Hostile Interpretation Bias in Depression

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Abstract

Background: Research suggests an important relationship between interpretation bias, hostility and Major Depressive Disorder (MDD). Extant literature has yet to examine hostile interpretation bias in clinically depressed samples; the current studies sought to fill this gap.

Method: Study 1 participants included undergraduates who met criteria for MDD ($n = 36$) or no anxiety or mood diagnosis ($n = 35$). Each participant completed a structured clinical interview along with measures of depression, hostile interpretation bias, and trait hostility. In Study 2, a sample of treatment-seeking individuals with elevated trait anger completed measures of depression, hostile interpretation bias, and trait anger.

Results: Study 1 demonstrated that, relative to the non-depressed group, individuals with depression displayed greater hostile interpretation bias but comparable levels of trait hostility. In Study 2, greater hostile interpretation bias was associated with greater depressive symptoms, and this relationship was independent of co-occurring trait anger.

Limitations: The correlational nature of these studies precludes interpretation of causal relationships between constructs. Additionally, replication of these results should be sought in a larger, more diverse sample.

Conclusion: Overall, the findings suggest hostile interpretation bias may play a unique role in depression and could be a treatable feature of interpersonal mechanisms maintaining MDD.

Key words: hostile interpretation bias, depression, hostility, clinical sample, cognitive bias

Introduction

Interpretation bias is emphasized in the literature as an important feature in the development and maintenance of major depressive disorder (MDD). Cognitive theory suggests that negative interpretation bias increases emotional distress and leads to deficits in the individual's ability to generate positive, future-oriented thoughts due to preferential processing of depressogenic information (Ahrens & Haaga, 1993; Beck, 1979; Cropley & MacLeod, 2003; Eysenck, Mogg, May, Richards, & Mathews, 1991; Holmes, Lang, Moulds, & Steele, 2008; Lawson, MacLeod, & Hammond, 2002; Mogg, Bradbury, & Bradley, 2006; Reardon & Williams, 2007; Richards & French, 1992). Researchers have conceptualized depressive interpretation bias as both the tendency to interpret ambiguous information as negative and as a propensity to predict negative outcomes of ambiguous situations (Mathews & Mackintosh, 2000; Wisco & Nolen-Hoeksema, 2010). In a recent review of extant literature, misperception of social interactions was found to mediate the relationship between depression and interpersonal difficulties (Gadassi & Rafaeli, 2015).

Problematic anger and hostility have been highlighted as severity markers for the course of depression, and epidemiological studies have linked high levels of anger to a more chronic, comorbid, and symptomatic presentation (Benazzi & Akiskal, 2005; Fava et al., 2010; Judd, Schettler, Coryell, Akiskal, & Fiedorowicz, 2013; Perlis et al., 2009). Theoretically, this link can be understood through an interpersonal lens, in which problematic anger is implicated as a potential social repellent that may diminish an individual's support network and contribute to feelings of isolation and worthlessness (Coyne, 1976; Joiner & Metalsky, 1995). Hostility is considered a cognitive component of anger which, at high levels, is theorized to cause individuals to be habitually

suspicious of others and to behave in a defensive or aggressive manner toward others due to – often erroneously – perceived threat (Moreno, Fuhrman, & Selby, 1993; Riley, Treiber, & Woods, 1989). Specifically, severely depressed individuals endorse higher rates of intropunitive thoughts and suspicion of others compared to individuals with mild dysphoria or healthy controls (Moreno et al., 1993). Other research has found that depressed individuals were more likely to preferentially interpret ambiguous sentences or homophones as threatening than their non-depressed counterparts (Mogg et al., 2006). Interpreting ambiguous scenarios as threatening may translate to elevations in hostility such that individuals who are predisposed to threatening perceptions or mistrust may respond to situations with opposition or aggression (Moreno et al., 1993). Additionally, depression featuring irritability and proneness to anger may promote a hostile worldview or elevations in interpersonal hostility (Riley et al., 1989). This may conversely contribute to increased depressive features such as reactive irritability, social withdrawal, and isolation.

Hostile interpretation bias is an information processing bias that reflects an individual's tendency to assume hostile or aggressive intent in *others'* actions. Although this construct inherently overlaps with the cognitive component of hostility, hostile interpretation bias does not measure aggressive disposition. This type of interpretation bias was first assessed in adolescents with problematic aggression (Dodge & Newman, 1981) and has since been evidenced in adult individuals with high levels of trait anger (Bond, Verheyden, Wingrove, & Curran, 2004; Epps & Kendall, 1995; Hazebroek, Howells, & Day, 2001; Wenzel & Lystad, 2005). Researchers have suggested that hostile interpretation bias may represent a potentially instrumental maintenance factor in

depression, particularly with regard to associated social impairment (Mogg et al., 2006; Moreno et al., 1993; Riley et al., 1989); however, it has yet to be empirically evaluated in a clinically depressed sample, to the authors' knowledge. The current paper sought to investigate hostile interpretation bias within the context of depression.

Study 1

Study 1 examined the role of hostile interpretation bias in depression by comparing depressed and non-depressed college students. Participants completed measures of hostile interpretation bias, trait hostility, and depression symptom severity. We hypothesized that individuals with depression would show greater hostile interpretation bias scores than those without a mood disorder diagnosis. Further, based on extant research suggesting elevated levels of hostility in depressed individuals (Riley et al., 1989), we hypothesized that the depressed group would show greater trait hostility scores than the non-depressed group.

Method

Participants

Participants were undergraduate students who met criteria for current Major Depressive Disorder (MDD; $n = 36$) or no mood diagnosis ($n = 35$) based on responses to a brief, structured clinical interview (MINI; Sheehan, Janavs, Baker, Harnett-Sheehan, & Knapp, 2006). The sample was predominantly White (83.6%) and female (86.3%) with a mean age of 18.8 ($SD = .99$). Other ethnicities represented included Hispanic (6.8%), Black (5.5%), and Asian/Pacific Islander (4.1%).

Measures

Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 2006).

The full MINI was administered to each participant in the depressed group by an advanced doctoral student. Interviews were audio-recorded and an advanced doctoral student reviewed a random selection for reliability. In our laboratory, average Kappa for MINI diagnosis is .90 (range: .6 – 1.0), reflecting high overall agreement between raters. These participants were recruited as part of a larger randomized controlled trial for computerized depression treatment, which included multiple self-report questionnaires. Study measures used for the present analyses were administered prior to treatment.

The non-depressed comparison group completed measures as part of a separate investigation examining correlates of mood and anxiety disorders through a survey study consisting of diagnostic interviews and self-report questionnaires. These participants were administered MINI screener items by a thoroughly trained interviewer and were identified as having no clinical mood or anxiety diagnosis if they did not endorse the mood or anxiety disorder screener items (e.g., MDD, Mania/Hypomania, Social Anxiety Disorder, etc.).

Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996).

Depressive symptoms were assessed using the BDI-II. This questionnaire has 21 items that measure both presence and severity of MDD symptoms. This inventory is widely used and possesses strong validity and internal consistency (Beck et al., 1996). Internal consistency for this scale in the current study was excellent ($\alpha = .95$).

Word Sentence Association Paradigm- Hostility (WSAP-H; Dillon, Allan, Cougle, & Fincham, 2015). The WSAP-H was used to assess hostile interpretation bias.

In this measure, participants are presented with 16 interpersonally themed, ambiguous sentences on a computer (e.g., “Someone is in your way.”). Each sentence is followed by either a hostile word (e.g., “inconsiderate”) or a benign word (e.g., “unaware”).

Participants are then asked to rate how similar they believe the sentence is to the word on a scale of 1 (not at all similar) to 6 (extremely similar). Each sentence is presented twice non-consecutively, once with the hostile word and once with the benign word. Average ratings are derived for both hostile and benign word ratings to calculate the separate subscales. The measure has demonstrated good convergent and divergent validity and internal consistency across student and community samples (Dillon et al., 2015). Internal consistencies were good for both the hostile subscale ($\alpha = .85$) and the benign subscale ($\alpha = .84$) in the current sample. Please contact the corresponding author for a copy of this measure.

Cook-Medley Hostility Scale (HS; Cook & Medley, 1954). The 17-item version of the Minnesota Multiphasic Personality Inventory hostility scale was administered to participants as a measure of trait hostility. This measure assesses cynical outlook on the world and a general mistrust of others (Barefoot et al., 1991). Internal consistency for this scale in the present sample was acceptable ($\alpha = .74$).

Results

Descriptives and group comparisons are presented in Table 1. The groups did not differ in gender, ethnicity, or age. Scores on the BDI-II were positively correlated with WSAP-H hostile ratings ($r = .33, p = .006$) and negatively correlated with WSAP-H benign ratings ($r = -.39, p = .001$). WSAP-H hostile ratings were also positively correlated with trait hostility ($r = .34, p = .03$). WSAP-H benign ratings were not

significantly related to trait hostility ($r = -.19, p = .10$).

ANOVAs indicated that depressed individuals endorsed fewer benign word ratings, and greater hostile word ratings than non-depressed participants. Contrary to predictions, no group differences in trait hostility were found ($F_{(1,70)} = .69, p = .41$).

Study 2

In Study 2, we sought to replicate findings from Study 1 in a larger clinical sample. We recruited individuals seeking treatment for elevated trait anger to evaluate the relationship between symptoms of depression and hostile interpretation bias. It is possible that the depressive symptoms of irritability and associated anger give rise to hostile interpretation bias in depressed individuals; thus, it was important to examine whether this relationship would be accounted for by trait anger. If the association between hostile interpretation bias and depressive symptoms were *distinct* from trait anger, then this would provide further evidence for the importance of this bias in depression and would help further clarify the nature of this relationship.

Method

Participants

Participants ($N = 132$) were adult citizens of the United States, who were seeking treatment for problematic anger. They were recruited through flyers in the community and online via Craigslist.org and Reddit.com. Each participant reported elevated trait anger based on the trait subscale of the State Trait Anger Expression Inventory (STAXI scores ≥ 19 ; Spielberger, 1999). All participants were medically stable, and did not meet criteria for any psychotic disorders based on SCID-I/P criteria. Additionally, 72.7% met criteria for at least one current DSM-IV psychiatric disorder (see Table 3 for diagnostic

breakdown). Participants were between the ages of 18 and 63 ($M = 34.5$, $SD = 12.8$), 53.0% female, and 49.2% of the sample completed some college. The ethnic make-up was: 65.2% White, 15.9% Black, 9.8% Hispanic, 3.0% Asian/Pacific Islander, and 6.1% other.

Measures

Participants completed measures of hostile interpretation bias (WSAP-H), depressive symptoms (BDI-II), and trait anger (STAXI-2). See Study 1 for psychometric properties of the WSAP-H and the BDI-II. These study measures were completed prior to initiating an internet-based anger-reduction treatment.

State Trait Anger Expression Inventory, trait subscale (STAXI-2 trait; Spielberger, 1999). The STAXI-2 trait anger subscale is a 10-item measure of an individual's general tendency to experience anger. Participants rate statements on a scale of 1 (almost never) to 4 (almost always). Internal consistency for this scale was good in the present sample ($\alpha = .82$).

Results

See Table 2 for zero-order correlation analyses. A significant positive relationship was found between scores on the BDI-II and the hostile ratings subscale of the WSAP-H; no significant correlation was found between the BDI-II and the benign ratings subscale. Further, a significant positive correlation was shown between trait anger and WSAP-H hostile ratings and a significant negative correlation was shown between trait anger and benign ratings.

We conducted a linear regression analyses to assess the unique contributions of depression symptoms and trait anger in predicting interpretation bias. BDI-II scores and

trait anger were the independent variables (entered simultaneously), and WSAP-H subscale scores were the dependent variables. In the first analysis, both depression ($Sr^2 = .05$, $\beta = .25$, $t = 2.79$, $p = .006$) and trait anger ($Sr^2 = .05$, $\beta = .26$, $t = 2.93$, $p = .004$) were uniquely related to greater hostile bias scores (overall model: $F = 15.73$, $p < .001$). In our second regression analysis, trait anger ($Sr^2 = .09$, $\beta = -.34$, $t = -3.63$, $p < .001$), but not depressive symptoms ($p = .94$) was associated with lower benign bias scores (overall model: $F = 8.74$, $p < .001$).

Because of this non-replication of the negative relationship between depression status and benign ratings, we conducted an exploratory analysis to test whether reduced benign bias was more closely related to depression diagnosis than to depressive symptoms. Our ANOVA found individuals with depression or dysthymia diagnosis ($n = 28$) had lower WSAP-H benign ratings ($M = 3.7$, $SD = 1.0$) than individuals with no diagnosis ($n = 36$; $M = 4.1$, $SD = 0.9$), though this was a non-significant trend ($F = 2.88$, $p = .09$, $\eta^2 = .044$).

Discussion

The present studies examined the unique relationship between hostile interpretation bias and depressive symptom severity. Consistent with hypotheses, Study 1 showed higher hostile interpretations of ambiguous interpersonal scenarios in the depressed group than the non-depressed group. The depressed group also reported lower benign interpretations of interpersonal ambiguous situations. Similarly, Study 2 demonstrated a unique, positive relationship between the hostile ratings and depression symptoms in a treatment-seeking population of individuals with problematic anger. Further, this relationship was not accounted for by trait anger, which suggests that

depression symptoms were uniquely related to the tendency to perceive hostility from others in ambiguous interpersonal situations. These findings suggest that hostile interpretation bias is distinct from trait anger and that these constructs may each play unique roles in characterizing depression.

Study 2 did not replicate the relationship observed between depression and lower benign interpretations from Study 1. This inconsistency may be explained in part by the consideration of depression symptoms as opposed to depression diagnosis; when individuals with depression were compared to those with no diagnosis in this sample, these findings were replicated, though at a trend. It is also possible that the use of a high trait anger sample in Study 2 obscured the relationship between depression and reduced benign bias that would be found in a sample not specifically selected for high anger (through range restriction)..

Contrary to predictions, findings of Study 1 revealed no group differences in trait hostility. This contradicts findings of some published studies (Fava et al., 1986; Fava et al., 1996; Moreno et al., 1993). Perhaps an important distinction to make between these studies is that they utilized different measures of hostility in their samples. For example, Moreno et al. (1993) used the Buss-Durkee Hostility Inventory (Biaggio & Maiuro, 1985), which could be considered more closely related to depression in that it includes a negativism, resentment, and guilt subscale among scales of irritability, indirect hostility, and suspicion. Fava and colleagues (1986, 1996) used hostility subscales from Kellner's Symptom Questionnaire (Kellner, 1987), a self-report state measure for mood and mood-associated symptoms. The measure used in the present study assesses disposition toward mistrust in others more so than specifically mood-relevant constructs (Cook & Medley,

1954). Future research should incorporate a variety of these measures in an effort to provide a more comprehensive understanding of the relationship between depression and hostility.

The studies presented in the current paper have some important strengths. Firstly, we addressed study aims using clinically depressed (Study 1) and treatment-seeking (Study 2) samples, with findings of each study largely corroborating the other. Additionally, we demonstrated the incremental role of hostile interpretation bias in depression. That is, Study 1 assessed hostile interpretation bias and trait hostility and found that the two measures, although related, are discrete constructs in the context of major depressive disorder. Further, Study 2 demonstrated that hostile interpretation bias was distinct from trait-level anger in its relationship to depressive symptoms.

These studies also have some limitations that provide direction for future research. First, the use of a college-aged, primarily White female sample limits the generalizability of findings of Study 1. Thus, it may be important for future research to also examine variables such as the WSAP-H and HS, in a more diverse population that more closely resembles the demographics of depressed and treatment-seeking populations. Secondly, due to the correlational nature of both studies, we were not able to determine the causal role of hostile interpretation bias in depression. Researchers have demonstrated that hostile interpretation bias could be altered through completion of a computerized bias training task (Hawkins & Cougle, 2013); future research might examine the efficacy of similar paradigms in a depressed sample. Lastly, we did not include clinical comparison groups or individuals with remitted depression; future research may benefit from comparing interpretation biases in depression with other

diagnoses or remitted depression to further investigate the specificity of this bias and the nature of its relationship with depression. Examination of other types of interpretation bias (e.g., anxiety/threat-related bias; globally negative attribution bias) in the context of depression is also warranted in order to determine specificity of these constructs to the diagnosis. Additionally, future research may consider using multiple hostile interpretation bias measures to assess consistency of effects.

In conclusion, these studies are the first to our knowledge to examine hostile interpretation biases in relation to depression. It will be important for future research to assess whether reductions in this bias impact symptoms or associated features of MDD (including irritability and anger) in a depressed sample. Considering negative interpretation biases are conceptualized as maintenance factors of anxiety and mood disorders, our findings suggest it is possible that hostile interpretation bias serves a similar function in the maintenance of depression symptoms. It is possible that reducing hostile interpretation bias may impact the mechanisms that underlie a depressogenic loss of social support by encouraging benign appraisals of ambiguous social situations and ameliorating perceptions of rejection, criticism, or loss.

Extant literature has shown interpretations biases can be modified through implementation of computerized interventions (Cognitive Bias Modification; CBM) that aim to change biases by encouraging benign or positive interpretations of ambiguous scenarios and discouraging negative interpretations that characterize depressive or anxious pathology. Further, in certain studies, this shift in interpretive style has been shown to reduce disorder-specific symptoms (e.g., social

anxiety (Beard, Weisberg, & Amir, 2011)). Thus, a logical next step will be to assess whether the hostile interpretation bias can be modified such that individuals with depression and elevated anger can begin to acknowledge healthier alternative explanations of ambiguous information that they may otherwise tend to interpret in a hostile manner. If such interpretive biases can be modified through CBM, it is possible that this change in information processing could positively influence (reduce) depressive thinking patterns and subsequent behavior. Hostile biases can also be explicitly targeted in cognitive therapies via cognitive restructuring techniques. Lastly, a clinical focus on hostile interpretation bias in depression may lead to improved treatment outcomes for individuals who present with a hostile worldview or high irritability and could potentially reduce the risk of depression recurrence.

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Table 1. *Study 1 group comparisons between depressed and non-depressed participants.*

	Depressed Group (<i>n</i> = 36)	Non-depressed Group (<i>n</i> = 35)	χ^2	<i>p</i> -value	
Female	<i>n</i> = 30 (83.3%)	<i>n</i> = 27 (77.1%)	.43	.51	
White	<i>n</i> = 30 (83.3%)	<i>n</i> = 26 (74.3%)	.35	.39	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>F</i> -value	<i>p</i> -value	η^2
Age	18.9 (1.1)	18.9 (1.3)	.01	.91	--
BDI-II	28.8 (7.5)	5.3 (5.2)	233.46	<.001	.77
WSAP - Hostile subscale	3.3 (0.7)	2.9 (0.8)	6.06	.02	.08
WSAP-Benign subscale	4.4 (0.6)	4.8 (0.6)	7.72	.007	.10
Cook-Medley Hostility Scale	26.6 (3.6)	27.3 (4.1)	.26	.61	.01

Table 2. *Zero-order correlations for Study 2 variables.*

	Mean (SD)	1.	2.	3.	4.
1. WSAP-H Hostile Ratings	3.8 (1.1)	--			
2. WSAP-H Benign Ratings	3.9 (0.8)	-.17	--		
3. BDI-II	20.8 (14.2)	.38**	-.15	--	
4. STAXI-2 Trait	26.4 (5.5)	.38**	-.35**	.48**	--

Note: ** $p < .001$

Table 3. *Descriptives of clinical diagnoses for Study 1 and Study 2*

Study 1 Depressed Group	MINI Diagnoses	N (%)
	Dysthymia	13 (36.1%)
	Generalized Anxiety Disorder	13 (36.1%)
	Posttraumatic Stress Disorder	12 (33.3%)
	Social Anxiety Disorder	11 (30.6%)
	Panic Disorder	6 (16.6%)
	Agoraphobia	4 (11.1%)
	Anorexia Nervosa	2 (5.6%)
	Alcohol Use Disorder	1 (2.7%)
Study 2 Sample	SCID-I Diagnosis Met	N (%)
	Intermittent Explosive Disorder	34 (25.8%)
	Social Anxiety Disorder	28 (21.2%)
	Major Depressive Disorder	24 (18.2%)
	Alcohol Use Disorder	20 (15.1%)
	Posttraumatic Stress Disorder	18 (13.6%)
	Generalized Anxiety Disorder	18 (13.6%)
	Borderline Personality Disorder	12 (9.1%)
	Panic Disorder	7 (5.3%)
	Bipolar I Disorder	7 (5.3%)
	Obsessive Compulsive Disorder	5 (3.8%)
	Agoraphobia	4 (3.0%)
	Dysthymia	4 (3.3%)
	Antisocial Personality Disorder	3 (2.3%)
	Substance Use Disorder	9 (6.8%)
	Bipolar II Disorder	2 (1.7%)
	Body Dysmorphic Disorder	1 (0.8%)

Note: MINI = Mini International Neuropsychiatric Interview, SCID-I = Structured Clinical Interview for the DSM-IV – Patient Edition.