to exposure to this information via audio.

Hypothesis #2

We expected higher scores on all measures in the race-related audio condition than in the race-unrelated audio control condition.

Hypothesis #3

Finally, we expected cognitive and emotional empathy to mediate the association between experimental condition and the other dependent measures, such that the non-embodied 360° VR experience would elicit greater feelings of

empathy relative to the audio condition(s), which in turn would be associated with greater recognition of and motivation to combat personal and systemic bias, and greater perceptions of racism.

We report how the sample size was determined, and all data exclusions, manipulations, and measures. The preregistration can be found at https://osf.io/92zuv?view_only=e653219772344cb69c3d76b849cf6711. The data, analytic code, research materials, and supplemental online materials (SOM) are available at https://osf.io/gxr4v/?view_only=e653219772344cb69c3d76b849cf6711. Instances in which analyses deviate from preregistrations are noted in the Results sections.

Method

Design and Participants

This study was approved by the university and its associated Institutional Review Board (IRB # 2024–189). After providing informed consent, participants were randomly assigned to one of three conditions in a single-factor between-participants design. Data were collected from March 2024 through October 2024 from 326 non-Black undergraduate students at a large midwestern university in the United States. Participants received partial course credit for taking part in the study. We excluded data from four participants who were 17 years old. After preregistered exclusions (e.g., nine participants indicated that they were Black), 313 participants remained for analyses ($M_{\text{age}} = 18.84$, $SD_{\text{age}} = 1.23$; 162 women, 147 men, two nonbinary, one agender, one gender-fluid; 245 White, 42 Asian or Asian American, 12 Hispanic or Latino/a, 11 biracial/multiracial (but not Black), two Middle Eastern (Arab), one indicated a different identity).¹ A sensitivity analysis indicated that our sample size provided 80% power to detect a small-to medium effect size, $d = 0.36$, with $\alpha = .05$. Participants had minimal past experience using VR (92.90% indicated having never used it or having used it no more than once prior to the study).

Procedure

Participants signed up to complete the study online and were told that it concerned “how people learn about aspects of U.S. history via different communication modalities.” Upon arrival at the lab, participants were randomly assigned to one of three conditions:

Virtual Reality (VR) Traveling While Black

Participants used an Oculus Quest VR headset to watch and listen to a 19-minute non-embodied immersive 360° VR documentary experience titled *Traveling While Black* (Williams, 2019). Within this virtual environment,

participants were able to view their surroundings naturalistically, creating a sense of presence (Groom et al., 2009). For example, participants were transported to Ben's Chili Bowl, an iconic restaurant in Washington, D.C. During the Civil Rights movement, this restaurant was a popular gathering spot for activists and protestors, serving food to those engaged in the March on Washington and remaining open during the historic 1968 Washington D. C. riots. At times, participants were virtually seated across from Black individuals including (civil rights activists and politicians) in the restaurant as they recounted and reflected on their harrowing experiences living in the Jim Crow South during the 1950s and 1960s or described ongoing violence and discrimination against the Black community, such as Tamir Rice's mother describing his tragic death in 2014. In other moments, the VR experience transported participants into the narrated events themselves, immersing them in the environment being described. For example, when Courtland Cox described the anxiety Black people felt when exercising their right to sit at the front of the bus, knowing that they might be physically assaulted, participants were virtually seated on a bus, surrounded by other passengers.

Audio Only Traveling While Black

Instead of the immersive non-embodied 360° VR experience of *Traveling While Black*, participants listened to the 19-minute audio recording of the experience.

Control Condition

Participants listened to a 19-minute audio recording about the history of the automobile.

Participants then completed the dependent measures, beginning with randomly ordered assessments of emotional and cognitive empathy. They proceeded to take a *Traveling While Black* content quiz, followed by randomly ordered measures of perceived isolated or systemic manifestations of racism and recognition of and motivation to combat personal and systemic bias. Finally, participants completed a manipulation check question, demographic questions, reported prior VR use, and received debriefing information.

Measures

Primary study measures (including example items) appear in Table 1. All primary measures were completed on a 1 (*strongly disagree*) to 9 (*strongly agree*) scale, except the empathy measures. Emotional empathy was completed using a 1 (*Does not apply at all*) to 7 (*Applies very much*) scale, and cognitive empathy was completed using a 1 (*Not at all*) to 7 (*Very much so*) scale. Participants also completed a manipulation check question which asked them to describe what they were asked to do in the study, with three response

Table 1. Measures and example items.

Personal Bias Measures	
Recognition of Personal Bias (nine items; Noland & Monteith, 2025)	• When talking to Black people, I may be unintentionally acting in a prejudiced way. • I recognize that stereotypes and unintentional biases could influence my behavior toward Black people.
Motivation to Combat Personal Bias (six items; Noland & Monteith, 2025)	• I am motivated to be on guard so that stereotypes do not affect my judgments of Black people. • I'm willing to learn more about my biases so that I can behave in non-prejudiced ways toward Black people.
<i>Systemic Bias Measures</i>	
Recognition of Systemic Bias (eight items (Noland & Monteith, 2025, adapted from; Henry & Sears, 2002; Adams et al., 2008; Shin et al., 2016))	• I recognize that racism is embedded in the legal, educational, and economic systems within our society. • Structural and institutional racism in society (e.g., racist laws, policies, customs) are responsible for racial inequality.
Motivation to Combat Systemic Bias (seven items; Noland & Monteith, 2025, adapted from Rapa et al., 2020)	• I am motivated to do what I can to correct social and economic inequality that disadvantages Black people. • I am willing to learn more about how systemic bias operates in society (e.g., in housing, education, healthcare) so that I can get involved with combatting it.
<i>Perceptions of Racism Measures</i>	
Perceptions of Isolated Incidents of Racism (five items; Nelson et al., 2013)	To what degree does the situation below reflect a case of racism? • An African American woman made reservations for a rental car over the phone, but when she arrived in person to collect the car, the agent informed her that no cars were available. • An African American man goes to a real estate company to look for a house. The agent takes him to look only at homes in low income neighborhoods.
Perceptions of Systemic Racism (eight items; Nelson et al., 2013)	• The relatively small number of African Americans in professional sports coaching positions (NBA, NFL) relative to the number of African American athletes. • The portrayal of African Americans in US entertainment media.
<i>Empathy Measures</i>	
Emotional Empathy (six items; Batson, Early, et al., 1997)	Based on what you just experienced, please indicate the extent to which each item applies to you at this moment using the provided scale. When answering each item, please consider how you feel at this moment. • tender, softhearted, warm, compassionate, moved, and concerned
Cognitive Empathy (five items; adapted from Martin & Johnson, 2024)	Based on what you just experienced, please answer the following questions according to how you feel in the current moment. • I tried to take the perspective of the people involved. • I imagined what the people involved might be thinking.

options corresponding to the three experimental conditions (watch a VR film about Black history, listen to information about black history, listen to information about automotive history). Other measures not pertinent to the present study were also collected, including measures of prosocial behavior and personality.

Results

Reliabilities, descriptive statistics, and intercorrelations among measures are shown in Table 2. One-way between-participant analyses of variance (ANOVAs) were performed on each measure. Given *a priori* hypotheses for most condition comparisons, Fisher's least significant difference tests were used for pairwise comparisons. For all tests, we report effect size *ds* for significant pairwise comparisons, and 95% confidence intervals of these effect sizes.

Personal and Systemic Bias

Means and standard deviations for the primary dependent variables as a function of condition are presented in Table 3.

Personal Bias

Contrary to hypotheses, the three conditions did not differ significantly in recognition of personal bias, $F(2, 310) = 0.15$, $p = .860$, $\eta_p^2 = .00$. Interestingly, each of the condition means was lower than the midpoint of the scale (i.e., $M = 4.50$), indicating that the non-Black participants generally acknowledged their own racial biases to only a moderate extent. We will return to this point in the discussion section.

However, we did find a significant main effect for motivation to combat personal bias, $F(2, 310) = 6.26$, $p = .002$, $\eta_p^2 = .04$. In line with Hypothesis 1, VR *Traveling While Black* elicited greater motivation to combat personal bias than the audio version of *Traveling While Black*, $p = .006$, $d = 0.39$, 95% CI

Table 2. Means, standard deviations, and correlations among variables.

	α	M	SD	1	2	3	4	5	6	7
(1) Recognition of Personal Bias	.89	4.34	1.63	–						
(2) Motivation to Combat Personal Bias	.82	7.15	1.29	.09	–					
(3) Recognition of Systemic Bias	.88	6.74	1.42	.24***	.61***	–				
(4) Motivation to Combat Systemic Bias	.90	6.43	1.49	.05	.69***	.71***	–			
(5) Perceptions of Isolated Incidents of Racism	.69	5.49	1.00	.06	.59***	.60***	.67***	–		
(6) Perceptions of Systemic Racism	.85	4.65	1.13	.24***	.55***	.74***	.65***	.70***	–	
(7) Emotional Empathy	.88	4.45	1.38	.00	.31***	.20***	.30***	.27***	–.25***	–
(8) Cognitive Empathy	.91	5.61	1.13	–.06	.22***	.18**	.25***	.22***	.15**	.66***

Note: All measures completed on 1 to 9-point scales except empathy, which were completed on 1 to 7-point scales. * $p < .05$. ** $p < .01$. *** $p < .001$. (two-tailed).

Table 3. Means and standard deviations for dependent variables as a function of Experimental condition.

Dependent Variables	Control	Condition Audio TWB	VR TWB
Recognition of Personal Bias	4.38 _a (1.57)	4.26 _a (1.65)	4.37 _a (1.69)
Motivation to Combat Personal Bias	6.93 _a (1.29)	7.01 _a (1.31)	7.50 _b (1.22)
Recognition of Systemic Bias	6.61 _a (1.35)	6.58 _a (1.47)	7.00 _b (1.40)
Motivation to Combat Systemic Bias	6.24 _a (1.48)	6.31 _{ab} (1.45)	6.71 _{bc} (1.51)
Perceptions of Isolated Incidents of Racism	5.40 _a (0.94)	5.32 _a (1.04)	5.73 _b (0.99)
Perceptions of Systemic Racism	4.51 _a (1.07)	4.66 _a (1.16)	4.78 _a (1.15)
Emotional Empathy	3.15 _a (1.10)	4.90 _b (1.03)	5.29 _c (0.90)
Cognitive Empathy	4.77 _a (1.13)	5.90 _b (0.91)	6.17 _c (0.82)

Note: For each dependent variable, means not sharing a subscript differ significantly, $p < .05$, according to Fisher's LSD tests. TWB = Traveling While Black.

[0.11, 0.66] and the control condition, $p = .001$, $d = 0.45$, 95% CI [0.18, 0.72]. Contrary to Hypothesis 2, audio *Traveling While Black* and the control condition did not differ significantly, $p = .681$.

In sum, we found partial support for Hypothesis 1 that the VR *Traveling While Black* strategy would influence personal outcomes. Participants were more willing to combat their own personal biases after learning about injustice and discrimination in a highly immersive virtual reality environment; however, they did not report a greater awareness of their own biases. Contrary to what we expected, we did not find that simply listening to the *Traveling While Black* experience influenced personal bias outcomes relative to the control condition.

Systemic Bias

The main effect of condition was just short of significance when predicting recognition of systemic bias, $F(2, 310) = 2.91$, $p = .056$, $\eta_p^2 = .02$. Confirming Hypothesis 1, VR *Traveling While Black* elicited greater recognition of systemic bias than audio *Traveling While Black*, $p = .033$, $d = 0.29$, 95% CI [0.02, 0.56], and the control condition, $p = .045$, $d = 0.28$, 95% CI [0.01, 0.55]. Audio *Traveling While Black* and the control condition did not differ, $p = .875$.

We found a significant main effect for condition when predicting motivation to combat systemic bias, $F(2, 310) = 3.10$, $p = .046$, $\eta_p^2 = .02$. In line with Hypothesis 1, VR *Traveling While Black* elicited significantly greater motivation to combat systemic bias relative to the control condition, $p = .021$, $d = 0.31$, 95% CI [0.04, 0.58], and somewhat greater motivation to combat systemic bias than Audio *Traveling While Black*, $p = .055$, $d = 0.27$, 95% CI [-0.01,

0.54]. Contrary to predictions, audio *Traveling While Black* and the control condition did not differ significantly, $p = .728$.

In sum, the expectation that the VR *Traveling While Black* experience would stimulate recognition of and motivation to combat systemic bias was fully supported. Recognition of and motivation to combat systemic bias was heightened for participants after exposure to discrimination experiences in a highly immersive virtual reality environment relative to one that was less immersive or race-unrelated. However, contrary to hypotheses, we did not find that simply listening to *Traveling While Black* influenced systemic bias outcomes relative to the control condition.

Perceptions of Isolated Incidents of Racism

We found a significant main effect for condition when predicting perceptions of isolated incidents of racism, $F(2, 310) = 5.11$, $p = .007$, $\eta_p^2 = .03$. As expected, VR *Traveling While Black* elicited stronger perceptions of racism when participants considered isolated incidents than audio *Traveling While Black*, $p = .003$, $d = 0.40$, 95% CI [0.13, 0.68] and the control condition, $p = .015$, $d = 0.34$, 95% CI [0.07, 0.61]. Contrary to predictions, audio *Traveling While Black* and the control condition did not differ significantly, $p = .580$.

Perceptions of Systemic Racism

In contrast, we did not find a significant main effect for condition when predicting perceptions of systemic racism, $F(2, 310) = 1.58$, $p = .208$, $\eta_p^2 = .01$. Thus, whereas learning about discrimination experiences in a highly immersive environment influenced participants' perceptions of racism in isolated incidents, modality did not affect perceptions of systemic racism.

Empathy

As expected, we found a significant main effect for condition when predicting emotional empathy, $F(2, 310) = 134.28$, $p < .001$, $\eta_p^2 = .46$. Confirming Hypothesis 1, VR *Traveling While Black* elicited greater emotional empathy than audio *Traveling While Black*, $p = .005$, $d = 0.41$, 95% CI [0.14, 0.69] and relative to the control condition, $p < .001$, $d = 2.13$, 95% CI [1.79, 2.46]. Furthermore, in line with Hypothesis 2, audio *Traveling While Black* elicited greater emotional empathy than the control condition, $p < .001$, $d = 1.63$, 95% CI [1.32, 1.95].

We also found a significant main effect for condition when predicting cognitive empathy, $F(2, 310) = 62.86$, $p < .001$, $\eta_p^2 = .29$. Confirming Hypothesis 1, VR *Traveling While Black* elicited greater cognitive empathy than audio *Traveling While Black*, $p = .048$, $d = 0.31$, 95% CI [0.03, 0.58] and relative to the control condition, $p < .001$, $d = 1.41$, 95% CI [1.11, 1.71]. Furthermore, in line with Hypothesis 2, audio *Traveling While Black* elicited

greater cognitive empathy than the control condition, $p < .001$, $d = 1.09$, 95% CI [0.80, 1.39].

Learning about discrimination experiences stimulated greater emotional and cognitive empathy relative to a race-unrelated condition. The immersive VR environment was particularly effective at stimulating emotional and cognitive empathy.

Mediation Analyses

For measures that showed a direct effect of condition, we used Hayes' (2018) PROCESS macro (Model 4; 5,000 bootstrapped samples) to test possible processes underlying the significant effects of VR *Traveling While Black* on motivation to combat personal bias, recognition of and motivation to combat systemic bias, and perceptions of isolated incidents of racism. Condition was dummy coded to compare (a) VR *Traveling While Black* and the control condition and (b) audio *Traveling While Black* vs. VR *Traveling While Black*.

No significant effects emerged for cognitive empathy for any of the comparisons; however, emotional empathy consistently emerged as a significant mediator (see Figures 1 and 2). As shown in Figure 1, for the VR *Traveling While Black* vs. control comparison, the indirect effect of emotional empathy was significant for each dependent variable. As expected, these results suggest that exposure to discrimination experiences via virtual reality (vs. a race unrelated audio) was associated with greater feelings of emotional empathy, which in turn produced significant indirect effects of greater motivation to combat personal bias (indirect effect: $b = 0.75$, $se = 0.20$, 95% CI [0.37, 1.16]), recognition of systemic bias (indirect effect: $b = 0.48$, $se = 0.22$, 95% CI [0.07, 0.92]), motivation to combat systemic bias (indirect effect: $b = 0.81$, $se = 0.23$, 95% CI [0.38, 1.28]), and perceptions of racism in isolated incidents (indirect effect: $b = 0.51$, $se = 0.15$, 95% CI [0.23, 0.80]).

Supporting our preregistered hypotheses, for audio *Traveling While Black* vs. VR *Traveling While Black*, the indirect effect of emotional empathy was significant for each dependent variable (see Figure 2). As expected, these results suggest that exposure to discrimination experiences via audio (vs. exposure to discrimination experiences via VR) was associated with lower feelings of emotional empathy, which in turn produced significant indirect effects of less motivation to combat personal bias (indirect effect: $b = -0.14$, $se = 0.06$, 95% CI [-0.28, -0.04]), recognition of systemic bias (indirect effect: $b = -0.09$, $se = 0.05$, 95% CI [-0.21, -0.01]), motivation to combat systemic bias (indirect effect: $b = -0.15$, $se = 0.07$, 95% CI [-0.30, -0.04]), and perceptions of isolated incidents of racism (indirect effect: $b = -0.09$, $se = 0.04$, 95% CI [-0.19, -0.02]).

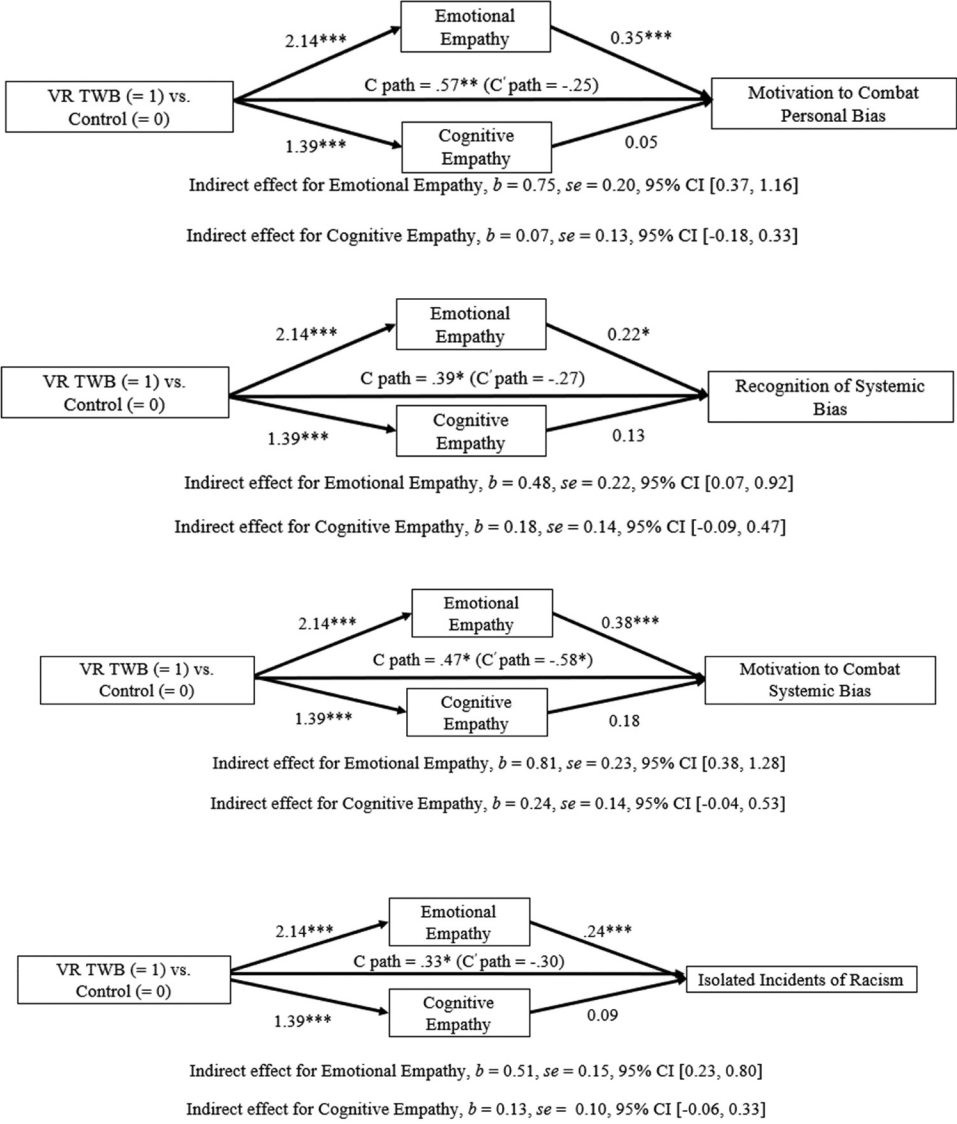


Figure 1. Mediation models depicting the indirect effects of emotional and cognitive empathy when comparing VR TWB and the control condition on motivation to combat personal bias, recognition of systemic bias, motivation to combat systemic bias, and perceptions of racism in isolated incidents. Path values represent unstandardized regression coefficients. * $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

The current study investigated how the modality through which non-Black individuals are exposed to racial injustice narratives influences recognition of and motivation to combat bias, perceptions of racism, and feelings of empathy. We hypothesized that exposure to race-related discrimination experiences through a non-embodied 360° VR experience would produce stronger effects

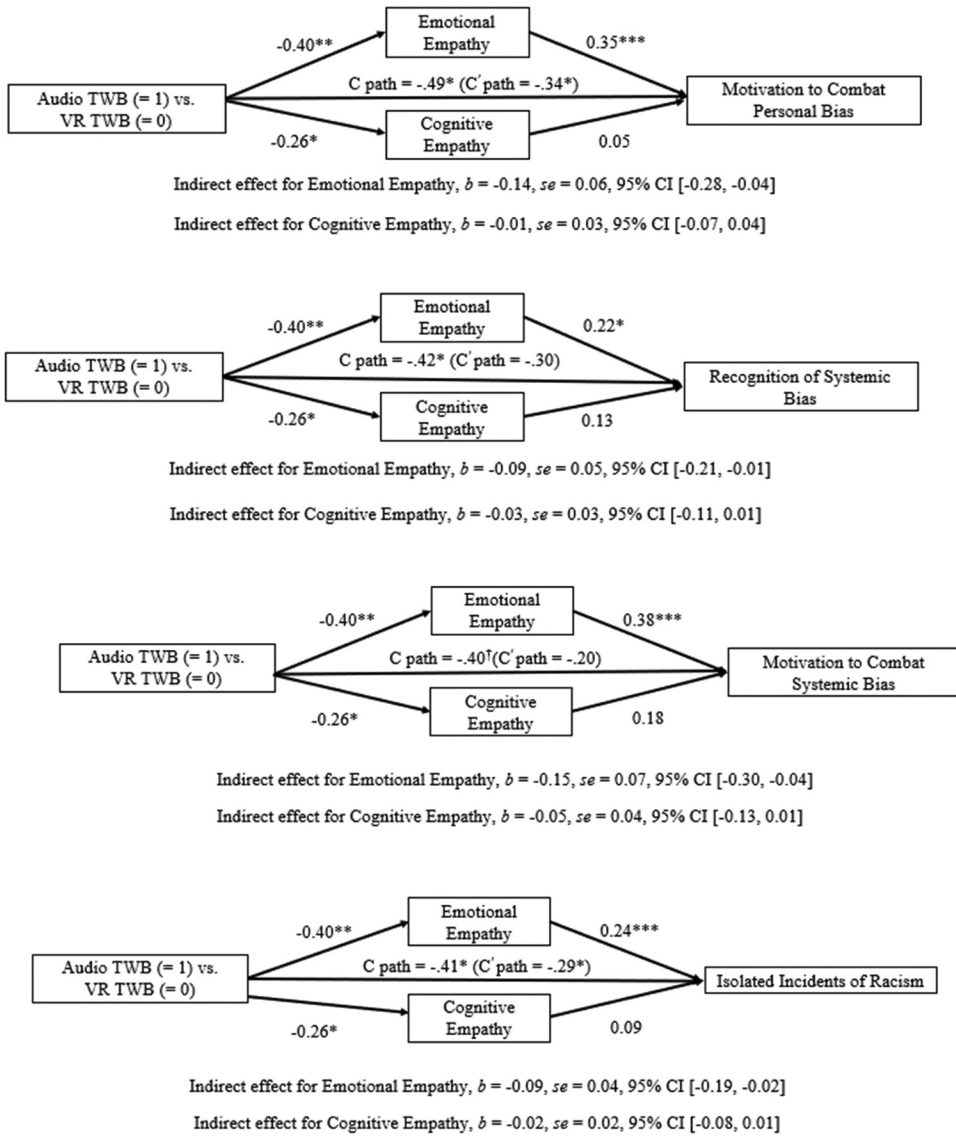


Figure 2. Mediation models depicting the indirect effect of emotional and cognitive empathy when comparing audio TWB and VR TWB on motivation to combat personal bias, recognition of systemic bias, motivation to combat systemic bias, and perceptions of racism in isolated incidents. Path values represent unstandardized regression coefficients. † $p = .055$ * $p < .05$. ** $p < .01$. *** $p < .001$.

on recognition of and motivation to combat personal and systemic bias, perceptions of racism, and empathy versus a more traditional audio-based approach. The findings provide general support for our hypotheses and contribute to a growing body of literature examining how technologically mediated interventions can shape motivational-based and affective responses to racial injustice. Consistent with past theorizing on the importance of

empathy in prejudice reduction (Batson, Polycarpou, et al., 1997; Dovidio et al., 2004; Vescio et al., 2003), the results also highlight the utility of immersive technology in anti-bias education.

Virtual Reality Narratives Enhance Recognition, Motivational, and Empathic Responses

As predicted by Hypothesis 1, participants in the non-embodied 360° VR condition demonstrated significantly greater recognition of systemic bias and motivation to combat both personal and systemic bias. Although not statistically significant, the mean for perception of systemic bias incidents was in the expected direction (i.e., highest in VR condition). Additionally, participants reported greater perceptions of racism for isolated incidents, and greater feelings of emotional and cognitive empathy, compared to participants in the audio-only and race-unrelated control conditions.

Encouraging individuals, particularly members of advantaged groups, to recognize racism and to feel motivated to confront it is a critical step toward social change (Radke et al., 2020). Yet, advantaged group members are often unreceptive to acknowledging bias, with many denying bias or distance themselves and view inequality as not personally relevant (Shuman et al., 2025). Thus, identifying strategies that can foster openness to recognizing racism and strengthen motivation for both personal and systemic change is essential. The current findings point to non-embodied 360° VR experiences as a potentially powerful immersive means of enhancing awareness and empathy that may translate into sustained efforts toward greater equality. These findings are consistent with research suggesting that VR can heighten engagement and emotional responses (Herrera et al., 2018; Slater & Sanchez-Vives, 2016). By immersing participants within narrated experiences of racial discrimination, the non-embodied 360° VR experience may have disrupted distancing strategies often used to downplay bias (Peck et al., 2013) and fostered more visceral feelings of empathy (Ahn et al., 2013). Indeed, people may minimize bias by construing it as uncommon, ambiguous, or disconnected from their worldview (Knowles et al., 2014; Pronin et al., 2002). Rather than embodying a target of discrimination, participants witnessed discrimination from within an immersive environment, reducing this distance by making biased incidents more vivid, concrete, and emotionally engaging (Ahn et al., 2013).

Contrary to Hypothesis 2, participants in the audio-only condition did not differ significantly from those in the control condition on the outcome measures. These findings diverge from prior research showing that narratives about discrimination can effectively heighten motivation to combat personal bias and recognition of and motivation to combat systemic bias (Bonam et al., 2019; Noland & Monteith, 2025). One explanation is that a single, passive listening session may not provide sufficient engagement or emotional arousal

to generate recognition of or motivation to combat bias. Audio stimuli lack the sensory richness and embodied immersion of VR, which may be particularly important when engaging audiences unfamiliar with or resistant to racial justice content (Balcerak Jackson & Balcerak Jackson, 2024). Another possible explanation is that the VR experience did not lend itself well to an audio-only format. Participants in the audio-only condition listened to the VR experience, but it is possible that they missed essential elements as this documentary experience was created for VR.

Empathy as a Potentially Critical Underlying Process

Confirming Hypothesis 3, the findings suggest that empathy may operate as a key psychological mechanism through which parasocial contact exerts its effects. Consistent with parasocial contact frameworks, immersive exposure to racial injustice narratives appears to foster affective connection with targets of discrimination. Indeed, analyses revealed that emotional empathy significantly mediated the effect of the VR *Traveling While Black* (versus both the control and audio *Traveling While Black* conditions) and several key outcome measures. These findings demonstrate empathy's central role in anti-prejudice processes (Batson, Polycarpou, et al., 1997; Batson et al., 2002; Dovidio et al., 2004; Legault et al., 2025), particularly the importance of emotional resonance. While cognitive empathy was also elevated in the VR condition, only emotional empathy emerged as a mediator of the effect of the effects of the VR experience on motivation to combat personal bias, recognition of and motivation to combat systemic bias, and perceptions of racism in isolated incidents. Thus, the mediating role of emotional empathy observed here aligns with the notion that parasocial contact operates not merely through cognitive awareness, but through affective resonance that makes inequality feel immediate and morally compelling.

Notably, despite relatively high levels of recognition of systemic bias, motivation to combat both personal and systemic bias, and perceptions of racism in isolated incidents in the VR *Traveling While Black* condition, with emotional empathy serving as a statistical mediator, the VR participants did not report greater recognition of their own racial bias than other participants. Indeed, across conditions, mean scores for recognition of personal bias were lower than for the other race-relevant measures and fell below the scale midpoint. This disconnect suggests that even when individuals recognize systemic bias and feel motivated to combat injustice, they may resist acknowledging their own biases – a phenomenon consistent with identity protection processes and prior findings of defensive denial (Howell et al., 2015; Rucker & Richeson, 2021). Research also finds that acknowledgment of one's own personal bias conflicts with people's commitment to being viewed as nonprejudiced (Dovidio & Gaertner, 2000; Howell et al., 2015; O'brien et al., 2010).

Implications and Future Directions

Responding to recent calls for mechanism-focused immersive intervention research (Tassinari et al., 2026), the present findings suggest that immersive documentary-based VR experiences influence anti-bias outcomes through heightened emotional empathy. Motivating systemic change is difficult. Construal level theory suggests that this challenge arises because people tend to construe events that are socially, temporally, or historically distant in abstract rather than concrete terms, which reduces their emotional impact and sense of urgency (Trope & Liberman, 2010). The present work is novel in demonstrating that a non-embodied 360° VR experience overcomes this barrier by creating a visceral, embodied experience that situates participants directly into instances of racial discrimination, making these experiences feel immediate and self-relevant (Ahn et al., 2013; Blascovich et al., 2002; Peck et al., 2013). Importantly, the intervention examined here differs from many prior studies that employ embodied paradigms (e.g., Groom et al., 2009; Peck et al., 2013). Rather than inhabiting a virtual outgroup avatar, participants were immersed within a documentary-based experience that allowed them to witness racial discrimination from an engaging first-person perspective. This immersive format appears to foster both emotional and cognitive empathy, but the present findings suggest that emotional empathy may be the more influential mechanism linking immersive experiences to greater anti-bias motivation.

This study also contributes to ongoing discussions about intervention modality. Compared to traditional approaches, non-embodied immersive 360°VR may be more effective in eliciting concern about bias without triggering defensiveness, particularly among individuals from dominant social groups. Given that there are few prejudice reduction methods that are both effective in the real world and scalable (e.g., Paluck et al., 2021), this VR experience has practical implications for institutional diversity training programs, and media creators seeking to increase public understanding of anti-Black racism.

These practical implications may be especially important in the current U.S. sociopolitical climate. The U.S. is experiencing a critical period during which diversity, equity, and inclusion (DEI) initiatives and education related to systemic racism are being restricted (Ng et al., 2025). Thus, there is a growing need for additional strategies to engage the public with critical Black history. Salter et al. (2024) argue that critical histories serve as counters-tories that challenge dominant narratives about race and serve as antiracist affordances that help people to connect historical systems of oppression to present-day racial inequality. Moreover, limiting opportunities to engage with these histories may reduce opportunities for developing a broader understanding of structural racism and its persistent effects on the Black

community. VR experiences such as *Traveling While Black*, complement traditional educational approaches by providing an engaging medium of exposure through which people can encounter historical narratives outside of formal classroom settings. More broadly, non-embodied immersive 360° VR may represent a promising tool for shaping social and cultural understanding of race by making critical historical narratives available through an engaging and immersive medium.

Nonetheless, the current results also caution against reliance on non-embodied immersive 360° VR only. Although VR effectively increases empathy and motivation, it was not sufficient for fostering recognition of personal bias. Future interventions should consider pairing VR with reflective exercises, facilitated discussion, or historical instruction to support deeper understanding and lasting change (e.g., Bonam et al., 2019; Devine et al., 2012). Indeed, this study assessed only short-term outcomes. Longitudinal research is needed to determine whether the effects of immersive interventions persist over time. Additionally, interactive elements can be incorporated into non-embodied immersive 360° VR experiences, such as decision-making within the virtual environment, which may further enhance participants' sense of agency and personal relevance (e.g., Ahn et al., 2016).

Limitations of the current study's methods should also be noted. A strength of VR as an experience is that it has the potential to bring the user beyond basic perspective-taking; it can provide a first-person experiential perspective of a given world. Although *Traveling While Black* immerses participants into contexts as they unfold, it is not a fully embodied experience in that a participant does not appear in avatar form within contexts nor interact directly with those presented within the experience. A comparison of different forms of VR experience in this domain remains ripe for future research.

Another noteworthy limitation is that our design does not allow us to isolate the specific effects of immersive virtual reality from the broader effects of audiovisual media exposure. We did not include a non-immersive audiovisual condition (e.g., a two-dimensional video presentation of *Traveling While Black*), so the extent to which the observed effects are attributable to immersion specifically versus visual experiences remains unclear.

Conclusion

The current research demonstrates that non-embodied 360° immersive VR is a promising modality for eliciting empathy and promoting motivation to address racial bias and recognition of isolated instances of bias and bias at a systemic level. VR significantly enhanced people's recognition of and motivation to combat systemic bias and their motivation to combat personal bias. Moreover, it heightened their emotional engagement and feelings of emotional empathy. However, recognition of personal bias remained limited,

suggesting that immersive experiences must be accompanied by intentional educational support to foster deeper reflection and personal accountability. As immersive technologies become increasingly accessible, their thoughtful use in anti-racism work holds considerable promise.

Note

1. Eighteen participants incorrectly reported their experimental condition in the post-experiment survey. Analyses were conducted both including and excluding these participants. Results did not differ substantively so results from the larger sample are reported.

Author contributions

CRedit: **Elisabeth S. Noland:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Christopher R. Agnew:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Writing – review & editing; **Margo J. Monteith:** Conceptualization, Formal analysis, Methodology, Supervision, Writing – review & editing.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Funding

This research was facilitated by funds provided by Meta Platforms Technologies to the second author. Meta had no role in this research other than providing financial support.

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References

- Adams, G., Edkins, V., Lacka, D., Pickett, K. M., & Cheryan, S. (2008). Teaching about racism: Pernicious implications of the standard portrayal. *Basic and Applied Social Psychology*, 30(4), 349–361. <https://doi.org/10.1080/01973530802502309>
- Ahn, S. J., Bostick, J., Ogle, E., Nowak, K. L., McGillicuddy, K. T., & Bailenson, J. N. (2016). Experiencing nature: Embodying animals in immersive virtual environments increases inclusion of nature in self and involvement with nature. *Journal of Computer-Mediated Communication*, 21(6), 399–419. <https://doi.org/10.1111/jcc4.12173>
- Ahn, S. J., Le, A. M. T., & Bailenson, J. (2013). The effect of embodied experiences on self-other merging, attitude, and helping behavior. *Media Psychology*, 16(1), 7–38. <https://doi.org/10.1080/15213269.2012.755877>
- Allport, G. W. (1954). *The nature of prejudice*. Addison-Wesley.
- Arora, G., & Milk, C. (2015). *Clouds over Sidra* [Video]. MIT Docubase. <https://docubase.mit.edu/project/clouds-over-sidra/>
- Balcerak Jackson, M., & Balcerak Jackson, B. (2024). Immersive experience and virtual reality. *Philosophy & Technology*, 37(1), 19. <https://doi.org/10.1007/s13347-024-00707-1>
- Bart-Plange, D. J., & Trawalter, S. (2025). On the role of police shootings, recognition of systemic racism, and empathy on White Americans' support for police reform. *Personality and Social Psychology Bulletin*, 51(10), 1962–1986. <https://doi.org/10.1177/01461672241237286>
- Batson, C. D., Chang, J., Orr, R., & Rowland, J. (2002). Empathy, attitudes, and action: Can feeling for a member of a stigmatized group motivate one to help the group?. *Personality and Social Psychology Bulletin*, 28(12), 1656–1666. <https://doi.org/10.1177/014616702237647>
- Batson, C. D., Early, S., & Salvarani, G. (1997). Perspective taking: Imagining how another feels versus imaging how you would feel. *Personality and Social Psychology Bulletin*, 23(7), 751–758. <https://doi.org/10.1177/0146167297237008>
- Batson, C. D., Polycarpou, M. P., Harmon-Jones, E., Imhoff, H. J., Mitchener, E. C., Bednar, L. L., Klein, T. R., & Highberger, L. (1997). Empathy and attitudes: Can feeling for a member of a stigmatized group improve feelings toward the group? *Journal of Personality & Social Psychology*, 72(1), 105–118. <https://doi.org/10.1037/0022-3514.72.1.105>
- Beelmann, A., & Heinemann, K. S. (2014). Preventing prejudice and improving intergroup attitudes: A meta-analysis of child and adolescent training programs. *Journal of Applied Developmental Psychology*, 35(1), 10–24. <https://doi.org/10.1016/j.appdev.2013.11.002>
- Blascovich, J., Loomis, J., Beall, A. C., Swinth, K. R., Hoyt, C. L., & Bailenson, J. N. (2002). Target article: Immersive virtual environment technology as a methodological tool for social psychology. *Psychological Inquiry*, 13(2), 103–124. https://doi.org/10.1207/S15327965PLI1302_01
- Bonam, C. M., Nair Das, V., Coleman, B. R., & Salter, P. (2019). Ignoring history, denying racism: Mounting evidence for the Marley Hypothesis and epistemologies of ignorance. *Social Psychological and Personality Science*, 10(2), 257–265. <https://doi.org/10.1177/1948550617751583>
- Bond, B. J. (2021). The development and influence of parasocial relationships with television characters: A longitudinal experimental test of prejudice reduction through parasocial contact. *Communication Research*, 48(4), 573–593. <https://doi.org/10.1177/0093650219900632>
- Brondolo, E., Halen, V., Pencille, M., Beatty, D., & Contrada, R. J. (2009). Coping with racism: A selective review of the literature and a theoretical and methodological critique. *Journal of Behavioral Medicine*, 32(1), 64–88. <https://doi.org/10.1007/s10865-008-9193-0>

- Carter, E. R., & Murphy, M. C. (2017). Consensus and consistency: Exposure to multiple discrimination claims shapes whites' intergroup attitudes. *Journal of Experimental Social Psychology*, 73, 24–33. <https://doi.org/10.1016/j.jesp.2017.06.001>
- Cohen, J. (2001). Defining identification: A theoretical look at the identification of audiences with media characters. *Mass Communication & Society*, 4(3), 245–264. https://doi.org/10.1207/S15327825MCS0403_01
- Cummings, J. J., Tsay-Vogel, M., Cahill, T. J., & Zhang, L. (2022). Effects of immersive storytelling on affective, cognitive, and associative empathy: The mediating role of presence. *New Media and Society*, 24(9), 2003–2026. <https://doi.org/10.1177/1461444820986816>
- Decety, J., & Jackson, P. L. (2004). The functional architecture of human empathy. *Behavioral and Cognitive Neuroscience Reviews*, 3(2), 71–100. <https://doi.org/10.1177/1534582304267187>
- Devine, P. G., Forscher, P. S., Austin, A. J., & Cox, W. T. (2012). Long-term reduction in implicit race bias: A prejudice habit-breaking intervention. *Journal of Experimental Social Psychology*, 48(6), 1267–1278. <https://doi.org/10.1016/j.jesp.2012.06.003>
- Dix, E. L., & Devine, P. G. (2024). “It’s not an overreaction”: Increasing White people’s acceptance of the reality of bias and receptivity to black people’s bias concerns. *Journal of Experimental Social Psychology*, 110, 104545. <https://doi.org/10.1016/j.jesp.2023.104545>
- Dovidio, J. F., Eller, A., & Hewstone, M. (2011). Improving intergroup relations through direct, extended and other forms of indirect contact. *Group Processes and Intergroup Relations*, 14(2), 147–160. <https://doi.org/10.1177/1368430210390555>
- Dovidio, J. F., & Gaertner, S. L. (2000). Aversive racism and selection decisions: 1989 and 1999. *Psychological Science*, 11(4), 315–319. <https://doi.org/10.1111/1467-9280.00262>
- Dovidio, J. F., ten Vergert, M., Stewart, T. L., Gaertner, S. L., Johnson, J. D., Esses, V. M., Riek, B. M., & Pearson, A. R. (2004). Perspective and prejudice: Antecedents and mediating mechanisms. *Personality and Social Psychology Bulletin*, 30(12), 1537–1549. <https://doi.org/10.1177/0146167204271177>
- Galinsky, A. D., & Moskowitz, G. B. (2000). Perspective-taking: Decreasing stereotype expression, stereotype accessibility, and in-group favoritism. *Journal of Personality & Social Psychology*, 78(4), 708–724. <https://doi.org/10.1037/0022-3514.78.4.708>
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality & Social Psychology*, 74(6), 1464–1480. <https://doi.org/10.1037/0022-3514.74.6.1464>
- Groom, V., Bailenson, J. N., & Nass, C. (2009). The influence of racial embodiment on racial bias in immersive virtual environments. *Social Influence*, 4(3), 231–248. <https://doi.org/10.1080/15534510802643750>
- Harwood, J. (2010). The contact space: A novel framework for intergroup contact research. *Journal of Language & Social Psychology*, 29(2), 147–177. <https://doi.org/10.1177/0261927X09359520>
- Harwood, J., Hewstone, M., Amichai-Hamburger, Y., & Tausch, N. (2013). Intergroup contact: An integration of social psychological and communication perspectives. *Annals of the International Communication Association*, 36(1), 55–102. <https://doi.org/10.1080/23808985.2013.11679126>
- Hayes, A. F. (2018). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (2nd ed.). Guilford Press.
- Henry, P. J., & Sears, D. O. (2002). The symbolic racism 2000 scale. *Political Psychology*, 23(2), 253–283. <https://doi.org/10.1111/0162-895X.00281>
- Herrera, F., Bailenson, J., Weisz, E., Ogle, E., & Zaki, J. (2018). Building long-term empathy: A large-scale comparison of traditional and virtual reality perspective-taking. *PLOS ONE*, 13(10), e0204494. <https://doi.org/10.1371/journal.pone.0204494>

- Higgins, S., Alcock, S., De Aveiro, B., Daniels, W., Farmer, H., & Besharati, S. (2024). Perspective matters: A systematic review of immersive virtual reality to reduce racial prejudice. *Virtual Reality*, 28(3). <https://doi.org/10.1007/s10055-024-01024-w>
- Howell, J. L., Gaither, S. E., & Ratliff, K. A. (2015). Caught in the middle: Defensive responses to IAT feedback among whites, blacks, and biracial black/whites. *Social Psychological and Personality Science*, 6(4), 373–381. <https://doi.org/10.1177/1948550614561127>
- Jolliffe, D., & Farrington, D. P. (2006). Development and validation of the basic empathy scale. *Journal of Adolescence*, 29(4), 589–611. <https://doi.org/10.1016/j.adolescence.2005.08.010>
- Knowles, E. D., Lowery, B. S., Chow, R. M., & Unzueta, M. M. (2014). Deny, distance, or dismantle? How white Americans manage a privileged identity. *Perspectives on Psychological Science*, 9(6), 594–609. <https://doi.org/10.1177/1745691614554658>
- Legault, L., Page, R., Reynolds, M., & Mallery-Winegard, C. (2025). Comparing brief antiracism messages: Empathy-focused communication is more effective than social norms, calls to action, and self-awareness. *Social Psychological and Personality Science*, 17(3), 361–371. <https://doi.org/10.1177/19485506251350179>
- Lui, P. P., Stringer, E., & Jouriles, E. N. (2023). Advancing knowledge on the health consequences of discrimination: The potential of virtual reality. *Cultural Diversity and Ethnic Minority Psychology*, 29(1), 96–105. <https://doi.org/10.1037/cdp0000460>
- Martin, K. J., & Johnson, K. L. (2024). You can't dismantle what you don't recognize: The effect of learning critical black history in healthcare on perspective-taking. *Journal of Experimental Psychology General*, 153(11), 2631–2641. <https://doi.org/10.1037/xge0001482>
- Massey, Z. B., Wong, N. C., & Barbati, J. L. (2021). Meeting the (Trans.) parent: Test of parasocial contact with transgender characters on reducing stigma toward transgender people. *Communication Studies*, 72(2), 232–250. <https://doi.org/10.1080/10510974.2021.1876125>
- Milk, C. (2015, March). *How virtual reality can create the ultimate empathy machine [video]*. TED Conferences. https://www.ted.com/talks/chris_milk_how_virtual_reality_can_create_the_ultimate_empathy_machine
- Moss-Racusin, C. A., Pietri, E. S., Hennes, E. P., Dovidio, J. F., Brescoll, V. L., Roussos, G., & Handelsman, J. (2018). Reducing stem gender bias with VIDS (video interventions for diversity in stem). *Journal of Experimental Psychology: Applied*, 24(2), 236–260. <https://doi.org/10.1037/xap0000144>
- Murrar, S., & Brauer, M. (2018). Entertainment-education effectively reduces prejudice. *Group Processes and Intergroup Relations*, 21(7), 1053–1077. <https://doi.org/10.1177/1368430216682350>
- Nelson, J. C., Adams, G., & Salter, P. S. (2013). The Marley hypothesis: Denial of racism reflects ignorance of history. *Psychological Science*, 24(2), 213–218. <https://doi.org/10.1177/0956797612451466>
- Ng, E., Fitzsimmons, T., Kulkarni, M., Ozturk, M. B., April, K., Banerjee, R., & Muhr, S. L. (2025). The anti-DEI agenda: Navigating the impact of Trump's second term on diversity, equity and inclusion. *Equality, Diversity and Inclusion: An International Journal*, 44(2), 137–150. <https://doi.org/10.1108/EDI-02-2025-0116>
- Noland, E. S., & Monteith, M. J. (2025). Understanding the influence of single bias reduction strategies on personal and systemic bias outcomes. *Group Processes and Intergroup Relations*, 28(1), 164–185. <https://doi.org/10.1177/13684302241252406>
- O'Brien, L. T., Crandall, C. S., Horstman-Reser, A., Warner, R., Alsbrooks, A., & Blodorn, A. (2010). But I'm no bigot: How prejudiced White Americans maintain unprejudiced self-images. *Journal of Applied Social Psychology*, 40(4), 917–946. <https://doi.org/10.1111/j.1559-1816.2010.00604.x>

- Paluck, E. L., Porat, R., Clark, C. S., & Green, D. P. (2021). Prejudice reduction: Progress and challenges. *Annual Review of Psychology*, 72, 533–560. <https://doi.org/10.1146/annurev-psych-071620-030619>
- Peck, T. C., Seinfeld, S., Aglioti, S. M., & Slater, M. (2013). Putting yourself in the skin of a black avatar reduces implicit racial bias. *Consciousness and Cognition*, 22(3), 779–787. <https://doi.org/10.1016/j.concog.2013.04.016>
- Pettigrew, T. F., & Tropp, L. R. (2008). How does intergroup contact reduce prejudice? Meta-analytic tests of three mediators. *European Journal of Social Psychology*, 38(6), 922–934. <https://doi.org/10.1002/ejsp.504>
- Pettigrew, T. F., Tropp, L. R., Wagner, U., & Christ, O. (2011). Recent advances in intergroup contact theory. *International Journal of Intercultural Relations*, 35(3), 271–280. <https://doi.org/10.1016/j.ijintrel.2011.03.001>
- Pietri, E. S., Hennes, E. P., Dovidio, J. F., Brescoll, V. L., Bailey, A. H., Moss-Racusin, C. A., & Handelsman, J. (2019). Addressing unintended consequences of gender diversity interventions on women's sense of belonging in stem. *Sex Roles*, 80(9–10), 527–547. <https://doi.org/10.1007/s11199-018-0952-2>
- Pietri, E. S., Moss-Racusin, C. A., Dovidio, J. F., Guha, D., Roussos, G., Brescoll, V. L., & Handelsman, J. (2017). Using video to increase gender bias literacy toward women in science. *Psychology of Women Quarterly*, 41(2), 175–196. <https://doi.org/10.1177/0361684316674721>
- Pronin, E., Lin, D. Y., & Ross, L. (2002). The bias blind spot: Perceptions of bias in self versus others. *Personality and Social Psychology Bulletin*, 28(3), 369–381. <https://doi.org/10.1177/0146167202286008>
- Radke, H. R. M., Kutlaca, M., Siem, B., Wright, S. C., & Becker, J. C. (2020). Beyond allyship: Motivations for advantaged group members to engage in action for disadvantaged groups. *Personality and Social Psychology Review*, 24(4), 291–315. <https://doi.org/10.1177/1088868320918698>
- Rapa, L. J., Bolding, C. W., & Jamil, F. M. (2020). Development and initial validation of the short critical consciousness scale (CCS-S). *Journal of Applied Developmental Psychology*, 70, 101164. <https://doi.org/10.1016/j.appdev.2020.101164>
- Richeson, J. A., & Shelton, J. N. (2007). Negotiating interracial interactions: Costs, consequences, and possibilities. *Current Directions in Psychological Science*, 16(6), 316–320. <https://doi.org/10.1111/j.1467-8721.2007.00528.x>
- Rucker, J. M., & Richeson, J. A. (2021). Toward an understanding of structural racism: Implications for criminal justice. *Science*, 374(6565), 286–290. <https://doi.org/10.1126/science.abj7779>
- Ruggs, E. N., & McGonagle, A. K. (2023). Can brief video trainings reduce bias and improve knowledge and attitudes toward applicants with disabilities? *Journal of Business & Psychology*, 38(2), 305–326. <https://doi.org/10.1007/s10869-022-09857-5>
- Salter, P. S., Perez, M. J., Battle, J. S., & Crist, J. D. (2024). Each one, teach one: Critical history as counterstories, antiracist affordances, and cues for belonging. *The American Psychologist*, 79(4), 631–644. <https://doi.org/10.1037/amp0001245>
- Sanchez, K. L., Kalkstein, D. A., & Walton, G. M. (2022). A threatening opportunity: The prospect of conversations about race-related experiences between Black and White friends. *Journal of Personality & Social Psychology*, 122(5), 853–872. <https://doi.org/10.1037/pspi0000369>
- Schiappa, E., Gregg, P. B., & Hewes, D. E. (2005). The parasocial contact hypothesis. *Communication Monographs*, 72(1), 92–115. <https://doi.org/10.1080/0363775052000342544>

- Shelton, J. N., West, T. V., & Trail, T. E. (2010). Concerns about appearing prejudiced: Implications for anxiety during daily interracial interactions. *Group Processes and Intergroup Relations*, 13(3), 329–344. <https://doi.org/10.1177/1368430209344869>
- Shin, R. Q., Ezeofor, I., Smith, L. C., Welch, J. C., & Goodrich, K. M. (2016). The development and validation of the contemporary critical consciousness measure. *Journal of Counseling Psychology*, 63(2), 210–223. <https://doi.org/10.1037/cou0000137>
- Shuman, E., Halperin, E., & Knowles, E. (2025). Advantaged identity management strategies differentiate five subgroups of white Americans. *Communications Psychology*, 3(1), 58. <https://doi.org/10.1038/s44271-025-00239-0>
- Slater, M., & Sanchez-Vives, M. V. (2016). Enhancing our lives with immersive virtual reality. *Frontiers in Robotics and AI*, 3(74), 236866. <https://doi.org/10.3389/frobt.2016.00074>
- Sue, D. W., Capodilupo, C. M., Torino, G. C., Bucceri, J. M., Holder, A., Nadal, K. L., & Esquilin, M. (2007). Racial microaggressions in everyday life: Implications for clinical practice. *The American Psychologist*, 62(4), 271–286. <https://doi.org/10.1037/0003-066X.62.4.271>
- Tassinari, M., Aulbach, M. B., Harjunen, V. J., Cocco, V. M., Vezzali, L., & Jasinskaja-Lahti, I. (2024). The effects of positive and negative intergroup contact in virtual reality on outgroup attitudes: Testing the contact hypothesis and its mediators. *Group Processes and Intergroup Relations*, 27(8), 1773–1798. <https://doi.org/10.1177/13684302241237747>
- Tassinari, M., Marinucci, M., & Hasler, B. S. (2026). Immersive technologies and intergroup relations: A critical review of theoretical questions and methodological challenges. *Computers in Human Behavior*, 178, 108908. <https://doi.org/10.1016/j.chb.2026.108908>
- Timmer-Murillo, S. C., Kangas, K., & Gordon, N. (2026). Exploring the effect of counter-stereotype and perspective taking in reducing bias and promoting empathy in police. *Race and Justice*, 16(2), 387–406. <https://doi.org/10.1177/21533687251377232>
- Todd, A. R., Bodenhausen, G. V., Richeson, J. A., & Galinsky, A. D. (2011). Perspective taking combats automatic expressions of racial bias. *Journal of Personality & Social Psychology*, 100(6), 1027–1042. <https://doi.org/10.1037/a0022308>
- Trope, Y., & Liberman, N. (2010). Construal-level theory of psychological distance. *Psychological Review*, 117(2), 440–463. <https://doi.org/10.1037/a0018963>
- Uluğ, M., & Tropp, L. R. (2021). Witnessing racial discrimination shapes collective action for racial justice: Enhancing awareness of privilege among advantaged groups. *Journal of Applied Social Psychology*, 51(3), 248–261. <https://doi.org/10.1111/jasp.12731>
- Vescio, T. K., Sechrist, G. B., & Paolucci, M. P. (2003). Perspective taking and prejudice reduction: The mediational role of empathy arousal and situational attributions. *European Journal of Social Psychology*, 33(4), 455–472. <https://doi.org/10.1002/ejsp.163>
- Vezzali, L., Hewstone, M., Capozza, D., Giovannini, D., & Wölfer, R. (2017). Improving intergroup relations with extended and vicarious forms of indirect contact. *European Review of Social Psychology*, 25(1), 314–389. <https://doi.org/10.1080/10463283.2014.982948>
- Williams, R. R. (2019). *Traveling while black [film]*. Felix & Paul Studios.