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

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Abstract

Intergroup competition makes social identity salient, which in turn affects how people respond to competitors' hardships. The failures of an in-group member are painful, whereas those of a rival out-group member may give pleasure—a feeling that may motivate harming rivals. The present study examined 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 functional magnetic resonance imaging. Subjectively negative outcomes (failure of the favored team or success of the rival team) activated anterior cingulate cortex and insula, whereas positive outcomes (success of the favored team or failure of the rival team, 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, which has implications for intergroup harm.

Keywords

intergroup competition, schadenfreude, harm, fMRI, ventral striatum

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Intergroup competition increases the salience of social identification—defines "us" and "them" (Hamilton, Sherman, & Lickel, 1998; Tajfel, 1982). How people respond to another person's pain or pleasure is strongly affected by their relationship with 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). Such responses highlight 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 out-group members' suffering, then one may be motivated to inflict suffering on them. In extreme cases, this motivation may lead to atrocities, including genocide, and in more quotidian cases, it can lead to brawls among rival sports fans. Taking a social neuroscience approach, we investigated this link between social identification and aggression by examining the neural correlates of valuation of witnessed outcomes in the setting of intergroup competition. Specifically, we looked at whether neural structures whose activity correlates with outcome valuation are also related to willingness to harm individuals associated with the out-group.

Recent research has shed light on affective responses to and neural correlates of witnessing other individuals' rewards and punishments (de Bruijn, de Lange, von Cramon, & Ullsperger, 2009; Fehr & Camerer, 2007; Fliessbach et al., 2007). This research, however, has been limited to cases in which the relationship is personal (e.g., interindividual competition; Singer et al., 2006). Although interpersonal morality prohibits people from harming others, engaging in violence on behalf of the in-group is accepted, if not required, in times of group conflict (Cohen, Montoya, & Insko, 2006). Examining the effects of social identification on responses to other people's outcomes is crucial because groups up the ante: Intergroup interactions engender significantly more competition and aggression than interpersonal interactions do (Insko et al., 1987; Meier & Hinsz, 2004) and lead people to aggress against out-group

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individuals merely because of who they are rather than what they have done. Moral prohibitions against harm become flexible in the context of intergroup competition; in this study, we sought to unpack the social, cognitive, and neural bases of these processes.

We employed a multimethod approach in the context of a real-world intergroup rivalry to investigate the effects of social group identity on affective and neural responses to competition outcomes, and how these responses relate to likelihood of harming out-group 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 that participants would respond with positive affect both to success of their favored team and to failure of a rival team (even against a third party) and with negative affect to failure of their favored team and success of a rival team. We also predicted that these ratings would correlate with willingness to harm the out-group. At the neural level, we tested whether affective reactions driven by social group identification engage the same neural structures as primary rewards and punishments do and whether activation in these regions is associated with willingness to harm the out-group. Of particular interest were brain regions implicated in both valuation (e.g., pleasure in response to out-group failure) and motivation (e.g., urges to inflict harm): One of the few such regions is the ventral striatum (VS; Berridge, Robinson, & Aldridge, 2009). Indeed, previous research has shown that neural structures such as the 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 has demonstrated that participants exhibit the opposite neural responses when they witness a competitor's rewards and punishments (de Bruijn et al., 2009; Singer et al., 2006; Takahashi et al., 2009). We predicted that these effects can take place on behalf of one's in-group. More important, we tested, for the first time, whether these affective and neural responses are related to a desire to aggress against individuals affiliated with the out-group.

Method

Participants

Participants were 18 healthy baseball fans (3 female, 15 male; mean age = 23.1 years; 11 Red Sox fans, 7 Yankees fans). All were right-handed, native English speakers with normal or corrected vision; they had no history of psychiatric or neurological problems. We obtained written informed consent, and procedures complied with guidelines of the local institutional review board. We collected data between the 2008 and 2009 Major League Baseball seasons to ensure that responses were not influenced by recent games' outcomes. Because of equipment failure, affect ratings were unavailable for 1 participant, and analyses including these ratings were conducted on data from 17 participants.

To be included in the study, participants had to correctly identify photos of three Red Sox players and three Yankees players that we selected, as well as the position of a fourth player we selected from each team. Participants also had to give extreme responses to questions regarding how they felt about their favored team and how they felt about their rival team (scale from 1, *love them*, to 10, *hate them*). Only participants who replied with 1 or 2 for their favored team (Red Sox fans: $M = 1.55$, $SD = 0.52$; Yankees fans: $M = 1.29$, $SD = 0.49$) and also replied with 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 because people appraise events from an intergroup rather than interpersonal perspective when they strongly identify with an in-group (Mackie, Silver, & Smith, 2004).

Stimuli

Stimuli were created using screenshots of ESPN's online Gamecasts of actual games involving the relevant teams. We animated a small baseball leaving the pitcher's mound, moving toward the batter, and being hit. The final location of the baseball depended on the condition. Six types of baseball plays yielded four conditions: favored team's success against the rival team (subjectively positive condition); rival team's failure against the favored team (subjectively positive condition); rival team's success against the favored team (subjectively negative condition); favored team's failure against the rival team (subjectively negative condition); rival team's failure against a neutral team, the Orioles (pure schadenfreude condition, because the favored team was not playing); and plays involving two neutral teams (the Orioles batting against the Blue Jays, with both success and failure outcomes; control condition). The stimuli for this final condition included all the low-level features of the other stimuli, but without any of the emotional content associated with the other conditions. We included three outcomes for success and failure plays, respectively: getting to first base, getting to second base, and hitting a home run in the success plays; runner tagged out at first base, fly ball caught in the outfield, and line drive caught by short stop in the failure plays. All six outcomes were included in the control condition.

Procedure

Participants arrived at the lab, gave consent, and practiced viewing and rating the baseball plays. We emphasized that no single play determined an entire game's outcome or any team's league standings. Following each stimulus play (see Fig. 1 for a schematic illustration of a stimulus), participants rated the extent to which it made them feel anger, pain, and pleasure (scale from 1, *none*, to 4, *extreme*); responses were made using a button box, and 2 s were allowed for each response. (See

Fig. 1. An example of a trial in which the Red Sox made a successful play (hitting a home run against the Yankees). The first screen designated the participating teams (2 s). Then, participants saw the field, the pitcher, and the batter (we created the background by taking screenshots of ESPN's Gamecast during actual games); the play began when the ball moved from the pitcher's mound to home plate, where the player hit the ball (4 s). The final screen designated the outcome of the play (2 s).

Supplementary Methods in the Supplemental Material available online for further details about the protocol.)

Participants underwent functional magnetic resonance imaging (fMRI) while viewing the baseball plays and reporting their affective responses. Details on the fMRI acquisition and preprocessing methods are available in the Supplementary Methods.

Approximately 2 weeks after we scanned them, participants completed a Web survey. On the survey, they rated the likelihood that they would heckle, personally insult, throw food or beverage at, threaten, shove, and hit a rival fan and an Orioles fan (scale from 1, *not at all likely*, to 10, *extremely likely*).

fMRI analyses

Whole-brain contrasts. Group analyses treated the variability between participants as a random effect. Because we did not have a full-factorial design, we used AFNI's 3dttest (Cox, 1996) to examine the contrast between each of the three experimental conditions—subjectively positive, subjectively negative, and schadenfreude—and the control condition. Statistical parametric maps were derived from the resulting t values associated with each voxel. To identify clusters, we adopted a significance level, p, of .05, corrected for multiple comparisons (see the Supplementary Methods for details).

Correlational analyses. We computed correlations within brain regions that were first functionally defined by the contrasts. For each region that surpassed the multiple-comparisons threshold, we extracted the average (not peak) parameter estimate for the positive, negative, schadenfreude, and control conditions, for each participant. We calculated within-condition correlations between brain activity in response to viewing the stimuli and associated pleasure, pain, and anger ratings (or harm score—see Results). These ratings were not included in the general linear model used to define the regions in order to ensure independence of the analyses (Vul, Harris, Winkielman, & Pashler, 2009).

Results

Behavioral results

Participants rated the subjectively positive plays (favored team's success, rival team's failure against the favored team) and the plays in the pure schadenfreude condition as significantly more pleasurable than the subjectively negative plays (favored team's failure, rival team's success against the favored team) and the plays in the control condition. Similarly, participants rated the subjectively negative plays as significantly more angering and painful than the plays in the subjectively positive and control conditions (Fig. 2). In the follow-up, participants reported that they were significantly more likely to aggress toward a rival fan compared with an Orioles fan in the following ways: heckling, insulting, threatening, and hitting, all ts$(17) \geq 2.20$, ps $< .05$ (Table 1).

fMRI results

As predicted, viewing subjectively positive outcomes (favored team's success and rival team's failure against the favored team > control) engaged VS (Table 2; Fig. 3). Other regions of activation for this contrast included left middle frontal and superior frontal gyrus, left insula, bilateral caudate, and supplementary motor area (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 (Fig. 4a). None of the other regions identified by the positive > control contrast were correlated with pleasure ratings.

Viewing subjectively negative outcomes (favored team's failure or rival team's success > control) activated ACC, SMA, and right insula (Table 2; Fig. 3). Average hemodynamic

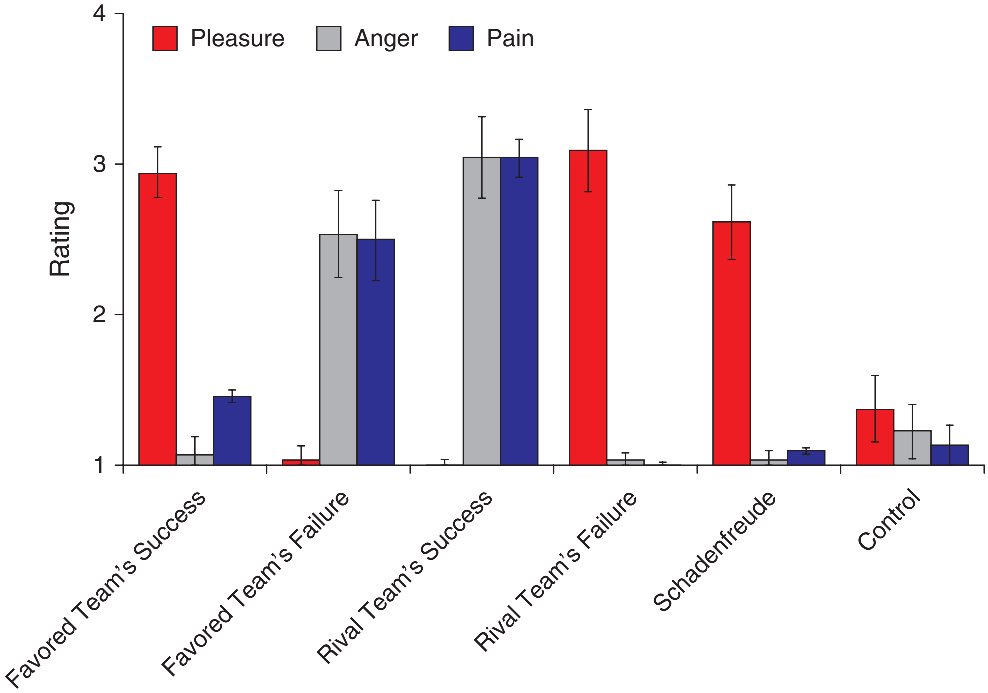

Fig. 2. Mean pleasure, anger, and pain ratings for each of the six types of plays. Error bars represent standard deviations.

responses in ACC during negative plays correlated with participants' self-reported pain (but not anger or pleasure) in response to watching subjectively negative plays, $r(15) = .49$, $p < .05$ (Fig. 4b). Responses in neither SMA nor right insula correlated with pain ratings.[1]

We hypothesized that if watching a rival group's misfortune is accompanied by the experience of pleasure (instead of empathy, e.g.), this pleasure might be related to a desire to harm the rival group and people associated with it (in the present case, fans of the rival team; 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 self-reported likelihood of aggressing against Orioles fans from the self-reported likelihood of aggressing against the rival team's fans, averaging across the behaviors. This difference score quantifies the likelihood of rival-specific harm, controlling for general aggressive tendencies. As predicted, participants who reported a greater likelihood of harming the rival team's fans also exhibited more VS activation in response to watching their rival team fail (to maximize power, we averaged activation over the favored team's success, rival team's failure, and pure schadenfreude conditions), $r(16) = .44$, $p < .05$, one-tailed (see Fig. S1 in the Supplemental Material). In contrast, subjective ratings of pleasure while watching the same baseball plays trended in the predicted direction, but were not significantly correlated with likelihood of harm, $r(16) = .37$, n.s. Thus, the neural data predicted rival-specific harm better than self-reported pleasure did.

Table 1. Mean Likelihood of Engaging in Aggressive Behaviors Against Fans of the Rival Team and the Orioles

Behavior	Rival-team fans	Orioles fans
Heckle	7.50_a (1.79)	5.22_b (2.46)
Personally insult	4.44_a (2.52)	2.44_b (1.69)
Throw food or beverage	1.95_a (1.62)	1.39_a (1.04)
Threaten	2.66_a (2.11)	1.56_b (1.14)
Shove	1.78_a (1.48)	1.39_a (1.03)
Hit	1.83_a (1.50)	1.28_b (0.96)

Note: $N = 18$. The rating scale ranged from 1 (*not at all likely*) to 10 (*extremely likely*). Standard deviations are given in parentheses. Within a row, means that do not share subscripts are significantly different, $t(17) \geq 2.20$, $p < .05$.

Discussion

In this study, brain regions that encode primary rewards and punishments (Berns, McClure, Pagnoni, & Montague, 2001; Decety, in press; 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 the rival team's failures (even against third parties) was correlated with self-reported likelihood of harming the rival team's fans, which suggests a neural account for the link between valuation of witnessed outcomes and willingness to harm.

Table 2. Regions Identified in Whole-Brain Analyses

Contrast and region	Coordinates *x*	*y*	*z*	No. of voxels
Positive outcomes (favored team's success, rival team's failure against favored team) > control				
Left middle frontal gyrus	−27	−8	61	41
Left caudate/insula	−31	2	12	27
Right ventral putamen[a]	25	4	−9	19
Left superior frontal gyrus	−14	−5	74	19
Left insula	−40	5	−3	13
Right caudate	28	4	6	10
Left middle frontal gyrus	−42	−24	63	10
Left ventral putamen	−24	0	−9	8
Medial frontal gyrus (SMA)	0	1	57	8
Negative outcomes (rival team's success, favored team's failure against rival) > control				
Anterior cingulate	0	8	36	90
Medial frontal gyrus (SMA)	1	0	58	27
Right insula	41	10	−2	20

Note: The table reports location of the peak voxel and cluster size (1 voxel = $3mm^3$). We set the voxel-wise significance threshold at $p < .05$, corrected. Coordinates refer to the Montreal Neurological Institute stereotaxic space. SMA = supplementary motor area.
[a]Activation in this cluster extended medially to include nucleus accumbens.

As predicted, viewing subjectively positive plays modulated the VS response, which correlated with ratings of pleasure. Although previous studies have implicated the striatum in personal competition paradigms (de Quervain et al., 2004; Singer et al., 2006), this is the first study to demonstrate such effects on behalf of participants' in-groups.[2] Viewing subjectively negative plays modulated insula and ACC responses; the latter correlated with ratings of pain. These regions are activated by both observing and experiencing pain. In contrast to the current study, however, previous studies of empathic pain have used stimuli related to 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). Here we demonstrated that an abstract animation 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 rival teams fail, even against a third party. Note that this VS response while watching the rival team fail (against the favored team and a third team, the Orioles) was more closely linked to harm than was self-reported pleasure in response to the same plays. The current data implicate not only the VS's valuation function (i.e., evaluating outcomes in intergroup competitions), but also its motivation function (i.e., wanting to harm individuals associated with the out-group; Berridge et al., 2009). Thus, social identification modulates both valuation and action; the

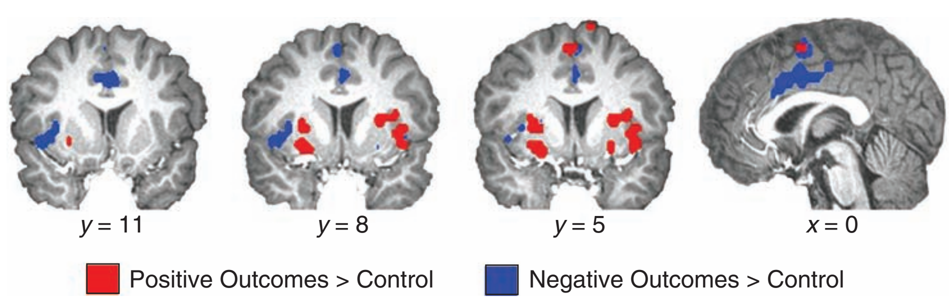

Fig. 3. Overlay map for whole-brain contrasts. Subjectively positive plays were those showing the favored team's success or the rival team's failure against the favored team; subjectively negative plays were those showing the favored team's failure or the rival team's success. All clusters are significant, $p < .05$, corrected. Any relationship between the color coding in this figure and team colors is entirely unintended.

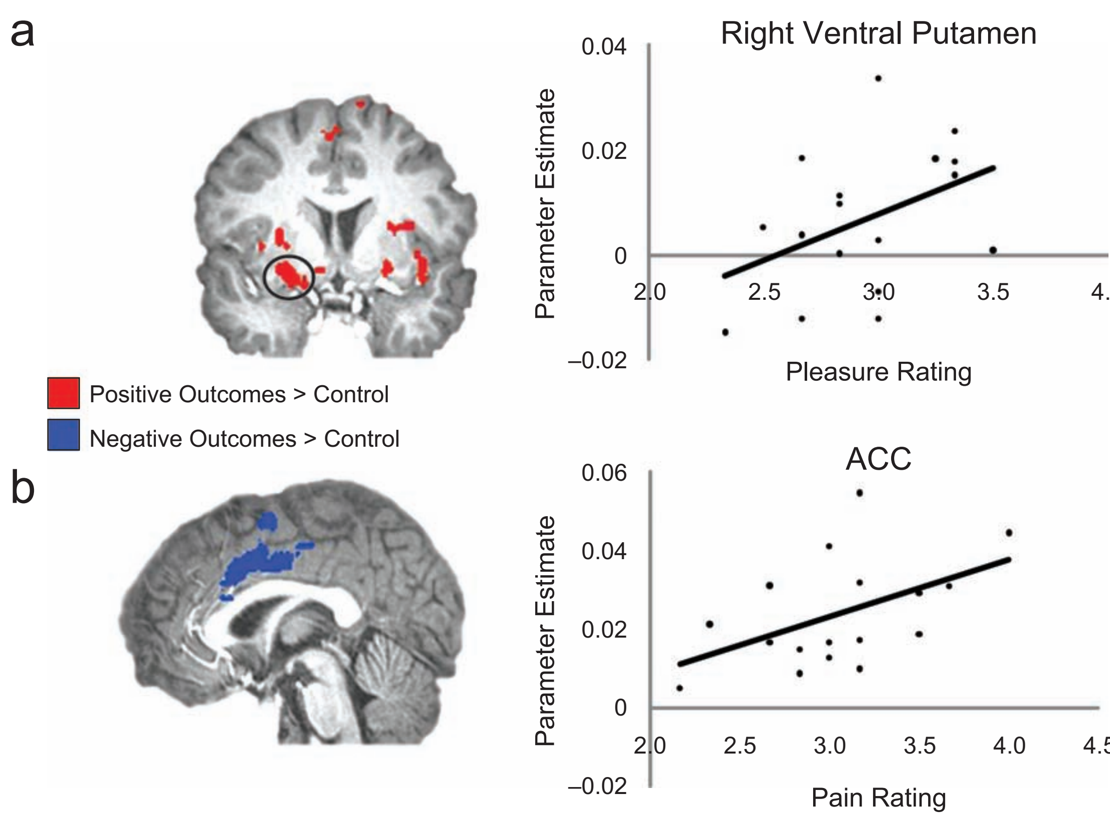

Fig. 4. Correlation between brain activity and affect ratings. The scatter plot in (a) illustrates the correlation between self-reported pleasure in response to subjectively positive plays and mean parameter estimates from superthreshold voxels in right ventral putamen (y = 3; see the circled area in the image to the left of the plot) while participants viewed positive plays. The scatter plot in (b) illustrates the correlation between self-reported pain in response to subjectively negative plays and mean parameter estimates from superthreshold voxels in anterior cingulate cortex (ACC; x = 0; see the brain image to the left of the plot) while participants viewed negative plays.

VS may provide a critical link between these two. Future research should directly examine whether hedonic (liking) or motivational (wanting) processes (Berridge, 1996) better predict desire to harm and actual harm of out-group members and whether degree of social identification affects the relationship between VS activation and harm. Although our data are correlational, our findings encourage further investigation of neural responses to threatening out-groups' misfortunes and their relation to tendencies toward out-group 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, in press; O'Doherty, 2004), have evolved to encode group-level rewards and punishments. Complementing previous fMRI studies of intergroup competition, which have focused on evaluations of the in-group/out-group members themselves (e.g., Van Bavel, Packer, & Cunningham, 2008), our study highlights neural systems that (a) encode the subjective meaning of intergroup-competition outcomes and (b) 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 in 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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Declaration of Conflicting Interests

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

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Supplemental Material

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

Notes

1. In the whole-brain analyses, the pure schadenfreude > control contrast did not yield any significant clusters. We predicted, however, that VS would respond to all pleasurable plays, including those in which participants' rival team failed against the Orioles. In the right VS, average parameter estimates were greater for positive than for control outcomes, $t(17) = 5.61$, $p < .001$; were greater for schadenfreude than for control outcomes, $t(17) = 2.54$, $p < .05$; and were marginally greater for positive than for schadenfreude outcomes, $t(17) = 1.69$, $p = .11$.
2. Viewing subjectively positive plays also engaged caudate, SMA, and middle frontal gyrus. These regions respond to positive outcomes (e.g., Nieuwenhuis, Slagter, Alting Von Geusau, Heslenfeld, & Holroyd, 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 in insular cortex, insula 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).

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