The Blame Game: The Effect of Responsibility and Social Stigma on Empathy for Pain

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Abstract

■ This investigation combined behavioral and functional neuroimaging measures to explore whether perception of pain is modulated by the target's stigmatized status and whether the target bore responsibility for that stigma. During fMRI scanning, participants were exposed to a series of short video clips featuring age-matched individuals experiencing pain who were (a) similar to the participant (healthy), (b) stigmatized but not responsible for their stigmatized condition (infected with AIDS as a result of an infected blood transfusion), or (c) stigmatized and responsible for their stigmatized condition (infected with AIDS as a result of intravenous drug use). Explicit pain and empathy ratings for the targets were obtained outside of the MRI environment, along with a variety of implicit and explicit measures of AIDS bias. Results showed that participants were significantly more sensitive to the pain of AIDS transfusion targets as compared with healthy and AIDS drug targets, as evidenced by significantly higher pain and empathy ratings during video evaluation and significantly greater hemodynamic activity in areas associated with pain processing (i.e., right anterior insula, anterior midcingulate cortex, periaqueductal gray). In contrast, significantly less activity was observed in the anterior midcingulate cortex for AIDS drug targets as compared with healthy controls. Further, behavioral differences between healthy and AIDS drug targets were moderated by the extent to which participants blamed AIDS drug individuals for their condition. Controlling for both explicit and implicit AIDS bias, the more participants blamed these targets, the less pain they attributed to them as compared with healthy controls. The present study reveals that empathic resonance is moderated early in information processing by a priori attitudes toward the target group. ■

INTRODUCTION

When we witness another individual in pain, do we wince automatically? Or are we more likely to wait to respond until we determine the cause of the pain, the context of the situation, or the background of the individual?

The psychological construct of empathy refers to an intersubjective induction process through which the cognitive and affective experiences of another come to be shared, without losing sight of the original source of the experience (Decety & Jackson, 2004). In light of multiple levels of analysis from social and developmental psychology, cognitive neuroscience, and clinical neuropsychology, it has been proposed that empathy involves both bottom–up and top–down information processing components (Goubert, Craig, & Buysse, 2009; Decety & Moriguchi, 2007). The former refers to the automatic and covert mimicry component, which drives emotional contagion during interpersonal interactions, and the latter to self-regulation and meta-cognition, which modulates both this automatic resonance system and subsequent prosocial behaviors.

As the first-hand experience of pain is ubiquitous across individuals and cultures and there is extensive knowledge about the physiological mechanisms underlying the processing of nociceptive information, studying the perception of pain in others constitutes a valuable and ecologically valid paradigm for investigating the underpinning of human empathy.

In recent years, an accumulating number of fMRI studies have demonstrated striking similarities in the neural circuits involved in the processing of both the first-hand experience of pain and the second-hand experience of observing other individuals in pain (for a meta-analysis, see Jackson, Rainville, & Decety, 2006). These studies have consistently shown that the perception of pain in others elicits activation of the neural circuit subserving the processing of the affective and motivational dimension of pain (Cheng et al., 2007; Gu & Han, 2007; Lamm, Batson, & Decety, 2007; Moriguchi et al., 2007; Ogino et al., 2007; Saarela et al., 2007; Zaki, Ochsner, Hanelin, Wager, & Mackey, 2007; Jackson, Brunet, Meltzoff, & Decety, 2006; Botvinick et al., 2005; Jackson, Meltzoff, & Decety, 2005; Morrison, Lloyd, di Pellegrino, & Roberts, 2004; Singer et al., 2004). This neural circuit includes the dorsal ACC (dACC), the anterior midcingulate cortex (aMCC), and the anterior insula (AI; Derbyshire, 2000).

The findings from these recent cognitive neuroscience investigations provide empirical support for observer–target congruence in pain processing similar to that which social psychologists have reported for the past 30 years. For instance, Hygge (1976) found that when an observer

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witnessed a target's distress, they experienced an increase in skin conductance similar to the arousal response elicited by the aversive stimulation itself, demonstrating that observers are autonomically aroused by a target's distress. Further, Vaughan and Lanzetta (1980) demonstrated that observers respond to a target's pain display with similar expressive behavior. Using EMG recordings from three facial muscle sites, these authors found that the pattern and timing of activation of the observer's facial muscles paralleled those of the target expressing pain.

With the abovementioned neuroimaging and physiological findings, there is strong evidence to suggest that perceiving the pain of others triggers an automatic somatic sensory-motor resonance mechanism between other and self, resulting in pain processing in the observer. This sharing of neural circuits between self (observer) and other (target) provides the foundation for analogical reasoning and offers a possible, yet partial, route to understanding others (Decety & Grèzes, 2006).

Although the neuroscience research in somatic sensory mimicry provides evidence for a universal neurological mechanism underlying empathy, it does not address the effect of a host of social factors that might influence such an empathic response. For instance, recent work in social cognition has shown that both bottom–up and top–down mechanisms of empathy can be modulated by how the target is perceived, including how similar the target is to the observer (i.e., Ames, 2004; Batson et al., 1997), how likable the target is (i.e., Kozak, Marsh, & Wegner, 2006; Singer et al., 2006), and the group membership of the target (i.e., Stürmer, Snyder, Kropp, & Siem, 2006; Yabar, Johnston, Miles, & Peace, 2006). Understanding how such factors impact the ability to perceive and to respond with care to the cognitive, affective, and motivational internal states of another is crucial to understanding the conditions in which empathy will be expressed (Decety & Batson, 2007).

One way to more fully elucidate how a priori attitudes may moderate empathy for pain is to explore the effect of social stigma on the empathic response. Stigmatization of an individual occurs when that individual is (1) labeled, (2) negatively stereotyped, (3) discriminated against, and (4) experiences status loss as a result of their stigma (Link & Phelan, 2001). Stigmatized individuals possess or are believed to possess some attribute or characteristic that conveys a social identity that is devalued in a particular context (Crocker, Major, & Steele, 1998). As a result of such a devalued and dehumanized out-group status, it can be predicted that someone would experience less empathy for an individual who is stigmatized.

A particularly illustrative example of a group of people who are stigmatized by society is those infected with HIV or who currently have AIDS. A number of empirical investigations have documented both explicit and implicit negative attitudes toward people with HIV/AIDS (for a review, see Herek, 1999). For instance, Neumann, Hulsenbeck, and Seibt (2004) measured participant's implicit attitudes toward people with AIDS (PWA) using both an implicit association test (IAT) and an automatic approach/avoidance task. Participants demonstrated a significant and negative implicit association for PWA and were significantly faster at making avoidance movements than approach movements in response to pictures of PWA.

Furthermore, attributions of responsibility can modulate an observer's emotional response toward such stigmatized targets. If targets are deemed responsible for their condition, they are judged with anger and blame and are stigmatized and socially rejected. Alternately, if targets are not considered responsible for their condition, they are judged with relative sympathy and social acceptance (Crandall & Martinez, 1996). In particular, attributions of responsibility have been shown to moderate attitudes toward individuals infected with AIDS: participants are less likely to show compassion for individuals who contracted HIV through stigmatized behavior (i.e., drug use) than for people who were infected through other means, such as a blood transfusion (Capitanio & Herek, 1999; Weiner, Perry, & Magnusson, 1988).

The abovementioned research demonstrates not only that people infected with HIV/AIDS are negatively viewed and stigmatized in society but also that attributions of responsibility for how PWA contracted the disease influences how they are perceived. Applying this research on stigmatized out-groups (such as PWA) to the literature on the somatic sensory mimicry components of empathy, it is hypothesized that resonance to stigmatized targets will be moderated by attributions of responsibility.

To investigate this hypothesis, the current study examined whether the hemodynamic response in the neural circuits underlying pain processing was modulated by the stigma of the target and whether the target bore responsibility for his or her stigmatized status. During fMRI scanning, white participants were exposed to a series of short video clips featuring age-matched white individuals experiencing pain who were (a) similar to the participant (healthy), (b) stigmatized but not responsible for their stigmatized condition (infected with AIDS as a result of an infected blood transfusion from a recent hospital stay), or (c) stigmatized and held responsible for their stigmatized condition (infected with AIDS as a result of intravenous drug use). We predicted that although participants should show resonance to the pain of all targets (regardless of group membership), resonance should depend on the target's stigma and his or her responsibility for acquiring that stigma. As such, we predicted reduced hemodynamic activation in pain processing areas when viewing stigmatized targets in general as compared with control targets similar to the participants. However, we predicted that attributions of responsibility would moderate this effect, such that significantly greater hemodynamic activation in pain processing areas would be observed when viewing not-responsible stigmatized targets and significantly less activity would be observed for

responsible stigmatized targets. The results of this investigation have important societal significance and will yield a better understanding of the mechanisms involved in interpersonal sensitivity and the factors that influence this ability.

METHODS

Participants

Twenty-six white participants completed the full testing procedure approved by the Behavioral Sciences Division Institutional Review Board at the University of Chicago. However, due to magnet-related artifacts in the fMRI data, 4 subjects were dropped from all subsequent analyses, resulting in sample of 22 healthy participants (11 men; mean age = 25.2 ± 5.05 years). All subjects were right-handed and had no prior history of major neurological, medical, or psychiatric disorders. Furthermore, all subjects did not personally know anyone with HIV/AIDS and did not personally know anyone who used intravenous drugs (currently or in the past). Each participant gave informed consent and was paid for their participation in this study.

Materials

A detailed description of the video stimuli used in this experiment, as well as the video collection and validation procedures, can be found in Lamm et al. (2007). Each video depicted a white individual wearing a white medical blouse and headphones and sitting in front of a light blue background curtain. The purpose of this setting was to imply the hospital environment outlined in the study description (below). To obtain video clips of facial expressions of pain, we videotaped 24 male and female targets (12 men) while they listened to painful, dissonant tone pairs. For the duration of the tone, the individual in the video portrayed an expression of genuine pain. Video clips were 3.5 sec in duration, showing the transition from a neutral (0.5 sec) to a pained (3 sec) facial expression. Video clips showed a natural pain response in which targets displayed brow lowering, orbit tightening, and either cursing/pressing of the lips or opening/stretching of the mouth. These movements have consistently been attributed to the facial expression of pain (e.g., Craig, Prkachin, & Grunau, 2001). Two clips meeting these criteria were selected for each target, yielding 48 dynamic video stimuli of male and female targets expressing pain.

Experimental Procedure

fMRI Data Collection

Using standardized written and verbal instructions, participants were informed that they would view short video clips of individuals expressing pain. Participants were told that all of the individuals in the clips suffer from a middle ear disorder called *tinnitus aurium*, which results in a painful and an unpleasant ringing sound in the ears. They were told that the individuals acquired the tinnitus aurium as a complication from a virus that they acquired either by chance when they were healthy or as a complication from having HIV/AIDS. Furthermore, participants were told that these patients contracted HIV as a result of either (a) an infected blood transfusion or (b) sharing infected needles used during illegal intravenous drug use. Participants were informed that they would watch short video clips of these three groups of individuals listening to unpleasant sounds as part of their treatment therapy, and as such, the individuals would be experiencing moderate to strong pain.

Stimuli were presented via E-Prime software (Psychology Software Tools, Inc., Pittsburgh, PA) in a mixed-block/event-related format, with group membership (healthy, AIDS transfusion, and AIDS drug) blocked to minimize task-switching demands. Each block consisted of four trials, with each trial as follows: first, participants saw a word cue ("healthy," "AIDS transfusion," or "AIDS drug") for 1.5 sec to indicate which group the subsequent individual in the video belonged to. This word cue was followed by a jittered fixation cross. Next, participants viewed a 3.5-sec video clip of the individual in pain. To complete the trial, participants viewed a second jittered fixation cross. Both within-trial fixation durations were randomly jittered (range: 2–5 sec) to prevent stimulus predictability and to allow independent event-related signal estimation for both the cue and the video clip (Donaldson & Buckner, 2001). Each block was separated by a fixed 6-sec interblock interval.

In each group, two different video clips of eight (four male) individuals were shown, resulting in 16 clips per condition. Each video clip was repeated once; thus, participants viewed 96 video clips in total with 32 trials per condition. Average pain ratings within condition were equivalent across the three group conditions ($F < 1$; *SD*: $F < 1$; ratings based on pretested data; see Lamm et al., 2007). The assignment of the target individuals to their group was counterbalanced across participants. This resulted in three different versions of the experimental procedure that were pseudorandomly assigned such that a third of the participants each viewed eight different target individuals in each of the three groups.

Four consecutive fMRI runs were performed, with each run consisting of six blocks of four trials each. The order of the blocks was pseudorandomized so that no more than two blocks for each condition appeared per run, and eight blocks per condition were displayed in total. Before and during the rest period between runs, participants were verbally instructed to closely attend to each video clip and were informed that they would be asked questions about these individuals after the fMRI scanning session.

Explicit Behavioral Measures

Following fMRI scanning, participants completed a behavioral task using E-Prime (Psychology Software Tools, Inc.) presentation software. In this task, participants repeated the viewing procedure previously shown in the fMRI scanner. However, participants were asked to respond to three questions after each video clip trial. Specifically, they were asked to evaluate the level of pain and distress that they thought the individual in the video clip was experiencing using a visual analog scale (VAS; left = *no pain/distress*, right = *severe pain/distress*). Participants were then asked how much distress they themselves felt when watching the individual in pain using the same VAS (left = *no distress*, right = *severe distress*). Ratings and response times were recorded for each trail.

Finally, to measure participant's emotional responses to the video clips, participants indicated the degree (1 = *not at all*, 7 = *extremely*) to which they experienced 14 emotional states (Baston, Fultz, & Schoenrade, 1987) for four randomly selected video clips for each group. Six of these adjectives measured empathy (sympathetic, softhearted, warm, compassionate, tender, and moved), and eight of these adjectives measured personal distress (alarmed, grieved, troubled, distressed, upset, disturbed, worried, and perturbed). An empathy index was calculated by averaging participant's responses to the six empathy adjectives, and a personal distress index was calculated by averaging participant's responses to the eight personal distress adjectives (Baston et al., 1987).

Implicit Behavioral Measures

Following this task, participants completed a computer-based IAT (Implicit Association Test) to measure implicit AIDS stigma[1] (Greenwald, McGhee, & Schwartz, 1998). The purpose of the AIDS IAT was to assess unconscious bias toward PWA that may be veiled in explicit questionnaire measures due to social desirability constraints. For the AIDS IAT, participants first memorized the faces of four individuals who were previously classified as healthy and four individuals who were previously classified as having AIDS. Then, pictures of the healthy and AIDS-infected individuals were presented on the computer screen, followed by positive and negative target words. Participants were asked to categorize these target words as either positive or negative. In one block of trials, participants pressed one key for pictures of the healthy individuals and words with positive meanings and another key for pictures of the AIDS-infected individuals and words with negative meanings. In another block of trials, they pressed one key for pictures of healthy individuals and words with negative meanings and pressed a different key for pictures of AIDS-infected individuals and words with positive meanings. Implicit AIDS bias was defined as the difference in response latency between these two blocks, and as such, larger values are indicative of greater implicit bias (Greenwald et al., 1998). Measures of implicit AIDS bias were computed using the improved scoring algorithm detailed in Greenwald, Banaji, and Nosek (2003).

Self-report Dispositional Measures

Self-report questionnaires were also used to investigate the relationship between explicit attitudes toward the target groups and the behavioral and fMRI measures of pain perception and empathy. Each of these measures was completed at least one week before the testing procedure so as not to influence participants' responses to the experimental manipulations.[2] To assess participant's beliefs about AIDS and HIV, we administered Green's (1995) attitudes toward HIV scale. In addition, a 10-item Likert-type scale was administered to investigate participants' attitudes toward people who use illegal, intravenous drugs (Drug Use Questionnaire). In each of the abovementioned scales, higher scores are associated with greater endorsement of the respective characteristic (i.e., more positive attitudes toward PWA and intravenous drug users). Finally, as a manipulation check, two independent Likert-type scales asked participants to separately indicate whether the AIDS drug use and the AIDS transfusion groups were responsible for their illness (1 = *strongly disagree*, 7 = *strongly agree*) and whether they were to blame for their condition (1 = *have only themselves to blame*, 7 = *not personally responsible for their condition*). After reverse coding the "blame" item, responses were summed to create separate "blame" scales for AIDS drug and AIDS transfusion groups. Higher scores indicate greater blame for the target AIDS group.

fMRI Data Acquisition

Images were acquired using a whole-body GE 3.0-T MRI scanner (Horizon LX, Milwaukee, WI). Functional imaging was obtained using T2*-weighted gradient-echo spiral in/out pulse sequence. Forty coronal slices of 4.2 mm slice thickness with a 0.5-mm spatial gap were obtained for 160 repetitions (including three discarded acquisitions at the onset of each of two runs) using the following parameters: repetition time (TR) = 3000 msec, echo time = 28 msec, flip angle = 84°, field of view = 24 cm, matrix = 64 × 64, and in-plane resolution = 3.75 × 3.75 mm. An axial T1-weighted three-dimensional magnetization-prepared rapid acquisition gradient-echo anatomical scan was also acquired for three-dimensional localization (TR = 8 msec, echo time = 3.2 msec, flip angle = 6°, field of view = 24 cm, matrix = 256 × 192, slice thickness = 1.5 mm, 124 slices).

Data Analysis

Behavioral Data Analysis

In addition to differences due to the general stigma associated with AIDS, we predicted that attributions

of responsibility for AIDS will influence participants' perceptions of pain experienced by PWA. Accordingly, in all subsequent repeated measures ANOVAs, we decomposed the three-level within-subject factor group (AIDS transfusion, healthy, and AIDS drug use) into two orthogonal contrasts. Our first contrast of interest was designed to capture differences in pain perception due to stigma alone and as such, compared perceptions of healthy targets to perceptions of the AIDS targets combined. The orthogonal contrast concerned the distinction between AIDS transfusion and AIDS drug use and thus specifically addressed the role of attributions of responsibility in pain perception for stigmatized targets. Follow up analyses included planned pairwise comparisons designed to explore the nature of the relationship between each AIDS target group and the healthy controls.

To investigate whether implicit and explicit attitudes toward people with HIV/AIDS in general and the target groups in particular moderate pain and emotion evaluations, we performed multiple regression analyses with attitudes toward HIV, blame, and AIDS IAT variables as predictors. It was predicted that group differences in pain perception would emerge as a result of participant's implicit and explicit attitudes toward these target groups.

Image Processing and Analysis

Image processing was carried out with SPM5 (Wellcome Department of Imaging Neuroscience, London, UK), implemented in MATLAB 7.0 (Mathworks Inc., Sherborn, MA). Preprocessing of the data included correction for head motion (realignment to the first image volume), normalization to the EPI template provided in SPM5, and smoothing using a 6-mm FWHM isotropic Gaussian kernel. Event-related responses were assessed by creating fixed-effects general linear models for each subject. Regressors of interest included the target cues and the pain videos for each group (AIDS transfusion, healthy, and AIDS drug use). The pain videos comprised of 0.5 sec of neutral expression, followed by 3.0 sec of pained expression, and the 3.0-sec TR was synchronized to the onset of pain that occurred 0.5 sec into in each video clip. However, pain video regressors were analyzed at the onset of the neutral expression clip to capture the ecologically valid transition from neutral to pain.[3] Regressors were convolved with a canonical hemodynamic response function (hrf) and its temporal and dispersion derivatives. The latter derivatives were incorporated into the model to account for potential differences in neural and hemodynamic responses to the differing groups of video stimuli (Lamm et al., 2007; Friston et al., 1998). Following model estimation, contrasts were calculated for each subject to assess within-subject differences in perceptions of pain by target group. Contrasts were as follows: pain > fixation, healthy > fixation, AIDS transfusion > fixation, AIDS drug use > fixation. The resulting pairwise contrast images were then entered into second level random-effects repeated measures ANOVAs. Except where noted, a voxel-level threshold of $p < .001$ for group contrasts, uncorrected for multiple comparisons (with an extent threshold of 10 continuous voxels), was used to identify significant activity changes in pain-related regions and other regions of a priori interest based on previous fMRI studies using similar facial stimuli (Lamm et al., 2007; Saarela et al., 2007; Simon, Craig, Miltner, & Rainville, 2006; Botvinick et al., 2005). These included regions associated with theory of mind (TPJ and STS) and emotion regulation [i.e., dACC, medial prefrontal cortex (mPFC), orbital midfrontal cortex (oMFC), bilateral inferior frontal gyri (IFG)]. Activations were overlaid on a representative high-resolution structural T1-weighted image from a single subject from the SPM5 canonical image set, coregistered to the Montreal Neurological Institute (MNI) space.

In addition to whole-brain analyses, specific ROI (region of interest) analyses were computed with the MarsBaR toolbox in SPM5. To more closely examine the hypothesized differences in pain perception by target group, we selected ROIs in areas previously demonstrated to be associated with processing facial expressions of pain (Lamm et al., 2007; Saarela et al., 2007; Simon et al., 2006; Botvinick et al., 2005). These ROIs included the AI, the aMCC, the perigenu cingulate cortex (pgCC), and the periaqueductal gray (PAG). Furthermore, to explore the extent to which emotion regulation may be differentially involved in pain perception by target group, ROIs were selected in areas associated with emotion regulation and cognitive control, including the dACC, the oMFC, and the bilateral IFG (Kim & Hamann, 2007; Ochsner et al., 2002).

All ROI were functionally defined as 6-mm spherical regions (3-mm radius) centered on the subject-specific peak coordinate showing a significant main effect of pain (collapsed across group membership) versus fixation. Functional ROI coordinates overlapped corresponding anatomical regions and fell within the range of coordinates reported in two recent meta-analyses on fMRI studies on pain empathy (Jackson, Rainville, et al., 2006) and on empathy, theory of mind, and perspective taking (Decety & Lamm, 2007).

Estimates of percent signal change were extracted for each ROI by target group and were submitted to 1×3 (group: AIDS transfusion, healthy, and AIDS drug use) repeated measures ANOVAs. As with the behavioral pain ratings, the contrasts of interest within the omnibus F test concerned the distinction between the healthy and the AIDS targets combined and between AIDS transfusion and AIDS drug use targets. Follow-up analyses explored the nature of the relationship between each AIDS target group and the healthy control condition. As with the behavioral data, zero-order correlations and multiple regression analyses were performed to investigate whether implicit and explicit attitudes toward people with HIV/AIDS in general and the target groups in particular moderate

Table 1. Mean and *SD* Scores for the Dispositional Measures

	Mean (SD)	*Cronbach's α*
Attitudes toward HIV	13.8 (10.2)	.86
Blame for AIDS drug	10.4 (2.95)	.75
Blame for AIDS transfusion	2.91 (2.39)	.95
Drug Use Questionnaire[a]	26.9 (6.26)	.74
AIDS IAT	0.532 (0.278)	

[a]Items specifically related to treatment (Items 7 and 10) were deleted from the Drug Use Questionnaire to provide the adequate interitem reliability reported above.

the abovementioned hemodynamic responses to each target group.

BEHAVIORAL RESULTS

Validation of Study Assumptions

Consistent with our predictions, participants believed that PWA as a result of intravenous drug use were significantly more to blame for their condition than PWA as a result of an infected blood transfusion, $t(21) = 9.97$, $p < .001$. Results from the AIDS IAT also supported predictions about attitudes toward the target groups: the AIDS IAT showed that, on average, participants demonstrated a negative bias toward PWA relative to healthy people, $t(21) = 7.93$, $p < .001$. Descriptive statistics of these tests and the self-report measures can be viewed in Table 1.

Video Evaluations

Video evaluations were *z* transformed using the mean and the *SD* from the combined group ratings. Pain and distress VAS ratings, and the personal distress VAS ratings and personal distress and empathy scales of Baston et al. (1987) were highly correlated within group (all $r > .60$, $p < .001$). Consequently, composite pain ratings and composite emotion ratings were computed separately for AIDS transfusion, healthy, and AIDS drug use groups. No significant participant gender differences were found in pain and in emotion evaluations across group; as a result, analyses were collapsed across gender.

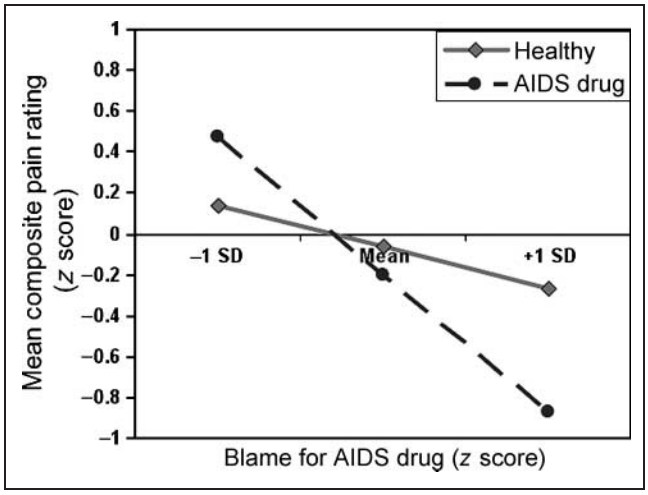

Figure 2. Effect of blame on mean composite pain ratings across groups, controlling for implicit AIDS bias and explicit attitudes toward HIV. Participants who blamed PWA as a result of drug use for their condition attributed significantly less pain to AIDS drug use individuals than healthy individuals, $t(18) = 2.83$, $p = .01$, whereas participants who did not blame PWA as a result of drug use for their condition tended to attribute more pain to AIDS drug use individuals as compared with healthy individuals, $t(18) = -1.55$, $p = .14$.

Main Effects

Analysis of composite pain ratings showed that participants rated the pain of the individuals depicted in the

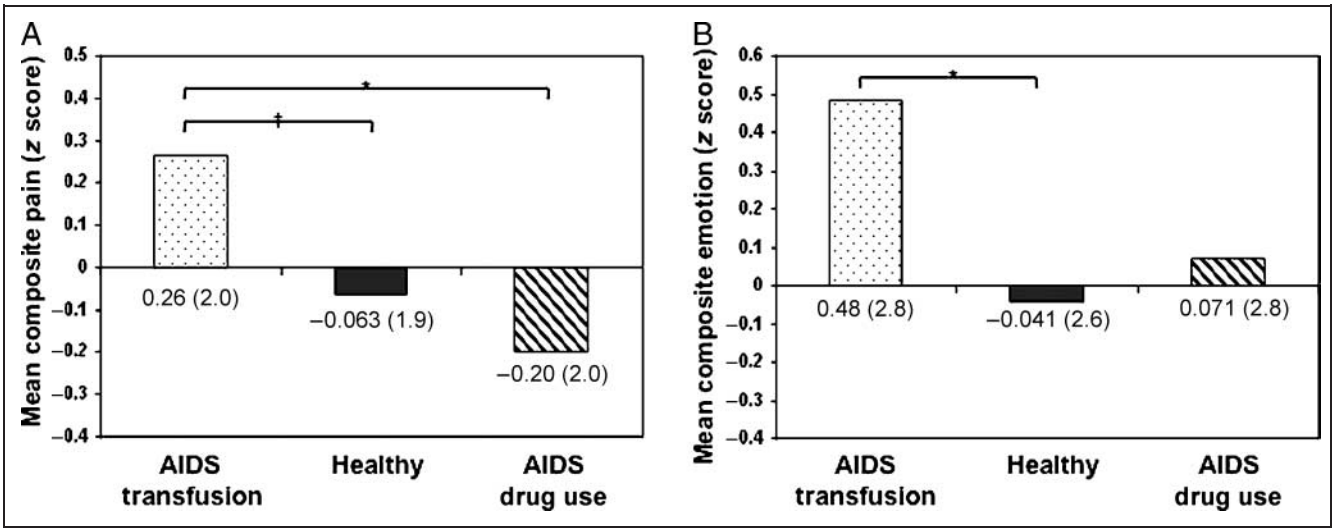

Figure 1. Means and *SD*s of video evaluations for (A) composite pain ratings (*z* score) and (B) composite emotion ratings (*z* score). Results from significant contrasts of interests are highlighted (*$p = .05$; †$p = .08$).

videos differently as a function of the target's group label. The contrast comparing perceptions of pain of healthy targets to AIDS targets was not significant, $t(21) = -0.71, p > .15$. However, in line with our attribution predictions, participants rated the pain of AIDS transfusion targets as greater than the pain of AIDS drug use targets, $t(21) = 2.18, p = .04$. Follow-up planned comparisons showed that although the pain of AIDS transfusion targets was perceived as marginally greater than that of healthy controls, $t(21) = 1.81, p = .08$, the pain of AIDS drug use targets was not perceived to be significantly different from that of healthy targets, $t(21) = 0.84, p > .15$ (Figure 1A).

Analyses of the composite emotion ratings revealed a similar but weaker effect such that participants reported a trend toward experiencing more empathy and personal distress for AIDS transfusion targets than AIDS drug use targets, $t(21) = 1.66, p = .11$. The orthogonal contrast (healthy vs. the combined AIDS targets) was significant, $t(21) = -2.57, p = .02$. However, planned comparisons showed that this effect was primarily driven by the fact that participants reported greater empathy and personal distress in response to AIDS transfusion targets than healthy targets, $t(21) = 3.10, p < .01$, whereas reactions to healthy and AIDS drug use targets did not differ, $t(21) = 0.62, p > .15$ (Figure 1B).

Moderation Analyses

When investigating the relationship between AIDS drug use predictors (i.e., AIDS IAT, attitudes toward HIV, blame for AIDS drug use, and attitudes toward drug users) and the discrepancy in pain ratings between healthy and AIDS drug use targets, only blame for AIDS drug use emerged as a significant zero-order predictor for the difference in pain ratings between healthy and AIDS drug use targets, $r = .52, p = .01$ (all other $| r | < .38, p > .15$). Moreover, when controlling for explicit attitudes toward HIV, both the AIDS IAT, $b = .33, t(18) = 2.28, p = .04$, and the blame for AIDS drug use, $b = .470, t(18) = 2.79, p = .01$, emerged as significant predictors of the difference in pain ratings between healthy and AIDS drug individuals (all other $| b | < .03, t < 1, p > .15$).[4] Thus, (a) the more participants demonstrated a negative implicit association toward PWA in general and (b) the more they explicitly reported that targets in the AIDS drug use condition were personally to blame for their condition, the less pain they attributed to AIDS drug individuals relative to healthy individuals (see Figure 2).

Similarly, only blame for AIDS drug use emerged as a marginally significant zero-order predictor for the difference in empathy and personal distress ratings between healthy and AIDS drug use targets, $r = .391, p = .07$ (all other $| r | < .26, p > .15$). However, when controlling for explicit attitudes toward HIV and AIDS IAT, the effect of blame for AIDS drug use, $b = .36, t(18) = 1.61, p = .13$ (all other $| b | < .2, t < 1, p > .15$) was reduced and emerged as a trending predictor of the difference in empathy and personal distress ratings between healthy and AIDS drug individuals.[5] Thus, the more participants reported that targets in the AIDS drug use condition were personally responsible for their stigma, the less likely they were to express empathy and personal distress while observing those targets relative to healthy targets (see Figure 3).

Notably, neither implicit AIDS bias (AIDS IAT), explicit attitudes toward HIV, or blame for AIDS transfusion did not emerged as a significant predictors of the difference between AIDS transfusion and healthy targets on either composite pain ratings or composite emotion ratings, $| b | < .2, t < 1, p < .15$.

fMRI RESULTS

Network of Areas Involved in the Processing of Pain

Collapsing across group, analyses showed that observing individuals in pain was associated with activation in a number of regions involved in the processing of the sensory and affective content of the videos. Bilateral activation was detected in the medial and lateral occipital cortex, including the fusiform gyrus. In addition, increased hemodynamic activity was found in the neural circuit underpinning first-hand processing of pain, including AI, dACC, supplementary motor cortex, and PAG. Activation was also observed in the pgCC and oMFC and bilaterally in the IFG, mPFC, TPJ, and STS (see Table 2). Similar patterns of activity were also observed when comparing each target group to fixation baseline.

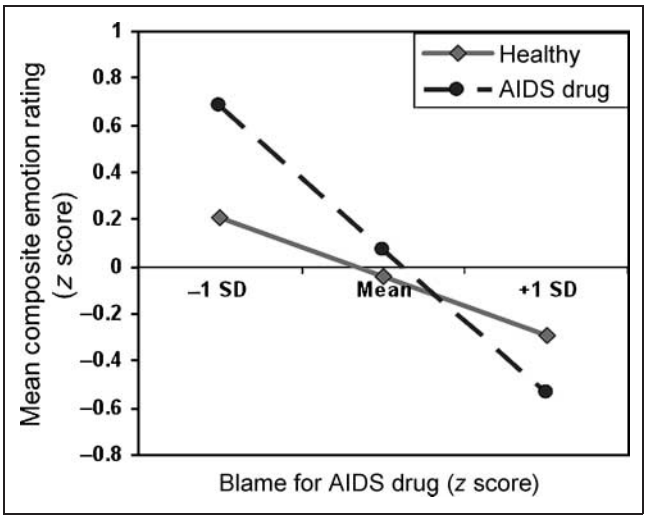

Figure 3. Effect of blame on mean composite emotion ratings across groups, controlling for implicit AIDS bias and explicit attitudes toward HIV. Participants who did not blame PWA as a result of drug use for their condition tended to experience more empathy and personal distress in response to the pain of AIDS drug use individuals than healthy individuals, $t(18) = -1.66, p = .12$. No mean differences in composite emotion ratings where observed between AIDS drug use and healthy individuals for participants who blamed AIDS drug use individuals for their condition.

Table 2. Regions That Demonstrate Significant Hemodynamic Signal Change during the Observation of Targets in Pain Collapsed across Group, as Compared with Baseline Fixation Cross ($p < .001$, $k > 10$)

	MNI Coordinates			
Brain Regions	*x*	*y*	*z*	*t*
R AI	36	24	−8	4.50
L AI	−26	30	0	3.75
	−40	26	−4	3.60
	−26	26	−10	3.70
R perigenual cingulate cortex	8	40	2	3.73[a]
R dACC	2	30	36	3.82
L medial pFC	−2	42	26	4.13
L superior frontal gyrus/L dorsal aMCC	−6	18	52	4.02[a]
R superior frontal gyrus/dorsal midcingulate cortex	12	−2	58	3.82[a]
L orbital midfrontal gyrus	−4	34	−22	3.85[a]
L IFG	−52	24	0	4.68
	−46	24	20	5.40
R IFG	52	32	4	6.65
	50	20	24	3.72
R temporal-parietal junction/midtemporal gyrus	60	−38	−4	3.02
	62	−50	0	4.07
R middle temporal gyrus	50	−10	−18	3.62
R fusiform gyrus	38	−70	−14	4.91
L fusiform gyrus	−34	−62	−14	3.75
R PAG	2	−22	−12	4.76[a]

L = left hemisphere; R = right hemisphere.

[a]$k = 0$.

ROI Associated with Pain Perception

Right AI

The contrast comparing hemodynamic activation in the right AI between healthy and AIDS targets was not significant, $t(21) = 1.21$, $p > .15$. However, the orthogonal contrast between AIDS transfusion and AIDS drug use showed significantly greater hemodynamic activity in the right AI in response to the pain of AIDS transfusion targets as compared with AIDS drug use targets, $t(21) = 2.45$, $p = .02$. Follow-up analyses showed marginally more right AI activity when participants viewed AIDS transfusion as compared with healthy targets, $t(21) = 1.95$, $p = .07$, and when viewing healthy targets as compared with AIDS drug use targets, $t(21) = 1.94$, $p = .07$.

Anterior Midcingulate Cortex

The contrast comparing aMCC activity when observing the pain of healthy and AIDS targets combined was not significant, $t(21) = 0.084$, $p > .15$. However, significant signal change was detected in the aMCC when participants watched painful facial expressions of AIDS transfusion targets as compared with AIDS drug use targets, $t(21) = 2.59$, $p = .02$. As expected, significantly more aMCC activity was found when participants viewed healthy targets as compared with AIDS drug use targets, $t(21) = 2.09$, $p = .05$. No significant signal change was detected in the aMCC when participants viewed AIDS transfusion and healthy targets, $t(21) = 1.00$, $p > .15$ (Table 3).

Periaqueductal Gray

A nonsignificant trend was found in the PAG in response to the pain of AIDS transfusion targets as compared with AIDS drug use targets, $t(21) = 1.57$, $p = .13$. Interestingly, the orthogonal contrast comparing PAG activity between healthy and AIDS targets was significant, $t(21) = -2.33$, $p = .03$; however, this result was primarily due to a significant difference in PAG activity between AIDS transfusion

Table 3. Mean Coordinates, Descriptive Statistics, and Results for Nine 1 × 3 (Group: Healthy, AIDS Transfusion, and AIDS Drug Use) Repeated Measures ANOVAs Comparing Average Percent Signal Change When Observing Pain > Fixation across Group Condition

		MNI Coordinates			*Group Mean (SD)*			
Brain Region		*x*	*y*	*z*	*Healthy*	*AIDS Transfusion*	*AIDS Drug Use*	*F*
AI	R	38	21	−4	3.44 (3.08)	4.90 (4.93)	2.94 (2.67)	4.90**
	L	−33	22	−3	3.31 (2.90)	3.83 (4.33)	3.16 (2.69)	0.66
aMCC	R	6	23	26	4.21 (4.34)	5.06 (5.44)	3.27 (3.75)	3.43*
pgCC	R	7	41	6	3.65 (3.53)	4.17 (5.05)	2.81 (2.88)	1.66
dACC	R	2	42	25	4.23 (3.46)	4.87 (3.41)	3.70 (2.55)	1.73
PAG	R	2	−28	−18	3.22 (3.33)	4.88 (5.42)	3.56 (3.18)	3.23*
oMFC	R	1	43	−15	3.96 (4.01)	4.72 (5.33)	4.35 (5.26)	0.67
IFG	R	48	26	7	5.88 (3.00)	7.76 (6.29)	6.08 (4.23)	2.48***
	L	−46	20	9	5.91 (6.07)	6.45 (5.93)	6.12 (4.77)	0.19

Coordinates by subject are available upon request.

*p = .05.

**p = .01.

***p = .10.

and healthy targets, $t(21) = 2.29$, $p = .04$, as PAG activity when watching healthy and AIDS drug use targets was not significantly different, $t(21) = -0.836$, $p > .15$ (Figure 4).

ROI Associated with Emotion Regulation

Right IFG

A similar pattern of results was observed in the right IFG: A nonsignificant difference was observed in the right IFG in response to the pain of AIDS transfusion targets as compared with AIDS drug use targets, $t(21) = 1.49$, $p = .15$. The orthogonal contrast comparing right IFG activity between healthy and AIDS targets was marginally significant, $t(21) = 1.80$, $p = .09$, due to a marginally significant difference in right IFG activity between AIDS transfusion and healthy targets, $t(21) = 1.93$, $p = .07$. Right IFG activity when watching healthy and AIDS drug use targets did not significantly differ, $t(21) = -0.33$, $p > .15$.

ROI Moderation Analyses

When investigating the relationship between the AIDS drug use predictors (i.e., AIDS IAT, attitudes toward HIV, blame for AIDS drug use, and attitudes toward drug users) and the hemodynamic activity observed when viewing AIDS drug use targets, AIDS IAT emerged as a

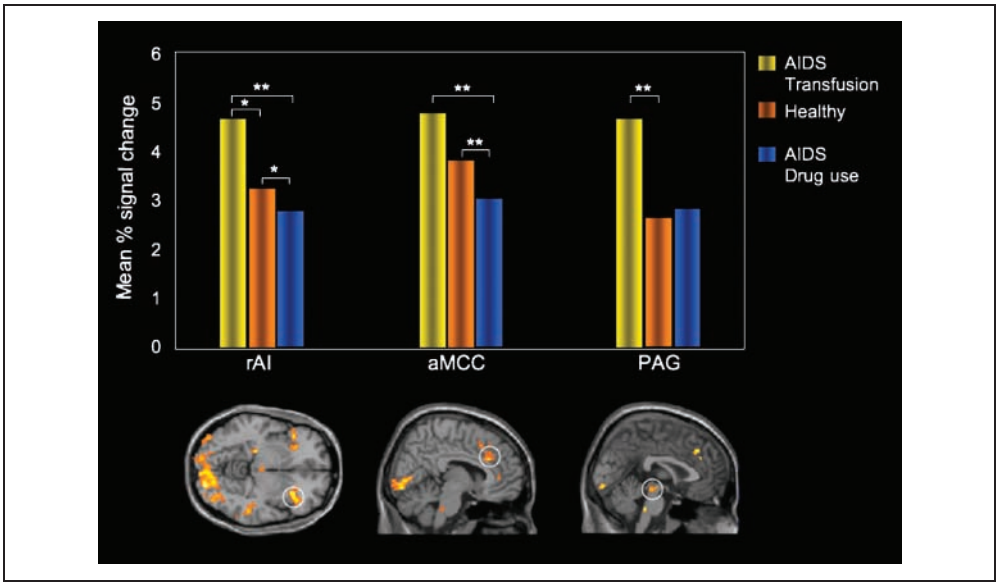

Figure 4. ROI demonstrating significant differences in percent signal change by target group. Results from significant contrasts of interests are highlighted (*$p \leq .05$; **$p < .10$).

significant zero-order predictor for activity in the right IFG ($r = .45$, $p = .04$) and attitudes toward drug use emerged as a significant zero-order predictor for activity in the mPFC ($r = .65$, $p = .001$; all other regions $| r | < .38$, $p > .08$). However, when the aforementioned AIDS drug use predictors were included in multiple regression analyses to assess whether they moderated the difference in hemodynamic activity between healthy and AIDS drug use targets, no significant predictors emerged for any of the ROI investigated (all $t < 1$, $p > .15$).

Notably, when investigating the relationship between the AIDS transfusion predictors (i.e., AIDS IAT, attitudes toward HIV, blame for AIDS transfusion) and the hemodynamic activity observed when viewing AIDS transfusion targets, only attitudes toward HIV emerged as a significant zero-order correlate for hemodynamic activity in the dACC when watching AIDS transfusion individuals ($r = .42$, $p = .05$; all other regions $| r | < .39$, $p > .08$). Moreover, when controlling for blame for aids transfusion and AIDS IAT, attitudes toward HIV emerged as a significant predictor for the difference in hemodynamic activity between healthy and AIDS transfusion individuals in the left AI, $b = -1.7$, $t(18) = -2.4$, $p = .03$, all other $| b | < 1$, $t(18) < .15$, and dACC, $b = -1.7$, $t(21) = -3.2$, $p < .01$ (all other $| b | < 1.3$, $p < .15$). Furthermore, the difference in hemodynamic activity observed in the PAG when viewing healthy controls as compared with AIDS transfusion remained significant when controlling for these AIDS transfusion predictors, $b = -1.7$, $t(21) = -2.3$, $p = .04$ (all other $| b | < 1.1$, $p < .15$). Thus, the more participants expressed positive attitudes toward HIV, the more hemodynamic activity was observed in the left AI, dACC, and PAG when viewing AIDS transfusion individual as compared with healthy controls.

DISCUSSION

When witnessing another person experiencing pain, the scope of observer's reaction can range from concern for personal safety, including feelings of alarm, fear, and avoidance, to concern for the other person, including compassion, sympathy, and caregiving (Goubert et al., 2009). It is important to explore the interpersonal factors that affect one's perceptions of pain to understand and to predict how an observer will empathize and react to another's distress. Using both behavioral and brain measures, the present investigation explored whether an observers' perception of a target's pain was modulated by stigmatization of the target and whether the target bore responsibility for his or her stigmatized status.

Attributions of Responsibility and Empathy for Pain

Consistent with our hypothesis regarding attributions of responsibility for one's stigmatized status, behavioral results showed that participants were significantly more sensitive to the pain of targets who were not responsible for their stigmatized condition (people who contracted AIDS as the result of a blood transfusion) than either controls (healthy individuals) or targets who were held responsible for their condition (those who contracted AIDS through illegal drug use). In addition, participants expressed more empathy and personal distress in response to the pain of people who were not responsible for their stigmatized condition as compared with controls. Importantly, the differences between reactions to healthy controls and targets that were held responsible for their condition depended on individual differences in attributions of blame. The more participants blamed AIDS drug use targets for their condition, the less pain and empathy they reported when viewing their distress (compared with controls).

Demonstrating congruence across behavioral and functional neuroimaging methodologies, these video evaluations were supported by the modulation of the hemodynamic response by target group. ROI analyses in areas previously associated with both first- and second-hand pain perception showed significant differences in percent signal change between AIDS transfusion, healthy, and AIDS drug use targets. Participants demonstrated the greatest hemodynamic activity in areas involved in pain resonance when viewing AIDS transfusion individuals, often responding more to these targets than to either the healthy controls or the AIDS drug use targets. By contrast, the AIDS drug use targets prompted lower levels of resonance than the control condition in the aMCC. Combined, results indicated that attributions of responsibility moderated both the explicit evaluations and the hemodynamic activity underlying empathic resonance.

Substantial behavioral evidence has shown that individuals demonstrate negative attitudes toward AIDS victims, particularly those who are considered to be responsible for their disease (i.e., Devine, Plant, & Harrison, 1999; Weiner et al., 1988). The present investigation demonstrates that this negative evaluation may affect the perception of these targets' pain. These findings suggest that the perception of pain is not the exclusive domain of automatic bottom–up processing of nociceptive information (Fan & Han, 2008; Preston & de Waal, 2002), but that somatic sensorimotor resonance is profoundly modulated by top–down considerations, including how observers conceptualize both the situation and the person who is expressing pain. It is interesting to note, however, that different patterns of variables predicted participant's behavioral and brain responses (i.e., blame for AIDS drug use predicted a decreased sensitivity to the pain of AIDS drug use targets in behavioral pain ratings, but not in areas of the brain associated with pain processing). Additional research is necessary to elucidate the complex relationship between cover and overt information processing in social cognition.

AIDS Transfusion: A Special Case

Notably, the abovementioned differences in pain and empathy ratings between controls (healthy) and stigmatized

targets that were not held responsible for their condition (AIDS transfusion) remained even when controlling for either implicit or explicit attitudes about PWA. In fact, positive attitudes toward AIDS were associated with increased hemodynamic activity in the areas associated with pain processing when viewing AIDS transfusion targets only as compared with controls. This may indicate that AIDS transfusion targets were considered to be a subtype of the general AIDS category and, thus, viewed as not representative of the stigmatized group as a whole (Hewstone, Macrae, Griffiths, & Milne, 1994). As such, the pain of AIDS transfusion individuals may have warranted additional sympathy and understanding relative to healthy controls as befitting their objectively disadvantaged health situation.

In corroboration with this hypothesis, we found trends in neural regions associated with emotion regulation (Posner, Rothbart, & Sheese, 2007; Ochsner et al. 2002) when viewing AIDS transfusion targets as compared with other target groups. Participants tended to exhibit more signal change in the right inferior frontal cortex when viewing AIDS transfusion individuals relative to AIDS drug use individuals. In line with the hypothesis that AIDS transfusion targets were subtyped within the AIDS category and not stigmatized per se, this trend may indicate the relative increase in cognitive control required to process AIDS transfusion targets as a disadvantaged group worthy of sympathy and understanding (over and above that of healthy controls). Future research will need to address the relative contribution of top–down and bottom–up factors that modulate the pain resonance system.

AIDS Stigma and Empathy for Pain

Our hypothesis predicting reduced hemodynamic activity toward stigmatized targets in general as compared with healthy controls was not supported by either behavioral nor neuroimaging data, as evidenced by a series of nonsignificant differences in video evaluations and underlying hemodynamic activity between the healthy targets and the AIDS targets combined. Instead, effects appear to be primarily driven by attributions of responsibility for acquiring said stigma. However, it is possible that the effect of attributions of responsibility was particularly emphasized in this investigation by a design that explicitly blocked AIDS transfusion and AIDS drug use targets separately from healthy targets. This may have biased observers to treat AIDS transfusion and AIDS drug use targets as separate entities and reduced the emphasis on the general stigma associated with AIDS. It is possible that when confronted with an AIDS victim in a real-world setting, (i) how the individual contracted the disease will not be readily apparent, and (ii) such attributions of responsibility may not modulate how the individual is perceived to the same extent as observed in this investigation.

On a related note, previous studies investigating the neurological underpinnings of stigma have examined how such stimuli elicit disgust-like reactions in the observer and as such result in activation in the amygdala (e.g., Krendl, Macrae, Kelley, Fugelsang, & Heatherton, 2006). Our data do not appear to elicit this visceral response, potentially due to (a) the length of our stimuli presentation, (b) the abovementioned fact that general stigma associated with AIDS stigma was not emphasized in the design of this experiment, and (c) that instead of using visually arousing stimuli, all of the targets in the video clips shared many visual characteristics with the participants themselves (i.e., targets were age matched to a college sample, white, etc.). Instead, in the current investigation, a target's stigmatization was communicated by a simple word label and thus was not necessarily expected to generate an automatic avoidance response.

Limits of the Current Investigation and Future Directions of Research

In addition to the design constraints outlined above, there are other features of the present investigation that should be taken into account when considering the external validity of the findings. For example, a limitation of this investigation may lie in the explicit measurement of AIDS bias and intravenous drug use. In such a liberal intellectual community as the University of Chicago, both explicit (i.e., rules and regulations of conduct) and implicit social norms exist that endorse empathy and censure prejudice. Thus, it is possible that a self-presentation bias may have prevented participants from reporting the true extent of their feelings toward PWA and intravenous drug users on the self-report measures, video evaluations, and even in their resonance to the targets' pain. This self-presentation bias may have particularly influenced participants' responses to AIDS drug use targets as compared with healthy controls and may have contributed to the lack of mean level differences between these groups on most behavioral and hemodynamic measures. This self-presentation bias, should it exist, could limit the likelihood of detecting and replicating a significant relationship between explicit measures of empathy and prejudice and behavioral and hemodynamic responses toward different groups of people expressing pain.

Further, participants were primarily young adults drawn from the student population of the University of Chicago, a private postsecondary education institution. As Herek (1999) states that "younger and better educated respondents consistently manifest lower levels of AIDS stigma than older respondents and those with lower education" (p. 1104), it is possible that the attitudes toward persons with AIDS generally, and AIDS drug use in particular, reflected in this study are more liberal than the attitudes of the general population. The fact that the current investigation did result in significant differences in pain resonance across stigmatized target group despite these population and design considerations may speak to the strength of the reported findings. However, this is an empirical question that should be investigated by

selecting a larger and more representative sample of the population as a whole.

Finally, the present investigation explored how individual differences in attitudes and attributions of responsibility moderated participants' perceptions of pain, operationalized by both explicit video evaluations and somatosensory resonance observed during fMRI. However, it is yet unclear as to how this shared perception (or lack thereof) is related to the documented helping disparities between in- and out-group members (i.e., Stürmer et al., 2006). Thus, future directions of research will attempt to directly relate shared resonance and empathic accuracy to helping behaviors for both in- and out-group members.

Conclusion

By employing a unique combination of attitudinal, behavioral, and functional neuroimaging measures, the present investigation explored the effect of attributions of responsibility and social stigma on empathy for pain. It is the hope that such an interdisciplinary perspective will reveal manifestations of congruence (and incongruence) between attitudes, behavior, and the brain and will provide important insight in current models of empathy and pain processing.

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Notes

1. To investigate whether participant's behavioral or hemodynamic responses to the PWA were influenced by a bias against homosexuality (a characteristic previously associated with HIV/AIDS), we conducted a sexuality IAT to measure implicit bias against homosexuality. Although results showed that participants demonstrated a negative bias toward homosexuality relative to heterosexuality, $t(21) = 3.24$, $p < .003$, implicit homosexuality bias failed to predict the difference in pain or emotion ratings or hemodynamic activity between healthy and AIDS drug use targets or healthy and AIDS transfusion targets.
2. To investigate whether dispositional empathy, emotion contagion, or motivation to control prejudice moderated participants empathic resonance to the targets by group, we administered the perspective-taking subscale of the Interpersonal Reactivity Index (Davis, 1994), the Emotion Contagion Scale (Doherty, 1997), and an AIDS-specific version of Plant and Devine's (1998) five-item Internal Motivation to Control Prejudice Questionnaire. However, these trait variables failed to predict the difference in pain or emotion ratings, or hemodynamic activity between healthy and AIDS drug use targets or healthy and AIDS transfusion targets. Furthermore, these trait variables failed to significantly mediate the pattern of responses observed in all multiple regression analyses.
3. Pain video regressors were also modeled beginning at the pain expression 0.5 sec after the onset of the clip, yielding similar results with slightly smaller signal strength.
4. AIDS IAT and blame for AIDS drug use remained significant predictors of the difference in composite pain ratings between healthy and AIDS drug individuals when controlling for attitudes toward drug use.
5. The addition of the attitudes toward drug use scale to the model increases the significance of blame for AIDS drug use as a predictor to from $p = .13$ to $p = .05$.

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