Corrigendum

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The introduction to Experiment 3 in this article misstated the central hypothesis, as a result of two words being switched. The first sentence of the second paragraph in this introduction should read as follows: "We anticipated that, as in the prior experiments, participants would have less difficulty categorizing threat-related words and more difficulty categorizing safety-related words after Black primes than after White primes."

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Does Seeing Faces of Young Black Boys Facilitate the Identification of Threatening Stimuli?

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Abstract
Pervasive stereotypes linking Black men with violence and criminality can lead to implicit cognitive biases, including the misidentification of harmless objects as weapons. In four experiments, we investigated whether these biases extend even to young Black boys (5-year-olds). White participants completed sequential priming tasks in which they categorized threatening and nonthreatening objects and words after brief presentations of faces of various races (Black and White) and ages (children and adults). Results consistently revealed that participants had less difficulty (i.e., faster response times, fewer errors) identifying threatening stimuli and more difficulty identifying nonthreatening stimuli after seeing Black faces than after seeing White faces, and this racial bias was equally strong following adult and child faces. Process-dissociation-procedure analyses further revealed that these effects were driven entirely by automatic (i.e., unintentional) racial biases. The collective findings suggest that the perceived threat commonly associated with Black men may generalize even to young Black boys.

Keywords
age, process dissociation, stereotyping, threat, weapon identification task

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One of the most pernicious stereotypes of Black Americans, particularly Black men, is that they are hostile and violent (Devine, 1989). So pervasive are these threat-related associations that they can shape even low-level aspects of social cognition. Much like other entities that are perceived as physically threatening (e.g., snakes; Öhman, Flykt, & Esteves, 2001), faces of Black men tend to capture visual attention (Trawalter, Todd, Baird, & Richeson, 2008) and can trigger neural activity of the kind implicated in rapid threat detection (Amodio, 2014). Black males are more likely than White males to be misidentified as angry (Becker, Neel, & Anderson, 2010; Hugenberg & Bodenhausen, 2003) and aggressive (Duncan, 1976). Furthermore, merely thinking about Black men can lead to the misidentification of harmless objects as weapons (Correll, Park, Judd, & Wittenbrink, 2002; Payne, 2001); conversely, thinking about crime can prompt thoughts of Black men (Eberhardt, Goff, Purdie, & Davies, 2004). These racial biases can have serious—even deadly—consequences for people to whom they are applied.

Is this association between Black males and threat so robust that it extends even to young Black boys? In the experiments reported here, we examined whether seeing briefly presented faces of Black boys facilitated participants' categorization of threat-related stimuli in the same way that faces of Black men are reported to do.

Despite strong links between Black males and threat, responses that conform to such associations are not inevitable. Recent work has identified several target-based cues, including averted eye gaze (Richeson, Todd, Trawalter, & Baird, 2008; Trawalter et al., 2008) and happy emotional expressions (Kubota & Ito, 2014; see also Neel, Neufeld, & Neuberg, 2013), that can modulate these biases. Age may be another such cue. For instance, stereotypes of older adults as warm but incompetent (Fiske, Cuddy, Glick, & Xu, 2002) directly contradict

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threat-related stereotypes associated with younger Black men. Kang and Chasteen (2009) found that anger was recognized less readily on elderly Black men's faces than on elderly White men's faces, which supports the idea that old age may neutralize the threat posed by Black males. Is it possible that youth might serve as a similar threat-attenuating cue?

Some theory and research indicate that children tend to be viewed as innocent and nonthreatening and thus typically elicit moral concern (Sherman & Haidt, 2011) and care (Buckels et al., 2015) from adults. Such protective treatment is even extended to adults with babyish faces (Montepare & Zebrowitz, 1998). Applying this reasoning to race-based social judgment, Livingston and Pearce (2009) found that Black men who have risen to positions of power (i.e., CEOs) are more likely to be babyfaced than are White men in similar positions; the researchers posited that babyfaceness disarms race-based threat. Likewise, Small, Pope, and Norton (2012) found that negative racial stereotypes (e.g., hostility) were less likely to be applied to Black children (prekindergarten through Grade 5) than to Black adolescents (Grades 6–12). These findings suggest that young age (or features signifying youth) may be a potent cue signaling nonthreat.

Other evidence, however, suggests an alternative hypothesis—that youth might not be disarming enough to reduce such biases. For instance, despite finding differences in negative stereotyping of younger compared with older Black children, Small et al. (2012) also found that such stereotypes were more likely to be applied to Black children than to White children. Another study found that Black juvenile offenders were rated as more deserving of adult treatment and thus received harsher sentences relative to White offenders of the same age (Rattan, Levine, Dweck, & Eberhardt, 2012). Likewise, Goff, Jackson, Di Leone, Culotta, and DiTomasso (2014) found that notions of childlike innocence were applied less to Black children than to White children and that, in the context of violent crime, Black adolescents were judged as more culpable than White adolescents of the same age. These findings suggest that, particularly in crime-related contexts, youth might not be disarming enough to attenuate the perceived threat engendered by Black males.

We tested these competing hypotheses by investigating whether racial biases commonly observed in response to Black men generalize to Black boys. To be conservative, we focused on potential bias toward young boys (5-year-olds), an age group for which Goff et al. (2014) found no racial bias in participants' explicit beliefs about innocence. Moving beyond this prior work, furthermore, we examined implicit biases as a function of age and race. Investigating potential implicit biases is important because people's spontaneous reactions often diverge from their explicit beliefs, particularly for socially sensitive topics such as race (Hofmann, Gschwendner, Nosek, & Schmitt, 2005).

In Experiments 1, 2a, and 2b, participants completed a weapon identification task (Payne, 2001) in which they categorized objects as weapons or nonweapons after brief presentations of young boys' faces of various races (Black and White) or after seeing faces of various ages and races (Black and White children and adults). In Experiment 3, participants completed a similar task in which they categorized words as threatening or safe after seeing faces of various ages and races. Across experiments, our outcomes of interest were response times (RTs) and error rates. We also used process-dissociation-procedure (PDP; Jacoby, 1991) analyses to estimate the independent contributions of automatic and controlled processes on task performance.

We determined our sample sizes in the current research by consulting existing research in which the weapon identification task had been used with a response deadline (Amodio et al., 2004; Payne, 2001). These prior studies used samples of roughly 30 participants and revealed large effect sizes for the key Race of Prime × Target Object interaction indicative of racial bias (η_p^2s > .24). We settled on target samples of about 60 participants for our experiments; data were collected until this target number was reached or surpassed. A power analysis revealed that this sample size afforded 99% power to detect an effect (η_p^2) of .24 and 80% power to detect an effect half that size ($\eta_p^2 = .12$; see Faul, Erdfelder, Lang, & Buchner, 2007). For all experiments, we report all data exclusions, manipulations, and measures.

Experiment 1

Method

White undergraduates ($N = 64$) participated for course credit. We decided a priori to exclude data from participants with below-chance accuracy (i.e., errors on > 50% of trials) on the weapon identification task. This resulted in excluding data from 1 participant, which left a final sample of 63 (43 women, 20 men). Retaining this participant's data did not meaningfully alter the results, except that the simple effect of race of prime on RTs for gun trials was no longer significant ($p = .101$); all other significant effects remained significant (ps ≤ .040).

Participants completed a categorization task in which two images flashed on the monitor in quick succession. Participants were instructed to ignore the first image (the prime), which was always a face; it merely signaled that the second image was about to appear. Instead, their primary task was to quickly and accurately categorize the second image (the target object) as a gun or a toy by pressing one of two response keys (key assignments were counterbalanced across participants).

The primes were 12 photos of boys (6 Black, 6 White) taken from the Child Affective Facial Expression set (LoBue & Thrasher, 2015). We selected these photos using the following criteria: The faces had to be easily categorized by race, to have a neutral expression, to have no idiosyncrasies (e.g., facial scars), and to be similar in actual age (mean age for Black faces = 4.98 years; mean age for White faces = 5.01 years; p > .250). Each photo was cropped so that it included only the head and was standardized in size. The target objects were 6 gun images taken from Payne (2001) and 6 toy images (e.g., a rattle) taken from online sources. The toy images were converted to gray scale and sized to match the gun images.

Each trial sequence began with a blank screen (500 ms), followed by a face prime (200 ms), then a target object (200 ms), and finally a pattern mask (which remained on screen until participants responded). If participants did not respond within 500 ms, a message ("Please respond faster!") appeared for 1 s. Each of the 12 face primes was paired once with each of the 12 target objects, which resulted in 144 randomly ordered experimental trials. Eight practice trials preceded the experimental trials.

After completing the weapon identification task, participants rated the age and race-ethnicity of the face in each photo as well as how threatening the face seemed. In addition, participants rated all of the faces we used in Experiments 2a, 2b, and 3. For complete methodological details and analyses involving these ratings, see the Supplemental Material available online.

Results

For all experiments, we report the results most pertinent to our focal hypotheses (for additional results, see the Supplemental Material). Effect sizes for simple effects were calculated per recommendations for repeated measures designs (Lakens, 2013). Descriptive statistics (mean RTs, error rates, and PDP estimates) for all combinations of prime and target are displayed in Table 1.

Table 1. Results for Experiment 1: Mean Response Times, Error Rates, and PDP Estimates

	Prime type	
Variable	Black primes	White primes
Response time (ms)		
Target object: Guns	255.8 (35.0)	261.9 (37.4)
Target object: Toys	296.6 (30.7)	287.7 (30.7)
Error rate (%)		
Target object: Guns	11.4 (9.7)	13.2 (10.4)
Target object: Toys	14.2 (12.7)	11.9 (10.1)
PDP estimate		
Automatic processing	.55 (.19)	.48 (.20)
Controlled processing	.74 (.20)	.74 (.18)

Note: Values in parentheses are standard deviations. PDP = process-dissociation procedure.

RTs. Before analysis, we excluded errors (12.8% of trials) and RTs less than 100 ms (3.1% of trials). RTs exceeding the 500-ms deadline were excluded from analyses, and responses on those trials were treated as errors. We then subjected the remaining RTs to a log transformation (Payne, 2001); however, for interpretive ease, we report raw RTs.

A 2 (race of prime: Black, White) × 2 (target object: gun, toy) repeated measures analysis of variance (ANOVA) revealed a significant interaction, $F(1, 62) = 17.21$, $p < .001$, $\eta_p^2 = .22$. Participants identified guns more quickly after Black-child primes than after White-child primes, $t(62) = 2.20$, $p = .031$, Hedges's average g (g_{av}) = 0.16, whereas they identified toys more quickly after White-child primes than after Black-child primes, $t(62) = 4.08$, $p < .001$, $g_{av} = 0.28$.

Error rates. Analyses of error-rate data revealed that, as with the RT data, there was a significant Race of Prime × Target Object interaction, $F(1, 62) = 7.20$, $p = .009$, $\eta_p^2 = .10$. Participants misidentified toys as guns more often after Black-child primes than after White-child primes, $t(62) = 2.18$, $p = .033$, $g_{av} = 0.19$, whereas they misidentified guns as toys more often after White-child primes than after Black-child primes, $t(62) = 2.00$, $p = .050$, $g_{av} = 0.18$.

PDP estimates. We next computed estimates of automatic and controlled processing, for Black and White primes separately, using the equations from Payne (2001). Controlled processing reflects the ability, independent of response biases, to distinguish guns from toys, whereas automatic processing reflects the unintentional biasing influence of race of prime when control fails. We calculated estimates of controlled processing by subtracting the proportion of errors on toy trials from the proportion of correct responses on gun trials; we calculated estimates of automatic processing by dividing the proportion of errors on toy trials by (1 − controlled processing estimate). In cases of perfect performance (controlled processing estimate = 1), automatic processing was undefined; thus, we applied an adjustment commonly used in signal detection analysis (see Snodgrass & Corwin, 1988).

These analyses revealed that the racial bias in weapon identification described earlier was driven entirely by differences in estimates of automatic processing.

Automatic-processing estimates were greater for Black-child primes than for White-child primes, $F(1, 62) = 5.27$, $p = .025$, $\eta_p^2 = .08$, whereas controlled-processing estimates did not differ by race of prime ($p > .250$).

Experiments 2a and 2b

Experiment 1 provided preliminary evidence that implicit biases commonly observed in response to seeing Black men's faces may also emerge in response to seeing young Black boys' faces; however, these findings left several questions unanswered. First, our target-object stimuli comprised guns and toys—objects typically associated with adults and children, respectively. Thus, it is possible that our findings simply reflect stronger implicit associations between Black children and adult-related objects and between White children and child-related objects. Although documenting such an association is informative and consistent with prior work showing that Black children are rated as less childlike than White children of the same age (Goff et al., 2014), our focal hypotheses concern associations with threatening stimuli in particular. Second, because our prime stimuli comprised only children's faces, it is unknown how the magnitude of racial bias for child primes compares with that for adult primes. We addressed these questions in Experiments 2a and 2b by having participants categorize guns and tools—two objects that are clearly associated with adults—after brief presentations of faces of various ages and races.

Overall, we predicted that participants would have more difficulty identifying tools and less difficulty identifying guns after Black primes than after White primes. If youth attenuates race-based threat, this racial bias should be weaker after child primes than after adult primes (i.e., the Age of Prime × Race of Prime × Target Object interaction should be significant). If, however, youth sustains the threat associated with Black men, this racial bias should be comparable after child and adult primes (i.e., the Race of Prime × Target Object interaction should be significant, but age of prime should not moderate this effect). Finally, to the extent that the primes bias weapon identification unintentionally, these effects should emerge primarily in automatic processing.

Method

White undergraduates participated in Experiment 2a ($N = 63$) and Experiment 2b ($N = 68$) for course credit. We excluded data from 1 participant in Experiment 2a and 1 participant in Experiment 2b who had below-chance accuracy on the weapon identification task; retaining their data did not meaningfully alter the results, except that the interactive effect of age of prime and target object on RTs in Experiment 2b was no longer significant ($p = .126$); all other significant effects in Experiments 2a and 2b remained significant ($ps < .005$ and $ps < .025$, respectively). Computer malfunctions resulted in substantial data loss for 3 additional participants in Experiment 2a and 1 participant in Experiment 2b. Together, these exclusions left final samples of 59 (36 women, 23 men) in Experiment 2a and 66 (38 women, 28 men) in Experiment 2b.

The weapon identification tasks used in Experiments 2a and 2b were very similar to that used Experiment 1, with the following exceptions: First, along with the photos of boys, we included 12 photos of men (6 Black, 6 White) taken from the Chicago Face Database (Ma, Correll, & Wittenbrink, 2015). We selected these photos using criteria similar to those used to select the child photos in Experiment 1. Second, we replaced the toy images with 6 images of tools taken from Payne (2001). Each of the 24 face primes was paired once with each of the 12 target objects, which resulted in 288 randomly ordered experimental trials. Sixteen practice trials preceded the experimental trials. In Experiment 2a, the adult and child primes appeared in separate, counterbalanced blocks of trials. In Experiment 2b, the adult and child primes appeared together in a single block of trials.

Results

Preliminary analyses revealed several unexpected effects involving block order in Experiment 2a (for details, see the Supplemental Material). However, these order effects did not meaningfully alter the general conclusions that we drew from this and our other experiments. Descriptive statistics (mean RTs, error rates, and PDP estimates) for all combinations of prime and target are displayed in Table 2.

RTs. RT data were prepared as in Experiment 1. We excluded errors (Experiment 2a: 12.3% of trials; Experiment 2b: 12.5% of trials) and RTs less than 100 ms (Experiment 2a: 1.6% of trials; Experiment 2b: 2.8% of trials) and log-transformed the remaining RTs; however, we report raw RTs for interpretive ease.

A 2 (age of prime: child, adult) × 2 (race of prime: Black, White) × 2 (target object: gun, tool) repeated measures ANOVA revealed a significant Race of Prime × Target Object interaction in both Experiment 2a, $F(1, 58) = 41.01$, $p < .001$, $\eta_p^2 = .41$, and Experiment 2b, $F(1, 65) = 27.08$, $p < .001$, $\eta_p^2 = .29$. Participants identified guns more quickly after Black primes than after White primes in both Experiment 2a, $t(58) = 6.05$, $p < .001$, $g_{av} = 0.28$, and Experiment 2b, $t(65) = 3.37$, $p = .001$, $g_{av} = 0.16$. Conversely, participants identified tools more quickly after White primes than after Black primes in both Experiment 2a, $t(58) = 4.04$, $p < .001$, $g_{av} = 0.18$, and Experiment 2b, $t(65) = 4.80$, $p < .001$, $g_{av} = 0.22$.

Table 2. Results for Experiments 2a and 2b: Mean Response Times, Error Rates, and PDP Estimates

Variable	Prime type: Child primes, Black primes	Child primes, White primes	Adult primes, Black primes	Adult primes, White primes
	Experiment 2a			
Response time (ms)				
Target object: Guns	265.4 (43.2)	276.0 (44.7)	266.1 (36.8)	277.6 (40.0)
Target object: Tools	298.3 (41.3)	295.5 (42.3)	302.8 (39.4)	293.8 (40.6)
Error rate (%)				
Target object: Guns	9.5 (7.2)	13.1 (10.8)	9.7 (9.2)	12.3 (9.8)
Target object: Tools	16.1 (13.1)	13.0 (9.5)	13.2 (10.8)	11.3 (9.9)
PDP estimate				
Automatic processing	.61 (.17)	.51 (.19)	.58 (.18)	.48 (.21)
Controlled processing	.74 (.18)	.73 (.18)	.76 (.17)	.76 (.17)
	Experiment 2b			
Response time (ms)				
Target object: Guns	268.9 (37.0)	277.8 (37.2)	266.8 (35.8)	270.7 (38.4)
Target object: Tools	300.4 (33.1)	292.5 (34.4)	299.6 (37.8)	292.4 (34.6)
Error rate (%)				
Target object: Guns	10.7 (9.0)	13.1 (10.8)	10.9 (8.8)	12.8 (9.8)
Target object: Tools	13.6 (12.2)	12.1 (10.3)	13.4 (13.1)	12.8 (12.7)
PDP estimate				
Automatic processing	.54 (.21)	.48 (.20)	.52 (.21)	.47 (.20)
Controlled processing	.75 (.17)	.74 (.18)	.75 (.19)	.74 (.18)

Note: Values in parentheses are standard deviations. PDP = process-dissociation procedure.

Participants in Experiment 2b also identified guns more quickly after adult primes than after child primes, whereas they identified tools equally quickly after adult and child primes, which produced a significant Age of Prime × Target Object interaction, $F(1, 65) = 6.94$, $p = .011$, $\eta_p^2 = .10$. The pattern of this interaction suggests that youth may modulate general threat associations. Neither experiment, however, found support for the more specific hypothesis that youth would attenuate race-based threat associations: In Experiment 2a, the Age of Prime × Race of Prime × Target Object interaction was not significant, $F(1, 58) = 1.53$, $p = .221$, $\eta_p^2 = .03$, which indicates comparable racial bias after child and adult primes. In Experiment 2b, the Age of Prime × Race of Prime × Target Object interaction was marginally significant, $F(1, 65) = 3.69$, $p = .059$, $\eta_p^2 = .05$, but the pattern of means suggests that, if anything, racial bias was slightly stronger after child primes than after adult primes.

To test the strength of the evidence that the adult and child primes elicited equivalent racial bias against an alternative hypothesis that racial bias was stronger after adult primes than after child primes, we created indices of racial bias separately for adult and child primes: RTs for trials in which a gun appeared after a Black face were subtracted from RTs for trials in which a gun appeared after a White face; RTs for trials in which a tool appeared after a White face were subtracted from RTs for trials in which a tool appeared after a Black face. The results of those subtractions were summed (i.e., [White face–gun trials minus Black face–gun trials] + [Black face–tool trials minus White face–tool trials]; see Kubota & Ito, 2014). We then used Rouder, Speckman, Sun, Morey, and Iverson's (2009) Bayes-factor calculator for paired samples (http://pcl.missouri.edu/bayesfactor) to estimate the Jeffreys-Zellner-Siow (JZS) Bayes factor for the comparison of racial bias after adult primes and after child primes; the scale *r* was set to the default of .707 reported by Rouder et al. (2009). The JZS Bayes factor indexes the strength of evidence in favor of a null hypothesis over an alternative hypothesis. In both experiments, the evidence favored no difference in racial bias after adult primes than after child primes—Experiment 2a: JZS Bayes factor = 3.40 in favor of the null hypothesis (i.e., no difference between adult and child primes was more than three times as likely as a difference); Experiment 2b: JZS Bayes factor = 1.32 in favor of the null hypothesis (this was relatively weak, but as noted earlier, the pattern of means suggested, if anything, that racial bias was weaker after adult primes).

Error rates. Analyses of error-rate data revealed that, as with the RT data, there was a significant Race of Prime × Target Object interaction in both Experiment 2a, $F(1, 58) = 22.51$, $p < .001$, $\eta_p^2 = .28$, and Experiment 2b, $F(1, 65) = 6.28$, $p = .015$, $\eta_p^2 = .09$. Participants misidentified guns as tools more often after White primes than after Black primes in both Experiment 2a, $t(58) = 3.83$, $p < .001$, $g_{av} = 0.39$, and Experiment 2b, $t(65) = 2.55$, $p = .013$, $g_{av} = 0.24$. Conversely, they misidentified tools as guns more often after Black primes than after White primes in both Experiment 2a, $t(58) = 3.23$, $p < .001$, $g_{av} = 0.26$, and Experiment 2b, $t(65) = 1.49$, $p = .141$, $g_{av} = 0.09$, but the latter effect was not significant.

There was also a significant Age of Prime × Target Object interaction, $F(1, 58) = 4.01$, $p = .050$, $\eta_p^2 = .07$. Participants in Experiment 2a misidentified tools as guns more often after child primes than after adult primes, whereas they misidentified guns as tools equally often after child and adult primes. This pattern of response, unlike that observed for the RTs, was inconsistent with the idea that youth modulated general threat associations. More important, as with the RT data, error-rate analyses did not support the hypothesis that youth would attenuate race-based threat associations. The Age of Prime × Race of Prime × Target Object interaction was not significant in either experiment (ps > .250). We computed racial bias for error rates using the same formula as for RTs, and we calculated JZS Bayes factors for the difference in racial bias after adult primes and after child primes as 4.55 and 5.50 in favor of the null hypothesis in Experiments 2a and 2b, respectively (i.e., no difference between adult and child primes was more than four times as likely as a difference).

PDP estimates. We next computed estimates of automatic and controlled processing, separately for each combination of race of prime and age of prime. These analyses revealed that the racial bias in weapon identification described earlier was driven entirely by differences in estimates of automatic processing. Automatic-processing estimates were greater for Black primes than for White primes in both Experiment 2a, $F(1, 58) = 17.26$, $p < .001$, $\eta_p^2 = .23$, and Experiment 2b, $F(1, 65) = 6.72$, $p = .012$, $\eta_p^2 = .09$. The Age of Prime × Race of Prime interaction was not significant in either experiment (ps > .250), which indicates comparable racial bias in automatic-processing estimates for adult primes and for child primes. Comparing racial bias in automatic-processing estimates for adult primes and child primes produced JZS Bayes factors of 6.96 and 7.08 in favor of the null hypothesis for Experiments 2a and 2b, respectively. There were no significant effects on the controlled-processing estimates in either experiment (Fs < 1.81, ps > .180).

Experiment 3

In Experiments 1, 2a, and 2b, we consistently found that briefly presented faces of young Black boys led to claims of having seen a gun when there was none. In Experiment 3, we aimed to broaden the scope of this work by investigating whether associations with threat-related words, instead of objects, also generalize to young Black boys. To examine this possibility, we used a sequential priming task that was similar to the weapon identification tasks from the prior experiments, but we replaced the images of weapons and nonweapons with words connoting threat and safety, respectively.

We anticipated that, as in the prior experiments, participants would have less difficulty categorizing threat-related words and more difficulty categorizing safety-related words after Black primes than after White primes. Moreover, we predicted that youth would sustain the perceived threat associated with Black men, which would result in comparable racial bias after child primes and after adult primes. Finally, we expected that these effects would emerge primarily in automatic processing.

Method

White undergraduates ($N = 82$) participated for course credit. We excluded data from 16 participants with below-chance accuracy on the sequential priming task; retaining their data did not meaningfully alter the results, except that the Race of Prime × Target Word interaction was no longer significant for RTs ($p = .116$); all other significant effects remained significant (ps < .01). We also excluded data from 2 participants who pressed the same response key on every trial. Computer malfunctions resulted in substantial data loss for 2 additional participants. Together, these exclusions left a final sample of 62 (32 women, 30 men).

The sequential priming task that we used (adapted from Cesario, Plaks, Hagiwara, Navarrete, & Higgins, 2010) was very similar to that used in Experiment 2b, with these exceptions: First, we replaced the gun and tool images with word stimuli. The participants' task was to ignore the prime images and instead to rapidly and accurately categorize the words as threatening (*violent, dangerous, hostile, aggressive, criminal*, and *threatening*) or safe (*innocent, harmless, friendly, trustworthy, peaceful*, and *safe*). Second, we increased the response deadline to 750 ms. Each of the 24 face primes was paired with each of the 12 target words, which resulted in 288 randomly ordered experimental trials that appeared in a single block of trials. Eight practice trials preceded the experimental trials.

Results

Descriptive statistics (mean RTs, error rates, and PDP estimates) for all combinations of prime and target are displayed in Table 3.

RTs. RT data were prepared as in the prior experiments. We excluded errors (32.2% of trials) and RTs less than 100 ms (8.5% of trials). RTs exceeding the 750-ms deadline were excluded from analyses, and responses on those trials were treated as errors. We log-transformed the remaining RTs, but we report raw RTs for interpretive ease.

A 2 (age of prime: child, adult) × 2 (race of prime: White, Black) × 2 (target word: safe, threatening) repeated measures ANOVA revealed a significant Race of Prime × Target Word interaction, $F(1, 61) = 4.48$, $p = .038$, $\eta_p^2 = .07$. Participants identified threatening words marginally more quickly after Black primes than after White primes, $t(61) = 1.77$, $p = .083$, $g_{av} = 0.09$; they identified safe words more quickly after White primes than after Black primes, but this effect was not significant, $t(61) = 1.37$, $p = .177$, $g_{av} = 0.08$. The three-way interaction, however, was not significant ($p > .250$; JZS Bayes factor = 7.17 in favor of the null hypothesis), which suggests comparable racial bias after child and adult primes.

Error rates. Analyses of error-rate data revealed that, as with the RT data, there was a significant Race of Prime × Target Word interaction, $F(1, 61) = 32.30$, $p < .001$, $\eta_p^2 = .35$. Participants misidentified safe words as threatening more often after Black primes than after White primes, $t(61) = 3.51$, $p = .001$, $g_{av} = 0.23$, whereas they misidentified threatening words as safe more often after White primes than after Black primes, $t(61) = 5.55$, $p < .001$, $g_{av} = 0.37$.

There was a significant Age of Prime × Target Word interaction, $F(1, 61) = 11.82$, $p = .001$, $\eta_p^2 = .16$. Participants also misidentified safe words as threatening more often after adult primes than after child primes, whereas they misidentified threatening words as safe more often after child primes than after adult primes. This pattern of response suggests that youth may modulate general threat associations. Contrary to the hypothesis that youth would attenuate race-based threat associations, however, the Age of Prime × Race of Prime × Target Word interaction was not significant ($p > .250$; JZS Bayes factor = 4.47 in favor of the null hypothesis), which indicates comparable racial bias after child primes and after adult primes.

PDP estimates. We next computed estimates of automatic and controlled processing separately for each combination of race of prime and age of prime. These analyses revealed that the racial bias in word categorization was driven entirely by differences in estimates of automatic processing. Automatic-processing estimates were greater for Black primes than for White primes, $F(1, 61) = 34.67$, $p < .001$, $\eta_p^2 = .36$. Automatic-processing estimates were also greater for adult primes than for child primes, $F(1, 61) = 9.19$, $p = .004$, $\eta_p^2 = .13$. However, the Age of Prime × Race of Prime interaction was not significant ($p > .250$; JZS Bayes factor = 4.29 in favor of the null hypothesis), which indicates comparable racial bias in automatic-processing estimates for adult primes and child primes. There were no significant effects on the controlled-processing estimates (Fs < 2.23, ps > .140).

Discussion

The current research tested competing hypotheses about the role of age on race-based threat associations. Four experiments provided converging evidence that brief

Table 3. Results for Experiment 3: Mean Response Times, Error Rates, and PDP Estimates

	Prime type			
	Child primes		Adult primes	
Variable	Black primes	White primes	Black primes	White primes
Response time (ms)				
Target object: Threatening words	435.7 (79.9)	446.1 (83.5)	430.8 (79.1)	443.4 (79.3)
Target object: Safe words	431.0 (75.1)	423.3 (74.5)	442.6 (77.0)	436.2 (70.2)
Error rate (%)				
Target object: Threatening words	32.0 (15.5)	37.8 (16.4)	28.9 (15.7)	33.6 (16.0)
Target object: Safe words	31.9 (13.0)	27.5 (15.8)	33.9 (17.9)	31.3 (16.2)
PDP estimate				
Automatic processing	.51 (.14)	.41 (.13)	.54 (.14)	.47 (.15)
Controlled processing	.36 (.24)	.35 (.37)	.37 (.28)	.35 (.26)

Note: Values in parentheses are standard deviations. PDP = process-dissociation procedure.

presentations of Black male faces—whether of adults or children—primed the detection of threatening objects (i.e., guns) and increased accessibility of threat-related words. Furthermore, these racial biases were driven entirely by differences in automatic processing; indeed, we found no differences in estimates of controlled processing. The collective findings, therefore, support the hypothesis that youth sustains, rather than attenuates, race-based threat associations.

Of course, this interpretation of our findings hinges on the assumption that participants were able to extract information about both race and age from the brief presentations of faces in our sequential priming tasks. Although prior research has found that people readily encode information about race, gender (Ito & Urland, 2003), and even individual identity (Jacques & Rossion, 2006) from briefly presented faces, we know of no prior work on the speed and accuracy of categorizations of age or simultaneous categorizations of age and race. One piece of evidence supporting the idea that our participants were able to extract age information is that they displayed greater ease in categorizing threatening stimuli after seeing adult primes than after seeing child primes (collapsing across race of prime). However, this age bias was inconsistent across metrics and was even reversed in one case.

To further address this issue, we conducted a supplemental experiment (for detailed method and results, see the Supplemental Material) in which participants completed a sequential priming task entailing identification of toys and tools after seeing faces of various races and ages. Results revealed a significant Age of Prime × Target Object interaction for both RTs and errors (ps < .001). Participants had more difficulty identifying toys (child-associated objects) and less difficulty identifying tools (adult-associated objects) after adult primes than after child primes (all simple effects, ps < .001), regardless of race (no moderation by race of prime, ps > .250). These results provide additional evidence that participants were able to extract age information from the briefly presented face primes. Future research should continue exploring the time course of social categorization by age, race, gender, and other social identities.

The current work sets the stage for several additional directions for future research. First, we took a conservative approach by investigating racial bias toward young boys (5-year-olds). For children of what age, if any, might such biases disappear? Because agency may be required for evoking threat (K. Gray & Wegner, 2009), and because infants are typically thought to have virtually none (H. M. Gray, Gray, & Wegner, 2007), it is possible that these racial biases might dissipate for infants. However, Small et al. (2012) found that negative stereotypes were more likely to be ascribed to Black infants than White infants, which suggests that these biases might extend even to infants. Second, we focused exclusively on bias toward Black males. Would faces of young Black girls elicit similar biases? Prior work has found that threat-based racial biases are stronger for male than for female adult targets (Navarrete et al., 2009). Furthermore, whereas White perceivers commonly display biases toward shooting unarmed Black men in first-person shooter tasks (Correll et al., 2002), they display biases against shooting unarmed Black women (Plant, Goplen, & Kunstman, 2011). Female gender may thus modulate threat-based racial biases at any age. Finally, our prime stimuli consisted entirely of facial photos. Do similar racial biases emerge when other visual cues that reliably signal age are available? A paradigm using full-body images of targets would provide extra age-related information via apparent size, which informs judgments about formidability (Fessler, Holbrook, & Snyder, 2012). Perhaps this additional visual information would attenuate the racial biases reported here. Future research should investigate these possibilities.

In sum, the current research adds to the growing literature on social cognition at the intersection of race and other social categories (e.g., age, gender; Kang & Bodenhausen, 2015). Our findings suggest that youth may be insufficient to disarm the threat associated with Black men; implicit biases commonly observed for Black men appear to generalize even to young Black boys.

Author Contributions

A. R. Todd developed the study concept. All authors contributed to the study design. Data collection, analysis, and interpretation were performed by A. R. Todd. A. R. Todd drafted the manuscript, and K. C. Thiem and R. Neel provided critical revisions. All authors approved the final version of the manuscript for submission.

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Declaration of Conflicting Interests

The authors declared that they had no conflicts of interest with respect to their authorship or the publication of this article.

Supplemental Material

Additional supporting information can be found at http://pss.sagepub.com/content/by/supplemental-data

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