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The Neural Bases of Feeling Understood and Not Understood

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Abstract

Past research suggests that feeling understood enhances both personal and social well-being. However, little research has examined the neurobiological basis of feeling understood and not understood. The current paper addressed these gaps by experimentally inducing felt understanding and not understanding as participants underwent functional magnetic resonance imaging (fMRI). The results demonstrated that feeling understood activated neural regions previously associated with reward and social connection (i.e., ventral striatum and middle insula), while not feeling understood activated neural regions previously associated with negative affect (i.e., anterior insula). Both feeling understood and not feeling understood activated different components of the mentalizing system (feeling understood: precuneus and temporoparietal junction; not feeling understood: dorsomedial prefrontal cortex). Neural responses were associated with subsequent feelings of social connection and disconnection and were modulated by individual differences in rejection sensitivity. Thus, this study provides insight into the psychological processes underlying feeling understood (or not) and may suggest new avenues for targeted interventions that amplify the benefits of feeling understood or buffer individuals from the harmful consequences of not feeling understood.

Every day, thousands of individuals visit the website "Experience Project" to share their personal experiences. The nodes of this social network are organized by life experiences (e.g., surviving a divorce, fighting cancer), and members can share their stories with others who have had encountered similar events. The slogan for the website is "Find people who understand you" and this goal seems to appeal to many, as the website reports that over 33 million experiences have been shared. But why is feeling understood so appealing? One possibility is that feeling understood provides us with the sense that we are socially connected and not alone, whereas not feeling understood may make us feel socially rejected and isolated.

Indeed, much of human behavior is driven by the need to belong and the desire to connect with others (Baumeister & Leary, 1995; Cacioppo & Patrick, 2008; Lieberman & Eisenberger, 2008). Findings across social psychology, neuroscience, and health psychology all suggest that social connection is rewarding and salubrious (Cohen, 2004; Eisenberger, 2013; Inagaki & Eisenberger, 2011, 2013), while social disconnection is aversive and detrimental to mental and physical health (Cacioppo & Patrick, 2008; Hawkley, Burleson, Berntson, & Cacioppo, 2003; Whisman, Sheldon, & Goering, 2000). Although these studies have consistently demonstrated that interpersonal connections bolster happiness and health, it is unclear what specific social interactions produce these robust effects.

Past research suggests that feeling understood by others may be a critical component of social connection, enhancing both personal and social well-being (Cahn, 1990; Oishi, Krochik, & Akimoto, 2010; Reis, Clark, & Holmes, 2004; Reis & Shaver, 1988; Reis, Sheldon, Gable, Roscoe, & Ryan, 2000; Swann, 1990). For example, on days participants felt more understood during social interactions, they also felt most closely connected with others and more satisfied with their life (Lun, Kesebir, & Oishi, 2008; Reis et al., 2000). In interactions between strangers, felt understanding enhanced interaction satisfaction and partner liking (Cross, Bacon, & Morris, 2000), as well as decreasing negative affect (Seehausen, Kazzer, Bajbouj, & Prehn, 2012) and perceived pain (Oishi, Schiller, & Gross, 2013). In close relationships, felt understanding has been shown to foster intimacy, trust, and relationship satisfaction, in addition to diminishing stress and boosting positive affect and life satisfaction (Gable, Gonzaga, & Strachman, 2006; Gable, Reis, Impett, & Asher, 2004; Laurenceau, Barrett, & Pietromonaco, 1998; Lippert & Prager, 2001; Oishi, Koo, & Akimoto, 2008; Reis et al., 2004). In contrast, not feeling understood degrades social relationships and personal well-being, leading to reduced liking, relationship breakups, negative affect, and less satisfaction with life (Butler et al., 2003; Gable et al., 2006; Lun et al., 2008; Oishi et al., 2010).

Given the importance of felt understanding for well-being, it is critical to establish the neural bases of feeling understood and not understood and link these neural signatures to interpersonal and intrapersonal outcomes. However, to our knowledge, no studies have examined these critical questions. Further, although studies have shown that individual and cultural differences impact felt understanding (Cross et al., 2000; Lun et al., 2008; Oishi et al., 2010), it is unclear how these individual differences are instantiated in the brain when feeling understood and not understood. The current study addressed these gaps by experimentally inducing felt understanding and not understanding as participants underwent functional magnetic resonance imaging (fMRI). Critically, our analyses examined neural regions that track with participants' subjective ratings of felt understanding. Further, we tested whether these subjective ratings of felt understanding were associated with subsequent interpersonal closeness with interaction partners (i.e., liking). Lastly, we examined whether individual differences in rejection sensitivity altered neural responses to understanding and non-understanding feedback from others.

Due to the paucity of neural work on feeling understood and not understood, it is difficult to make precise predictions. However, a large body of work on neural responses to various forms of social connection and disconnection suggest several candidate regions. For example, when individuals receive positive feedback from others (Izuma, Saito, & Sadao, 2008,2010) or receive loving messages from close others (Inagaki & Eisenberger, 2013), reward-related regions (e.g., ventral striatum, VS) are activated. In addition, some research suggests that experiencing physical and emotional closeness with others or viewing close others activates the middle insula (Bartels & Zeki, 2004; Eisenberger, Inagaki, Muscatell, Haltom, & Leary, 2011; Inagaki & Eisenberger, 2013; Olausson et al., 2002). Thus, we predicted that felt understanding may boost feelings of social closeness and activate VS and middle insula. In contrast, we predicted that not feeling understood may create social distance and activate neural regions previously associated with social disconnection. More specifically, past research demonstrates that social rejection and negative social feedback activate the dorsal anterior cingulate cortex (dACC) and anterior insula (AI) (Eisenberger et al., 2011; Eisenberger, Lieberman, & Williams, 2003; Kross, Egner, Ochsner, Hirsch, & Downey, 2007). Therefore, not feeling understood may activate the dACC and AI, with trait differences in rejection sensitivity amplifying neural responses in these regions.

Methods

Participants

Informed consent was obtained from 35 healthy UCLA undergraduates during an initial behavioral session. 21 of these students met criteria for the fMRI scanning session (i.e., right-handed, no metal, no psychoactive medications) and were scanned approximately one week later. One student was excluded from analyses due to a brain abnormality; a second student was excluded due to severe problems with normalization. Of the remaining 19 students, 9 were male and 10 were female (mean age =18.9 years, *SD* = 1.15). The sample was 37% Caucasian, 47% Asian American, and 16% Latino/a.

Initial Behavioral Session

Before arriving at the lab, participants were asked to write a paragraph on SurveyMonkey for each of the 6 most positive and 6 most negative events in their life that they were willing to discuss in a lab setting and while being videotaped (following the procedure used by Zaki and colleagues (2008)). In addition, they gave each event a short title and rated its emotional intensity on a 9-point likert scale. Before the lab session, the experimenter selected the four most intense positive and four most intense negative events and pseudorandomized the order of events, such that no more than two positive or two negative events occurred in a row.

Once participants arrived at the lab, they were asked to videotape themselves while describing the details and emotions they experienced during each of the eight pre-selected events. Critically, participants were told that no one would see these videos, but the participants themselves. For each event, participants were asked to read their own paragraph about the event, spend one minute reliving the event, self-record a video approximately two minutes long describing the event, and then rate how emotionally intense they felt while talking about the event. Some example positive events were acceptance into UCLA, a surprise birthday party, and winning a scholarship; some example negative events were failing a class, getting bullied, and a romantic breakup.

While the experimenter prepared the videos for playback, participants completed the Sensitivity to Rejection Scale (Mehrabian, 1970). Participants then watched each of their videos and continuously rated the affective valence they felt while discussing the event, using a digital sliding scale ranging from *very negative* (1) up to *very positive* (9). Finally, participants were asked for their permission to have other UCLA students watch their videos in the upcoming week. In reality, no UCLA students ever watched their videos.

In the week between the behavioral session and fMRI scanning session, the experimenters used the participants' videos and continuous ratings to create short, emotionally intense video clips with a significant upshift or downshift in self-reported valence for positive and negative events, respectively. More specifically, a clip was selected from a positive event if the continuous ratings were above the midpoint and showed an increase of two points or more in a 20-second time period (e.g. ratings from 5 → 7 or 6 → 9). In contrast, a clip was selected from a negative event if the ratings were below the midpoint and showed a decrease of two points or more in the 20-second time period (e.g., ratings from 5 → 2 or 3 → 1). Using iMovie, we then spliced these time periods from the full-length videos. For each participant, all video clips were reviewed by two independent judges and assessed for perceived emotional intensity (i.e., strong facial and verbal expressions of emotion) and comprehensibility. After discussing and resolving discrepancies, judges then selected two positive and two negative clips (each from a separate full-length video) to include in the fMRI task. Participants who did not have enough clips that met these criteria were not invited to participate in the fMRI scanning session.

fMRI Task

Before entering the scanner, participants were told that several UCLA students had come into the lab over the past week and that each student randomly viewed one of the participant's eight videos. The experimenter then told participants that they would see how different students responded to each of their videos, that two responses per video would be shown, and that these students' responses were intentionally selected due to their different reactions to the same video.

Next, participants were shown photos of the supposed UCLA students and told that each student responded to their video by choosing three sentences from a list of provided sentences. Lastly, participants were familiarized with the structure of the experiment and given instructions about how to make responses in the scanner.

During the fMRI task, participants believed they were seeing how other UCLA students (i.e., responders) responded to two of their positive videos and two of their negative videos. For each of these four videos, participants saw responses from two different students that were intended to make the participant feel either understood or not understood. Participants saw a total of four "Understood" blocks and four "Not Understood" blocks. Each participant saw these blocks in one of five pseudorandomized orders.

In each block for the Understood and Not Understood conditions (Figure 1), participants saw: (1) the title of their event for 2 seconds (2) a short video clip of their event for 20 seconds cued in on a moment of high emotionality (3) a cue that they were about to see a student's response (e.g., "Student 1") for 1 second (4) the three sentences the responder supposedly chose in response to their video (each shown for 5 seconds with a 0.5 second transition between sentences), (5) a rating scale for how understood they felt for 4 seconds, and (6) a fixation cross for 12 seconds.

As described previously, the title of the event and video clip were drawn from each participant's initial behavioral session. The responders' three sentences for each of the "understood" or "not understood" blocks were generated by the authors and behaviorally piloted to verify that participants did indeed feel understood or not (Gable et al., 2004; Reis et al., 2004; Reis et al., 2000). Some examples of understanding sentences included: "I know exactly how you felt," "I understand why that affected you a lot," and "I get why you responded like that."

Some examples of sentences that were not understanding included: "I don't get why you reacted like that," "I would feel differently in that same situation," and "I don't understand why you felt that strongly." After viewing the three sentences from the responder, participants then rated how understood they felt on a scale from *not at all* (1) up to *quite a bit* (4).

Post Scanner Ratings

After exiting the scanner, participants were asked to provide additional ratings about their experiences in the scanner. Therefore, participants were re-shown the title of each event followed by the responders' three sentences for both the Understood and Not Understood conditions. After each block, participants were asked to rate how they felt in response to seeing the feedback on a scale from *very negative* (1) up to *very positive* (9). To assess how much the participant liked the responder, we asked participants to rate (1) how much they liked the responder, (2) how warmly they felt towards the responder and (3) whether they would want to spend time with the responder.

fMRI Acquisition and Data Analysis

Scanning was performed on a Siemens Trio 3T at the UCLA Ahmanson-Lovelace Brain Mapping Center. The MATLAB Psychophysics Toolbox version 7.4 (Brainard, 1997) was used to present the task to participants and record their responses. Participants viewed the task through MR compatible LCD goggles and responded to the task with a MR compatible button response box in their right hand. For each participant, 278 functional T2*-weighted echo planar image volumes were acquired in one run (slice thickness = 3 mm, gap = 1 mm, 36 slices, TR=2000 ms, TE=25 ms, flip angle=90°, matrix= 64x64, FOV=200 mm). A T2-weighted, matched-bandwidth anatomical scan (slice thickness = 3 mm, gap = 1 mm, 36 slices, TR=5000 ms, TE=34 ms, flip angle=90°, matrix= 128x128, FOV=200 mm) and a T1-weighted, magnetization-prepared, rapidacquisition, gradient echo (MPRAGE) anatomical scan (slice thickness = 1 mm, 192 slices, TR = 2170 ms, TE = 4.33 ms, flip angle = 7°, matrix = 256 × 256, FOV = 256 mm) were also acquired.

In SPM8 (Wellcome Department of Imaging Neuroscience, London), all functional and anatomical images were manually reoriented, realigned, co-registered to the MPRAGE, and normalized using the DARTEL procedure. First-level effects were estimated using the general linear model. 16-second blocks (i.e., three sentences of feedback from the responder for 5 seconds each with .5 seconds in between sentences) were modeled and convolved with the canonical (double-gamma) hemodynamic response function (HRF). The model included four regressors of interest: Positive Event-Understood, Negative Event-Understood, Positive Event-Not Understood, and Negative Event-Not Understood. The title for the event, the video clips, the rating scales and the standard six motion parameters were included as nuisance regressors. Based on a custom tool for assessing how different high-pass filters affect the estimation efficiency of an SPM design matrix, the time series was high-pass filtered using a cutoff period of 140 s. Serial autocorrelations were modeled as an AR(1) process.

Random effects analyses of the group were computed using the contrast images generated for each participant (Friston, Holmes, Price, Büchel, & Worsley, 1999). Because our study is the first paradigm to examine the neural correlates of feeling understood and not understood, whole-brain group-level analyses were performed using an uncorrected *p*-value of <.005 with a cluster threshold of 25. For visualization of results, group contrasts were overlaid on a surface representation of the MNI canonical brain using MRIcron (Rorden, Karnath, & Bonilha, 2007).

Results

Behavioral Results

Manipulation check. To assess participants' affective response in each condition, we examined in-scanner ratings of how understood participants felt, as well as post-scanner ratings of how positive/negative they felt in response to seeing the responders' feedback. Using a hierarchical linear model, we found that felt understanding was positively associated with positive affect over the eight different blocks (B = 1.54 , SE B = .12, p < .001) Therefore, we computed a "felt understanding" composite that averaged these two ratings together. We then conducted a repeated measures 2 x 2 analysis of variance with emotional event (positive, negative) and feedback type (understanding, not understanding) as the two independent variables. The main effect of emotional event (F(1,18) = 2.76, *ns*) and the interaction (F(1,18) = .02, *ns*) were not significant. However, the main effect of feedback type was significant, F(1,18) = 216.71, p < .001; participants felt more understood in the 'Understood' condition (M = 5.42, SD = 0.62) compared to the 'Not Understood' condition (M = 2.04, SD = 0.59). Thus, the participants' subjective ratings of felt understanding confirm that the experimental manipulation was effective.

Consequences of feeling understood. To test our hypothesis that feeling understood would increase liking for the responder, we examined these relationships within each participant across the eight blocks. For each of the eight blocks, a composite measure of liking was created by averaging together participants' ratings of liking, warmth, and willingness to spend time with each responder. Then, using a hierarchical linear model, we examined if felt understanding would covary with liking over the eight different blocks. In the within-subjects analyses, felt understanding showed a significant positive relationship with liking (B = .89 , SE B = .08, p < .001). Taken together, these analyses suggest that feeling understood by someone may increase interpersonal closeness, while not feeling understood may create social distance.

Individual differences and felt understanding. To test whether trait rejection sensitivity (RS) would impact felt understanding, we conducted several correlational analyses. First, averages for the felt understanding composite in the Understood and Not Understood condition were computed. Analyses then focused on whether RS would correlate with felt understanding in each condition. RS showed a marginal negative correlation with felt understanding in the Not Understood condition (r = -0.42, p = 0.07), suggesting that participants who are sensitive to rejection felt less understood when receiving the same negative feedback as other participants. However, RS was not significantly correlated with felt understanding in the Understood condition (r = 0.15, *ns*). Overall, rejection sensitivity seems to amplify decreases in felt understanding after non-understanding feedback.

fMRI Results

Neural responses to feeling understood. Our first aim was to examine whether feeling understood would activate regions that have been implicated in reward-processing or receiving social rewards (such as VS or middle insula). These analyses collapsed across positive and negative events because the behavioral data (see above) did not show an interaction between emotional event (positive vs. negative) and feedback type (understanding vs. not understanding) on felt understanding ratings. Further, in whole-brain analyses, the same interaction contrasts yielded no significant clusters in areas of interest. Hence, the 'Understood condition' was created by averaging the Positive Event-Understood condition and the Negative Event-Understood condition together. The 'Not Understood condition' was created by averaging the Positive Event-Not Understood condition and the Negative Event-Not Understood condition together. Then, a contrast was created to examine neural regions that were more active during the Understood condition compared to the Not Understood condition. Results revealed significant clusters of activation in the VS and middle insula (Table 1, Figure 2), suggesting that feeling understood activates regions related to reward and social connection. In addition, this contrast showed increased activation in regions related to mentalizing such as the precuneus and temporoparietal junction (TPJ) (Table 1).

Next, a parametric analysis was conducted to identify what neural regions would show parametric increases as a function of felt understanding. More specifically, a parametric felt understanding regressor (i.e., felt understanding composite) was entered to scale the hemodynamic responses during the feedback sentences for all 8 blocks. As expected, parametric increases occurred in the VS as a function of felt understanding (Table 2). Additional mentalizing-related regions such as the precuneus and TPJ (Table 2) were also activated. Due to the strong associations between the felt understanding composite and liking (see above), we do not discuss additional parametric analyses with these variables to avoid redundancy. However, these analyses revealed very similar patterns.

Neural responses to not feeling understood. Our second aim was to explore what regions would be activated when participants did not feel understood. Therefore, we conducted a whole brain analysis comparing the Not Understood condition to the Understood condition. This contrast showed increased activation in AI/inferior frontal gyrus (IFG) (Table 1, Figure 2), suggesting that not feeling understood activates a region previously associated with negative affect – including negative affective experiences arising from feeling rejected, being negatively evaluated, or being treated unfairly (Eisenberger et al., 2011; Eisenberger et al., 2003; Sanfey, Rilling, Aronson, Nystrom, & Cohen, 2003). We also found an additional cluster in the DMPFC (Table 1, Figure 2), suggesting that not feeling understood may activate a mentalizing–related region previously associated with thinking about dissimilar others (Mitchell, Macrae, & Banaji, 2006).

In addition, a parametric analysis was conducted to identify what neural regions would show parametric increases as a function of not feeling understood. Parametric increases in not feeling understood occurred in AI/IFG and DMPFC (Table 2), suggesting that not feeling understood may be tracked in regions related to negative emotion and thinking about others.

Rejection sensitivity and neural responses to feeling understood and not understood. In our last set of analyses, we examined whether RS would impact neural responses when feeling understood and not understood. A regression analysis was conducted using the contrast Understood > Not Understood with RS entered as a regressor. Analyses showed that heightened RS was associated with greater neural activity in AI during Not Understood vs. Understood blocks (Table 3, Figure 3). To examine what might be driving this effect, post-hoc analyses were conducted. A functional region of interest (ROI) from the AI cluster was created, and parameter estimates were extracted for the contrasts Understood > Fixation and Not Understood > Fixation. Parameter estimates from AI for each contrast were then correlated with RS. RS was positively correlated with AI activity for Not Understood > Fixation ($r = 0.61$, $p < 0.01$), (Figure 3, bottom left). However, RS was not significantly correlated with AI activity for Understood > Fixation ($r = -0.01$, *ns*) (Figure 3, bottom right). Similar to our behavioral findings, these analyses suggest that rejection sensitivity may amplify neural responses in regions previously associated with negative affect and social rejection, when not feeling understood.

Discussion

Our results begin to shed light on the neural bases of feeling understood and not understood. Feeling understood is tracked in neural regions previously associated with reward and social connection (i.e., VS and middle insula) as well as those associated with mentalizing (i.e., precuneus and TPJ). In contrast, not feeling understood is tracked in regions related to negative affect and social pain (i.e., AI), as well as regions previously associated with mentalizing and thinking about dissimilar others (i.e., DMPFC). Behavioral ratings paralleled the neural findings: feeling more understood predicted increased interpersonal closeness, while not feeling understood was associated with feeling socially distant from others. Further, when getting feedback that was not understanding, rejection-sensitive individuals felt less understood and showed amplified neural responses in regions related to negative affect (i.e., AI).

On the surface, the term 'feeling understood' seems to emphasize the importance of *cognitive* processes, such as recognizing that others have listened attentively and have accurately understood "the facts" about a personal event (Reis & Patrick, 1996). To the extent that feeling understood results primarily from knowing that others understand one's actions or intentions, feeling understood (or not) should activate neural regions known to be involved in processing social cognitive information about the self and others (Lieberman, 2007; Mitchell, 2009). Indeed, our findings are partially consistent with this idea: feeling understood led to increased activation in the precuneus and TPJ, whereas not feeling understood led to increased activation in DMPFC. However, our findings also suggest that feeling understood (or not) is an emotional process as well, as evidenced by increased activity in regions known to correlate with positive affective states (VS, middle insula) in response to feeling understood and increased activity in regions associated with negative affective states (AI) in response to not feeling understood. Although past research has examined felt understanding in live social interactions, the present study minimized emotional cues from others (i.e., no facial expressions, body language, or vocal tone) and simply had participants read sentences from a stranger. Therefore, one might expect that feeling understood (or not) would not evoke a strong emotional response. However, these minimal interactions were powerful enough to activate neural systems related to social reward and pain (Lieberman & Eisenberger, 2008). This is consistent with prior work showing that feeling understood makes individuals feel valued, respected, and validated (Reis & Patrick, 1996). Thus, even though feeling understood sounds like primarily a cognitive process, these results support the idea that feeling understood leads to important changes in affective experience and feelings of social connection as well.

By understanding the underlying neural mechanisms of feeling understood and not understood, we have begun to identify why feeling understood (or not) is such a powerful driver of social behavior, as well as a critical component of positive social relationships. More specifically, the anticipated reward of feeling understood may motivate individuals to seek out positive interaction partners, much like individuals seek out primary and secondary rewards such as food or money (Young, 1959). Further, feeling understood may then act as a social reward, reinforcing and strengthening the social relationship. In contrast, the anticipated social pain of not feeling understood may cause individuals to avoid negative interaction partners, much like individuals avoid physical pain and threats (Lieberman & Eisenberger, 2008). Further, if individuals who don't feel understood experience social pain, it may explain why they also show increases in sensitivity to physical pain (Eisenberger, 2012; Oishi et al., 2013). Lastly, our results provide insight into how individual differences may impact these different psychological experiences. Individual differences in rejection sensitivity altered emotional, but not cognitive, processing during others' non-understanding feedback.

Our study, however, also had limitations that should be addressed in future research. First, the felt understanding task partially conflates understanding (i.e., getting the facts right;

e.g., “I understand why you were feeling that way”) with validation (i.e., acceptance, respect, or support for the other’s perspective; e.g., “It makes sense you felt that way.”) (Reis & Patrick, 1996). Although these concepts are difficult to disentangle, testing these separate components may help clarify whether neural regions associated with cognitive processes are primarily involved in understanding, whereas neural regions associated with affective processes are primarily involved in validation. A second limitation is that our study did not include a trait measure that parallels rejection sensitivity on the positive end, such as a measure of ‘social’ reward sensitivity. Therefore, future studies should examine whether individuals high in trait social reward sensitivity show greater VS activity in response to feeling understood. Finally, future research is needed to better understand why certain mentalizing-related regions were responsive to feeling understood (TPJ, precuneus), whereas others were responsive to not feeling understood (DMPFC).

Taken together, these findings inform psychological theory by demonstrating that feeling understood is supported by different emotional and cognitive processes than not feeling understood. Further, by understanding how individual differences alter these emotional and/or cognitive processes, we may be able to more accurately target interventions and tailor therapy to buffer individuals from the harmful consequences of not feeling understood or to amplify the benefits of feeling understood. Although the present study begins to elucidate the neural bases of feeling understood and not understood, future studies are needed to replicate these findings and explore additional topics such as neural responses to felt understanding in individuals with altered social functioning and individuals in close relationships.

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Table 1. Neural regions that were more active during the Understood condition compared to the Not Understood condition.

Region	BA	Hemisphere	*k*	Coordinates *x*	*y*	*z*	*t*
Understood > Not Understood							
Ventral striatum	-	-	35	0	18	-3	5.06
Middle insula	6/44/13	L	126	-42	-3	9	4.64
	13	R	47	39	6	15	4.85
Precuneus/paracentral lobule	5/3	L	127	-12	-24	51	4.77
		R	115	9	-36	45	3.61
Temporoparietal junction/inferior parietal lobule	40/4	L	404	-51	-27	27	4.69
Ventrolateral prefrontal cortex	46	L	37	-48	33	9	4.75
Middle cingulate/supplementary motor area	24	L	42	-9	-6	48	3.97
Hippocampus	-	L	36	-33	-21	-12	5.16
		L	26	-24	-33	0	3.79
Fusiform	36/37	R	54	33	-36	-18	6.14
Supplementary motor area	6	R	73	15	-12	60	4.22
Occipital lobe/cerebellum	18/19	R	62	24	-66	-18	3.84
Not Understood > Understood							
Anterior insula/inferior frontal gyrus	13/47	L	52	-30	21	18	4.01
Dorsomedial prefrontal cortex	9	R	37	3	54	33	3.58

Table 2. Neural regions that show parametric increases as a function of feeling understood and not understood.

				Coordinates			
Region	BA	Hemisphere	*k*	*x*	*y*	*z*	*t*
Parametric Increases in Feeling Understood							
Ventral striatum	-	-	27	0	18	-3	5.06
Precuneus	7	L	27	-18	-60	48	3.13
Temporoparietal junction/inferior parietal lobule	40	L	52	-48	-30	24	5.32
Ventrolateral prefrontal cortex	46	L	34	-48	36	21	3.84
Fusiform	36/37	R	46	33	-33	-18	5.63
Superior parietal lobule	3/5/2	L	74	-15	-48	66	3.32
Precentral gyrus	4	L	112	-36	-27	63	3.95
Parametric Increases in Not Feeling Understood							
Anterior insula/inferior frontal gyrus	13/47	L	96	-27	15	-15	4.05
Dorsomedial prefrontal cortex	9/10	R	146	6	54	33	3.79

Table 3. For the contrast Not Understood compared to Understood, neural regions that show increased activation as rejection sensitivity increased.

Region	BA	Hemisphere	*k*	Coordinates			*t*
				x	*y*	*z*	
Not Understood > Understood with Rejection Sensitivity Regressor							
Anterior insula	13	L	51	-36	9	-6	4.11
Temporoparietal junction	40	R	45	63	-39	24	4.09
Precuneus/paracentral lobule	5	R	152	12	-30	54	5.67
Dorsolateral prefrontal cortex	10/46	L	56	-36	36	15	6.72
Superior/inferior frontal gyrus	22	R	69	66	-3	-6	4.82
Dorsal striatum	-	L	40	-18	18	9	3.88
Occipital lobe	19	L	49	-12	-87	42	3.81
		R	64	36	-75	-18	4.17

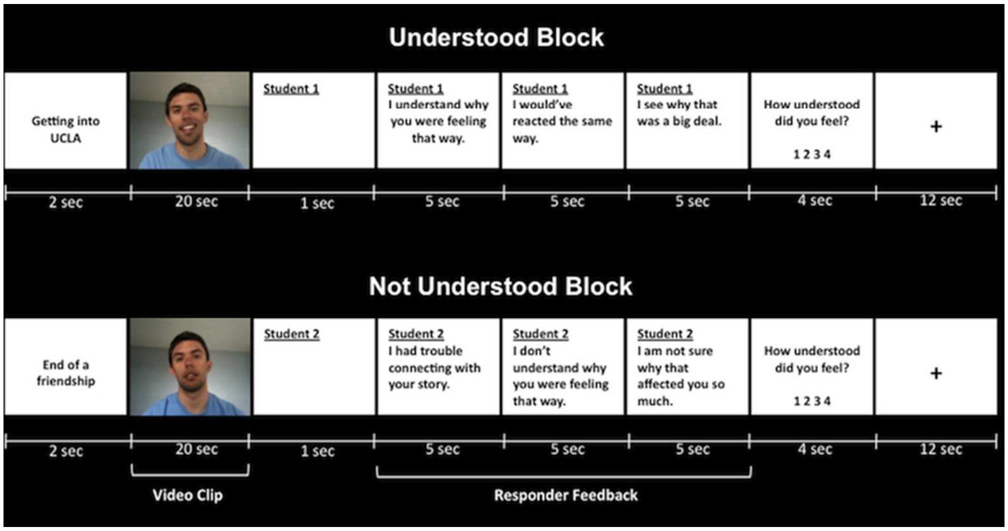

Figure 1. The experimental design for the fMRI task, depicting an example of an Understood block and a Not Understood block.
67x35mm (300 x 300 DPI)

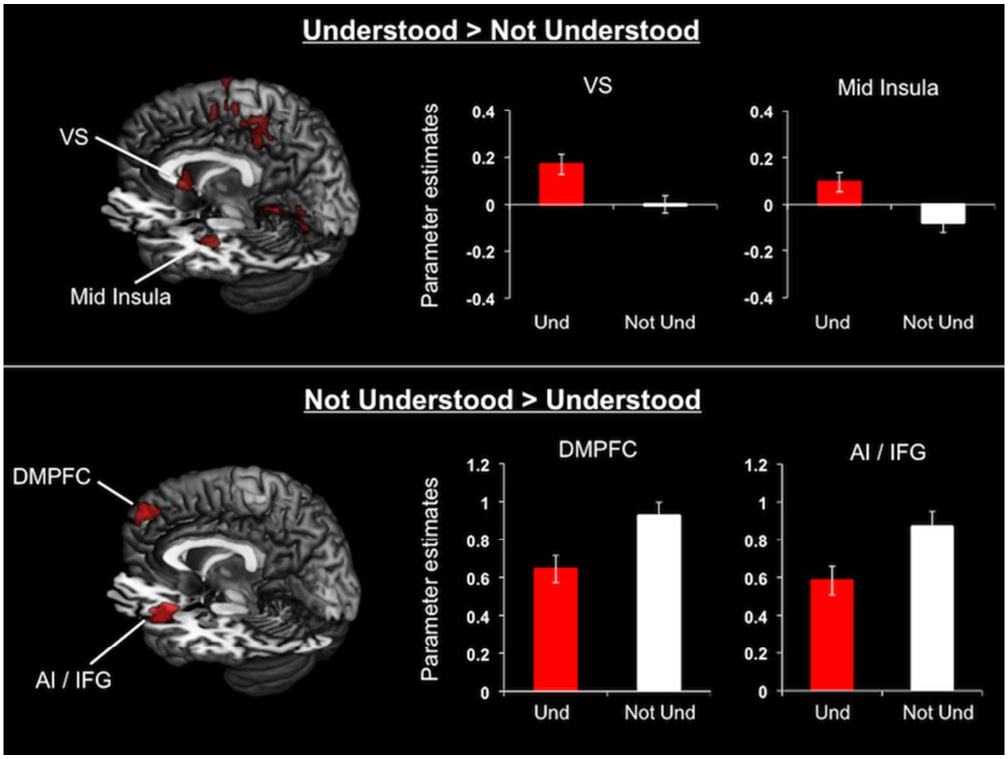

Figure 2. Neural activations for the contrast Understood > Not Understood and Not Understood > Understood, in addition to the parameter estimates for each region for Understood > Fixation and Not Understood > Fixation.
67x50mm (300 x 300 DPI)

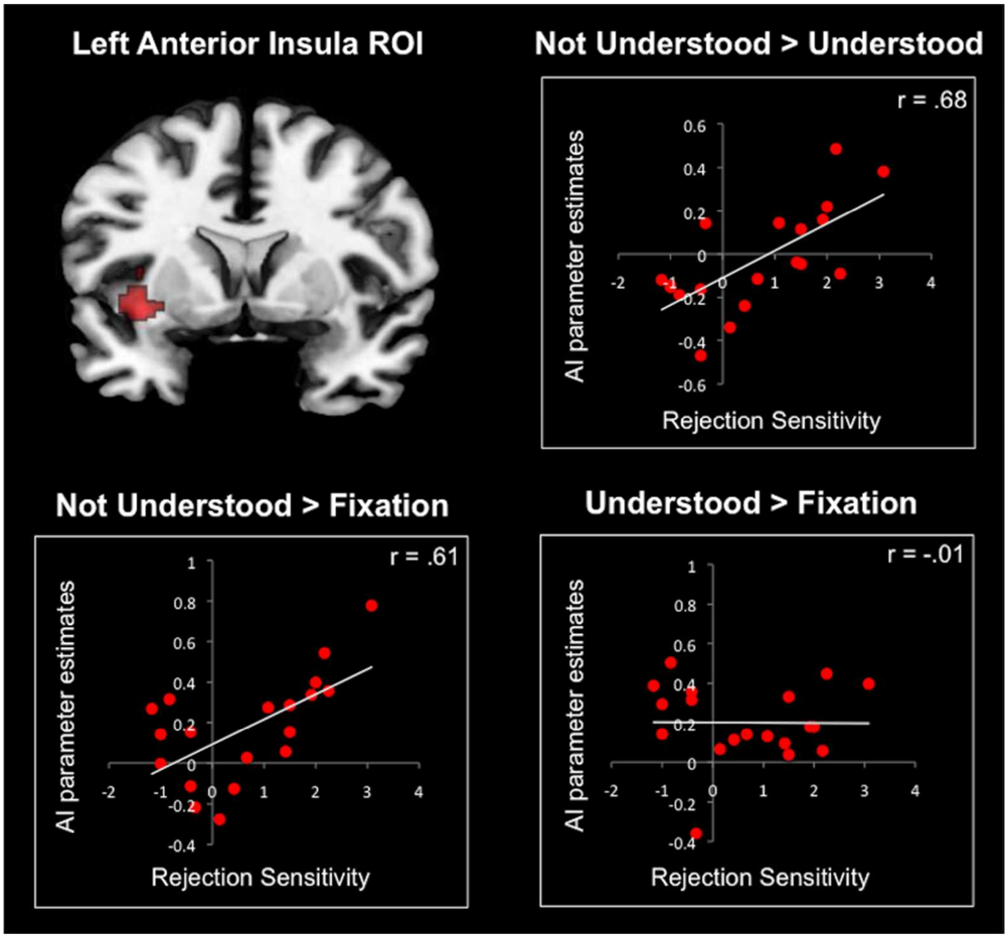

Figure 3. For the Not Understood condition compared to the Understood condition, left anterior insula activation increased with increasing levels of trait rejection sensitivity (top left). For visualization purposes, only AI activation is shown. The scatter plots depict the correlation between trait rejection sensitivity and parameter estimates from this left anterior insula ROI for (1) Not Understood > Understood (top right), (2) Not Understood > Fixation (bottom left), and (3) Understood > Fixation (bottom right).
67x63mm (300 x 300 DPI)