**Guns are not faster to enter awareness after seeing a Black face:
Absence of race-priming in a gun/tool task during continuous flash suppression**

Timo Stein^a, Tommaso Ciorli^b, & Marte Otten^{a,*}

^a Brain and Cognition, Department of Psychology, University of Amsterdam, The Netherlands

^b SAMBA research group, Department of Psychology, University of Turin, Turin, Italy

* corresponding author

Marte Otten

University of Amsterdam

Department of psychology, Brain & Cognition

Postbus 15915, 1001 NK, Amsterdam, The Netherlands

m.otten@uva.nl

Abstract

Almost two decades of research using the Weapon Identification Task (WIT) show that seeing Black face primes facilitates the identification of guns compared to tools. However, it is unknown whether the stereotype-based association between Black faces and guns impacts initial perceptual processing or only later memory or response-related processes. Here, to test for the presence of a perceptual effect while controlling for memory and response-effect we measured the influence of race-priming on visual awareness during continuous flash suppression (CFS), a strong interocular suppression technique. Eighty-four participants were primed with Black or Asian faces, and then indicated the location of a gun or tool target that was temporarily rendered invisible through CFS. Faster localization in this task reflects faster entry into visual awareness. The same participants also completed a standard WIT gun/tool identification task with Black and Asian face primes. We replicated the standard race-priming effect in the WIT: Black faces primed the identification of guns, while Asian faces primed the identification of tools. However, in the CFS task, Black and Asian primes did not affect when guns and tools enter into awareness. This shows that the stereotypical Black-gun association does not alter early visual processing. Instead it suggests that race-priming most likely originates from later memory- or response-related processing stages.

Keywords: Weapon Identification Task; Continuous flash suppression; Race priming; Stereotypes; Visual awareness.

Introduction

The New Look movement (Bruner, 1957; Bruner, 1992) argued that there is no pure percept: the perceptual process is always shaped by internal (social) goals and biases. One well studied topic, in this regard, is how stereotypes about groups (related to race, class or gender for example) change perception. There is a wide range of studies showing that the group membership of a person can alter how children interpret an ambiguously aggressive act of that person (Sagar & Schofield, 1980), how a doctor evaluates that person (Van Ryn & Burke, 2000), or how harshly that person will be sentenced (Bowers, Sandys, & Brewer, 2003). Based on this wide range of findings, current theories of perception suggest that social information can directly influence perception (Jenkin & Siegel, 2015; Newen & Vetter, 2017; Ogilvie & Carruthers, 2016; Otten, Marte, Seth, & Pinto, 2017; Siegel, 2012; Vetter & Newen, 2014). Within this view, social knowledge in the form of stereotypes should, for example, change whether and when a stimulus enters perceptual awareness. Here we test whether this is the case for a well-studied stereotype-based social association, between Black faces and weapons.

In the Weapon Identification Task (WIT) participants are presented with an image of a Black or White face (the prime), followed by an image of a weapon or a tool. Participants are faster and more accurate in identifying the target as a weapon or tool when the target follows a stereotype-congruent prime (weapon following a Black face or tool following a White face) than when the target follows a stereotype-incongruent prime (weapon following a White face or tool following a Black face (Eberhardt, Goff, Purdie, & Davies, 2004; Kidder, White, Hinojos, Sandoval, & Crites Jr, 2018; Payne, 2001; Payne, Shimizu, & Jacoby, 2005; Payne, 2006). These results demonstrate the existence of a stereotype-based association between the group and the response to the target. Although such priming effects are sometimes interpreted as reflecting a change in perception, they could similarly originate from later processing stages related to memory, decision, or response selection and execution.

In the standard WIT participants *identify* the target as a weapon or tool, and then initiate a response. In other words, the target object needs to be visually processed, after which the resulting visual representation needs to be recognized, which includes both memory retrieval and matching the representation of the input to the memory representation. Faster or better visual recognition of congruent targets therefore does not necessarily imply that congruent targets are *seen* faster or better. Whenever the task involves target identification, effects of race on identification times may instead reflect faster memory retrieval or matching, for example through primed associations in memory networks.

It is also possible that the effect of race on the gun/tool decision originates from processing stages beyond memory, for example from the response stage. In the WIT the prime is related to the response required to the target. This prime-response relationship varies across congruent and incongruent trials. Priming effects could thus reflect activation of the response rather than perceptual

or memory effects (Wentura & Degner, 2010). For example, when participants have the goal to identify weapons vs. tools, due to their stereotypical relationship with weapons, Black face primes may activate the response required for weapons. This activation of the response would be independent of what the target is, and would lead to an overall tendency to choose the weapon response in the case of a Black face prime, and a tool response in case of a White face prime (Klauer & Voss, 2008).

Considering the alternative memory- and response-based explanations for biased responding in the standard weapons identification task, the results of the standard WIT cannot provide evidence for effects of stereotype activation on perception. To test whether stereotype priming can influence perception while circumventing these issues, we measured access to awareness for weapons and tools that followed Black or Asian primes, combining continuous flash suppression (CFS, Tsuchiya & Koch, 2005) with a simple localization task that did not involve a decision about the identity of the target object.

CFS is a variant of binocular rivalry where “Mondrian-like” masks flashed into one eye can render an image presented to the other eye invisible for up to several seconds. The time it takes an image to break through such interocular suppression and become visible is often regarded as an index of potency to gain access to visual awareness. Studies using this “breaking CFS” task (b-CFS: Jiang, Costello, & He, 2007; for a review of this method see Stein, 2019) revealed that contextual factors such as primes can have a profound influence on when observers become aware of a suppressed stimulus. For example, the duration of perceptual suppression is shorter when words predict a target’s object identity, category, or color (Lupyan & Ward, 2013; Pinto, van Gaal, de Lange, Lamme, & Seth, 2015; Stein & Peelen, 2015). Even purely semantic priming has an effect in b-CFS (Costello, Jiang, Baartman, McGlennen, & He, 2009): Suppression times are shorter when a word target (e.g. “salt”) follows a semantically congruent word prime (e.g. “pepper”). Thus, b-CFS may represent a particularly powerful method for detecting effects of stereotype activation on perception.

Importantly, as suppression times are measured with simple localization tasks, post-perceptual influences from memory or response selection are less likely in b-CFS than in the standard WIT. In b-CFS participants indicate in which location any part of an initially invisible target breaks through CFS and becomes visible. Thus, there is no requirement to identify or recognize the target. Furthermore, there is no association between the prime-target relationship and the response, as target location is randomized and independent of congruency. Shorter suppression times for congruently primed targets in the weapons task would therefore demonstrate that a semantic association between primes and targets can influence initial visual perception, equipping stereotype-congruent targets with privileged access to awareness.

In addition to the b-CFS target localization task, where the targets were initially suppressed from conscious awareness, participants also completed a traditional WIT, where both primes and targets were normally visible, and the targets needed to be identified as a weapon or tool. We expected to replicate

the standard WIT findings, that compared to baseline face primes, Black primes will lead to shorter response times and less errors when identifying guns, and longer response times and more errors when identifying tools. If these effects were partly due to more effective perceptual processing of guns after seeing a Black face, then CFS-masked guns should enter awareness faster relative to tools after a Black face compared to the baseline prime face. If, however, the effects observed in the WIT are post-perceptual then the race of the prime should not moderate b-CFS times for guns and tools.

Figure 1. Schematic trials from the two tasks. In both tasks, participants were primed with either a Black or an Asian face, followed by a gun or tool target. (a) In the identification task, participants identified a target as quickly and accurately as possible as a gun or a tool. (b) In the breaking CFS task, targets were presented to one eye while CFS masks flashing at 10 Hz were presented to the other eye, and participants indicated in which location (above or below the fixation cross) a target became visible.

Methods

Participants. Eighty-eight participants were recruited through the University of Amsterdam participant pool. We only tested participants who said they had normal or corrected-to-normal vision, and who had a racial background different from the face photographs used as prime stimuli. Participants were naïve to the research question, and received course credit for their participation. Informed consent was obtained following a protocol approved by the University of Amsterdam ethics committee. Four participants were excluded because their response accuracy was below 75% correct in either the identification or the b-CFS task. The final sample consisted of 84 participants (70 women, mean age 20.1 years, $SD = 2.5$). Participants received written and verbal instructions and practice trials, and both tasks contained two short obligatory breaks. Half of the participants first did the identification task and then the breaking CFS task; for the other half the order was reversed.

Statistical power. Sample size was determined before any data analysis. Kidder and colleagues (2018) reported a meta-analytic effect size for the standard weapons identifications task of $d_z = 0.46$. With our sample size we had 98.6% power to detect effects of this size. Furthermore, with 84 participants we had 80% power to detect effect sizes of $d_z > 0.30$, and thus sufficient power to detect effects of the size of the lower bound of the 95% CI reported in the meta-analysis of Kidder and colleagues ($d_z = 0.36$).

Display. Participants viewed stimuli presented on a 24-inch LCD display (1920 × 1080 pixels resolution, 60 Hz refresh rate) dichoptically through a custom-built mirror stereoscope using a chin-and-head rest placed approximately 60 cm away from the screen. The mirrors of the stereoscope were adjusted for each observer to yield stable binocular fusion. Experiments were programmed in Matlab using Psychtoolbox (Brainard, 1997) functions. Presentation times were synchronized with the vertical refresh cycle of the screen. Two fusion contours ($7.0^\circ \times 7.0^\circ$ of visual angle) consisting of random black and white pixels (width 0.2°) were displayed side-by-side on the screen such that one contour was shown to each eye (distance between the centers of the two contours 16°). A small black fixation cross was presented in the center of each contour, and the remainder of the space enclosed by the contour was white. The rest of the screen outside these contours was black. Participants were asked to maintain fixation throughout the breaking CFS experiment (moving the eyes between trials if necessary), to not close one eye, and to blink between trials only.

Stimuli. For the prime stimuli, 15 images of Black males, and 15 images of Asian males, all with neutral facial expressions, were selected from the Chicago Face Database. To preserve all potentially relevant differences between Black and Asian primes, the prime stimuli ($7.0^\circ \times 7.0^\circ$) were presented in their original color and not further processed (e.g. cropped, contrast-matched). As target stimuli, we selected six color photographs of guns and six photographs of tools (can openers) from the internet. For each category, three targets were pointing to the left side, and three were pointing to the right side. Targets were resized to fit into the same rectangle ($3.9^\circ \times 3.0^\circ$), but no further processing was applied (e.g. no adjustment of contrast or luminance), as we were interested in response to identical stimuli as a function of the primes. We also generated 200 “Mondrian-like” masks ($7.0^\circ \times 7.0^\circ$) consisting of randomly arranged circles of different sizes in various colors (diameter $0.3\text{--}1.2^\circ$).

Identification task. Every trial started with a 1-s presentation of the fixation cross, followed by a 200-ms presentation of a prime (Black or Asian face). After 17 ms of fixation, a target (gun or tool) was presented for 200 ms to one randomly selected eye (Figure 1a). The target image was vertically centered 1.8° either above or below the fixation point and its horizontal position was jittered randomly from trial to trial with an offset from the horizontal center to the left or right of 0° , 0.4° , 0.9° , or 1.3° . Target presentation was followed by a mask presented to both eyes until response or for a maximum of 1.8 s (corresponding to the maximum time window in which participants could enter their response). Participants were asked to categorize the target as quickly and accurately as possible as a gun or can

opener, using the left and right arrow keys on the keyboard. In a random subset of 12.5% trials participants were then asked to select the prime stimulus presented on that trial from two sequentially presented face stimuli (shown for 200 ms each, with a 650 ms blank in-between) of which the foil always displayed the other race than the actual prime. These prime-check trials were included to keep participants' attention on the primes (and they were instructed to do so). There were 288 trials, in which each combination of two eyes for target presentation, target location above or below the central fixation cross, gun and tool target, six target identities, and Black and Asian prime occurred equally often. The identity of the prime was selected at random for each trial, and trial order was randomized.

Breaking CFS task. Stimulation in the b-CFS task was identical, except for the target presentation sequence (Figure 1b). Masks changing every 100 ms were presented to one eye, and a target was gradually introduced to the other eye by decreasing its transparency from 100% to 0% over the first second of a trial. Beginning one second after trial onset, the contrast of the CFS masks was linearly decreased to zero over six seconds in order to force eventual breakthrough. The target was presented until response, or for a maximum trial length of eight seconds. Participants were asked to indicate as quickly and accurately as possible where a target or any part of a target (i.e. any stimulus or part of a stimulus not belonging to the mask) became visible, using the up and down arrow key for locations above or below the fixation cross, respectively. The prime-check trials, number of trials, and randomization of conditions were the same as in the identification task.

Analyses. In these experiments, we report all measures, manipulations, end exclusions. Trials without a response were counted as incorrect. For analyses of response times (RTs) and suppression times, we only included trials with correct responses (identification task: $Mdn = 95.3\%$ correct, $IQR = 4.5$; b-CFS task $Mdn = 97.6\%$ correct, $IQR = 3.7$). Because proportional data such as accuracy are not strictly normally distributed, descriptive statistics in the text are given as median and interquartile range, and all statistical analyses were carried out following a rationalized arcsine transformation (RAU, where a score of 50 corresponds to 50% correct, with RAU values scaling between -23 and 123). As RTs and suppression times also violate the assumption of normality they were $\log_{10}$ -transformed before condition means were calculated and statistical analyses were carried out. For illustration purposes and easy eyeballing of the results in standard units for the text and figures $\log_{10}$ -transformed suppression times were transformed back. Finally, to directly compare priming effects from the identification and b-CFS task, (raw) mean differences between the respective conditions from each task were divided by their pooled standard deviation (i.e. z-transformed).

Statistics. We report both standard frequentist statistics and Bayes factors (BFs) calculated in JASP (JASP Team, 2020) with default prior scales (Cauchy distribution, scale 0.707). When frequentist statistics indicate a significant effect, the corresponding BF quantifies the evidence for the alternative hypothesis (BF_{10}); when the effect is not significant, the reported BF quantifies the evidence for the null

hypothesis (BF_{01}). For multi-factorial ANOVAs, we report the inclusion BF quantifying the evidence for all models containing a particular effect compared to all models without that effect.

Figure 2. Results from the identification task. (a) Mean response times as a function of prime and target. For easy eyeballing, $\log_{10}$ -transformed suppression times were transformed back to standard units. (b) Mean accuracy in rational arcsine (RAU) scores (where a score of 50 corresponds to a proportion of 0.5, with RAU values scaling between -23 and 123) as a function of prime and target. In Figure 2a and 2b, error bars represent the 95% CIs for the respective comparisons between Black and Asian primes. Error bars represent the 95% CIs for the comparison of congruent and incongruent trials. * $p < .05$, ** $p < .01$, *** $p < .001$

Results

Prime-check trials. We first analyzed performance in the prime-check trials in both experiments, where participants were quizzed about the prime stimulus at the end of 12.5% randomly selected trials. Median accuracy in the prime-check trials was very similar in the identification task ($Mdn = 91.7\%$ correct, $IQR = 25.0$) and in the b-CFS task ($Mdn = 90.3\%$ correct, $IQR = 19.4$); a paired t -test on the mean RAU scores revealed slightly better performance in the identification task ($t(83) = 2.50$, $p = .016$, $d_z = 0.27$, 95% CI for d_z $[0.05, 0.49]$, but $BF_{10} = 2.04$).

Identification task. A repeated-measures ANOVA with the factors prime (Black, Asian) and target (gun, tool) on $\log_{10}$ -transformed RTs revealed a significant interaction between prime and target ($F(1, 83) = 35.50$, $p < .001$, $\eta_p^2 = .30$, $BF_{10} = 4.34 \times 10^3$). As can be seen in Figure 2a, for gun targets, responses were significantly faster when preceded by a Black prime than by an Asian prime ($t(83) = -4.39$, $p < .001$, $d_z = -0.48$, 95% CI for d_z $[-0.70, -0.25]$, $BF_{10} = 545.59$). For tool targets, by contrast, responses were significantly slower when preceded by a Black prime than by an Asian prime ($t(83) = 4.59$, $p < .001$, $d_z = 0.50$, 95% CI for d_z $[0.27, 0.73]$, $BF_{10} = 1.08 \times 10^3$).

Similarly, as shown in Figure 2b, for accuracy in RAU scores the interaction between prime and target was significant ($F(1, 83) = 18.44$, $p < .001$, $\eta_p^2 = .18$, $BF_{10} = 355.20$). For gun targets, responses were significantly more accurate when preceded by a Black prime than by an Asian prime ($t(83) = 3.85$, $p < .001$, $d_z = 0.42$, 95% CI for d_z $[0.20, 0.64]$, $BF_{10} = 89.31$). For tool targets, responses were significantly

more accurate when preceded by an Asian prime than by a Black prime ($t(83) = 2.29, p = .019, d_z = 0.26$, 95% CI for d_z [0.04, 0.48], but $BF_{10} = 1.76$).

Breaking CFS task. In contrast, in the b-CFS task, there was no evidence for priming effects (Figure 3a). A repeated-measures ANOVA on $\log_{10}$ -transformed suppression times revealed only a significant main effect of target ($F(1, 83) = 58.17, p < .001, \eta_p^2 = .41, BF_{10} = 3.13 \times 10^{19}$), with shorter overall suppression times for tools (back-transformed RT $M = 3.06$ s, $SD = 1.38$ s) than for gun targets ($M = 3.28$ s, $SD = 1.39$ s). The interaction between prime and target was not significant, with moderate-to-strong evidence for a null effect ($F(1, 83) = 0.21, p = .648, \eta_p^2 < .01, BF_{01} = 5.97$). For accuracy in RAU scores there were no significant effects; for the interaction effect there was with moderate evidence for a null effect ($F(1, 83) = 0.45, p = .507, \eta_p^2 < .01, BF_{01} = 5.15$).

We also compared suppression times between the first and the second half of the CFS task. This was done to test whether overall suppression weakened over time, as is commonly found. Indeed, suppression times were longer in the first than in the second part of the experiment ($t(83) = 11.15, p < .001, d_z = 1.22$, 95% CI for d_z [0.93, 1.50], $BF_{10} = 1.56 \times 10^{15}$). As can be seen in Figure 3b, there was a roughly linear decrease in suppression times when dividing the experiment in four trial bins ($F(3, 249) = 81.88, p < .001, \eta_p^2 = .50, BF_{10} = 2.04 \times 10^{70}$), and there was no strong evidence for no difference between “congruent” and “incongruent” trials ($F(1, 83) = 0.06, p = .806, \eta_p^2 < .01, BF_{01} = 11.90$; bin $\times$ congruency interaction, $F(3, 249) = 0.43, p = .730, \eta_p^2 < .01, BF_{01} = 61.17$).

Figure 3. Results from the b-CFS task. For easy eyeballing, $\log_{10}$ -transformed suppression times were transformed back to standard units. (a) Mean suppression times as a function of prime and target. Error bars represent the 95% CIs for the respective comparisons between Black and Asian primes. (b) Mean suppression times in “congruent” trials (Black prime, gun target, or Asian prime, tool target) and in “incongruent” trials (Asian prime, gun target, or Black prime, tool target) as a function of trial bin. Error bars represent the 95% CIs for the comparisons of congruent and incongruent trials, separately for each trial bin.

Identification vs. breaking CFS task. Figure 4 shows that the key finding of presence of race-bias in the identification task, and absence in the CFS-localization task, is observed when the z-scores are directly compared. Priming effects were significantly larger in the identification task than in the b-CFS task ($t(83) = 4.85$, $p < .001$, $d_z = 0.53$, 95% CI for d_z [0.30, 0.76], $BF_{10} = 2.77 \times 10^3$). This was due to the fact that the race-based priming effect in on gun/tool identification is clearly present ($t(83) = 5.78$, $p < .001$, $d_z = 0.63$, 95% CI for d_z [0.40, 0.86], $BF_{10} = 1.04 \times 10^5$) while there is strong evidence for the absence of a priming effect in the b-CFS task ($t(83) = 0.05$, $p = .962$, $d_z < 0.01$, 95% CI for d_z [-0.21, 0.22], $BF_{01} = 8.30$).

Figure 4. Standardized RT priming effects (congruent vs. incongruent trials) from the identification task and from the breaking CFS task. The saturated symbols represent the mean and error bars the 95% CIs. The desaturated symbols represent individual participants ($N = 84$). *** $p < .001$

Discussion

We replicate the classical pattern of racial bias when participants are asked to identify guns and tool: Participants are faster to respond to guns after a Black prime than an Asian prime, and the reverse is observed for tool targets which elicit faster responding after an Asian prime compared to Black primes. Moreover, tools are more often misidentified as a gun after a Black prime than an Asian prime, while the reverse is observed for gun targets which are more often identified as a tool following an Asian prime than a Black prime. However, in the same group of participants who show a clear effect of race on gun/tool identification, Black and Asian faces do not differentially affect entry into awareness for guns and tools that are rendered invisible through continuous flash suppression (CFS). Overall, in this experiment, tool targets enter awareness faster than guns, but this effect is not modified in any way by the faces that precede the target objects. This suggests that the association between Black faces and guns measured by the WIT does not gear the perceptual system towards guns during the early stages of visual processing. Instead, priming with a Black or Asian face leads to similar early visual processing of guns

and tools. This suggests that the race-based association between Black faces and guns (and/or Asian faces and tools) exerts its effect only after the gun or tool enters visual awareness.

This finding is in line with Pylyshyn's (1999) suggestions that basic perceptual processing proceeds independent of higher level knowledge. Even though the race biases observed in the WIT might *suggest* changes in perception, they *measure* changes in response to perceptual stimuli (Firestone & Scholl, 2014; Firestone & Scholl, 2016), which, as explained in the introduction, also potentially include effects of the prime on memory and response processes. The current b-CFS experiment reduces the influence of such memory- and response-related effects. Firstly because the participants only localized the objects, without the need to identify the object. Secondly because the localization responses (top/bottom) were not associated with the primes (Black/Asian faces). Therefore, the current results suggest that basic perceptual processing of guns and tools is not influenced by race priming.

With a sample size of 84 participants, the evidence presented here is robust. The effect size of the key interaction terms that reflect the race bias in the identification task for the response times ($\eta_p^2 = .30$) and the accuracy ($\eta_p^2 = .18$) are in line with estimations of these effect sizes from a recent meta-analysis (Rivers, 2017), with the effect size for the RT analysis exceeding the reported estimate. At the same time, the Bayesian evidence for the absence of a race bias in the b-CFS task was moderate to strong (Kass & Raftery, 1995), indicating that the current sample provides enough information to accept with relative certainty that race primes do not influence how quickly guns and tools enter awareness.

Even though we only explore one task in which racial bias influences how people respond to and potentially see the world, namely the WIT, our findings have implications that reach further than just this task. The WIT represents a particularly strong paradigm within research on racial biases, and reliably shows effects of race on response times and error patterns (Kidder et al., 2018; Mekawi & Bresin, 2015; Rivers, 2017). The absence of a perceptual base of race-induced shifts in behavior within such a reliable task as the WIT suggests that perhaps other instances of racial bias in identification tasks, for example in emotion identification (Bijlstra, Holland, Dotsch, Hugenberg, & Wigboldus, 2014; Hugenberg & Bodenhausen, 2003; Otten, M. & Banaji, 2012), are similarly not anchored in shifts in perception, but may be due to factors related to memory or responding. An overall absence of perceptual basis for these race-based shifts in responding would go against theories stating that social knowledge directly affects perceptual processes (Bach & Schenke, 2017; Balcetis & Cole, 2013; Freeman & Johnson, 2016; Otten, Marte et al., 2017; Xiao, Coppin, & Van Bavel, 2016). Instead, it would suggest that early perception proceeds in a stimulus-driven fashion, while top-down social knowledge can only influence the processing of these stimuli after initial perceptual processing has finished (Firestone & Scholl, 2016; Pylyshyn, 1999). Indeed, a number of b-CFS studies show that entry into awareness is not affected by social knowledge related to facial dominance and trustworthiness (Stein, Awad, Gayet, & Peelen, 2018)

or by affective learning about faces (Rabovsky, Stein, & Rahman, 2016; Stein, Grubb, Bertrand, Suh, & Verosky, 2017).

Based on this lack of effects of social context on b-CFS, one might conclude that perhaps the b-CFS paradigm is simply not sensitive to top-down/ contextual modulation. A wide range of studies showing the opposite counter this argument. A range of experiments show faster break-through of invisible information that is consistent with (non-social) primes (Costello et al., 2009; Lupyan & Ward, 2013; Stein, Thoma, & Sterzer, 2015), the content of working memory (Gayet, Paffen, & Van der Stigchel, 2013; van Moorselaar et al., 2018), the focus of spatial and content-based attention (Pinto et al., 2015; Stein & Peelen, 2015; Zhang & Jiang, & He, 2012), fear conditioning (Gayet, Paffen, Belopolsky, Theeuwes, & Van der Stigchel, 2016), or contextual information presented through other senses such as audition, touch, and smell (Alsus & Munhall, 2013; Lunghi, Lo Verde, & Alais, 2017; Zhou, Jiang, He, & Chen, 2010). Together, this shows that the b-CFS paradigm is very suitable to study the interplay between perceptual processing and top-down or contextual knowledge (for reviews see Gayet, Van der Stigchel, & Paffen, 2014; Stein, 2019). It thus seems unlikely that the current absence of a b-CFS effect of race-priming on gun/tool perception is due to the lack of sensitivity of the b-CFS paradigm.

Other potential explanations for the lack of effect of the race prime on breakthrough times could be two design choices that diverge from the standard WIT. In our current setup, Firstly, Asian faces functioned as the baseline prime face to which Black faces were compared, and not White faces. This was implemented to reduce potential differences in familiarity with the two types of prime faces, which might have led to differential processing (such as an own race bias, Stein, End, & Sterzer, 2014) independent of the actual prime-target relationship. Secondly, the experiment included randomly occurring “prime checks” to make sure that participants were paying attention to the primes. However, our results show that the results on the WIT identification task are not influenced by these slight modifications of the task. There are clear differences between Asian and Black face primes on both error and response time patterns. Moreover, shapes or colors held in working memory actually foster faster entry into awareness of objects sharing these features (Gayet et al., 2013; van Moorselaar et al., 2018). Therefore, instructing participants to pay attention to the face prime, and keep them in working memory until after the b-CFS trial, should, if anything, have amplified the power of the prime on CFS breakthrough times, rather than diminish it. The fact that even while requiring participants to keep the face in working memory, guns and tools still showed no effect of the race of the face prime, suggests that race primes robustly do not affect early perceptual processing of guns and tools.

The current experiment shows that even though Black faces (compared to Asian faces) reduce response times to guns, and make it more likely to misidentify a gun as a tool, these effects are unlikely to be the result of prime-induced shifts in the early perceptual processing of guns and tools. The presence of a Black face prime, compared to an Asian prime, did not alter the entry into awareness of guns and

tools. This suggests that social biases might influence post-perceptual processes related to memory, interpretation, and response selection and execution, but not the early stages of visual perception.

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