DISSOCIATING COGNITIVE AND AFFECTIVE EMPATHY IN UNIPOLAR DEPRESSION

BY

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Abstract

One aspect of higher order social cognition is empathy, a psychological construct comprising a cognitive (i.e., recognizing emotions) and an affective (i.e., responding to emotions) component. Empathy deficits have been linked to executive and emotion regulation dysfunction in depression that might underlie a patient's interpersonal difficulties. However, most studies measure empathy through the Interpersonal Reactivity Index (IRI), which may not accurately capture affective empathy. Critically, prior studies have not examined a potential dissociation between cognitive and affective empathy in depressed individuals. In Study 1, a factor analysis determined the appropriateness of using the IRI to measure affective empathy. Results showed poor model fit with the affective empathy factor. In Study 2, we developed a behavioral measure of empathy, and examined differences in empathic processing as it relates to depression and ruminative thought. Results revealed differences in empathy between depressed and healthy controls, as well as differences by level of rumination. We discuss the implications of these findings for depression treatment.

Dissociating Cognitive and Affective Empathy in Unipolar Depression

Depression is a debilitating illness that affects millions of Americans each year (DeRubeis, Siegle, & Hollon, 2008). Among the many behaviors that have been associated with the disease are problems with cognitive control, which refers to the ability to maintain information pertinent to performance on a given cognitive task, while inhibiting information that is irrelevant to that task. In depression, cognitive control deficits have been associated with problems in empathizing processes and ruminative thinking. Rumination involves having repeated thoughts about one's depressed mood and it has been shown to result in inflexible thought patterns (Altamirano, Miyake, & Whitmer, 2010). Thus, individuals who are ruminating perform less well at tasks that require goal switching, but better on tasks that require goal-maintenance. This type of thinking can be especially important in social interactions, where goals can shift depending on the moods of those involved. Marsh and Knight (1991) showed that individuals who were inflexible in processing information performed more poorly on social interaction tasks, and De Lissnyder, Koster, and De Raedt (2012) found that high levels of rumination are associated with worse performance on an emotion recognition task.

Additionally, rumination in depression has been shown to have a significant impact on the amount of cognitive resources available in areas of the brain that are used for emotional processing, including the middle frontal gyrus and medial prefrontal cortex (Cooney, Joormann, Eugène, Dennis, & Gotlib, 2010). This could be one possible explanation for the deficits in empathy that have been associated with depression (Cusi, Macqueen, Spreng, & McKinnon, 2011; Thoma et al., 2011). When these areas are engaged in behaviors related to rumination, the cognitive resources that are used are no longer available to process emotional information that is crucial to empathizing with others. In particular, Cusi et al. (2011) found that individuals with

major depression showed deficits in overall empathy ability, as well as more specific empathic abilities associated with the processing of emotions (e.g., concern for others).

Empathy and Depression

In the literature, empathy has been divided into two main components: cognitive empathy, which consists of emotional perspective taking and imagination, and affective empathy, which consists of personal distress and affective responsiveness (Hooker, Verosky, Germine, Knight, & D'Esposito, 2010). Recent studies using neuroimaging have identified brain regions that appear to be crucial to these two processes. Specifically, ventromedial regions of the prefrontal cortex are involved in cognitive empathy, whereas affective empathy relies on areas that are more dorsal and lateral, such as the inferior frontal gyrus (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009). These areas have also been shown to be involved in depressive episodes. Koenigs and Grafman (2009) found that the ventromedial region tends to be hyperactive in depression, while the dorsolateral region is hypoactive. This model for depression is supported by other neuroimaging and neurostimulation studies. Drevets (2001) associated the dorsolateral prefrontal cortex (DLPFC) with hypoactivation in depression, and Dell'Osso et al. (2012) found that anodal (i.e., excitatory) stimulation to the DLPFC with transcranial direct current stimulation (tDCS) was associated with a decrease in depressive symptoms. These findings suggest that similar brain regions play an important role in both depression and empathy. The relation between these constructs remains unexplored, in part because of the complicated nature of empathy and problems in measurement.

More broadly, empathy refers to the ability to interpret the emotions of others correctly, as well as to have the correct emotional response to a given situation. Most of the empathy literature discusses empathy as referring to a shared representation between individuals, which

has primarily been explored with functional neuroimaging. Accordingly, a substantial portion of this work has focused on whether the sharing of emotions is a completely subjective experience, or whether there are areas of shared activation between experiencing an emotion and observing another individual experience the emotion. In other words, seeing someone experience a particular emotion results in a similar network of activation in the observer (i.e., seeing someone happy activates regions associated with happiness in the observer).

Most of this research has been focused on empathy for pain. The somatosensory cortex shows activation in response to both verbal and visual stimuli for pain, even when physical pain is not experienced (Lang, Yu, Markl, Müller, & Kotchoubey, 2011). There also appears to be a specific neural network that contributes to this shared representation. In a meta-analysis examining both picture-based and cue-based paradigms of empathy for pain, Lamm, Decety, and Singer (2011) found that although the two paradigms recruited, overall, different networks of activation, the anterior insula, anterior medial cingulate cortex, and posterior anterior cingulate cortex maintained activation across all studies.

In contrast to the shared representation model, the threat-value hypothesis states that rather than being an empathic response, the activation that is seen in response to pain is a result of a possible threat that is causing pain to the other individual. Using subliminal priming and event-related potentials (ERP), Ibáñez et al. (2011) found that priming an individual with emotional faces of others affected the processing of stimuli showing pain, but the effect was not found when individuals were primed with their own face. Thus, simply perceiving the emotion is not enough to elicit an empathic response; there is also a critical component that comes from seeing the emotion experienced by another individual. This has important implications for social situations, where the perception of emotions and other empathic abilities are needed to engage in

appropriate interpersonal interactions.

Empathy in a Social Context

This social component of empathy is crucial when examining problems in interacting with others. Although this type of empathy is similar to empathy for pain, the process is distinct in that there isn't an inherent threat value. However, this type of empathy shows a similar brain activation pattern. While watching a social exclusion simulation, adolescents showed significant activation of the medial prefrontal and dorsomedial prefrontal cortex (Masten, Eisenberger, Pfeifer, & Dapretto, 2010). Critically, this activation of the prefrontal cortex was positively correlated with participants' level of trait empathy. When examining prosocial behaviors, Rameson, Morelli, and Lieberman (2011) found that individuals with high trait empathy did not show a reduction in empathy abilities when under a cognitive load. Additionally, high trait empathy was associated with higher levels of activation of the medial prefrontal cortex, and this activation was positively correlated with prosocial behaviors.

Research investigating the effect of cognitive load on empathy for specific emotions has elicited similar findings. Empathy for happy, sad, and anxious emotions is diminished when under a cognitive load; however, the relationship between attentional focus and performance on empathy tasks doesn't appear to function in both directions. Direct focus on an empathy task (i.e., when individuals are instructed to empathize), is not associated with higher activation of the prefrontal cortex, and individuals don't report a higher subjective empathy experience than individuals completing the task naturally (Morelli & Lieberman, 2013). Like empathy for pain and empathy in social situations, empathy for emotions is closely associated with activation of the prefrontal cortex, particularly the medial and dorsomedial regions. However Derntl et al. (2010) found that this also depended on gender and strategy. Using functional magnetic

resonance imaging (fMRI) to examine emotion recognition, emotional perspective taking, and affective responsiveness, they found that females tended to use more emotional strategies to empathize whereas males preferred to utilize more cognitive strategies. Thus, the pattern of activation for each task differed slightly between the genders.

Empathy and Emotion

Emotion dysregulation, which has been associated with depression, has also been tied to empathy. In a recent review article, Schipper and Petermann (2013) propose a model of empathy in which both a deficit and profusion in empathic abilities could trigger the dysregulation of emotions, and in turn rumination on negative affect. A relationship between deficits in empathic abilities and emotional dysregulation has been well established in several psychopathologies. Autism spectrum disorders have been associated with impairments to primarily cognitive empathy abilities, as well as emotion dysregulation (Samson, Huber, & Gross, 2012). In contrast, conduct disorders have been associated with deficits to the affective empathy abilities, yet the relationship between empathy deficits and emotion dysregulation remains largely unknown (Davidson, Putnam, & Larson, 2000; Decety, Michalska, Akitsuki, & Lahey, 2009; Lewis, Lamm, Segalowitz, Stieben, & Zelazo, 2006). Schipper and Petermann (2013) have concluded that a healthy level of empathy is required to prevent emotion dysregulation, and have proposed that overly high levels of empathy would show the same relation to emotion dysregulation as deficits, but this remains unexplored. Critically, no studies have yet examined a possible dissociation between cognitive and affective empathy in individuals with depression, and how they might be associated with the emotion dysregulation that is characteristic of the disorder.

Measuring Empathy

Self Report. This examination is complicated by the difficulty of measuring the two

empathic processes independently. Most studies use the Interpersonal Reactivity Index (IRI), which consists of four subscales: Perspective Taking (the ability to shift to another's emotional perspective), Empathic Concern (feeling warmth or compassion for others), Fantasy (the ability to put oneself in a fictional situation), and Personal Distress (feeling fear or anxiety in response to seeing others in distress; Davis, 1980). Additional research on the IRI has supported models similar to the original model (Carey, Fox, & Spraggins, 1988; Cliffordson, 2002; Pulos, Elison, & Lennon, 2004; Yarnold, Bryant, Nightingale, & Martin, 1996). However, in the literature, this measure is used to assess both affective and cognitive empathy by combining the original factors of Fantasy and Perspective Taking into a Cognitive Empathy factor, and Personal Distress and Empathic Concern into an Affective Empathy factor (Hooker et al., 2010; Maurage et al., 2011; Shamay-Tsoory et al., 2009; Shamay-Tsoory, Tomer, Goldsher, Berger, & Aharon-Peretz, 2004). While this split of the IRI has been widely used to examine differences cognitive and affective empathy between individuals, there has been no research to validate the use of this model. Support has been found for a hierarchical factor structure of the IRI (Cliffordson, 2001; Pulos et al., 2004); however, these analyses have shown that the Perspective Taking, Fantasy, and Empathic Concern subscales load onto one factor, whereas the Personal Distress subscale loads onto its own factor.

The use of this two-factor model of the IRI has helped contribute to many of the important findings in the empathy literature, including much of the literature localizing cognitive and affective empathy to specific brain regions. For example studies have looked for differences in the two factors between groups of patients with lesions in different areas (Shamay-Tsoory et al., 2009; Shamay-Tsoory et al., 2004). These studies have found a dissociation between the two factors, with impairments in cognitive and affective empathy being associated with the

ventromedial prefrontal cortex and inferior frontal gyrus respectively. A dissociation between these two factors of the IRI has also been found in alcoholism, with individuals showing deficits in affective empathy compared to controls, but normal levels of cognitive empathy (Maurage et al., 2011).

Alternatively, Cox et al. (2012) used the IRI to calculate a Relative Empathic Ability score by subtracting the score on the Empathic Concern subscale from the Perspective Taking subscale. They found that this difference score was more stable than the corresponding ratio score. Using this method in conjunction with fMRI, they found that affective empathy was associated with strong functional connectivity between the orbitofrontal cortex, amygdala, and other areas associated with social-emotional processing. Cognitive empathy was associated with connectivity between the brainstem, superior temporal sulcus, and areas associated with introspection and other social-cognitive processes. While this approach to the IRI has received more statistical support than the two-factor model, the high dependency of the empathy literature on the IRI as the main measure is problematic due to the social desirability of the participants (Fleming, 2012). The nature of the questions included in the IRI are such that many individuals will respond with the desirable answer. Thus, even a stable and statistically supported structure may not provide an accurate measure of these processes.

Behavioral Measures. The best way to measure empathy is through behavioral measures. While this is less common, several studies have had success using this type of methodology. Thoma et al. (2011) used the Multifaceted Empathy Test, which consists of pictures with an emotion recognition task (cognitive empathy), as well as a rating of the intensity of the emotion and how strong of a response the picture evoked (affective empathy). In a similar paradigm, Krause, Enticott, Zangen, and Fitzgerald (2012) used the Yoni task, which consists of a cartoon

whose facial expression cues the answer to a question, and the Reading the Mind in the Eyes Task (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) to measure affective and cognitive empathy, respectively. Both Thoma et al. (2011) and Krause et al. (2012) found that the behavioral data were more accurate and interpretable than data obtained from questionnaires. Behavioral methodology has also proved beneficial in fMRI paradigms. Hooker et al. (2010) created two versions of several scenes and then asked participants whether there was a physical, social, or no change between the two images. They found significant correlations between cognitive and affective empathy and regions of activation in the social change compared to no change condition including areas of the medial prefrontal cortex. However, the two factors of the IRI alone were not associated with overall performance on task, or performance on a specific trial type. Thus, in this study the behavioral data were a better indicator of empathic abilities than the data from the IRI.

Priming. The behavioral methodologies have shown to be a significant improvement over relying on self-report data alone as a measure of empathic abilities, but they also have flaws. The behavioral tasks for affective empathy are somewhat dependent on cognitive empathy (Hooker et al., 2010). The tasks ask individuals how they would feel in a certain situation, but in order to answer accurately, they must be able to cognitively put themselves in that situation. Thus, cognitive empathy serves as a “gateway” to affective empathy in these paradigms. One possible solution to this problem that shows promise for getting around the “gateway” is subliminal priming. Affective empathy tasks that rely on subliminal processing are independent of cognitive empathy, because there is no conscious processing of the stimuli. This results in measuring only the raw affective reaction.

Importantly, this type of paradigm has shown to be effective with emotional faces,

especially when using binocular rivalry or masking (Faivre, Berthet, & Kouider, 2012).

Binocular rivalry refers to two different images being presented to different eyes. This results in the images competing for conscious dominance. Masking involves a target image being present quickly, and then covered up by a high contrast image. This quick change to a high contrast image overrides the target image for dominance in visual processing. In a study comparing binocular rivalry, visual masking, and continuous flash suppression, Faivre et al. (2012) found that both binocular rivalry and visual masking were effective in eliciting behavioral changes, while not allowing full processing of the stimuli. Further research into binocular rivalry has shown that emotional faces will dominate over neutral faces (Alpers & Gerdes, 2007; Yoon, Hong, Joormann, & Kang, 2009), and the affective state of the individual will also influence what is dominant, with a stimulus congruent to the affective state more likely to dominate (Anderson, Siegel, & Barrett, 2011). Importantly, all of these studies have noted that individuals must see the face in order for the behavioral changes to be seen. Thus, the priming should not be completely subliminal, just enough to keep participants from being able to process the emotions of the face.

The Current Study

The present study aimed to build on past findings by exploring the extent to which ruminative thought in depression impacts an individual's empathic abilities. Our objective was to (1) explore the validity of the two-factor approach to the IRI (Study 1); and (2) develop a behavioral measure of affective empathy to explore differences in empathic abilities in the context of major depression (Study 2). In Study 1, we utilized Confirmatory Factor Analysis (CFA) to examine the two-factor approach to the IRI that has become widely used. A follow-up Exploratory Factor Analysis (EFA) was conducted to determine the ideal factor structure of IRI.

In Study 2, we sought to validate a behavioral measure of affective empathy and examined differences between depressed and non-depressed individuals. Specifically, the goal of this study was to (a) determine if there is a relationship between depression and empathy; and to (b) examine the relationship between rumination and the subcomponents of empathy within the context of unipolar depression. Thus, this study employed a behavioral manipulation to inform current literature about the underlying relationship between rumination and empathic abilities and how this relationship manifests in depressed individuals.

In Study 1, we hypothesized that the two-factor approach to the IRI would show poor model fit in the CFA. Furthermore, we hypothesized that the EFA would show that a model similar to the original model found by Davis (1980) would have the best model fit. In Study 2, we hypothesized that individuals with depression would show normal levels of cognitive empathy and lower levels of affective empathy relative to healthy controls. Furthermore, we predicted that the rumination conditions would affect depressed and control participants differently. We expected that when ruminating, depressed individuals would show greater impairments to their empathy abilities, but when not ruminating, they would show improved performance due to the goal-maintenance nature of the task and the trait inflexibility associated with depression (Altamirano et al., 2010). In contrast, we didn't expect rumination to show an effect in controls, as they are generally more resistant to ruminative thinking.

Study 1

Method

Participants. Four hundred and thirty-five participants ($N = 435$, 247 female) completed the IRI through Amazon's Mechanical Turk (MTurk). Qualification requirements were placed on the study to limit participation to individuals located in the United States who had an approval

rating of over 50 percent. The participants ranged in age from 18-70, with a mean age of 33.17. Participants received \$0.10 for approximately 3.5 minutes (\$1.71 per hour), which is above the median hourly pay on MTurk of \$1.38 (Horton & Chilton, 2010).

Materials. *Interpersonal Reactivity Index (Davis, 1980).* The IRI is a 28-item questionnaire that is measured on a five-point Likert scale ranging from 0 (Does not describe me well) to 4 (Describes me very well). The questionnaire is divided into four subscales of seven items each (see Appendix A for the full questionnaire). The psychometric properties were confirmed by Davis (1980), with the subscales showing acceptable test-retest reliability. Like most measures of empathy, females score higher on all subscales compared to males, on average (Davis, 1983).

Procedure. Participants accepted the job (known as a “HIT”) on MTurk. After accepting, they were directed to the survey, which was hosted on Qualtrics. They were presented with informed consent, and could choose to discontinue the study. After choosing to continue they completed a demographics questionnaire and the IRI. Participants were then given a completion code to be entered on MTurk to receive payment.

Analytical Procedure. *Confirmatory Factor Analysis.* In order to investigate the validity of the two-factor structure of the IRI used in the literature (Figure 1), a categorical CFA was conducted by analyzing the tetrachoric correlations of the items using MPlus version 7.11. The analysis used the robust diagonally weighted least squares estimation (DWLS). In order to identify the scale of the latent variables, the variance of each factor was fixed at 1.

Exploratory Factor Analysis. In order to examine the overall factor structure of the IRI, a categorical EFA was conducted. This analysis also utilized the DWLS estimator, and the oblique quartimin rotation was also used to account for rotational indeterminacy. An oblique rotation was

used in order to allow the factors to correlate with each other. The quartimin rotation was selected as it generally performs well under a variety of conditions (Browne, 2001). A factor loading cutoff of .45 was used, as this represents 20% of the variance in the item being explained by the factor.

Results

Of the 435 participants to accept the job, 18 participants completed only the demographic questionnaire and declined to complete the IRI. Thus, these individuals were removed from the analyses. The final sample consisted of 417 individuals ($N = 417$, 246 female).

The CFA of the two-factor model failed to yield an acceptable model fit. The fit indices for this model, CFI = 0.57, TLI = 0.53, RMSEA = 0.18, 90% CI = 0.18 – 0.19, all suggest a poor fit for this model.

Given the poor model fit that was found for the two-factor model, an EFA was conducted to determine the most appropriate model for the data. The scree plot for the data (Figure 2) suggests that either a five- or six-factor model would provide the best fit. The fit indices for the five-factor model, CFI = .95, TLI = .92, RMSEA = .08, 90% CI = 0.07 – 0.08, suggest that the model has acceptable fit. The fit indices for the six-factor model, CFI = .97, TLI = .95, RMSEA = .06, 90% CI = 0.06 – 0.07, are similar. However when investigating the interpretability, the five-factor model provides a cleaner interpretation, as well as being more parsimonious. The rotated factor loadings and factor correlations for this model can be seen in Tables 1 and 2 respectively. No items loaded onto multiple factors using this criterion, and three items failed to load significantly on any factor.

Discussion

This study sought to examine the factor structure of the IRI by conducting a CFA on the

two-factor structure that has been widely used in the literature and an EFA to determine the model that provides the best global fit. The CFA showed unacceptable model fit, indicating that the IRI should not be used in this way. This is most likely due to the cognitive nature of the questionnaire. Items that were aimed at affective empathy in this model (e.g., “In emergency situations, I feel apprehensive and ill-at-ease.”) require the individual to use cognitive empathy to put him/herself in the situation. This limits the ability to measure the affective response, which could be better-examined using behavioral measures (Derntl et al., 2010; Krause et al., 2012; Masten et al., 2010; Rameson et al., 2011; Thoma et al., 2011).

The EFA yielded a five-factor model for the IRI. The factors map very closely to the original factors found by Davis (1980), with the exception of the Perspective Taking factor, which was split into two in the EFA. Factors 1 and 5 were each composed of three items; Factor 5 having three items from the Perspective Taking subscale, and Factor 1 having two, plus one item from the Empathic Concern subscale. Factor 1 is characterized by items that address Interpersonal Understanding (e.g., “Sometimes I don’t feel very sorry for other people when they are having problems.”), and Factor 5 is characterized by items focused on Interpersonal Problem Solving (e.g., “When I’m upset at someone, I usually try to ‘put myself in his shoes’ for a while.”). Factor 2 is made up of the remaining six items from the Empathic Concern subscale, which we call Emotional Concern. Factor 3, Situational Placement, is composed of six items, all of which come from the original Fantasy subscale. The final factor, Negative Emotion Regulation, is composed of seven items, and is identical to the original Personal Distress subscale. Of the three items that failed to load on any of the five factors, two came from the original Perspective Taking subscale, and the other item came from the Fantasy subscale.

These findings have significant implications for the literature. The IRI is the most widely

used measure of empathy, and thus using the correct structure is critical to receiving accurate results. When interpreted incorrectly (e.g., the two-factor approach), the findings and conclusions of studies become unclear. This study is possibly limited by the MTurk sample. Goodman, Cryder, and Cheema (2013) found that MTurk participants tend to be less extraverted and also tend to show lower self-esteem than normal research samples. However the majority of research suggests that while samples from MTurk are more diverse in terms of ethnic and socioeconomic characteristics, the data collected are very similar to data attained through more traditional means (Casler, Bickel, & Hackett, 2013; Paolacci, Chandler, & Ipeirotis, 2010). Future studies should attempt to replicate these results to confirm the underlying structure of the IRI.

Because of the problems with the way the IRI is currently used, in Study 2 we developed a behavioral measure of empathy explore differences in cognitive and affective empathy between depressed and healthy individuals. We also administered the IRI to investigate whether our 5-factor model provided results that were consistent with the behavioral findings. In this way, we were able to compare different methods of measuring empathy in the context of the proposed model of dissociated cognitive and affective empathy in depression.

Study 2

Method

Participants. A total of 37 control ($N = 37$; 57% female) and 17 depressed individuals ($N = 17$; 88% female) from the University of Kansas undergraduate psychology pool completed the study for course credit or \$10. Participants ranged in age from 18 to 21 with a mean age of 18.8 years.

Materials. *Beck Depression Inventory – II (BDI-II; Beck, Steer, & Brown, 1996).* The BDI-II is a depression questionnaire that consists of 21 questions measuring depression

symptomatology according to the criteria set forth in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000). The questionnaire is widely used in both clinical and research settings. Scores on each item range from 0 to 3, with total scores ranging from 0 to 63. Cutoff scores have been established by Dozois, Dobson, and Ahnberg (1998) with scores 13-19 indicating symptoms consistent with mild depression, and 20-63 indicating symptoms consistent with a more severe depression diagnosis. Dozois et al. (1998) also established the reliability ($\alpha = 0.91$) and validity of the scale.

Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS questionnaire consists of 20 questions measured on a scale ranging from 0 to 5. The 20 questions are divided between two scales: positive affect and negative affect. The validity and reliability of the scale ($\alpha = 0.88$ for positive affect; $\alpha = 0.87$ for negative affect) have been confirmed by Watson et al. (1988).

NEO Five-Factor Inventory (NEO-FFI; McCrae & Costa, 2004). The NEO-FFI is a 60-item questionnaire that measures five factors of personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness. The items are scored on a Likert scale from 1 to 5, with scores ranging from 12 to 60 on each factor of personality. The validity and reliability have been established by McCrae and Costa (2004) with alphas of 0.84, 0.81, 0.77, 0.73, and 0.79 for neuroticism, extraversion, openness, agreeableness, and conscientiousness, respectively.

Ruminative Responses Scale (RRS; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). The RRS is a 22-item questionnaire that measures ruminative thought patterns. The items are measured on a scale from 1 to 4, with total scores ranging from 22 to 88. Subscales have also been developed which measure reflective and brooding rumination. The validity and reliability of these subscales have been established (Treynor et al., 2003) with the reflective and brooding

rumination both showing moderate coefficient alphas ($\alpha = 0.72$ for reflective; $\alpha = 0.77$ for brooding).

Empathy Assessment Index (EAI; Lietz et al., 2011). The EAI is a 17-item questionnaire used to measure empathy. Each item is scored using a 6-point Likert scale. The measure consists of 5 subscales: Affective Response, Emotion Regulation, Perspective Taking, Self-Other Awareness, and Empathic Attitudes. Lietz et al. (2011) established the factor structure, validity, and internal consistency ($\alpha = 0.82$), with the subscales also showing moderate internal consistency ($\alpha = 0.75$ for Affective Response; $\alpha = 0.79$ for the cognitive components; $\alpha = 0.67$ for Empathic Attitudes).

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 2002). The SCID-I is a structured clinical interview that is used for the diagnosis of Axis I disorders according to the criteria of the *DSM-IV-TR*. For the purpose of this study, only Module A, which is used for the diagnosis of mood disorders, was administered. The SCID-I was administered by a researcher trained in the administration and scoring of the interview. The validity of the measure has been well established (Basco et al., 2000), and the inter-rater reliability, as well as the longitudinal reliability, are also at an adequate level (Lobbestael, Leurgans, & Arntz, 2011; Zanarini et al., 2000).

Rumination Manipulation. In this task, participants are asked to follow a prompt and write for 5 minutes in order to manipulate the participants' cognitive load. The prompts are presented at the top of a blank word document, and participants are instructed to write until they are told to stop after 5 minutes. We created three rumination conditions: (a) emotional load, where participants are asked to write about time they were sad; (b) non-emotional load, where participants are asked to describe how to make breakfast; and (c) no load, where participants are

not given a prompt and instead moved straight onto the next part of the experiment. The full writing prompts can be seen in Table 4.

Reading the Mind in the Eyes (Baron-Cohen et al., 2001). The Reading the Mind in the Eyes task was used as a measure of cognitive empathy. It consists of 36 items that measure emotion recognition. Individuals are shown a pair of eyes, and then asked to select the emotion portrayed by the eyes from a set of options. The task has been normed on healthy control subjects, as well as individuals with psychopathologies involving emotion recognition deficits (e.g., Asperger Syndrome). Stimuli were presented on 13.5” by 10.5” Dell™ screen with a refresh rate of 75.359 Hz. The script was created using E-Prime version 2.0. Responses are given by pressing the number on the keyboard that corresponds to the emotion of the participant’s choice. Before the task begins participants are given a list of all the emotions that will be presented in the task and any emotions that are unknown are defined for the participant. The options for each item are presented for three seconds before the eyes are added to options, after which participants have five seconds to respond (Figure 4).

Two-Level Affective Empathy Task. To measure affective empathy, we developed a lexical decision task using emotionally valenced words as the target and emotional faces as a prime. The goal of a lexical decision task is to identify whether a string of letters forms an English word or forms a non-word. Additionally, lexical decision tasks can be used in conjunction with priming, which affects the participant’s reaction time to identify whether the letter string is a word or non-word. Thus, the task has a priming manipulation, but we are also measuring the reaction times to the valenced words, which are also an implicit measure. Because the reaction time is implicit, it cannot be tapping on cognitive empathy, and gives us an additional measure of affective empathy.

Eighty-two happy, neutral, and sad faces were selected randomly from the NimStim set of facial stimuli (Tottenham et al., 2009), for a total of 246 faces, which were used as emotional primes. We then selected 246 positively valenced and 246 negatively valenced words from the Affective Norms for English Words (ANEW) database (Bradley & Lang, 2010). Positively valenced words were selected randomly from words with a valence rating of 7.0 or higher, and negatively valenced words from those with a valence rating of 3.0 or lower. We also selected 246 non-words from the ARC Non-word Database (Rastle, Harrington, & Coltheart, 2002). Thus, there were a total of 738 letter strings. These were divided into congruent trials (emotion of face matching valence of word), incongruent trials (emotion of the face opposite of word valence), neutral face controls, and non-word controls. Each face was used 3 times, and each word once. The task was divided into 3 blocks of 246 trials each. Each block contained an equal number of trials from each category and the valence, dominance, and arousal of the positive and negative words were matched across blocks. The full break down of trials can be seen in Table 3.

The trials were presented using a combination of binocular rivalry and visual masking. The stimuli were presented using the same screen and software used for the Reading the Mind in the Eyes task according to the guidelines suggested by Carmel, Arcaro, Kastner, and Hasson (2010). The screen was viewed using a mirror stereoscope placed 26 cm from the screen with a foam board placed down the middle to ensure that each eye saw only the intended image. We created 738 high contrast Mondrian images using Matlab version 8.2. These are used as competing images during the binocular rivalry and as masking images.

The face is presented on one side of the screen for 13.3ms concurrently with a Mondrian image. The face is then removed and the Mondrian remains for 250ms to mask the face. The target word is then presented on one side while the other side remains blank. After the participant

responds using the 1 and 0 keys on a standard keyboard (1 = word, 0 = non-word), a fixation cross is presented on both sides for 250ms before the next trial begins. A full example of the presentation of a trial can be seen in Figure 5.

The side of the screen the face is presented on is counterbalanced across the task and the individual blocks. The side of the word presentation is also counterbalanced across all trials. Thus, there are four versions of each trial (face left, word left; face left, word right; face right, word left; face right, word right), which results in four versions of the EPrime script. These were counterbalanced across participants.

Procedure. Participants were given a consent form to read carefully and were instructed to sign it if they wished to continue. If they declined to continue, they were given one course credit for their time. After completing the consent form, participants filled out a demographics form. Following the demographics form, the SCID-I was administered to classify the participant as a depressed or control participant. The BDI-II, PANAS, NEO-FFI, and RRS were then administered on the computer using E-Prime. A participant was placed in the depressed group if they received a SCID-I diagnosis of depression and/or a BDI-II score of 13 or higher. Participants were then randomly administered the rumination manipulation based on their participant number. After five minutes of writing, the Reading the Mind in the Eyes task and Lexical Decision task were administered. The order of the two tasks was counterbalanced across each group of participants (depressed and control) to control for order effects. Following the two tasks, the IRI and EAI were administered as additional measures of empathy to validate the behavioral measures. After completing the final two questionnaires, the participants were debriefed and given a copy of the consent form for their records. All procedures and materials were approved through the Human Subjects Committee Lawrence, Institutional Review Board.

Results

Self-Reports. On the RRS, depressed and healthy individuals scored significantly different, with depressed individuals reports reporting significantly higher levels of ruminative thought ($t[52] = -7.14, p < .001$).

To examine personality differences between the depressed and control groups, we conducted t-tests on the Big Five personality factors. To control the Type I error rate, the accepted p -value for these test was .01. Depressed individuals reported significantly higher levels of neuroticism ($t[52] = -8.54, p < .001$) and significantly lower levels of extraversion ($t[52] = 5.18, p < .001$). Openness ($t[52] = -1.42, p = .16$), agreeableness ($t[52] = 0.94, p = .35$), and conscientiousness ($t[52] = 2.47, p = .02$) were all non-significant.

To measure state affect when the study began, we administered the PANAS to all participants. Depressed individuals reported significantly higher levels of negative affect ($t[19.9] = -4.43, p < .001$), and significantly lower levels of positive affect ($t[52] = 5.12, p < .001$). Accordingly, the overall state affect for depressed individuals was significantly lower than the healthy controls ($t[20.56] = 5.47, p < .001$).

Two-Level Affective Empathy Task. The median reaction time for each trial type was calculated using the MAD Score as described by Wilcox and Keselman (2003). To examine the effects of emotional priming during the Lexical Decision task, a 2 (depression) $\times$ 3 (rumination) one-way Analysis of Variance (ANOVA) was conducted on the congruent-incongruent reaction time difference. This test was non-significant ($F_{(5,48)} = .288, p = .92$), indicating that there was no effect of the prime on either depressed or control subjects (Figure 6). Thus, further analyses were collapsed across priming condition.

To assess differences in reaction time to recognizing words, we conducted a 2

(depression) $\times$ 3 (rumination) one-way ANOVA of the total reaction time for all words. A significant interaction was found between depression and rumination ($F_{(2,48)} = 4.13, p = .02$). To examine differences with the interaction, we conducted one-way ANOVAs with each of the factors. We found that in the “No Load” condition, depressed individuals were significantly faster at recognizing emotional words than controls ($t[16] = 2.50, p = .02$, Cohen’s $d = 1.25$; Figure 7).

Additionally, we found that the reaction times across the rumination conditions were significantly different in the depressed group ($F_{(2,14)} = 4.17, p = .04$), but the same comparison was non-significant among the control subjects (Figure 8). Post-hoc tests showed a significant difference between the “No Load” and “Emotional Load” conditions in the depressed group ($p = .04$, Cohen’s $d = 2.27$), with the “Emotional Load” condition being significantly slower.

To examine a possible interaction between word type (i.e., happy vs. sad), depression, and rumination condition, we conducted a 2 (word type) $\times$ 2 (depression) $\times$ 3 (rumination) repeated measures ANOVA, with word type as the within subjects factor, and depression and rumination as the within subjects factor. There were no significant interactions between any of the factors, but there was a significant main effect of word type (Pillai’s Trace = .469, $p < .001$), with happy words having significantly faster reaction times ($F = 42.47, p < .001$).

We then examined the interaction between word type and rumination within each level of depression by conducting a 2 (word type) $\times$ 3 (rumination) repeated measures ANOVA on both the control and depressed group. In the control group, there was a non-significant interaction (Pillai’s Trace = .005, $p = .92$), but a significant main effect of word type (Pillai’s Trace = .485, $p < .001$), with happy words showing faster reaction times ($F = 32.09, p < .001$, Cohen’s $d = 1.69$). For the depressed group we had similar findings. The interaction was non-significant (Pillai’s

Trace = .123, $p = .40$), but there was a main effect of word type (Pillai's Trace = .649, $p < .001$), with happy words showing faster reaction times ($F = 25.94$, $p < .001$, Cohen's $d = 1.52$).

To further explore the relationship between depression and rumination on this task, we examined the interaction for positive and negative words separately. We found that for positive words, reaction times were significantly different across rumination conditions only for depressed individuals ($F_{(2,14)} = 4.50$, $p = .03$), with the "Emotional Load" condition once again being significantly slower ($p = .03$, Cohen's $d = 2.41$; Figure 9). However, for negative words the effect of rumination within depressed participants was only marginally significant ($F_{(2,14)} = 3.33$, $p = .07$), and none of the post-hoc tests were significant using the Tukey correction (Figure 10). Rumination conditions were not significantly different for control participants for any word type.

Reading the Mind in the Eyes. To examine the effects of depression and rumination on the Reading the Mind in the Eyes task, an ANOVA was conducted on the median reaction time, calculated using the MAD Score (Wilcox & Keselman, 2003). We found a marginally significant interaction between depression and rumination ($F_{(2,48)} = 2.92$, $p = .06$). As with the Lexical Decision task, we found that the depressed group was significantly faster than the control group in the "No Load" condition ($t[16] = 2.69$, $p = .02$, Cohen's $d = 1.35$; Figure 11). Accuracy on the task did not differ across depression or rumination condition.

Empathy Questionnaires. To assess differences on EAI, we conducted a MANOVA with the 5 subscales as dependent variables and depression and rumination condition as the factors. Due to unequal cell sizes, Pillai's Trace was used for significance testing. We did not find a significant interaction between depression and rumination condition, however we did find a significant main effect for depression (Pillai's Trace = 8.03, $p < .001$; Figure 12).

Post-hoc tests using the Tukey correction found that depressed individuals scored significantly lower on the Affective Response ($t[52] = 3.35, p < .01$, Cohen's $d = 0.93$), Emotion Regulation ($t[52] = 4.07, p < .001$, Cohen's $d = 1.13$), and Self-Other Awareness ($t[52] = 2.13, p = .05$, Cohen's $d = 0.59$) subscales, and significantly higher on the Empathic Attitudes ($t[52] = -4.00, p < .001$, Cohen's $d = -1.11$) subscale. The difference on the Perspective Taking subscale was non-significant ($t[52] = -0.37, p = .64$).

The IRI showed similar results using our 5-factor model. We failed to find a significant interaction, but did find a significant main effect of depression (Pillai's Trace = 3.22, $p = .02$; Figure 13). Post-hoc tests using the Tukey correction showed that the only subscale that was significantly different between depressed and control individuals was the Negative Emotion Regulation subscale ($t[52] = -3.82, p < .001$, Cohen's $d = -1.06$), with depressed individuals scoring significantly higher relative to control subjects.

Discussion

This study sought to examine a possible dissociation between cognitive and affective empathy abilities between depressed and healthy individuals, with depressed individuals showing impaired affective, but not cognitive, empathy. We also manipulated the level of rumination in participants to investigate the effect of ruminative thought on emotional processing. We hypothesized that depression would show a dissociated pattern of empathy. That is, depressive symptoms would be associated with impairments to affective empathy, but cognitive empathy would remain intact. Additionally, we hypothesized that rumination would be associated with empathic deficits in both healthy and depressed participants. However, we anticipated that the emotional load would elicit a larger deficit than a neutral load, and that these deficits would be more pronounced in the depressed sample than in control participants.

We used a lexical decision task with positively and negatively valenced words and emotional primes to measure the participants' response to emotional information (affective empathy). We also used the Reading the Mind in the Eyes test developed by Baron-Cohen et al. (2001) to measure participants' ability to recognize various emotions (cognitive empathy). By having the participants complete a writing exercise before the two tasks, we were also able to examine the effect of mood and ruminative thoughts on emotional processing.

We found that there was a significant interaction between depressive symptoms and rumination condition on reaction time to emotional words. Specifically we found that the rumination condition only affected the depressed individuals, with more rumination being associated with higher reaction times. However, although this finding was significant for only happy words, it was marginal for sad words. This suggests that for mood congruent words, the effect of rumination is slightly smaller, impairing performance less than it does for mood incongruent words. The implication then is that depressed individuals showed impaired affective empathy, but the effect was stronger for happy or mood-incongruent emotions.

Notably, depressed individuals who were in the "No Load" condition outperformed the controls for every word type. It was only when ruminating that their performance suffered. However this high level of performance by depressed individuals in the "No Load" condition is likely a manifestation of the task itself. Throughout the task, the goal never changes, as participants simply choose "Word" or "Non-Word" for three 5-minute blocks. Thus, the task can be characterized as a goal-maintenance task, in which depressed individuals have been shown to outperform controls due to their train inflexibility that is consistent with being prone to ruminative thought (Altamirano et al., 2010).

On the Reading the Mind in the Eyes test, we failed to find any significant differences

between depressed and healthy individuals. We did find a marginal interaction, however that was driven by low reaction times by depressed individuals in the “No Load” condition. This result is likely an effect of the goal-maintenance nature of the task, as with the Lexical Decision task discussed above. This supports our hypothesis that depressed individuals would not show impairments in cognitive empathy. Thus, these behavioral results give evidence for a dissociation between cognitive and affective empathy in depression.

Findings from the self-report measures support these behavioral findings. The EAI showed impairments in depressed compared to healthy individuals on Affective Response, Emotion Regulation, and Self-Other Awareness, all of which are abilities usually related to affective empathy. The Perspective Taking subscale, which would be associated with cognitive empathy, showed no differences. Thus, the EAI also showed a dissociated pattern with impaired affective but normal cognitive empathy. The Empathic Attitudes subscale from the EAI and the Negative Emotion Regulation factor from the IRI both showed significantly elevated levels in depression compared to controls. Both of these scales measure empathy for negative emotions, which the Lexical Decision task showed was only marginally impaired in depressed individuals. Although the Lexical Decision task did not show higher levels of affective empathy for negative emotions, both the task and self-reports failed to show significant impairments in affective empathy when the emotions in question were limited to negative affect.

Overall, these findings support our hypothesis and provide evidence for a dissociation between cognitive and affective empathy in unipolar depression. Although affective empathy was impaired at higher levels of depression and rumination, cognitive empathy abilities remained intact for the depressed individuals. These findings are in line with what would be predicted from the findings of Shamay-Tsoory et al. (2009). Given that the DLPFC cortex is hypoactive in

depression as has been widely reported (Drevets, 2001; Koenigs & Grafman, 2009; Sacher et al., 2012), we would expect to see an impairment of affective empathy, but not cognitive empathy. Thus, that there was a behavioral change in affective empathy for depressed individuals indicates that the DLPFC may in fact play a role in this area of emotional processing.

The further impairment that was seen in high rumination conditions appears to be due to the lack of cognitive resources that are available for this kind of processing while ruminating. That there was no effect of rumination found in the healthy control subjects suggests that the manipulation failed to induce ruminative thinking for the controls. Demeyer, De Lissnyder, Koster, and De Raedt (2012) suggest that healthy individuals may show higher levels of cognitive control than depressed individuals, which could be one explanation for why the controls were resistant to the manipulation. Additionally, cognitive control may improve the ability to engage in flexible thinking, whereas those who ruminate are usually inflexible in their thought processes (Altamirano et al., 2010). It is important to note that rumination did not show an effect on cognitive empathy. This would suggest that this area of emotional processing either requires fewer cognitive resources than affective empathy and is, thus, able to occur alongside ruminative thought, or relies on brain circuits or mechanisms that are not involved in the rumination process. However, determining this relationship is beyond the scope of the current study.

This study is limited by the somewhat small sample of depressed individuals. Additionally, not everyone in the depressed sample was experiencing a severe depressive episode. More moderate BDI scores of 13-19, which were included in the depressed sample, are generally more representative of a more dysthymic depression (Dozois et al., 1998). It is possible that the pattern of empathic abilities may differ between moderately and severely depressed

individuals, however our sample was not large enough to make this comparison. Future research should continue to use behavioral measures to further examine empathic abilities among a broader spectrum of depression. The role of rumination in emotional processing should also be explored more in depth. Neuroimaging studies would be helpful in determining the areas of the brain important to both cognitive and affective empathy, as well as how these areas work in tandem with ruminative thought processes.

Conclusion

This project set out to 1) investigate the validity of currently used empathy measures, and 2) examine a possible dissociation between cognitive and affective empathy in major depression. Our findings supported our hypotheses in both studies. In Study 1, we found that the widely used two-factor approach to the IRI does not fit well, and findings that are predicated upon these factors are likely biased since these two constructs cannot be accurately measured in this way. Furthermore, our findings from Study 2 illustrate that behavioral measures of empathy can be used to examine differences in empathic processing. These findings showed a dissociated pattern between depressed and healthy individuals with normal levels of cognitive empathy, but impaired affective empathy, particularly for positive emotions, in depression. These behavioral findings were supported by the findings of the self-reports, which also showed lower levels of affective empathy, but normal levels of cognitive empathy. The exception to this was empathy specifically for negative emotions, for which depressed individuals reported higher levels of affective empathy. This illustrates that behavioral measures can be a good instrument for examining empathy without the demand characteristics or self-serving bias that accompanies self-report measures. This is especially true for self-report measures without psychometric support.

Overall, these findings illustrate the importance of emotional processing in the context of depression. Our evidence suggests that the main impairment to this system in depression involves the affective response to, not the cognitive recognition of, emotions. While the current study cannot speak to the directionality of the relationship between impaired affective empathy and depression, future studies should examine this link to help guide treatments for depression. Whether impairments to affective empathy are a vulnerability factor for depression or a symptom of depression, being able to improve these abilities may be able to help improve the functioning of depressed individuals in social situations.

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Table 1

Factor Loadings for Exploratory Factor Analysis With Quartimin Rotation of IRI

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Item 1	.10	-.02	.44	.12	.07
Item 2	.03	.85	-.04	.00	.10
Item 3	.92	.01	-.02	.04	-.05
Item 4	.92	-.01	-.01	.02	-.08
Item 5	.00	.05	.75	-.04	-.06
Item 6	.12	.06	.15	.68	.10
Item 7	.08	-.19	-.54	-.04	.40
Item 8	-.33	.27	.06	-.09	.40
Item 9	.06	.73	.03	-.10	.15
Item 10	.29	.31	.13	.50	.09
Item 11	-.26	.29	.19	.02	.42
Item 12	.20	-.14	-.61	.09	.45
Item 13	.14	-.25	.09	-.59	.28
Item 14	.22	-.73	.05	-.09	.28
Item 15	.47	-.19	.04	.03	.01
Item 16	.07	-.12	.82	.06	.12
Item 17	.23	.14	.16	.58	.03
Item 18	.19	-.67	.03	.12	.22
Item 19	.19	.14	.10	-.80	.18
Item 20	.07	.75	.07	-.06	.11
Item 21	-.29	.21	.20	-.09	.45
Item 22	.05	.70	.07	.04	.12
Item 23	.05	.02	.86	.01	.11
Item 24	.08	-.14	-.01	.80	.06
Item 25	-.38	.08	.04	.02	.63
Item 26	-.08	-.08	.81	.01	-.01
Item 27	.04	-.03	.02	.76	.16
Item 28	-.32	.21	.04	.06	.55

Note. Factor loadings > .45 are boldface.

Table 2

Pearson Correlation Matrix and P-Values for Exploratory Factor Analysis

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor 1	1.00				
Factor 2	.38	1.00			
Factor 3	.09	.28	1.00		
Factor 4	-.24	-.04	.06	1.00	
Factor 5	.07	.09	.07	-.02	1.00

Note. Correlations significant at 5% level are boldface.

Table 3

Trial Breakdown of the Lexical Decision Task

Face Emotion	Word Type	Trial Type	Number of Trials
Happy	Positive	Congruent	82
Sad	Negative	Congruent	82
Happy	Negative	Incongruent	82
Sad	Positive	Incongruent	82
Neutral	Positive	Neutral Control	82
Neutral	Negative	Neutral Control	82
Neutral	Non-word	Neutral/Non-Word Control	82
Happy	Non-word	Non-word Control	82
Sad	Non-word	Non-word Control	82
<i>Total</i>			738

Table 4

Writing Prompts Used in the Rumination Manipulation

Condition	Prompt
Emotional Load	Think about a time when you were sad. Please describe the situation by typing in the space provided below. When did the situation occur? What happened? Who was involved? How close were you to these people at the time of the event? Did the relationship change? How did you react afterwards?
Non-Emotional Load	Think about how one normally prepares breakfast. Please write, in as much detail as possible, the process of making breakfast. What all could one make for breakfast? How would each of these be made? What ingredients and kitchen tools are necessary? If you're cooking, how can you tell when the food is done?

Figure 1. The two-factor model tested in the CFA.

Figure 2. Scree plot for the EFA. The scree plot suggests that a 5- or 6- factor model may provide the best model fit. Moving from 5 to 6 and from 6 to 7 factors both show a drop in the eigenvalue, however it is less pronounced moving from 6 to 7 factors.

1	2	3	4
Joking	Insisting	Amused	Relaxed

Figure 3. Example Stimuli for the Reading the Mind in the Eyes Task.

Figure 4. Example presentation of the Reading the Mind in the Eyes task.

Figure 5. Example stimuli presentation for Two-Level Affective Empathy Task.

Figure 6. Average difference between congruent and incongruent trials (congruent – incongruent) for depressed and control subjects by rumination condition. No differences were found. Error bars show the standard error of the mean.

Figure 7. Average median reaction time for all emotional words by rumination condition. There was a significant interaction between depression and rumination. We found that there was a significant difference in the “No Load” condition between depressed and control subjects. Error bars show the standard error of the mean.

Figure 8. Average reaction time for all emotional words by depression. There was a significant interaction between depression and rumination. We found that performance varied across rumination conditions only in the depressed group. Error bars show the standard error of the mean.

Figure 9. Average median reaction time for only happy words. There was a significant interaction between depression and rumination. We found that as with the total words, performance varied across rumination for only the depressed group. Error bars show the standard error of the mean.

Figure 10. Average median reaction time for only sad words. There was a significant interaction between depression and rumination. However, this was driven by the difference between depressed and control subjects in the “No Load” condition, which was significant for all word types. Unlike in the happy words, the variation in performance across rumination conditions was non-significant for the depressed group. Error bars show the standard error of the mean.

Figure 11. Average median reaction time for the Reading the Mind in the Eyes task. There was a significant interaction between depression and rumination, and this was driven by the significantly lower reaction of the depressed group in the “No Load” condition compared to the controls. Error bars show the standard error of the mean.

Figure 12. Average score on the 5 subscales of the EAI. There was a significant main effect of depression, but no interaction with rumination condition. We found significant differences on subscales that relate to abilities that are associated with affective empathy, but not cognitive empathy. Error bars show the standard error of the mean.

Figure 13. Average scores on the 5 factors of the IRI that were found in the EFA conducted in Study 1. There was a significant main effect for depression, but no interaction with rumination condition. We found a significant difference between the depressed and control groups on the Negative Emotion Regulation factor. Error bars show the standard error of the mean.

Appendix A

Interpersonal Reactivity Index

(Davis, 1980)

The following statements inquire about your thoughts and feelings in a variety of situations. For each item, indicate how well it describes you by choosing the appropriate letter on the scale at the top of the page: A, B, C, D, or E. When you have decided on your answer, fill in the letter on the answer sheet next to the item number. READ EACH ITEM CAREFULLY BEFORE RESPONDING. Answer as honestly as you can. Thank you.

ANSWER SCALE:

A	B	C	D	E
DOES NOT				DESCRIBES ME
DESCRIBE ME				VERY
WELL				WELL

1. I daydream and fantasize, with some regularity, about things that might happen to me. (FS)
2. I often have tender, concerned feelings for people less fortunate than me. (EC)
3. I sometimes find it difficult to see things from the "other guy's" point of view. (PT) (-)
4. Sometimes I don't feel very sorry for other people when they are having problems. (EC) (-)
5. I really get involved with the feelings of the characters in a novel. (FS)
6. In emergency situations, I feel apprehensive and ill-at-ease. (PD)
7. I am usually objective when I watch a movie or play, and I don't often get completely caught up in it. (FS) (-)
8. I try to look at everybody's side of a disagreement before I make a decision. (PT)
9. When I see someone being taken advantage of, I feel kind of protective towards them. (EC)
10. I sometimes feel helpless when I am in the middle of a very emotional situation. (PD)
11. I sometimes try to understand my friends better by imagining how things look from their perspective. (PT)
12. Becoming extremely involved in a good book or movie is somewhat rare for me. (FS) (-)
13. When I see someone get hurt, I tend to remain calm. (PD) (-)

14. Other people's misfortunes do not usually disturb me a great deal. (EC) (-)
15. If I'm sure I'm right about something, I don't waste much time listening to other people's arguments. (PT) (-)
16. After seeing a play or movie, I have felt as though I were one of the characters. (FS)
17. Being in a tense emotional situation scares me. (PD)
18. When I see someone being treated unfairly, I sometimes don't feel very much pity for them. (EC) (-)
19. I am usually pretty effective in dealing with emergencies. (PD) (-)
20. I am often quite touched by things that I see happen. (EC)
21. I believe that there are two sides to every question and try to look at them both. (PT)
22. I would describe myself as a pretty soft-hearted person. (EC)
23. When I watch a good movie, I can very easily put myself in the place of a leading character. (FS)
24. I tend to lose control during emergencies. (PD)
25. When I'm upset at someone, I usually try to "put myself in his shoes" for a while. (PT)
26. When I am reading an interesting story or novel, I imagine how I would feel if the events in the story were happening to me. (FS)
27. When I see someone who badly needs help in an emergency, I go to pieces. (PD)
28. Before criticizing somebody, I try to imagine how I would feel if I were in their place. (PT)