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Us versus Them: Social Identity Shapes Neural Responses to Intergroup Competition and Harm

Mina Cikara, **Matthew M. Botvinick**, and **Susan T. Fiske**
Princeton University

Abstract

Intergroup competition makes social identity salient, which affects how people respond to competitors' hardships. The failures of a fellow group member are painful, while those of a rival group member may give pleasure—a feeling that may motivate harming rivals. The present study examines whether valuation-related neural responses to rival groups' failures correlate with likelihood of harming individuals associated with those rivals. Avid fans of the Red Sox and Yankees teams viewed baseball plays while undergoing fMRI. Subjectively negative outcomes (favored-failure, rival-success) activated anterior cingulate cortex and insula, while positive outcomes (favored-success, rival-failure—even against a third team) activated ventral striatum. The ventral striatum effect, associated with subjective pleasure, also correlated with self-reported likelihood of aggressing against a fan of the rival team (controlling for general aggression). Outcomes of social group competition can directly affect primary reward-processing neural systems, with implications for intergroup harm.

Intergroup competition increases the salience of social identification—defines "us" and "them" (Hamilton, Sherman, & Lickel, 1998; Tajfel, 1982). How people respond to others' pains and pleasures is strongly affected by the relationship between the observer and the individual experiencing the outcome; witnessing an ally in distress typically elicits empathic responses (Batson, 1991; Decety & Ickes, 2009), whereas a rival's pain may be cause for pleasure, *Schadenfreude* (Leach, Spears, Branscombe, & Doosje, 2003; Smith, Powell, Combs, & Schurtz, 2009). This marks one mechanism by which aggressive behaviors may spread beyond individual competitors to others merely associated with a rival group: If one attaches positive value to outgroup members' suffering, then one may be motivated to inflict suffering—in extreme cases leading to atrocities including genocide, and in more quotidian cases brawls among rival sports fans. Taking a social neuroscience approach, we investigate this link by examining the neural correlates of valuation of witnessed outcomes in the setting of intergroup competition. Specifically, we look at whether neural structures correlating with outcome valuation are also related to willingness to harm individuals associated with the outgroup.

Recent research has shed light on affective responses to and neural correlates of witnessing other individuals' rewards and punishments (de Bruijn et al., 2009; Fehr & Camerer, 2007; Fliessbach et al., 2007). This research, however, has been limited to cases where the relationship is personal (e.g., inter-individual competition; Singer et al., 2006). Although interpersonal morality prohibits people from harming others, engaging in violence on behalf of the ingroup is accepted, if not required in times of group conflict (Cohen, Montoya, & Insko, 2006). Examining the effects of social identification on responses to others' outcomes is crucial because groups up the ante: Intergroup interactions engender significantly more

Address correspondence to: Mina Cikara, Department of Psychology, Princeton University, Princeton, NJ 08540, Tel #: (609) 258-9157, Fax #: (609) 258-1113, mcikara@princeton.edu.

competition and aggression than interpersonal interactions do (Insko et al., 1987; Meier & Hinsz, 2004) and lead people to aggress against outgroup individuals merely because of who they are, not what they have done (as is the case with interpersonal revenge). Moral prohibitions against harm become flexible in the context of intergroup competition; this study aims to unpack the social, cognitive, and neural bases of these processes.

The current study employs a multi-method approach in the context of a real-world intergroup rivalry to investigate the effect of social group identity on affective and neural responses to competition outcomes, and how these responses relate to endorsement of harming outgroup members. We measured the affective reactions and neural responses of die-hard Yankees and Red Sox fans as they viewed baseball plays involving favored, rival, and other teams. At the behavioral level, we predicted participants would respond with positive affect both to favored-team success and rival-team failure (even against a third party), and with negative affect to favored-group failure and rival-success; we predicted these ratings would correlate with willingness to harm the outgroup. At the neural level, we sought to test whether affective reactions driven by social group identification engage the same neural structures as primary rewards and punishments and whether activation in these regions was associated with willingness to harm the outgroup. Of particular interest are brain regions implicated in both valuation (e.g, pleasure in response to outgroup pain) and motivation (e.g., urges to inflict harm): one of few such regions is the ventral striatum (Berridge, Robinson, & Aldridge, 2009). Indeed, previous research has shown that neural structures such as the ventral striatum (VS) and anterior cingulate cortex (ACC) are engaged when participants personally receive rewards (O'Doherty, 2004) and punishments (Botvinick et al., 2005; Decety & Ickes, 2009), respectively; however, more recent research demonstrates that participants exhibit the opposite neural responses when they witness an individual competitor's rewards and punishments (de Bruijn et al., 2009; Singer et al., 2006; Takahashi et al., 2009). We seek to demonstrate that these effects can take place on behalf of one's ingroup. More important, we test for the first time, whether these affective and neural responses are related to a desire to aggress against outgroup competitors.

Method

Participants

Participants were 18 healthy baseball fans (3 Female, M_{age} = 23.1; 11 Red Sox, 7 Yankees) right-handed, native English speakers with no history of psychiatric or neurological problems, with normal or corrected vision. Written informed consent and procedures complied with IRB guidelines. We collected data between the 2008 and 2009 MLB seasons to ensure that responses were not influenced by recent games' outcomes. Due to button-box complications, N = 17 for analyses including affect ratings.

Selection criteria—Participants had to correctly identify photos of 3 players that we selected from the Red Sox and Yankees, and the position of a fourth player we selected from each team. Participants also had to answer extremely, regarding how they felt about their favored and rival team (1 *love them* to 10 *hate them*). Only participants who marked 1 or 2 for the favored team (Red Sox fans M = 1.55, SD = 0.52; Yankees fans M = 1.29, SD = 0.49), *and* 8 or 9 for their rival team (Red Sox fans M = 8.45, SD = 0.33; Yankees fans M = 8.71, SD = 0.49) were invited to participate: People appraise events from an intergroup rather than interpersonal perspective when they strongly identify with an ingroup (Mackie, Silver, & Smith, 2004).

Stimuli

Stimuli were created using screenshots of ESPN's online gamecast during actual games involving the relevant teams. We animated a small baseball leaving the pitcher's mound, moving towards the batter, and being "hit." The final location of the baseball depended on the condition: favored-success against rival; rival-success against favored; favored-failure against rival; rival-failure against favored; rival-failure against the neutral team (pure Schadenfreude because the favored team is not playing); neutral team versus neutral team (i.e., Orioles bat against the Blue Jays, with success and failure outcomes). The final control condition included all the low-level features of the other stimuli, but without any of the emotional content associated with the other conditions. We three outcomes for success and failure plays, respectively: successful plays included getting to 1st base, getting to 2nd base, and hitting a home run; failure plays included tagged out at first, flyball caught outfield, and line drive caught by short stop.

Procedure

Participants arrived to the lab, gave consent, and practiced the task. We stressed that no single play determined an entire game's outcome or any team's league standings. See Figure 1 for a schematic of each trial. Following each stimulus, participants had 2 s to rate the extent to which the preceding play made them feel anger, pain, or pleasure (1 *none* to 4 *extreme*) using a button box. See supplementary materials for further protocol details.

Follow up questionnaire—Approximately two weeks after we scanned them, participants completed a web survey rating the likelihood that they would heckle, personally insult, throw food or beverage, threaten, shove, and hit a rival fan and an Orioles fan (1 *not at all likely* to 10 *extremely likely*).

fMRI

See supplementary materials for fMRI acquisition and preprocessing methods.

Whole-brain contrasts—Group analysis treated the variability between participants as a random effect. Because we did not have a full-factorial design, AFNI's 3dttest examined the contrast between each of the 3 experimental conditions—positive, negative, and Schadenfreude—against the control condition. Statistical parametric maps were derived from the resulting t values associated with each voxel. All clusters reported are $p < .05$, corrected for multiple comparisons (see supplementary materials for details).

Correlations analyses—We computed all correlations within brain regions that were first functionally defined by the contrasts. For regions that surpassed the multiple comparisons threshold, we extracted the average (not peak) parameter estimate values in that region for each condition, for each participant. We report the correlations between activity in those regions in response to viewing each of the experimental conditions and their associated pleasure/pain/anger ratings (or harm ratings in the case of correlations with harm). Ratings were not included in the group-analysis GLM used to define the regions, ensuring independence of the analyses (Vul, Harris, Winkielman, & Pashler, 2009).

Results

Behavioral results

Participants rated the favored-success, rival-failure, and pure Schadenfreude conditions as significantly more pleasurable than the subjectively negative and control conditions. Likewise, participants rated favored-failure and rival-success as significantly more angering and painful than the subjectively positive and control conditions (Figure 2). In the follow-up, participants reported that they were significantly more likely to aggress towards a rival fan as compared to an Orioles fan in the following ways: heckling, insulting, threatening, and hitting, all *t*s(17) ≥ 2.20, $p < .05$ (Table 1).

fMRI results

As predicted, viewing subjectively positive outcomes (favored team-success, rival-failure against favored > control) engaged VS (Table 2; Figure 3). Other regions of activation for this contrast included left middle frontal and superior frontal gyrus, left insula, bilateral caudate, and SMA. Average responses in right VS during subjectively positive plays correlated with participants' self-reported pleasure (but not pain or anger) in response to watching subjectively positive plays, $r(15) = .41$, $p < .05$, one-tailed (Figure 4a). None of the other regions identified by the positive > control contrast were correlated with pleasure ratings.

Viewing subjectively negative outcomes (favored-failure, rival-success > control) activated ACC, SMA, and right insula (Table 2; Figure 3). Average hemodynamic responses in ACC in response to watching negative plays correlated with participants' self-reported pain (but not anger or pleasure) when watching subjectively negative plays, $r(15) = .49$, $p < .05$ (Figure 4b). Neither responses in SMA nor right insula correlated with pain ratings.[1]

We hypothesized that if watching a competitive group's misfortune is accompanied by the experience of pleasure (instead of empathy, for example), this pleasure might be related to a desire to harm the rival team and people associated with it (i.e., their fans; Leach & Spears, 2009). We focused specifically on the VS because it has been linked previously to self-reports of Schadenfreude (Singer et al., 2006; Takahashi et al., 2009). To examine the relationship between harm and VS responses, we computed a single harm score for each participant by subtracting the likelihood of aggressing against Orioles fans from the likelihood of aggressing against rival team fans, averaging across the behaviors; the difference score quantifies rival-specific harm, controlling for a general aggressive tendencies. As predicted, participants who reported a greater likelihood of harming rival fans also exhibited more VS activation in response to watching their rival fail (activation averaged over favored-success, rival-failure, and pure Schadenfreude plays to maximize power), $r(16) = .44$, $p < .05$, one-tailed (Figure S1). In contrast, subjective ratings of pleasure while watching the baseball plays were not significantly correlated with likelihood of harm, $r(16) = .37$, *ns*, indicating that the neural data better predict rival-specific harm than self-reported pleasure does.

Discussion

In the current study, brain regions that encode primary rewards and punishments (Berns, McClure, Pagnoni, & Montague, 2001; Decety, 2010; O'Doherty, 2004), also encoded *groups*' outcomes, the subjective values of which are inherently defined by the perceiver's social identity. More important, pleasure-associated neural activity in response to viewing rival failures (even against third parties) was correlated with self-reported likelihood of harming rival team fans, suggesting a neural account for the link between valuation of witnessed outcomes and willingness to harm.

[1]The pure Schadenfreude > control condition contrast did not yield any significant clusters in the whole-brain contrast. We predicted, however, that VS would respond to all pleasurable plays, including those in which participants' rival failed against the Orioles. In the right VS, average parameter estimates were greater for positive than control outcomes, $t(17) = 5.61$, $p < .001$, greater for Schadenfreude than control outcomes, $t(17) = 2.54$, $p < .05$, and marginally greater for positive than Schadenfreude outcomes, $t(17) = 1.69$, $p = .11$.

As predicted, viewing subjectively positive plays modulated the VS response, which correlated with ratings of pleasure. While previous studies have implicated the striatum in personal competition paradigms (de Quervain et al., 2004; Singer et al., 2006), this is the first to demonstrate these effects on behalf of participants' ingroups' successes.[2] Viewing subjectively negative plays modulated insula and ACC responses; the latter correlated with ratings of pain. These regions are activated both by observing and experiencing pain; in contrast to the current study, however, previous studies of empathic pain have used stimuli based on specific individuals (e.g., faces expressing pain (Botvinick et al., 2005); symbols indicating that a loved one is receiving painful stimulation (Singer et al., 2004)). Related, these regions are relatively less active in response to seeing other-race as compared to same-race individuals experiencing pain (Xu, Zuo, Wang, & Han, 2009). Here we demonstrate that an abstract diagram of a hypothetical baseball play can elicit the same response in die-hard fans, even when no one pictured is in pain.[3]

Finally, participants who reported greater rival-specific aggression not only reported more pleasure, but also exhibited greater VS activity in response to watching rivals fail, even against a third party. Note that the VS response was more closely linked to harm than was self-reported pleasure in response to rival failure. The current data implicate not only the VS's valuation function, but also its motivation and learning functions (Berridge et al., 2009). Thus social identification modulates both *valuation* and *action*, and the VS may represent a critical link between these two. Future research should directly examine whether hedonic (liking) or motivational (wanting) processes (Berridge, 1996) better predict harm and whether degree of social identification impacts the relationship between VS and harm. While these data are correlational, the current findings encourage further investigation of neural responses to threatening outgroups' misfortunes and tendencies toward outgroup harm.

In sum, these results suggest that evolutionarily old neural systems, which may have developed to respond to physically rewarding and painful stimuli in the service of reinforcing adaptive behaviors (Decety, 2010; O'Doherty, 2004), have evolved to encode group-level rewards and punishments. Indeed, researchers have theorized that the motivation to help allies and harm rivals may have co-evolved in humans (Choi & Bowles, 2007). Complementing previous fMRI studies of intergroup competition, which have focused on evaluations of the ingroup/outgroup members themselves (e.g., Van Bavel, Packer, & Cunningham, 2008), the current study highlights neural systems that 1) encode the subjective meaning of intergroup competition outcomes and 2) possibly promote behavioral responses. Furthermore, this study extends prior neuroimaging investigations of Schadenfreude (Takahashi et al., 2009) by demonstrating for the first time that neural activation associated with pleasure in response to rival groups' misfortunes is related to endorsing harm against people associated with those groups. The computations involved with processing group-based outcomes may have demonstrable behavioral implications for intergroup conflicts; understanding these responses and their consequences will help expand the picture of the social, cognitive, and neural mechanisms that give rise to human tragedies and triumphs.

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[2]Viewing subjectively positive plays also engaged caudate, SMA, and middle frontal gyrus. These regions respond to positive outcomes (e.g., Niewuhuis et al., 2005), as well as many other experimental contexts; we refrain from interpreting their computational roles in the current study to avoid reverse inference.

[3]We observed insula activation in response to both positive and negative plays. Despite the literature's emphasis on disgust responses, insular cortex responds to an array of positively arousing stimuli, including appetitive food (Wang et al., 2004), and even positive self-referential words (Fossati et al., 2003).

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Fig. 1.
An example of a favored-success play for a Red Sox fan: Red Sox hit a home run against the Yankees. The first screen designates the participating teams (2 s); then the participant sees the field, the pitcher and the batter and the play begins when the ball moves from the pitcher's mound to home plate, where the player "hits" the ball (4 s); the final screen designates the outcome of the play (2 s).

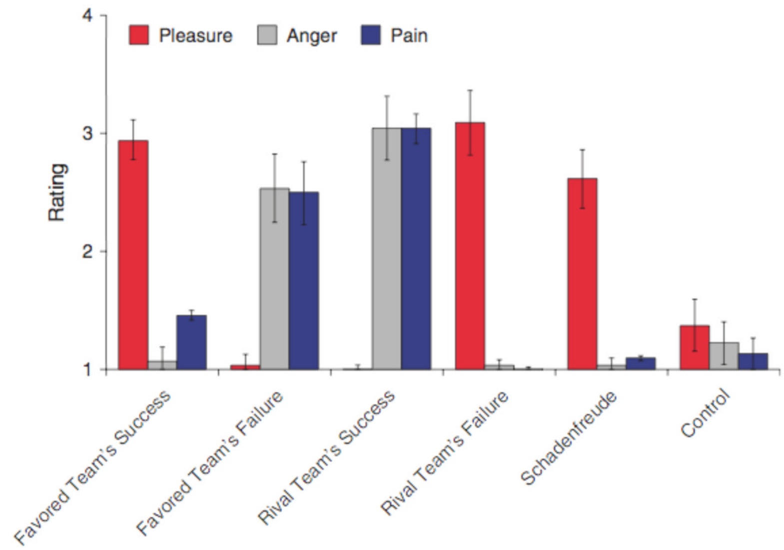

Fig. 2.
Pleasure, anger, and pain ratings for each of the 6 conditions. Bars represent standard deviation.

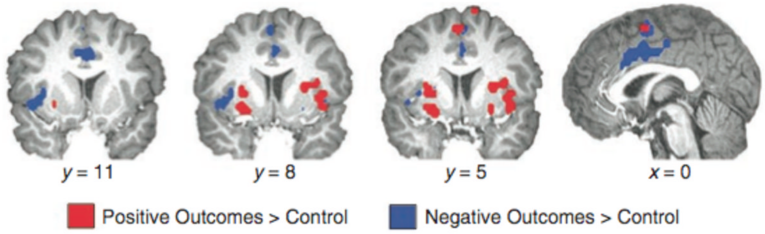

Fig. 3.

Overlay map for whole-brain contrast: brain regions identified by “positive outcomes > control” appear in red; regions identified by “negative outcomes > control” appear in blue. All clusters are $p < .05$, corrected. First panel, y = 11; second panel, y = 8; third panel, y = 5; fourth panel x = 0. Any relationship between the figure color coding and team colors is entirely unintended.

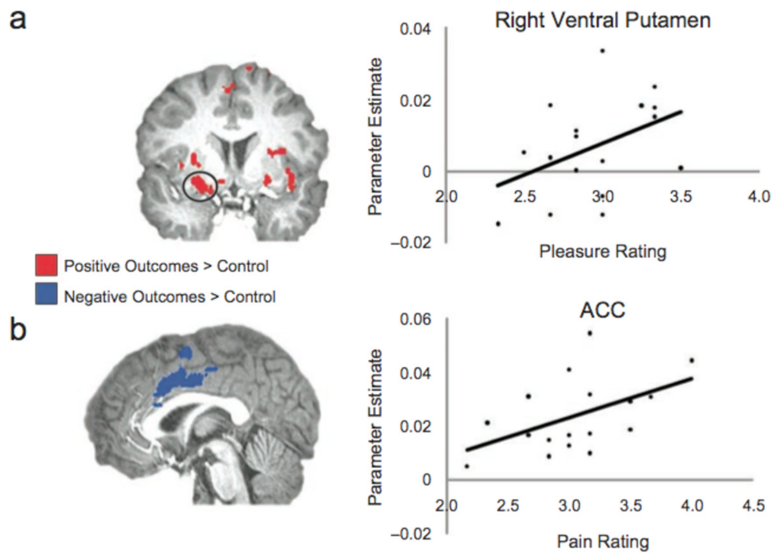

Fig. 4.

(A) Correlation between self-reported pleasure and mean parameter estimates from superthreshold voxels in right ventral putamen (y = 3), while viewing favored success baseball plays, $r(15) = .41$. (B) Correlation between self-reported pain and mean parameter estimates from superthreshold voxels in ACC (x = 0), while viewing rival success baseball plays, $r(15) = .49$.

Table 1

Likelihood of Engaging in Aggressive Behaviors Against Rival and Orioles Fans

	Rival Fans	Orioles Fans
Behavior		
Heckle	7.50 (1.79) [a]	5.22 (2.46) [b]
Personally insult	4.44 (2.52) [a]	2.44 (1.69) [b]
Throw food or beverage	1.95 (1.62) [a]	1.39 (1.04) [a]
Threaten	2.66 (2.11) [a]	1.56 (1.14) [b]
Shove	1.78 (1.48) [a]	1.39 (1.03) [a]
Hit	1.83 (1.50) [a]	1.28 (0.96) [b]

Note. N = 18. Scale: 1 (*not at all likely*) to 10 (*extremely likely*). Standard deviations appear in parentheses. Different letters in each row indicate that values are significantly different from one another, $t(17) \geq 2.20$, $p < .05$.

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Table 2

Whole-brain Analyses

Regions	*x*	*y*	*Z*	Cluster Size (Voxels)
Positive Outcomes > Control (Favored success; Rival failure against favored team)				
L middle frontal gyrus	−27	−8	61	41
L caudate/insula	−31	2	12	27
R ventral putamen[a]	25	4	−9	19
L superior frontal gyrus	−14	−5	74	19
L insula	−40	5	−3	13
R caudate	28	4	6	10
L middle frontal gyrus	−42	−24	63	10
L ventral putamen	−24	0	−9	8
Medial frontal gyrus (SMA)	0	1	57	8
Negative Outcomes > Control (Rival success; Favored failure against rival)				
Anterior cingulate	0	8	36	90
Medial frontal gyrus (SMA)	1	0	58	27
R insula	41	10	−2	20

Note. Peak voxel and cluster size (1 voxel = $3mm^3$). Voxelwise significance threshold, $p < .05$, corrected. Coordinates refer to the Montreal Neurological Institute stereotaxic space.

[a]Extends medially to include nucleus accumbens.