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ATTITUDES AND SOCIAL COGNITION

Racialized Images: Tracing Appraisals of Police Force and Protest

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As race acts as a social frame of reference, it should guide individual's appraisal of visual representations of social events and issues. Thus, grounded in Scherer's (2009) model of appraisal as a sequential process, in 2 experiments (N = 133, 166) we used early event-related potentials (ERPs) of brain activity (the N100, P200, P300) to examine Black and White participants' appraisals of the novelty of images of police force against Black (and White) targets, as well as of Black-led protest. We used a later ERP (the late positive potential, LPP) as well as blood pressure to assess their appraisal of motivational relevance, and self-reported affect and emotion to assess conscious experience. White participants' early ERPs suggested that they appraised the images as more novel than did Black participants. Nevertheless, Black participants' later (LPP) ERP, and blood pressure, suggested that they appraised the images as more motivationally relevant. Consistent with this, Black participants expressed more attentiveness, anger, and empowerment at the images, whereas White participants expressed more surprise. A mediation model in Experiment 2 showed that self-reported familiarity with past racial violence, as well as surprise and attentiveness to the images, explained the difference between Black and White participants' appraisals of motivational relevance (i.e., the LPP). We discuss implications for appraisal theory, stress and coping, and societally situated cognition and affect.

Keywords: race, police, protest, event-related potentials, appraisal

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Racial bias in policing is a salient issue again after a series of publicized incidents, many of which were caught on camera (see Weitzer, 2015). Given the long-standing links between race and policing in the United States (for discussions, see Goldberg, 2002; Sidanius & Pratto, 1999), it is not surprising that African Americans are more attentive to policing, object more to the acquittal of police officers who harm civilians, and express greater support of Black-led protest movements against biased policing such as Black Lives Matter (for reviews, see Reinka & Leach, 2017; Weitzer, 2015). Indeed, a good deal of research shows that race operates as a social and psychological frame of reference that guides cognition, affect, and motivation (for reviews, see Eberhardt & Goff, 2004; Markus, 2008; Richeson & Sommers, 2016).

As a frame of reference, race should even affect the visual processing of the racialized images of police and protest that can now circulate so easily in social and news media (for general discussions, see Amodio, 2008; Balcetis & Lassiter, 2010; Eberhardt & Goff, 2004; Xiao, Coppin, & van Bavel, 2016). In fact, systems of visual cognition and affect respond in the first few hundred milliseconds to the key social features in such images: racial group membership (for reviews, see Eberhardt & Goff, 2004; Ito & Senholzi, 2013), violence or other physical force (e.g., Hajcak, Moser, & Simons, 2006; for a review, see Bradley & Lang, 2007), and human suffering (e.g., Hajcak et al., 2006; for a review, see Bradley & Lang, 2007). Although it has not previously been used to examine the processing of racialized images, Scherer's (2009) sequential model of cognitive appraisal offers a useful approach. It argues that cognitive appraisal proceeds in a sequence from the earliest (often unconscious) appraisal of novelty to the later appraisal of motivational relevance and eventually to the appraisal of coping potential and the experience of emotion. As such, sequential cognitive appraisal provides a model by which individual's cognitive and affective processing of images of police and protest can be traced over time, down to the scale of milliseconds.

A good deal of prior work has examined the way that basic racial content (such as faces) affects visual attention and cognition in the first few hundred milliseconds (for reviews, see Gutsell & Inzlicht, 2013; Ito & Senholzi, 2013; Xiao et al., 2016; Young, Hugenberg, Bernstein, & Sacco, 2011). No work of which we are aware, however, has traced over time Black and White people's

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appraisals of images of racialized social action such as police use of force and Black-led protest against it. Thus, we used event-related potentials (ERPs) of brain activity, as well as systolic blood pressure (in Experiment 2), to assess the appraised novelty and relevance of racialized images of police force and protest against it over the course of milliseconds, seconds, and minutes. To examine the conscious experience of these images, we assessed self-reported affect and emotion (i.e., surprise, attentiveness, anger, and empowerment), and familiarity with past instances of police and other racialized violence (e.g., Trayvon Martin, Rekia Boyd). By extending approaches to group-based appraisal (see Iyer & Leach, 2008; Smith & Mackie, 2015; van Zomeren, Leach, & Spears, 2012) to include Scherer's (2009) temporal model of appraisal, our multimethod approach sought to trace the ways in which a social frame of reference like race can guide the online cognitive and affective processing of images that represent societally important issues and events.

Given their greater interest in, exposure to, and knowledge of race and policing, we suspect that African Americans tend to appraise racialized images of police and protest as less novel, but more motivationally relevant than do European Americans (see also Reinka & Leach, 2017). Consistent with this, African Americans should feel more attentive, angry, and empowered, but less surprised in response to such images. In contrast, we suspect that European Americans appraise racialized images of police and protest as more novel, but less motivationally relevant than do African Americans (see Reinka & Leach, 2017). In concert with these appraisals, European Americans should feel more surprised, but less attentive, angry, or empowered in response to images of police and protest (see Leach, Snider, & Iyer, 2002). Thus, we expect that race makes a divergence in the online cognitive and affecting processing of racialized images in a way consistent with the divergences observed in more "downstream" processes such as beliefs, attitudes, and actions.

Race and Social Cognition

White and Black Americans have long expressed differing views of how race and racism affect individuals and society (e.g., Forman, 2004; Kawakami, Dunn, Karmali, & Dovidio, 2009; Nelson, Adams, & Salter, 2013). Notably, African Americans express much more criticism of past and present police force against unarmed Black people and the routine acquittal of violent police officers (Pew Research Center, 2014a, 2014b; for reviews, see Reinka & Leach, 2017; Weitzer, 2015). African Americans are also more interested and informed about racial bias in policing as well as Black-led protest against it, such as Black Lives Matter (see Freelon, McIlwan, & Clark, 2016; Nelson et al., 2013; Reinka & Leach, 2017). Likely as a result, African Americans express much greater support than European Americans of political movements against racial injustice (e.g., Freelon et al., 2016; Leach & Allen, 2017).

Given the many and profound ways in which race affects attitudes, beliefs, and experience, race can work subtly, even unconsciously, to color the processing of newly encountered images and information (for reviews, see Eberhardt & Goff, 2004; Xiao et al., 2016; Young et al., 2011). For example, a number of studies have used ERP of electrical activity in the brain to assess European American's visual processing of Black faces from 100 to 1,000 ms after exposure. These studies suggest that White participants treat Black faces as more salient initially, but less memorable over time (for reviews, see Amodio, 2008; Ito & Senholzi, 2013; Xiao et al., 2016; Young et al., 2011). Other studies using ERPs suggest that individuals' brain activity is less responsive to the actions of out-group members and others who are less motivationally relevant (for a review, see Gutsell & Inzlicht, 2013; see also Dietze & Knowles, 2016). Thus, prior work suggests a straightforward ingroup bias in the processing of racialized images of police and protest such that both Black and White participants should process out-group protagonists as more salient in the earliest stage of attention and in-group protagonists as more motivationally relevant in the longer run.

Racialized Images

As interesting as White and Black faces may be, in the real world they are but one racial feature of the social scene. Given the ubiquity of media today, people encounter photos, videos, and other images of Black and White people interacting in ways that are suffused with a great deal more meaning than can be found in a face—White or Black. Images of police applying a choke hold to a prostrate Black man, or of Black women standing together with raised fists at a protest can command attention (for reviews, see Balcetis & Lassiter, 2010; Xiao et al., 2016), beg interpretation (see Gutsell & Inzlicht, 2013; Mendes & Park, 2014), and promote emotion (Bradley & Lang, 2007; Iyer & Oldmeadow, 2006) because they include the especially provocative visual features of race (for reviews, see Eberhardt & Goff, 2004; Ito & Senholzi, 2013), physical force (Bradley & Lang, 2007), and human suffering (Bradley & Lang, 2007; Iyer & Oldmeadow, 2006). Research using ERPs to assess neural activity in response to photos of interpersonal and group violence, as well as individuals in emotional distress, has shown differential attention to such unpleasant and arousing stimuli as early as 100 to 300 ms (for a review, see Bradley & Lang, 2007). Despite the complexity of images of social action, our systems of visual cognition and affect respond readily to them.

(Sequential) Cognitive Appraisal

Cognitive appraisal theory (for reviews, see Lazarus, 1991; Scherer, 2009) is one compelling way to conceptualize and study the processes by which a social reality like race affects how individuals cognitively and affectively process racialized images. In line with long standing perceptual, attentional, and social–cognitive models of group and intergroup processes (for reviews, see Amodio, 2008; Ito & Senholzi, 2013; Xiao et al., 2016), recent approaches to group-based emotion argue that group membership helps provide the interpretive basis for affect and emotion by guiding the process of cognitive appraisal (for reviews, see Iyer & Leach, 2008; Smith & Mackie, 2015). For instance, research on van Zomeren et al.'s (2012) dynamic model of coping with societal disadvantage shows that individuals who see their in-group's disadvantage as motivationally relevant make socially supported appraisals of injustice that feed feelings of anger. In parallel, sufficient motivational relevance enables individuals to make socially supported appraisals of instrumental coping resources, which feed a sense of collective efficacy to cope. Before the present effort,

however, work on group-based appraisal has not tended to conceptualize or study the appraisal process as a temporal sequence that involves multiple systems in the brain and body (van Peer, Grandjean, & Scherer, 2014) as outlined in Scherer's (2009) model.

A small body of work has offered some support for this sequential model of appraisal and the neurological, physiological, cognitive, and affective processes said to enable each appraisal. Most notably, Grandjean and Scherer (2008) manipulated the novelty of visual images and participants' task goal and assessed early and later brain activity with electroencephalogram (EEG). They found early brain activity to be sensitive to stimuli novelty and intrinsic pleasantness, which suggests that these were the appraisals occurring early. Brain activity suggestive of the appraisal of motivational relevance came later in time. This was corroborated by van Peer et al. (2014) who examined the early (N100, P200, P300) and later (LPP) EEG ERPs examined here. With its excellent temporal resolution, ERP is ideal to examine the time-course of the neural activity indicative of cognitive appraisal (see Ibanez et al., 2012).

Appraisal of novelty. Likely because most prior work on race and visual processing has focused on the fleeting salience of isolated Black faces for White participants, many may expect that White participants should appraise images of Black targets of police force *and* Black-led protest as especially novel. However, more recent thinking conceptualizes attention to novelty as a product of the ecology and the person (including their group membership and social location; for reviews, see Amodio, 2008; Blascovich & Mendes, 2010; Gutsell & Inzlicht, 2013; Ito & Senholzi, 2013; Xiao et al., 2016). Because images of police force are *less* ecologically prevalent than those of protest,[1] we expect images of police force to be appraised as more novel. This should be especially true for European Americans who are less exposed to, and less well-informed about, race and policing. Three earlier ERPs can be used to assess our ideas about race and the appraisal of novelty.

In the earliest stage of cognitive appraisal, the N100 ERP pinpoints the lower-order process of novelty-driven selective attention to begin around 100 ms after stimulus onset (see Hillyard, Hink, Schwent, & Picton, 1973). The N100, reflects basic, bottom-up perceptual processing of stimuli (Näätänen & Picton, 1987), and is the earliest marker of selective attention (to novelty). Occurring before conscious awareness, the N100 reflects the attention drawn by the degree of mismatch between the stimulus and one's stored memories (Hillyard et al., 1973).

The subsequent P200 ERP indicates the largely unconscious activity of a cognitive matching system around 200 ms (Evans & Federmeier, 2007; Polich, 2007). This process of matching stimuli to stored memories results in greater P200 values when the stimulus is familiar (Evans & Federmeier, 2007) and, thus, processed more efficiently (Phillips & Takeda, 2009). The P300, on the other hand, reflects somewhat more complex processing, indicating greater attention allocation as working memory systems update in light of new stimuli (for a review, see Polich, 2007). As indicators of appraisals of novelty, the N100, P200, P300 should respond in similar ways to racialized images of police and protest (van Peer et al., 2014). As such images are relatively complex, however, the appraisal of novelty may be less apparent in the earliest stage of processing (i.e., the N100; see also Bradley & Lang, 2007). The earliest ERPs such as the N100 are also less reliable in general as they tend to be smaller amplitudes that may not offer a strong enough signal through the noise of other electrical activity in the brain (Woodman, 2010).

Appraisal of motivational relevance. As images of police force and protest are racialized, they should be more motivationally relevant to African Americans than to European Americans regardless of the race of the protagonists in the images (see Eberhardt & Goff, 2004; Mendes & Park, 2014) or of their novelty to European Americans. Although images of Black-led protest are more prevalent at present,[1] they should be appraised as more motivationally relevant than images of police force by both Black and White participants because the protagonists in protest are engaged in action more applicable and, therefore, relevant to participants than the actions of a police officer (for a general discussion, see Gutsell & Inzlicht, 2013). This hypothesis differs from an intergroup bias view, which suggests that both types of images should be appraised as more relevant by Black participants. We also diverge from an intergroup bias view by suspecting that Black participants will appraise targets of police force as more relevant than do White participants even when the targets of the police are White. Again, what should matter in our view is that police force is motivationally relevant to African Americans rather than the (ingroup) membership of the target of such force. To examine these ideas, we surreptitiously assessed the appraisal of motivational relevance with the LPP ERP (Experiment 1 and 2) and with systolic Blood Pressure (Experiment 2).

Late positive potential. The late positive potential (LPP) has been linked to the evaluative judgment, emotion regulation, and motivational significance that typically occur more than 300 ms after stimulus onset (see Ibanez et al., 2012). It reflects the affective meaning of stimuli (Hajcak et al., 2006), as well its motivational relevance to the individual (Schupp, Flaisch, Stockburger, & Junghöfer, 2006; see also Ito & Senholzi, 2013). This is why it has been used as an indicator of the appraisal of motivational relevance in recent research (see van Peer et al., 2014).

Systolic blood pressure. As variations in blood pressure can occur outside conscious awareness of engagement or effort (Smith & Hess, 2015) blood pressure measurement is an appropriate methodological compliment to the later LPP ERP as an indicator of the appraisal of motivational relevance. Acute stress elevates blood pressure, even if it is not experienced in the moment as unpleasant or distressing (Smith & Hess, 2015). Thus, increased (systolic) blood pressure is a marker of motivational engagement

[1] Freelon et al. (2016) analyzed a year of Twitter data making any reference to Black Lives Matter and "police killings of Black people under questionable circumstances" (mostly hashtagged names); 40,815,975 tweets were contributed by 4,435,217 unique users. In the 3 weeks after Michael Brown's killing, 5 times the number of tweets were of #ferguson than of Brown's name. The most shared image was of protest in Ferguson, MO (46,000). And, images of protest made up 49% of the top-10 tweeted images, whereas the image of Officer Wilson standing over Mike Brown's dead body made up 13% of the top-10 tweeted images. Image of Eric Garner being choked to death made up 9% of the top-10 tweeted images. An image of him alive with his family and protest images made up 29%.

Ince et al. (2017), analyzed a random sample of 66,159 2014 tweets that included the hashtag #blm. After the killing of Michael Brown, #ferguson was the most common hashtag paired with #blm (8,987) followed by #mikebrown (2,275). This difference became more dramatic after officer Wilson was not indicted when the top two hashtags referred to ferguson (14,285; 4,038) and reference to mike brown was a distant fourth (2,608).

with a task or goal (for reviews, see Mendes & Park, 2014; Scherer, 2009; Wright & Kirby, 2001).

Affect

There is a broad consensus that affect can be understood in terms of two general dimensions: (un)pleasantness and arousal/activation (for reviews, see Barrett & Russell, 1999; Lazarus, 1991). As images of violence and people in distress are rated as highly unpleasant (for a review, see Coan & Allen, 2007), we expect that images of police force will be more "intrinsically unpleasant" (Scherer, 2009) than images of Black-led protest. Given that they portray people in concerted action, however, images of protest should be more arousing (see Gutsell & Inzlicht, 2013; Mendes & Park, 2014). Observing these differences would serve to establish the ecological and construct validity of these images for the present purposes. Despite these expected differences, it is also important to establish that White and Black participants experience each type of image as equally unpleasant and arousing. This would suggest that the stimuli are affectively equivalent for the two groups and, thus, that any processing differences are because of the ways in which group membership colors the appraisal of the (racialized) stimuli (for general discussions, see Coan & Allen, 2007; Scherer, 2009).

Emotion

For our examination of appraisals of novelty and relevance, the emotions of surprise and attentiveness seem especially important. Surprise ("amazed," "astonished") is a state of high arousal/activation at unanticipated or novel events that is often experienced as a mixture of pleasant and unpleasant feeling (Watson & Clark, 1994). Thus, it corresponds most closely to the appraisal of novelty. Attentive ("alert," "concentrating") is a somewhat less aroused and generally more pleasant state of conscientious and determined engagement (Watson & Clark, 1994). Thus, it is the emotion that most corresponds to the appraisal of motivational relevance. We expect White participants to be more surprised by the racialized images, especially of unarmed Black targets of police force. Although Black participants should be less surprised by these images, they should experience more attentiveness. It may be important to note, however, that these conscious experiences of emotion may not be directly tied to the much earlier cognitive processing indicated by the ERPs. Indeed, the neural activity assessed in the ERPs operates on the very different time course of milliseconds and may be outside of conscious awareness (see Coan & Allen, 2007; Ibanez et al., 2012; Scherer, 2009).

Self-reports of anger and empowerment should follow the pattern of motivational relevance (see Iyer & Leach, 2008; Scherer, 2009). As we expect Black participants to appraise the racialized images as more motivationally relevant, they should report more anger at Black targets of police force (Leach & Allen, 2017) and more empowerment at Black-led protest (Reinka & Leach, 2017). Anger at police force and empowerment at Black-led protest are the most obvious emotional consequences of Black individuals appraising each type of event as relevant to them as members of an in-group collectively facing a serious issue of social and psychological importance (for general discussions, see Iyer & Leach, 2008; Smith & Mackie, 2015; van Zomeren et al., 2012).

Overview

Given the research reviewed above, we expected Black participants to be much more familiar with past instances of racialized violence against unarmed Black victims. As a result, Black participants should devote less early attention (ERPs: N100, P200, P300) to original images of police force against Black (and White) targets, which suggests that they appraise the images as less novel. However, Black participants' familiarity with racialized violence should lead them to appraise images of police force, and protest against it, as more motivationally relevant. This should lead to their greater LPP ERP and (systolic) blood pressure, as well as emotions of attentiveness, anger, and empowerment.

As we expected White participants to be much less familiar with instances of racialized violence, their appraisals should take an opposite pattern. White participants should appraise images of police force and protest as more novel. Although they should feel more surprised by these images, they should feel less attentive, angry, and empowered, if the images are appraised as less motivationally relevant to them. As a first step, Experiment 1 aimed to validate treating participants' self-reported "race" as frame of reference that can affect cognition, affect, and emotion regarding experimentally presented images of police force and protest. The better powered and more elaborate Experiment 2 aimed to provide a more comprehensive assessment of our argument.

Experiment 1

Experiment 1 was designed to validate our methodological approach and to test our starting hypotheses regarding how participants' race should affect cognitive and affective processing of original images of police force and protest against it. We used a more modest sample of White and Black participants than focal Experiment 2, so as not to exhaust the limited supply of Black participants in our participant pool.

First, we wish to confirm our starting hypotheses that Black participants are *more familiar* with past instances of racialized violence against Black people and are *more attentive* to original images of police force (against Black targets) and Black-led protest. White participants should be less familiar with past instances and more surprised by our original images. Such evidence would serve to validate our use of self-reported group membership as a proxy for the multifaceted construct of race that we expect to be so central to participants' processing of the original images we present.

Second, Experiment 1 aims to show that ERPs can be used to examine the cognitive and affective processing of the socially rich images of interest here. This is important because prior ERP research on race (for reviews, see Amodio, 2008; Ito & Senholzi, 2013) has tended to examine neural activity in the first 400 ms after exposure to single faces and objects. Although a great deal of research has examined similar ERPs to affectively laded images of interpersonal violence and people in distress, that work has tended not to examine the effects of the racial or other social content of the images (for reviews, see Bradley & Lang, 2007; Coan & Allen, 2007).

Third, we aim to further validate the original images we use as stimuli. Indeed, it is important to show that each set of images provoke similar affect (unpleasantness and arousal) in Black and White participants. The affective equivalence of each set of stimuli

across groups would suggest that differential cognitive and affective processing is because of participant race guiding processing of these particular stimuli, rather than processing being guided by the stimuli alone (for general discussions, see Eberhardt & Goff, 2004; Richeson & Sommers, 2016). Also, it is important to establish the ecological validity of our stimuli. Evidence that the earliest ERPs (N100, P200, P300) are greater for our archetypal images of police force than of Black-led protest would confirm our starting assumption that original images of police force are more novel than images of Black-led protest because images of protest have been circulated more widely (see Freelon et al., 2016).[1]

Although a few particularly disturbing images of police shootings may be salient at present, most attention in social and news media has been on the largely Black-led protest in response. For instance, in Turetsky and Riddle's (2018) database of 3,278 news articles in the 10-day period after Michael Brown was killed in Ferguson, MO, 71% of articles mentioned "protest" and "riot" as much or more than they mentioned Michael Brown—the unarmed Black 17-year old who was killed. In a randomly generated sample of 1,000 of the over 22,000 images used in these news articles, photos of Black-led protest outnumbered the archetypal photo of Michael Brown lying dead in the street by a ratio of 74 to 1.

In addition, we conducted Google Image searches for the recent instances of police (or similar) killings of unarmed Black victims that were rated as most familiar in both of the present Experiments: "Michael Brown," "Eric Garner," and "Trayvon Martin." Only a very small minority of the first 100 photos or drawings showed photos like those used in the present Experiments that portrayed them as victims of deadly force—4, 15, and 1%, respectively. In fact, there were many more portraits of the men alive (37, 31, and 47%) or of Black-led protest in response to their deaths (15, 25, and 18%). Analyses of the images (see Freelon et al., 2016) and hashtags (Freelon et al., 2016; Ince, Rojas, & Davis, 2017) used on Twitter at the time of the killings of Michael Brown and Eric Garner in 2014 also show that protests were focused upon more than use of force.[1]

Method

Participants were "invited to participate in a research study to examine how people react to different kinds of images" entitled "A Multi-Method Integration of Visual Processing." They were met at an EEG lab by an experimenter who was matched to participant's self-reported identity as White or Black. After completing informed consent, participants were fitted with an EEG cap per manufacturer's recommendations (Electrical Geodesics, Inc., Eugene, OR) and seated at a desk in a dim room, approximately 3 feet from a computer screen, with a keyboard within easy reach. Formal instructions were provided via E-Prime 2.0 (Psychology Software Tools, Inc., Sharpsburg, PA), presented on a 19-in., 1,280 by 1,024-pixel resolution computer monitor. Thus, participants were engaged in a passive viewing task. The experimenter sat approximately 6 feet away at a separate desk, where they were able to monitor live EEG data quality during acquisition. Experimenters made adjustments to EEG electrodes as needed during breaks in the task to ensure data quality.

Participants. Participants were 131 undergraduates (61 European American/White, 70 African American/Black; 49 Men, 81 Women, 1 unreported) who participated in exchange for course credit if they met the criteria for inclusion (e.g., no history of epilepsy or seizures, English as a primary language). However, 46 participants were excluded from analyses of the ERPs because of EEG cap fitting and data acquisition issues that disproportionately ruled out Black participants whose hair tended to make good EEG measurement via the scalp more difficult. Another 10 participants were excluded because of excessive artifacts (e.g., eye blinking), leaving them with less than seven good trials of EEG data for each type of image (for a general discussion of these difficulties in EEG measurement, see Jackson & Bolger, 2014). After noticing extraordinarily high *SD*s on several ERP measures, we identified another two participants who were removed because of high influence values (Cook's distance $>.1$) for at least two averaged ERP outcomes. These exclusions yielded a final sample of 73 participants (41 White and 32 Black) for ERP analyses.

It is not unusual to lose substantial numbers of participants to cap fitting difficulties and other impairments to EEG data quality (see Jackson & Bolger, 2014). Fortunately, this loss of data did not distort our EEG sample. A series of analyses showed very little difference in the characteristics of those for whom we could and could not collect good EEG data.[2] As a result, the analyses of ERPs include all 73 participants (41 White and 32 Black) for whom we could collect good data and the analyses of self-report include the full sample of 131 participants (61 Black, 70 White). Nevertheless, we took steps in Study 2 to increase the number of (especially Black) participants with EEG data.

Design and statistical power. The experiment used a 2 (participant race: White or Black; between-participants) × 2 (type of image: Black target of police force or Black-led protest; within-participant) × 2 (image order; between-participants) mixed design. Participants were randomly assigned to one of two image presentation orders to assess possible primacy effects. Thus, either the images of police force against Black targets or of Black-led protest were presented first. In lieu of a control condition that presented "neutral" images, in the interval between trials we extracted an ERP of neurological activity indicative of general attention. We also examined "baseline" activity before the presentation of each image to assess any general (attentional) differences between participants.

A power analysis using PANGEA (Westfall, 2016) suggested that we needed a sample size of 88 (44 Black and 44 White) to achieve 80% power to detect the medium-size effects ($d = .5$) we expected at $p < .05$. Thus, we had very good power for the self-report measures that tested our most important assumptions. However, we fell short of the preferred sample size for the ERP

[2] We conducted a series of GLMs with participant race and good EEG data as factors. After accounting for the effect of participant race, there was no difference in reported political orientation between those with and without EEG data, $F(1, 126) = .003$, $p = .958$, $\eta_p < .03$. Also, participants with and without EEG data were no different in the affect or emotion they reported in response to the images, all $F < 3.43$, $p > .067$, $\eta_p < .17$. In addition, African Americans with or without EEG data did not differ in their degree of racial identification, all $F < 1.65$, $p > .203$, $\eta_p < .16$. However, after accounting for the large and expected effect of participant race, participants with EEG data ($M = 1.53$, $SD = .78$) were slightly *less* familiar with past cases of racialized violence than those without EEG data ($M = 2.05$, $SD = .89$), $F(1, 126) = 4.422$, $p = .037$, $\eta_p = .18$. As a result, our analyses may somewhat underestimate the effect that familiarity had on the LPP.

analyses after data loss because of the EEG cap fitting issues, which disproportionately ruled out Black participants. As the earliest ERPs, like the N100 and P200, are the least reliable given their smaller amplitude and likelihood of being swamped by alpha wave "noise" (Woodman, 2010), they are likely to suffer the most from our somewhat compromised statistical power in this first experiment. Despite this, our statistical power compares favorably to other EEG research of this kind (for reviews, see Amodio, 2008; Ito & Senholzi, 2013) and seems sufficient for this first study. Better statistical power was achieved in Study 2 by recruiting a larger sample and achieving better success at EEG cap fitting with Black participants.

Stimuli. Images were obtained through Internet searches of lesser-known, contemporary, news-quality photos of Black-led protest (https://www.dropbox.com/sh/2io5vgxfn60xjpu/AAAHlH_Q-Yg8TkTOekGRbmOta?dl=0) and police force against Black targets (https://www.dropbox.com/sh/4orq9arjlsnamt2/AAAPvz2mnMxuE1MHfzXD4ML2a?dl=0). Given our focus on the appraisal of novelty, we excluded well-publicized images of high-profile incidents of police use of force or of protest. The images were all made black and white and adjusted or cropped to create as much consistency as possible. No images with obvious blood or gore were included to avoid distraction or undue discomfort (for a general discussion, see Coan & Allen, 2007).

We excluded photos that contained cues suggesting that the targets of police force were protesters (e.g., riot police, large crowds). Thus, each image showed police officers in uniform with official gear using physical force or weapons to subdue a Black target. In 22 of these 30 images, it was clear that the police officer(s) were White because their faces were shown. As we discuss below, the apparent race of the police had little role in the processing of these images of police use of force. To encourage attention and affective reaction, we placed the (Black) target's face at the center of each image and their expression was one of clear distress (see Coan & Allen, 2007). A separate study showed Black and White respondents to report very similar affect to these images and to describe them in very similar terms.[3]

The images of Black-led protest were largely taken from the Black Lives Matter movement and were screened to only include those in which at least a majority of the people in the scene appeared to be Black. Half the images contained legible text in banners and placards, which most participants could not read in the 1,000 ms the image was on the screen (see Jackson & McClelland, 1979). As we discuss below, the presence of text had little role in the processing of the images of Black-led protest. A separate study showed Black and White respondents to report very similar affect to these images and to describe them in similar terms.[4]

EEG data processing, ERP extraction. Following standard practice, participants were shown each image for 1,000 ms, with a jittered 1,000–1,500 ms intertrial interval between images. Continuous EEG was recorded during image presentation using a 128-channel HydroCel Geodesic Sensor Net with a Net Amps 300 amplifier (Electrical Geodesics, Inc., Eugene, OR). The data were sampled at 250 Hz and referenced to the vertex during acquisition. A 0.1 Hz first-order highpass filter was applied to the data, followed by a 30 Hz lowpass filter before analysis as per manufacturer recommendation. Next, the data was segmented into 1,200 ms trial epochs: a 200 ms baseline before the image stimulus, followed by a 1,000 ms window after the stimulus presentation onset.

As mentioned above, epochs were screened for excessive data artifacts including eyeblinks, eye movements, bad channels, and noncephalic artifacts, and removed from data processing to reduce contamination and ensure data quality. Only participants with at least seven good trials for each type of image were included for analysis,[5]

[3] Initial validity evidence for these images of Black targets of police force comes from Leach et al. (2018) who asked 100 White and 99 Black MTurk workers to rate their affect at each image using a simple pictorial measure and to describe each set of images in their own words. Linguistic analysis of the descriptions showed White and Black participants to have equal "cognitive engagement" with the images as they appeared to describe the images in similarly extensive and complex language. Regarding self-reported affect, the apparent race of the police had little effect on White or Black participants who rated the images as very unpleasant and moderately arousing. A mixed effects analysis with individual image and participant specified as random effects and apparent race of the police specified as a fixed effect showed that there was very little variance in the affective ratings across individual images. Thus, it is appropriate to treat the images as a homogenous set (Judd et al., 2012).

[4] Initial validity evidence comes from Reinka and Leach's (2017) linguistic analysis of 100 White and 100 Black MTurk workers' descriptions of these images of Black-led protest. They found no difference in Black and White participants' "cognitive engagement" with the images. In addition, both groups referred to the Black Lives Matter movement to the same degree and used the same degree of disapproving language to describe the protests (e.g., riot, violent). Neither did they differ in the use of irrelevant function words or total number of words, which suggests that the images were equivalent stimuli for White and Black participants. However, Black participants made slightly greater reference to (in)justice and described the images of protest somewhat more positively. Black participants also used more affiliative language—indicating greater feelings of solidarity and more causal language and "clout"—indicating greater solidarity and empowerment. Whites, on the other hand, used slightly more uncertain language and wrote in a less authoritative tone regarding the photos of Black-led protest.

The images of Black-led protest were rated as slightly unpleasant and moderately arousing on average. The presence of legible text made the images slightly more unpleasant and arousing. More important, a mixed effects analysis with individual image and participant specified as random effects and the presence of legible text specified as a fixed effect showed that there was very little variance in the affective ratings across individual images. Thus, it is appropriate to treat the images as a homogenous set irrespective of the presence or absence of text (see Judd et al., 2012). However, as these prior studies were conducted online and, thus, allowed participants to look at each image for at least several seconds, it is important to assess experienced affect in this particular laboratory experiment, which tightly controlled exposure and assessment.

[5] There is no consensus regarding how many trials are necessary to elicit a reliable ERP component, partly because it appears to depend on the demands of the task being performed (e.g. Meyer, Riesel, & Proudfit, 2013). However, some researchers estimate that one can gain a valid and reliable ERP component in as few as six trials (Pontifex et al., 2010). Our inclusion of participants with at least seven good trials for each type of image yielded a near equal number of trials for images of Black targets ($M = 20.01$, $SD = 5.08$) and of Black-led protest ($M = 19.41$, $SD = 5.77$), $t(72) = 1.073$, $p = .287$. Nevertheless, in response to a reviewer's concern, we performed all key analyses with the higher threshold of 12 good trials for each type of image. This reduced the N to 63 (35 White, 28 Black) for Experiment 1, to 99 (53 White; 43 Black) for Experiment 2. More important, the pattern of results was nearly identical with this data quality standard. In terms of statistical significance, only three tests diverged from the analyses reported above. In Experiment 1, the marginal effect of image type predicting LPP amplitude was no longer significant, although protest images were still appraised as more motivationally relevant, $b = .741$, $SE = .482$, $p = .127$. In Experiment 2, the interaction between Black target images and participant race predicting the P200 was no longer significant, $b = .437$, $SE = .270$, $p = .105$. In addition, the interaction between participant race and White target images in the LPP also was no longer significant with the more stringent cutoff, $b = .646$, $SE = .448$, $p = .150$. That these interactions became nonsignificant is unsurprising given the greater statistical power required for tests of interactions.

which resulted in the exclusion of 10 participants. The remaining trials were baseline corrected for 200 ms before the image presentation and then average referenced to the vertex. Individual participant average waveforms were averaged together to produce grand average waveforms used only to identify components for extraction (e.g., Kramer, 1985; Luck, 2005).

Unlike prior research, which used ERPs to examine the visual processing of racial out-group faces (for reviews, see Amodio, 2008; Ito & Senholzi, 2013), we saw no evidence of an N170 component over the expected maximal sites.[6] This is consistent with our presumption that the racialized images of police force and protest contain more racial content than the single, decontextualized, Black and White faces used in most prior ERP research on race.

Based on previous research as well as our grand average waveforms, the N100 and P200 were identified and extracted as the mean amplitudes from a seven-site cluster surrounding FCz from 100–150 ms and 150–225 ms post stimulus onset, respectively. We extracted the P300 as a mean amplitude component from 275–500 ms averaged from a six-site cluster surrounding Pz. Finally, we identified and extracted the LPP as a mean amplitude component from 500–900 ms. After examining amplitudes for caudality and laterality, we averaged the LPP across the five frontal sites where it was maximal, which included sites F3, Fz, and F4 on the 10–20 international system. Intercorrelations between the four ERPs are reported in Table 1a of the online supplemental material.

Rather than computing averaged ERP scores for each image type as is tradition (see Luck, 2005), we join a recent wave of researchers (e.g., Koerner & Zhang, 2017; Tremblay & Newman, 2015; Wierda, van Rijn, Taatgen, & Martens, 2010) and instead extracted trial-level data for each component of interest and treated image type (Black-led protest and Black targets of police force) as a fixed effect in a linear mixed effects model. This approach specifies more precisely the systematic and error variance, in what is traditionally very noisy data.

Following standard practice, we applied a baseline correction process, which takes the neurological activity in the 200 ms prestimulus baseline period and subtracts it from the activity assessed in the 1,000 ms after stimulus presentation (see Luck, 2005; Woodman, 2010). This baseline correction serves to reduce the degree to which the analyzed ERPs are affected by preexisting attentional or other differences between participants. In our case, it would help to reduce the influence of possible chronic attentional or other differences between White and Black participants who have very rarely been compared in ERP research, even that on the visual processing of racialized content like Black and White faces.

Although prestimulus baseline activity is typically used only to correct ERPs, we also took advantage of it here to assess White and Black participants' neural activity at baseline to examine any general differences between the groups in attention or other relevant processing. Thus, we examined prestimulus baseline activity as a sort of "control" condition free of racialized stimuli. The average waveform amplitude of the 200 ms prestimulus baseline period was extracted in the same trial-level manner as the four ERP components, as explained above. By analyzing the *uncorrected* neural activity before stimulus presentation, we can assess the degree to which standard baseline correction is reducing general differences in White and Black participants' neural activity in the context of this experiment. This analysis of prestimulus baseline activity, and the correction for it in our analyses of the ERPs, increase confidence that any observed effects on the ERPs are the result of Black and White participants' visual processing of the particular types of images that we presented to them.

Measures. To assess familiarity with the issues at hand, participants were shown a set of 15 photos (https://www.dropbox.com/sh/xlmc2mq2okyskg3/AADAuJ_G6q8-JGI8HzIGu4f_a?dl=0) that contained brief descriptions of police and civilian shootings and other violence against unarmed Black people. The vast majority resulted in death. They ranged from more well-known (e.g., Michael Brown, Trayvon Martin, and Eric Garner) to less well-known (e.g., Renisha McBride, John Crawford, and Rekia Boyd). Although most events occurred in the last few years, three events were older (i.e., Rodney King, Amadou Diallo, and Oscar Grant). Participants rated how familiar they were with each incident on a scale from *not at all* (0) to *extremely* (5), $M = 1.75$, $SD = .86$. These ratings were very consistent across events and, thus, yielded a reliable scale (standardized $\alpha = .852$). Leach, Reinka, and DeRosa (2018) showed that Black and White adults on MTurk rated these images equally—as extremely unpleasant and moderately arousing.

To assess affective reactions to the original images of Black targets of police force and of Black-led protest presented here, we used the serenity subscale of the Extended Positive and Negative Affect Schedule (PANAS-X; Watson & Clark, 1994) to measure the arousal dimension of affect and eight of the negative affect items to assess the unpleasantness dimension of affect.

We also used validated PANAS-X subscales to assess surprise and attentiveness emotion to our original images as well as anger and empowerment (i.e., "self-assurance").[7] Scale reliability and descriptive statistics are reported in Tables 1 and 2. Only surprise at images of Black-led protest fell below conventional standards of scale reliability (standardized $\alpha = .617$).

We asked participants to indicate their gender, as well as to indicate their political orientation on a single dimension that ranged from *extremely liberal* (1) to *extremely conservative* (7). A number of other self-report measures were also included in the study that have little bearing on the early processes of cognitive appraisal of central interest here (e.g., willingness to protest,

[6] The N170, a common marker of facial processing is often observed maximally over lateralized occipitotemporal and temporal electrode sites (Ito & Senholzi, 2013). Given the preponderance of work on the topic, we searched for an N170 in these areas (e.g. Kramer, 1985) but did not find any evidence for one. In fact, much of the waveform in those areas was overtaken by spillover from our large P300. Although we took pains to ensure that the race of the target of police force or of protesters was clear in our images, the naturalistic quality of these news photos necessarily means that they are visually richer than the intentionally austere facial images used in much of the previous work on the N170.

[7] The PANAS-X also included other measures of emotion, such as guilt, fear, and sadness of less interest here (see Leach et al., 2018). Participants also reported their action tendencies (Frijda et al., 1989), as well as their attitudes toward police, motivation to join BLM protest, and the perceived efficacy of BLM (adapted from van Zomeren, Spears, Fischer, & Leach, 2004). Lastly, Black participants indicated their identification as African American/Black (Leach et al., 2008), whereas White participants completed the Internal and External Motivation to Respond without Prejudice scales (Plant & Devine, 1998).

Table 1
Descriptive Statistics for Self-Reported Affect and Emotion, Experiment 1

Variable	Mean (*SD*)	α	1	2	3	4	5
			Black target images				
1: Negative affect	1.40 (.92)	.784					
2: Serenity	1.33 (1.17)	.831	−.360*				
3: Surprise	1.48 (1.23)	.785	.490*	−.139			
4: Attentiveness	2.84 (1.14)	.755	.186*	.162	−.022		
5: Anger	3.06 (1.28)	.910	.595*	−.474*	.245*	.245*	
6: Empowerment	1.32 (1.13)	.856	−.131	.394*	−.116	.468*	−.120
			Black-led protest images				
1: Negative affect	.63 (.65)	.759					
2: Serenity	2.28 (1.19)	.831	−.326*				
3: Surprise	1.32 (1.02)	.617	.174*	.007			
4: Attentiveness	2.95 (1.07)	.719	.074	.073	.246*		
5: Anger	1.16 (1.22)	.911	.556*	−.430*	.024	.144	
6: Empowerment	2.43 (1.21)	.853	−.027	.124	.225*	.537*	.017

Note. All reliability coefficients are standardized. Arousal was measured by the serenity subscale of the PANAS-X. A low score indicates higher arousal.
* $p < .05$.

perceived efficacy).[7] All procedures were approved by the university's Institutional Review Board.

Results and Discussion

To examine self-reported familiarity, affect, and emotion, our analyses were 2 (participant race: White or Black; between-participants) × 2 (type of image: Black target of police force or Black-led protest; within-participant) × 2 (image order; between-participants) mixed generalized linear models (GLMs) in SPSS 24 to examine the full experimental design.

Familiarity with racialized violence. Our hypotheses regarding race, appraisal, and emotion rest on the expectation that Black participants are much more familiar than White participants with police and other violence against unarmed Black people. Thus, it is important that Black participants were in fact much *more familiar* than White participants with the 15 in-

Table 2
Descriptive Statistics for Self-Reported Affect and Emotion, Experiment 2

Variable	Mean (*SD*)	α	1	2	3	4	5
			Black target images				
1: Negative affect	1.67 (1.07)	.828					
2: Serenity	1.03 (1.12)	.819	−.422*				
3: Surprise	1.43 (1.17)	.787	.321*	.005			
4: Attentiveness	2.71 (1.13)	.734	.326*	.106	.085		
5: Anger	3.03 (1.33)	.913	.682*	−.337*	.222*	.439*	
6: Empowerment	1.00 (1.01)	.851	−.014	.325*	.093	.368*	.064
			Black-led protest images				
1: Negative affect	.65 (.74)	.830					
2: Serenity	1.98 (1.34)	.830	−.336*				
3: Surprise	1.28 (1.00)	.570	.138	.161*			
4: Attentiveness	2.90 (1.20)	.838	.069	.339*	.231*		
5: Anger	.93 (1.15)	.915	.736*	−.319*	.125	.012	
6: Empowerment	2.46 (1.36)	.906	−.070	.280*	.333*	.650*	−.063
			White target images				
1: Negative affect	1.30 (1.02)	.825					
2: Serenity	1.27 (1.19)	.842	−.276*				
3: Surprise	1.86 (1.31)	.802	.437*	−.172*			
4: Attentiveness	2.41 (1.17)	.766	.304*	.123	.283*		
5: Anger	2.35 (1.43)	.921	.697*	−.383*	.520*	.409*	
6: Empowerment	.98 (.94)	.827	.174*	.388*	.032	.492*	.073

Note. All reliability coefficients are standardized. Arousal was measured by the serenity subscale of the PANAS-X; therefore, a low score indicates higher arousal.
* $p < .05$.

stances we presented, $F(1, 128) = 65.53$, $p < .001$, $\eta_p = .76$. There was no effect of the image presentation order, nor any interactions between presentation order and participant race, all $p > .29$, $\eta_p < .10$. The large effect of participant race on familiarity was independent of participant gender, political orientation, and EEG inclusion.

Black participants' familiarity with past violence against unarmed Black people was moderately correlated to their reported attentiveness to the original archetypal images we presented of police force against unarmed Black targets, $r(70) = .33$, $p = .005$, and of Black-led protest against it, $r(70) = .31$, $p = .009$. White participants' familiarity with past instances of racialized violence was not correlated with attentiveness to the original images we presented of police force, $r(60) = -.022$, $p = .867$, or of Black-led protest, $r(60) = -.02$, $p = .882$.

Familiarity was also differentially related to affect regarding the images. For Black participants, familiarity with past killings was significantly correlated to greater unpleasantness of the archetypal images of unarmed Black targets, $r(70) = .24$, $p = .049$, whereas for White participants familiarity was significantly correlated to greater unpleasantness of images of Black-led protest, $r(60) = .35$, $p = .006$. And, for Black participants, familiarity was significantly correlated to greater arousal at Black targets of police force, $r(70) = .27$, $p = .025$, whereas for White participants, familiarity was significantly correlated to greater arousal at Black-led protest, $r(60) = .30$, $p = .020$. Thus, Black and White participants' very different familiarity with past instances of police and other violence against unarmed Black victims was associated with differential affect and emotion at the original archetypal images we presented in this experiment.

Affect: Unpleasantness and arousal. The means for affect and emotion toward each type of image are shown in Table 1, along with scale reliabilities. As expected, these images of Black targets of police force were rated as much more unpleasant than the images of Black-led protest, $F(1, 126) = 85.57$, $p < .001$, $\eta_p = .64$. More important, there was no significant or sizable effect of participant race, $F(1, 126) = .057$, $p = .812$, $\eta_p < .001$. There was no effect of the image presentation order, nor any interactions between presentation order, participant race, and type of image, all $p > .391$, $\eta_p < .08$.

Participants reported much more arousal at images of police force against Black targets than at images of Black-led protest, $F(1, 126) = 74.41$, $p < .001$, $\eta_p = .61$, with no effect of participant race, $F(1, 126) = .300$, $p = .585$, $\eta_p = .04$. However, image presentation order had a significant effect on arousal: those who saw police force against Black targets first reported more arousal than those who saw Black-led protest first, $F(1, 126) = 5.96$, $p = .016$, $\eta_p = .21$. No other interactions were significant, all $p > .065$, $\eta_p < .16$.

Taken together, the present results offer important evidence of the construct validity of the original images examined here. Whereas Images of police force against Black targets were rated as more affectively unpleasant, images of Black-led protest were and as more arousing. Results also show that White and Black participants had similar affective reactions to the two types of images. This is consistent with Reinka and Leach's (2017) linguistic analyses of descriptions of the images as well as Leach et al.'s (2018) analyses of the affective ratings of each individual image. Thus, any effect of participant race on cognitive and affective processing should be attributed to how race guides reaction to the images rather than to any differential effects of the images themselves.

Emotion: Surprise and attentiveness. There was no effect of participant race or image presentation order on reported surprise, nor an interaction between the two, all $p > .137$, $\eta_p < .13$. However, there was a significant interaction between participant race and type of image, $F(1, 126) = 10.03$, $p = .002$, $\eta_p = .27$. As expected, White participants reported being more surprised than Black participants by police force against unarmed Black targets. In addition, White participants reported being more surprised by Black targets of police force than by Black-led protest.

Neither image type nor presentation order affected reported attentiveness to the images, all $p > .18$, $\eta_p < .12$. However, as predicted, there was a significant effect of participant race, with Black participants reporting moderately more attentiveness than White participants, $F(1, 126) = 14.089$, $p < .001$, $\eta_p = .32$. There was also a significant three-way interaction between image presentation order, image type, and participant race, $F(1, 126) = 7.53$, $p = .007$, $\eta_p = .23$. White participants' reported attentiveness waned for the second set of images compared with the first, no matter the presentation order, whereas Black participants' reported attentiveness either stayed stable or increased from the first to the second set of images, indicating continued engagement with the images. No other interactions were significant, all $F < 1.1$, $p > .30$, $\eta_p < .10$.

Together the self-report measures of familiarity, surprise, and attentiveness help to validate race as a broad point of reference for the processing of these images of police use of force and Black-led protest. Before proceeding to our main question of whether race guides the appraisal of these images over time (in Experiment 2), we examined the viability of using neurological indicators of the appraisal of novelty (the N100, P200, P300) and motivational relevance (i.e., the LPP). ERP descriptive statistics by image type are shown in Table 1a of the online supplemental material. Table 2 of the online supplement material provides correlations between familiarity, surprise, attention, and the ERPs.

Each ERP was analyzed using linear mixed effects models in the "lme4" package (Bates, Mächler, Bolker, & Walker, 2015) for RStudio Version 1.0.136 (R Core Team, 2014). Individual participant, and trial (individual image presentation) nested within image type, were both specified as random effects, whereas participant race and image type were specified as fixed effects. See Table 3 for parameter estimates and significance tests.

Prior analyses, which included order of image presentation as a fixed effect, showed it to have no noteworthy effects. It was, therefore, excluded from the present analysis.

N100. As shown in Table 3, neither image type, participant race, nor their interaction produced significant effects on this earliest of our ERPs. White participants, and Black targets of police force, did show slightly larger ERPs, as expected.

P200. Given the prevalence of media on Black Lives Matter and similar protest (Freelon et al., 2016; Turetsky & Riddle, 2018),[1] the images of Black-led protest should be matched more quickly and easily to stored memories (Evans & Federmeier, 2007). Indeed, images of Black-led protest elicited greater P200 than Black targets of police force (see Table 3). And, as expected, Black participants had significantly greater P200 than Whites. As the two-way interaction was not significant, the main effects of

Table 3
Linear Mixed Effects Models on the Four ERP Outcomes of Interest, Experiment 1

	All images			Black-target images			Black-led protest images		
	b	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*
N100									
Fixed effects									
Intercept	−2.956	.265	<.001	−2.894	.268	<.001	−2.772	.274	<.001
Participant race	.358	.395	.367	.289	.405	.477	.080	.401	.842
Image type	.221	.204	.280	—	—	—	—	—	—
Interaction	−.344	.290	.237	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	2.037			2.113			2.130		
Trial:Image type	.052			<.001			.112		
Residual	14.776			15.645			13.729		
P200									
Fixed effects									
Intercept	−3.349	.366	<.001	−3.293	.357	<.001	−2.767	.379	<.001
Participant race	1.162	.542	.035	1.134	.526	.035	1.030	.562	.071
Image type	.600	.223	.008	—	—	—	—	—	—
Interaction	−.152	.300	.609	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	4.472			4.122			4.815		
Trial:Image type	.142			.162			.126		
Residual	15.487			15.676			15.243		
P300									
Fixed effects									
Intercept	6.528	.478	<.001	6.479	.516	<.001	4.638	.420	<.001
Participant race	−2.741	.682	<.001	−2.672	.733	.001	−2.816	.621	<.001
Image type	−1.840	.376	<.001	—	—	—	—	—	—
Interaction	−.068	.482	.887	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	6.458			7.251			4.900		
Trial:Image type	.522			.858			.149		
Residual	40.621			44.776			36.961		
LPP									
Fixed effects									
Intercept	−1.502	.415	<.001	−1.438	.480	.004	−.704	.344	.045
Participant race	.164	.477	.731	.087	.488	.859	−.166	.478	.730
Image type	.816	.479	.092	—	—	—	—	—	—
Interaction	−.366	.437	.402	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	2.362			2.485			2.356		
Trial:Image type	2.095			3.691			.472		
Residual	33.305			33.984			32.446		

Note. ERP = event-related potential; LPP = late positive potential. Reference category for participant race is White participants. Reference category for image type is Black-target images.

participant race and image type appeared to be independent in this modestly powered analysis.

P300. As expected given their lesser ecological prevalence, images of Black targets of police force elicited much greater P300 than those of Black-led protest (see Table 3). Also, consistent with their lesser familiarity with past instances of racialized violence, White participants showed much greater P300 to all images. Again, there was no interaction between these two factors.

Late Positive Potential. Protest images elicited marginally greater LPP than the images of police force against Black targets, suggesting that the images of protest were appraised as more motivationally relevant. Although Black participants showed slightly larger LPP than White participants, this main effect was not significant in this first, modestly powered, experiment (see Table 3). Once again in this experiment, there was no interaction between these two factors.

Prestimulus baseline activity. As explained above, we examined neural activity in the 200 ms prestimulus baseline period as a sort of "control condition" to estimate general attentional or other differences between Black and White participants. For consistency, baseline activity was extracted and analyzed at the same site clusters as the ERP components: a five-site frontal average, seven-site cluster surrounding FCz, and six-site cluster surrounding Pz. Visual inspection of the data suggested some outliers on individual trials. Hence, we excluded uncorrected baseline amplitudes ≥3 *SD*s from the *M* for these analyses (trial data lost: frontal average $n = 36$; FCz average $n = 39$; Pz average $n = 48$).

Prestimulus baseline activity in the three multisite clusters was examined like the ERPs with linear mixed effects models that specified participant and individual image as random effects and participant race as a fixed effect. Participant race did not significantly affect neural activity at any of three multisite clusters for prestimulus baseline activity, all $p > .49$. Thus, there was no indication of general differences in Black and White participants' neural activity before the presentation of the images. As such, the differences in neurological activity reported in the ERP analyses above appear to be due specifically to White and Black participants' differential processing of the images of Black-led protest and Black targets of police force.

Emotions: Anger and empowerment. A mixed GLM analysis parallel to those above for self-reported affect examined whether the greater motivational relevance the images appeared to have for Black participants (i.e., their greater LPP), was corroborated by greater subjective experience of anger and empowerment at the images. Unsurprisingly, images of Black targets of police force elicited much more anger than images of Black-led protest, $F(1, 126) = 208.24$, $p < .001$, $\eta_p = .789$. And, images of Black-led protest elicited much more empowerment than images of police force against Black targets, $F(1, 126) = 130.30$, $p < .001$, $\eta_p = .713$. This offers further construct validation of the images. More interesting, Black participants' greater appraisal of motivational relevance was corroborated by the fact that Black participants reported moderately more anger than White participants, $F(1, 126) = 8.46$, $p = .004$, $\eta_p = .251$. Black participants also reported greater empowerment than White participants, $F(1, 126) = 33.20$, $p < .001$, $\eta_p = .457$.

An interaction between participant race and type of image qualified these main effects in the expected way, $F(1, 126) = 4.70$, $p = .032$, $\eta_p = .190$. Thus, compared with White participants, Black participants reported more anger at images of police force against Black targets (see Figure 1a) and more empowerment at images of Black-led protest (see Figure 1b). None of the other main effects or interactions reached significance for either emotion, all $p > .05$, $\eta_p < 17$.

Summary. In summary, Experiment 1 provided a good deal of support for our starting assumptions about the role of race in the processing of images of police force and Black-led protest against it. As expected, White participants were less familiar with past police and other racialized violence against unarmed Black people and, consistent with this, were also more surprised at our original archetypal images of police force against unarmed Black targets as well as Black-led protest. In addition, White participants' familiarity was uniquely associated with their negative affect at the images *of Black-led protest*. In contrast, Black participants' much greater familiarity with past instances of racialized violence was uniquely linked to their greater attentiveness to our original images *of Black targets* of police force and their negative affect regarding these images.

Experiment 1 also provided some support for our planned use in Experiment 2 of ERPs as indicators of the appraisals of novelty and relevance. As expected, early ERPs suggested that our archetypal images of police force were appraised as more novel than the images of Black-led protest which are likely reminiscent of the many widely circulated images of Black Lives Matter and other protests.[1] In contrast, the later LPP ERP indicative of appraised relevance was somewhat greater in response to the images of Black-led protest.

Our examination of the between-participants factor of race was less well powered and, likely as a result, evidence of its effects on the ERPs was less strong. Nevertheless, in two of the four ERPs (P200, P300), results were congruent with our expectation that White participants would give more attention to images of Black targets of police force. This suggests that White participants appraised these images as more novel, which is consistent with their much lesser familiarity with these issues and their reported surprise at Black targets of police force. Better evidence for the expected effect of participant race on all four ERPs may be obtained in better-powered Experiment 2. That Black participants reported much greater anger and empowerment at the images in this experiment provided some initial reason to maintain our expectation that they appraise the images as more motivationally relevant.

Experiment 2

Experiment 2 was designed to meet five goals. First, Experiment 2 sought to replicate the key construct validity evidence of Experiment 1. Thus, we sought to offer further evidence that self-reported racial group membership is a powerful enough reference point to indicate differential familiarity with instances of racialized violence against unarmed Black people. Moreover, as in Experiment 1, this familiarity should be tied to Blacks' greater attentiveness to original archetypal images of police force compared with Whites'. To further confirm the construct validity of our original images, we again assessed their affect to further establish that Black and White participants view each type of image as equally unpleasant and arousing.

Second, we used a larger sample than Experiment 1 to increase our statistical power to examine the effects of participant race on the four ERPs examined in Experiment 1 to assess appraisals of novelty and relevance. We also performed a mini meta-analysis of the two experiments to provide an empirical assessment of the size and consistency of effects (Goh, Hall, & Rosenthal, 2016).

Third, to more closely examine the processing of images of police force against unarmed *Black targets*, we added a closely matched set of images of police force against unarmed *White targets*. Although Black targets may be more prototypical and salient, White targets should elicit a similar (if weaker) response if participants are appraising the images as instances of police use of force rather than simply focusing on the race of the target at the center of these images. By including a condition with White targets here, we can also better distinguish our

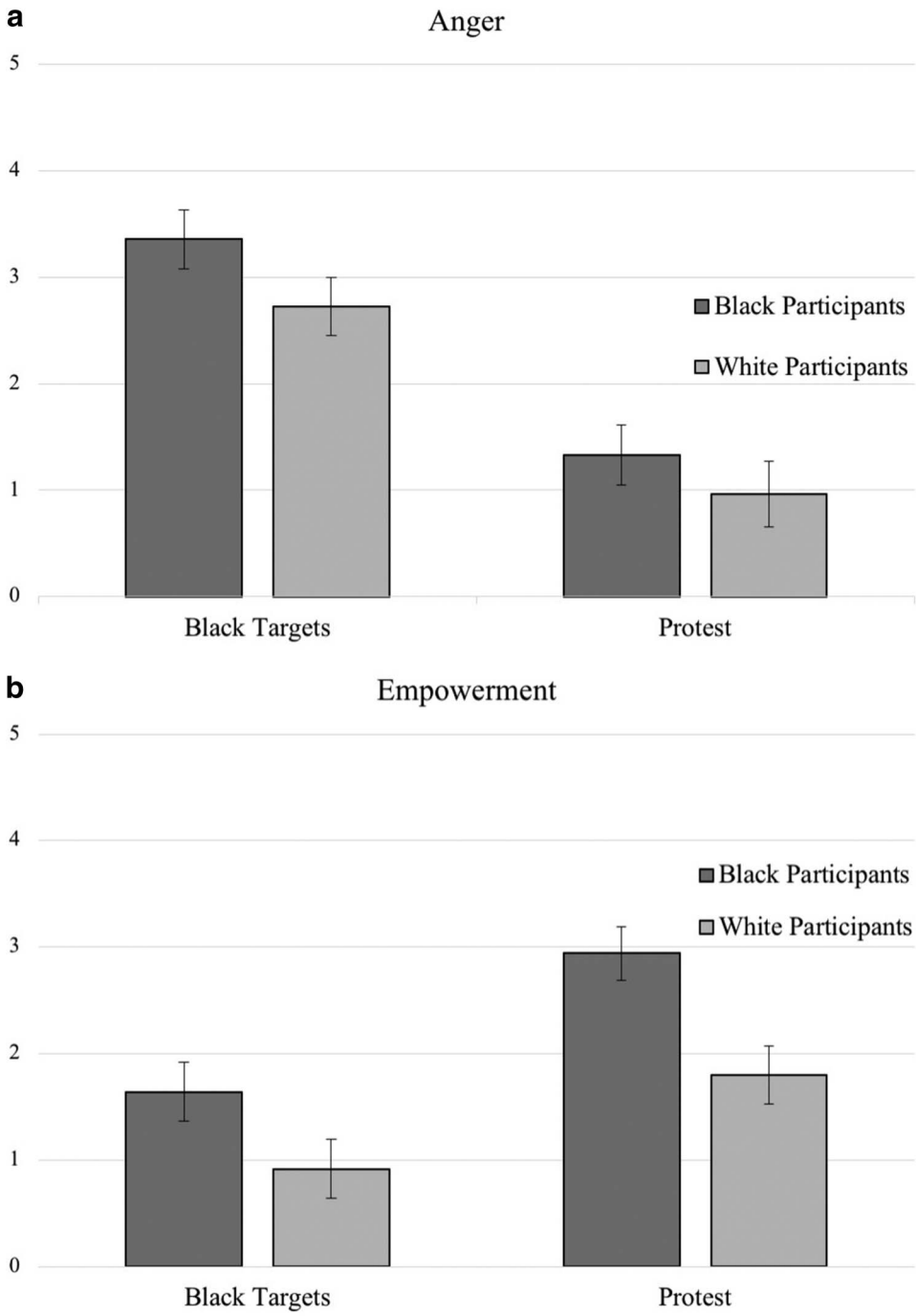

Figure 1. (a and b). Reported feelings of Anger (1a) and Empowerment (1b) in Experiment 1, divided by participant race and image type. Error bars represent 95% confidence intervals.

findings from the preponderance of work on race and ERPs, which examines greater attention to in-group (or out-group) faces (for reviews, see Amodio, 2008; Ito & Senholzi, 2013). Unlike that work, we expect Black and White participants here to most differentiate between images of police force and Black-led protest against it, rather than between images that feature Black or White targets.

Fourth, Experiment 2 aims at examining an empirical (mediation) model of *why* Black and White participants differentially appraise images of police force and Black-led protest. If White and Black participants again differ in familiarity past instances of racialized violence, and surprise and attentiveness experienced at our original images of police force, these differences should explain their differential appraisals of the im-

ages' novelty and relevance. However, as these potential mediators are all self-reported individual differences, they may better explain the appraisal of motivational relevance indicated by the late LPP ERP that is more deliberative in nature than the appraisal of novelty indicated by the early ERPs (N100, P200, P300) that are likely less conscious (see Ibanez et al., 2012).

Fifth, Experiment 2 expanded the surreptitious assessment of appraised motivational relevance beyond the LPP ERP by also assessing blood pressure. Increased (systolic) blood pressure is a good indicator of motivational engagement with a task or goal (for reviews, see Mendes & Park, 2014; Scherer, 2009; Wright & Kirby, 2001) and is surreptitious because it is not experienced as unpleasant or arousing (Smith & Hess, 2015).

Method

The procedure here paralleled that of Experiment 1 in every way. Thus, the same EEG lab was used and experimenters were almost always matched to participants' self-reported identity as Black or White. The university Institutional Review Board approved all procedures.

Participants. 167 students (85 European American/White, 82 African American/Black; 59 Men, 107 Women, 1 Transgender Man) who met the same inclusion criteria as Study 1 participated. Most students, including all White students, participated in exchange for course credit in their introductory psychology classes. However, because of the difficult nature of recruiting African American students on a predominantly White campus, we conducted extra recruitment on campus during the summer to achieve our desired sample of Black participants. These (42) Black students were compensated $20 for their participation. The paid Black participants reported key characteristics very similar to those who received course credit.[8] Furthermore, supplemental analyses showed recruitment strategy not to moderate the findings for ERPs or blood pressure.[8]

Problems with the blood pressure cuff prevented measurement in four participants, yielding a sample of $n = 163$. With greater effort to fit EEG caps, especially for Black participants whose hair regularly made this challenging, the number of participants lost for poor EEG measurement (33) or excessive artifacts (15) was much lower than in Experiment 1. We again retained only participants with at least seven good trials[5] of any image type: Black victim images: $M = 20.87$, $SD = 5.85$; Black-led protest images $M = 20.19$, $SD = 6.10$; White victim images $M = 17.63$, $SD = 7.28$. This yielded a final EEG sample of 119 participants (52 Black and 67 White). There were no differences between White and Black participant in number of good trials in any of the image types either before, $t(132) < 1.5$, $p > .15$, or after this filtering process, $t(117) < .89$, $p > .40$ (see Table 3 of the online supplemental material).

Unlike in Experiment 1, those with and without EEG data did not differ significantly in their familiarity with past racialized violence. Also, they did not differ on other key self-report measures. Thus, the analyses below were conducted on the full sample available for EEG data and the full sample available for self-report data, respectively. Restricting the analyses of self-report to only those with good EEG data yielded the same pattern of findings. Thus, the various forms of data loss across methods appeared unsystematic and, therefore, had little effect on results.

Design and statistical power. We used a 2 (participant race; between-participants) × 2 (image presentation order; between-participants) × 3 (type of image; within-participant) mixed design. A power analysis using PANGEA (Westfall, 2016) suggested that we needed a sample of 44 Black and 44 White participants to achieve 80% power to detect the medium-size effects ($d = .5$) we expected at $p < .05$. Thus, with the extra effort to recruit Black participants, we achieved more than the desired .80 power for the analyses of ERPs and substantially more power for the other analyses.

Stimuli. We added a closely matched set of original, archetypal images of police force against White targets, https://www.dropbox.com/sh/rp4ki1vr40yh4bo/AABBv3EscZaYAnYIavkyOhd8a?dl=0, as a comparison to the images of Black targets used in Experiment 1. Thus, the order manipulation here varied whether images of Black or White targets were presented first or last; images of Black-led protest were always presented second.

Measures. Participants once again completed familiarity ratings of the 15 cases of police and other killings of unarmed Black people used in Experiment 1 (standardized $\alpha = .888$, $M = 1.65$, $SD = .96$). They also completed the attentiveness, surprise, serenity, and negative affect subscales of the PANAS-X used in Experiment 1, as well as those of anger and empowerment (see Table 2 for reliabilities and intercorrelations).

Blood pressure. Participants wore an automatic inflatable blood pressure cuff over their upper left arms, placed in accordance with manufacturer instructions. Systolic and diastolic blood pressure was collected at four time points: after a 5-min resting baseline, and immediately after viewing each of the three types of images, while participants were seated comfortably with both lower back and arm support. Although there is a substantial literature showing blood pressure, and other cardiovascular differences between White and Black Americans, many of the risk factors for African Americans are not applicable to our young, healthy, educated sample (Bosworth et al., 2006). Unsurprisingly, then, there were no baseline differences in blood pressure between Black and White participants, $t(1,163) = 1.114$, $p = .267$. Given the high variability between individuals ($M = 112.81$, $SD = 10.50$), however, we followed recommended best practice and analyzed BP as the change from resting baseline to each of the three subsequent

[8] Paid Black participants were older ($M = 21.2$, $SD = 3.08$) than the Black students from the participant pool ($M = 19.0$, $SD = 1.10$), $F(1, 80) = 17.93$, $p < .001$, $\eta = .43$, and more likely to speak English as their native language, $F(1, 80) = 7.23$, $p = .009$, $\eta = .29$, as well as more likely to have been born in the United States, $F(1, 80) = 5.28$, $p = .024$, $\eta = .25$. Paid and volunteer participants reported equal self-esteem, $F(1, 74) = 2.41$, $p = .125$, $\eta = .18$, political orientation, $F(1, 80) = 2.16$, $p = .145$, $\eta = .16$, and familiarity with past instances of racialized violence, $F(1, 80) = .004$, $p = .948$, $\eta < .01$.

A mixed effects GLM, parallel to that reported in the text, replaced participant race with recruitment group to assess its influence among Black participants. Recruitment group had no effect on the LPP, $F(1, 47) = 2.53$, $p = .118$, $\eta_p = .23$, and did not interact with image type or presentation order, all $p > .66$, $\eta_p < .10$. A corresponding investigation of systolic blood pressure yielded similar results: recruitment group had no unique effect, $F(1, 78) = .002$, $p = .996$, $\eta_p < .03$, and no interactions between recruitment group and any other factor reached significance, all $p > .05$, $\eta_p < .22$.

measurements (see Gollwitzer, Christ, & Lemmer, 2014). Including baseline blood pressure as a covariate yielded the same pattern of results.

EEG data processing, ERP extraction. EEG for all three types of images was recorded and extracted in an identical manner to Experiment 1. Descriptive statistics by image type and participant race are shown in online supplemental Table 1b and online supplemental Table 4. We also conducted the same extraction and analysis as in Experiment 1 of the 200 ms prestimulus baseline activity (trial data lost: frontal average $n = 67$; FCz average $n = 65$; Pz average $n = 58$).

Results and Discussion

As in Experiment 1, we conducted a series of parallel 2 (participant race; between-participants) × 2 (order of images; between-participants) × 3 (image type; within-participants) mixed GLMs to analyze self-reported familiarity, affect, and emotion. Some of the mixed GLMs violated the assumption of sphericity, in which case we used the Huynh-Feldt degrees of freedom calculations to correct for this. To examine the consistency between this experiment and Experiment 1, we conducted a mini meta-analysis of key findings using Goh et al.'s (2016) tool.

Familiarity. In a replication of Experiment 1, Black participants reported much more familiarity with past racialized violence than did Whites, $F(1, 165) = 52.42$, $p < .001$, $\eta_p = .49$ (see Figure 2). This large effect held after controlling for participant gender, political orientation, EEG inclusion, and image presentation order. A mini meta-analysis showed the effect of participant race on familiarity with racialized violence to be large ($r = .60$), significant ($z = 9.12$, $p < .001$), and homogenous across experiments, $Q(1) = 1.16$, $p = .282$.

As in Experiment 1, Black participants' familiarity was positively correlated to reported attentiveness to images of Black targets of police force, $r(80) = .230$, $p = .037$, and of Black-led protest, $r(80) = .357$, $p = .001$. A minimeta analysis showed these effects to be consistent and significant across the two experiments: $r = .28$, $z = 3.41$, $p < .001$, $Q(1) = 0.43$, $p = .512$; $r = .35$, $z = 4.11$, $p < .001$, $Q(1) = 0.11$, $p = .740$. Also replicating the previous experiment, White participants' lesser familiarity with past police and other killings of unarmed Black people was not correlated to attentiveness to any of the three types of images, all $r < |.116|$, $p > .292$. A minimeta analysis showed these effects to be consistently small and nonsignificant across the Black target and Black-led protest images examined in both two experiments: $r = -.03$, $z = -0.27$, $p < .787$, $Q(1) = 0.08$, $p = .777$; $r = -.05$, $z = -0.57$, $p < .569$, $Q(1) = 0.08$, $p = .777$.

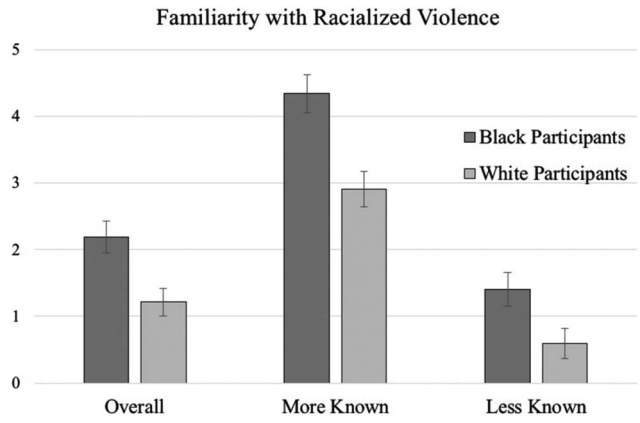

Figure 2. Black and White participants' familiarity with cases of racialized police and other violence overall, and split by cases that are more and less well known, Experiment 2. Error bars represent 95% confidence intervals.

Black participants' familiarity with past cases of racialized violence was moderately correlated to reported unpleasantness at Black targets of police force, $r(80) = .295$, $p = .005$. Their familiarity was unrelated to their arousal, $r(80) = .087$, $p = .437$. White participants' familiarity with past racialized violence was not correlated to their feelings of unpleasantness or arousal regarding any of the images, all $r < |.136|$, $p > .21$.[9]

Affect: Unpleasantness and arousal. The means for affect and emotion toward each type of image are shown in Table 2, along with scale reliabilities. Replicating Experiment 1, Black and White participants did not differ in the rated unpleasantness of each type of image, $F(1, 161) = .66$, $p = .419$, $\eta_p = .06$. The effect across experiments was very small, nonsignificant, and homogenous, $r = .03$, $z = 0.55$, $p < .582$, $Q(1) = .250$, $p = .617$. As in Experiment 1, the images of police force were judged as more unpleasant than those of Black-led protest, $F(2, 322) = 4.11$, $p = .017$, $\eta_p = .16$. Across experiments, Black targets of police force were rated as moderately more unpleasant than protest, $r = .42$, $z = 6.54$, $p < .001$, $Q(1) = 24.81$, $p < .001$.

Similar to Experiment 1, images of police force elicited greater arousal than images of protest $F(1.81, 294.97) = 54.58$, $p < .001$, $\eta_p = .50$. However, unlike in Experiment 1, Black participants reported more arousal to the images than White participants here, $F(1, 163) = 5.84$, $p = .017$, $\eta_p = .19$. Nevertheless, these main effects were consistent across the two experiments: Black participants reported only slightly more arousal than White participants, $r = .13$, $z = 2.06$, $p = .039$, $Q(1) = 1.67$, $p = .196$, and images of Black-led protest were much more arousing than images of police force against Black targets, $r = .45$, $z = 7.20$, $p < .001$, $Q(1) = 14.72$, $p < .001$.

A significant interaction showed that Blacks experienced heightened arousal to images of police force, compared with those of protest, $F(1.81, 294.97) = 6.85$, $p = .002$, $\eta_p = .20$. There was no significant main effect of image order here, $F(1, 163) = 1.30$, $p = .255$, $\eta_p = .09$. However, there was an interaction between image type and order, such that participants reported greater arousal for the target group that they viewed first, $F(1.81, 294.97) = 7.47$, $p = .001$, $\eta_p = .21$.

Emotion: Surprise, attentiveness. As in Experiment 1, Black participants reported feeling greater attentiveness than did White participants, $F(1, 161) = 6.65$, $p = .011$, $\eta_p = .21$. Across experiments, this effect was medium-sized, significant, and homogenous, $r = .27$, $z = 4.44$, $p < .001$, $Q(1) = .980$, $p = .322$.

[9] Neither Black, $r(80) = .140$, $p = .209$, nor White, $r(83) = .016$, $p = .886$, participants' familiarity with past racialized violence was correlated to attentiveness at images of White targets of police force. White participants' familiarity did not affect the unpleasantness of White target images, $r(83) = .083$, $p = .450$. However, for Black participants, there was a trend in the expected direction, $r(80) = .207$, $p = .062$.

Participants were more attentive to Black targets of police force and Black-led protest than to White targets of police force, $F(1.95, 317.37) = 21.13$, $p < .001$, $\eta_p = .34$, especially when Black targets were presented first, $F(1.95, 317.37) = 9.02$, $p < .001$, $\eta_p = .23$. This image type difference was also more true for Black participants than White participants, $F(1.95, 317.37) = 3.62$, $p = .029$, $\eta_p = .15$. Neither image order on its own, nor the three-way interaction was significant, all $p > .20$, $\eta_p < .10$.

Images of White targets of police force elicited the greatest level of surprise, likely because they are ecologically infrequent, $F(2, 326) = 21.56$, $p < .001$, $\eta_p = .34$. There was no main effect for participant race, $F(1, 163) = 1.39$, $p = .241$, $\eta_p = .09$. Indeed, a mini meta-analysis showed that White participants were not generally more surprised than Black participants, $r = .001$, $z = .020$, $p = 984$, $Q(1) < .001$, $p > .999$. Nevertheless, as expected White participants did report more surprise at Black targets of police force, $F(2, 326) = 8.26$, $p < .001$, $\eta_p = .22$. No other effect reached significance, all $p > .073$, $\eta_p < .13$.

Taken together, the results of Experiment 2 offer further construct validity evidence for self-reported race as a likely influence on Black and White participants' cognitive and affective processing of the original images we presented.

Event-Related Potentials. Descriptive statistics for the ERPs are shown in Tables 1b and 4 of the online supplemental material. We conducted linear mixed effects models to parallel to those in Experiment 1 here. As shown in Table 4, the variance in the ERPs attributable to the individual images increased dramatically over time: N100 (.020), P200 (.170), P300 (.600), LPP (2.83). This is consistent with our supposition that the specific content of the images can be processed more fully with more time to process them. This also suggests that whatever effect the images have on the earlier (N100, P200, P300) ERPs is because of the content that the individual images have in common (i.e., police use of force, protest).

As in Experiment 1, the order of image presentation had little effect on the ERPs in a prior analysis and, thus, was excluded. Also as in Experiment 1, supplemental analyses of the apparent race of police in the images of police and of the presence of text in the Black-led protest images (as fixed effects in a linear mixed effects model) showed these factors to have no significant or notable effects on the ERPs. There was, however, a marginal effect on the N100 such that White police officers using force against Black targets produced slightly greater amplitudes, $b = .360$, $SE = .198$, $t(2512) = 1.82$, $p = .069$.

N100. White targets of police force elicited marginally greater N100 than Black-led protest (see Table 4). This is consistent with our ecologically based expectation that White targets of police force are appraised as more novel. In addition, White participants showed greater N100 than Black participants (see Figure 3), suggesting that they generally appraised the images as more novel.

There were no significant interactions. Thus, the less reliable N100 ERP did not show the expected interaction of White participants appraising images of Black targets of police force as especially novel. The subsequent, more reliable, ERPs should offer a better-powered test of this hypothesis.

A mixed GLM, parallel to those used for the self-report measures, was used to compare the effects produced here and in Experiment 1 using Goh et al.'s (2016) tool. Although the effect of participant race in the N100 was larger in better powered Experiment 2 than in Experiment 1, the two effects were not significantly different from each other, $Q(1) = 3.19$, $p = .074$. Thus, across the two experiments, the effect of participant race on the N100 was small-moderate in size and significant, $r = .22$, $z = 2.79$, $p = .005$.

P200. White participants once again appraised the images as more novel than did Black participants as evidenced by lower P200 (see Table 4). Furthermore, both White and Black targets of police force yielded less P200 than images of Black-led protest, suggesting that the former were appraised as more novel than the latter.

In addition, participant race moderated the effect of images of Black targets of police force versus Black-led protest. As shown in Figure 3, White participants appraised images of police force against Black targets as much more novel than images of Black-led protest, $b = -.806$, $SE = .213$, $t(84) = -3.78$, $p < .001$. In contrast, Black participants appeared to appraise both types of images as relatively less novel, $b = -.227$, $SE = .186$, $t(3166) = -1.22$, $p = .222$.

Across experiments, a mini meta-analysis showed that the medium-sized effect of participant race on the P200 ($r = .34$) was significant ($z = 4.39$, $p < .001$) and homogenous, $Q(1) = .900$, $p = .343$. The main effect of image type was also moderate, significant, and homogenous across the two experiments, $r = .37$, $z = 4.84$, $p < .001$, $Q(1) = .010$, $p = .920$.

P300. As shown in Table 4, the pattern of results was highly similar to those for the P200. Thus, White participants appeared to appraise the images as more novel than did Black participants, and images of police force (against Black and White targets) appeared to be appraised as more novel than images of Black-led protest. As expected, participant race interacted with image type. This pattern of results is shown in Figure 4. In addition to White participants appraising all images as more novel than did Black participants, White participants showed a bigger gap between the appraised novelty of images of police force than Black-led protest. Thus, the greatest appraisals of novelty were of White participants in response to images of police force.

Across both experiments, White participants showed much greater P300 than Black participants in a large ($r = .48$), significant ($z = 6.12$, $p < .001$) and homogenous, $Q(1) = .030$, $p = .863$ effect. Similarly, greater P300 for images of police force than Black-led protest was also large ($r = .72$) and significant ($z = 8.43$, $p < .001$), but heterogeneous, $Q(1) = 4.94$, $p = .026$ across experiments.

Late Positive Potential. As shown in Table 4, the random effects of participant and individual image accounted for substantial variance in the LPP, in contrast to the preceding ERPs. By accounting for this in a linear mixed effects model, we can more precisely estimate the effects of interest (see Judd, Westfall, & Kenny, 2012).

In line with hypotheses, protest images appeared to be appraised as the most motivationally relevant, although this was most clear in their comparison to White targets of police force (see Table 4). Qualified support for our hypothesis comes from the marginally higher LPP from Black than White participants. This difference becomes clearer when images of police force are distinguished from those of Black-led protest. As shown in Table 4, Black participants had greater LPP than White participants to images of

Table 4
Linear Mixed Effects Models on the Four ERP Outcomes of Interest, Experiment 2

	All images			Police images			Black-led protest images		
	b	*SE*	*p*	*b*	*SE*	*p*	*b*	*SE*	*p*
N100									
Fixed effects									
Intercept	−3.063	.200	<.001	−3.289	.195	<.001	−3.067	.215	<.001
Participant race	.957	.265	<.001	1.042	.271	<.001	.825	.318	.011
White target images	.214	.132	.107	−.078	.126	.534	—	—	—
Black target images	−.142	.127	.266	—	—	—	—	—	—
Interaction: White targets	.269	.254	.289	.115	.254	.651	—	—	—
Interaction: Black targets	.193	.245	.431	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	1.743			1.662			2.034		
Trial:Image type	.020			<.001			.073		
Residual	18.617			18.743			18.193		
P200									
Fixed effects									
Intercept	−2.693	.262	<.001	−3.514	.262	<.001	−2.768	.297	.003
Participant race	1.085	.380	.005	1.672	.385	<.001	1.118	.371	.378
White target images	−.903	.206	<.001	−.117	.196	.551	—	—	—
Black target images	−.809	.200	<.001	—	—	—	—	—	—
Interaction: White targets	.361	.266	.175	−.225	.263	.393	—	—	—
Interaction: Black targets	.577	.256	.024	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	3.240			3.387			2.972		
Trial:Image type	.170			.115			.279		
Residual	20.309			20.054			20.690		
P300									
Fixed effects									
Intercept	3.653	.386	<.001	5.852	.406	<.001	3.657	.344	<.001
Participant race	−1.737	.545	.002	−2.706	.571	<.001	−1.780	.483	<.001
White target images	2.231	.336	<.001	.017	.355	.963	—	—	—
Black target images	2.220	.327	<.001	—	—	—	—	—	—
Interaction: White targets	−.947	.407	.020	.061	.432	.888	—	—	—
Interaction: Black targets	−.978	.392	.013	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	6.349			7.020			5.063		
Trial:Image Type	.600			.638			.490		
Residual	47.660			54.177			34.669		
LPP									
Fixed effects									
Intercept	−1.476	.436	.001	−2.170	.479	<.001	−1.428	.328	<.001
Participant race	.789	.468	.094	1.100	.496	.028	.806	.388	.040
White target images	−1.855	.520	.001	−1.176	.574	.044	—	—	—
Black target images	−.697	.513	.177	—	—	—	—	—	—
Interaction: White targets	.870	.428	.042	.550	440	.212	—	—	—
Interaction: Black targets	.302	.412	.463	—	—	—	—	—	—
	Variance			Variance			Variance		
Random effects									
Participant	3.839			4.854			2.120		
Trial:Image type	2.827			3.624			1.268		
Residual	52.775			56.124			46.125		

Note. ERP = event-related potential; LPP = late positive potential. Reference category for participant race is White participants. Reference category for image type in the all images analyses is Black-led protest images; in the police images analyses it is the Black-target images. Trial random effect was nested within image type; trial was nonnested for the single-image analyses (e.g., protest images).

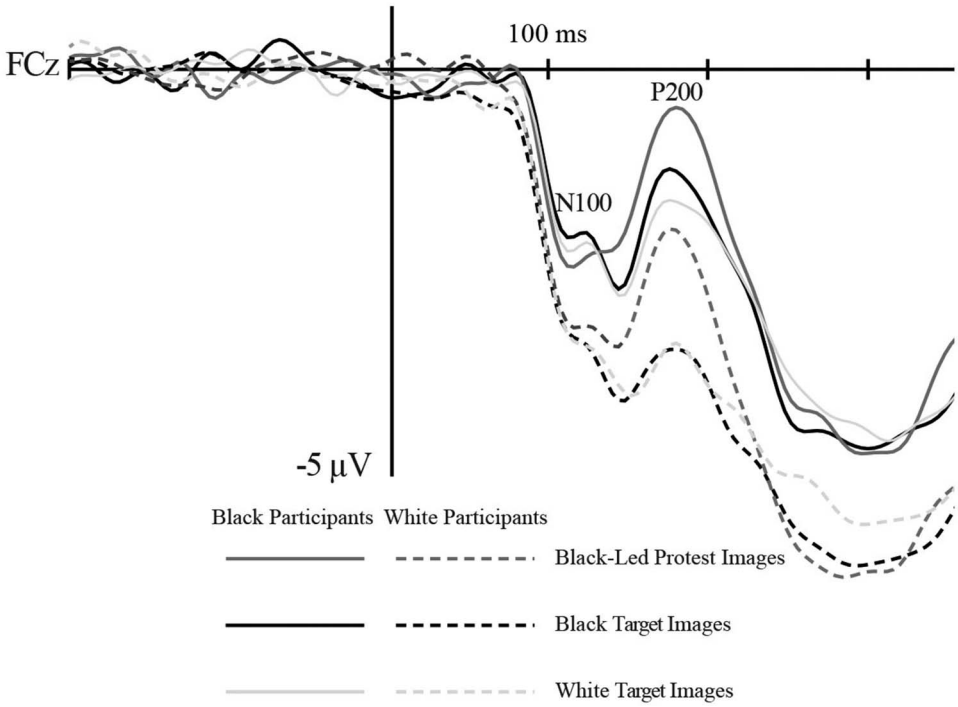

Figure 3. N100 and P200 waveforms by image type and participant race, represented by site FCz with 200 ms corrected baseline, Experiment 2.

police force (against Black and White targets) as well as to the images of Black-led protest.

Table 4 also reports a significant interaction between participant race and image type. More specifically, Black participants appraised (Black and White) targets of police force as more motivationally relevant than did White participants, $p = .028$ (see Figure 5). This was partly because Black participants appraised White and Black targets of police force as equally relevant ($p = .268$), whereas White participants appraised Black targets of police force as more motivationally relevant than White targets ($p = .063$). In contrast to a simple intergroup bias explanation, Black participants appraised White targets of police force as more relevant to themselves than did White participants (see Figure 5).

Although the effect of participant race was larger in better powered Experiment 2 than in Experiment 1, $Q(1) = 3.87$, $p = .049$, a mini meta-analysis showed the effect was small-moderate in size and significant, $r = .19$, $z = 2.34$, $p = .019$. The difference in LPP between Black-led protest and police force images were medium-large ($r = .40$), significant ($z = 5.04$, $p < .001$) and homogeneous, $Q(1) = .470$, $p = .493$.

Prestimulus baseline activity. As in Experiment 1, linear effects models showed White and Black participants not to differ in neural activity before the presentation of the images at the three multisite clusters examined in the ERPs, all $p > .18$. Thus, the above reported effects appear because of the way that Black and White participants processed the images presented.

Mediation models. The findings with the surreptitious method of EEG are consistent with those for self-reported familiarity with violence against unarmed Black people, and surprise and attentiveness to our archetypal images of police force against unarmed black targets. As such, it made sense to examine these three self-report measures as explanations (mediators) of the difference between Black and White participants in the most deliberative of the ERPs we examined—the LPP.[10]

Mediation models were estimated with the PROCESS macro (Version 2.16; Hayes, 2013) for SPSS with bias-corrected 95% confidence intervals (CIs) for indirect effects derived by a bootstrap approach using 5,000 samples. Reported familiarity with racialized violence, as well as reports of surprise and attentiveness to the images of Black targets of police force, were examined as mediators of the effect of participant race on the LPP overall. This model is shown in Figure 6.

Although none of the mediators was significant individually, together they served to significantly mediate the effect of participant race on the LPP, $b = .489$, $SE = .181$ [.150, .860]. In fact, consistent with full mediation, the effect of race on the LPP was no

[10] Given that the LPP is the latest and most deliberative of the components studied here, we would expect it to have the greatest relationship to more conscious, self-report variables that may act as mediators. The earlier components are likely too automatic and, therefore, too psychologically distant, to be related to elaborative emotion and familiarity. In fact, this suspicion was confirmed. Neither familiarity, nor attention, nor surprise were significant predictors of the N100, all $t < |.643|$, $p > .52$ and, thus, they did not mediate the effect of participant race on the N100, all $b < |.102|$, all $p > .56$. Similarly, none of the mediating variables were predictive of the P200, all $t < 1.62$, $p > .10$. Accordingly, no mediating paths were significant, all $b < |.349|$, all $p > .13$. None of the mediating variables predicted the P300, all $t < |.478|$, $p > .633$, and, as such, did not mediate the relationship between participant race and the P300, all $b < |.233|$, all $p > .26$.

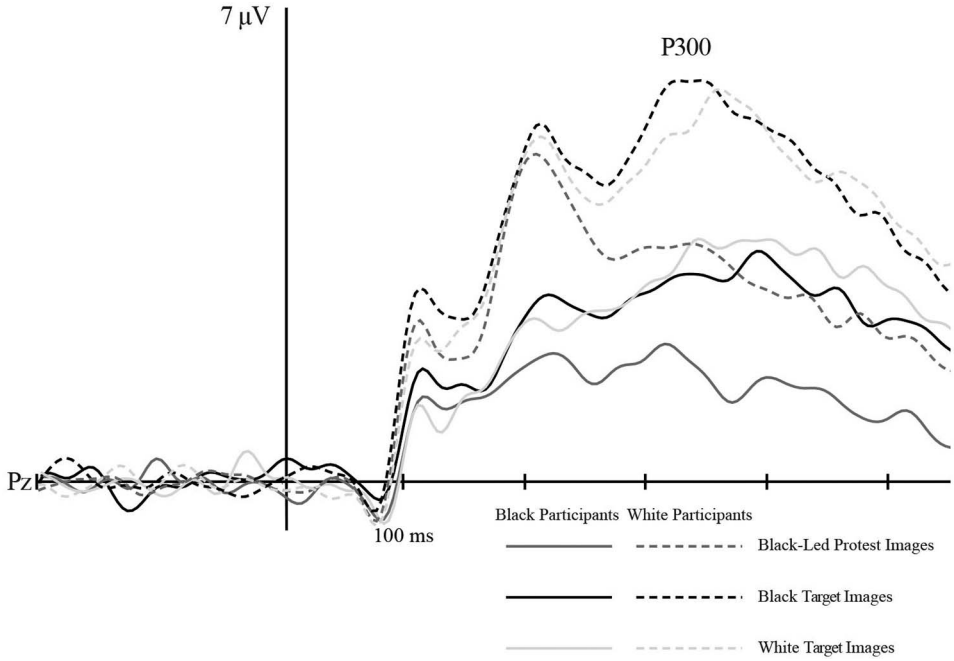

Figure 4. P300 waveforms by image type and participant race represented by site Pz with 200 ms corrected baseline, Experiment 2.

longer significant in the mediation model, $b = .701$, $SE = .428$, $t(117) = 1.64$, $p = .104$. Taken together, the three mediators accounted for 41% of the total effect of participant race. Familiarity with instances of violence against unarmed Black people accounted for 27% of the total effect, making it the single most important mediator. In fact, familiarity on its own would serve as a significant mediator of the LPP, $b = .395$, $SE = .166$ [.088, .757], and render the effect of participant race on the LPP marginally significant.

Blood pressure change. Descriptive statistics for change in systolic blood pressure are shown in Table 5 of the online supplemental material. As a mixed GLM parallel to those above violated the assumption of sphericity, we used the Huynh-Feldt degrees of freedom calculations.

Black participants showed a marginally greater increase in systolic blood pressure than Whites, $F(1, 159) = 3.492$, $p = .063$, $\eta_p = .15$. In addition, there was a significant interaction between image type and order of presentation, $F(1.94, 308.05) = 7.101$, $p = .001$, $\eta_p = .21$. Those who saw Black targets first had a significant increase in systolic blood pressure ($d = .40$, $p = .010$), whereas those who saw white targets first did not.

Participant race and type of image were involved in a marginal quadratic interaction, $F(1, 159) = 3.276$, $p = .072$, $\eta_p = .14$. This

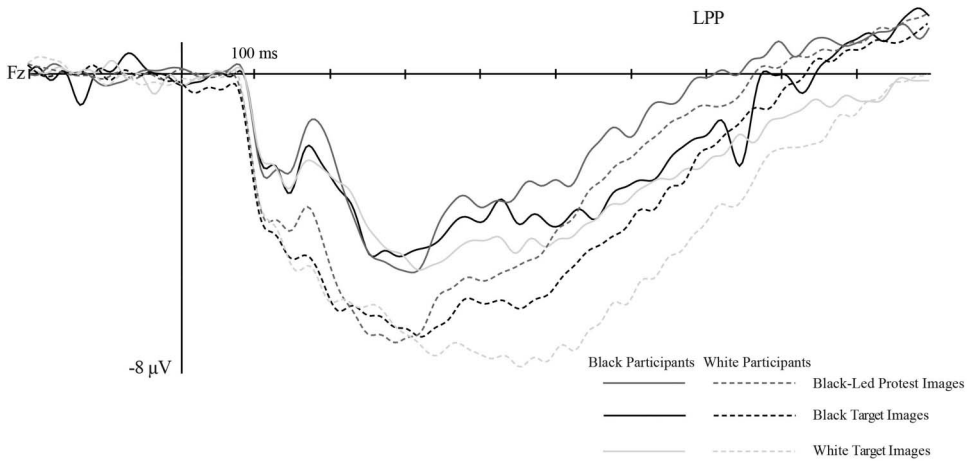

Figure 5. Late positive potential (LPP) waveforms by image type and participant race, represented by site Fz with 200 ms corrected baseline, Experiment 2.

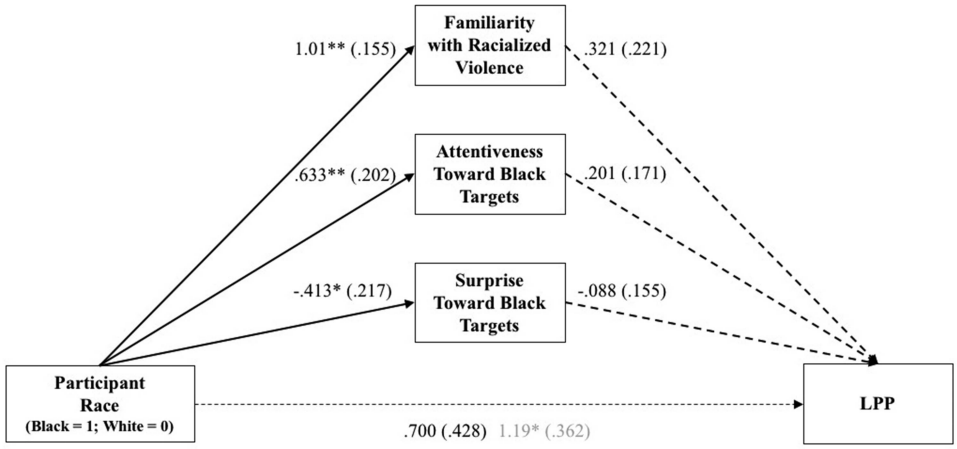

Figure 6. Mediation model predicting late positive potential (LPP) amplitudes, averaged across images. The total effect of participant race predicting LPP amplitude is in gray. All coefficients are unstandardized. * $p < .10$. ** $p < .05$.

is worth noting because it seems to clarify the above effects. Thus, as shown in Figure 7, only in response to images of Black targets of police force did Black participants show a greater increase in systolic blood pressure than White participants, $d = .30$ [-.01, .61], $p = .056$. No other main effects or interactions were significant or sizable, all $p > .19$, $\eta_p < .11$.

Thus, taken together, change in blood pressure offers some qualified evidence that Black participants were more physiologically reactive to the original images we presented, especially when they portrayed police force against Black targets. This is consistent with our hypotheses, and with the LPP and attentiveness findings above, which also suggest that Black participants appraise the racialized images as more motivationally relevant than do White participants. Further support for this inference comes from participants' self-reported emotions of anger and empowerment.

Emotions: Anger and empowerment. Participants reported much greater anger at images of Black targets of police force, than at either images of White targets or of protest, $F(1.78, 290.69) = 178.18$, $p < .001$, $\eta_p = .72$. Also as expected, participants felt most empow-

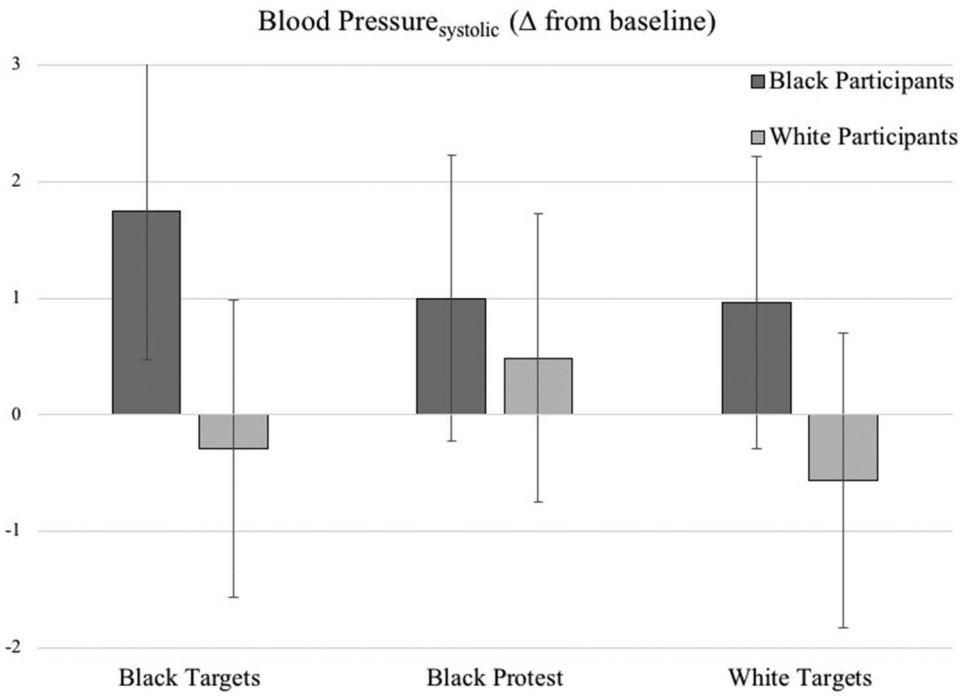

Figure 7. Systolic blood pressure as change from baseline, by image type and participant race, Experiment 2. Error bars represent 95% confidence intervals.

ered at images of Black-led protest, $F(1.65, 268.49) = 190.10$, $p < .001$, $\eta_p = .73$.

Black participants' anger and empowerment suggested that they the appraised the images as more motivationally relevant than did White participants. Although Black participants did not report greater anger overall, $F(1, 163) = 2.02$, $p = .157$, $\eta_p = .11$, they did report greater anger than White participants at Black targets of police force, $F(1.78, 290.69) = 6.83$, $p = .002$, $\eta_p = .20$ (see Figure 8a). Consistent with the LPP findings above, it is also clear in 8a, that Black participants expressed as much anger at White targets of police force as did White participants. In addition, Black participants reported more empowerment overall, $F(1, 163) = 13.29$, $p < .001$, $\eta_p = .27$, and especially in response to images of Black-led protest, $F(1.65, 268.49) = 18.18$, $p < .001$, $\eta_p = .32$ (see Figure 8b).

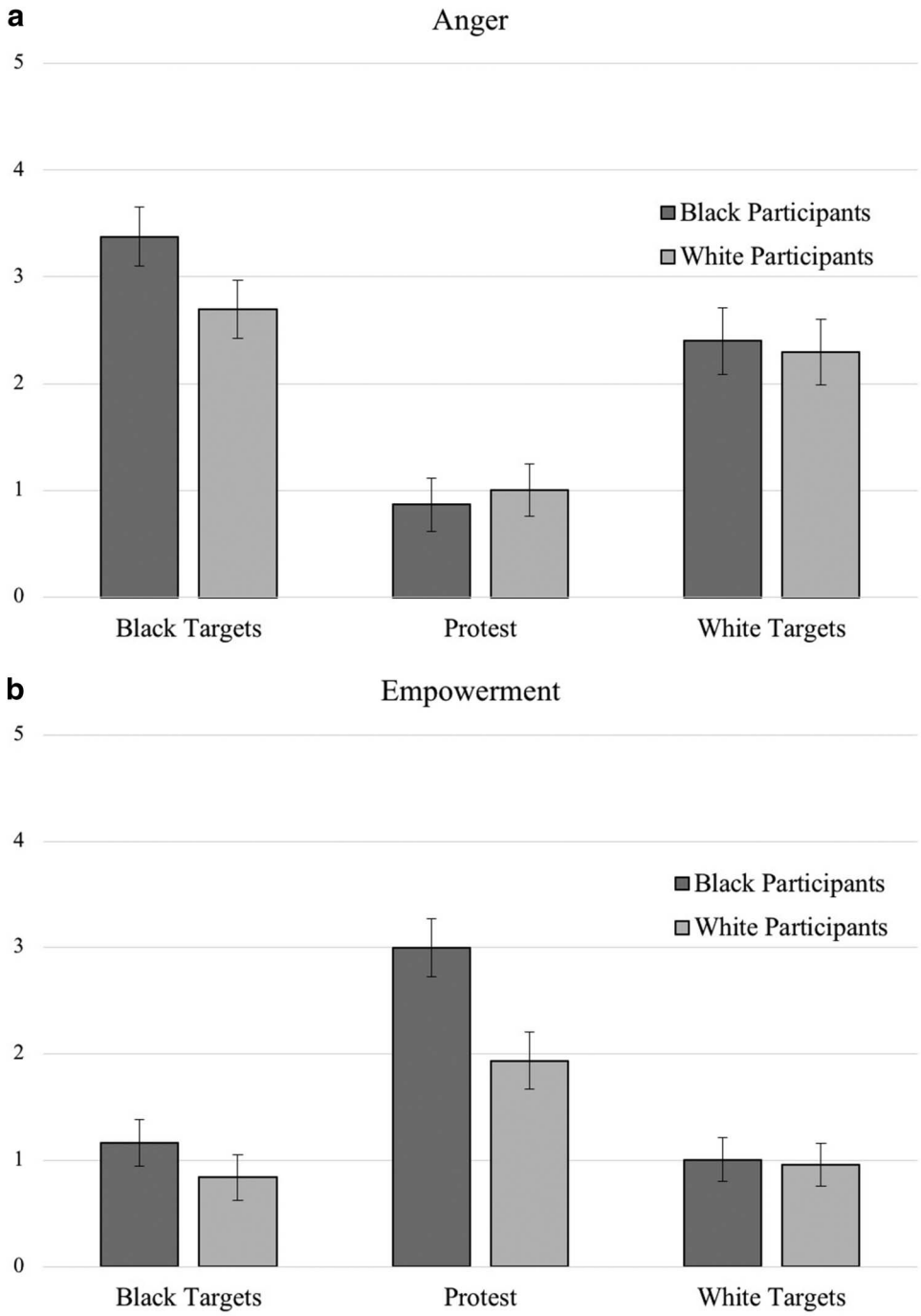

Figure 8. (a and b). Reported feelings of Anger (8a) and Empowerment (8b) in Experiment 2, divided by participant race and image type. Error bars represent 95% confidence intervals.

An interaction between image type and order, $F(1.78, 290.69) = 3.45$, $p = .038$, $\eta_p = .15$, suggested that when presented first, the greater anger at Black targets of police force reduced anger at the other image types. In addition, those who saw the images of Black targets first reported feeling less empowered by the subsequent images of White targets of police force, $F(1.65, 268.49) = 5.88$, $p = .006$, $\eta_p = .19$. No other main effects or interactions were significant, all $p > .14$, $\eta_p < 12$. Thus, these order effects reinforce the particular emotional power of the images of police force against Black targets.

General Discussion

We conducted two multimethod experiments to examine over time indicators of the early (the N100, P200, P300) and later (the LPP, systolic blood pressure) appraisals of seldom seen images of police force against Black (and, in Experiment 2, White) targets, as well as of Black-led protest against it. We also assessed affect (unpleasantness, arousal) and emotion (surprise, attentiveness, anger, and empowerment) regarding these images, as well as familiarity with past violence against unarmed Black victims (e.g., Eric Garner, Renisha McBride).

More important, White and Black participants reported very similar affect (unpleasantness and arousal) at each type of image (see also Leach et al., 2018; Reinka & Leach, 2017). Further evidence of construct validity in the present experiments, and in prior studies (see also Leach et al., 2018; Reinka & Leach, 2017), established that the sets of images we produced were equivalent stimuli for Black and White participants. Consistent with research on the prevalence of similar images and content on news and social media (e.g., Freelon et al., 2016; Turetsky & Riddle, 2018), we also established that images of police force are less prevalent ecologically than Black-led protest, which should lead them to be appraised as more novel.

As expected, given the social reality of race in the United States and its effects on social cognition, emotion, and motivation (for reviews, see Eberhardt & Goff, 2004; Markus, 2008), Black participants were much more familiar with past incidents of racialized killings of Black victims than were White participants. Also, as expected, Black participants reported being more attentive to images of police force and protest against it. Moreover, for Blacks, familiarity was associated with more attentiveness and negative affect regarding police force against Black targets. White participants, in contrast, reported being more surprised by the images, particularly by Black targets of police force. This is all consistent with a great deal of evidence that Black people in the United States are more interested in, and informed about, police and other racialized violence than are White people (see Reinka & Leach, 2017).

The substantial Black and White samples in well-powered Experiment 2 enabled us to examine our central questions regarding the role of race in appraisals of the novelty and motivational relevance of the racialized images. As expected, White participants' early ERPs (the N100, P200, P300) suggested that they appraised the images as more novel. In contrast, Black participants later ERP (the LPP) and systolic blood pressure suggested that they appraised images of protest and police force as more motivationally relevant. A mediation model of the more deliberative LPP provided further support for our hypothesized explanation: Black participants' greater familiarity with past racialized violence and reported attentiveness to our archetypal images, as well as White participants' reported surprise at the images, together explained most of the difference in motivational relevance between the groups. This pattern of greater motivational relevance seemed to carry into the self-reported experience of the emotions of anger and empowerment. In both experiments, Black participants expressed stronger anger and empowerment in response to Black targets of police force.

Because we were interested in examining appraisals of the novelty and relevance of archetypal images of police force and Black-led protest, we examined ERPs in response to racialized images of social action which necessarily contained much more information than the isolated (Black and White) faces examined in much prior ERP research on race (for reviews, see Amodio, 2008; Ito & Senholzi, 2013). Likely because we gave participants so much more (racialized) information, they did not appear to focus solely on the apparent race of the central protagonist(s) of the images. In addition to there being little neural signature of race face processing (the N170 ERP), race of the target had little effect on the ERPs in Experiment 2 despite being at the center of the images. Neither did apparent race of the police play a role in participants' neural activity. Taken together, the present results are difficult to explain in terms of a simple intergroup bias in early attention to out-group faces or late attention to motivationally relevant in-group faces. Instead, participants appeared to process, quite quickly, the (racialized) social content of the archetypal images we presented of police force and of protest.

The present results are broadly consistent with our interpretation that participants' early and later ERPs, are indicative of the appraisals of novelty and motivational relevance identified in Scherer's (2009) temporal model of appraisal. However, past research has tended to focus on fairly typical events that are appraised as novel *and* as motivationally relevant (see Coan & Allen, 2007; Hajcak et al., 2006; Ibanez et al., 2012; Ito & Senholzi, 2013). For example, when one sees an angry face, one's appraisals of novelty, relevance, and more, are likely to feed complementary affective, emotional, and motivational responses across one's cognitive, physiological, and neurological systems. In line with Scherer's (2009) dynamic model, however, the social reality of race here led Black and White participants' appraisals of race-relevant images to form distinct trajectories over time. Partly because White participants were less informed about racialized violence they appraised images of police force as especially novel. This novelty was not, however, accompanied by relevance even when the targets of police force were White (in-group members). In contrast, Black participants' familiarity with the issues led them to appraise newly presented instances as less novel. Being unsurprised did not appear to dampen attentiveness and interest, however, as Black participants appraised all images of police force as more relevant than did White participants.

Methodological Concerns

There are a number of methodological concerns worth considering as potential limitations. First, as all three types of

images were rated as moderately arousing and highly unpleasant, some may wonder if our results can be interpreted as suggesting that Black participants generally pay less early attention in an EEG lab environment than White participants, perhaps because of historically based mistrust of lab settings and physiological methods (see Gamble, 1993). However, partly to limit this concern, we generally matched participants to an experimenter who appeared to match their self-reported race. Our actual pattern of results also suggest against this interpretation as it assumes that all Black participants' ERPs would be dampened by the cognitive strain involved in working under threat. Yet, Black participants demonstrated larger P200 and LPP amplitudes, both of which have previously been found to diminish under working memory load (MacNamara, Ferri, & Hajcak, 2011; Phillips & Takeda, 2009). In addition, Black participants not only reported *more* attentiveness in response to the images than White participants, but there was no difference in the uncorrected prestimulus baseline period. Therefore, we can be confident that any divergence in attention between our participant groups is, in fact, because of the content of the images, and not any situational threat or other general difference.

Second, because of restraints on statistical power largely because of the difficulty of recruiting Black participants to the lab and fitting them with an EEG net, we were not able to manipulate every possible order of image presentation in Experiment 2. This may be important, as both the P300 and the LPP can be sensitive to the context within which stimuli are placed (Ibanez et al., 2012). However, given the null effects of image presentation order in the initial mixed effects analyses of both Experiments, such a manipulation may not matter as much for the sort of powerful, ecologically valid, stimuli as we used here.

Third, there is an inherent ambiguity in interpreting ERP components, especially in response to the archetypal images of social action that we examined here. For this reason, we focused on the most general, and most consensual, interpretations of the cognitive processes suggested by the ERPs. Therefore, it was also important that we corroborated our ERP results with "behavioral" measures of self-reported familiarity, affect, and emotion. Of course, there is a fundamental difficulty in relying on such deliberative constructs to validate the early and automatic attentional processes assessed in the early ERPs of the N100, P200, and P300.

Conclusion

Race is a powerful proxy for social and psychological differences in people's experience and interpretation of the social world. Here, race was related to large differences in familiarity with past instances of police and other violence against unarmed Black people. These differences translated into sizable differences in Black and White student's cognitive appraisal of archetypal instances of police force and Black-led protest against it. Black participants appeared to "opt in" to the appraisal process at the stage of relevance, which is the basis for emotion, motivation, and ultimately action (Frijda, Kuipers, & ter Schure, 1989; Lazarus, 1991; Scherer, 2009). In contrast, the relevance stage is where White participants appeared to "opt out" of the appraisal process. This divergence at the earliest stages of appraisal may have important consequences for subsequent appraisal, emotion, and coping.

Black people's greater psychological engagement seems a likely basis for their greater social and political engagement. This may be self-defining (Leach & Livingstone, 2015). However, over time, engagement may exact a (psychological or physiological) toll if it remains too high for too long (see Mendes & Park, 2014; Williams, Neighbors, & Jackson, 2003). Given that Black people appear to be more physiologically "reactive" to racial stressors in general (Williams et al., 2003), we can wonder about the longer-term consequences of their neurological, physiological, and emotional reactivity here (see also Chida & Steptoe, 2010). Some theorists posit such reactivity as one reason for disproportional cardiovascular disease and other stress-related illness among African Americans (Williams et al., 2003). Another, somewhat independent, possibility is that appraisals of motivational relevance and attendant physiological and emotional reactions to perceived injustice are an active form of coping that facilitates the use of instrumental, emotional, and social resources (Leach & Allen, 2017; Reinka & Leach, 2017; more generally, see van Zomeren et al., 2012). It is entirely possible that the early appraisal processes we examined here later leads to beneficial *psychological* reactions and harmful *physiological* reactions (see Leach & Livingstone, 2015). This is an important avenue for future research.

The social reality of race matters for White people too. Although they are less interested in, and informed about, racialized violence, their early appraisal of the novelty of images of police force did not translate into greater appraised relevance. Consistent with this, linguistic and content analyses of MTurk workers' descriptions of the images examined here showed Whites to view police force against unarmed Black targets as less clear and less clearly illegitimate (Leach et al., 2018; Reinka & Leach, 2017). Also, Whites described the images of Black-led protest in less positive and justice-oriented terms and reported feeling less empowered by them. Of interest to the authors, Leach et al. (2018) found that the White adults least moved by these images of police force were also *least* personally committed to being racially egalitarian (Plant & Devine, 1998).

We may wonder *why* Black Lives seem to matter less to White participants despite their early attention to what were clearly novel, unpleasant, and moderately arousing images of police force and Black-led protest against it. Are they trying to avoid the unpleasant moral implications of being White in a society where being Black comes with greater risk of police violence (Leach et al., 2002)? Or, do they see police and protest as "Black issues" rather than "White issues" or "American issues"? As Forman (2004) has argued, being relatively uninterested in, and indifferent to, the dynamics of race in one's society may constitute a kind of "racial apathy" that all but the most committed Whites enjoy (Leach et al., 2002). And, Kawakami et al. (2009) showed that White participants are not particularly distressed by, or avoidant of, White confederates who express moderate or extreme racism even though observers expect them to be. This indifference to issues of apparent societal import is a pertinent issue for future theory, research, and practice.

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