HOSTILITY AND DEPRESSION: LONGITUDINAL STUDY OF DATA FROM

THE NATIONAL SURVEY OF FAMILIES AND HOUSEHOLDS

BY

Melinda A. Gaddy, M.A.

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Chairperson: Rick E. Ingram, Ph.D.

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Raymond Higgins, Ph.D.

_____

Stephen Ilardi, Ph.D.

_____

Tracey LaPierre, Ph.D.

_____

Wei Wu, Ph.D.

Date Defended: May 23rd, 2013

The Dissertation Committee for Melinda A. Gaddy certifies that

this is the approved version of the following dissertation:

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Chairperson: Rick E. Ingram, Ph.D.

Date approved:

Abstract

Hostility is thought by some researchers to be a correlate of depressive symptoms and by others to be a risk factor for depression. Previous studies of longitudinal trends in depression and hostility suggest that hostility confers risk for depression, but each such study used demographically restricted samples. In contrast, this study seeks to examine longitudinal trends in depression and hostility using a large sample of Americans exhibiting clinically relevant levels of depressive symptomatology. Data from the second and third waves of the National Survey of Families and Households (NSFH) were analyzed using structural equation modeling to explore longitudinal relationships between hostility and depression among American adults exhibiting elevated depressive symptomatology during at least one wave of interest (N = 2044). For the current sample, the hostility and depression measures used in the NSFH were found to exhibit measurement invariance both across the second and third waves of measurement and also across male and female groups of participants. Correlations between hostility and depression were significant and positive at each wave of measurement in all specified models, supporting the idea that hostility represents an intraepisodic feature of depression for many. Hostility levels at one time point, however, did not predict depressive symptoms at a later time point, failing to support the notion that hostility confers risk for the later development of depression. The present findings have implications for understanding heterogeneity in clinical presentations of depression and diagnostic criteria for depression. The current findings are also discussed with consideration of the cognitive theory of depression posited by Beck as well as the cognitive specificity perspective.

Dedication and Acknowledgments

This dissertation is dedicated to my husband, Arthur W. Gaddy. His support and commitment have been outstanding, and I am so grateful to have him in my life.

I would like to express my sincerest gratitude for guidance offered by each of the faculty members on my dissertation committee, Drs. Rick Ingram, Ray Higgins, and Stephen Ilardi, Tracey LaPierre, and Wei Wu. Also, many thanks to my internship supervisors, Drs. Chad Neal, Jenny Rosinski, and Sally Hass as well as my fellow interns, Hilary Casner, Amber Hinton-Dampf, and Amber Guzman who have provided invaluable support and encouragement throughout the final stages of the dissertation process. Lastly, I thank my family and friends for their love and inspirational words.

Table of Contents

List of Tables

List of Figures

Hostility and Depression: Longitudinal Study of Data from the National Survey of

Families and Households

Hostility, irritability, and anger represent an interrelated group of phenomena known to

be associated with depression, but the nature of this association remains poorly understood.

Some studies have suggested that hostility-related phenomena represent a salient feature of the

depressive episodes experienced by many individuals (e.g., Fava et al., 2010; Pasquini, Picardi,

Biondi, Gaetano, & Morosini, 2004). Other research results have suggested that hostility may

represent a risk factor for the subsequent development of depression (e.g., Ingram, Trenary,

Odom, Berry, & Nelson, 2007; Stewart, Fitzgerald, & Kamarck, 2010). Researchers have not yet

explored in a comprehensive study the extent to which hostility may represent a correlate of or a

risk factor for elevated depressive symptoms. Furthermore, most studies on the relationship

between hostility and depression have employed small and demographically restricted samples,

limiting the extent to which their conclusions are generalizable. The lack of comprehensive and

generalizable studies on the relationship between hostility and depression has precluded a clear

understanding of hostility's role in depression.

The primary goal of this study was to provide relatively generalizable conclusions about

the role of hostility in depression. To do so, I used data from the National Survey of Families

and Households (NSFH; Sweet & Bumpass, 1996, 2002), a large, nationally representative

sample of American adults and employed structural equation modeling to allow simultaneous

estimation of the cross-sectional (i.e., within a single time point) and longitudinal (i.e., across

time points) relationships between hostility and depression. The use of both a nationwide sample

and structural equation modeling enabled me to draw more comprehensive and generalizable

conclusions than were previously available regarding the extent to which hostility may be a risk factor for and/or intraepisodic feature of depression among American adults.

Background

Adults with depression commonly report experiencing clinically relevant anger or hostility, although the mood state most often associated with depression is sadness. In the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Text Revision* (DSM-IV-TR; American Psychiatric Association, 2000), "depressed mood" is the only affective symptom explicitly included in the diagnostic criteria for Major Depressive Episode in adults. Studies of depressed samples have estimated the prevalence of marked intraepisodic hostility-related phenomena to be between 19% and 44% (Benazzi & Akiskal, 2005; Fava, Anderson, & Rosenbaum, 1990; Fava et al., 1993; Pasquini et al., 2004; Perlis et al., 2005; Raja & Azzoni, 2005; Snaith & Taylor, 1985). Hostility represents an important part of the clinical presentation for many with depression, supporting the need to further study the implications of experiencing hostility in the context of depressive disorders. The prominence of hostility-related features in the context of depressed mood has implications for nearly every area of depression research including, but not limited to, studies concerning the nosology, heterogeneity, risk, etiology, clinical presentation, course, and treatment of depression.

Conclusions drawn from studies of depressive phenomena may be imprecise or erroneous when important sources of heterogeneity in depression are ignored. Rather than considering correlated features such as anxiety or hostility which may have implications for the depressive phenomena of interest in a particular study, depression research typically "involves comparing individuals who possess a minimum number of the generally correlated symptoms

2

with individuals who do not experience a sufficient number of these correlated symptoms"
(Scott, Ingram, & Shadel, 2003, pp. 233-234). The variation associated with these heterogeneous
symptom presentations, then, becomes a source of error variance in analyses. Reduced attention
to the variation of presentations among individuals with depression likely precludes accurate
estimations of the extent to which these individuals differ in thoughts, personality, biological
features, behavior, and information processing. Further, the statistical power to identify such
differences is reduced when variation associated with relevant facets of depression heterogeneity
are modeled as error variance rather than independent variables or covariates. The reduced
power and reduced precision associated with modeling depression heterogeneity as random error
may very well be responsible for inconsistent findings in various areas of depression research.

The most salient form of depression is a syndrome in which sad mood predominates.
However, compared to depression with sadness, depression marked by anxiety or hostility may
be associated with different symptom profiles, risk factors, and patterns of response to treatment.
Furthermore, different kinds of cognitive and behavioral patterns may contribute to the
maintenance of depression with and without hostility. Attending more explicitly to heterogeneity
in depressive syndromes would likely result in the clarification of many inconsistent findings
within the depression literature.

Definition and Measurement of Hostility

Lack of consistency in definitions and measurements of hostility-related phenomena
represents a substantial roadblock to advancing understanding of how these constructs affect the
presentation, treatment, and outcomes of depression. In some work, hostility has been
conceptualized as a multifaceted concept including emotional (anger), behavioral (aggression),

and cognitive facets. Terms such as "anger," "hostility," and "irritability" are often used interchangeably to describe the same phenomena (Vranceanu, Gallo & Bogart, 2006). Elsewhere, hostility is conceptualized as a cognitive construct that is distinct from, although related to, the emotional construct of anger and the behavioral construct of aggression (Ruiz, Smith, & Rhodewalt, 2001; Smith, Glazer, Ruiz, & Gallo, 2004). As a result of this definitional overlap, most scales designed to measure hostility-related constructs are largely lacking in conceptual clarity (Moreno, Fuhriman, & Selby, 1993; Moreno, Selby, Fuhriman, & Laver, 1994). Conceptually similar studies of hostility-related phenomena, therefore, may reach substantially different conclusions if they are defining and measuring hostility differently. The findings from such studies would appear to offer inconsistent conclusions when they may really be examining and measuring two different constructs.

Confusion about the definition of hostility is exacerbated by the multiple terms used by researchers to describe depressive syndromes marked by hostility-related phenomena. For instance, Benazzi and colleagues (2004) identified an "irritable-agitated" depressed group. Subsequently, Benazzi and Akiskal (2005) discussed a form of depression they called "irritable-hostile," and they suggested that irritable depression and agitated depression may actually represent distinct syndromes. Another research group described an "angry hostile" style of depression (Bagby, Kennedy, Dickens, Minifie, & Schuller, 1997). Finally, a factor analysis by Pasquini and colleagues (2004) identified an "anger/irritability" grouping of depressive symptoms. It is unclear whether these various forms of depression represent the same kind of syndrome or whether there is an incomplete overlap in the syndromes described by these researchers. What is clear is that researchers who have attempted to describe the heterogeneous

symptom presentations associated with depression consistently identify individuals for whom hostility-related features are particularly salient. Therefore, it is likely that the different kinds of hostile depression identified by researchers represent substantially overlapping depressive syndromes. In other words, the labels researchers have placed on these syndromes are likely more varied than the syndromes themselves.

Researchers have reached little agreement about the conceptual distinctions between hostility and anger, but these constructs are likely correlated among many individuals with depression. The conceptual overlap between anger and hostility in prior studies renders the separation of these as distinct constructs difficult and premature at this time. Specific details regarding the measurement and conceptualization of hostility and anger are beyond the scope of this paper. Therefore, theories and findings associated with hostility and anger in the context of depression is reviewed together in this paper.

Theoretical Relevance of Hostility in Depression

Beck's idea that negative thoughts in depression form a depressive "cognitive triad" (1970; 1976) may have implications for hostility in depression. Specifically, Beck posited that depressotypic negative thinking entailed negative thoughts and expectations pertaining to three facets (i.e., a triad) of experience: the self, the world outside the self, and the future. Research elucidating cognitive biases associated with depression, however, has tended to focus on negative self-referential cognitive biases (e.g., Barry, Naus, & Rehm, 2006; Beevers, 2005; Gotlib, Roberts, & Gilboa, 1996; Ingram, 1990; Wisco, 2009) and hopelessness about the future (e.g., Abramson, Metalsky, & Alloy, 1989; Beck, Steer, Beck, & Newman, 1993; Beck, Wenzel, Riskind, Brown, & Steer, 2008) while disregarding negative thinking pertaining to the outside

world. Haaga and colleagues have even suggested that each facet of Beck's cognitive triad actually represents "one set of negativistic self-relevant biases reflecting the self as a whole and two aspects of the self [i.e., the *self's* world and future rather than the world and future per se]" (1991, p. 218). Hostility, however, is a necessarily interpersonal construct. Thus, depression with hostility may represent a form of depression for which the external world facet of Beck's cognitive triad becomes particularly relevant. For depression without hostility, cognitive biases towards self-relevant negative thinking may predominate; for depression with hostility, negative thinking about others may predominate.

Contemporary research exploring the relationships between mood states and cognitive processes are rooted, in part, in Bower's classic ideas on affect priming (1981). Bower's theory suggests that the presence of a particular mood state will lead to a spreading activation of relevant schemas, defined as organized cognitive networks of stored information. Thus, when an individual is experiencing a sad mood state, information associated with sadness will be activated such as self-deprecating thoughts and/or memories of past sad events. This mood-related schema activation then increases the accessibility of sad-relevant information and facilitates information processing consistent with the sad mood state (i.e., sad information is preferentially selected, elaborated upon, and recalled; Bower, 1981). Depression with hostility and depression without hostility may be associated with the activation of different types of schemas. An individual experiencing depression with hostility may exhibit activation and preferential cognitive processing of schemas and information related to the negative intent or behaviors of other individuals, for example, rather than sadness-relevant information.

The cognitive specificity perspective (CSP) extends both Beck's (1967) cognitive theory

of depression and Bower's (1981) notion of affect priming, and represents a particularly useful framework for understanding the implications of hostility in depression. In particular, the CSP suggests that different mood states in the context of depression may be associated with different patterns of information processing (Ingram & Hamilton, 1999; Ingram et al., 1987). For instance, when someone is in a sad mood, a specific "sad" schema may be activated for the individual. The activation of this sad schema, then, becomes a lens through which the individual interprets information and thinks about the world. Sad schema activation may be associated with a tendency to recall sad memories, attend to sadness-relevant information, and interpret benign events as having a sad valence. On the other hand, depression with hostility may be associated with the activation of a hostile schema. If depression marked by anger or hostility is associated with preferential processing of negative interpersonal information, as opposed to negative self-relevant information, this style of depression may be uniquely associated with aggressive behavior, damage to interpersonal relationships, and differential response to treatment.

Support for the CSP in depression has been demonstrated by studies finding that hostility alters depressotypic cognitive biases. In one study of participants with dysphoria, a subclinical depressive syndrome, results suggested that individuals exhibiting greater levels of hostility displayed a tendency to blame others and to attribute specific external causes to negative events. In contrast, those with greater levels of sadness made more self-blaming and global attributions about the causes of such events (Scott et al., 2003). In other words, the dysphoric individuals higher in hostility may be more likely to blame the external world for occurrences perceived as negative; dysphoric individuals experiencing predominantly sad affect may be more likely to blame themselves for these occurrences. For example, a college student with a sad style of

dysphoria may attribute a failing exam score to globally negative characteristics of themselves, whereas a student with a hostile dysphoria may attribute the score to specific negative intentions of the instructor. Gaddy and Ingram, (2010) examined attentional allocation processes rather than attribution styles and found that greater sadness in the context of dysphoria was associated with greater allocation of attention towards emotion-relevant aspects of information (i.e., the person about whom the information described). Hostility on the other hand was associated with greater attention towards person-relevant aspects of information. Although theories about cognitive biases in depression typically highlight preferential processing of sad or depressive information (e.g., Beck, 1964; Beck, 1967), depressed mood marked by hostility seems to be associated with vigilance for interpersonally-relevant information and a tendency to interpret negative events as being caused by others.

Extending the implications of the CSP beyond cognitive phenomena, different emotions and information processing patterns may engender different symptoms and behaviors among individuals presenting with the same clinical syndrome. For example, an individual with a sad style of depression may experience anhedonia and social withdrawal, whereas an individual with hostile depression may exhibit psychomotor agitation, aggression, and self-destructive behaviors. These differential patterns of behaviors and symptoms might require different treatment protocols. Thus, emotional heterogeneity in depression may have implications that extend beyond the cognitive processes that were the original focus of the CSP. Research on depression should consider the role of specific mood states and how these mood states may impact both clinical presentation and also treatment effectiveness.

8

Hostility as a Depressive Symptom

Attempts to accurately classify heterogeneous depressive syndromes have been ongoing for several decades. One of the first proposed and widely used subgroupings of depression entailed a dichotomous split representing "endogenous" and "nonendogenous" types (see Roth & Barnes, 1981 for a review). Endogenous depression was thought to have an internal (or physiological) etiology, whereas non-endogenous depression was associated with symptom onset in response to external stressors (Winokur, 1985, p. 1116). Early research by Pilowsky and Spence (1975) suggested that hostility may be related only to nonendogenous depression. Even within these early discussions of heterogeneity and possible subgroupings of depression, hostility was recognized as an important part of the depressive syndrome.

Researchers have attempted to further subdivide nonendogenous depression and, notably, have identified subcategories marked by hostility, anger, and irritability. For instance, Parker and colleagues (1999) conducted a cluster analysis which revealed a nonendogenous depressive symptom cluster characterized by hostility and irritability. Roth and Barnes (1981) also identified a hostile subgroup within a sample of individuals diagnosed with non-endogenous depression. The salience of hostility within these efforts to categorize heterogeneous presentations of depression further supports the significance of hostility-related phenomena in the context of depressive disorders.

Most research efforts made during the previous several decades have elucidated depressive syndrome subgroupings that reflect a wider range of symptomatology than the endogenous versus non-endogenous dichotomy, and the importance of hostility has been further highlighted in such subgroupings. Paykel (1971) conducted one of the first cluster analyses

9

based on clinical depressive symptoms, previous history of mood symptoms, life stressors, and trait neuroticism using a sample of both inpatients and outpatients with a primary diagnosis of depression. This analysis yielded four subgroups of depression: psychotic, anxious, hostile, and young individuals with mild depression severity and comorbid personality pathology. Both the hostile subtype and the subtype with personality pathology were overrepresented among younger individuals. Another cluster analysis performed by Overall and colleagues yielded three subcategories of depression labeled hostile, anxious, and retarded (Overall & Hollister, 1980; Overall, Hollister, Johnson, & Pennington, 1965). The authors described the hostile depression subgroup as exhibiting some tendencies towards anxiety and suspiciousness, but predominantly marked by irritability and anger (Overall & Hollister, 1980; Overall, Hollister, & Johnson, 1966).

Anger attacks represent a specifically defined hostility-related phenomenon experienced by many individuals with depression. Like panic attacks, anger attacks are described as having a relatively sudden onset and engendering marked somatic distress (Fava et al., 1990; Fava & Rosenbaum, 1997). They differ from panic attacks, though, in that they lack the experience of significant fear and anxiety (Fava, 1998). Anger attacks appear to be ego-dystonic, in that they are recognized as inappropriate and considered uncharacteristic by the sufferer (Fava, Anderson, & Rosenbaum, 1990). Although briefer in duration than other hostility-related depressive phenomena, anger attacks represent an important example of how experiences of anger may manifest in depression. The experience of these attacks as ego-dystonic may indicate that hostility in the context of depression represents a cluster of phenomena only present during the depressive episode rather than a longer-standing trait-like anger that precedes or engenders risk

10

for depression.

Fava and colleagues have estimated in a number of samples the prevalence of anger attacks in patients with depression. Anger attacks are prevalent in depression, reported by 44% of individuals with depression in one sample (Fava, et al., 1993) and 39% in another (Fava, et al., 1996a). Furthermore, depression with anger attacks may be more closely associated with clinically significant hostility than depression without these attacks (Fava, et al., 1996a). These findings suggest that anger attacks in depression are not only prevalent, they also may be indicative of a subtype of depression that is associated with a distinct psychological profile. Depression with marked bouts of anger, in other words, may be a marker for other forms of intraepisodic hostility.

Studies of anger attacks in depression, as well as cluster analyses revealing a hostile subgroup of depression, have provided evidence that a substantial portion of individuals experience clinically significant anger and hostility while depressed. Summarizing the studies reviewed, hostility-related phenomena seem to be experienced by between one fifth and two fifths of individuals who suffer from depression (Benazzi & Akiskal, 2005; Fava et al., 1990; Fava et al., 1993; Pasquini et al., 2004; Perlis et al., 2005; Raja & Azzoni, 2005). Although prevalent, researchers commonly don't consider the implications of hostility-related phenomena for cognitive, physiological, and other factors that are associated with depression. Anger attack suffers report that their anger attacks are present only during depression, but it is not clear whether the hostility that is associated with these attacks is similarly intraepisodic. One possibility is that hostility could both precede and *also* be exacerbated by the presence of a depressive episode. Thus, anger attacks could be engendered by the depression-related

11

exacerbation of longer-standing hostility.

Hostility as Risk Factor for Depression

Hostility-related phenomena may represent a risk factor for subsequent depression rather than a depressive symptom or correlate only. Risk factors differ from correlated phenomena in their temporal precedence to the onset of symptomatology (see Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). Risk factors can be assessed using longitudinal studies or retrospective accounts given in cross-sectional studies. In one cross-sectional study of hostility and depression risk, Ingram and colleagues (2007) found that undergraduate students at risk for depression exhibited more hostility and anger than did low-risk students. Depression risk was retrospectively assessed using a structured interview (Structured Clinical Interview for DSM-III-R; Spitzer, Williams, Gibbon, & First, 1989), and individuals reporting a previous depressive episode were classified as high risk. No participants exhibited elevated depressive symptoms during their participation in the study, and thus, the absence of depressed mood during the study reduced the likelihood that measured hostility or retrospective reports of depression were biased by the participants' mood states at the time of participation in the study. Although it is difficult to determine the extent to which the hostility in this sample preceded the onset of their identified depressive episodes, the findings of Ingram and colleagues (2007) suggest that further research clarifying the extent to which hostility represents a risk factor for depression is warranted.

Longitudinal data are best suited to assess risk factors since risk suggests that a factor is observed prior to observing the onset of a syndrome or episode (Ingram, 2009). Thus far, only a small number of studies have explored longitudinal trends in hostility and depression. One such study found that greater stability of hostility from childhood through adolescence and higher

levels of hostility during adolescence each predicted increased risk for depression during early adulthood (Heponiemi et al., 2010). Even with several years between assessments conducted first in adolescence and again in early adulthood, hostility emerged as a risk factor for subsequent depression. This finding is consistent with those associated with samples of older adults (Stewart et al., 2010), Mexican Americans (Miller, Markides, Chiriboga, & Ray, 1995), American young adults (Reinherz, Giaconia, Carmola Hauf, Wasserman, & Silverman, 1999), and predominantly white male alumni of one American university (Siegler et al., 2003). Although each of these studies used a demographically restricted sample, their findings converge to suggest that hostility may be an important risk factor for depression. Compared to effects associated with previous studies of demographically limited samples, effect estimates derived from the more demographically diverse sample used in the current study were expected to yield more precise and generalizable estimates regarding the extent to which hostility confers risk for subsequent elevations in depressive symptoms.

Neurotransmission of serotonin may represent a biological mechanism by which higher levels of hostility confer risk for depression. Decreased serotonergic neurotransmission is commonly associated with the presence of elevated depressive symptoms (Fava, 1998; Flory, Manuck, Perel, & Muldoon, 2004; Park, Williamson, & Cowen, 1996; Rosenbaum et al., 1993). Depletion of tryptophan, an amino acid precursor to serotonin, has also been shown to result in increased levels of hostility among both healthy and psychopathological individuals (Russo et al., 2003). Further, individuals with depression and hostility exhibit reduced basal serotonin binding (Lauterbach et al., 2006) and lower serum levels of serotonin metabolite (Placidi et al., 2001) compared to individuals with depression without hostility. Researchers have not yet

explored the extent to which the serotonin-related dysfunction associated with hostility may predict later depressive symptom elevations. It is possible that serotonergic dysfunction, however, may represent a mechanism by which hostility may confer risk for later depression.

Evidence supports both the idea that hostility represents an important correlate of depression and also the notion that hostility may represent a risk factor for depression. No known study has attempted to quantify using a single sample the extent to which each idea is supported. Therefore, the extent to which the correlation between hostility and depression is due to the preexistence of hostility and the extent to which the risk for depression conferred by hostility is due to the correlation between depression and hostility remain unclear. To precisely estimate relevant parameters associated with the relationship between depression and hostility, cross-sectional and longitudinal parameters were estimated simultaneously in the current study.

Diagnostic Implications

Some research has found that depression with marked hostility-related features may be more akin to bipolar (including both depressive and manic features) than unipolar (without manic features) mood disorders. In a sample of patients with depression described by Benazzi and Akiskal (2005), irritability was related to several bipolar mood disorder markers such as younger age of onset, bipolar family history, and higher rates of atypical depressive features (i.e., agitation, increased appetite, and increased sleep). Similarly, Bottlender and colleagues (2004) found that hostility in the context of unipolar depression was associated with hypomanic symptoms such as distractibility, racing thoughts, psychomotor agitation, and the tendency to engage in risky behavior. Biondi and colleagues (2005) conducted a factor analysis of depressive symptoms, including symptoms commonly appearing alongside depressive symptoms such as

anxiety and hostility, using a sample of outpatients meeting criteria only for DSM-IV depressive

disorders. Their results revealed a relationship between hostility-related symptoms and what the

authors called an "activated" dimension, as opposed to "anxious" or "depressive" dimensions, of

unipolar depression (Biondi, Picardi, Pasquini, Gaetano, & Pancheri, 2005). This activated

dimension was not only characterized by anger and aggressiveness, but also irritability and

psychomotor agitation. From these findings, some have concluded that depression with hostility

may actually represent a "pseudounipolar" syndrome, fitting somewhere between unipolar and

bipolar on a spectrum of mood disturbance (Benzazzi & Akiskal, 2005; Biondi et al., 2005;

Bottlender et al., 2004).

In accordance with evidence suggesting that depression with hostility represents a

"pseudounipolar mood disorder," some researchers have proposed broadening the bipolar

concept to include some forms of depression with symptoms of anger, hostility, and irritability

(Akiskal et al., 2000; Akiskal & Benazzi, 2003; Cassano et al., 1992). The proposed widening of

the bipolar criteria would include such conditions as mixed states with subthreshold manic

symptoms (compared with the symptoms of mania and hypomania described in the current

DSM-IV diagnostic criteria) and would result in an increase of bipolar mood disorder prevalence

from approximately 1% to approximately 5% (Akiskal et al., 2000). Akiskal and Benazzi (2006)

examined the distribution of several hypomanic symptom dimensions to clarify the potential

diagnostic implications of these additional bipolar mood disorders. Participant hypomanic

symptom scores exhibited a normally-shaped distribution for a unipolar sample, a sample of

individuals with Bipolar II Disorder, and in both samples combined. Akiskal and Benazzi

concluded that a bimodally-shaped distribution would be expected in the combined sample if the

unipolar and bipolar samples represented truly distinct groups (2006). The normally-shaped

distribution of hypomanic symptomatology in a combined unipolar-bipolar sample is

inconsistent with the current grouping of mood disorders into distinct unipolar and bipolar

categories in the DSM (APA, 2000). Rather, this distribution suggests that mood disturbance

varies quantitatively, on a continuum, in the extent to which bipolarity is exhibited.

Although some evidence suggests that anger in the context of a depressive episode

represents undiagnosed bipolar mood disturbance, there is also evidence that these episodes may

be more closely aligned with unipolar depression. Anti-depressant medications have been found

to reduce anger attacks during depressive episodes (Fava & Rosenbaum, 1999; Tedlow et al.,

1999). Further, individuals with depression plus anger attacks are not especially likely to

experience a "switch" to a manic episode following treatment with antidepressant medications

(Tedlow et al., 1999), whereas anti-depressant medications increase anger among individuals

with bipolar mood disorders (Baldessarini, 2001; Bottlender et al., 2004; Goldberg & Truman,

2003; Koukopoulos & Koukopoulos, 1999). Thus, the conclusion that anger and hostility in

depression represent a marker of undiagnosed bipolar mood disturbance may be unfounded.

The current diagnostic framework set forth by the DSM-IV-TR places unipolar and

bipolar mood disturbance into separate categories (American Psychiatric Association, 2000),

implying qualitatively separate kinds of mood disorder. In contrast, the normal distribution of

markers and symptoms of bipolarity in the context of the depressive episodes of a combined

unipolar-bipolar sample suggests that mood disorders may actually fall along a continuum

between unipolar and bipolar mood disturbance (Akiskal & Benazzi, 2006). In other words,

bipolar tendencies likely vary quantitatively rather than representing tendencies that are either

16

present or absent. Research is needed to further clarify the utility of such a continuous diagnostic conceptualization. Given the categorical nature of the current DSM-IV-TR diagnostic system as well as evidence that unipolar depression marked by hostility is *not* especially predictive of a later bipolar mood disorder diagnosis, continuing to explore hostility as a source of heterogeneity in unipolar depression is warranted. Rather than a new form of bipolar mood disorder, depression with hostility may be best conceptualized as a subtype of unipolar depression, especially given the current categorical diagnostic system in place.

Clinical and Health Implications

The investigation of hostility in the context of depressed mood is important not only for the sake of description, but also because of the substantial clinical and health-related implications that hostility may have for individuals with depression. Hostility, for example, is a well-established risk factor for the development of cardiovascular diseases (e.g., Dembroski, MacDougall, Costa, & Grandits, 1985; Diamond, 1982; Smith, 1994; Smith, et al., 2004) as well as hypertension and stroke (see Smith & MacKenzie, 2006). Hostility may also be associated with interpersonal and occupational problems, including greater discord in close relationships (Miller, Smith, Turner, Guijarro, & Hallet, 1996; Newton & Kiecolt-Glaser, 1995; Siegler et al., 2003; Smith, Pope, Saunders, Allred, & O'Keefe, 1998), lower occupational status, and greater negative mood at work (Flory, Matthews, & Owens, 1998). In addition to potentially conferring risk for depression (Ingram, Trenary, Odom, Berry, & Nelson, 2007), hostility-related interpersonal discord may present special challenges for the psychotherapeutic treatment of depression with hostility. In treating depression with hostility, both the depressive syndrome and the complicating interpersonal and health-related consequences of elevated hostility may need to

17

be considered.

Hostility in the context of depression is associated with greater severity of depression and more reports of dangerous behaviors. In general, hostility in the context of depression seems to carry negative prognostic value, and may be associated with longer time spent ill (Heerlein, Richter, Gonzalez, & Santander, 1998). Furthermore, individuals exhibiting relatively severe depression with hostility are more likely than their less-hostile counterparts to have previously attempted suicide (Weissman, Fox & Klerman, 1973), abused alcohol (Riley, Mabe, & Davis, 1991), and engaged in self-destructive acts (Yesavage, 1983). Therefore, hostility has relevance for the etiology, clinical presentation, course, and treatment of the depressive syndrome, itself, in addition to potentially complicating the treatment of individuals with depression.

Selective serotonin reuptake inhibitors (SSRIs) have been found to reduce not only depressive symptoms, but also hostility-related symptoms in individuals suffering from depression with anger or hostility. In contrast to mixed findings concerning tricyclic antidepressants (Fava et al., 1986; Klerman & Gershon, 1970), studies of pharmaceutical treatments for hostile depression have consistently supported the effectiveness of SSRIs for reducing both hostility (Bagby et al., 1999; Fava, et al., 1996b) and the frequency of anger attacks (Fava, 1998; Fava et al., 1991; Fava et al., 1993; Mischoulon et al., 2003) in the context of depression. SSRIs also have demonstrated effectiveness in alleviating depressive symptoms, perceived stress, and negative thoughts for those with depression marked by anger (Fava, et al., 1996). The effectiveness of SSRIs for the treatment of depression with anger and hostility further supports the etiological relevance of serotonergic dysfunction for this kind of depression. However, researchers have yet to determine whether the serotonergic dysfunction associated

18

with hostile depression represents additive or interactive combination of the dysfunction associated with hostility alone and that associated with depression alone. Determining the nature of the relationship between depressotypic and hostility-related serotonergic dysfunction represents a topic for future study that may reveal further implications of hostility-related phenomena for the psychopharmaceutical treatment of depression.

Effective psychotherapeutic options are available to manage anger and hostility, but none are specifically intended to treat depression with marked hostility-related features. Techniques demonstrating effectiveness for reducing anger include dialectical behavior therapy (DBT; e.g. Linehan, Armstrong, Suarez, Allmon & Heard, 1991; Linehan, Heard & Armstrong, 1993), other cognitive-behavioral anger management interventions (see Beck and Fernandez, 1998) and stress inoculation training (e.g. Novaco & Meichenbaum, 1985). In addition, cognitive behavioral therapy (CBT) is a widely used psychotherapeutic treatment for depression (Woody, Weisz, & McClean, 2005). To treat hostile depression, CBT could be modified to target hostile, anger provoking thoughts in addition to the more traditional depressive thoughts. Including either CBT-inspired anger management strategies or DBT-inspired emotion regulation and interpersonal effectiveness skills within a modified CBT depression treatment protocol would likely provide additional benefit in the psychotherapeutic treatment of hostile depression.

Depression marked by hostility-related phenomena represents a severe but treatable variety of depressive illness. Therefore, efforts to develop an effective treatment targeted towards a hostile depression style, or towards hostility that may engender risk for depression at a future time, may result in a greater reduction of depression-related burden compared to the targeted treatment of other forms of depression. This possibility should make research on

hostility in the context of depression a priority for public health funding agencies, organizations, and policy makers.

Summary of Background Literature

Previous research supports the idea that hostility-related phenomena play an important role in the syndromes of many diagnosed with a unipolar mood disorder. Hostility is commonly reported by individuals experiencing depression, and cluster analyses of depression-related variables typically reveal a depression subtype characterized by experiences of hostility, anger, and/or irritability (e.g., Overall & Hollister, 1980). Regarding cognitive styles, a negativistic focus on others may be more relevant for individuals experiencing depression with hostility, whereas a negativistic self-focus may be more relevant for individuals experiencing depression without hostility (e.g., Ingram et al., 2007). Hostility has also been associated with greater severity of depression and greater likelihood of suicide attempt (Weissman, Fox, & Klerman, 1973). Individuals with depression vary in the extent to which they exhibit hostility, but previous findings indicate that hostility is among the most important sources of heterogeneity in depression.

Many important questions remain regarding the relationship between hostility and depression. First, nosological clarity is required regarding the extent to which hostile depression represents a syndrome more aligned with a bipolar mood disturbance or a subtype of unipolar mood disturbance. Second, researchers have not reached a consensus about accurate conceptualizations and measurements of hostility-related phenomena. Third, researchers have not yet evaluated the possibility that tailored cognitive-behavioral psychotherapies may be more effective than standard cognitive-behavioral psychotherapies for the treatment of depression

with hostility. Finally, and most relevant to the current study, limited evidence is available regarding the extent to which hostility represents a correlate of elevated depressive symptoms versus a risk factor for depression. A better understanding of both the relationship between hostility and depression and also the implications of high levels of hostility in the context of depressed mood will be critical in the effort to better understand individual differences in depression. Such an understanding would likely result in substantial improvements in the diagnosis and treatment of unipolar mood disorders.

Current Study

The primary goal of this study is to produce more generalizable estimates than previously available regarding the extent to which hostility is a correlate of and risk factor for subsequent depression. To assess longitudinal trends associated with depression and hostility, I analyzed data from the second and third waves (subsequently referred to here as W2 and W3, respectively) of the National Survey of Families and Households (NSFH: Sweet & Bumpass, 1996, 2002). A team of researchers at the University of Wisconsin-Madison collected these data between 1992 and 2002. Measures of hostility are not included in the first wave. W2 and W3 include measures of both hostility and depressive symptoms and, thus, were deemed particularly useful for this study.

All hypotheses for this study were evaluated using structural equation modeling (SEM). SEM is a flexible analytical technique that permits simultaneous estimation of predictive and correlational relationships among constructs in longitudinal data. Furthermore, SEM provides estimates of the relationship between latent variables, in contrast to observed variables, by estimating the underlying factor structure of measurements. The modeling of factor structures in

SEM reduces the influence of error variance on the estimates of parameters representing relationships between latent variables of interest (Kline, 2005). In addition to the use of a large nationwide sample, the correction for error variance and the ability to evaluate all parameters of interest in a single model that is afforded by SEM contributes to both the reliability and also the utility of the results derived from the current study.

Three primary hypotheses guided the statistical analyses for this study. First, I predicted that the factor structure of the hostility and depression measures used would exhibit factor structure invariance across the two waves of measurement (i.e., invariance in both item loadings and also intercepts representing estimated item means). Second, I predicted that higher levels of hostility would correlate with higher levels of depressive symptomatology at both W2 and W3. In other words, I predict that the correlation between the latent constructs representing hostility and depression at both waves of measurement would be statistically significant and positive in valence. Finally, and consistent with previous findings (e.g., Stewart et al., 2010), I predicted that W2 hostility levels would significantly predict depressive symptom levels at W3. No known studies have explored the potential moderating impact of demographic characteristics on relationships between hostility and depression. Therefore, I posed no specific hypotheses regarding the relationship between these characteristics and longitudinal trends in hostility and depression.

Method

Sample

Data were attained from W2 and W3 (1992 - 1994 and 2001-2002, respectively) of the NSFH (Sweet & Bumpass, 1996; 2002). The NSFH dataset contains a range of information

pertaining to demographic characteristics, occupational data, well-being measures, and other variables from a nationally representative sample. The initial sample included over 13,000 individuals with a response rate of 74% for the first wave and 81.7% for W2 (Sweet & Bumpass, 1996). The response rate for W3 was 57% (including both those who had and had not participated during W2; Sweet & Bumpass, 2002). Further, W3 participants were restricted to only those individuals 45 years or older and/or participants with children at the time of the wave (Sweet and Bumpass, 2002). Cases included in the analyses here are those for which 1) depression- and hostility-related information was provided during both the second and third waves of data collection, and 2) elevated depressive symptoms were exhibited, defined as a12-item CES-D scale total greater than or equal to 9, during at least one of these two waves. In total, 2,044 NSFH participants met these criteria, and these cases were included in the analyses for the current study. (See Table 1 for a summary of sample demographic characteristics.)

The research questions associated with this study pertained to levels of hostility and depressive symptoms among individuals exhibiting elevated depressive symptomatology. Therefore, only participants providing data about depressive and hostility-related symptoms at both waves of interest were included in the analyses described here. Further, because the current research questions associated with this study pertained to clinically relevant psychopathological phenomena, only data for individuals exhibiting elevated levels of depressive symptoms during W2, W3, or both were included (N = 2,044).

Table 1

Sample Demographic Characteristics

	Females (n = 1455)		Males (n = 589)		Total (N = 2044)		
	M	SD	M	SD	M	SD	p[1]
Age at W2	49.26	12.65	49.07	11.67	49.20	12.38	.75
Years of Education	12.70	2.54	13.21	3.17	12.84	2.75	<.001
	n	%	n	%	n	%	p[2]
Married	776	53.3	402	68.3	1178	57.6	<.001
Race/Ethnicity							.50
Caucasian	1100	75.6	472	80.1	1572	76.9	
Black	283	19.5	89	15.1	372	18.2	
Other	72	4.9	28	4.8	100	4.9	

[1]Evaluated using independent samples *t*-tests
[2]Evaluated using chi-square tests of independence

Note. M = Mean; SD = Standard Deviation

Measures

  Depression. In each wave of the NSFH, severity of depressive symptomatology was measured using a 12-item version of the Center of Epidemiological Studies – Depression Scale (CES-D; Kessler, Foster, Webster, & House, 1992; original version by Radloff, 1977). For the NSFH version of the CES-D, participants indicated the number of days during the previous week on which they experienced a range of depressive symptoms including, but not limited to, sadness, anhedonia, insomnia, and appetite disturbance. Responses for each symptom ranged from 0 to 7 days. Prior to analyses these responses were recoded, making the resulting item scores congruent with the original CES-D coding scale (0 = no days, 1 = 1 – 2 days, 2 = 3 – 4 days, 3 = 5 – 7 days; Radloff, 1997). Recoding was performed so the conventional CES-D cutoff score of 9, commonly used for the 12-item version of the CES-D (e.g., Pascoe, Stolfi, & Ormond, 2006; Wolinsky et al., 2009), could be employed in the current study for selection of included cases. In the full NSFH sample, the CES-D exhibited high internal consistency, with Chronbach's alpha values for each wave ranging from 0.88 to 0.93 (Kessler et al., 1992).

  Hostility. Three questions were used in W2 and W3 of the NSFH survey to assess recent hostility-related experiences. They were not included in the first wave. These three items entailed responding to questions regarding the number of days during the previous week participants felt "like telling someone off," felt "angry or hostile for several hours at a time," and felt irritable (Sweet & Bumpass, 1996; 2002). In the full sample, this measure exhibited adequate internal reliability (Chronbach's alpha = 0.85 in wave 2 and 0.75 in wave 3). Also, in one study using data from the NSFH, scores for this hostility measure exhibited expected and marked negative correlations with self-esteem ($r = -0.30$), happiness ($r = -0.38$), a sense of

personal mastery (r = -0.38), general psychological wellness (r = -0.39), and self-rated health (r = -0.22) as well as a large positive correlation with depressive symptoms (r = 0.54; Marks, Lambert, Jun, & Song, 2008). Thus, the three-question hostility scale from the NSFH appears to represent a range of hostility-related experiences, and it has exhibited adequate reliability and validity in the analyses for which it has been used.

Results

As described in the Method section, a sequence of measurement models preceded the specification of structural models reflecting the longitudinal relationships between hostility and depression. Further, in addition to a single-group set of SEM analyses, in which a single set of parameter estimates was derived for the entire sample, a parallel two-group set of analyses was completed to reveal potential gender differences in these estimates. Following the presentation of descriptive statistics, findings are described here as they pertain to the 1) single-group measurement models, 2) single-group structural models, 3) two-group measurement models, and 4) two-group structural models.

Descriptive Statistics

Demographic characteristics. Of the 2,044 cases included in the current analyses, 1,225 (59.93%) exhibited elevated depressive symptoms at only one wave of data collection (n = 657 elevated at W2 only, n = 568 at W3 only), and 819 (40.%) exhibited elevated depressive symptoms at both waves. 71% were female (n = 1,455) and 29% were male (n = 589). A majority of the sample identified as Caucasian (76.9%), and a smaller majority reported being married at W2 (57.6%). The proportions of individuals identifying as Caucasian, African American, or another race or ethnicity did not significantly differ based on gender. Similarly, age

did not differ, on average, between the males and females included in the current analyses (for males and females combined, M = 49.2, SD = 12.38). Males and females did differ, however, in the proportions that reported being married at W2, as opposed to any other marital status, with a greater proportion of males than females reporting being married at that time (χ^2(1, N = 2044) = 37.61, p<.001). Further, males reported more years of education (t(2042) = 3.81, p<.001) compared to their female counterparts in the current sample (see Table 1).

Depression and hostility scale scores. Regarding depression scores in the total sample, the average 12-item CES-D total score was 13.25 (*SD* = 8.29) at W2 and 12.35 (*SD* = 8.06) at W3, with possible scores ranging from 0 to 36. Females and males exhibited significant differences in W2 mean observed depression scores (t(2042) = 4.24, p < .001) as well as W3 mean observed depression scores (t(2042) = 2.29, p = .02). At both waves, depression scores for females were greater than those for males. Observed hostility scale total scores averaged 4.46 (*SD* = 4.84) at W2 and 3.55 (*SD* = 4.26) at W3 in the total sample, with possible scores ranging from 0 to 21. Gender differences in mean observed hostility scores were observed for neither wave of measurement. (See Table 2 for descriptive statistics associated with the observed depression and hostility scores for males, females, and the total sample.)

Regarding averages in depression and hostility scores at W2, the scores for females appear more variable than the scores for males (see Table 2). Differences in variability are not as apparent in score averages from W3 compared to averages from W2. Homogeneity of variances across genders, as well as homogeneity in covariances among the constructs, is formally tested in a subsequent section, **Two-Group Measurement Models**, and implications of heterogeneous variances for the interpretation of those results are also introduced in that section.

Table 2

Observed Total Scores on Hostility and Depression Measures at Waves 2 and 3

	Females (n = 1455)		Males (n = 589)		Total (N = 2044)		
	M	*SD*	*M*	*SD*	*M*	*SD*	*p*
W2 Depression	13.74	8.56	12.03	7.44	13.25	8.29	<.001
W3 Depression	12.61	8.14	11.71	7.81	12.35	8.06	.02
W2 Hostility	4.55	5.02	4.25	4.39	4.46	4.84	.40
W3 Hostility	3.46	4.21	3.75	4.37	3.55	4.26	.16

Note. M =Mean, SD = Standard Deviation; W2 = wave 2 of the National Survey of Families and Households (NSFH); W3 = wave 3 of the NSFH. Depression constructs measured using a 12-item version of the Center for Epidemiological Studies - Depression Scale (Kessler et al., 1992; possible total scores range from 0 - 36). Hostility measured using a three-item measure administered in the second and third waves only (Sweet & Bumpass, 1996; 2002; possible total scores range from 0 – 21). Significance of gender differences evaluated using independent samples *t*-tests.

Analytical Methods

MPLUS 6.11 statistical software was used to construct all SEM models for the current study. Cases were weighted in the analyses using the sample case weights included in the original NSFH datasets, calculated to adjust for the oversampling of particular demographic groups during data collection (Sweet & Bumpass, 1996; 2002). The marker variable method of scale setting was used for all models described here. This method entails fixing the loading of one indicator per construct to 1.0, and it is among the most commonly used scale setting methods for the SEM technique. (See Kline, 2005 for a description of scale setting methods.)

The SEM analysis first entailed specifying measurement models using confirmatory factor analysis (CFA) to represent the relationships between the observed variables representing hostility and depression and their corresponding latent constructs. A sequence of CFA models was specified to confirm both the invariance of the factor structures associated with hostility and depression across waves of measurement and also the homogeneity across time of variances and covariances among the latent constructs. Then, measurement models were constructed to evaluate the longitudinal relationships between hostility and depression, with beta paths representing W3 depression regressed onto W2 depression and W2 hostility as well as paths representing W3 hostility regressed onto W2 depression and W2 hostility. After specifying the initial structural model, a final model was constructed that included covariate effects associated with relevant demographic characteristics. Semi-partial covariate effects were specified, with gamma (i.e., regression) paths included representing the W2 hostility and W2 depression latent constructs regressed onto each covariate construct.

To elucidate the impact of gender on longitudinal relationships between hostility and

depression, the single-group analysis of these relationships was followed by a two-group analysis, with relationships among the observed and latent variables estimated separately in males and females. All across-wave constraints from the single-group testing were retained. Prior to the construction of the two-group measurement models, invariance and homogeneity testing was performed using a sequence of CFA models to determine the tenability of across-group invariance and homogeneity constraints. Semi-partial covariate effects were included in the final step of the two-group structural equation modeling.

Prior to specifying the measurement models, data screening revealed severe nonnormality in some indicators, particularly those for the latent constructs representing hostility. Multivariate normality is an assumption of structural equation modeling using maximum likelihood (ML) estimation procedures. If univariate normality is violated, the assumption of multivariate normality is also violated, and estimates of both fit statistics and parameters can be distorted (Kline, 2005). To adjust for nonnormality, maximum likelihood estimation with robust standard errors (MLR) estimation was used. MLR estimation, an extension of ML estimation, produces scaling correction values used in the current analyses to compute an adjusted chi-square value, the Satorra-Bentler chi-square ($SB\chi^2$), as well as standard error values that are robust to nonnormal variable distributions (Satorra; 2000; Satorra & Bentler, 2001). For all nested model comparisons used in analyses for the current study, $SB\chi^2$ differences were evaluated using the Scaled Difference in Chi-Squares (SDCS) test, a difference test that must be used in place of the standard chi-square difference test since raw differences between $SB\chi^2$ values are not, themselves, distributed as chi-square (see Satorra & Bentler, 2001).

The MLR estimation method provides parameter estimates even when some data points

30

are missing. Therefore, neither multiple imputation nor other special handling of missing data were required. For models that include covariates or other exogenous variables, cases with missing exogenous variable data points were not included by MPLUS in the analysis. In the current dataset, 105 cases had missing data for at least one covariate variable (i.e., demographic variable), and these cases were excluded in any analyses in which covariate effects were estimated. Therefore, N = 2,044 for all models described here that do not include covariate effect estimates, and N = 1,939 for all models that include covariate effect estimates. A review of each covariance coverage matrix revealed that all covariance coverage values for the models reported here exceeded 0.90 (90% coverage).

Single-Group Measurement Models

Prior to specifying an initial unconstrained measurement model to examine the factor structure of the observed hostility and depression items in the current sample, a null model was specified. Rather than a standard null model which assumes all indicator covariances are equal to zero, a more appropriate null model for longitudinal data entails specifying that the variances and intercepts (i.e., means) of each corresponding indicator are equal across waves of measurement (Widaman & Thompson, 2003). For the current data, as expected, the null model specified in this manner was associated with very poor model fit ($SB\chi^2$ (465, n = 2044) = 15961.50, p = <.001, CFI = 0.00, RMSEA = .128). Noteworthy, however, is the relatively small value of the RMSEA, an absolute fit index based on a model's n, df, and χ^2 values for which values of .01 and .08 are traditional cutoffs representing excellent and mediocre fit, respectively (Kline, 2005; MacCallum, Browne, & Sugawara, 1996).

Kenny (2012) has noted that small RMSEA values in the null model engender difficulties

31

with the interpretation of incremental fit indices, such as the comparative fit index (CFI) and the non-normed fit index (NNFI), which are commonly included among the fit statistics reported for SEM models (Kline, 2005). Specifically, Kenny (2012) suggests that an incremental fit index is not appropriate for cases in which the null model RMSEA is smaller than .158. This is because the incremental fit indices measure a proportion of improvement of a specified model compared to its null model, with RMSEA-related functions representing the measures of fit being compared across the two models. For example, RMSEA is calculated as $\sqrt{(\chi^2 - df)} / \sqrt{[df*(N-1)]}$, and the CFI represents the proportion of reduction in $\chi^2 - df$ (the square of the RMSEA formula numerator) in the specified model compared to the null model. Therefore, if RMSEA is already small in the null model, even substantial absolute improvement in the fit of the specified model is likely to result in a CFI value (or other incremental fit index value) that is outside the range of values traditionally considered to represent acceptable model fit (Kenny, 2012). Since the RMSEA value was found to be small for the current null model (RMSEA = .128), only noncomparative fit estimates (i.e., $SB\chi^2$ and RMSEA) were considered appropriate for evaluating model fit in the current study.

Subsequent to the null model, a nested sequence of measurement models was constructed to assess the acceptability of the factor structure for the latent variables associated with hostility and depression across waves of measurement. In addition, this nested sequence was used to evaluate the first hypothesis for the current study, the expectation that the factor structure underlying the depression- and hostility-related latent constructs would be invariant across the two waves of measurements. Model tenability was evaluated using the RMSEA Model Test (see Little, 1997).

Table 3

Fit Indices for the Nested Sequence in the Single-Group Confirmatory Factor Analysis

Model	$SB\chi^2$	df	$\Delta SB\chi^2$	Δ df	p	RMSEA	RMSEA 90% CI	Constraint Tenable?
Configural Invariance	994.83	384	---	---	---	.039	.037 – .041	---
Loading Invariance[1]	973.59	397	---	---	---	.039	.037 – .041	Yes
Intercept Invariance[1]	1073.98	410	---	---	---	.040	.039 – .042	Yes
Homogenity of Variances[2]	1078.99	412	5.09	2	.07	.040	.038 – .042	Yes
Homogenity of Variances/[2] Covariance	1080.55	413	1.56	1	.21	.041	.039 – .042	Yes

[1] Model tenability was evaluated with the RMSEA Model Test (Little, 1997)
[2] Model tenability was evaluated with the Scaled Difference in Chi-Squares test (Satorra, 2000).

Note. $SB\chi^2$ = Satorra-Bentler corrected chi-square. CI = Confidence Interval. Each nested model contains its constraints plus the

constraints of all previous models.

33

The initial unconstrained model demonstrated good fit ($SB\chi^2$ (384, n = 2044) = 994.83, p < .001, RMSEA = .039). Next, factor loadings for the indicators (observed variables) were constrained to equality across waves of measurement, and intercepts were then constrained to equality across the two waves. Compared to the freely estimated measurement model, as shown in Table 3, the loading and intercept equality constraints were found to be tenable ($SB\chi^2$ (410, n = 2044) = 1073.98, p < .001, RMSEA = .040). Therefore, the factor structure of the both the 12-item CES-D depression measure and also the hostility measure used in the NSFH were found to be invariant across time points for the current sample. In addition to model fit indices, parameter estimates from the unstandardized and completely standardized solution of the invariant measurement model (the measurement model containing all invariance-related constraints) were reviewed. The unstandardized solution produced depression indicator loadings ranging from 0.59 to 1.0 and hostility indicator loadings ranging from 1.0 to 1.38 (see Table 4). Further, the squared multiple correlation values for all indicators exceeded 0.20. As reflected in Table 5, the hostility and depression constructs exhibited the expected within-wave positive correlations (r = .68 at wave 2, p < .01; r = .59 at wave 3, p < .01). All values were within expected ranges.

Table 4

Indicator Loadings from the Single-Group Structural Model

Depression

	Indicator (W2 / W3)	Estimate	S.E.	p
	MT206A / RT206A	1.00	--	--
	MT206B / RT206B	0.59	0.025	<.01
	MT206C / RT206C	0.94	0.020	<.01
	MT206D / RT206D	0.77	0.020	<.01
	MT206E / RT206E	0.99	0.019	<.01
	MT206F / RT206F	0.79	0.020	<.01
	MT206G / RT206G	0.72	0.022	<.01
	MT206H / RT206H	0.64	0.023	<.01
	MT206I / RT206I	0.71	0.023	<.01
	MT206J / RT206J	0.82	0.026	<.01
	MT206K / RT206K	0.94	0.020	<.01
	MT206L / RT206L	0.72	0.022	<.01

Hostility

	Indicator (W2 / W3)	Estimate	S.E.	p
	MT206M / RT206M	1.00	--	--
	MT206N / RT206N	1.38	0.043	<.01
	MT206O / RT206O	1.13	0.050	<.01

Note. Estimates from the unstandardized solution of the intercept invariant model (i.e., indicator variances and loadings were constrained to equality across time points). S.E. = standard error; W2 = wave 2; W3 = wave 3. Names for the depression and hostility indicators are labeled here such that they are consistent with the variable names used in the original National Survey of Families and Households (NSFH) datasets and codebooks.

Table 5

Hostility and Depression Latent Construct Correlations in the Single-Group Measurement Model

	D2	H2	D3	H3
D2	1	--	--	--
H2	.68**	1	--	--
D3	.04	.06	1	--
H3	.09	.25**	.59**	1

**$p < .01$.

Note. Estimates from the completely standardized solution of the intercept invariant model (i.e., indicator variances and loadings constrained to equality across time points). D2 = depression at wave 2; H2 = hostility at wave 2; D3 = depression at wave 3; H3 = hostility at wave 3.

Following invariance testing, additional nested measurement models were specified to evaluate the homogeneity of the variances and covariances of the depression and hostility latent constructs across the two waves of measurement. Models tenability was evaluated using the SDCS test (Satorra, 2000) which produces an adjusted score representing the difference between Satorra-Bentler chi-square values for a comparison and a nested model that is distributed, itself, as chi-square. Constraining latent construct variances and covariances to be equal across waves resulted in no significant drop in model fit (for the model including all invariance and homogeneity constraints, $SB\chi^2$ (413, n = 2040) = 1080.55, $p < .001$, RMSEA = .041). Together, the results for the nested sequence suggested that the depression and hostility constructs measured by the NSFH are consistent across time points for the current sample, supporting the first hypothesis for the current study. In other words, the measures of hostility and depression used here seem to measure the same constructs at each time point for the current sample.

Single-Group Structural Models

A panel model was constructed that included autoregressive and cross-lagged paths between the hostility and depression latent constructs measured during the W2 and W3 of the NSFH. Similar to the fit exhibited by the measurement models, this structural model exhibited good fit ($SB\chi^2$ (412, n = 2044) = 1406.03, $p < .001$, RMSEA = .048). To estimate the impact of demographic characteristics on the relationship between hostility and depression, variables representing gender, years of education, socioeconomic status (SES; value used in the NSFH is based on occupational status and the work of Stevens & Cho, 1985), marital status (dummy coded as married versus another marital status), and race/ethnicity (coded as Caucasian versus minority race/ethnicity) were included in the structural model as semi-partial covariates.

Regression paths were included in the model that represented each W2 latent construct regressed onto each covariate variable. The structural model including these semi-partial covariate effects continued to exhibit good fit ($SB\chi^2$ (582, n = 1939) = 2804.95, $p < .001$, RMSEA = 0.46). Depression and hostility continued to exhibit significant positive correlations at each wave of measurement, consistent with the second hypothesis for the current study (for the completely standardized solution, W2 $r = .65$, $p < .001$, W3 $r = 0.61$, $p < .001$).

An examination of the regression paths in the single-group model with covariates revealed that the paths representing W3 depression regressed onto W2 hostility and W2 depression were not statistically significant (see Figure 1). Thus, neither hostility nor depression levels at W2 predicted depression levels atW3. The finding that W2 hostility was not a significant predictor of W3 depression is inconsistent with the third hypothesis for the current study. Greater W3 hostility, however, was predicted by greater W2 hostility ($\beta = 0.36$, $p < .01$) as well as lesser W2 depression ($\beta = -0.20$, $p < .01$). It is also worth noting that constraining the latent depression construct means to equality resulted in significantly decreased model fit ($\Delta SB\chi^2$ (1) = 440.72, $p < .001$) as did constraining the latent hostility construct means to equality ($\Delta SB\chi^2$ (1) = 137.67, $p < .001$). For both constructs, the latent mean values exhibited a decrease at W3, compared to their respective W2 means.

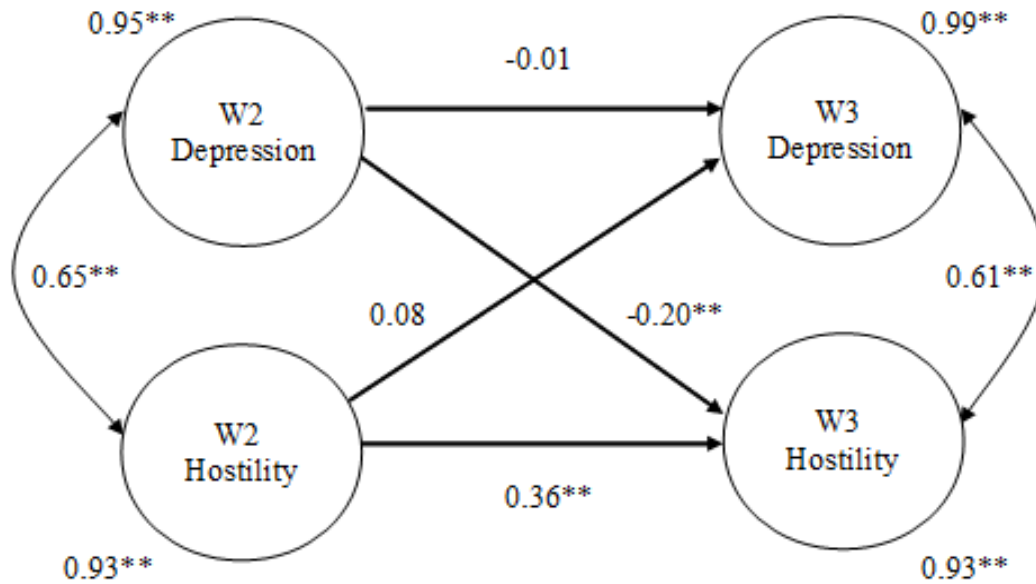*Figure 1*: Illustration of the single-group structural panel model. Parameter estimates based on the completely standardized solution. Indicator variances, indicator loadings, mean structures, and semi-partial covariate effects not included in this illustration. W2 = wave two; W3 = wave three. Model fit: Satorra-Bentler adjusted χ^2 (582, *n* = 1939) = 1912.41, *p* <.001, RMSEA = .046. **p < .01. *p < .05.

Table 6

Single-Group Structural Model Paths for Semi-Partial Covariates Regressed onto the Latent Constructs Representing Wave 2 Depression and Hostility

Covariate	Construct	Estimate	S.E.	*p*
Education				
	D2	0.05	0.018	<.01
	H2	0.10	0.028	<.01
SES				
	D2	0.04	0.023	.09
	H2	0.04	0.039	.38
Gender				
	D2	0.10	0.020	<.01
	H2	0.06	0.032	.06
Race				
	D2	0.08	0.019	<.01
	H2	0.19	0.031	<.01
Marital Status				
	D2	0.16	0.020	<.01
	H2	0.12	0.031	<.01
Age				
	D2	0.00	0.018	.87
	H2	-0.07	0.028	.02

Note. Estimates from the completely standardized solution; S.E. = standard error; D2 = depression at wave 2; H2 = hostility at wave 2. Education coded as the number of years of education reported. SES variable reflected the value used in the NSFH, as computed by Stevens & Cho (1985). Age entered as reported at wave 2. Gender, Race, and Marital Status dummy coded such that 1 = male, 2 = female; 1 = Caucasian, 2 = minority race/ethnicity; and 1 = married, 2 = another status, respectively.

After the specification of the initial structural model that did not account for the effects of demographic characteristics, a final model was constructed that included semi-partial covariate effects associated with W2 latent constructs regressed onto relevant demographic characteristics (i.e., gender, age, race/ethnicity, SES, and years of education). A review of the covariate effects specified for the structural model revealed that female gender, having a marital status other than "married", identifying as any race/ethnicity other than Caucasian, and greater years of education were associated with greater W2 depressive symptomatology. SES and age did not exhibit significant effects on levels of depression. Younger age, having a marital status other than "married", identifying as a race/ethnicity other than Caucasian, and greater years of education were associated with greater W2 hostility. SES and gender did not exhibit significant effects on levels of hostility. (See Table 6 for semi-partial covariate effect estimates associated with all demographic characteristics specified as covariates for this structural model.)

Testing Gender Differences

Some researchers have described a male depressive syndrome marked by irritability and anger (Rutz, von Knorring, Pihlgren, Rihmer, & Wålinder, 1995; Rutz, Wålinder, von Knorring, Rihmer, & Pihlgren, 1997; Rutz, 1999; Winkler, Pjrek, & Kasper, 2005). Winkler, Pjrek, and Kasper (2005) found that males with depressed mood exhibited greater irritability, more anger attacks, and greater reactivity to minor annoyances compared to their female counterparts. Another study failed to find gender differences in the frequency or average severity of most hypothesized masculine depressive symptoms such as irritability (Möller-Leimkühler, Bottlender, Strauss, & Rutz, 2004). Examinations of gender differences in hostility within a longitudinal sample of individuals exhibiting depressed mood would help to clarify the extent to

which hostility may be more strongly related to depression in males than in females. Therefore, as a follow-up to the single-group models, a series of two-group models was specified to determine whether males and females differed with regard to the longitudinal relationships between hostility and depression.

Two-Group Measurement Models

Similarly to the single model sequence, a nested sequence of measurement models was constructed to assess the invariance of the factor structure for the latent variables associated with hostility and depression across the male and female groups as well as across the two waves of measurements. All across-time constraints were maintained from the single-group models, and across-group equality constraints were added sequentially to determine the extent to which invariance and homogeneity assumptions are met in the two-group models. The unconstrained two-group model demonstrated acceptable fit ($SB\chi^2$ (832, n = 2044) = 2129.89, $p < .001$, RMSEA = .053). Next, factor loadings for the indicators (observed variables) were constrained to equality across the male and female groups, and intercepts were then constrained to equality across the groups. As shown in Table 7, both constraints were found to be tenable, and the intercept invariant model continued to demonstrate acceptable fit ($SB\chi^2$ (856, n = 2044) = 2171.41, $p < .001$, RMSEA = .053). Therefore, the factor structure of the depression and hostility measures used in the current study were invariant across groups in addition to across waves. In other words, the NSFH depression and hostility indicators seem to measure their respective factors in similar ways across time points for both males and females in the current sample. Consistent with results from the single-group model, the findings of measurement invariance in the two-group model is consistent with the first hypothesis for the current study.

Table 7

Fit Indices for the Nested Sequence in the Two-Group Confirmatory Factor Analysis

Model	$SB\chi^2$	df	$\Delta SB\chi^2$	Δdf	p	RMSEA	RMSEA 90% CI	Constraint Tenable?
Configural Invariance	2129.89	832	--	--	--	.053	.052 – .055	--
Loading Invariance[1]	2085.05	843	--	--	--	.052	.050 – .054	Yes
Intercept Invariance[1]	2171.41	856	--	--	--	.053	.051 – .055	Yes
Homogeneity of Variances[2]	2328.41	858	123.78	2	<.001	.056	.054 – .057	No
Depression Constructs[2]	2327.22	857	28.16	1	<.001	.056	.054 – .057	No
Hostility Constructs[2]	2226.13	857	35.99	1	<.001	.054	.052 – .056	No
Homogeneity of Covariances[2]	2360.20	861	144.54	5	<.001	.056	.054 – .058	No
Latent Mean Invariance[2]	3030.09	858	5360.56	5	<.001	.066	.064 – .067	No

[1]Model tenability evaluated with the RMSEA Model Test
[2]Model tenability evaluated with the Scaled Difference in Chi-Squares test (Satorra, 2000)

Note. Invariance tested across groups, with across-time constraints maintained from single-group testing. $SB\chi^2$ = Satorra-Bentler corrected chi-square. CI = Confidence Interval. Each model contains its constraints plus those of all previous tenable models.

A review of the unstandardized solution of the intercept invariant model revealed that all depression indicator loadings ranged from 0.69 to 1.15, and hostility indicator loadings ranged from 0.93 to 1.13 (see Table 8). The squared multiple correlation values for all indicators exceeded 0.20. Similar to the single group model, the hostility and depression constructs exhibited the expected within-wave positive correlations for both males ($r = .84$ at W2, $p < .01$; $r = .84$ at W3, $p < .01$) and also for females ($r = .66$ at W2, $p < .01$; $r = .66$ at W3, $p < .01$; see Table 9). All values were within expected ranges, and the finding that the correlations between hostility and depression at both waves of measurement for both groups was positive in valance and statistically significant is consistent with the second hypothesis for this study.

Following factor structure invariance testing, assumptions of across-groups homogeneity of the depression and hostility latent construct variances and covariances were evaluated using the SDCS test (Satorra, 2000). As shown in Table 7, constraining latent variances to be equal across waves resulted in a significant drop in model fit ($\Delta SB\chi^2$ (2) = 123.78, $p = <.001$). Follow-up testing revealed that constraining only the depression construct variances to equality resulted in a significant drop in model fit ($\Delta SB\chi^2$ (1) = 28.16, $p = <.001$). Constraining only the hostility construct variances also resulted in a significant drop in fit ($\Delta SB\chi^2$ (1) = 35.99, $p = <.001$). Similarly, compared to the intercept invariant model, constraining only the factor covariances across males and females resulted in reduced model fit ($\Delta SB\chi^2$ (5) = 144.54, $p = <.001$). Therefore, although the indicators seem to consistently measure the same constructs across time and gender, significant gender differences were found in the variances and covariances among the depression and hostility latent constructs.

Table 8

Indicator Loadings from the Two-Group Structural Model

Depression

	Indicator (W2 / W3)	Estimate	S.E.	*p*
	MT206A / RT206A	1.00	--	--
	MT206B / RT206B	0.69	0.030	<.01
	MT206C / RT206C	1.10	0.029	<.01
	MT206D / RT206D	0.90	0.027	<.01
	MT206E / RT206E	1.15	0.029	<.01
	MT206F / RT206F	0.92	0.027	<.01
	MT206G / RT206G	0.83	0.028	<.01
	MT206H / RT206H	0.74	0.028	<.01
	MT206I / RT206I	0.83	0.028	<.01
	MT206J / RT206J	0.96	0.034	<.01
	MT206K / RT206K	1.10	0.030	<.01
	MT206L / RT206L	0.84	0.029	<.01

Hostility

	Indicator (W2 / W3)	Estimate	S.E.	*p*
	MT206M / RT206M	1.00	--	--
	MT206N / RT206N	1.13	0.034	<.01
	MT206O / RT206O	0.93	0.037	<.01

Note. Estimates from the unstandardized solution of the intercept invariant model (i.e., indicator variances and loadings were constrained to equality across time points as well as across groups). S. E. = standard error; Est. = estimate; W2 = wave 2; W3 = wave 3. Names for the depression and hostility indicators are labeled here such that they are consistent with the variable names used in the original National Survey of Families and Households (NSFH) datasets and codebooks.

Table 9

Hostility and Depression Latent Construct Correlations in the Two-Group Measurement Model

	Males					Females			
	D2	H2	D3	H3		D2	H2	D3	H3
D2	1	--	--	--	D2	1	--	--	--
H2	.84**	1	--	--	H2	.66**	1	--	--
D3	.75**	.64**	1	--	D3	.06	.10**	1	--
H3	.63**	.64**	.84**	1	H3	.11**	.26**	.66**	1

**p < .01. *p < .05.

Note. Estimates from the completely standardized solution of the intercept invariant measurement model (i.e., indicator variances, loadings, and intercepts were constrained to equality across groups). D2 = depression at wave 2; H2 = hostility at wave 2; D3 = depression at wave 3; H3 = hostility at wave 3.

According to Kline (2005), heterogeneity in multi-group model variances and covariances is not uncommon. However, this heterogeneity should raise caution against directly comparing parameter estimates across groups, even for estimates associated with the standardized solution. To help overcome this limitation, at least in part, the SDCS test was used to guide all analyses pertaining to group differences.

Two-Group Structural Models

A panel model was constructed that included autoregressive and cross-lagged paths between the latent constructs representing the first and second waves of measurement. Similar to the measurement models, this structural model exhibited acceptable fit ($SB\chi^2$ (852, n = 2044) = 2415.11, p = <.001, RMSEA = .057). Variables representing years of education, SES, marital status (married vs. another marital status), and race/ethnicity (Caucasian vs. minority race/ethnicity) were included in the structural model as semi-partial covariates, specified as regression paths representing each W2 latent construct regressed onto each covariate variable. Gender was not included as a covariate in the two-group models since it functioned as the grouping variable for this set of analyses. The two-group structural model including semi-partial covariate effects exhibited good fit ($SB\chi^2$ (1132, n = 1939) = 2537.98, p = <.001, RMSEA = 0.48).

In the final structural model including covariate effects, depression and hostility exhibited significant positive correlations, consistent with the second hypothesis for this study as well as findings from the single-group model (see Figure 2). Interestingly, W2 hostility exhibited similar patterns in relation to W3 constructs across both genders. W2 hostility predicted W3 depression among neither males nor females. The third hypothesis for this study was that W2 hostility

would predict W3 depression, and this finding is inconsistent with that hypothesis. In both

groups, greater W2 hostility predicted greater W3 hostility (in males, $\beta = 0.40$, $p < .01$; in

females, $\beta = 0.37$, $p < .01$). These results associated with W3 hostility regressed onto the W2

hostility and depression constructs are consistent with results from the single-group model.

Regarding group differences, W2 depression significantly predicted W3 depression in the male

group only ($\beta = 0.52$, $p < .01$), and W2 depression predicted greater W3 hostility in females only

($\beta = -0.14$, $p < .01$).W2 depression did not predict W3 hostility for the male group, and W2

depression did not predict W3 depression in the female group.

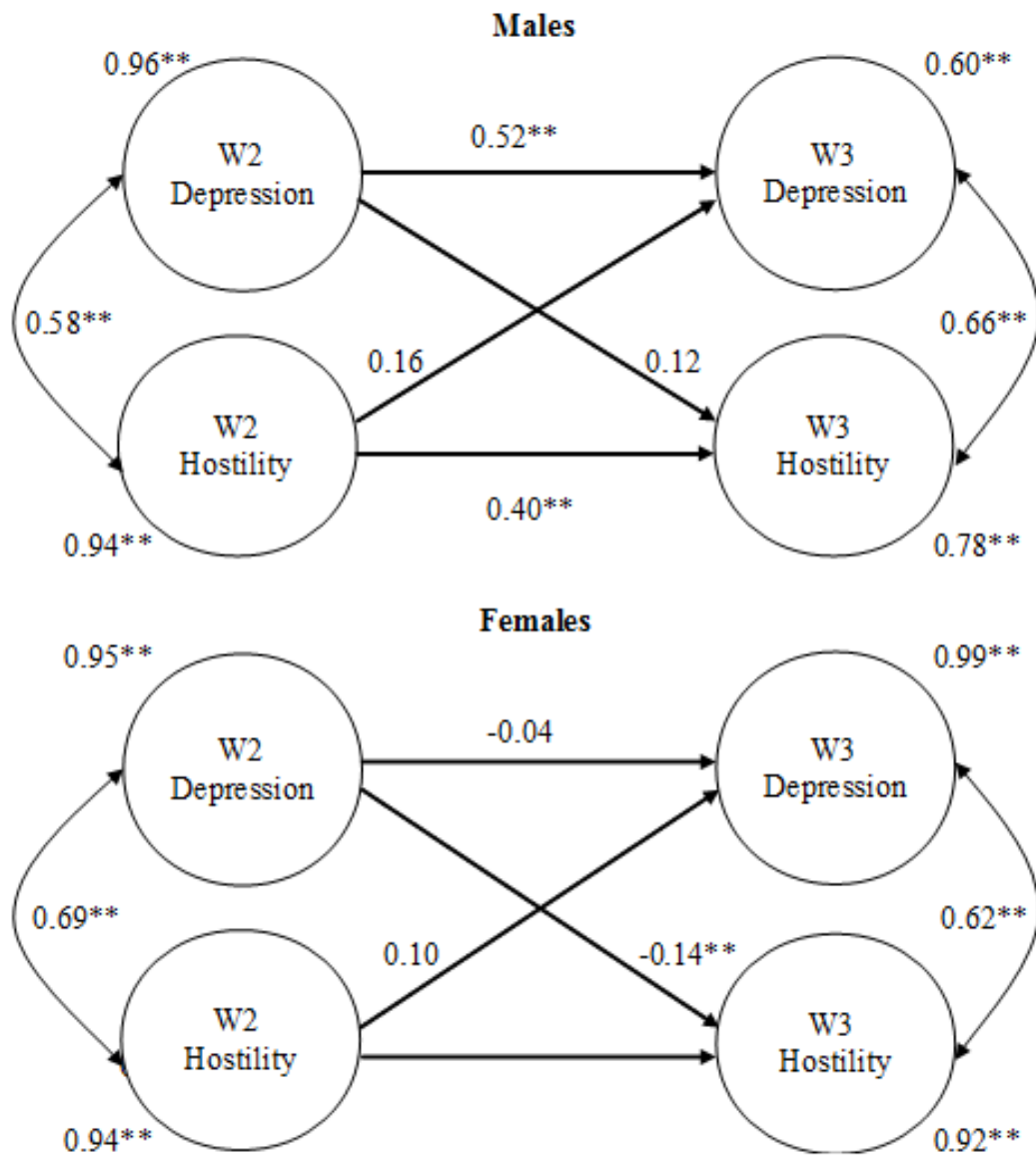*Figure 2*: Illustration of the two-group structural model. Estimates based on the completely standardized solution. Estimates for males reflected on the top half, females on the bottom. Neither indicator- nor covariate-related estimates are represented. W2 = wave two; W3 = wave three. Model fit: Satorra-Bentler χ^2 (1132, n = 1,938) = 2537.98, p <.001, RMSEA = .048. **p < .01. *p < .05.

To formally test for gender differences in latent construct averages, means for depression and hostility were constrained to equality across males and females at both waves. The resulting model exhibited a significant drop in fit ($\Delta SB\chi^2$ (2, n = 1,938) = 5360.56, p <.001). This initial test was followed by four separate tests of latent construct mean equality constraints across the groups, one each for W2 depression, W2 hostility, W3 depression, and W3 hostility. As reflected in Table 10, each constraint resulted in a significant drop in model fit. Compared to males, females exhibited higher score on each latent construct at both waves of measurement. Also, similar to the results for the single-group model, a drop in latent construct means was exhibited for the W3 hostility and depression construct means compared to the respective W2 construct means.

To assess the reliability of cross-group regression path differences across groups, all regression paths were first simultaneously constrained to equality across the group of males and the group of females. These constraints resulted in a significant drop in model fit ($\Delta SB\chi^2$ (4, n = 1,938) = 145.16, p <.001). To determine the extent to which individual paths exhibited significant differences, four follow-up tests were conducted which assessed separately the tenability of cross-group equality constraints for each of the four beta paths. As shown in Table 11, only the path representing W3 depression regressed onto W2 depression exhibited significant difference between groups ($\Delta SB\chi^2$ (1, n = 1,938) = 17.73, p <.001).Group differences in the magnitude of the other three beta paths, therefore, may not represent reliable gender differences in these longitudinal relationships between hostility and depression.

Table 10

Results of Nested Scaled Difference in Chi-Squares Tests for Latent Mean Level Differences in the Two-Group Model

Constructs	Latent Mean Males	Latent Mean Females	$SB\chi^2$	df	p	$\Delta SB\chi^2$	Δdf	p	Equivalent Across Groups?
Baseline Model	---	---	2537.98	1132	<.001	---	---	---	---
W2 Depression	0.00	2.35	2582.31	1133	<.001	187.96	1	<.001	No
W3 Depression	0.00	1.81	2826.90	1133	<.001	212.62	1	<.001	No
W2 Hostility	0.00	1.75	2562.53	1133	<.001	24.55	1	<.001	No
W3 Hostility	0.00	0.93	2622.47	1133	<.001	366.62	1	<.001	No

Note. As the reference group, latent construct variances for the male sample were constrained to 0.00. Model tenability evaluated with the

Scaled Difference in Chi-Squares test (Satorra, 2000). Mean estimates derived from the completely standardized solution. $SB\chi^2$ = Satorra-

Bentler corrected chi-square.

Table 11

Results of Nested Scaled Difference in Chi-Squares Tests for Beta Path Differences in the Two-Group Model

Constructs	Beta Value Males	Beta Value Females	$SB\chi^2$	df	p	$\Delta SB\chi^2$	Δdf	p	Equivalent Across Groups?
Baseline Model	---	---	2537.98	1132	<.001	---	---	---	---
D3 on D2	0.52**	-0.04	2555.72	1133	<.001	17.73	1	<.001	No
D3 on H2	0.16*	0.10	2538.97	1133	<.001	0.99	1	<.001	Yes
H3 on D2	0.12	-0.14*	2537.94	1133	<.001	0.96	1	<.001	Yes
H3 on H2	0.40**	0.37**	2537.96	1133	<.001	0.97	1	<.001	Yes

**$p < .01$. *$p < .05$.

Note. Model tenability evaluated with the Scaled Difference in Chi-Squares test (Satorra, 2000). Mean estimates derived from the completely

standardized solution. $SB\chi^2$ = Satorra-Bentler corrected chi-square, D2 = wave 2 depression, D3 = wave 3 depression, H2 = wave 2 hostility,

H3 = wave 3 hostility.

Among females, covariate effect estimates revealed that lesser years of education, having a marital status other than "married," and younger age were associated with greater W2 depressive symptomatology. SES and whether females reported Caucasian race did not exhibit significant effects on levels of depression. Younger age and having a marital status other than "married" were associated with greater W2 hostility for this sample of females. Years of education, SES, and whether females reported Caucasian race did not exhibit significant effects on levels of hostility. (See Table 12 for covariate effect estimates from the completely standardized solution of the two-group structural model.)

For males, covariate effect estimates revealed that having a marital status other than "married", identifying as any race/ethnicity other than Caucasian, and greater years of education were associated with greater W2 depressive symptomatology. SES and age did not exhibit significant effects on levels of depression. Identifying as a race/ethnicity other than Caucasian and greater years of education were associated with greater W2 hostility. SES, marital status, and anger did not exhibit significant effects on levels of hostility for males in the current sample (see Table 12).

Caution is warranted in attempting to interpret the absolute magnitude of between-groups beta path differences for the current sample, given the heterogeneity of latent construct variances and covariances across the two groups. The significance of group differences in the magnitude of these paths, however, is supported by SDCS testing results reflecting a significant drop in model fit after these beta paths were constrained to equality across the two groups ($\Delta SB\chi^2$ (4) = 145.16, p = <.001). Regarding construct variance differences, W3 constructs exhibited lesser variance than the respective W2 constructs for males only.

Table 12

Two-Group Measurement Model Paths for Semi-Partial Covariates Regressed onto the Latent Constructs Representing Wave 2 Depression and Hostility

		Males			Females		
Covariate	Construct	Estimate	S.E.	*p*	Estimate	S.E.	*p*
Education							
	D2	0.06	0.027	.03	-0.07	0.035	.04
	H2	0.12	0.056	.03	-0.06	0.037	.09
SES							
	D2	0.04	0.033	.27	-0.06	0.036	.07
	H2	0.03	0.074	.68	0.01	0.039	.78
Race							
	D2	0.10	0.029	<.01	-0.01	0.029	.77
	H2	0.21	0.064	<.01	0.07	0.034	.07
Marital Status							
	D2	0.15	0.028	<.01	0.18	0.033	<.01
	H2	0.09	0.056	.10	0.159	0.034	.02
Age							
	D2	0.04	0.025	.05	-0.12	0.033	<.01
	H2	0.01	0.055	.92	-0.21	0.034	<.01

Note. Estimates from the completely standardized solution; S. E. = standard error; D2 = depression at wave 2; H2 = hostility at wave 2. Education was coded as the total number of years of education reported. SES variable reflected the "total" (both sexes-based) socioeconomic score used in the NSFH, as computed by Stevens and Cho (1985). Age was entered as reported at wave 2. Race and Marital Status were dummy coded such that 1 = Caucasian, 2 = minority race/ethnicity; 1 = married, 2 = another status, respectively.

Discussion

The purpose of this study was to explore the longitudinal and cross-sectional relationships between hostility and depression as measured in the second and third waves of NSFH, a large nationwide longitudinal study. To increase the clinical relevance of the findings, only NSFH participants exhibiting elevated depressive symptomatology during at least one wave of interest were included in the analyses. Using the SEM method, a number of questions related to the interrelationships between hostility and depression were evaluated, including factor structure invariance for the measures used, cross-sectional correlations, the ability of hostility and depression at one time point to predict the same constructs at a subsequent time point, and the extent to which males and females differ with regard to these relationships. The following discussion of these findings and their implications are divided into six sections: overview of findings, theoretical implications of findings, clinical implications of findings, limitations of the study, strengths of the study, and directions for future research.

Overview of Findings

Invariance of Loadings and Intercepts. The first hypothesis guiding analyses for the current study was that the hostility and depression measures used in the NSFH would exhibit invariant factor structure both across waves of measurement and also across groups, with one group representing males and another representing females. A nested sequence of single-group measurement models was specified to test the across-waves portion of this hypothesis. These models exhibited good fit, and results supported the conclusion that the NSFH hostility and depression measures exhibited invariance in factor loadings and intercepts across the two waves of interest. When a similar nested sequence of models was specified for males and females as

separate groups, these measures exhibited measurement invariance across the groups as well. Therefore, the first hypothesis was supported, and the hostility and depression measures used by the NSFH are considered invariant for the current sample.

In addition to invariance testing, comparisons of nested models were performed to also assess the extent to which the latent constructs representing hostility and depression exhibited homogeneous variances and covariances between the male and female groups. Model constraints specifying homogeneous variances and covariances were not found to be tenable in the two-group model. To avoid inappropriate conclusions that can result from the direct comparisons of across-group parameter estimate differences when variances and covariances are heterogeneous, testing of nested models were used to evaluate across-group parameter estimate differences. Scaled differences in Satorra-Bentler adjusted chi-square values (Satorra, 2000; Satorra & Bentler, 2001) was performed to support all conclusions about group differences in parameter estimates.

Cross-Sectional Interrelationships. Previous research has suggested that hostility represents an intraepisodic depressive symptom for many people (e.g., Fava et al., 2010). Correlations between hostility and depression constructs at both waves of measurement were tested to evaluate this suggestion, and the second hypothesis for this study entailed the prediction that all such correlations would be both significant and positive in valence. Positive and significant correlations between hostility and depression were found at each wave of measurement for all models specified. This was true for both males and females in the current sample. These correlations suggest that hostility is increased during times at which depressive symptoms are elevated, supporting the idea that hostility is an intraepisodic depressive

56

phenomenon.

Gender Differences in Latent Hostility and Depression Means. Based on the *observed* means and standard deviations of total depression and hostility scale scores, the results of independent samples *t*-tests suggested that females scored higher on the depression measure used in the NSFH at both the second and third waves. Tests of hostility score differences, however, resulted in nonsignificant findings. Gender differences in *latent* means were also tested within the SEM framework. Mean difference testing within the SEM framework is advantageous since the results take into account measurement factor structure and latent construct interrelationships. Further, SEM produces parameter estimates that are not baised by unreliability of measurement. For this sample, latent mean difference testing revealed significant mean differences between males and females in levels of both hostility and depression at both waves of measurement. The differences were such that females scored higher than males on each latent construct.

Prediction of Wave 3 Hostility and Depression. Some researchers have found that hostility may represent a risk factor for future development of elevated depressive symptoms (e.g., Ingram et al., 2007; Siegler et al., 2003). The third hypothesis for the current study was that greater hostility at an earlier wave of measurement would be predictive of greater depressive symptoms at a subsequent wave, consistent with previous findings cited. The regression path representing W3 depression regressed onto W2 hostility, however, was significant in neither the single-group nor the two-group structural models specified here. Therefore, the third hypothesis was not supported. It is worth noting that the duration of time between data collection for W2 and W3 of the NSFH averaged about nine years. This duration of time between waves of measurement, however, did not preclude other significant findings associated with the regression

paths specified in the structural models for this study.

Similar to the finding that W3 depression was not predicted by W2 hostility, W2 depression was predicted by W2 depression in neither the total sample nor among females in the two-group analyses. For males, on the other hand, depressive symptom elevation at the earlier wave was clearly predictive of elevated symptoms at the later wave of measurement. Considering both the statistical significance of this finding and also the magnitude of the beta path associated with W3 depression regressed onto W2 depression in the male group, this finding is considered reliable.

Additional regression paths were specified in the structural models that represented the extent to which W3 hostility was predicted by W2 hostility and W2 depression. For both males and females, greater hostility at the earlier wave of measurement was predictive of greater hostility at the subsequent wave. Gender differences were found in the extent to which W2 depression predicted W3 hostility. Among males, W2 depression was not a significant predictor of W3 hostility; among females, the path representing W3 hostility regressed onto W2 depression was significant and *negative*. Therefore, lesser severity of depressive symptoms may be predictive of greater subsequent levels of hostility for females. It should be noted, however, that constraining this beta path (representing W3 hostility regressed onto W2 depression) to equality across males and females did not result in a significant drop in model fit. Therefore, the apparent gender difference in the ability of depression symptom levels to predict subsequent hostility levels may not be a reliable difference.

Semi-Partial Covariate Effects. A complex exploration of covariate effects on the

longitudinal relationships between hostility and depression was beyond the scope of the current

study. A limited number of variables reflecting a range of demographic characteristics, however,

were chosen for inclusion as covariates in the current study. Choices about demographic variable

inclusion reflected not only data available in the NSFH datasets, but also a balance between

broad coverage of characteristics and complexity of coverage that fit the peripheral role of these

effects in current study. Variables representing age, gender, years of education, and occupational

status-based SES scores were among the variables included in the current analyses. It should be

noted that, whereas gender was reported in the NSFH and analyzed here as reflecting a

male/female dichotomy, this binary conceptualization of gender reflects a construction of society

that does reflect the gender identity of all individuals (see Cameron, 1998 for a review). In

general, the results described here should be used to guide future analyses focused on more fully

elucidating the effects of these and similar demographic characteristics on hostility in the context

of depression, rather than interpreted as conclusive evidence regarding the effects of these

characteristics.

In the current sample, restricted to individuals exhibiting elevated depressive symptoms

during at least one wave of measurement, age was not associated with levels of depression and

hostility in males. In females exhibiting elevated depressive symptoms during at least one wave,

however, younger age was associated with higher levels of hostility and depression. This may be

due to the general tendency for earlier onset depression to be associated with female gender and

greater severity of depressive symptoms among females (e.g., Kornstein et al., 2000). Future

studies should clarify the nature of the interaction between gender and age on levels of

depression as well as hostility in the context of depression.

In both the single-group and two-group models, SES (an occupational status-based variable calculated for the NSFH consistent with the work of Stevens & Cho, 1985) did not exhibit significant effects on hostility and depression, and years of education exhibited effects opposite the expected effects for males. Specifically, reporting more years of education was associated with greater depression and hostility in the male group. Among females, years of education exhibited no impact on hostility levels, but lesser years of education was associated with greater depressive symptomatology. Ross and Mirowsky (1989) suggested that male gender, being married, Caucasian race, and higher levels of education are consistently associated with lower levels of depression due to greater social support and sense of control over life circumstances. Accordingly, Ibana and colleagues (2005) found that years of education and CES-D scores were inversely related in the total NSFH sample. The current sample exhibited educational levels similar to those in the sample analyzed by Ibana and colleagues, but was restricted to those individuals who reported CES-D scores predictive of clinically relevant levels of depressive symptomatology. For these individuals already exhibiting elevated symptoms of depression, SES may not be as strongly associated with levels of depression as has been reliably found in the general population. Further, gender differences may exist for individuals already exhibiting depressive tendencies such that higher levels of education protect females against further exacerbation of depressive symptoms but exacerbate depression and hostility in males. Future research should further clarify the impact of sociodemographic variables on the distribution of depressive symptoms among individuals who struggle with depressed mood.

Consistent with previous research (see Ross & Mirowsky, 1989 for a review), being married was associated with less depression in both males and females. Being married was also

associated with less hostility among females in the current sample, but not among males. A study of the full NSFH sample by Lambert and Marks (1998) revealed no impact of gender, marital status, or the interaction between the two on hostility levels, although marital status change impacted hostility in females only (with divorce or separation increasing hostility, becoming widowed decreasing hostility, and a marriage dissolution followed by a remarriage between waves of measurement associated with no impact on hostility). The restriction of the current sample to only those exhibiting elevated depressive symptoms likely accounts for the discrepancy between findings here and findings reported by Lambert and Marks (1998). In other words, marital status may have limited impact on hostility levels in the general population, but being unmarried may be associated with greater hostility among females who struggle with elevated symptoms of depression.

In the current sample, consistent with findings from broader samples (e.g., Ibara et al., 2005), female gender was associated with greater severity of depressive symptoms than was male gender. In response to gender differences in observed and latent means in the single group model as well as inconsistencies in previous findings regarding gender differences in hostility measured in the context of depressed mood, the two-group models described in the current study were specified to more fully explore gender differences in the longitudinal relationships between hostility and depression. As previously discussed, the two-group models revealed greater latent mean depression and hostility levels among females, compared to males, and greater stability of depressive symptom levels among males than among females.

Theoretical Implications

61

In the context of the depressive "cognitive triad" portion of his theory about cognition in depression, Beck (1970; 1976) posited that depressotypic negative thinking entailed negative thoughts not only about the self and the future, but also the external world. The traditional focus in depression research on negative self-referent thinking (e.g., Gotlib et al., 1996) and hopelessness (e.g., Abramson, Metalsky, & Alloy, 1989) may represent a more limited view of negative depressotypic thinking than is appropriate based on the cognitive triad and current findings. Hostility is a necessarily interpersonal construct, and hostility levels were found to be strongly correlated with depression levels at both time points in all models described here. Thus, to better describe depressotypic thinking and heterogeneity in cognitive styles associated with depressed mood, researchers would be well advised to begin incorporating measures of hostility, and particularly hostile cognition, into studies aimed at elucidating the cognitive correlates of depressed mood.

With regard to cognitive specificity, the idea that cognitive research pertaining to depression should account for a variety of affective states and associated cognitive styles is consistent with CSP (Ingram & Hamilton, 1999; Ingram et al., 1987). The findings described here suggest that hostility tends to increase as depressive symptoms increase among individuals exhibiting elevated depressive symptomatology. Hostility in the context of depressed mood is associated with greater attention towards interpersonal features of emotional information (Gaddy & Ingram, 2010) as well as greater likelihood of blaming others for negative events (Scott et al., 2003). Therefore, consideration of emotions other than sadness-related emotions in the context of depressed mood, including anger and irritability, may allow researchers to more fully understand the ways in which different depressotypic cognitions are associated with different presentations

of depressive syndromes.

Nosological Implications

Symptoms of Major Depressive Episode. A substantial proportion of individuals with depression experience marked anger and hostility during episodes of depressed mood (e.g., Benazzi & Akiskal, 2005), although the DSM-IV-TR does not include hostility-related phenomena among the diagnostic criteria for Major Depressive Episode (MDE; American Psychiatric Association, 2000). Findings from the current study suggests that hostility does not simply represent a trait among this subgroup of individuals with depression since an increase in depressive symptoms is associated with an increase in hostility among individuals who exhibit elevated depressive symptoms. The discrepancy between the absence of hostility-related features in the criteria for MDE and the apparent relevance of hostility in depressed mood should be addressed in future DSM revisions. Such revisions may take one of several forms, including additional hostility-related criteria that may contribute to the diagnosis of MDE, a mood disorder continuum representing varied degrees of unipolar versus bipolar mood disturbance, or subtypes of Major Depressive Disorder reflecting the predominance of sadness versus hostility versus other features (see, e.g., Overall & Hollister, 1980 for potential subtypes based on cluster analysis).

Classification of depression with hostility. In the current sample, hostility scores exhibited positive skew suggesting that most included cases exhibited relatively low levels of hostility. The observed hostility score means also reflect low levels of hostility in the total sample, although restricted variability in levels of hostility was not found to be a concern. This finding is in contrast to results offered by Akiskal and Benazzi (2006) suggesting that a range of

hypomania-related features (including but not limited to irritability, talkativeness, racing thoughts, psychomotor agitation, and increased goal-directed activity) exhibited a normal distribution in a combined sample of individuals diagnosed with unipolar and bipolar mood syndromes. Therefore, it is not likely appropriate to conceptualize depression with irritability, anger, or hostility as a quasi-bipolar mood disturbance in absence of other features associated with hypomanic or mixed mood episodes. This conclusion is supported by findings that antidepressant medications for hostility depression do not engender increased symptoms of manic or hypomanic mood (see Tedlow et al., 1999). Rather than conceptualizing hostile depression as a bipolar or bipolar-like mood disturbance, more appropriate diagnostic criteria revisions may entail additional hostility-related criteria or a depressive subtype associated with marked anger and hostility. Of course, careful research on the implications of any diagnostic revision would be warranted. Such revisions in diagnostic criteria, though, are likely to produce diagnostic criteria for depressive episodes that better account for heterogeneity in presentations of MDE than is reflected in the DSM-IV-TR criteria.

Clinical Implications

The results reported here suggest that depressed mood may represent a state that is more stable among males than among females. Some studies have suggested that depression among females exhibits a more chronic and recurrent course than among males, although the samples used in these studies are almost exclusively patient samples (e.g., Amenson & Lewinsohn, 1981) or population studies in which attempts are not made to differentiate between those who and do not exhibit clinical significant elevations in depressive symptomatology (e.g., Bracke, 1998). The use of patient samples restricts data to only those exhibiting the most severe and impairing

depressive syndromes (e.g., Keller et al., 1992). Also, females are more likely than males to seek treatment for psychological difficulties (see Kessler, Brown, & Broman, 1981). Therefore, whereas females in treatment for depression may exhibit more chronic course of illness than their male counterparts, this gender difference may be absent or opposite in direction within the general population of Americans who struggle with symptoms of depression. This idea is supported by one community sample that found no overall gender difference in depression chronicity (Sargeant, Bruce, Florio, & Weissman, 1990). For the current study, however, it remains unclear why earlier depression predicted subsequent depression only in males.

Hostility and depression exhibited reliable positive correlations for both males and females in this study. In addition, nested model SDCS tests indicated that females exhibited greater hostility than males at both waves of measurement examined. These results offer little support for the notion that hostile depression represents a male-specific depressive syndrome (e.g., Winkler et al., 2005). If anything, hostility in the context of depressed mood may be somewhat more prevalent among females than males exhibiting depressed mood, consistent with findings by Scheibe and colleagues (2003). The positive and significant correlations between hostility and depression also suggest that, for both males and females, hostility decreases as depressive symptoms subside. Hostility in females is frequently associated with personality pathology, however, and this association between hostility and depression in females may contribute to clinicians' tendencies to exhibit a gender bias in the diagnosis of Borderline Personality Disorder (e.g., Adler, Drake, & Teague, 1990; Becker & Lamb, 1994). The current findings should caution clinicians to refrain from assigning a diagnosis of Borderline Personality Disorder (or a bipolar mood disorder), especially in female clients, based only on the co-

occurrence of depressed mood and hostility. Rather, hostility may represent a feature of depression for many of these clients.

Current findings suggest that greater hostility does not represent a risk factor for later depression in the general population. This finding is contrary to findings from more circumscribed samples (Heponiemi et al., 2010; Miller et al, 1995; Reinherz et al., 1999; Siegler et al. 2003; Stewart et al., 2010) as well as findings from a cross-sectional study of a college student sample (Ingram et al., 2007). However, the studies of Hepomiemi and colleagues (2010), Ingram and colleagues (2007), Miller and colleagues (1995), and Reinherz and colleagues (1999) focused on hostility and depression in adolescents and young adults. The earlier referenced study by Stewart and colleagues (2010) was limited to adults between 50 and 70 years of age. Importantly, researchers have noted that hostility tends to exhibit a curvilinear trend over time, with greater hostility reported during adolescents and early as well as late adulthood (e.g., Barefoot, Peterson, & Dahlstrom, 1991). Accordingly, Siegler and colleagues (2003) specifically timed their data collection such that the initial measurement of hostility was taken between 16 and 19 years of age for all participants. The notion that hostility represents a risk factor for later depression, therefore, may be more applicable for hostility initially measured during adolescence, young adulthood, and older adulthood than for hostility measured across ages in the general population. Clinicians working with adolescents, young adults, and older adults who exhibit marked hostility-related symptoms would be prudent to monitor depressive symptoms in these individuals. Such monitoring may be less relevant for adults in other age ranges who exhibit anger or hostility in absence of other symptoms associated with depression.

Limitations of the Study

The hostility measure used in the NSFH was only administered during the second and third waves of data collection, and these waves were separated by approximately nine years. The inclusion of fewer than three waves precluded any assessment of latent growth trajectories for the current sample. The extent to which varied latencies between waves of measurement would engender different results is unclear. Future research should address the potential moderating effect of measurement latency as well as exploring growth trajectories in longitudinal studies of hostility and depression.

Some limitations are inherent in the measures of hostility and depression used in the NSFH. First, all questionnaire-based measures of depressive symptoms, including the reliable and well-validated CES-D, are limited in the extent to which their results are indicative of a clinically-relevant depressed mood state. Individuals included in the current analyses are those exhibiting relatively elevated symptoms of depression, scoring at or above relevant cutoff scores. Not all of these individuals, however, can be said to exhibit "clinically depression" or to be suffering from Major Depressive Disorder, as opposed to another disorder in which depressed mood may be a feature (e.g., Dysthymic Disorder, Bipolar II Disorder, etc.; see American Psychiatric Association, 2000). For the purposes of this preliminary study of the longitudinal relationships between hostility and depression, both the use of the CES-D and also the restriction of included cases to only those exhibiting elevated symptoms of depression increase the clinical utility of the results reported here. However, future research should consider using structural clinical interviews to determine presence of a Major Depressive Episode or other mood phenomena of interest.

The hostility measure used in the NSFH is one that has been used in other studies (e.g.,

Marks et al., 2008), but it is not among the most well-developed and commonly used measures of hostility-related phenomena. The NSFH measure included three items representing days during the previous week on which participants experienced marked anger or hostility, irritability, and urges to "tell off" others. These three items represent a range of hostility-related phenomena, but the measure is not specifically designed to assess different facets of hostility which may be differentially related to intraepisodic depressive experiences or depression risk. In their 2010 the longitudinal study of hostility and depression, Stewart and colleagues used both the Cook-Medley Hostility Scale (Cook & Medley, 1954), a measure of hostile cognitive styles, and also the Anger In and Anger Out subscales of the State-Trait Anger Expression Inventory (Spielberger, 1988), a measure responses to anger-related emotions. Using these multifactorial measures of hostility-related phenomena, Stewart and colleagues (2010) found that higher baseline scores on the Cook-Medley Hostility Scale predicted greater elevations in depressive symptoms at a subsequent time, whereas baseline Anger In and Anger Out scores were not predictive of subsequent depression. The hostility measure used in the NSFH reflected hostility-related emotions and urges rather than cognitive styles or responses to those emotions. Therefore, the discrepancy between current findings and the findings of Stewart et al. (2010) regarding hostility as a risk factor for depression may partially be explained by the different hostility-related constructs measured in the two studies.

Future studies of hostility in the context of depression would benefit from the use of hostility measures that assess different relevant factors including cognitive, affective, and behavioral correlates of anger and hostility. One measure that exhibits such distinctions is the Aggression Questionnaire (AQ; Buss & Perry, 1992) which consists of four subscales

representing angry affect, hostile cognition, verbal aggression, and physical aggression. Confirmatory factor analyses have generally verified this four-factor structure (Harris, 1997). With regard to psychometric standards, the AQ demonstrates moderate to high reliability and internal consistency (Harris, 1997; Buss & Perry, 1992) and researchers propose that it exhibits a good degree of construct validity (Bryant & Smith, 2001). Therefore, it appears that this scale may be a relatively superior measure of hostility, and this measure should be considered for use in future studies of hostility in the context of depression.

The cases included in the current analyses were those that not only included information for depression and hostility at both the second and third NSFH waves, but also those exhibiting elevated symptoms of depression during at least one of those waves of measurement. Sweet and Bumpass (1996, 2002) noted that greater CES-D scores at one wave of data collection was associated with increased likelihood of dropping out of the study before the next wave. This phenomenon may account for the general decrease in depression construct means from the second wave to the third wave in the current sample. The current study also excluded all individuals who dropped out prior to the second wave, those who dropped out prior to the third wave, those who did not provide information about hostility- and depression-related experiences at the second and/or third wave, and younger adults without children (due to inclusion criteria for the third wave of data collection for the NSFH . Therefore, the current sample may disproportionately exclude severely depressed individuals. Finally, it is possible that those who exhibited relatively severe symptoms of depression at wave two and did not drop out may differ systematically from those who did drop out.

The demographic characteristics included as covariates in this study were chosen to

represent a range of characteristics shown in previous studies to have implications for levels of

hostility and depression. It was beyond the scope of the current study to explore these

characteristics in detail, however. For instance, both marital status and race/ethnicity were coded

as dichotomous variables to capture the potential variability in depression and hostility scores

associated with being married versus unmarried and Caucasian versus a minority race or

ethnicity. Previous research findings have indicated that age and gender may interact in

important and nonlinear ways to predict hostility (e.g., Barefoot et al.,1991). This interaction

may have interesting implications for hostility in the context of depressed mood. Detailed

clarification of covariate effects described here, however, will require extensive follow-up

research.

Strengths of the Study

Although the current sample is not entirely representative of Americans exhibiting

elevated symptoms of depression, it is the relatively more representative than samples used in

other available studies focused on longitudinal relationships between hostility and depression. In

other available studies, samples have been restricted in terms of age or other potentially

important characteristics. The inclusion in the current study of only those individuals exhibiting

elevated symptoms of depression increases the clinical relevance of the current findings. Since a

commonly used version of the CES-D was used to measure symptoms of depression in the

NSFH, a cutoff score previously found to exhibit utility in discriminating between depressed and

nondepressed individuals (e.g., Pascoe et al., 2006) was used to select cases included in the

analyses described here.

The use of the SEM framework for analyses represents a significant strength of the

current study. This technique ensures that relevant factor structures are confirmed prior to assessing relationships between latent constructs and also produces parameter estimates that are not biased by error variance. Using SEM, it was also possible to simultaneously model cross-sectional correlations and across-wave relationships between hostility and depression. The ability to include all parameters of interest in a single analysis increases the accuracy of parameter estimates by fitting estimates to the covariance matrix representing all included data (see Kline, 2005). Finally, the use of MLR estimation, adjusted chi-square estimates, and scale chi-square difference testing produced estimates that were not biased by the nonnormal distribution of hostility scores in the current sample.

In the current sample, the variance and covariances of the hostility and depression latent constructs differed across males and females. Homogeneity of variances is an assumption of many statistical techniques used to compare two or more groups. Measurement models specified for multi-group SEM allow for the testing of this assumption, and although this assumption of homogeneity was not met in the current analyses, hostility and depression variances and covariances were able to be estimated separately in each group. Also, SDCS testing was employed to formally test for group differences in other parameter estimates, rather than relying on direct informal comparisons of parameter estimates across groups.

Future Directions

It is likely that the relationship between hostility and depression is not the same for everyone. Therefore, it is important that researchers consider possible individual differences regarding the role of hostility in depression. One way to better understand these individual differences is to assess more thoroughly than was possible here the impact of demographic

71

characteristics on hostility in the context of depressed mood. Researchers could also use methods such as Latent Class Growth Analysis (see Jung & Wickrama, 2008) to identify possible clusters of depressive symptom change trajectories. Cluster analysis would allow researchers to determine whether different latent classes could be identified which represent different courses of the depressive syndrome. Associations between hostility-related phenomena and latent class assignment could then be identified.

It will be important to study the ways in which factors such as alcohol use and other impulsive behaviors impact the relationships between hostility and depression. Due to the depressive effects of excessive and prolonged alcohol use (e.g. McGuire, Stein, & Mendelson, 1966) as well as the positive correlations between hostility and alcohol use for both males and females (e.g., Whiteman, Fowkes, Deary, & Lee, 1997), it is possible that using alcohol to cope with hostility-related emotions could engender subsequent elevations in depressive symptoms. Therefore, the use of heavy alcohol use as a means of coping with anger and other negative emotions may be an important mediator of the relationship between hostility and subsequent levels of depressive symptoms.

Replication of the current findings in additional samples would be helpful. Ideally, the longitudinal relationships between hostility and depression should be explored in a demographically representative community sample of individuals for whom a diagnosis of Major Depressive Disorder and/or Dysthymic Disorder is confirmed by a structured diagnostic interview. Analyses of samples with known diagnoses would help to determine the extent to which current findings apply to particular unipolar depressive phenomena of interest, rather than just depressed mood, in general. Similar analyses comparing patient samples to community

samples may also help to determine differences in the relationships among hostility and depression between individuals who seek treatment for symptoms of depression and those who do not.

Psychotherapeutic treatment outcome studies should address the extent to which anger and hostility in the context of depressed mood are alleviated by treatments such as Cognitive Behavioral Therapy (e.g., Beck, 1995), Mindfulness-Based Cognitive Behavioral Therapy (Segal, Williams, Teasdale, & Kabat-Zinn, 2012), and Acceptance and Commitment Therapy (Hayes, Strosahl, & Wilson, 2011), three empirically supported treatments for depression that would be easily adaptable for the purpose of also addressing hostility-related phenomena. Incorporating elements of mindfulness, emotion regulation, distress tolerance, and interpersonal effectiveness skills from DBT (Linehan, 1993) may also help individuals struggling with anger and hostility to more effectively manage the emotions, urges, and interpersonal difficulties associated with these experiences. Research estimating the effectiveness of such treatment for hostile depression that include (versus do not include) such adaptations would help to clarify the extent to which adapted therapies would enhance the efficacy of psychotherapeutic treatment for the large proportion of individuals with depression who also experience intraepisodic elevations in hostility-related symptoms.

Conclusion

Data from the NSFH were used in the current study to clarify the longitudinal relationships between hostility and depression in the general American population. The results of the current study suggest that, in general, hostility represents and intraepisodic feature of depression for many individuals rather than a risk factor for subsequent elevations in depressive

symptoms. Previous studies have found that hostility in adolescence, early adulthood, and later adulthood are predictive of elevated depression at follow-up measurement (Heponiemi et al., 2010; Miller et al, 1995; Reinherz et al., 1999; Siegler et al. 2003; Stewart et al., 2010). It is likely, however, that this effect is specific to hostility exhibited during those stages of life and does not necessarily apply to individuals of all ages who exhibit depressive tendencies. These findings may have been impacted by the long duration of time between measurements or the disproportionate attrition of more severely depressed individuals from the study (as noted by Sweet & Bumpass, 1996; 2002). However, the use of structural equation modeling techniques and a large nationwide sample were expected to enhance the reliability of the current findings. The within-wave positive correlations between hostility and depression noted here, in addition to the previously noted prevalence of hostility in the context of clinically depressed mood (between approximately 19% and 44% of individuals exhibiting MDE; Benazzi & Akiskal, 2005; Fava, Anderson, & Rosenbaum, 1990; Fava et al., 1993; Pasquini et al., 2004; Perlis et al., 2005; Raja and Azzoni, 2005; Snaith & Taylor, 1985), justify greater attention to hostile information processing patters in cognitive research on depression. Finally, determining the extent to which empirically-supported treatments for depression should be adapted for individuals exhibiting depression with hostility would help to enhance the effectiveness of psychotherapeutic approaches to treating depression, one of the most prevalent and economically burdensome mental health problems in the developed world today.

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