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Economic scarcity increases racial stereotyping in beliefs and face representation☆

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ABSTRACT

Racial discrimination typically expands under resource scarcity, but the psychological mechanisms driving this effect remain poorly understood. We examined the role of stereotypes in this effect, given their theorized function in asserting and maintaining existing group hierarchies, and hypothesized that stereotype expression would be heightened in response to scarcity, a signal of social instability. In Study 1, the manipulated perception of scarcity strengthened reported knowledge of stereotypes of Black Americans as low in socioeconomic status and as threatening, relative to control participants. In Study 2, perceived scarcity increased the stereotypicality of participants' visualizations of a Black male face, as assessed using a reverse correlation procedure and judged by independent raters. Study 3 replicated the effect of scarcity on stereotypic face visualizations and further demonstrated that scarcity increased anti-Black stereotypes even among individuals with relatively weak implicit stereotype associations. Together, these studies reveal that the mere perception of scarcity can increase stereotyping of Black Americans, as expressed in self-reports and implicit visualizations of Black faces. We discuss the potential role of stereotyping under scarcity as a means to justify racial discrimination and maintain power structures in response to systemic threat.

Racial disparities often widen in the wake of economic downturns. For example, in the Great Recession of 2008, Black and Latinx Americans lost their jobs at approximately twice the rate of White Americans—a pattern observed again in 2020 during the recession triggered by the COVID-19 pandemic (Chattopadhyay & Bianchi, 2020; Saenz & Sparks, 2020). Explanations for these disparate effects of economic recession often focus on structural disparities in American society, yet scarcity has been shown to exacerbate prejudice in White Americans' perceptions, judgments, and actions—individual-level forms of prejudice that may meaningfully interact with and contribute to these broader patterns (Krosch & Amodio, 2014; Bianchi, Hall, & Lee, 2018). Indeed, the 2020 recession notably coincided with the more prevalent use of ethnic stereotypes by civilians, politicians, and media sources (Croucher, Nguyen, & Rahmani, 2020; Ilchi & Frank, 2021). This suggests the possibility that increased stereotyping may reflect a direct response to scarcity, which in turn may serve a broader function of maintaining social dominance under a form of system threat. In the present research, we sought to elucidate this process by directly examining the effect of perceived scarcity on the expression of racial stereotypes.

1. Scarcity effects on intergroup bias

Competition over resources is long known to exacerbate intergroup bias. In classic studies, resource competition and scarcity fostered distrust and induced discriminatory resource allocations between groups (Brewer & Silver, 1978; LeVine & Campbell, 1972; Sherif, 1966) and promoted the devaluation of others' worth and deservingness (Ross & Ellard, 1986; Skitka & Tetlock, 1992). Perceived scarcity has also been shown to predict support for anti-outgroup policies (Riek, Mania, & Gaertner, 2006), negative explicit and implicit attitudes toward minority groups (Bianchi et al., 2018; Stephan, Ybarra, & Bachman, 1999), and, among individuals lacking egalitarian motives, racial bias in monetary allocations (Krosch, Tyler, & Amodio, 2017).

This pattern of increased intergroup bias in response to scarcity is proposed to function instrumentally, such that it represents a reaction by

☆ This paper has been recommended for acceptance by Professor Michael Kraus

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dominant group members aimed at exerting social dominance in the face of system instability (Esses, Jackson, & Armstrong, 1998; Sherif, 1966). This proposal is consistent with Intergroup Threat Theory, which posits that multiple forms of threat, ranging from interpersonal to economic (e.g., scarcity), can exacerbate intergroup conflict and discrimination (Stephan, Ybarra, & Rios, 2016). Together, this research suggests that increases in prejudice and discrimination under scarcity may reflect a broader response to a system threat by members of a dominant social group.

2. Stereotyping in response to scarcity

Although prior research has shown that scarcity increases prejudice and discrimination, it has not examined the effect of scarcity on stereotyping. Yet stereotypes are particularly germane to the maintenance and exertion of social dominance and support of the status quo, such that they may be used to justify and legitimize existing norms and power structures (Sidanius, 1993; Sidanius & Pratto, 2001; Jost & Banaji, 1994; Cuddy, Fiske, & Glick, 2008). Thus, given the role of stereotypes in bolstering such institutions, we would expect the perception of economic scarcity—a form of threat to the stability of a social system—to increase the expression of subordinated group stereotypes. In this sense, an increase in stereotyping may reflect the direct instrumental effort to derogate and justify discrimination of minority group members. Furthermore, the threat of scarcity may provide a perceived justification of stereotype use in response to a group-based threat, effectively providing an excuse or outlet to enact deeply held stereotype beliefs (Crandall & Eshleman, 2003).

According to this theoretical analysis, the perception of scarcity among White Americans, as well as non-Black intermediate-status racial group members (Caricati, 2018), should elicit stereotypes of Black Americans that legitimize the relational positions within society between these racial groups. Although all aspects of a stereotype may serve the purpose of legitimizing and maintaining the societal hierarchy, stereotypes concerning a group's position in a hierarchy and their propensity for threat may be particularly relevant. Hence, we focused on the commonly-held American stereotypes of Black American people as being low in socioeconomic status (SES) and threatening (Devine & Elliot, 1995). In the American context, the low-SES stereotype is typically expressed in terms of attributes and traits such as "poor," "uneducated," and "lazy" (Devine & Elliot, 1995; Maddox & Gray, 2002). Being lazy and uneducated conveys that one is less deserving of resources and being stereotyped as poor may imply that one's status was earned (i.e., a just-world belief; Lerner, 1980). Low-SES stereotypes could be used to justify majority group members' goal to allocate more resources to the ingroup than the outgroup. Hence, scarcity would be expected to evoke low-SES stereotypes of Black Americans in the minds of non-Black American perceivers.

Given the links between resource scarcity, system instability, and dominance threat, as described above and demonstrated in recent research (Bianchi et al., 2018; Quist & Resendez, 2002), scarcity, via social dominance motives, may also evoke stereotypes that portray Black Americans as a threat. Threat-based stereotypes include attributes such as "hostile," "criminal," and "dangerous" (Devine & Elliot, 1995; Maddox & Gray, 2002), and their activation has been theorized to justify actions that disenfranchise subordinated group members (Jost & Banaji, 1994; Sidanius & Pratto, 2001; Crandall & Eshleman, 2003).

Low-SES and threat stereotypes, which we propose to be more strongly activated under scarcity, are most prevalent in Americans' stereotype knowledge regarding Black Americans (Devine & Elliot, 1995). By contrast, other commonly-reported stereotypes of Black Americans as athletic and as musical/rhythmic (i.e., "good dancers") have less clear theoretical links to perceptions of scarcity or intergroup competition (see Bianchi et al., 2018). Although positively-construed stereotypes may be used in a complementary manner to negative stereotypes in many contexts, they are not expected to directly support intergroup responses to economic scarcity, and thus they provide a useful comparison stereotype category.

3. Scarcity effects on stereotyping in face perception

In addition to their influence on overt responses, stereotypes can influence the visual processing of group members (Hugenberg & Bodenhausen, 2003; Kawakami, Amodio, & Hugenberg, 2017; Schmid & Amodio, 2017). For example, in Dotsch, Wigboldus, Langner, and van Knippenberg (2008), visualizations of Moroccan outgroup faces were judged as higher in criminality—a component of the Moroccan stereotype in the Netherlands—among participants with greater implicit anti-Moroccan prejudice. Similarly, in Brown-Iannuzzi, Dotsch, Cooley, and Payne (2017), when participants were instructed to identify welfare recipients in a reverse correlation classification task, welfare recipients were more likely to be visualized as appearing Black and more representative of Black American stereotypes, relative to non-welfare recipients. Importantly, stereotypic representations in face visualizations can induce biased judgments and discriminatory behaviors toward outgroup members (Ratner, Dotsch, Wigboldus, van Knippenberg, & Amodio, 2014).

The perception of scarcity can also induce biased perceptions of minority group member faces (Krosch & Amodio, 2014, 2019; Rodeheffer, Hill, & Lord, 2012). Using a reverse-correlation method to assess participants' visualizations of Black faces, Krosch and Amodio (2014) found that scarcity induced White American participants to visualize Black individuals' faces as appearing darker in skin tone and with more Afrocentric features. This effect was notable because it appeared to emerge implicitly, without perceivers' explicit intention or awareness, and thus its influence on subsequent judgments and decisions would proceed without detection or intervention. Moreover, it represents another mode of stereotyping, beyond self-reports and implicit associations, through which stereotypes may be perceived, and hence another process through which scarcity may induce increased stereotyping.

4. Research overview

The broad goal of this research was to investigate the effect of perceived scarcity on the accessibility and expression of racial stereotypes. Across studies, we examined stereotypes of low-SES and threat—two major components of the Black American stereotype (Devine & Elliot, 1995) hypothesized to increase in accessibility under scarcity—as well as positively-valenced stereotypes and non-stereotype traits that were included as comparisons. Study 1 tested these effects on explicit self-reported stereotypes, whereas Studies 2 and 3 examined effects on implicit mental visualizations of Black faces using a reverse correlation image classification approach. Study 3 additionally assessed the potential moderating effect of implicit stereotypes, using stereotype-specific implicit association tests (IATs). Across studies, samples comprised a majority of White-identifying participants but also included individuals of other non-Black racial identities. Because our theoretical question pertained to groups with relationally dominant positions relative to Black Americans, and given that Black Americans have the lowest status in the U.S. racial hierarchy, we included all who did not identify as Black (i.e., *non-Black*). Collectively, these studies tested the hypothesis that perceived scarcity increases the expression of stereotypes in both self-reports and visualizations of racial outgroup faces.

5. Study 1: Effects of scarcity on stereotype knowledge and endorsement

The aim of Study 1 was to test the effect of perceived scarcity on stereotype accessibility. To this end, we assessed White participants' personal endorsement and reported cultural knowledge of anti-Black stereotypes. In contrast to personal stereotype endorsements which are prone to social desirability, reports of cultural knowledge yield more

candid reports. Further, in research examining indirect expressions of bias, cultural knowledge measures were more strongly associated with implicit stereotyping and discriminatory behavior than measures of personal stereotype endorsement (Correll, Park, Judd, & Wittenbrink, 2002; Devine, 1989; Devine & Elliot, 1995). Hence, scarcity was expected to affect reported knowledge of stereotypes but not necessarily their personal endorsement. Specifically, we predicted that participants in the scarcity condition would report greater prevalence of low-SES and threat stereotypes regarding Black Americans than participants in the control condition, whereas reports of these attributes regarding White Americans would not differ by condition. Furthermore, we tested whether the effect of scarcity on low-SES and threat stereotypes differed in magnitude. In this and subsequent studies, we report all measures, manipulations and exclusions (all materials, data, and code can be found at https://github.com/mberkebi/scarcity-stereo).

5.1. Method

5.1.1. Participants

Two hundred participants were recruited on Amazon's Mechanical Turk (MTurk). Participants were required to sign onto MTurk using IP addresses from within the United States. Because our present theorizing primarily concerned the effect of scarcity on White majority group members' perceptions of Black Americans, the a priori rule for data collection was to stop at 200 subjects and then determine whether valid data were obtained from at least 50 White participants per condition; if not, data collection would continue until this criterion was met. Of the 200 subjects, 138 identified as White (68 in control, 70 in scarcity), thus meeting our criterion. All data were collected prior to analysis.[1]

Data from two participants were excluded due to incomplete participation and from 33 participants for failing the attention check (described below). This resulted in a valid sample of 165 participants, of which 150 identified as non-Black (87 in control condition, 63 in scarcity condition; 115 White, 18 Asian, 2 Native American, 15 non-Black multiracial; 14 Hispanic; 97 male-identified, 53 female-identified; mean age = 35, range: 19–71). Based on a sensitivity analysis, this sample size provided 0.80 power to detect a Scarcity Condition x Race x Stereotype Trait interaction on reported stereotypes of effect size Cohen's $f = 0.10$ or greater.

5.2. Procedure

5.2.1. Scarcity manipulation

Scarcity was manipulated between participants using the procedure of Krosch and Amodio (Study 3; 2014). After providing informed consent, participants learned they would play a "money allocation game" with previous online players and would be randomly assigned to perform the role of either an allocator or recipient. In fact, all participants were assigned to the role of allocator. While waiting for the task to begin, participants were told that the pool of resources available for their allocations would be determined randomly. They were then shown an animated pie chart depicting the maximum possible resources and the proportion available for their individual allocations. In the control condition, participants were shown an empty pie chart representing $10, with animated pie wedges that appeared, one at a time, until the entire pie was full (thus indicating $10 of $10). In the scarcity condition, participants were shown a full pie chart representing $100, with animated pie wedges that disappeared, one at a time, until only one remained, represented $10. Thus, in both conditions, the amount available was held constant at $10. After this, as an attention check, participants were asked to state how much money was available to them for the allocation decisions.

5.2.2. Stereotype ratings

While waiting for the task to begin, participants were asked to complete a series of questionnaires aimed at measuring their social attitudes. These questionnaires assessed their (a) knowledge of and (b) personal endorsement of attributes associated with Black people, and they constituted the dependent measures of this study.

The attribute list included 24 words: 16 stereotypes commonly associated with Black Americans and 8 neutral non-stereotype traits not typically associated with Black Americans (or White Americans). Of the Black American stereotypes, six referred specifically to low-SES-related attributes (*poor, uneducated, ignorant, on welfare, lazy, unintelligent*), six referred to threat-related attributes (*aggressive, criminal, dangerous, hostile, loud, rude*), and three represented a stereotype category with more positive valence[2] (*musical, rhythmic, athletic;*Devine & Elliot, 1995). Finally, the non-stereotype words included eight traits not typically associated with any particular race or social group (*curious, content, conscientious, thoughtful, adventurous, courageous, grumpy, unassuming*).

Following Devine and Elliot (1995), participants rated, in separate questionnaires, (a) the extent to which each attribute characterizes Black people based on the "cultural stereotype of Black people in America" and (b) the extent to which they personally believe each attribute to characterize Black people in America. These ratings were repeated with reference to White Americans. Ratings were made on a 0–100% slider scale indicating the percentage of people characterized by the trait, thus representing the reported prevalence of a stereotype. Questionnaires were administered on Qualtrics, and the order of questionnaires (and the items within each) was randomized.

5.2.3. Manipulation check

Next, participants completed a manipulation check, in which they indicated the extent to which the funds available for allocation seemed scarce, on a 100-point slider (1 = funds very limited, 100 = funds not at all limited).

5.2.4. Allocation task

Lastly, in order to maintain the cover story and avoid unnecessary deception, participants completed a resource allocation task. Participants viewed pictures of the purported players and chose, based on the picture alone, how much money to allocate to each. Because the focus of this study was on stereotype activation, and not allocation behavior, a brief version of the task was used which was not intended to produce data for analysis. In this task, participants viewed ten White and ten Black faces, and made allocation decisions in the style of the commonly-used Dictator Game.

5.2.5. Suspicion probe and debriefing

Prior to debriefing, participants were asked whether they found any aspect of the study strange or confusing and, then, what they believed to be the true purpose of the study. Participants provided free responses, which were later coded for suspicion. No participants reported any suspicion regarding scarcity as part of the study. Participants were then debriefed regarding the purpose of the research and returned to the MTurk site to receive payment.

5.3. Results

Our main prediction was that scarcity would increase participants' reported prevalence of stereotype traits regarding Black people, but not

[1] Although the sample sizes were not formally preregistered, the hypotheses, procedures, sample sizes, and analyses for all studies were determined a priori in NSF grant BCS 1551826.

[2] The trait item "opinionated" was also collected in Study 1 and Study 2, but did not fit clearly into the four trait types assessed, based on a factor analysis. Hence it was removed from all analyses. The removal of this item bore no effects on the results from any analysis.

White people, relative to control condition participants. Moreover, we expected this effect to emerge in reports of cultural knowledge but not necessarily personal endorsement, based on research suggesting that participants inhibit their expression of stereotypes on personal endorsement measures due to social desirability (Devine, 1989; Devine & Elliot, 1995). Hence, effects of scarcity on cultural and personal stereotype outcomes were tested separately.

To test this prediction, we fit a generalized linear mixed effects model using the lme4 package in R (Bates, Mächler, Bolker, & Walker, 2014). We regressed trait ratings on dummy coded factors representing the fixed effects of scarcity condition (control and scarcity) and race (Black and White), along with a variable representing the random effect of trait type (low-SES stereotype, threatening stereotype, positive stereotype, non-stereotype). The trait type variable was estimated with random slopes within subjects, and participants were modeled as random factors. We used the Satterthwaite approximation in the lmerTest R package (Kuznetsova, Brockhoff, & Christensen, 2017) to calculate *t*- and *p*-values. Non-stereotype traits always served as the reference group in analyses assessing the categorical variable of trait type, given our theoretical interest in the effect of scarcity on stereotypes specifically.

This analysis produced several significant main effects and two-way interactions, but these were qualified by a significant Scarcity x Race x Trait Type interaction, consistent with predictions: with non-stereotype traits used as the reference condition, this three-way interaction was significant for both low-SES stereotype ratings, $b = 10.22$, 95% $CI = [1.27, 19.19]$, $SE = 4.60$, $t = 2.23$, $p = .026$, and threatening stereotype ratings, $b = 10.55$, 95% $CI = [1.60, 19.51]$, $SE = 4.60$, $t = 2.30$, $p = .022$.

To decompose this three-way interaction, effects of scarcity condition, trait type, and their interactions were tested separately for ratings of Black and White people. As predicted, for ratings of Black people, with non-stereotype traits used as the reference condition, the two-way interaction was significant for low-SES stereotype ratings, $b = -10.25$, 95% $CI = [-17.64, -2.87]$, $SE = 3.79$, $t = -2.71$, $p = .007$, as well as threatening stereotype ratings, $b = -9.99$, 95% $CI = [-17.38, -2.61]$, $SE = 3.79$, $t = -2.64$, $p = .009$ (Fig. 1).

Pairwise comparisons indicated that for ratings of Black people, participants in the scarcity condition (compared with control) reported significantly higher rates of both low-SES stereotypes ($M_{Scarcity} = 64.26$, $SD = 20.87$; $M_{Control} = 55.74$, $SD = 24.21$; $t(148) = 2.25$, $p = .026$, $d = 0.37$) and threatening stereotypes ($M_{Scarcity} = 65.62$, $SD = 20.22$; $M_{Control} = 57.36$, $SD = 24.94$; $t(148) = 2.40$, $p = .018$, $d = 0.36$). However, these conditions did not differ in ratings of the positive stereotype traits: $M_{Scarcity} = 64.95$, $SD = 16.05$; $M_{Control} = 63.25$, $SD = 15.26$; $t(148) = 0.66$, $p = .510$, $d = 0.11$; or non-stereotype traits: $M_{Scarcity} = 44.33$, SD = 15.39; $M_{Control} = 42.60$, $SD = 13.39$; $t(148) = 0.72$, $p = .474$, $d = 0.12$. By contrast, for White targets the Scarcity x Trait interaction did not reach statistical significance for any traits. This general pattern supported our main prediction: scarcity increased participants' reported prevalence of negative stereotypes about Black people but did not systematically affect trait ratings of White people.

We next conducted the same analysis on participants' personal endorsements of the given traits for Black and White targets. None of the critical three-way or subsequent two-way interactions reached statistical significance.[3]

5.4. Discussion

In Study 1, we tested the hypothesis that perceived scarcity increases the activation of negative stereotypes of Black people. Consistent with our hypothesis, participants who were led to believe that resources were scarce reported a higher prevalence of Black American stereotypes, compared with participants in the control condition. This effect of scarcity was not observed for ratings of White Americans. Moreover, this pattern emerged only in reports of cultural knowledge, in which participants could express stereotype beliefs without the social desirability concerns associated with personal stereotype endorsement (Devine & Elliot, 1995). These findings provided initial evidence that perceived scarcity increases the accessibility of Black stereotypes among non-Black individuals.

We further examined the specific nature of stereotyping under scarcity, exploring whether perceived scarcity selectively enhanced stereotypes associated with low-SES and threat as opposed other frequently documented positive stereotypes of Black Americans. We found that scarcity enhanced the accessibility of both low-SES and threat related stereotypes but did not affect reports of positive stereotypes or non-stereotype traits. This pattern suggests that scarcity specifically increased the accessibility of negative stereotypes. It is also broadly consistent with the idea that stereotypes operate, in part, to promote the dominance of relationally higher status groups by justifying the discrimination of lower status group members (e.g., Hadarics & Kende, 2019; Jost, Banaji, & Nosek, 2004; Oldmeadow & Fiske, 2007; Sidanius & Pratto, 2001), and thus that such stereotypes would be more highly accessible under conditions of resource scarcity. Although all stereotypes are theorized to help legitimize the status relations between groups, these results suggest that the perception of scarcity has a stronger, more direct effect on low-SES and threat stereotypes than on other stereotype domains, perhaps because these stereotypes more directly concern a group's position in a hierarchy.

6. Study 2: Effects of scarcity on visual representation

In Study 2, we asked whether the pattern of increased stereotype accessibility observed in Study 1 would appear in participants' implicit visualizations of Black individuals under conditions of scarcity. To test this hypothesis, we used a reverse correlation procedure used by Krosch and Amodio (2014) and implemented recommendations of Cone, Brown-Iannuzzi, Lei, and Dotsch (2020). This procedure involved two study phases. Participants in Phase 1 experienced a scarcity manipulation and then completed a race classification task designed to produce a visualization of their mental image of a Black individual. In Phase 2, these face visualizations were presented to a new group of participants who, without knowledge of their origin, rated the faces on traits that included Black American stereotypes of threat and low-SES. With this design, we could determine whether scarcity induces a mental perception of Black people in a way that conveys specific stereotypic traits. We report all measures, manipulations, and exclusions.

6.1. Method

6.1.1. Phase 1

6.1.1.1. Participants. 123 students from the New York University participant pool were recruited for Phase 1. The a priori rule for recruitment was to recruit at least 120 participants with the goal of obtaining at least 100 non-Black participants for analysis, given our focus on anti-Black prejudice. All data were collected before analysis began. Our final sample included the 111 non-Black self-identified participants (64 White, 38 Asian, 9 non-Black multiracial; 25 Hispanic; 71 female, 40 male; mean age = 19.5 years, range: 18–25).

6.1.1.2. Procedure. In individual laboratory sessions, participants were randomly assigned to either the scarcity or control condition, and scarcity was manipulated as in Study 1. Next, participants completed a "face perception task"—a reverse correlation image classification procedure similar to that used by Krosch and Amodio (2014) and based on

[3] Given our theoretical interest in White majority group members' perceptions, we repeated this full set of analyses on the White participants only ($n = 115$) and found identical results to the full sample of non-Black participants.

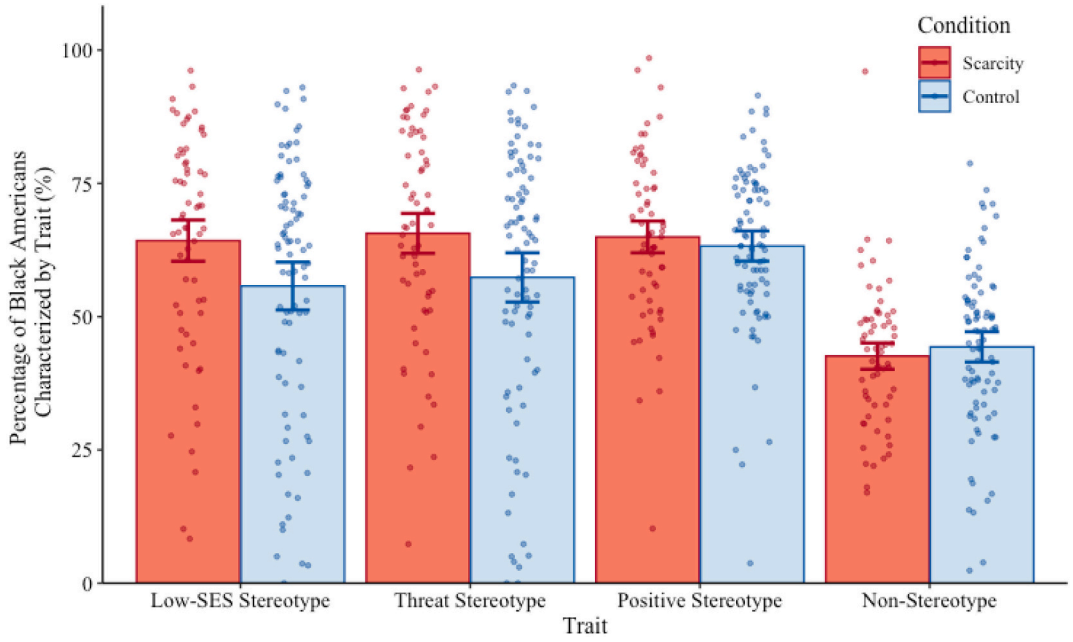

Fig. 1. Reported cultural knowledge of stereotype and neutral non-stereotype traits regarding Black Americans under scarcity and control conditions. Participants reported significantly higher prevalence of low-SES and threatening stereotypes under scarcity compared with control but did not differ on positive stereotypes or non-stereotype traits. Error bars represent 95% confidence intervals.

Dotsch et al. (2008). During this task, participants viewed 200 face pairs and judged which, of each pair, depicted a Black person. Each classification image was created from a single base face (a morph of 100 Black and 100 White neutral male grayscale faces) overlaid with a unique pattern of sinusoidal visual noise (or its inverse, to create the second image in the pair), which subtly distorted the image to produce unique facial features. A composite image was then constructed for each participant by averaging all the selected faces identified as "Black" from each pair (see Dotsch & Todorov, 2012; Krosch & Amodio, 2014). This composite image thus represented an approximation of each participant's mental representation of a Black male face. This procedure provided a data-driven approach to infer the mental representation of a Black person that presumably guided a participant's choices during the task. Following recommendations of Cone et al. (2020), participants' individual level composite images were randomly shuffled and split (without replacement) into subsets to create 8 composite classification images (4 per condition) for Phase 2 ratings (example composite faces shown in Fig. 2). This procedure mitigates potential statistical artifacts inherent to obtaining ratings on a single composite image (inflated Type I error; see Cone et al., 2020).

Finally, participants completed a manipulation check and brief allocation decisions, as in Study 1, responded to suspicion probes, and received debriefing.

6.1.2. *Phase 2*

6.1.2.1. Participants. 122 online participants were recruited from the New York University participant pool, with the same a priori rule as Phase 1, to provide ratings of the composite images. All data were collected before analysis began. Analyses included the 111 non-Black self-identified participants (91 White, 9 Asian, 5 Native American, 6 non-Black multiracial; 14 Hispanic; 79 male, 29 female, 3 non-binary; mean age = 32.4 years, range: 19–57). Based on a sensitivity power analysis, this sample size provided 0.80 power to detect a difference in face ratings between conditions of effect size Cohen's $d = 0.27$ or greater.

6.1.2.2. Procedure. Participants viewed composite face images and rated them on trait terms representing low-SES stereotypes (*financially*

Fig. 2. Example composite face images for Study 2. Left image is composite created from random subset of participants in control condition, right image is composite created from random subset of participants in scarcity condition. These images (along with 3 additional composite face images per condition) served as stimuli for participants in Phase 2 to rate.

poor, unemployed, likely to be on welfare, uneducated, ignorant, unintelligent), threatening stereotypes (*hostile, aggressive, dangerous, criminal, rude, loud*), and positive stereotypes, (*musical, rhythmic, athletic, muscular, religious*), as well as non-stereotype traits (*curious, content, conscientious, adventurous, courageous, unassuming*). On each trial, participants viewed a pair of composite images from Phase 1 shown side-by-side—one generated in the scarcity condition and one generated in the control condition (position counterbalanced)—and compared the two faces on each of 24 traits (e.g., "Who is more aggressive?"). A six-point comparative scale, ranging from "definitely left" to "definitely right" (with intermediate labels of "mostly" left/right and "slightly" left/right), was used to detect subtle differences in trait attributions between face composites. Responses were coded from −2.5 to 2.5 such that higher scores reflected a stronger inference of the trait for the face produced under scarcity relative to the face produced in the control condition. For each participant, an average score was computed for each trait type. Participants then completed a funneled debriefing, as in Phase 1. No participant reported suspicion relating to the manipulation of scarcity.

6.2. Results

We first asked whether stereotype traits were more strongly inferred from composite face images produced in the scarcity condition compared with the control condition. Because trait ratings were made on a comparative scale, with zero representing no difference between faces on a given trait, an effect of scarcity would be indicated by a significant increase from zero. Separate one-sample *t*-tests indicated that scarcity increased inferences of threat ($M = 0.27$, $SD = 0.76$), $t(110) = 3.82$, $p < .001$, $d = 0.36$, and low-SES ($M = 0.12$, $SD = 0.63$), $t(110) = 2.09$, $p = .039$, $d = 0.20$, but did not affect inferences of positive stereotypes ($M = -0.02$, $SD = 0.66$), $t(110) = -0.28$, $p = .784$, $d = 0.03$. Unexpectedly, participants were less likely to infer non-stereotype traits from scarcity-produced faces ($M = -0.12$, $SD = 0.56$), $t(110) = -2.27$, $p = .025$, $d = 0.22$ (Fig. 3).

Next, we tested our prediction that the manipulation of scarcity would more strongly affect inferences of threatening and low-SES stereotype traits than other trait inferences. A one-way ANOVA comparing ratings for each trait category was significant, $F(3,440) = 7.67$, $p < .001$, $\eta p^2 = 0.05$, $f = 0.23$. Pairwise comparisons indicated that perceived scarcity had a marginally stronger effect on inferences of threat than of low-SES, $t(110) = 1.87$, $p = .065$, $d = 0.18$. The effect of perceived scarcity was stronger for threat stereotypes than for the positive stereotypes, $t(110) = -3.07$, $p = .003$, $d = 0.29$, and non-stereotype traits, $t(110) = 4.14$, $p < .001$, $d = 0.39$. The effect of scarcity on low-SES stereotype inferences was marginally stronger than the positive stereotype ratings, $t(110) = 1.73$, $p = .087$, $d = 0.16$, and was significantly greater than the effect on non-stereotype traits, $t(110) = 2.78$, $p = .006$, $d = 0.26$. Finally, participants' inferences of positive stereotype traits from scarcity-produced faces did not differ relative to non-stereotype traits, $t(110) = 1.30$, $p = .198$, $d = 0.13$. Overall, these results show that scarcity increased the expression of threat and low-SES stereotypes in mental representations of Black faces.

6.3. Discussion

In Study 2, we examined the effect of perceived scarcity on implicit stereotypic visual representations of Black people. We found that scarcity induced visualizations of Black individuals' faces that appeared more threatening and lower in SES compared with a control condition. Scarcity did not increase the appearance of positive stereotypes, and it reduced the appearance of non-stereotype traits. This pattern of results supported the hypothesis that perceived scarcity induces increased stereotyping in non-Black Americans' mental representations of Black people's faces.

In addition to the effect of scarcity on threat and low-SES stereotypes, we observed an unexpected effect for non-stereotype trait words, such that scarcity reduced inferences of these words relative to the control condition. Although these trait terms were selected to be unassociated with Black American stereotypes, it is notable that they may connote attributes related to agency and human experience (e.g., *curious, content, conscientious*)—attributes often used to assess humanized as opposed to dehumanized perceptions. Thus, it is possible that decreased inferences of these traits under scarcity may reflect a pattern of dehumanization (Krosch & Amodio, 2019), which may operate in concert with stereotypes. This pattern suggests an important direction for future research.

Finally, although the present research concerns the influence of scarcity on stereotyping, it is possible that this influence reflects a more general effect of negative evaluation. That is, Study 2 results suggest that when classifying images of individuals' faces as "Black," participants' choices may have been guided by visual cues associated with low-SES and threat—specific components of the Black American stereotype

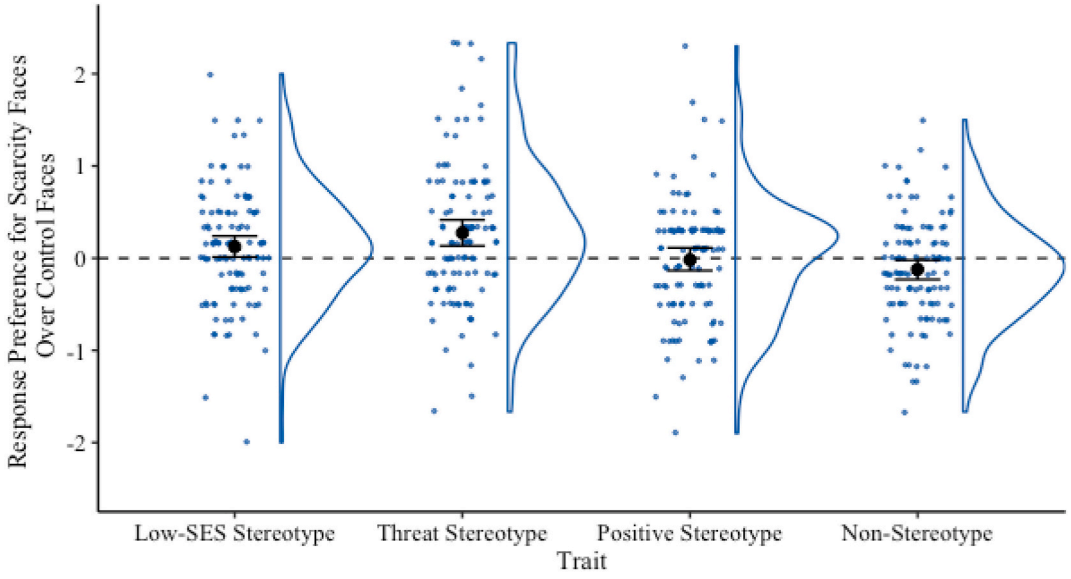

Fig. 3. Trait inferences from visualizations of Black faces created under perceived scarcity relative to a control condition. Data points reflect a mean difference score of individuals' responses toward scarcity faces over control faces. Black dot represents mean response; error bars represent 95% CI.

that may be used by non-Black individuals to justify discrimination in response to perceived competition. However, it is also possible that the visualizations produced under scarcity were simply judged as more negative in valence, but expressed via the stereotypes afforded in the questionnaire. Although either interpretation supports the hypothesis that scarcity induces stereotypic visualizations of Black people, a limitation of this study is that it could not determine whether this expression was driven by the activation of stereotypes per se or by a more general activation of prejudiced attitudes. Study 3 sought to improve upon this design by adding an evaluative component to both phases of a new reverse correlation task.

7. Study 3: Effects of scarcity on visual representation and stereotype activation

Study 3 was designed to replicate the main finding of Study 2 while investigating two additional questions: Do the effects of scarcity on threat-based and low-SES stereotypes reflect a more general effect of negative evaluation? And, are the effects of scarcity on stereotypic face visualizations associated with implicit stereotype activation? To answer these questions, Phase 1 participants completed separate IAT measures of threat, low-SES, and non-stereotypic valence associations with Black and White faces. Subsequently, Phase 2 participants rated faces on the stereotype traits included in Study 2 in addition to negative non-stereotype traits.

We initially aimed to test the hypothesis that implicit stereotypes mediated the effect of scarcity on stereotypic face visualizations. To investigate the initial step in this proposed mediation, we first examined whether the manipulation of perceived scarcity increased Black stereotype associations, as measured with the stereotype IATs. To preview the results: this analysis yielded a null result—there was no effect of scarcity on participants' IAT scores— precluding the possibility of mediation. However, this null finding presented the opportunity to consider a slightly different question: whether the effect of scarcity on face visualization is different for people with relatively stronger or weaker implicit stereotype associations.

To explore this possibility, we examined whether participants with high vs. low implicit stereotype strength produced face visualizations that were rated as more or less stereotypical under scarcity. Previous research suggests that implicit prejudice toward a group can bias visual representations of group members to be more consistent with stereotypes (Dotsch et al., 2008; Imhoff, Woelki, Hanke, & Dotsch, 2013). Here, we asked: are the effects of scarcity on biased visualizations larger among participants with stronger implicit bias? Or, alternatively, might scarcity induce a bias among participants who would, in non-scarce contexts, be relatively unbiased? In other words, we asked whether scarcity may lead typically low-bias individuals to see outgroup members through the lens of a high bias individual. To this end, we tested whether the effect of scarcity on face visualizations was moderated by implicit bias level. As in Studies 1 and 2, we report all measures, manipulations, and exclusions.

7.1. Method

7.1.1. Phase 1

7.1.1.1. Participants. 210 participants were recruited from the New York University participant pool for a lab-based study. The a priori rule for sample size was to recruit at least 200 participants. All data were collected prior to analysis. Sixteen participants were excluded from analysis due to incomplete data. As in Studies 1 and 2, analyses again focused on non-Black individuals, leaving a final sample of 175 individuals (82 White, 78 Asian, 15 non-Black multiracial; 27 Hispanic; 95 female, 79 male, 1 non-binary; mean age = 19.7, range: 18–28).

7.1.1.2. Procedure. The procedure of Study 3 followed that of Study 2 with two changes: (1) Phase 1 participants completed three IATs just prior to completing face classifications, and (2) Phase 2 participants rated composite faces (aggregated as a function of both scarcity condition and Phase 1 participants' IAT scores) on traits representing threat, low SES, and a non-stereotypic negative evaluation category.

7.1.1.3. IATs. Participants completed two stereotype IATs, designed to assess Black relative to White associations with low-SES and threat, respectively, in counterbalanced order, followed by a standard evaluative IAT. Each IAT used a seven-block format, with the order of compatible and incompatible blocks counterbalanced across participants (Amodio & Devine, 2006; Greenwald, Nosek, & Banaji, 2003). In the low-SES stereotype IAT, participants categorized male White and Black faces as "White" or "Black" and words associated with high- and low-SES as "wealthy" or "poor." In the threat stereotype IAT, participants categorized male White and Black faces along with words indicative of high and low threat as "hostile" or "friendly." In the evaluative IAT, participants classified Black and White male faces as well as positive and negative words that were unrelated to Black or White stereotype content. *D* scores were computed for each IAT by subtracting log correct response times on compatible blocks from those on incompatible blocks and dividing this difference by the standard deviation, as in Amodio and Devine (2006).

7.1.1.4. Creation of composite face images. In order to examine the potential joint effect of scarcity and IAT scores on face composites, we created three different sets of composite faces to represent high vs. low IAT scores on each of the IAT indices, separately for scarcity and control conditions. That is, we created separate sets of composite faces to represent Phase 1 participants with high vs. low scores on each of the three IATs, in both the scarcity and control conditions. This procedure yielded a total of 12 composite face images. To do this, we selected participants in the upper and lower tertile on each IAT, separately for each IAT type. Although subgrouping in this manner could potentially increase Type I error (see Cone et al., 2020), we chose this design as a reasonable compromise given the task demands. Specifically, given the repetitive nature of rating the degraded composite images, participants' ability to attentively respond to these items could have been negatively impacted by increasing the number of images, which would have resulted from creating the fully random subsets as in Study 2.

To mitigate order effects of IAT scores, whereby scores on a second IAT are typically attenuated due to practice, faces used to represent high vs. low implicit SES stereotyping were created from participants who completed the low-SES stereotype IAT first, and faces used to represent high vs. low implicit threat stereotyping were created from participants who completed the threat stereotype IAT first. Faces representing high vs. low evaluative IAT scores were created from all participants given that it was always completed last.

7.1.2. Phase 2

7.1.2.1. Participants. A new sample of 100 online participants from Amazon Mechanical Turk was recruited to rate the faces produced in Phase 1. We again focused on the non-Black individuals for analysis, leaving a final sample size of 86 participants (49 female, 36 male, 1 non-binary; 82 White, 3 Asian, 1 Native American; 9 Hispanic; mean age = 35.4 years, range: 19–68). All data were collected before analysis began.

7.1.2.2. Procedure. The Phase 2 procedure was similar to that of Study 2, except that it included a larger set of faces, and participants rated each of the 12 composite images on items representing low-SES, threat, and general evaluative traits. Composite faces were presented in sets of four, with each set including the images representing high and low IAT scores from both scarcity and control conditions, separately for the threat, low-

SES, and evaluative IAT. On each trial, participants viewed a set of four faces and rated each face on a 10-point bipolar scale on a single trait (e.g., the threat stereotype scale ranged from "hostile" to "friendly"; the low-SES scale ranged from "poor" to wealthy"; the evaluative scale ranged from "like" to "dislike"). All scales were recoded such that higher values reflected more stereotypical ratings or more negative valence. This procedure was completed separately for sets of faces created on the basis of threat stereotype IAT scores, low-SES stereotype IAT scores, and evaluative IAT scores, in counterbalanced order.

7.2. Results

7.2.1. Preliminary analysis: Effect of scarcity on implicit stereotyping

The first goal of Study 3 was to test whether perceived scarcity increased the activation of implicit stereotypes and prejudice, as indexed by the threat and low-SES stereotype IATs and the evaluative IAT, using a multi-level generalized estimating equation (GEE; Zeger, Liang, & Albert, 1988). A Scarcity x IAT type mixed-model GEE with an exchangeable working correlation matrix produced a non-significant effect of scarcity, indicating that perceived scarcity did not affect IAT scores on average ($B = -0.05$, $SE = 0.05$, Wald $\chi^2 = 0.77$, $p = .381$). We report no standardized effect size here or in subsequent GEE results (or the complementary sensitivity analyses), because to our knowledge no such measures have been developed for GEE. Corroborating the null effect of scarcity, independent tests of scarcity on each IAT were nonsignificant; low-SES: $t(88) = 1.51$, $p = .136$; threat: $t(83) = -0.19$ $p = .854$; evaluative: $t(173) = 0.87$, $p = .384$. These null results precluded the possibility that changes in implicit stereotyping, as measured by the IAT, might mediate the effect of scarcity on stereotypic face visualizations. However, this suggested an alternative possibility that IAT scores, unaffected by the manipulation, represent individual differences in implicit stereotyping that might moderate the effect of scarcity on face visualization.

7.2.2. Main analyses: Scarcity effects on stereotypic face visualization

In our main analysis, we sought to replicate the direct effect of scarcity on stereotypic visualizations, examine the potential role of general evaluation, and explore the possibility that the scarcity effects were moderated by individual differences in implicit stereotype strength. A multi-level GEE analysis was conducted in which stereotype ratings of face composites were regressed onto scarcity condition (scarcity, control), stereotype (low-SES, threat), IAT bias level (low, high), and all interactions. The results pertaining to each theoretical question are reported in turn.

7.2.3. Replication of scarcity effect on stereotypic face visualization

First, we asked whether the effect of scarcity on face ratings observed in Study 2 was replicated in Study 3. A significant main effect of scarcity on face ratings ($B = 0.77$, $SE = 0.19$, Wald $\chi^2 = 16.73$, $p < .001$) indicated that it did replicate, such that composite faces created under scarcity were rated as more stereotypical compared those created in the control condition. This effect was not moderated by type of stereotype (Scarcity x Stereotype interaction: $B = -0.17$, $SE = 0.23$, Wald $\chi^2 = 0.53$, $p = .466$), suggesting that the effect of scarcity was similar for low-SES and threat stereotypes.

7.2.4. Effect of scarcity on evaluation and its role in stereotyping

Next, we examined the effect of scarcity and evaluative IAT bias level on evaluative ratings of composite faces. This analysis produced a significant main effect of scarcity ($B = 0.56$, SE = 0.18, Wald $\chi^2 = 9.65$, $p = .002$), such that composite faces created under scarcity were evaluated less favorably compared to those created in the control condition.

Given the effect of scarcity on negative evaluation, we then asked whether the effect of scarcity on face ratings might be driven by a general effect of increased negative attitudes. When the regression testing the effect of scarcity on stereotype ratings was repeated while including evaluative face ratings as a covariate, the effect of scarcity on stereotype ratings remained significant ($B = 0.80$, $SE = 0.19$, Wald $\chi^2 = 16.93$, $p < .001$). Thus, the effect of scarcity on stereotype ratings could not be fully explained by the effect of negative evaluation.

7.2.5. Stereotype IAT effects on face visualization

The omnibus regression also produced a main effect of stereotype IAT level on face ratings, such that faces created by participants with higher stereotype IAT scores were rated as more stereotypical (i.e., more threatening and lower in SES) than those created by participants with low stereotype IAT scores ($B = 1.77$, $SE = 0.25$, Wald $\chi^2 = 49.44$, $p < .001$). This effect held when adjusting for evaluative face ratings ($B = 1.65$, $SE = 0.25$, Wald $\chi^2 = 45.26$, $p < .001$). Although not a central theoretical question in the present work, this finding demonstrates a novel effect of implicit stereotypes on visualizations of Black faces, independent of evaluative biases in perceptions, conceptually replicating prior implicit prejudice effects on outgroup face visualizations (e.g., Dotsch et al., 2008) and consistent with independent effects of implicit stereotyping and evaluations (Amodio, 2019; Amodio & Devine, 2006).

7.2.6. Implicit stereotyping strength as moderator of scarcity effect

Finally, we asked whether implicit stereotypes moderated the effect of scarcity on stereotype visualizations. Indeed, the Scarcity x IAT Level interaction was significant ($B = -1.06$, $SE = 0.25$, Wald $\chi^2 = 17.87$, $p < .001$; See Fig. 4), and this effect was not qualified by the kind of stereotype (Scarcity x IAT Level x Stereotype interaction: $B = 0.05$, $SE = 0.34$, Wald $\chi^2 = 0.02$, $p = .890$). This 2-way interaction effect remained significant when adjusting for evaluative face ratings ($B = -1.07$, $SE = 0.26$, Wald $\chi^2 = 17.53$, $p < .001$).

Decomposition of this 2-way interaction with follow-up *t*-tests revealed that the face visualizations of high-IAT participants were rated similarly when produced in the scarcity condition ($M = 5.86$, $SD = 2.03$) and control condition ($M = 6.22$, $SD = 1.95$), $t(341) = 1.64$, $p = .103$, $d = 0.18$. By contrast, the face visualizations of low-IAT participants were rated as appearing more stereotypical when produced under scarcity ($M = 5.82$, $SD = 1.91$) than in the control condition ($M = 5.13$, $SD = 1.98$), *t*

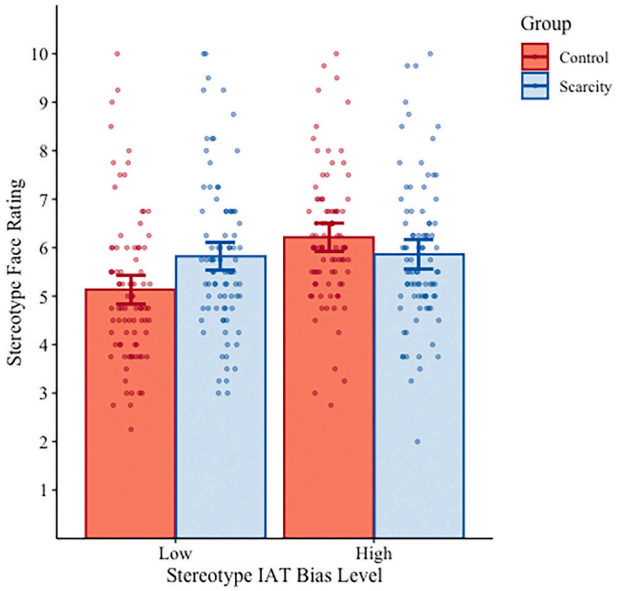

Fig. 4. Mean stereotype ratings by scarcity condition and IAT level. GEE analysis revealed that scarcity composite faces were rated as more stereotypical compared to the control composite faces, adjusting for evaluative ratings. High-IAT bias level faces were rated more stereotypical than low-IAT bias faces, adjusting for evaluative ratings. Main effects were qualified by significant Scarcity by IAT Bias Level interaction, again adjusting for evaluative face ratings. Error bars denote 95% confidence intervals.

(342) = 3.28, $p = .001$, $d = 0.35$. Furthermore, in the scarcity condition, low-IAT participants ($M = 5.82$, $SD = 1.91$) did not differ from high-IAT participants ($M = 5.86$, $SD = 2.03$), $t(341) = -0.191$, $p = .849$, $d = 0.02$. In the control condition, face visualizations of high-IAT participants ($M = 6.22$, $SD = 1.95$) were rated as more stereotypical than low-IAT participants ($M = 5.13$, $SD = 1.98$), $t(342) = 5.11$, $p < .001$, $d = 0.55$. Although exploratory, these effects suggest that perceived scarcity may induce a degree of bias in low-IAT participants similar to the level observed for high-IAT counterparts, relative to a control condition.

7.3. Discussion

Study 3 was designed to address multiple questions that emerged from Study 2. First, Study 3 results replicated the Study 2 findings, such that scarcity led to more stereotypical visualizations of Black individuals' faces in comparison with a control condition. This result strengthens our conclusion that scarcity leads perceivers to form more stereotypical mental representations of Black people, in addition to the increased verbal expressions observed in Study 1.

Second, we found that visualizations of Black faces produced under scarcity were evaluated less positively than those produced in a control condition. However, this effect on general evaluation did not fully account for the effect of scarcity on stereotype ratings; when adjusting for evaluation, the effect of scarcity on stereotyping remained significant. Hence, our results suggest that scarcity simultaneously increases non-Black perceivers' stereotyping and negative attitudes toward Black people.

Third, we found that individual differences in implicit stereotyping impacted stereotypic visualizations of Black people: participants with stronger implicit stereotype associations visualized Black individuals' faces in a more stereotypical manner—as appearing more threatening and lower in SES—than participants with weaker implicit stereotype associations. This novel finding complements prior research linking stronger implicit prejudice to more stereotypical visualizations of racial minority faces (Dotsch et al., 2008).

Finally, the effect of scarcity on stereotypic face visualizations was moderated by individual differences in implicit stereotype strength. That is, the visualizations of high-implicit stereotyping participants were rated as highly stereotypical across conditions, whereas the visualizations of low-implicit stereotyping participants were relatively lower in the control condition but increased under scarcity. This result suggests that perceived scarcity may elicit stereotypic perceptions even among people who, in a non-scarce context, would not normally show this effect. An explanation of this pattern is suggested by the Justification-Suppression Model of prejudice (Crandall & Eshleman, 2003), whereby scarcity may have provided a justification to express stereotypes among individuals who may normally suppress them. However, because this finding was not hypothesized a priori and was not central to our inquiry, we interpret this result with caution.

Collectively, the results of Study 3 provide further evidence that scarcity increases stereotyping—here, in the visualization of Black faces, replicating Study 2—and that this effect cannot be explained by general evaluation.

8. General discussion

Does the perception of economic scarcity lead to an increase in racial stereotyping? Across three studies, we found converging evidence that it does. In Study 1, we found that scarcity increased non-Black participants' reported prevalence of Black American stereotypes, relative to a control condition. This finding reveals that scarcity increases the accessibility of racial stereotypes, complementing prior evidence that resource scarcity elicits stronger prejudiced attitudes (Bianchi et al., 2018; Riek et al., 2006; Stephan et al., 1999).

In Studies 2 and 3, we extended our analysis to examine the effect of scarcity on representations of Black people's faces. In both studies, scarcity led non-Black participants to visualize Black people's faces in a manner conveying Black American stereotypes of threat and low-SES, relative to the control condition. These results demonstrate the implicit expression of specific stereotypes in the visual domain; that is, they show evidence that such stereotypes guided participants' selection of visual representations of Black faces, which in turn were conveyed visually to independent raters. In doing so, these studies revealed an implicit manifestation of the same stereotypes identified in Study 1, such that featural cues associated with these stereotypes were expressed indirectly through participants' explicit task of simply selecting faces based on their race. Further, Studies 2 and 3 reveal that the perceptual biases toward Black Americans under scarcity observed in prior research are not merely morphological (i.e., representing a "stereotypical" or dehumanized physical appearance; Eberhardt, Goff, Purdie, & Davies, 2004; Krosch & Amodio, 2014, 2019), but convey specific trait characteristics of the individual that reflect common racial stereotypes.

Study 3 additionally demonstrated that this effect reflected the selective expression of threat and low-SES stereotypes and not merely a general effect of negative valence. By doing so, these results elaborate on past findings that scarcity leads perceivers to view Black American faces as darker in skin tone and generically more stereotypical in appearance (Krosch & Amodio, 2014; Rodeheffer et al., 2012). The finding that scarcity effects on stereotypes were evident in face visualizations when adjusting for the effect of general negative valence is consistent with the longstanding distinction between stereotype beliefs, which refer to the attribute content linked to a group, and prejudiced attitudes, which refer to the positive or negative evaluations of a group (Allport, Clark, & Pettigrew, 1954; Dovidio, Brigham, Johnson, & Gaertner, 1996). The indirect expression of stereotypes under scarcity observed in Studies 2 and 3 is further consistent with evidence that implicit stereotypes and evaluations are dissociable and serve different functions in behavior (Amodio, 2019; Amodio & Devine, 2006).

Collectively, these findings indicate that when resources are scarce, non-Black Americans perceive Black people to be lower in SES and more threatening—specific anti-Black stereotypes associated with intergroup deprivation and harm (Jost et al., 2004; Sidanius & Pratto, 2001).

8.1. The functional role(s) of stereotyping in times of scarcity

Our results are consistent with the theory that signals of systemic instability activate stereotypes that function to reassert social dominance and strengthen the status quo. Stereotypes legitimize societal hierarchies and justify discriminatory behaviors directed toward the groups they typify (Jost & Banaji, 1994; Sidanius & Pratto, 2001). Although individuals might not endorse these beliefs personally (Devine, 1989), awareness of stereotypes alone can impact perceptions and serve to justify behaviors toward stereotyped groups.

Our findings are consistent with this broad theoretical idea, such that in response to scarcity, non-Black perceivers stereotype Black people in ways that may function to protect their relatively dominant status. Although all stereotypes are theorized to legitimize the status relations between groups (Sidanius, 1993; Sidanius & Pratto, 2001; Jost & Banaji, 1994; Cuddy et al., 2008), the current work suggests that scarcity has a stronger, more direct effect on low-SES and threat stereotypes than on positive stereotypes, perhaps because stereotypes concerning a group's position in a hierarchy and their propensity for threat may be particularly relevant in such contexts. Stereotypes conveying low-SES (e.g., lazy, poor, and uneducated) may function to justify a reduced distribution of resources. For example, stereotyping group members as lazy and uneducated may justify the belief that they are less deserving of resources, and stereotyping them as poor may imply that their subordinate status is deserved. By comparison, stereotypes conveying threat (e.g., aggressive, hostile) may justify the belief that members of a group are indeed a threat and require greater societal control.

By identifying the specific stereotype content associated with race perception under scarcity, we may begin to understand the specific

intergroup motives associated with these perceptions. For example, whereas perceptions of Black people as lower in SES may serve motives to disenfranchise them, perceptions of threat may serve motives to control and oppress Black people. Furthermore, it is possible that whereas low-SES stereotypes may activate different responses between more racist as opposed to more egalitarian perceivers (e.g., Krosch et al., 2017), threat-based stereotypes may shift all perceivers toward more anti-Black positions.

The observed effects of scarcity on these two different stereotypes could potentially relate to differential downstream behaviors. The effect of scarcity on low-SES stereotypes may relate to treating Black people as deserving less and, in doing so, promote a relatively passive manner of discrimination in service of upholding the status quo of economic relations (i.e., withholding resources). Separately, the effect of scarcity on threat-based stereotypes may reflect a threatened reaction to resource competition that might evoke more active aggression and harm. Specifically, such perceptions may serve to strengthen racial disparities in society that adversely affect communities of color (e.g., harsher criminal sentencing). Future research should consider these possibilities to more fully elucidate the consequences of this multifaceted stereotype response.

9. Limitations and future directions

Our main finding—that perceived scarcity increases stereotyping of Black Americans—is consistent with the position from Social Dominance Theory that cues to hierarchy instability motivate the use of stereotypes (i.e., legitimizing myths) to re-establish group dominance. However, while our hypotheses drew from this theory, it would be informative in subsequent work to more directly link these effects to social dominance motives, for example, by testing whether they are stronger among individuals higher in social dominance orientation (Pratto, Sidanius, Stallworth, & Malle, 1994).

Furthermore, our theoretical proposal regarding scarcity and the expression of stereotypes applies broadly to dominant group members' perceptions of subordinated groups within a society, yet we demonstrated this effect only in the context of non-Black Americans' perceptions of Black people. To expand on these findings and extend their applicability, future research should build on these findings by testing this hypothesis in the context of other groups with different relational dynamics. We speculate that this process does not simply describe race relations in the US, but rather encompasses a more general positional dynamic enforced by dominant groups upon oppressed groups across societies.

Finally, it is notable that the base images for both reverse correlation studies were male, adapted from previous research using this method to probe visualizations of Black, relative to White, faces. However, the use of a male base face limits our interpretations to the representation of stereotypes for Black men in the US context specifically. Although our theoretical hypotheses generalize across gender (but see Navarrete, McDonald, Molina, & Sidanius, 2010), additional research will be needed to confirm that results are similar for visualizations of female, male, and nonbinary or gender-nonspecific faces.

10. Conclusion

Economic downturns are typically associated with expanding racial disparities in a society and, among individuals, perceptions of economic scarcity have been shown to increase prejudiced attitudes and discriminatory behavior. Here, we have shown that the perception of scarcity also increases the activation of Black American stereotypes of threat and low socioeconomic status, expressed in self-reported descriptions of Black Americans and in the visualizations of Black individuals' faces. These findings expand our understanding of how perceptions of economic scarcity influence intergroup bias and, by revealing an effect on stereotyping, illuminate the sociocognitive processes through which members of a societally dominant group may justify discriminatory responses aimed at protecting an existing hierarchy.

Open practices

The studies in this article are aligned with open practices of scientific research. Materials, data, and code can be found at https://github.com/mberkebi/scarcity-stereo.

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