

Negative interpretation bias as a mechanism of the relationship between rejection sensitivity and depressive symptoms

Karys M. Normansell & Blair E. Wisco

To cite this article: Karys M. Normansell & Blair E. Wisco (2016): Negative interpretation bias as a mechanism of the relationship between rejection sensitivity and depressive symptoms, *Cognition and Emotion*

To link to this article: <http://dx.doi.org/10.1080/02699931.2016.1185395>



Published online: 20 May 2016.



Submit your article to this journal [↗](#)



View related articles [↗](#)



View Crossmark data [↗](#)

Negative interpretation bias as a mechanism of the relationship between rejection sensitivity and depressive symptoms

Kary M. Normansell and Blair E. Wisco

Department of Psychology, University of North Carolina at Greensboro, Greensboro, NC, USA

ABSTRACT

Rejection sensitivity and negative cognitive biases have been identified as important risk factors for depression. Rejection sensitivity is defined as the tendency to anxiously anticipate, easily perceive, and overreact to rejection. Although prior studies have found an association between one component of rejection sensitivity, the tendency to anxiously anticipate rejection, and depression, little is known about the mechanisms through which anxious anticipation of rejection might confer depression risk. One possibility is that rejection anticipation leads to negatively biased interpretations, a cognitive risk factor for depression. Results from two studies (one cross-sectional, one longitudinal) indicate that negative interpretation biases mediate the association between the anxious anticipation of rejection and depressive symptoms. These findings indicate that interpretation biases represent a mechanism through which anxious anticipation of rejection confers risk for depression, and suggest that interventions designed to challenge negative interpretations may help to decrease depression risk among individuals who anticipate rejection.

ARTICLE HISTORY

Received 16 October 2015

Revised 18 April 2016

Accepted 24 April 2016

KEYWORDS

Rejection sensitivity;
dysphoria; depression;
negative interpretation bias;
cognitive bias

Depression is a pervasive disorder with a high public health burden that affects individuals around the world (World Health Organization, 2008). The DSM-5 states that the 12-month prevalence of Major Depressive Disorder in the United States is 7% (American Psychiatric Association, 2013). In their lifetimes, 16.6% of Americans will be diagnosed with major depressive disorder, making it the most prevalent mental disorder in the United States (Kessler et al., 2005). It is important to determine the underlying processes that are related to depression in order to develop clinical strategies that correct the potential risk factors, rather than treating the symptoms of depression after they develop (Liu, Kraines, Massing-Schaffer, & Alloy, 2014). If we can identify and treat risk factors for depression, perhaps we can prevent the problem before it starts.

Previous research has established that interpersonal problems and cognitive biases are important risk factors for depression. An important personality phenomenon that exists at the intersection of

cognitive biases and interpersonal problems is rejection sensitivity, or the tendency to “anxiously expect, readily perceive, and overreact” to rejection (Ayduk, Downey, & Kim, 2001; Downey & Feldman, 1996; Downey, Feldman, Khuri, & Friedman, 1994). Rejection sensitivity is associated with insecure attachment beginning in childhood (Bowlby, 1980); responses to perceived rejection include dejection, emotional withdrawal, hostility, and jealousy (Baumeister & Leary, 1995; Coie, Lochman, Terry, & Hyman, 1992; Coyne, 1976; Dodge & Somberg, 1987; Lefkowitz & Tesiny, 1984; Salovey & Rodin, 1986). Rejection sensitive individuals anticipate rejection from peers and loved ones, leading to interpersonal difficulties. These individuals also experience anxiety when expressing needs or vulnerabilities to others, making them less likely to form stable and strong interpersonal relationships (Bowlby, 1980; Downey & Feldman, 1996; Downey, Freitas, Michealis, & Khouri, 1998; Kobak & Hazan, 1991).

Most research has focused on one specific aspect of the rejection sensitivity construct: anxious anticipation of rejection. Anxious anticipation refers to the expectation that one will be rejected in the future, before the potential for rejection even begins. Much of this research has used the Rejection Sensitivity Questionnaire (RSQ), which asks the participant to imagine a potentially vulnerable position in which they are forced to ask another person for help. The RSQ assesses how anxious the participant would be about the other person's response and how likely the participant thinks the other person would be to respond in an accepting manner (Downey & Feldman, 1996). A rejection sensitive individual would be very concerned that the other person involved would not wish to help them and would anticipate rejection in these scenarios. Although scores on the RSQ are commonly referred to as "rejection sensitivity", the questionnaire only measures the anxious anticipation of rejection, and does not measure the other two components of rejection sensitivity (the tendency to readily perceive or overreact to rejection). Therefore, we will use the more specific term "anxious anticipation of rejection" to refer to this construct.

A longitudinal study by Ayduk et al. (2001) found that individuals who anticipated rejection and then experienced it had an increased risk of depressive symptoms in the future when compared with both other individuals who anticipated rejection but did not experience it and individuals who did not anticipate rejection but did experience it. This study also showed that the anxious anticipation of rejection correlated with an increased concern with preventing the occurrence of rejection. According to theories of rejection sensitivity, an instance of rejection confirms a rejection sensitive person's worst fears (Ayduk et al., 2001). This in turn leads to despair and hopelessness, and eventually depression. While prior research has demonstrated an association between anxious anticipation of rejection and depression both cross-sectionally (Downey & Feldman, 1996; Pearson, Watkins, Mullan, & Moberly, 2010; Tops, Riese, Oldehinkel, Rijdsdijke, & Ormel, 2008) and longitudinally (Ayduk et al., 2001; Chango, McElhaney, Allen, Schad, & Marston, 2012; Liu et al., 2014), little is known about the mechanisms through which the anxious anticipation of rejection might confer depression risk.

One possible mechanism of the relationship between the anxious anticipation of rejection and

depression is negative interpretation bias (Mor & Inbar, 2009). Interpretation is the process of assigning meaning to a situation whose valence is unclear (Wisco & Nolen-Hoeksema, 2010). People can interpret such ambiguous situations in positive, benign, or negative ways. Cognitive theories state that interpretation of ambiguous situations is important in the development and maintenance of emotional disorders including depression (Beck, 1967; Bower, 1981, 1987; Mogg, Bradbury, & Bradley, 2006), and prior research has demonstrated that negative interpretation bias, or a tendency to interpret such situations as negative, increases risk for depression (Hertel & Mathews, 2011; Hertel, Mor, Ferrari, Hunt, & Agrawal, 2014; Mathews & MacLeod, 2005). This is because negative cognitive biases make negative content more easily accessible in the mind, which leads to negative affect (Hertel et al., 2014). Past studies on this topic have shown that dysphoric or depressed people interpret emotionally ambiguous situations in a negatively biased fashion (Carver, Ganellen, & Behar-Mitrani, 1985; Haley, Fine, Marriage, Moretti, & Freeman, 1985; Krantz & Hammen, 1979; Miller & Norman, 1986; Vocken, Bogels, & Peeters, 2007; Wisco, Gilbert, & Marroquin, 2014; Wisco & Nolen-Hoeksema, 2010) and that dysphoric ruminators complete negative word fragments faster than benign ones (Hertel et al., 2014).

The anxious anticipation of rejection may lead to the kinds of negative interpretations that have been associated with depression risk. Because these individuals begin worrying and anticipating rejection long before a social situation even begins, they may be predisposed to interpret ambiguous information in a negatively biased fashion. For example, imagine that an individual who tends to anxiously anticipate rejection missed a day of class and knew he needed to ask a classmate for notes in order to learn the material. This individual would already be concerned and nervous about the interaction before even approaching the other student. The fear of potential rejection and the anticipation of it would make rejection seem inevitable. When he asks the classmate for notes, he may interpret the other individual's actions (e.g. seeming distracted, not smiling) in negative ways, regardless of their actual valence.

Prior research supports the view that anxious anticipation of rejection leads to these kinds of negative cognitions. Rejection sensitivity has been

associated with a specific rejection-related bias characterised by schema-congruent processing (Mor & Inbar, 2009). This is thought to be due to an insecure working model, doubt, and anxiety (Downey & Feldman, 1996). People who anticipate rejection are more likely to interpret ambiguous social cues in a manner that is consistent with these insecurities and their fear of rejection (Liu et al., 2014). These individuals also worry about whether or not others will accept them and anticipate that they will not (Mor & Inbar, 2009). These expectations of rejection lead to the development of negative interpretations of social situations and in turn, these interpretations lead to behaviour that causes rejection to occur (Mor & Inbar, 2009). While these studies have established a relationship between rejection expectation and negative interpretation bias, they have not examined whether the resulting interpretation biases play a role in conferring depression risk.

The goal of these studies is to examine negative interpretation biases as possible mechanisms of the relationship between the anxious anticipation of rejection and depressive symptoms. We predict that the anxious anticipation of rejection leads to the development of negative interpretation biases, which in turn confer risk for depressive symptoms, and that interpretation biases explain the association between the anxious anticipation of rejection and depressive symptoms. We examine this hypothesis in two studies using different measures of interpretation bias that have been associated with depressive symptoms in prior research.

Study 1

In Study 1, we examined two distinct types of interpretation biases that may mediate the association between the anxious anticipation of rejection and depressive symptoms: interpretation generation and interpretation selection. Generation refers to the process of identifying all the interpretations one can think of for a given situation, and selection is the process of selecting one interpretation as the most likely explanation (Franklin, Huppert, Langner, Leiberg, & Foa, 2005; Huppert, Pasupuleti, Foa, & Mathews, 2007; Stopa & Clark, 2000; Wisco & Nolen-Hoeksema, 2010; Wisco et al., 2014). If presented with an ambiguous scenario such as "You are walking down the street, and you see one of your friends coming the other way with a group of people. You wave, but your friend doesn't respond.

Why?", one may generate several possible interpretations (Wisco & Nolen-Hoeksema, 2010). A potential positive or neutral interpretation could be "My friend did not respond because they did not see me" or "My friend did not respond because they were distracted by an important conversation". A potential negative interpretation could be "My friend did not respond because they are mad at me" or "My friend did not respond because they were too embarrassed to acknowledge me in front of the group". An individual with a negative interpretation bias would most likely generate and then select one of the latter interpretations.

Prior research has indicated that individuals with depressive symptoms show negative biases in both interpretation generation and selection (Huppert et al., 2007; Wisco & Nolen-Hoeksema, 2010; Wisco et al., 2014). Although interpretation bias in general has been studied in individuals who anxiously anticipate rejection, prior rejection sensitivity research has not differentiated between generation and selection of interpretations. We predict that both of these biases will be affected by the anxious anticipation of rejection, as individuals who fear rejection would be more likely to generate rejection-related interpretations and select these as most likely. In this study, we analysed data from a previously completed study (Wisco & Nolen-Hoeksema, 2010; Wisco et al., 2014) to examine whether either or both of these negative interpretation biases mediate the association between the anxious anticipation of rejection and depressive symptoms.

Method

Participants

For the parent study (Wisco & Nolen-Hoeksema, 2010), 89 participants who met study inclusion criteria were recruited from an undergraduate psychology subject pool and from flyers posted around a university campus.¹ They were compensated with research participation credit or with 15 dollars, respectively. Three participants were excluded from these analyses due to missing data, leaving a final sample of 86 participants. The participants ranged in age from 18 to 31 years old, with a mean (*M*) of 20.9 (standard deviation (*SD*) = 3.0). The group contained 35 males (40.7%) and 51 females (59.3%). The demographics of the group were as follows: 44.2% White, 25.6% Asian, 18.6% Hispanic, 5.8% Black or African American, and 5.8% Multiracial.

Materials

Interpretation Bias Questionnaire (IBQ; Wisco & Nolen-Hoeksema, 2010). This questionnaire contains 10 vignettes that describe ambiguous social situations. Participants were asked to imagine the presented situation happened to themselves (see note 1). After imagining the scenario the participants were asked to write down all the possible explanations that came to mind and select the interpretation they thought was the most likely explanation by circling it. In order to ensure that the participants understood the directions, a practice vignette was completed and reviewed by the experimenter. After this initial practice vignette, the participants were asked to complete the remaining vignettes at their own pace.

Interpretation ratings – participant. After the participants completed the IBQ, they were asked to rate the valence of their interpretations, rating the positivity and negativity on Likert-type scales from *not at all* (1) to *extremely* (5). Valence scores for each generated interpretation were computed by subtracting the negativity score from the positivity score, resulting in a total score ranging from -4 to 4 , with higher numbers indicating more positive interpretations. An interpretation generation score was computed using the mean valence of all generated interpretations and an interpretation selection score was computed using the mean valence of the 10 interpretations which were selected by the participants as the most likely explanation for each of the 10 situations. In our sample, interpretation generation and interpretation selection were highly correlated with each other according to the participant valence ratings, intra class correction (ICC) = .76, 95% CI .65–.83.

Interpretation ratings – coder. Coder ratings were also included to provide a more objective measure of interpretation valence that is not influenced by any rating biases on the part of the participants. After study completion, participants' responses on the IBQ were also coded by two independent coders who were unaware of participant condition and dysphoria status. The responses were coded using the same Likert-type scales. The coders were given a coding manual containing example responses as anchors. "Negative" was operationalised as being any interpretation that reflected poorly upon the participant or had negative consequences for his or her life, whereas "positive" included a positive portrayal

of the participant or indicated positive outcomes for him or her. The coders showed adequate inter-rater reliability and agreement for positivity (ICC = .88; $k = .78$) and negativity (ICC = .92, $k = .78$), and all discrepancies were resolved by consensus. Mean valence scores were computed for measures of both interpretation generation and selection using the same method as for the participant ratings. In our sample, interpretation generation and interpretation selection were correlated moderately according to the coder valence ratings, ICC = .48, 95% CI: .30–.62.

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996). The BDI-II is a commonly used self-report measure of depression which has been shown to be reliable and valid (Beck et al., 1996). It contains 21 items which are summed to provide a measure of the severity of depressive symptoms. For this study, participants were classified as either "non-dysphoric" (BDI-II total score < 9) or "dysphoric" (BDI-II total score ≥ 16), and this dichotomous dysphoria status variable was used for all analyses. Our final sample consisted of 41 (47.7%) dysphoric participants and 45 (52.3%) non-dysphoric participants.

RSQ (Downey & Feldman, 1996). The RSQ is a widely used self-report measure that measures the anxious anticipation component of rejection sensitivity. It contains 18 items asking participants how concerned or anxious they would feel about a situation (e.g. "How concerned or anxious would you be over whether or not your friend would want to help you out?") on a 6-point scale from *very unconcerned* (1) to *very concerned* (6). The participants are then asked to determine the likelihood that the other person would respond positively (e.g. "I would expect that he/she would willingly agree to help me out") on a 6-point scale from *very unlikely* (1) to *very likely* (6) (Downey & Feldman, 1996). This measure is forward-scored for the first portion of each question regarding concern, and reverse-scored for the second portion of each question regarding likelihood of a positive response. Therefore, a higher score indicates higher levels of anxious anticipation of rejection. This commonly used measure has been found to be psychometrically valid, internally consistent, and reliable with Cronbach's alpha scores of $\alpha = 0.83$ (Downey & Feldman, 1996) and $\alpha = 0.84$ (Brookings, Zembar, & Hochstetler, 2001). Prior work has also shown a good level of test-retest reliability with a correlation of 0.78 ($p < .001$) (Downey & Feldman, 1996). In this study, we used a

shortened version of the RSQ with eight-items. Our Cronbach's alpha for the shortened RSQ was 0.77.

Procedure

Interested individuals completed a pre-screening questionnaire via email containing a modified version of the BDI-II, which contained all but one question in the complete BDI-II. The eliminated question, which assessed suicidal ideation, was excluded due to Institutional Review Board concerns about follow-up with those who endorsed suicidal thoughts. Using common cut-offs (e.g. Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998), only those individuals scoring below 9 (control) or 16 or above (dysphoric) were invited to participate. The study was completed within two weeks of the pre-screening process, and the full BDI-II was re-administered at the time of the study; only individuals who still met the cut-off criteria at the time of the study were included in the analyses. The participants met individually with an experimenter and provided informed consent, followed by the IBQ, the interpretation ratings, and a packet of questionnaires including the BDI-II and the RSQ.

Data analysis plan

We planned simple mediational models for this study, in which the anxious anticipation of rejection was entered as the independent variable, negative interpretation bias as the mediator, and dysphoria status (i.e. non-dysphoric or dysphoric) as the dependent variable. We used separate models for the two types of interpretation bias (i.e. generation and selection). We used the bootstrapping approach to test significance of indirect effects (Preacher & Hayes, 2008), which is considered appropriate for small sample sizes (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Estimates of indirect effects are based on 5000 resamples and we report unstandardised coefficients and bias-corrected confidence intervals for all indirect effects (a 95% confidence interval not containing zero is statistically significant). Logistic regression is used for models with binary outcomes and linear regression is used for analyses with continuous outcomes.

We also planned reverse mediational models to test the direction of these effects. We adopted the same analytic approach to the reverse models, with negative interpretation bias serving as the independent variable and the anxious anticipation of rejection as the mediator. We again ran separate models for

each index of interpretation bias (generation and selection).

Results

We found that the anxious anticipation of rejection was positively associated with dysphoria, as predicted (see Figure 1). We ran separate mediational models using participant and coder ratings of both interpretation processes.

Participant ratings

Using ratings made by the participants of the valence of their own responses to the vignettes, we ran mediational models with the anxious anticipation of rejection as the independent variable, interpretation bias (generation or selection) as the mediator and dysphoria status as the dependent variable. Separate models were run for interpretation generation and selection biases.

Interpretation generation. The anxious anticipation of rejection was significantly related to both dysphoria status ($Z = 2.63, p = .008$) and the mediator, interpretation generation ($t = -4.81, p < .001$; see Figure 1(a)). The relationship between interpretation generation and dysphoria status was also significant when controlling for rejection sensitivity ($Z = -2.46, p = .014$). When interpretation generation was included in the model, the relationship between the anxious anticipation of rejection and dysphoria was no longer significant ($Z = 1.38, p = .169$). The indirect effect of the anxious anticipation of rejection on dysphoria status through interpretation generation was significant ($ab = .08, 95\% \text{ CI } [.02, .18]$).

Interpretation selection. Rejection sensitivity was also significantly related to dysphoria status ($Z = 2.63, p = .008$) and the mediator, interpretation selection ($t = -5.07, p < .001$; see Figure 1(b)). The relationship between interpretation selection and dysphoria status was found to be significant when controlling for the anxious anticipation of rejection ($Z = -3.28, p = .001$). When interpretation selection was included in the model, the relationship between the anxious anticipation of rejection and dysphoria was no longer significant ($Z = 0.88, p = .378$). The indirect effect of the anxious anticipation of rejection on dysphoria status through interpretation selection was also significant ($ab = .13, 95\% \text{ CI } [.04, .26]$).

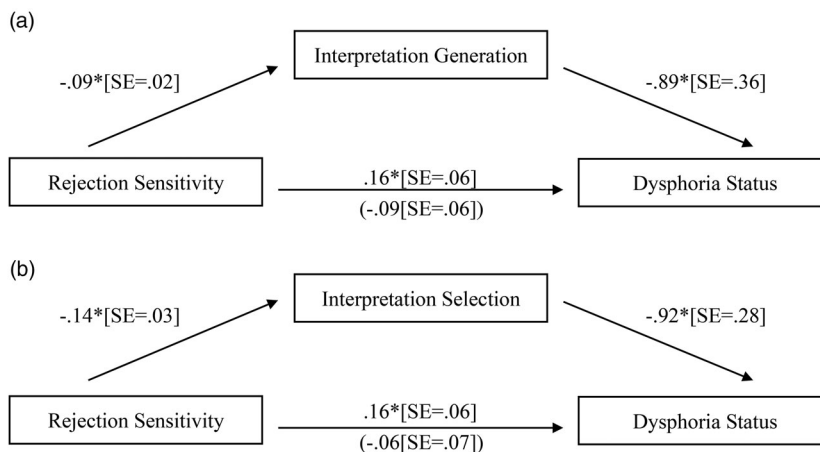


Figure 1. Mediational models examining interpretation biases as mechanisms of the association between rejection sensitivity and dysphoria status: Study 1 participant ratings. (a) Mediational model of interpretation generation. (b) Mediational model of interpretation selection. Note: Unstandardised coefficients are reported.

Coder ratings

We then ran the same mediational models using ratings made by the independent coders of the valence of the responses to the vignettes. We again ran separate models for interpretation generation and selection.

Interpretation generation. In this model, the anxious anticipation of rejection had a significant relationship with dysphoria status ($Z = 2.63$, $p = .008$) and the mediator, interpretation generation ($t = -4.14$, $p < .001$; see Figure 2(a)). The relationship between interpretation generation and dysphoria status was

also significant when controlling for the anxious anticipation of rejection ($Z = -2.54$, $p = .011$). When interpretation generation was included in the model, the relationship between the anxious anticipation of rejection and dysphoria was no longer significant ($Z = 1.51$, $p = .130$). The indirect effect of the anxious anticipation of rejection on dysphoria status through interpretation generation was significant ($ab = .07$, 95% CI [.01, .18]).

Interpretation selection. In this model, the anxious anticipation of rejection had a significant relationship with dysphoria status ($Z = 2.63$, $p = .008$) and the

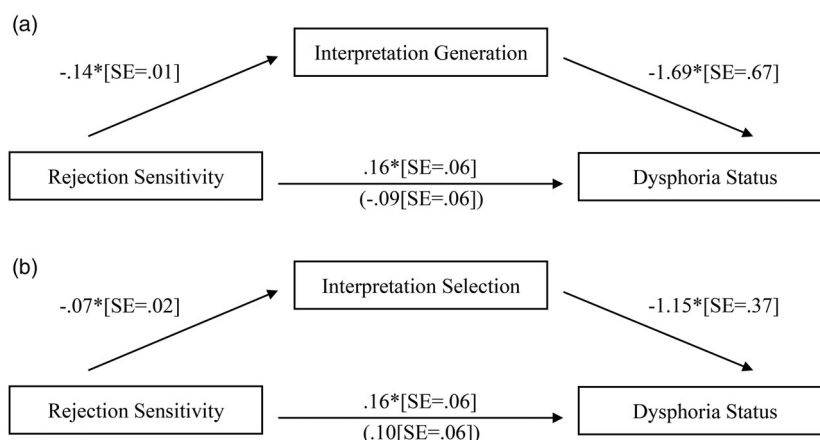


Figure 2. Mediational models examining interpretation biases as mechanisms of the association between rejection sensitivity and dysphoria status: Study 1 coder ratings. (a) Mediational model of interpretation generation. (b) Mediational model of interpretation selection. Note: Unstandardised coefficients are reported.

mediator, interpretation selection ($t = -3.38, p = .001$; see Figure 2(b)). The relationship between interpretation selection and dysphoria status was also significant when controlling for the anxious anticipation of rejection ($Z = -3.15, p = .001$). When interpretation selection was included in the model, the relationship between the anxious anticipation of rejection and dysphoria remained marginally significant ($Z = 1.67, p = .095$). The indirect effect of the anxious anticipation of rejection on dysphoria status through interpretation selection was significant ($ab = .08, 95\% \text{ CI } [.03, .19]$).

Reverse mediational models

We also ran reverse mediational models in which interpretation bias variables (generation and selection) were entered as the independent variable, dysphoria status as the dependent variable, and the anxious anticipation of rejection as the mediator. These reverse models address the issue of directionality of the associations we found and show what the relationship would look like with the anxious anticipation of rejection as the mediator. None of the indirect effects in these models were significantly different from zero. Point estimates ranged from $-.38$ to $-.10$. All of the 95% confidence intervals contained zero.

Discussion

Our findings offer support for a mediational model in which the anxious anticipation of rejection leads to depression through both types of negative interpretation biases. We found evidence that both generation and selection of negative interpretations mediated the association between the anxious anticipation of rejection and depression, and the non-significant reverse mediational models supported this direction of effects. The results were consistent in both the participant and coder ratings. This evidence suggests that negative interpretation biases could be one of the mechanisms that explain the relationship between the anxious anticipation of rejection and dysphoria status.

These findings also suggest that those who are high in this measure of rejection sensitivity (i.e. those who tend to anxiously anticipate rejection) have a tendency to generate and select more negative interpretations for ambiguous situations they face in order to maintain that rejection-related expectation. If these individuals are generating many potential negative

explanations for ambiguous situations and then selecting a very negative possibility as the most likely explanation, they are confirming their own fears of rejection with their negativity. These negative interpretations in turn may increase risk for depressive symptoms. If an individual repeatedly assumes the worst and interprets neutral stimuli as negative, over time they may train themselves to do so automatically. Since negative beliefs are a major factor in the development and maintenance of mood disorders like depression (Beck, 1967), these individuals may be putting themselves at risk for development of depressive symptoms.

While these findings are promising, this study is limited due a few factors. The first limitation of the study is the potential overlap in measurement of interpretation biases. The participants' ratings on these two types of biases were highly correlated. This may be due to the fact that our measure only allows participants to select interpretations from their previously generated options. This means that they could not select something that they had not generated earlier. Future research should examine interpretation generation and selection using separate measures in order to provide a measure of interpretation selection unconfounded with generation. The second, more serious, limitation of the study is the cross-sectional nature of the data collection. Because mediation is intended to measure changes over time, it is difficult to infer causal mediational relationships with cross-sectional data. Moreover, prior research has shown that cross-sectional data can create biased and misleading estimates of longitudinal mediation effects (MacKinnon et al., 2002; Maxwell & Cole, 2007; Reichardt & Gollob, 1986). Therefore, we conducted a second study to replicate these findings longitudinally.

Study 2

The purpose of Study 2 was to replicate the finding that negative interpretation biases mediate the association between the anxious anticipation of rejection and depressive symptoms using a longitudinal study design. Due to the longitudinal nature of this second study, a new measure of interpretation bias was necessary; specifically, a measure that is able to capture changes in interpretation biases over time. The Ambiguous Scenarios Test was used in this study because it was developed specifically for

repeated measures (Berna, Lang, Goodwin, & Holmes, 2011).

Method

Participants and procedure

Participants for this study were recruited from a psychology subject pool at a large university. At the beginning of the semester, participants completed an online mass screening survey, which is a battery of questionnaires offered to the entire psychology subject pool to recruit participants who meet certain pre-screening criteria for individual studies. The battery included 16 questionnaires assessing demographic and personality characteristics, health behaviours, emotions, relationships, and thought styles. All participants who completed and provided valid survey responses on the mass screening were invited to participate in our longitudinal study to receive course credit. For the purposes of this study, we used data from questionnaires administered during the mass screening as our "Time 1" assessment. The 398 participants who accepted the invitation to participate in our study completed two additional online surveys later in the semester consisting of a battery of questionnaires including the ones listed in the "Measures" section below. These surveys were administered approximately 6 and 12 weeks after the mass screening, with the number of days between Time 1 and Time 2 ranging from 26 to 61 ($M = 43.78$, $SD = 8.48$), and the number of days between Time 2 and Time 3 ranging from 27 to 56 ($M = 39.49$, $SD = 6.78$).

Again, we report how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. Of the 398 students who consented to participate in this study, 204 (51.3%) were excluded from analyses due to incomplete data on one or more measures (e.g. due to exiting the online survey before completing the entire questionnaire battery). Of those with complete data, 34 (8.5%) additional participants were eliminated from analysis due to invalid responses at one or more time points (see Validity scale in "Measures" below), leaving a final sample of 160 participants. The mean age of participants in the final sample was 18.97 ($SD = 2.50$). The sample contained 26 males (16.25%) and 134 females (83.75%). The demographics of the sample were as follows: 55.6% White, 6.9% Asian, 6.9% Hispanic, 20.0% Black or African American, 4.4% Multiracial, and 0.6% American Indian. The mean BDI score at

baseline was 7.54 ($SD = 8.36$), in the minimal symptom range. At baseline, 120 participants (75.0%) had none to minimal depressive symptoms (BDI score <10), 20 participants (12.5%) showed mild depressive symptoms (BDI score 10–18), 14 participants (8.8%) showed moderate depressive symptoms (BDI score 19–29), and 6 participants (3.8%) showed severe depressive symptoms (BDI score 30–63; Beck, Steer, & Garbin, 1988).

Materials

Ambiguous scenarios test – depressed mood – II (AST-D-II; Berna et al., 2011). The AST-D-II was developed to measure changes in depression-related interpretation bias over time, which is ideally suited to the longitudinal design of this study. It contains two forms (Form A and B), each containing 15 items, which have been shown to be equivalent in prior studies (Rohrbacher & Reinecke, 2014). The two forms are intended to be administered at different times, eliminating the tendency to give the same responses at each time point due to simply remembering previous answers. Participants imagine each of 15 scenarios vividly and then rate how pleasant the scenario is on a scale from *extremely unpleasant* (–5) to *extremely pleasant* (5). Lower scores indicate more negative interpretation bias. For example, one scenario on the questionnaire states, "You are in a reflective mood and think back at past achievements and disappointments that you have experienced during your life. Overall, your main feelings about your life so far emerge". Someone with a negative interpretation bias would interpret this ambiguous scenario as negative and therefore rate it as extremely unpleasant.

BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The BDI contains 21 items which provide a measure of the severity of depressive symptoms. For this study, total BDI score was used as an index of depressive symptom severity for all analyses. We used this measure of depression, rather than the BDI-II, because this version was included in the original battery of questionnaires administered at the beginning of the semester. In order to maintain consistency across time points, we used the original BDI for all time points in our study. According to a psychometric evaluation by Dozois, Dobson, and Ahnberg (1998) the BDI and BDI-II are highly correlated ($r = .91$), allowing for comparisons across studies using the two different versions.

RSQ (Downey & Feldman, 1996). The RSQ was identical to the eight-item version of the RSQ used in Study 1. In this second study, the Cronbach's alpha for the eight-item RSQ is 0.80.

Validity Scale (Chapman & Chapman, 1983). The validity scale consists of 13 true or false items that are designed to detect infrequent or random responding (e.g. "driving from New York to San Francisco is generally faster than flying between these cities"). These items were embedded within a longer measure consisting of true or false questions. Participants who endorsed the infrequent response on more than two of these items at any assessment time point were excluded from data analyses.

Data analysis plan

We planned a longitudinal mediational model for this study, in which the anxious anticipation of rejection at Time 1 was entered as the independent variable, negative interpretation bias at Time 2 as the mediator, and depressive symptoms at Time 3 as the dependent variable. In these analyses we controlled for depressive symptoms and negative interpretation bias at Time 1. We again used the bootstrapping approach to test significance of indirect effects (Preacher & Hayes, 2008), which is considered appropriate for small sample sizes (MacKinnon et al., 2002). Estimates of indirect effects are based on 5000 resamples; we report unstandardised coefficients and bias-corrected confidence intervals for all indirect effects (a 95% confidence interval not containing zero is considered statistically significant). Linear regression is used for these analyses because all outcome variables are continuous. We also planned reverse mediational models to test the direction of these effects. We adopted the same analytic approach to the reverse models, with negative interpretation bias at Time 1 serving as the independent variable, the anxious anticipation of rejection at Time 2 as the mediator, and depressive symptoms at Time 3 as the outcome variable, controlling for Time 1 depressive symptoms and anxious anticipation of rejection.

Results

Figure 3 presents the results of the longitudinal mediational model. The anxious anticipation of rejection at Time 1 was significantly related to depressive symptoms at Time 3 ($t = 1.96$, $p = .05$). The anxious

anticipation of rejection at Time 1 was also significantly related to the mediator, negative interpretation bias at Time 2 ($t = -2.35$, $p = .02$). The relationship between negative interpretation bias at Time 2 and depressive symptoms at Time 3 was also significant when controlling for the anxious anticipation of rejection and depressive symptoms at Time 1 ($t = -4.23$, $p < .001$). When negative interpretation bias at Time 2 was included in the model, the relationship between the anxious anticipation of rejection at Time 1 and depressive symptoms at Time 3 was no longer significant ($t = 1.25$, $p = .21$). The indirect effect of the anxious anticipation of rejection at Time 1 on depressive symptoms at Time 3 through negative interpretation bias at Time 2 was significant while controlling for depressive symptoms and negative interpretation bias at Time 1 ($ab = .11$, 95% CI [.03, .25]).

Reverse mediational model

Negative interpretation bias at Time 1 did not predict depressive symptoms at Time 3, controlling for Time 1 anxious anticipation of rejection and depressive symptoms ($B = .03$, $SE = .04$, $t = .69$, $p = .49$). Therefore, we did not test the degree to which the anxious anticipation of rejection mediated this non-significant association.

Discussion

The findings from this study support our hypothesis that negative interpretation bias is a mechanism of the association between anxious anticipation of rejection and depressive symptoms. This supports the findings of the initial study and further strengthens them by showing that the mediational relationship exists longitudinally, rather than only cross-sectionally. The longitudinal nature of these analyses supports the proposed direction of effects, as does the non-significant reverse model. These findings further support the idea that rejection sensitive individuals begin interpreting ambiguous situations negatively, perhaps due to their expectations of rejection. Importantly, these longitudinal analyses demonstrated that those who anxiously anticipated rejection showed more negatively biased interpretations at Time 2 even after statistically controlling for their negative interpretation bias at Time 1. This indicates that the anxious anticipation of rejection is not only associated with interpretation bias concurrently, but also increases the risk that interpretations will become more and more negative over time. The development

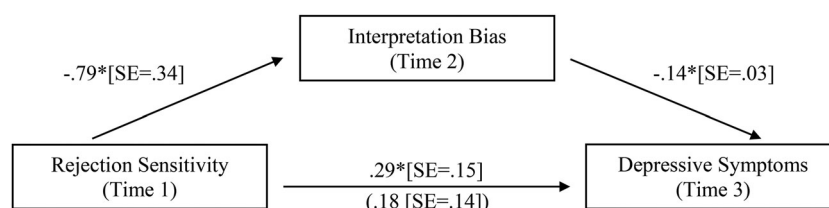


Figure 3. Longitudinal mediational models examining interpretation biases as mechanisms of the association between rejection sensitivity and depressive symptoms: Study 2 results. Note: This mediational model was run statistically controlling for Time 1 interpretation bias and Time 1 depressive symptoms. Unstandardised coefficients are reported.

of these negative interpretations may be driven by the individual's already existing rejection-related cognitive schema (i.e. that rejection is likely to occur to them). The resulting negative interpretations are produced increasingly over time and this process then may eventually lead to the development of depressive symptoms.

General discussion

Prior studies have shown that rejection sensitivity is associated with negative interpretation bias (Downey & Feldman, 1996; Liu et al., 2014; Mor & Inbar, 2009), and other studies have demonstrated that interpretation bias is, in turn, associated with risk for depression (Hertel & Mathews, 2011; Hertel et al., 2014; Mathews & MacLeod, 2005). Therefore, it might be expected to follow that the anxious anticipation of rejection increases risk for depression through these negatively biased cognitions. To our knowledge, however, our studies are the first to demonstrate that interpretation biases mediate the association between the anxious anticipation of rejection and depressive symptoms.

Our first study's results showed a significant indirect effect of the anxious anticipation of rejection on dysphoria status through negative interpretation bias for both generation and selection. These findings support a model in which the relationship between the anxious anticipation of rejection and dysphoria status is mediated by these negative interpretation biases. Models using both interpretation generation and selection were significant, indicating that individuals who anticipate rejection are both generating more negative interpretations for ambiguous situations and then selecting a very negative interpretation as the most likely explanation for that situation. Both generation and selection of interpretations were significantly related to dysphoria status, indicating that both of these processes are associated

with dysphoria status, and the association between rejection sensitivity and dysphoria status dropped to non-significance after accounting for interpretation biases. The reverse models in this study also support this direction of effects, but the first study is limited due to the use of cross-sectional data.

The second study addressed the problem of cross-sectional data by assessing these mediational relationships longitudinally. Our findings support a model in which the anxious anticipation of rejection at Time 1 is related to depressive symptoms at Time 3 through negative interpretation bias at Time 2. The reverse model in this analysis further supports this direction of effects, as Time 1 interpretation bias was not significantly associated with depressive symptoms at Time 3 after controlling for Time 1 anxious anticipation of rejection and depressive symptoms. Study 2 is limited, however, because the interpretation bias measure does not allow us to analyse the differences between generation and selection of interpretations. Because an individual must generate interpretations before selecting one as most likely, it can be inferred that these processes are likely still occurring, even though they cannot be separated using this particular measure. However, our measurement did not allow us to test whether negative biases in interpretation generation, selection, or both explain the observed pattern of results. Further longitudinal research using a method that measures both generation and selection would be necessary to examine this question empirically.

Taken together, our findings indicate that negatively biased interpretations serve as a mechanism through which the anxious anticipation of rejection leads to the development of depressive symptoms. These findings suggest that future research could focus on how to help individuals who anticipate rejection identify and challenge negatively biased interpretations of ambiguous situations, in order to

reduce their risk for depressive symptoms. It is thought that the anxious anticipation of rejection may lead to negative interpretation biases in order to maintain consistency with anticipations of rejection due to feelings of doubt and anxiety (Downey & Feldman, 1996; Liu et al., 2014; Mor & Inbar, 2009). The desire for consistency may interfere with the ability of individuals who anticipate rejection to identify and challenge negatively biased interpretations; the extent to which negative interpretations are amenable to change in this population is an important topic of future inquiry. Additionally, prior research has suggested that the anticipation of rejection leads to actual occurrence of rejection due to the behaviour exhibited by those who are anxiously anticipating this rejection (Mor & Inbar, 2009). The fear of rejection can also cause strained social relationships for individuals who anticipate it because they hold friends and loved ones at arm's length so they are less at risk of being hurt. The extent to which negatively biased interpretations may also explain the association between the anxious anticipation of rejection and these adverse social outcomes is another important topic for future research.

It is important to acknowledge these studies' limitations. Both of these studies are limited due to their use of a self-report measure of dysphoria status and depressive symptoms, rather than a clinical interview. This limitation makes it difficult to draw conclusions about how these results would generalise to a clinically depressed sample. Our non-clinical samples are also a limitation in that they not representative of the entire population. Both samples are predominately female, with the sample from the second study having an even greater proportion of females than the initial study. The samples were also both mostly composed of college undergraduates from a psychology subject pool, which, while not uncommon in this area of research, is still a limitation nonetheless. Additionally, the longitudinal study had a high proportion of missing data, which is common in online data collection, and was unable to distinguish between generation and selection processes of interpretation bias, making it difficult to conclude whether or not these processes are both affected longitudinally. Finally, we only examined one possible mediator of the association between anxious anticipation of rejection and depressive symptoms. Negatively biased interpretations may be just one of many mediators of this relationship. Future research should examine the relative contributions of

interpretation bias and other possible mediators, such as avoidance.

It is also important to address the potentially confounded nature of rejection sensitivity and negative interpretation bias. Some may argue that the two constructs are too closely related to tease apart these processes. We believe that the measures we used separate the two constructs clearly. Specifically, the RSQ asks participants to anticipate a future event in which there is a possibility for rejection, and asks them to make a prediction about the probability that they will be rejected during that encounter, without any information about the encounter itself. Our measures of interpretation bias, on the other hand, present ambiguous encounters to participants and ask them whether those situations are positive or negative. Thus, we argue that the anticipation of rejection precedes and then leads to interpretation and perception of it. However, some may argue that responses on the RSQ are affected by the perception of rejection, rather than only the anticipation of it, because people must perceive rejection in order to anticipate it. Future research could aim to better tease apart these two processes by experimentally manipulating anticipation of rejection and determining whether or not it leads to negative interpretations.

In spite of these limitations, our findings bring promising results to the proposed mediational model that the anxious anticipation of rejection leads to depression through interpretation bias. Our first study shows that this relationship exists both in the generation and selection of negative interpretations and our second study strengthens these findings by showing that the same mediational relationship occurs longitudinally. Because our findings suggest that people who anticipate rejection are putting themselves at risk for developing depression through biased interpretations, it is important to consider what strategies could be implemented to solve this problem before it reaches clinical significance. The results suggest that cognitive therapy techniques, particularly strategies that target interpretation biases, might be helpful for individuals who anticipate rejection that are also at risk for depression, and might be used to break the link between anxious anticipation of rejection and depression. Since depression is such a pervasive mental health issue, it is important to attempt to mitigate these types of risk factors before individuals experience clinical levels of depression that affect their daily functioning.

Note

1. As part of the aims of the parent study (Wisco & Nolen-Hoeksema, 2010), participants were randomly assigned to consider either themselves or one of two types of other individuals when completing the IBQ. Because self-relevant interpretations are most relevant to cognitive theories of depression and to the aims of this manuscript, we will only include participants who were assigned to consider themselves while completing the IBQ ($n = 89$).

Disclosure statement

No potential conflict of interest was reported by the authors.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: Author. doi:10.1176/appi.books.9780890425586
- Ayduk, O., Downey, G., & Kim, M. (2001). Rejection sensitivity and depressive symptoms in women. *Personality and Social Psychology Bulletin*, 27, 868–877. doi:10.1177/0146167201277009
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117, 497–529.
- Beck, A. T. (1967). *Depression: Clinical, experimental, and theoretical aspects*. New York, NY: Hoeber Medical Division, Harper & Row.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). Beck depression inventory-II. *PsycTESTS Dataset*. doi:10.1037/t00742-000
- Beck, A. T., Steer, R. A., & Garbin, M. G. J. (1988). Psychometric properties of the beck depression inventory: Twenty-five years of evaluation. *Clinical Psychology Review*, 8, 77–100. doi:10.1016/0272-7358(88)90050-5
- Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, 4, 561–571. doi:10.1001/archpsyc.1961.01710120031004
- Berna, C., Lang, T. J., Goodwin, G. M., & Holmes, E. A. (2011). Developing a measure of interpretation bias for depressed mood: An ambiguous scenarios test. *Personality and Individual Differences*, 51, 349–354. doi:10.1016/j.paid.2011.04.005
- Bower, G. H. (1981). Mood and memory. *American Psychologist*, 36, 129–148. doi:10.1037/0003-066X.36.2.129
- Bower, G. H. (1987). Commentary on mood and memory. *Behaviour Research and Therapy*, 25, 443–455. doi:10.1016/0005-7967(87)90052-0
- Bowlby, J. (1980). *Attachment and loss: Vol. 3. Loss, sadness, and depression*. New York, NY: Basic Books.
- Brookings, J. B., Zembar, M. J., & Hochstetler, G. M. (2001). An interpersonal circumplex/five-factor analysis of the rejection sensitivity questionnaire. *Personality and Individual Differences*, 34 (3), 449–461. doi:10.1016/S0191-8869(02)00065-X
- Carver, C. S., Ganellen, R. J., & Behar-Mitrani, V. (1985). Depression and cognitive style: Comparisons between measures. *Journal of Personality and Social Psychology*, 49, 722–728. doi:10.1037/0022-3514.49.3.722
- Chango, J. M., McElhaney, K., Allen, J. P., Schad, M. M., & Marston, E. (2012). Relational stressors and depressive symptoms in late adolescence: Rejection sensitivity as a vulnerability. *Journal of Abnormal Child Psychology*, 40, 369–379. doi:10.1007/s10802-011-9570-y
- Chapman, L. J., & Chapman, J. P. (1983). *Infrequency scale for personality measures*. Unpublished scale available from T. R. Kwapil, Department of Psychology, University of North Carolina at Greensboro, Greensboro, NC 27402.
- Coie, J. D., Lochman, J. E., Terry, R., & Hyman, C. (1992). Predicting early adolescent disorder from childhood aggression and peer rejection. *Journal of Counseling and Clinical Psychology*, 60, 783–792.
- Coyne, J. C. (1976). Depression and the response of others. *Journal of Abnormal Psychology*, 85, 186–193. doi:10.1037/0021-843X.85.2.186
- Dodge, K., & Somberg, D. (1987). Hostile attributional biases are exacerbated under conditions of threats to the self. *Child Development*, 58, 213–224.
- Downey, G., & Feldman, S. I. (1996). Implications of rejection sensitivity for intimate relationships. *Journal of Personality and Social Psychology*, 70, 1327–1343. doi:10.1037/0022-3514.70.6.1327
- Downey, G., Feldman, S. I., Khuri, J., & Friedman, S. (1994). Maltreatment and child depression. In W. M. Reynolds & H. F. Johnson (Eds.), *Handbook of depression in children and adolescents* (pp. 481–508). New York, NY: Plenum Press.
- Downey, G., Freitas, A. L., Michealis, B., & Khouri, H. (1998). The self-fulfilling prophecy in close relationships: Rejection sensitivity and rejection by romantic partners. *Journal of Personality and Social Psychology*, 75, 545–560.
- Dozois, D. J. A., Dobson, K. S., & Ahnberg, J. L. (1998). A psychometric evaluation of the beck depression inventory-II. *Psychological Assessment*, 10, 83–89. doi:10.1037/1040-3590.10.2.83
- Franklin, M. E., Huppert, J., Langner, R., Leiberg, S., & Foa, E. B. (2005). Interpretation bias: A comparison of treated social phobics, untreated social phobics, and controls. *Cognitive Therapy and Research*, 29(3), 289–300. doi:10.1007/S10608-005-2412-8
- Haley, G. M. T., Fine, S., Marriage, K., Moretti, M. M., & Freeman, R. J. (1985). Cognitive bias and depression in psychiatrically disturbed children and adolescents. *Journal of Consulting and Clinical Psychology*, 53, 535–537. doi:10.1037/0022-006X.53.4.535
- Hertel, P. T., & Mathews, A. (2011). Cognitive bias modification: Past perspectives, current findings, and future applications. *Perspectives on Psychological Science*, 6, 521–536. doi:10.1177/1745691611421205
- Hertel, P. T., Mor, N., Ferrari, C., Hunt, O., & Agrawal, N. (2014). Looking on the dark side: Rumination and cognitive bias modification. *Clinical Psychological Science*, 2, 714–726. doi:10.1177/2167702614529111
- Huppert, J. D., Pasupuleti, R. V., Foa, E. B., & Mathews, A. (2007). Interpretation biases in social anxiety: Response generation, response selection, and self-appraisals. *Behavior and Research Therapy*, 45, 1505–1515. doi:10.1016/j.brat.2007.01.006

- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the national comorbidity survey replication. *Archives of General Psychiatry*, 62, 593–602. doi:10.1001/archpsyc.62.6.593
- Kobak, R., & Hazan, C. (1991). Attachment in marriage: Effects of security and accuracy of working models. *Journal of Personality and Social Psychology*, 60, 861–869. doi:10.1037/0022-3514.60.6.861
- Krantz, S., & Hammen, C. (1979). Assessment of cognitive bias in depression. *Journal of Abnormal Psychology*, 88, 611–619.
- Lefkowitz, M., & Tesiny, E. (1984). Rejection and depression: Prospective and contemporaneous analyses. *Developmental Psychology*, 20, 776–785. doi:10.1037/0012-1649.20.5.776
- Liu, R. T., Kraines, M. A., Massing-Schaffer, M., & Alloy, L. B. (2014). Rejection sensitivity and depression: Mediation by stress generation. *Psychiatry: Interpersonal and Biological Processes*, 77, 86–97. doi:10.1521/psyc.2014.77.1.86
- Lyubomirsky, S., Caldwell, N. D., & Nolen-Hoeksema, S. (1998). Effects of ruminative and distracting responses to depressed mood on retrieval of autobiographical memories. *Journal of Personality and Social Psychology*, 75, 166–177. doi:10.1037/0022-3514.75.1.166
- MacKinnon, D. P., Lockwood, C. M., Hoffman, J. M., West, S. G., & Sheets, V. (2002). A comparison of methods to test mediation and other intervening variable effects. *Psychological Methods*, 7, 83–104.
- Mathews, A., & MacLeod, C. (2005). Cognitive vulnerability to emotional disorders. *Annual Review of Clinical Psychology*, 1, 167–195. doi:10.1146/annurev.clinpsy.1.102803.143916
- Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods*, 12, 23–44. doi:10.1037/1082-989X.12.1.23
- Miller, I. W., & Norman, W. H. (1986). Persistence of depressive cognitions within a subgroup of depressed inpatients. *Cognitive Therapy and Research*, 10, 211–224.
- Mogg, K., Bradbury, K. E., & Bradley, B. P. (2006). Interpretation of ambiguous information in clinical depression. *Behaviour Research and Therapy*, 44, 1411–1419. doi:10.1016/j.brat.2005.10.008
- Mor, N., & Inbar, M. (2009). Rejection sensitivity and schema-congruent information processing biases. *Journal of Research in Personality*, 43, 392–398. doi:10.1016/j.jrp.2009.01.001
- Pearson, K. A., Watkins, E. R., Mullan, E. G., & Moberly, N. J. (2010). Psychosocial correlates of depressive rumination. *Behaviour Research and Therapy*, 48, 784–791. doi:10.1016/j.brat.2010.05.007
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40, 879–891. doi:10.3758/brm.40.3.879
- Reichardt, C. S., & Gollob, H. F. (1986). Satisfying the constraints of causal modeling. In W. M. K. Trochim (Ed.), *Advances in quasi-experimental design and analysis* (pp. 91–107). San Francisco, CA: Jossey-Bass.
- Rohrbacher, H., & Reinecke, A. (2014). Measuring change in depression-related interpretation bias: Development and validation of a parallel ambiguous scenarios test. *Cognitive Behavior Therapy*, 43, 239–250. doi:10.1080/16506073.2014.919605
- Salovey, P., & Rodin, J. (1986). The differentiation of social-comparison jealousy and romantic jealousy. *Journal of Personality and Social Psychology*, 50, 1100–1112. doi:10.1037/0022-3514.50.6.1100
- Stopa, L., & Clark, D. M. (2000). Social phobia and interpretation of social events. *Behaviour Research and Therapy*, 38(3), 273–283. doi:10.1016/S0005-7967(99)00043-1
- Tops, M., Riese, H., Oldehinkel, A. J., Rijdsdijk, F. V., & Ormel, J. (2008). Rejection sensitivity relates to hypocortisolism and depressed mood state in young women. *Psychoneuroendocrinology*, 33(5), 551–559. doi:10.1016/j.psyneuen.2008.01.011
- Vocken, M. J., Bogels, S. M., & Peeters, F. (2007). Specificity of interpretation and judgemental biases in social phobia versus depression. *Psychology and Psychotherapy: Theory, Research, and Practice*, 80, 443–453. doi:10.1348/147608306X161890
- Wisco, B. E., Gilbert, K. E., & Marroquin, B. (2014). Maladaptive processing of maladaptive content: Rumination as mechanism linking cognitive biases to depressive symptoms. *Journal of Experimental Psychopathology*, 5, 329–350.
- Wisco, B. E., & Nolen-Hoeksema, S. (2010). Interpretation bias and depressive symptoms: The role of self-relevance. *Behaviour Research and Therapy*, 48, 1113–1122. doi:10.1016/j.brat.2010.08.004
- World Health Organization. (2008). *The global burden of disease: 2004 update*. Geneva: Author.