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Verbal Behavior In Individuals With Generalized Anxiety Disorder And Depressive Disorders

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VERBAL BEHAVIOR IN INDIVIDUALS WITH GENERALIZED ANXIETY DISORDER AND DEPRESSIVE DISORDERS

by

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Abstract

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Generalized Anxiety Disorder (GAD) and clinical depression are both internalizing disorders characterized by sustained negative affect and have mainly been studied utilizing either self-report or physiological measures. Fewer studies have focused on behavioral indices of these disorders, and little is known about their overlapping and distinct linguistic features. The present research examined the above gap in two separate studies. Study 1 synthesized previous efforts made to study the linguistic features of individuals with depression. Previous investigations found that depressed individuals evidence high proportions of I-words, high proportions of negatively-valenced words, low proportions of positively-valenced words, and high proportions of cognitive words. However, these investigations had several limitations: they did not identify word categories that were specific to depression, they made relatively vague conceptual connections between language variables and their underlying psychological meaning, and they overly-relied on one software tool—the Linguistic Inquiry and Word Count (LIWC) and its predefined content-based word categories. Study 1 also offered a roadmap for more nuanced, theoretically based investigations of the linguistic characteristics of depressed individuals. Study 2 utilized the conceptual and methodological insights from Study 1 to empirically examine the language of individuals with GAD, with or without comorbid depression (MDD and Dysthymic

Disorder) as they described peak autobiographical episodes: the happiest event of their lives, the saddest event in their lives, and the most anxiety-provoking situation they can imagine. Results showed that adults with comorbid GAD and depression used less specific language, but adults with GAD-only did not. Furthermore, while adults with comorbid Dysthymic Disorder (GAD+dys) were less specific across the entire interview, adults with comorbid MDD (GAD+MDD) were less specific only when describing happy memories. Second, adults with GAD+MDD were impaired in their ability to generate meaning from happy events. Adults with GAD+MDD also showed increased cognitive efforts at meaning-making, suggesting that they utilize ineffective verbal emotion regulation strategies. Finally, adults with GAD-only, as well as individuals with GAD+MDD, used language associated with less psychological distance than healthy controls. Taken together, these studies advance the knowledge of verbal behavior in adults with GAD and clinical depression and have the potential to inform both clinical practice and future research efforts.

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Chapter 1: Introduction

I. Background

Generalized Anxiety Disorder (GAD)—previously coined "the basic anxiety disorder" (Portman, Starcevic, & Beck, 2012, p. 82)—is marked by persistent anxiety, somatic tension, arousal and excessive worry (Portman, 2011). It is associated with significant economic burden: increased health care utilization as well as decreased work productivity (Wittchen, 2002). A characteristic behavior of adults with GAD, vaguely defined complaints when going to primary care physicians, makes it hard to diagnose. In the previous edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM III), GAD suffered from low diagnostic reliability even among mental health professionals. Despite the improved specificity in the DSM-IV (APA, 1994), which emphasized uncontrollable worry and physical symptoms related to heightened and chronic arousal (Aldao, Mennin, Linardatos, & Fresco, 2010a), distinguishing GAD from other disorders has remained challenging (Aldao et al., 2010a). The biggest challenge has been to disentangle GAD and depression; epidemiological studies suggest that two thirds of GAD patients retrospectively report an episode of major depression in their lifetime (Hofmann, Schulz, Heering, Muench, & Bufka, 2010).

In spite of the high overlap between GAD and depression, some studies have shown that these disorders do indeed have distinct features. For example, Hofmann and colleagues (2010) found differences in heart rate variability, in an experimental setting, with adults with comorbid GAD and MDD evidencing more cardiac vagal tone (a measure that is considered an indicator of autonomic nervous system flexibility) than adults with GAD-only. In another study, Dupuy and Ladouceur (2008) found that adults with comorbid GAD and major depressive disorder (MDD) were less tolerant of uncertainty, were worse problem solvers and displayed more cognitive

avoidance than adults with GAD-only. Finally, Mennin and colleagues (2008) showed that heightened activation when experiencing emotions was related to GAD over and above MDD, and that poor understanding of emotions was related to MDD but not to GAD.

Since GAD and depression are both internalizing disorders, they have mainly been studied utilizing either self-report or physiological measures. Self-report measures help understand the subjective experience (e.g., Aldao et al., 2010a; Dupuy & Ladouceur, 2008), while physiological measurements assess various bodily manifestations witnessed in the laboratory (e.g., Hofmann et al., 2010). Fewer studies have focused on behavioral indices of individuals with these disorders, likely due to the difficulty detecting behavioral manifestations of these "distress disorders" (Mennin & Fresco, 2013b; Zbozinek et al., 2012). However, an enhanced understanding of the behavioral manifestations of these disorders may help elucidate the underlying cognitive processes which may be distinct (Klenk, Strauman, & Higgins, 2011), and possibly contribute to the symptomatic picture. The current dissertation focuses on one aspect of behavior in individuals with GAD and depression—the use of language. By studying the ways in which these individuals speak, it may be possible to better understand the ways in which they think, feel, tell stories and reflect on their own experiences (Pennebaker, 2011).

II. Linguistic Analysis

Individuals are not usually aware of the particulars of their language style, especially not in an ongoing manner (Bucci, Maskit, & Hoffman, 2012). Instead, they usually focus more on the content of their speech and on what they wish to communicate. However, the words they use have been shown to be indicative of both long-lasting personality traits (Pennebaker & King, 1999) and changes in emotional states (e.g., Cohn, Mehl, & Pennebaker, 2004). In turn, looking

at word usage presents a unique opportunity to observe, in a fairly non-invasive way, a wide range of psychological phenomena (Pennebaker, 2011).

The large-scale systematic study of word usage began in the last two decades, with the development of an automated text analysis software tool—the Liguistic Inquiry and Word Count (LIWC; Pennebaker, Chung, & Ireland, 2007). The initial impetus for developing the LIWC was to see whether the words people use when writing about emotional topics predict later physical health. Until that point, Pennebaker and his colleagues relied on human judges to score the emotional essays; this created several problems: judges often disagreed about a wide range of dimensions; the process was slow and expensive; and judges tended to become depressed when reading depressive stories (Tausczik & Pennebaker, 2010).

Pennebaker and his colleagues originally meant to only calculate the percentage of positive and negative emotion words in a text (Pennebaker, 2011). However, once an automated tool became available, researchers began using it for multiple purposes, covering a wide range of psychological phenomena. To date, hundreds of studies have used computerized text analysis tools. Examples include comparisons of positive and negative political advertisements (Gunsch, Brownlow, Haynes, & Mabe, 2000; positive ads used more present and future tense verbs while negative ads used more past tense verbs), fiction writers and physicists (Djikic, Oatley, & Peterson, 2006; fiction writers used more emotion words, and especially negative emotion words), bloggers before and after 9/11 (Cohn et al., 2004; post 9/11 – a drop in "I" words and an increase in "we"), and more.

This line of research helped identify relatively small word groups which appeared to have predictive power. They are referred to in the literature as function, or style words, interchangeably. While an average English speaking adult has a vocabulary of about 100,000

words (Pennebaker, 2011), they are not evenly distributed. Of the 100 million (British English) words in the British National Corpus (BNC), 26% of them are accounted for by the 10 most frequent words (Brier & Hopp, 2011). These words are: ‘the’, ‘be’, ‘of’, ‘and’, ‘to’, ‘a’, ‘in’, ‘have’, ‘that’ and ‘it’. About 500 words are considered style (or function) words, and though they account for half a percent of the average vocabulary, they make up about 55% of spoken language (Tausczik & Pennebaker, 2010). Most function words are pronouns, prepositions, articles and auxiliary verbs and serve as “the cement that holds the content words together” (Chung & Pennebaker, 2007, p. 347). Because these function words occur so frequently, it is possible to detect word use differences between and within individuals (across time/conditions) by analyzing relatively short texts. As a thought experiment, consider how difficult it would be to detect how frequent someone you are talking to uses the relatively frequent content word ‘know’ (frequency of 0.0014 in a Texas Instrument switchboard corpus; Bell, Brenier, Gregory, Girand, & Jurafsky, 2009). But noticing how often they use the word ‘I’ would not be as difficult.

Having just made the case for the easier detection of function words due to their frequency, a caveat is in order. Unless conscious attention is focused on function words, they usually go unnoticed (Chung & Pennebaker, 2007). They are short (typically 1-4 letters); they are more predictable than content words (Bell et al., 2009); are in general processed faster than content words (Segalowitz & Lane, 2000); and are also processed somewhat differently in our brains (Diaz & McCarthy, 2009). Thus, automated tools are better suited for the task of identifying and comparing frequencies of function words.

The focus on function words, along with the additional categorization of content words in the realms of, among other, emotion and cognition, helped advance the field of linguistic

analysis. Social, clinical, developmental and forensic psychologists utilized the LIWC and its categories to study word usage, both in written and spoken language. However, despite the large amount of empirical data gathered, "the psychological meaning of language use remains somewhat ambiguous" (Pennebaker & King, 1999, p. 1309).

III. Linguistic Style and Depression

Though the relationship between language use and clinical disorders has interested theorists and researchers for decades (Pennebaker, Mehl, & Niederhoffer, 2003), fairly little is known about this relationship. In the case of depression, early accounts broadly described depressed individuals' language as "dull, stereotyped and blocked" (Bucci & Freedman, 1981, p. 337). Beck (1967) noted that depressed individuals' speech is brief, disfluent, and lacks spontaneity. Furthermore, he posited that they may be unable to express certain thoughts and feelings. In line with Beck's (1967) theorizing, an early study by Bucci and Freedman tested the hypothesis that depressed individuals are impaired in their referential activity (RA; Bucci & Freedman, 1978)—the ability to translate inner experience into verbal form. Five elderly female inpatients with a diagnosis of MDD were asked to freely talk about any interesting personal experience for five minutes. Compared to speech samples of healthy controls, these depressed patients' speech was characterized as "rambling, repetitious, and vague" (p. 348). Specifically, these patients used more first person pronouns than normal subjects and rarely used second person pronouns. Bucci and Freedman interpreted these findings as an indication of "weakness in reaching out to the listener or taking his point of view" (p. 350).

Later empirical investigations, utilizing the LIWC (Pennebaker et al., 2007), focused on depressed individuals' tendency to turn their attention inwards (Pennebaker et al., 2003). This tendency was operationalized by the use of first person pronouns (i.e., I, me, my). Several

investigations found that depressed individuals used more first person pronouns than healthy controls (e.g., Rude, Gortner, & Pennebaker, 2004; Stirman & Pennebaker, 2001). Other investigations also found that depressed individuals used more negatively valenced words (Ramirez-Esparza, Chung, Kacewicz, & Pennebaker, 2008) and more cognitive words (Rodriguez, Holleran, & Mehl, 2010). However, these investigations were mainly exploratory and not theoretically-driven (Pennebaker et al., 2003). One of the goals of this dissertation was thus to advance the understanding of the relationship between depression and linguistic style by conducting an extensive—conceptual and empirical—review of the literature.

IV. Linguistic Style and Anxiety

One area where connections between linguistic style and underlying psychological phenomenon have been particularly hard to pinpoint is anxiety. As an indication, Pennebaker's (2011) book, which covers the range of psychological topics studied via linguistic analysis, does not have the word "anxiety" in its index section. The reasons for this remain unclear, but one possibility is that one's language may become more diffuse and less focused when he or she is anxious, and this is harder to identify using the standardized word dictionaries. Though speculative, this explanation is consistent with psycholinguistic studies of anxiety conducted in the 1960s, prior to the existence of text analysis software tools. Mahl (Kasl & Mahl, 1965; Mahl, 1987; Zimbardo, Mahl, & Barnard, 1963), in a series of studies, found sentence changes, repetitions, omissions, sentence incompletions, tongue slips and intruding incoherent sounds to be associated with anxiety. For example, speech disturbances, not including "ah" were found to be strongly associated with a measure of palm sweat (Kasl & Mahl, 1965); and highly anxious children used more non- ah speech disturbances under evaluative conditions than non-anxious

children (Zimbardo et al., 1963). It is likely that the difficulty in identifying such speech disturbances, especially automatically, has led to the abandonment of these findings.

A few sparse, more recent studies, utilized a factor-analytically derived variable termed Verbal Immediacy to study anxious individuals' language, with the assumption that anxious individuals speak in a hyper-aroused, immediate way. Verbal Immediacy, which includes present tense verbs, first person pronouns, discrepancy words, short words (under 6 letters) and few articles, was hypothesized to reflect psychological hyperactivation and a lack of psychological distance (Lee, Sbarra, & Mason, 2011). The first study (Lee et al., 2011) included 119 adults from a community sample, who were recently separated from their romantic partner. The subjects' stream of consciousness was recorded for 4 minutes; their blood pressure was then measured as they were asked to reflect on various mundane scenarios (a non-emotional task); finally, they were asked to reflect on themselves and their ex-partner in a variety of different situations (a heightened emotional task). Results showed that participants who reported high attachment anxiety also scored high on Verbal Immediacy. Additionally, an interaction effect was found between attachment anxiety and verbal immediacy. Thus, individuals who were high on attachment anxiety and also scored high on Verbal Immediacy had increased blood pressure levels when thinking about divorce-specific material. In their discussion, the authors cautioned against equating anxiety with hyper-activation since not all anxious individuals become highly engaged/overinvolved.

In another study that used Verbal Immediacy as a behavioral index for activation/anxiety, Borelli and colleagues (2011) administered the Child Attachment Interview (CAI; Target, Fonagy, & Shmueli-Goetz, 2003) to 93 children between the ages of 8 and 12. The interviews were then coded to assess the child's state of mind with respect to attachment figures, and each

interview was given a score of attachment security. Each child was then classified into one of four attachment categories with respect to each caregiver: secure, dismissing, preoccupied, or disorganized. The interviews were also analyzed using LIWC to derive Verbal Immediacy scores. These authors found that children who were classified as preoccupied scored higher on Verbal Immediacy than all other attachment categories. Children classified as dismissing scored lower on Verbal Immediacy than securely attached children. Additionally, the study showed that children classified as disorganized had lower Verbal Immediacy scores when discussing loss.

Several limitations should be noted with regards to the psycholinguistic study of anxiety. First, the small number of studies studying connections between linguistic style and anxiety (Borelli et al., 2011; Lee et al., 2011) focused on attachment anxiety. While attachment anxiety and trait anxiety have been found to be correlated (e.g., Gillath, Bunge, Shaver, Wendelken, & Mikulincer, 2005), they do not denote the same psychological process. Attachment anxious individuals become emotionally activated when thinking about losses, breakups or other separations, while individuals with trait anxiety, as seen for example in GAD, are likely to make threatening interpretations of ambiguous stimuli, regardless of its source (Walsh, Balint, Smolira, Fredericksen, & Madsen, 2009). Consequently, it may be easier to detect hyperactivation in the language of individuals with high attachment anxiety because the context under which they become activated is better defined.

V. Overview of Dissertation Studies

The goal of this dissertation was to examine linguistic style in individuals with GAD and depressive disorders, in an effort to identify linguistic features related to anxiety and depression. Two studies were constructed to achieve this goal. Study 1 aimed to synthesize the efforts to delineate the ways in which individuals with depression speak. This qualitative review of the

literature had several secondary aims: (1) to identify—and organize—the aspects of depression that have been studied linguistically. (2) to review the methods used to study depression. (3) to delineate conceptual and methodological limitations in the literature. And (4) to offer guidelines for future studies. Using the insights learned from Study 1, Study 2 aimed to empirically study—using linguistic text analysis—the ways in which individuals with GAD, with or without comorbid depression speak. More specifically, this study focused on the ways in which they spoke about peak autobiographical episodes.

Chapter 2: Study 1 – A Roadmap to the Psycholinguistic Study of Depression. More than Meets the 'I'

Despite being recognized as a devastating disorder (e.g., Sapolsky, 2001), depression is often still stigmatized, hidden, and unrecognized (Jarrold, Javitz, Krasnow, Peintner, Yeh, Swan, & Mehl, 2011). Several factors contribute to the disorder's relatively poor detectability. First, depression is highly private, with most of its features having to do with negative thoughts or feelings, and only few external, behavioral manifestations (Rodriguez et al., 2010). Second, depressed individuals do not necessarily seek help, and when they do, it is often from non-mental health professionals (Diala, Muntaner, Walrath, Nickerson, LaVeist, & Leaf, 2001). Third, peers of depressed individuals are often the ones who make the initial assessment of level of depression; their judgments—especially in the case of mild or moderate depressive symptoms—are often inaccurate (Mehl, 2006). Finally, when clinicians and researchers evaluate psychopathology, they frequently rely on the individual's subjective reports (Balsters, Krahmer, Swerts, & Vingerhoets, 2010), with the two most common methods of assessing depression being self-report measures (e.g., the Beck Depression Inventory; BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) and clinical interviews (e.g., the Structured Clinical interview for DSM Disorders; SCID; First, Spitzer, Gibbon, & Williams, 2002). Psychologists have thus been searching for objective methods to detect depression that are not as reliant on professional assessment or on individuals' honest and accurate self-report (e.g., Rodriguez et al., 2010).

This study synthesizes—and aims to further—the efforts made to study the verbal behavior of depressed individuals. By closely looking at frequency of word use, it is possible to detect personality traits as well as situational mental states (Chung & Pennebaker, 2007; Spence, Scarborough, & Ginsberg, 1978). Pennebaker (2011) has asserted that words are like

"fingerprints," highlighting the relatively consistent ways in which an individual utilizes language in a context-independent manner (see also Pennebaker & King, 1999). Other investigations have demonstrated the sensitivity of language in detecting differences in emotional states (e.g., Cohn et al., 2004) and that language use can change following successful psychological treatment (e.g., Lane & Viney, 2005).

The first section of the study will provide a review of the existing literature on the psycholinguistic studies of depressed individuals. In the second section, both conceptual and methodological limitations in the literature will be discussed. The third section will describe an advanced text-analysis tool and three word category types that can be used to expand the scope of these investigations. Finally, a roadmap for future psycholinguistic studies of depression will be delineated.

Psycholinguistic Studies of Depression: an Overview

A number of studies have begun looking at word use of depressed individuals. These studies have by and large used the Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2007)—a text analysis software which goes through a series of text files (e.g., interviews, poems, blogs, etc.), word by word, and checks to see whether or not the word is part of one of its categories. When it is done processing the text files, it produces an output file with the frequencies of each LIWC dictionary. For example, when analyzing the line "It was a dark stormy night" (example from: Pennebaker et al., 2007), it will first come across the word "it". After comparing it to the different dictionaries it will aggregate the *function word*, *pronoun*, and *personal pronoun* categories.

In what follows, a review of the body of literature studying verbal behavior in depressed individuals is provided (see also Table 1). Of note, none of the studies reported used clinical interviews to determine depression status. Additionally, there is no one clear definition of depression used in all the studies. The review is organized according to the main hypotheses that have to date been proposed and studied. While these hypotheses bear some resemblance to the ones proposed in the suggested roadmap for future studies, they are not identical.

The Self-Focus Hypothesis

Referencing Pyszczynski and Greenberg's (1987) Self-Awareness Theory of Reactive Depression, researchers hypothesized that depressed individuals' attention is focused inwards and that in turn their language would evidence high rates of first person pronouns (e.g., I, me, my). In one study (Rude et al., 2004) depressed, formerly-depressed and never-depressed college aged students were asked to write for 20 minutes about their deepest thoughts and feelings about being in college. The essays were then compared using the LIWC (Pennebaker et al., 2007). Results showed that the currently depressed group used more first person singular pronouns than the never-depressed group. A post hoc analysis revealed that the only statistically meaningful difference was in the use of "I" (Rude et al., 2004).

Another study, literary in nature, examined linguistic differences between suicidal and non-suicidal poets (Stirman & Pennebaker, 2001). Poems from early, middle, and late periods of suicidal poets (e.g., Sylvia Plath, Vladimir Mayakovsky) and matched control non-suicidal poets (e.g., Denise Levertov, Osip Mandelstam) were selected; next, the following LIWC categories were compared: pronouns, communication words (e.g. talk, share), negative emotion words, positive emotion words and death words (e.g. dead, grave). Results showed that suicidal poets

used more I-words than controls. In this case, the authors did not elaborate on differences between "I", "me" and "my".

In a study that failed to demonstrate higher use of "I-words", Rodriguez and colleagues (2010) asked undergraduate participants to write about themselves as they would in either a personal diary or an online blog. Higher depression scores, as evidenced by the Beck Depression Inventory (BDI; Beck et al., 1961), were not significantly correlated with use of "I-words". The authors offer a possible explanation for this inconsistency with prior research: that the instruction already emphasized writing about oneself, therefore making it harder to identify between-subject differences in this variable.

Finally, a study by Jarrold et al. (2011) may help shed some light on the more specific connection of I-words and depression. The researchers, which specifically targeted the association between I-words and depression, found that depressed individuals were more likely to use I-words when answering the following question: "In your work or career, have you accomplished most of the things that you wanted to accomplish? (If not) why not? What's gotten in the way? Are you doing anything about this?" (p. 693). In fact, the I-word differences between depressed and non-depressed individuals were ***not*** statistically significant when comparing the entire interview. Thus, it may be the case that depressed individuals use I-words more when they ruminate (for a review on rumination, see Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008) about the sources of their problems.

Prevalence of Negative Affect

Since depression is characterized by negative affect, several studies have tested the hypothesis that depressed individuals' language—in comparison to non-depressed individuals—

evidences higher rates of negative emotion words (signaling negative affect) and low rates of positive emotion words (signaling a lack of positive affect). Rude et al. (2004) reported that the currently depressed group used far more negatively-valenced words (e.g., sad, homesick, inadequate) than the formerly depressed and non-depressed groups. No differences were reported, however, in their use of positive words. In the study conducted by Rodriguez et al. (2010), sadness words (e.g., sad, cry) were strongly correlated with depression in a personal diary condition, but not in an online blog condition. Conversely, swear words (e.g., damn) were strongly associated with depression in the online blog, but not in the personal diary condition. In this study, positive words were negatively associated with depression in both conditions.

An additional study (Ramirez-Esparza et al., 2008) compared posts in online depression forums with posts from breast cancer forums. They found differences in emotion words, positive and negative, between the groups, both in English and in Spanish. The posts on the depression forums had more negative emotion words and fewer positive emotion words than the posts on the breast cancer forums. In a study that failed to replicate this finding, Mehl (2006) used an electronic recorder and randomly sampled sound clips over two days in the lives of undergraduate students. These sound clips were later transcribed and analyzed using the LIWC. Results did not show any statistically significant correlation between emotion word use, positive or negative, and the students' scores on the short form of the BDI (BDI–SF; Beck & Beck, 1972).

High Rates of Cognitive Words

Several studies implicitly hypothesized (i.e., without clear justification) that depressed individuals would use higher rates of cognitive words. For example, Rodriguez and colleagues (2010) reported that depressed individuals used more cognitive mechanism words (e.g., know,

cause), more causation words (e.g., because, why), more insight words (e.g., think, realize) and more inhibition words (e.g., avoid, forbid). These differences only applied, however, to self-descriptions in personal diaries. None of these cognitive word groups remained significantly different in online blog self-descriptions.

A sub-category of cognitive words—causation words—was found to be positively correlated with depression scores in the Mehl (2006) study described above. Increased cognitive word use has also been found in studies of rumination, which is strongly associated with depression (Denson, Moulds, & Grisham, 2012; Grisham, Flower, Williams, & Moulds, 2011). For example, one study instructed undergraduate students to ruminate by thinking about a negative event, focusing on it from their own perspective, turning it over and over in their mind, and focusing on the reasons for their feelings and responses (Grisham et al., 2011). Results showed that participants in the rumination condition used significantly more cognitive words than participants in the reappraisal condition who were instructed to think about an event from the perspective of an impartial observer.

In a study that failed to demonstrate a correlation between high rates of cognitive word use and depression, Vanheule and colleagues (2009) analyzed semi-structured interviews with 32 Dutch mental health outpatients. In this study, no significant correlations were reported between LIWC categories and any of the BDI-II subscales.

Limitations in the Psycholinguistic Study of Depression

One limitation of previous studies is that they have not identified markers that are *specific* to depression, thereby limiting discriminant validity. For example, differences in first person pronoun use are connected to a wide range of other phenomena: women use more I-words

than men (Newman, Groom, Handelman, & Pennebaker, 2008); low-status people use more I-words than high-status people (Sexton & Helmreich, 2000); truth-tellers use more I-words than liars (Newman, Pennebaker, Berry, & Richards, 2003); and, anecdotally, Harry Truman used far more I-words than Barack Obama (Pennebaker, 2011). The following quote from Pennebaker (2011) highlights the multiple interpretations that can be made based on I-words:

> "Depending on the context, using I-words at high rates may signal insecurity, honesty, and depression proneness but also that you aren't planning on declaring war any time in the near future. Using I-words at low rates, on the other hand, may get you into college and boost your grade-point average but may hurt your chances of making close friends" (p. 289)

A second limitation of previous studies is that the connections between the different linguistic markers and their conceptual meaning were left vague. For example, one study (Mehl, 2006) reported in its method section that it only used linguistic categories "with strong theoretical connections to depression" (p. 341) but did not explain what those strong theoretical connections were. Another study (Vanheule, Desmet, & Meganck, 2009) reported using linguistic categories such as "affective or emotional processes" or "cognitive processes" (p. 476) but again did not explain why and how these word categories were related to their respective psychological constructs. A third study (Ramirez-Esparza et al., 2008), which reported differences in positive and negative emotion words, did not provide any theoretical explanation for why these words might be indicative of positive or negative affect, though it is implied.

A third limitation of these studies is their over-reliance on the LIWC. Some of the LIWC's characteristics may hinder more nuanced investigations of the linguistic markers of depression. For example, it uses a probabilistic algorithm and is insensitive to context. Thus it

cannot distinguish between the word “mad” as in “I’m mad about you” and “you make me mad”. Additionally, the LIWC can only produce output variables for an entire text segment. This limits the ability to track the ebb-and-flow of language across time. There is also no way to determine, in its current version, when in a text (usually more applicable to spoken language) one was struggling, anxious, “searching for words”, or elated. These are all capacities that seasoned clinicians and sensitive, psychologically minded, individuals have long been able to detect. The inability to track the ebb-and-flow of language also precludes the possibility of correlating linguistic variables with other physiological variables such as acoustic measures, facial expressions or other, more invasive measures of central or peripheral nervous system activation.

Finally, these studies relied on the predefined, content-based, dictionaries of the LIWC. As a hypothetical example, in order for the word ‘apple’ to be included in the ‘fruit’ dictionary, experts have to agree that it is, indeed, a fruit. While content validity is obviously high for these dictionaries (inclusion was based on judges’ agreement about content), their construct validity is less certain. Take the affect dictionaries for example. In a study that assessed individuals’ emotional experience via self-report measures, Bantum and Owen (2009) found that none of the affect dictionaries (positive emotions, positive feelings, optimism, negative emotions, anxiety, anger, or sadness) were correlated with the individuals’ self-reported positive or negative feelings. In a different study, Kahn and colleagues (2007) reported significant correlations between individuals’ state-level feelings and LIWC affect dictionaries. However, this was done by analyzing participants’ responses to a prompt to explicitly discuss their feelings, or by analyzing texts where they were asked to discuss sad or amusing memories. Thus, this adds little support to the notion that currently used affect dictionaries can tap into underlying emotional states more than self-report questionnaires can.

Expanding the Scope of Psycholinguistic Investigations

The psycholinguistic study of depression has been limited, among other reasons, by methodological hurdles (Cohen, 2012). While there may be various ways to overcome these hurdles, in this section I describe an advanced software tool and various dictionary types that can be used in future studies.

The Discourse Attributes Analysis Program (DAAP)

The DAAP (Maskit, 2014a, 2014b) shares many of the characteristics of the LIWC (Pennebaker et al., 2007): It reads texts of either spoken or written language, checks each word to see if it belongs to one of its word categories/ dictionaries and produces a final output which states what percentage of a text consisted of each word category. It has, however, a few distinct, more sophisticated, features: (a) It can track multiple speakers if these are indicated in the text; (b) it can utilize weighted dictionaries. For each word in a weighted dictionary, the software assigns a value. To illustrate, a weighted dictionary may assign a higher "uniqueness" value for the word "extraordinary" than for the word "different". The output will indicate a weighted average of all the words in the category; (c) it utilizes a smoothing function which computes a linguistic score for each dictionary at each point in the text. More emphasis is given to the current word and less emphasis to the words that came before it or after it. Thus, for example, to calculate a "smoothed" score for word number 2400, it will average all the words from 2300-2500, while emphasizing (giving stronger weights to) the words closer to word number 2400 (example from Maskit & Murphy, 2012); (d) it calculates covariations between pairs of measures. The smoothing function allows for the calculation of the tendency for different linguistic or other variables to move together or in opposite directions; and (e) it incorporates the

freeware acoustic analysis software tool PRAAT (Boersma & Weenink, 2014), thus allowing for the calculation of acoustic variables as well as their covariance with linguistic measures.

The DAAP has been used to study psychotherapy process (Bucci & Maskit, 2007; Bucci et al., 2012; Hoffman, Algus, Braun, Bucci, & Maskit, 2013; Mariani, Maskit, Bucci, & De Coro, 2013), to validate the measures of Bucci's (1997) referential process (Kingsley, 2009), to assess narration and vividness in autobiographical memories (Nelson, Moskovitz,, & Steiner, 2008), and to assess episodic memory (Maskit & Bucci, 2012). The software has, however, several limitations. First, it has been used less frequently by researchers. Second, though the DAAP developers aim to make it open-source and available for free online (Maskit, personal communication), there is no current downloadable version, and in order to use the software, one needs to, at least initially, collaborate with Bucci and Maskit's research group (www.thereferentialprocess.org). Third, it supports only English and Italian, thereby limiting cross-cultural studies.

Word Categories/Dictionaries Relevant to the Study of Depression

As mentioned, research efforts to study the linguistic characteristics of depressed individuals have mainly relied on the predefined (content-based) dictionaries of the LIWC (Pennebaker et al., 2007). Aside from content-based dictionaries, researchers have also utilized inductively–generated dictionaries and weighted dictionaries based on existing, empirically-validated word lists.

Inductively derived dictionaries use texts rated by human judges for theoretical constructs (e.g., cognitive rigidity; Cohen, 2012) to generate a list of words that co-occur with language that is high on the specific construct. One such example, relevant to the study of depression, is the Weighted Referential Activity Dictionary (WRAD; Bucci & Maskit, 2006) which assesses

language that is specific, clear, concrete and imagistic. Since it has been shown that depressed individuals, when talking about autobiographical memories, use vague and overgeneral descriptions (e.g., Williams et al., 2007), the WRAD may be useful in identifying such overgeneralized language.

The Weighted Referential Activity Dictionary (WRAD; Bucci & Maskit, 2006). Referential Activity (RA) denotes the capacity to express subsymbolic material in words. Language high in RA uses concrete and specific imagery; it captures an immediate quality; and is likely to evoke vivid, specific and immediate experience in the listener. To construct the WRAD, four distinct sets of spoken language, consisting of 763 texts, were used, after they had been manually scored for RA by at least two raters. These texts were then divided into 6 categories ranging from very low (0-2.75) to very high RA (7.25-10). Finally, a weight between -1 and 1 was assigned to each word, based on its proportional distribution (a detailed description of the weighting procedure is available in Bucci & Maskit, 2006). This helped exclude words with a bi-modal distribution such as "but". It also helped differentiate between words that contribute differentially to RA. For example, though both "a" and "the" are articles, they do not have the same weight (0.625 and 1 respectively). Talking about "a tree" is less specific or connected to inner experience than talking about "the big oak tree in my grandfather's back yard". As expected, the pronouns "it" and "that" receive negative weights, as they refer to non-specific items. Table 2 shows the first 20 rows in the WRAD matrix.

Weighted dictionaries may also be derived by using empirically-validated word lists and assigning appropriate weights. One example of such a dictionary is a weighted affect dictionary (Murphy, 2014) based on the ANEW (Bradley & Lang, 1999). Since depression is first and foremost a disorder of mood, a refined affect dictionary may help detect shifts in emotionality.

A Weighted Affect Dictionary (Murphy, 2014). The Weighted Affect Dictionary (WAD; Murphy, 2014) is based on the Affective Norms for English Words (ANEW; Bradley & Lang, 1999)—a set of 1,034 English words which includes verbs, nouns and adjectives. Each word in the ANEW was assigned three scores from 1-9 on arousal, pleasure and dominance based on an average of raters' scores using the Self-Assessment Manikin (SAM) (Lang, Bradley, & Cuthbert, 1999). For example, the word "bored" was assigned a low arousal (2.83), and a negative valence (low pleasure) score (2.95) while the word "frustrated" was assigned a relatively high arousal score (5.55) and a negative valence score (2.70). The ANEW has been used in a wide range of studies. For example, an fMRI study using words from the ANEW as a prompt (Lewis, Critchley, Rotshtein, & Dolan, 2007) showed that specific regions of the brain were involved in the processing of valence while other regions were involved in the processing of arousal. The WAD (Murphy, 2014) transforms the ANEW scores into weights compatible with the DAAP. High scores on the arousal scale denote high arousal and high scores on valence denote words that are associated with pleasurable feelings. This dictionary has yet to be used in text analytic studies presumably because of software limitation which precluded the use of weighted dictionaries but nonetheless holds promise for the improvement of detectability of affect in text analysis.

A Roadmap for Future Studies

In this final section, several strategies for more nuanced detection of linguistic markers in the language of depressed individuals will be detailed. These strategies make use of the DAAP (or similar software products that will be available in the future) and the dictionaries described in the previous section of the paper. I begin with a strategy for detecting Emotion Context-Insensitivity (ECI; Rottenberg, Gross, & Gotlib, 2005).

Strategy 1: Detecting Emotion Context-Insensitivity

Depression is characterized by deficient positive affect, excessive negative affect, or both (Rottenberg et al., 2005a). With the growing interest in emotion regulation, researchers have sought to understand if and how depression alters emotion reactivity. Rottenberg and colleagues (2005a) compared between three competing hypotheses: (a) the positive attenuation hypothesis which states that depressed individuals will exhibit little emotional reactivity to positive stimuli (e.g., not laugh at a joke); (b) the negative potentiation hypothesis which states that depressed individuals will evidence stronger negative reactions to negative emotional stimuli (e.g., feel acute sadness in response to a sad movie); and (c) the ECI hypothesis which states that depressed individuals exhibit reduced positive affect in response to positive stimuli but also reduced emotional reactivity in response to negative stimuli. Stated differently, according to this hypothesis depressed individuals are less engaged and reactive to stimuli regardless of valence. Rottenberg et al. (2005) concluded that the ECI hypothesis received the most empirical support. For example, unlike healthy controls, depressed individuals reported similar levels of sadness in response to happy, sad and neutral films. Depressed individuals also reported lower levels of happiness in response to the various emotional stimuli. The authors did not, however, find support for the ECI hypothesis in their physiological measurement (heart rate, finger pulse, respiration rate and skin conductance rate). Further support for the ECI model was reported by Bylsma and colleagues (2008) who conducted a meta-analysis to determine the best fitting model of emotional reactivity in depression.

Linguistically, we can hypothesize that depressed individuals will use more negatively-valenced words than their non-depressed counterparts and this can be detected using the weighted affect dictionary. However, since deficits in positive affect are not specific to

depression (e.g., Larson, Nitschke, & Davidson, 2007), other aspects of the ECI model should also be explored.

The main emotional reactivity theme delineated by the ECI model is that depressed individuals are less behaviorally reactive to emotional stimulus, regardless of its valence (Rottenberg & Vaughan, 2008). The "flatness" in their emotional reactions may be a source of interpersonal difficulties, as they can be "hard to read" and illicit negative emotional reactions and even elevated blood pressure in their conversational partners (Butler, Egloff, Wlhelm, Smith, Erickson, & Gross, 2003). Linguistically, we can hypothesize that the arousal level of depressed individuals' language—as measured with arousal dimension of the WAD—will be less variable than healthy controls.

Finally, the ECI model contradicts the Negative Potentiation Hypothesis (Lewinsohn, Lobitz, & Wilson, 1973) which states that depressed individuals with display strong negative emotions in response to negative stimuli. The covariation between the arousal and valence dimensions of the WAD can help test these competing hypotheses. If the negative potentiation hypothesis is correct, we could expect a negative covariation—arousal level goes up for negative affect and goes down for positive affect. Conversely, if the ECI model holds, we can expect a non-significant covariation—arousal is expected to be low regardless of valence.

Strategy 2: Detecting Reduced Autobiographical Memory Specificity (AMS)

Though finding specific trait-level characteristics of depression that can be detected linguistically is difficult, the reduced capacity to report specific autobiographical memories may qualify as one (Raes, Hermans, & Williams, 2006). Repeatedly, studies have found that depressed individuals, when asked to describe memories, tend to use overgeneral, nonspecific

language to describe personal memories (Watkins & Teasdale, 2001). For example, Birch and Davidson (2007) compared 17 depressed participants with matched healthy controls on the Autobiographical Memory Test (AMT; Robinson, 1976), which categorizes participants' memories (in response to word cues) as categorical, extended, or specific. The depressed group produced significantly less detailed memories, but the groups did not differ on categorical memories. Overall, Williams et al. (2007) found a large mean effect size (Cohen's $d = 0.94$) for overgeneral memory in depression across 28 studies. Very few studies failed to replicate overgeneral memory in depressed individuals (Williams et al., 2007). Additionally, autobiographical memory specificity (AMS)[1] has not been shown to be impaired in individuals diagnosed with only anxiety disorders (Williams et al., 2007). Since depression is often comorbid with anxiety disorders, deficits in AMS can be seen as a relatively specific characteristic of depression.

One explanation for the reduced AMS in depressive disorders has been termed the affect regulation hypothesis (Williams, Stiles, & Shapiro, 1999). It suggests that individuals ward off painful experiences by retrieving generic, nonspecific memories. While these memories might still be painful, they evoke secondary emotions which are preferable to the primary emotions evoked by a specific memory. Williams et al. (1999) illustrate this with an example:

> The general memory 'I've always been poor at maintaining relationships' may evoke secondary emotion that is painful but may nevertheless be preferable to the primary emotion associated with remembering the particular event of your partner telling you he or she had found someone else. (p. 301).

[1] Some studies examine overgeneral memory (OGM) and some studies examine autobiographic memory specificity (AMS). These are two ways of examining the same phenomenon.

Most studies aimed at assessing AMS utilized the Autobiographical Memory Test (AMT; Robinson, 1976), which uses cue words to elicit memories specific in time and place. A categorical response to a cue word would include a class of events (e.g., "going to work") or an extended period (e.g., "my first year in grad school"); conversely, a specific response would mention a unique occurrence that did not last more than 24 hours (e.g., "The Millennium party at my dorm room at Oberlin College"). Other ways of measuring autobiographical memory include structured interviews such as the Autobiographical Memory Interview (AMI; Kopelman, Wilson, & Baddeley, 1989) and the Autobiographical Interview (AI; Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002). The first scores memories for richness and specificity on a 0-3 scale, while the second classifies each detail of a memory as either internal (i.e., episodic) or external (i.e., non-episodic), and then sums them to form internal and external composites. Piolino and colleagues (2009) have also introduced an AM task—the TEMPau task—which focuses on the ability to subjectively "travel back into the past and relive specific details of that event" (p. 2315).

Referential Activity (RA; Bucci, 1997) assesses language for specificity, concreteness, clarity and imagery. Thus, there is at least conceptual overlap between RA and specificity of episodic memory. There appear to be an even larger overlap between the more recent conceptualizations of autobiographical memory (Levine et al., 2002; Piolino et al., 2009) and RA. Both draw on William James' (1890/2010) notion of personal memory that has "warmth and intimacy". A recent study was designed to determine if and which measures of RA would provide the best fit for autobiographical memory assessment. Maskit and Bucci (2012) used transcribed and scored interviews from Addis and colleague's (2008) study for this purpose. In the original study, participants were given an adapted form of the Autobiographical Interview

(Levine et al., 2002) and these interviews were subsequently scored according to the AI scoring procedures. The same transcribed interviews were analyzed using the DAAP. Results showed that WRAD scores were highly correlated ($r = 0.582$, $p<0.001$) with Levine et al.'s (2002) proportion of internal details. Thus, the WRAD may provide a sufficiently powerful linguistic marker for AMS.

Strategy 3: Detecting Rumination

Rumination is defined as "a mode of responding to distress that involves repetitively and passively focusing on symptoms of distress and on the possible causes and consequences of these symptoms" (Nolen-Hoeksema et al., 2008, p. 400). It is considered a cognitive or verbal activity (Fresco, Frankel, Mennin, Turk, & Heimberg, 2002) which provides a temporary escape or relief from physiological arousal but at the expense of poor emotional processing (Armey et al., 2009). Though it is considered a form of self-reflection, it has been conceptualized as perseverative and ineffective (Grisham et al., 2011). It inhibits adaptive problem solving, reduces motivation and initiative, and interferes with social support (Nolen-Hoeksema et al., 2008). Overall, ruminative content appears to be highly negative (Fresco et al., 2002), focused on past personal loss or failure (Papageorgiou & Wells, 2003), and on the reasons for the depressive symptoms (Smith & Alloy, 2009). Papageorgiou and Wells (2003) argue that it is not merely the content of rumination that is related to psychopathology, but also the "nature, flexibility, and beliefs about thinking" (p. 7).

Aldao and colleagues (2010b), in a meta-analytic review of the relationships between various emotion regulation strategies and psychopathology, found rumination to have the largest effect on psychopathology. They concluded that rumination was associated with anxiety, depression, eating and substance-related disorders. However, the largest association was found

with depression. Similarly, Mor and Winquist (2002) found rumination to be the form of self-focus most strongly and consistently related to depressive symptoms. Engagement in rumination has been associated with the onset of major depression (Just & Alloy, 1997; Nolen-Hoeksema, 2000; Nolen-Hoeksema et al., 2008), as well as the duration of depressive symptoms in several studies (e.g., Hong, 2007; Kuehner & Weber, 1999; Nolen-Hoeksema et al., 2008; Robinson & Alloy, 2003). The tendency to ruminate has been found to be relatively stable even after depressive symptoms subside (Just & Alloy, 1997).

The most commonly used measure of rumination is the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991). The 71-item self-report measure is used to identify coping strategies utilized in response to depressed mood. Among the items are the following: "try to understand yourself by focusing on your depressed feelings" and "think about all your shortcomings, failures, faults, mistakes". Since rumination is considered a verbal strategy, several studies have begun to examine which word categories tend to accompany rumination. Overall, these studies found that subjects who ruminate use more causal words (Denson et al., 2012; Grisham et al., 2011; Santa Maria, Reichert, Hummel, & Ehring, 2012; Watkins, 2004), more negative emotion words (Denson et al., 2012), more I-words (Grisham et al., 2011), and more past tense verbs (Denson et al., 2012; Papageorgiou & Wells, 2004). These results shed some light on the linguistic characteristics of rumination. The high use of cognitive words highlights an overemphasis on meaning-making; on attempts to find reasons for one's emotional situation. Furthermore, it is negatively valenced, focused on the past, and on the self.

All of the above studies were conducted using an experimental paradigm which prompted individuals to ruminate. For example, in one study individuals were asked to think about a negative event, focus on it from their own perspective, turn it over and over in their mind, and

focus on the reasons for their feelings and responses (Grisham et al., 2011). In another, they were instructed to write about their judgments of their emotional responses to a stressful situation (Low, Stanton, & Bower, 2008). Thus, since individuals—even when depressed—do not constantly engage in rumination, it is unlikely that such significant results could be found without an experimental induction.

In order to detect rumination linguistically without an experimental induction, a first step would entail generating a Weighted Rumination Dictionary (WRD) using the procedure outlined by Bucci & Maskit (2006). The construction and validation datasets can consist of experimentally induced rumination texts (e.g., Grisham et al., 2011). Once such a dictionary exists, we can calculate a HRP (High Rumination Proportion) variable. Similar to the HWP, it will calculate the proportion of a text that the speaker spent using language that was high on rumination. This strategy has the potential to increase the ecological validity of rumination detection as it does not require a specific prompt and can make use of a wide range of texts.

Limitations

Several limitations of the proposed roadmap should be noted. First, clearly the above strategies should be seen as speculative until they receive due empirical support. Second, the strategy for detecting the ECI model utilizes a dimensional theory of affect (Russell, 1980), which does not account for the role of discrete emotions. Further research is needed to determine if a discrete emotions approach (e.g., Gruber, Oveis, Keltner, & Johnson, 2011) is missing in order to better detect depression linguistically. Third, the strategy offered for detecting rumination is limited in the identification of a main feature of rumination—its repetitive nature (Smith & Alloy, 2009). For this to be possible, future versions of text analysis software tools need to compare words or phrases not only to external dictionaries, but also to

words or phrases used in previous parts of a text. Another challenge exists in the creation of a weighted rumination dictionary—researchers need to agree on the definition of rumination, or at least on which texts are high in ruminative content.

Summary and Conclusion

The analysis of written and spoken texts holds much promise for the possible detection of depression. Psycholinguistic studies of depressed individuals have shown that—compared to non-depressed controls—they use high rates of I-words, high rates of negatively valenced words, low rates of positively valenced words and high rates of cognitive words. To advance the knowledge of the unique linguistic markers of depression, three strategies were proposed, drawing on recent theoretical and empirical literature on depression, and on technological advances in psycholinguistics. Notably, these strategies use several advanced features in the DAAP—weighted dictionaries, the calculation of variability, and co-variance between different linguistic variables.

The first strategy was aimed at detecting common emotional reactivity themes in depression. Based on the ECI model, depressed individuals are known to have little variability in their emotional responses, and to consistently report negative affect. Using the arousal and valence dimensions of the weighted affect dictionary (Murphy, 2014) the following hypotheses were stated: (a) depressed individuals would have low valence scores; (b) depressed individuals would have low variability scores on both arousal and valence; (c) the covariance between the arousal and valence would be non-significant. The second strategy aimed to detect reduced Autobiographical Memory Specificity (AMS)—a cognitive feature shown to be strongly associated with depression. Using the WRAD, the following hypothesis was stated: depressed individuals would evidence lower WRAD scores than their non-depressed counterparts. The

third strategy aimed to identify rumination by creating an empirically modeled Weighted Rumination Dictionary. Using the High Rumination Proportion (HRP) variable, it was hypothesized that depressed individuals would evidence higher HRP than non-depressed even in texts generated without the intention of identifying rumination.

Future studies are needed to determine if and which of these strategies can indeed be reliable indicators of depression. Additionally, it is clear that there are large variations in language based on the context (Biber, 1988). Thus, in order to determine which strategies best detect depression, it will also be necessary to determine which contexts are best suited for such automated procedures. Despite the above limitations, the previously described psycholinguistic strategies have several strengths. They utilize empirically studied theoretical models of depression or related cognitive-emotional characteristics; they make use of relatively sophisticated text analysis tools; and they provide preliminary suggestions for integrating theory with empirical methodology. Hopefully, they will prove useful in improving the detectability and understanding of depressive disorders.

In the next chapter of this dissertation, an empirical study is presented. Study 2 builds on the above recommendations and utilizes automated text analysis using both the LIWC (Pennebaker et al., 2007) and the DAAP (Maskit, 2014a, 2014b) to closely examine the ways in which adults with GAD, with or without comorbid depression, talk about peak autobiographical episodes.

Table 1

Psycholinguistic Studies of Depression

Study	**Sample**	**Text**	**Depression Criteria**	**Pronoun Findings**	**Emotion Word Findings**	**Cognitive Word Findings**	**Verb Tense**
Jarrold et al. (2011)	14 Depressed Older Men 12 Nondepressed Older Men	15 minute structured interviews	Depressed group: above 25 on The Center for Epidemiologic Studies Depression Scale	1. Correlation between depression severity and self-focused words: r=0.42, p = 0.04 2. Group differences significant only for Q24-B, p=0.003, eta square=.36	Not assessed	Not assessed	Not assessed
Mehl (2006)	96 undergraduate students	Randomly selected recordings of students' speech in their natural environment.	Beck Depression Inventory -- Short Version	1st person singular words were correlated with severity of depression symptoms (r=0.2, p<0.05 for entire sample, r=0.8, p<0.001 for highly depressed individuals) No other pronoun findings reported	No significant findings for emotion words	Causation words were found to be correlated with depressive severity for highly depressed individuals only (r=0.53, p<0.05)	Not assessed
Ramirez-Esparza et al. (2008)	80 women who wrote on an internet Depression forum 80 women	Posts longer than 100 words judged as written by native	The internet forum topic and an indication that writers were writing about	Depression posts had more first person singular (d=2.75, p<0.001) depression posts had fewer	Depression posts had fewer positive emotion words (d=-0.5, p<0.001) depression posts had	Not assessed	Not assessed

	who wrote on an internet Breast Cancer forum	English speakers	their own concerns, not concerns for someone else	first person plural (d=-0.8, p<0.001)	more negative emotion words (d=1.68, p<0.001)		
Rodriguez et al. (2010)	57 undergraduate students	Two 12 minute writing assignments: (a) personal diary (b) online blog	Beck Depression Inventory	No significant findings	1. Positive emotion words: Personal diary: r=-.38 p<.001), Online Blog: r=-.26(p<.05) 2. Sadness words Personal Diary: r=.60(p<.001) Online Blog: NS 3. Swear words Personal Diary: NS Online Blog: r=.58(p<.001)	1. Cognitive mechanism words: Personal diary: r=.51(p<.001) Online Blog: NS 2. Causation words: Personal Diary: r=.26(p<.05) Online Blog: NS 3. Insight words: Personal Diary: r=.38(p<.001) Online Blog: NS 4. Inhibition words: Personal Diary: r=.51(p<.001) Online Blog: NS	1. Past tense: Personal diary: r=.31 (p<.05) Online blog: r=.45(p<.001) 2. Present tense: Personal Diary: NS online Blog: r=-.27(p<.05)
Rude et al. (2004)	31 currently depressed undergraduate students 26 formerly depressed undergraduate	Essays describing students' deepest thoughts and feelings	Beck Depression Inventory (for current depressive symptoms) Inventory to	Currently depressed individuals used more "I" than never depressed group (d=0.58, p<.02) No "me" or "my" differences between currently depressed and never depressed groups No differences between	Currently depressed individuals used more negative emotion words than never depressed group (d=1.17, p<0.001) Currently depressed	Not assessed	Not assessed

	students 67 never depressed undergraduate students	about being in college	Diagnose Depression-Lifetime (for past depressive symptoms)	formerly depressed and never depressed groups	individuals used marginally less positive emotion words than never depressed group (d=1.17, p=.08) no differences found between formerly depressed and never depressed groups		
Stirman & Pennebaker (2001)	9 suicidal poets 9 nonsuicidal poets, matched for nationality, era, education and sex	15 poems from each poet, from their early, mid and late careers	Committed suicide vs did not commit suicide	Suicidal poets used more first person singular words than non-suicidal poets (p=0.02, effect size not reported) no other significant pronoun differences found	No differences found	Not assessed	Not assessed
Vanhuele et al. (2009)	32 mental health outpatients	Semi-structured clinical interview	Beck Depression Inventory II	Not assessed	No significant correlations with BDI-II Affective subscale	No significant correlations with BDI-II cognitive symptoms subscale	Not assessed

Table 2

The WRAD Matrix

Item	***Weight***
I	-.75
and	1
the	1
to	.25
it	-.875
s	-1
she	1
that	-.875
a	.625
was	1
t	-.625
of	-.625
in	1
MM	-.625
he	.625
you	-.625
her	1
my	.625
but	NA
is	-1

Note. The items above represent the most commonly occurring words in the texts used to generate the WRAD, along with the weights that were assigned to them based on their occurrence in texts that were scored for RA by human raters. Scores range from -1 to 1 with higher scores denoting words that are more likely to coincide with high RA.

Chapter 3: Study 2

Episodic Processing in Adults with Generalized Anxiety Disorder and Comorbid Depressive Disorders

The capacity to mentally "travel through time" is considered uniquely human (e.g., Piolino et al., 2009; Tulving, 1985; Wheeler, Stuss, & Tulving, 1997). Over 100 years ago, William James (1890/2010) described the present cognized moment as a "saddle-back, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time" (volume I, p. 406). The recollection, or re-experiencing, of past experiences and the imagination, or pre-experiencing, of future episodes (Addis, Wong, & Schacter, 2007; Schacter, Addis, & Buckner, 2008) serve important functions for psychological health: they help maintain a coherent and continuous sense of self (e.g., Conway, 2005; Conway, Singer, & Tagini, 2004; Conway & Pleydell-Pearce, 2000; Prebble, Addis, & Tippett, 2012), they are tools for interpersonal connection (e.g., Alea & Bluck, 2003; Barclay, 1996), and they support problem-solving and decision-making (e.g., Bluck, 2003; Pillemer, 2003; Kahneman & Tversky, 1982). Several studies have also shown that people can recall positive autobiographical episodes (AEs) to reverse the effect of negative mood states (Joormann, Siemer, & Gotlib, 2007; Josephson, Singer, & Salovey, 1996).

When processing AEs, individuals integrate conceptual and episodic knowledge through the prism of their present affective state and active goals (Conway & Pleydell-Pearce, 2000; Conway et al., 2004; Singer & Conway, 2011). Ideally, retrieved AEs would accurately ***correspond*** to one's lived experiences or realistic future and provide a ***coherent*** sense of self (Conway et al., 2004), which binds views of self-in-past and self-in-future (Markus & Nurius, 1986). However, episodic processing can also go awry. When this occurs, individuals may

retrieve over-general episodes (e.g., Williams et al., 2007), ineffectively process their emotional experiences (e.g., Borkovec, Alcaine, & Behar, 2004) or generate faulty interpretations both about their selves (e.g., self-criticism; Aldao & Nolen-Hoeksema, 2012a; Blatt, 1995) and/or about their realistic ability to achieve desired goals (Bluck, 2003; Mennin & Fresco, 2013a).

Ineffective episodic processing can be seen as "transdiagnostic" as it occurs in a wide range of Axis I disorders (Markowitsch & Staniloiu, 2011; McKay et al., in press; Singer et al., 2013). However, some disorders appear to be associated with greater episodic processing impairments. For example, a wealth of studies has consistently showed that depressed individuals report non-specific, contextually impoverished episodes (for reviews, see: King et al., 2010; van Vreeswijk & de Wilde, 2004; Williams et al., 2007), that they have difficulties imagining positive personal events (Sharot, Riccardi, Raio, & Phelps, 2007), and that they ineffectively generate meaning from significant personal memories (Harkness, 2011; Fischer-Kern et al., 2013). In contrast, researchers have been mainly unable to identify anxiety-related impairments in episodic processing, including in individuals clinically diagnosed with generalized anxiety disorder (GAD; Burke & Mathews, 1992; Coles & Heimberg, 2002; McKay et al., in press; Williams et al., 2007), a disorder that remains poorly diagnosed and treated (Borkovec & Ruscio, 2001; Mennin & Fresco, 2013b; Wittchen, 2002). However, since GAD patients present with significant difficulties in two of the functions of episodic processing: interpersonal relationships (Borkovec, Newman, Pincus, & Lytle, 2002; Crits-Christoph, Gibbons, Schamberger, & Gallop, 2005; Erickson & Newman, 2007) and goal-driven behavior (e.g., Fresco, Mennin, Moore, Heimberg, & Hambrick, 2014; Mennin & Fresco, 2013b), it is possible that previous investigations overlooked certain impairments in episodic processing. The

main goal of this study was thus to exhaustively examine episodic processing in individuals with GAD in an effort to identify anxiety-related impairments.

Dimensions of Effective Episodic Processing: Specificity and Meaning-making

In line with Conway's (2005) emphasis on correspondence and coherence, most episodic processing studies examined two main capacities: (a) the capacity to generate specific, imagistic detailed episodes (e.g., Williams et al., 2007), and (b) the capacity to generate meaning from these episodes (Singer et al., 2013). However, these capacities have mainly been analyzed separately (Dimaggio, Salvatore, Popolo, & Lysaker, 2012).

Specificity. At the lowest level of the hierarchy of autobiographical knowledge, Conway and Pleydell-Pearce (2000) referred to event specific knowledge (ESK) which includes concrete, sensory-perceptual details of a personal episode. An influential early study found that suicidal patients provided categorical descriptions of events (e.g., "When I was at school"; Williams & Broadbent, 1986, p. 144) in response to both positive and negative cue words. Since then, overgeneral memory has been linked to impaired problem-solving (Raes et al., 2006) and delayed recuperation from depressive episodes (Dalgleish et al., 2007) and has been observed in a wide range of mood disordered populations (Williams et al., 2007).

The original operationalization of episodic specificity required only that an episode take place in a specific location and over a timespan of less than 24 hours (Williams & Broadbent, 1986). A more recent operationalization of specificity, which more closely relates to Conway and Pleydell-Pearce's (2000) definition of ESK, also requires that the episode include the encoding context (e.g., Wheeler et al., 1997) and specific details that distinguish it from other events (e.g., Lemogne et al., 2005; Piolino et al., 2003). In this study, I utilized a closely related linguistic construct to assess specificity—referential activity (RA; Bucci, 1997; Bucci &

Freedman, 1978). Language high in RA is specific, clear, concrete, and imagistic (Bucci, 1992). Specificity refers to level of details provided in the narrative; clarity refers to the speaker's intent in conveying information to the listener; concreteness refers to sensory or perceptual qualities of the verbalization; and imagery refers to the level of imagery or evocativeness.

Meaning-making. In addition to the ability to generate specific AEs, effective episodic processing requires a capacity to connect these episodes to long-term mental representations of one's self (i.e., meaning-making; Prebble, Addis, & Tippett, 2013; Singer et al., 2013). The generation of meaning from one's AEs helps unify disparate experiences over time (Prebble et al., 2013), enhances self-awareness (e.g., Morin, 2006), increases one's understanding of his or her mental states (e.g., Jurist, 2005, 2010), and increases the ability to infer and respond to mental states of others (Jurist, 2005, 2010; Mennin & Fresco, 2013a). Deficits in the capacity for autobiographical meaning-making have been associated with a wide range of psychological disorders (for a review see Katznelson, 2014), including borderline personality disorder (e.g., Levy, Clarkin, Yeomans, Scott, Wasserman, & Kernberg, 2006) and clinical depression (e.g., Fischer-Kern et al., 2013).

Empirical studies assessing autobiographical meaning-making varied in their operationalization of this process (e.g., Habermas & Bluck, 2000; McLean, Pasupathi, & Pals, 2007). In this study, I utilized a heavily theorized and widely studied operationalization of meaning-making—reflective function (RF; Fonagy, Gergely, Jurist, & Target, 2003; Katznelson, 2014) as a measure of autobiographical meaning-making. RF refers to the capacity to understand and interpret—implicitly and explicitly—one's mental states (Katznelson, 2014). Originally, RF was coded (for coding rules see Fonagy, Target, Steele, & Steele, 1998) in transcripts of the Adult Attachment Interview (AAI; Main & Goldwyn, 1990). The AAI is a semi-structured

interview whereby adults are asked to reflect on significant early autobiographical experiences with their primary caregivers (Van IJzendoorn, 1995). More recently, RF has also been assessed via self-report measures (e.g., Shaver, Belsky, & Brennan, 2000) and via automated text analysis (Fertuck, Mergenthaler, Target, Levy, & Clarkin, 2012).

Mechanisms Underlying Impairments in Episodic Processing

Williams and colleagues (2007), in explaining the mechanisms underlying overgeneral memory, underscore three mechanisms: functional avoidance, capture and rumination and impaired executive control. Functional avoidance refers to the tendency to generate non-specific episodes in an effort to avoid the emotional pain associated with more specific episodes, and is negatively reinforced by the reduction in distress following the retrieval of an abstract statement such as "I've always been poor at maintaining relationships" (Williams et al., 1999, p. 301). Capture refers to the tendency for the retrieval process to become truncated due to rigid negative self-representations (e.g., Beck, 1979; Blatt, 1995). Capture errors are more likely to occur in individuals prone to rumination (Watkins & Teasdale, 2001) who stop their search for specific episodes and instead focus their attention on the reasons for their negative experience (e.g., Why can't I be happy?). Finally, executive control refers to the inability to inhibit irrelevant conceptual knowledge (e.g., faulty attention regulation; Mennin & Fresco, 2013a, 2013b).

A critical mechanism underlying difficulties in meaning-making is a lack of psychological distance from one's inner experience (Kross & Ayduk, 2008; Kross, Ayduk, & Mischel, 2005; Mennin & Fresco, 2013b). Cocking and Renninger (1993) consider psychological distance a prime vehicle for bridging the gap between one's external world and one's mental world. Empirical research has shown that adequate distance from one's internal experience can promote effective meaning-making (Kross et al., 2012), enhance problem-solving, and reduce

negative emotional reactivity (Ayduk & Kross, 2010). In an experimental setting, psychological distance (also termed self-distanced reflection; Kross, Card, Deldin, Clifton, & Ayduk, 2012) is elicited by asking a person to conjure up an event so that they see themselves in it from a distance (Kross et al., 2012). In contrast, a self-immersed perspective is elicited by asking individuals to experience an event as if they were reliving it. Notably, psychological distance is not indicative of cognitive or affective avoidance (Kross et al., 2012) and has been found to be negatively correlated with rumination (Ayduk & Kross, 2010).

GAD and Comorbid Depressive Disorders

One of the main challenges in detecting impairments in episodic processing in individuals with GAD has been the high comorbidity rates of GAD with depressive disorders such as MDD and dysthymic disorder (Aldao et al., 2010a; Kessler, Berglund, Demler, Jin, Merikangas, & & Walters, 2005; Kessler, Chiu, Demler, & Walters, 2005). No study that I am aware of examined this process in individuals with GAD with and without comorbid depression. In turn, hypotheses about the ways depression and anxiety differentially impact episodic processing must be generated from the broader literature.

Mennin and Fresco (2013b), in their overview of a treatment for GAD and MDD, emotion regulation therapy (ERT; Mennin & Fresco, 2009), highlight several distinct and overlapping features of GAD and MDD. First, though individuals with both disorders engage in negative self-referential processing (NSRP; see also Northoff, 2007), individuals with GAD are more likely to utilize worry (Mennin & Fresco, 2013a), while individuals with MDD are more likely to utilize rumination (e.g., Nolen-Hoeksema et al., 2008) and self-criticism (e.g., Aldao & Nolen-Hoeksema, 2012a; Blatt, 1995). Thus, it is likely that when asked to assign meaning to AEs, individuals with MDD will be more likely to engage in rumination than individuals with

GAD-only. Second, since rigid negative self-representations are associated with MDD (e.g., Beck, 1979; Blatt, 1995), but not necessarily with GAD (Mennin & Fresco, 2013a), individuals with MDD may show difficulties processing positive AEs (Williams et al., 2007), while individuals with GAD may not. A third factor which has been shown to be more strongly related to MDD than to GAD is poor understanding of emotions (Mennin et al., 2007). Overlapping features of GAD and MDD include deficits in attention regulation and heightened subjective intensity when processing emotions (Mennin & Fresco, 2013b).

In contrast to the growing literature examining comorbidity of GAD and MDD (e.g., Mennin & Fresco, 2013b), few studies have examined the GAD-dysthymic disorder comorbidity, and some authors have questioned whether these disorders can even be differentiated (Rhebergen et al., 2013). Also, since direct comparisons between MDD and dysthymic disorder are rare (Klein, 2010), relatively little is known about the differences in cognitive processes between these disorders. However, since dysthymic disorder may have a more adverse impact on quality of life than non-chronic MDD, and is less amenable to psychological treatment (Cuijpers, van Straten, Schuurmans, van Oppen, Hollon, & Andersson, 2010), it is important to understand if and how its comorbidity with GAD is different than the MDD comorbidity. Due to the limited amount of previous research, I approached the MDD-dysthymic disorder distinction in an exploratory fashion.

Methodological Limitations in the Literature

One methodological limitation of previous studies examining autobiographical specificity is their over-reliance on the cue-word paradigm of the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986). In this procedure, subjects are presented with positive and negative cue words (e.g., joy, hurt) and are asked to provide the first memory or—in some

cases—future episode that comes to mind. However, this procedure does not control for the salience of the elicited memory/episode for the individual (Lemogne et al., 2005), since some cue words may be irrelevant to the individual's personal concerns (Rottenberg, Joorman, Brozovich, & Gotlib, 2005). In turn, it is possible that these studies did not tap into the motivational dysfunctions (Mennin & Fresco, 2013a, 2013b) present in individuals with GAD, who are geared towards warding off painful inner experience (Klenk et al., 2011), since they were able to discuss more benign episodes.

An additional limitation of the AMT (Williams & Broadbent, 1986) is that cue words did not control for the content of the reported episode (Griffith, Summer, Raes, Barnhofer, Debeer, & Hermans, 2012). For example, Williams and colleagues (2007) note that an individual may be asked to generate an episode to the seemingly positive cue word 'summer' and in turn recall a traumatic event that occurred over the summer. In turn, these studies have been inconclusive in determining whether deficits in specificity were more pronounced in response to positive or negative cues (King et al., 2010).

Finally, studies examining meaning-making utilizing RF scoring also had several limitations (Fertuck et al., 2012): they required time-intensive training of judges, a labor-intensive process of RF scoring, and they were mainly used to score AAI transcripts (Main & Goldwyn, 1990).

Overview of Current Study

The current study examined episodic processing in individuals with GAD, with or without comorbid MDD and dysthymic disorder. Subjects were administered a modified Emotion Interviews (Rottenberg et al., 2005a) whereby they were instructed to describe the happiest and saddest events in their lives and the most anxiety-provoking situation they can

imagine in the future. Transcribed interviews were linguistically analyzed via automated text analysis in order to assess the capacity to generate specific episodes (via RA; Bucci, 1997) and the capacity to generate meaning (via RF; Katznelson, 2014). In addition, in an effort to identify mechanisms underlying impairments in episodic processing, two additional measures were added: (a) the extent of cognitive efforts at meaning making; and (b) psychological distance—"the subjective experience that something is close or far from the self, here, and now" (Trope & Liberman, 2010, p. 441)—from the reported episodes. This measure was added since insufficient psychological distance may be indicative of ineffective meaning-making (e.g., Kross et al., 2010).

Based on the overgeneral memory literature (e.g., Williams et al., 2007), I predicted that adults with GAD with comorbid depression would show deficits in specificity, particularly in response to the happy prompt, but that adults with GAD-only would not. Based on the Emotion Dysregulation Model (Mennin et al., 2007) and on the RF literature (Katznelson, 2014), I predicted that adults with GAD with comorbid depression would show impaired meaning-making when processing peak AEs (Mennin et al., 2007), but that adults with GAD-only would not. I did not make any a priori predictions regarding an interaction between depression status and prompt. Third, since depressed patients have been shown to ruminate about the sources of their problems (Aldao et al., 2010b; Nolen-Hoeksema et al., 2008), I predicted that—compared to healthy controls—adults with GAD and comorbid depression would evidence increased cognitive efforts at meaning-making (Northoff, 2007), but adults with GAD-only would not. Finally, I predicted that adults with GAD, regardless of depression status, would evidence reduced psychological distance from their inner experience (Mennin & Fresco, 2013a, 2013b).

As noted, I approached the distinction between MDD and dysthymic disorder in an exploratory way and did not make any a-priori predictions regarding differences between these conditions.

Method

Participants

Eighty nine subjects were recruited from an urban community in the Northeast of the United States. In order to qualify for the study they had to be between the ages of 21 and 65, fluent in English, not be college students, and have no history of heart conditions or diabetes. Exclusion criteria also included substance related problems, not including nicotine, and the use of medication impacting cardiac functioning due to the physiological component of other aspects of this study. The mean age of the participants (64% female) was 30.76 (SD=8.911, range=21-61). A total of 65.2% identified as Caucasian, 11.2% as Asian American, 10.1% African American, 3.4% as Hispanic, 1.1% as Native American, and the rest did not specify their ethnicity. In terms of diagnosis, 28 participants (31.5%) did not meet DSM criteria for a mood or anxiety disorder and constituted the healthy comparison group; 32 participants (36%) met criteria for GAD-only, 18 participants (20.2%) met criteria for GAD+MDD, and 11 participants (12.3%) met criteria for GAD+dys.

Clinical assessment. Advanced clinical psychology graduate students and post-baccalaureate research assistants administered the Structured Clinical Interview Diagnosis (SCID; First et al., 2002) to participants who met the above criteria. Interviewers were trained rigorously over a 6-month period in diagnostic interviewing with the SCID. As part of their training, interviewers had to achieve reliability (with expert diagnosticians) in their diagnoses of patients in a departmental clinic or with individuals from the community. Reliability was determined via the clinician severity rating (CSR) from the Anxiety Disorders Interview

Schedule for DSM-IV (ADIS-IV; DiNardo, Brown, & Barlow, 1994). The CSR is a 0-8 rating of the severity of symptoms and impairment associated with each diagnosis; scores of 4 or greater represent clinically significant symptom severity. For diagnoses to be considered present there must have been complete agreement in diagnosis and CSR (within one rating point) between the interviewer and an expert diagnostician (Ph.D.), who provided ratings following a dispositional case presentation. Initial agreement was high, with correlations between CSRs by interviewers and expert diagnostician ranging from .83 to .97. Discrepancies of more than 1 CSR point would be discussed in order to reach an agreement. In addition, 25% of interviews were coded for each diagnosis by a senior member of the lab, who watched a video recording of the interview (for GAD and depressive disorders, k's from .89 to 1; for other disorders, k's from .70 to .85).

Procedure

Self-report measures. ***The Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996***) is a 21-item measure of depressive symptoms. It covers various aspects of the depressive condition: cognitive, affective, behavioral, somatic, and motivation. Each symptom is rated on a 4 point scale ranging from 0-3. The ratings are summed, yielding a score from 0-63. Internal consistency for this study was excellent ($\alpha = .908$).

The Generalized Anxiety Disorder Questionnaire-IV **(GADQ-IV; Newman et al., 2002)** is a 9-item self-report measure that assesses symptoms of GAD as delineated in DSM-IV-TR (APA, 2000). Five items are dichotomous and measure the excessiveness and uncontrollability of worry, one item is open-ended and asks for a list of the most frequent worry topics, two items on a 9-point scale measure the clinical distress and functional impairment associated with excessive worry and anxiety, and a final item asks about the presence of the each of the six physical symptoms outlined in the DSM-IV-TR criteria for GAD. Total scores range

from 0 to 13 (e.g., Newman et al., 2002). The GADQ-IV has shown good concurrent validity, test-retest reliability, and the ability to differentiate individuals with clinical and non-clinical levels of GAD (e.g., Newman et al., 2002).

Modified emotions interview. Research assistants administered a modified version of the Emotions Interview (Rottenberg et al., 2005b), a brief (approximately 10 minutes) semi-structured interview designed to elicit details concerning the maximally happy and sad moments experienced by each participant in his or her lifetime. In this study, each participant was additionally asked to describe the most anxiety provoking future situation that he or she could imagine. Interviews were videotaped and subjects were debriefed following the completion of the study. The protocol was approved by the Institutional Review Board of both Yale University and the City University of New York.

Transcription. Each interview was carefully transcribed from video files and prepared for automated text analysis. Initially, video files were converted into .wav audio files. These files were then transcribed by undergraduate and post- baccalaureate research assistants using the CLAN (freeware) software (MacWhinney, 1991). Each vocal utterance was highlighted, and a time marker was inserted. Transcriptions denoted changes in turn of speech (interviewer vs. interviewee), as well as segmentations for different interview condition (i.e., anxious, happy or sad). Two additional research assistants reviewed each transcription to assure accuracy of transcription.

Linguistic analysis. We utilized two computer programs to generate linguistic variables: (1) *The Linguistic Inquiry and Word Count* (LIWC; Pennebaker et al., 2007) is a text analysis computer program which calculates the percentage of words in a certain category (e.g., articles, verbs, etc.) in a given text or texts. (2) *The Discourse Attributes Analysis Program* (DAAP;

Maskit, 2014a, 2014b) is a text analysis computer program which calculates scores for different word categories, either as a percentage of total words (similar to the LIWC) or as frequency of appearance over time. When measuring frequency over time, linguistic variables (e.g., positive/negative words) are assessed to the extent which they appear per millisecond (Maskit, 2014a). In this study, linguistic variables were calculated over time in an effort to increase ecological validity. By doing so, the automatic processing of language more closely resembles the way humans implicitly process spoken language, for example by taking into account speech rate and pauses.

Linguistic measures. (1) Specificity. I used the Weighted Referential Activity Dictionary (WRAD; Bucci & Maskit, 2006) as a measure of specificity. The WRAD is an empirically generated word list that coincides with lanuage that was rated as high in RA (Bucci, 1997; Bucci & Kabasakalian-McKay, 1992). Each word in the WRAD has a weighted score. For example, the word "that" which is non-specific is scored low (-.875) while the article "the" which likely precedes a specific noun (e.g., "the tree") has the maximal score of 1.**(2)*Meaning-making.*** I used the *Computerized Reflective Functioning Dictionary* (CRF; Fertuck et al., 2012) as a measure of meaning-making. The CRF is a dictionary of words that are associated with language that is high in Reflective Functioning (RF; Fonagy et al., 2003; Katznelson, 2014). **(3)** I used the **LIWC cognitive processes** dictionary (Tausczik & Pennebaker, 2009) as a measure of increased cognitive efforts at meaning-making. This dictionary includes words that were rated by human judges as related to cognitive processes and include words such as 'because', 'should', and 'maybe.' **(4) *Psychological Distance.*** I used a composite score derived via a large factor analytic study (Pennebaker & King, 1999) which denotes psychologically distant language. It consists of articles, words with more than 6 letters, few first person singular, few present tense

verbs, and few discrepancy words. I used the following formula to calculate this score (Pennebaker, personal communication): PD = 0.765 * Z_article + 0.683 * Z_Sixltr - 0.823 * Z_i - 0.593 * Z_present - 0.4855 * Z_discrep. **(5)** ***Affective Tone.*** I used a weighted valence dictionary (Murphy, 2014) based on ratings from the Affective Norms for English Words (ANEW; Bradley & Lang, 1999) as a manipulation check to determine whether participants used more negatively-valenced language to discuss anxious and sad episodes than happy episodes. The initial ANEW ratings included scores from 1-9 on three dimensions: arousal, pleasure and dominance. For example, the word "relaxed" was assigned a high valence score (6.40) and a low arousal score while "frustrated" was assigned a low valence score (2.70) and a relatively high arousal score (5.55). In this study, I converted the valence and arousal scores to scores between 0-1 to allow for usage in the DAAP software.

Analytic Plan

The experimental design consisted of a mixed-effects MANOVA with one within-subject factor (Prompt: Anxious, Happy, Sad) and one between-subject factor (Diagnostic Group: Healthy Control, GAD, GAD+MDD, GAD+dys), with dummy codes for each of the psychopathology groups, in order to directly compare each psychopathology group with healthy controls. I then examined the main effects and interactions of prompt and diagnostic group by running similar mixed-effects ANOVAs for each of the dependent variables of interest: specificity (RA), meaning-making (RF), cognitive efforts at meaning-making and psychological distance.

Results

Demographic and Clinical Characteristics

Mean and standard deviations of demographic and clinical characteristics are presented in Table 1. There were no differences between the four diagnostic groups in gender, age and ethnicity (all *p's*>0.13). I compared the groups in terms of self-reported depression and anxiety and—consistent with expectations—found significant differences for both measures. As expected, both depression groups had significantly higher BDI-II scores than the GAD-only group (*p*'s<.05) and the control group (*p*'s<.0001). Similarly, all of the GAD groups had higher GAD-Q scores than the control group (all *p*'s<.0001).

Manipulation Check.

I examined the affective valence of the reported autobiographical episodes and found a significant main effect for prompt, Greenhouse-Geisser adjusted $F(1.872, 164.717) = 59.061$, $p<.001$, $\eta^2 = .402$. As expected, participants used more positively-valenced words when discussing happy episodes (M=.514, SD=.007) than when discussing sad episodes (M=.503, SD=.007) or anxious episodes (M=.503, SD=.007). Between-prompt differences remained significant after Bonferroni corrections, *p's*<.001. **Intercorrelations and multivariate analysis.**

Correlations between the WRAD, CRF, LIWC cognitive processes, and psychological distance, and self-report measures of depression (BDI-II) and anxiety (GAD-Q) are presented in Table 2. Examination of the bivariate correlations indicates a significant negative correlation between psychological distance and LIWC cognitive processes, as well as the BDI-II and the GAD-Q. Further, WRAD scores were positively correlated with CRF scores. Finally, LIWC cognitive processes scores were positively correlated with BDI-II scores.

The 4 (diagnostic group: GAD-only, GAD+MDD, GAD+dys, Controls) by 3 (prompt: anxious, happy, sad) mixed-effect MANOVA using WRAD, CRF, LIWC cognitive processes and psychological distance as dependent variables revealed a significant interaction between

GAD+MDD and prompt, $F(8, 74) = 2.373$, *Pillai's trace* = .196, $p = .024$, a significant main effect for GAD+MDD, $F(4, 82) = 2.711$, *Pillai's trace* = .117, $p = .036$, and a main effect for prompt, $F(8,78) = 43.592$, *Pillai's trace* = .817, $p < .001$. None of the other main effects or interactions reached significance (p's>.18).

Specificity.

In line with hypotheses, participants in the GAD-only group did not differ in their WRAD scores from healthy controls, $p = .79$ (see Figure 1). The predictions for the comorbid depressive groups were only partly confirmed: participants in the GAD+dys group had lower WRAD scores than healthy controls, $F(1,85)=4.441$, $p=.038$, $\eta^2 = .05$ but participants in the GAD+MDD group did not, $p=.974$. I also found an unexpected effect of prompt, $F(2,170)=14.024$, $p<.001$, $\eta^2 = .142$, whereby the descriptions for the anxious prompt had lower WRAD scores than those for the happy prompt, and the descriptions for the happy prompt had lower WRAD scores than those for the sad prompt (all p's<.05 after Bonferroni corrections). Finally, the predicted interaction effect for the comorbid depressive conditions was also mainly confirmed: the interaction between prompt and GAD+MDD diagnosis was significant, $F(2,170)=5.678$, $p=.004$, $\eta^2 = .063$,and the interaction between prompt and GAD+dys diagnosis showed a trend towards significance, $F(2,170)=2.527$, $p=.083$, $\eta^2 = .029$. Follow up post hoc tests using Bonferroni corrections revealed that participants in the GAD+MDD group had lower WRAD scores than healthy controls in the happy prompt ($p=.024$), but not in the anxious ($p=.866$) or sad ($p=.104$) prompts, and that participants in the GAD+dys group also had lower WRAD scores than healthy controls in the happy prompt ($p = .001$), but not in the anxious ($p = .271$) or the sad ($p = .633$) prompts.

Meaning making.

In contrast to predictions, there was no significant main effect of diagnostic group for the CRF (Fertuck et al., 2012), my measure of effective meaning-making (all *p*'s>.1; see Figure 1). Once again, I did find an unpredicted effect of prompt $F(2,170)=10.652$, $p<.001$, $\eta^2 = .111$,consisting of higher CRF scores in response to the sad prompt than in response to either the anxiety or happy prompts (*p*'s<.01). I also found an unpredicted interaction effect between prompt and the GAD+MDD diagnosis, $F(2,170)=3.461$, $p=.034$, $\eta^2 = .039$. None of the other interactions were significant (*p*'s>.12). Follow up post hoc tests using Bonferroni corrections revealed that participants in the GAD+MDD group had lower CRF scores than healthy controls in response to the happy prompt ($p=.012$), but not in response to the anxious ($p=.241$) or sad ($p=.437$) prompts.

Cognitive efforts at meaning-making.

My predictions for the measure of efforts at meaning-making, the LIWC cognitive processes dictionary (Tausczik & Pennebaker, 2009), were partially confirmed (see Figure 2): Participants in the GAD+MDD group used more cognitive process words than healthy controls across the entire interview, $F(1,85)=7.921$, $p=.006$, $\eta^2 = .085$, but those in the GAD-only group ($p=.152$) and in the GAD+dys group ($p=.207$) did not. I also found a main effect for prompt, $F(2,170)=84.533$, $p<.01$,$\eta^2 = .499$, with greater use of cognitive process words in the anxiety prompt than in the happy or sad prompts. Finally, I also found an interaction effect between prompt and the GAD+MDD diagnosis, $F(2,170)=4.814$, $p=.009$, $\eta^2 = .054$. None of the other main effects or interactions were significant (*p*'s>.15). Follow up post hoc tests using Bonferroni corrections revealed that participants in the GAD+MDD group used more cognitive process words than healthy controls in the anxiety ($p=.001$) and happy prompts ($p=.002$) but not in the sad ($p=.917$) prompt.

Psychological distance.

As predicted, participants in the GAD-only group used language with less psychological distance than healthy controls, $F(1,85)=.038$, $p=.038$, $\eta^2 = .050$. See Figure 2. Similarly, participants in the GAD+MDD group used language with less psychological distance than healthy controls, $F(1,85)=5.313$, $p=.024$, $\eta^2 = .059$. Participants in the GAD+dys group did not differ from healthy controls ($p=.206$). The main effect for prompt on psychological distance and the interactions between diagnostic groups and prompt on psychological distance were not statistically significant (p's>.2).

Discussion

The present study examined the ways in which episodic processing is impaired in adults with GAD, with or without comorbid depressive disorders. I aimed to clarify whether there exist anxiety-related impairments in episodic processing that have yet to be identified in the literature. Results suggest that adults with GAD-only are not impaired in their ability to generate specific contextual AEs or to ascribe meaning to them, but that they talk about these episodes in a highly involved way with insufficient psychological distance (Sigel, 1970). The results also shed some light on the ways in which adults with GAD and chronic, mild depression (i.e., dysthymic disorder) differ in their ways of processing AEs from adults with GAD with severe non-chronic depression (i.e., major depressive disorder).

Consistent with expectations, certain impairments in episodic processing were found to be related to depression but not to anxiety. First, I found reduced specificity in both of the depressive groups compared to healthy controls but did not find reduced specificity in the GAD-only group. I also found an unexpected difference between the two depressive groups. Whereas participants in the GAD+dys group showed reduced specificity across the entire interview, those in the GAD+MDD group showed reduced specificity only in response to the happy prompt.

Since previous studies focused on either MDD or nonclinical dysphoria (Williams et al., 2007), I can only tentatively speculate that adults with GAD and chronic low-level depression (i.e., GAD+dys) might have—over time—developed a context-insensitive (Rottenberg et al, 2005a) functional avoidance of specific emotional episodes (Williams et al., 1999), regardless of their valence. In this respect, it would be particularly important for future studies to examine specificity deficits in different depressive disorders and in response to a wide range of personally-meaningful prompts.

The MDD finding is mainly consistent with previous research showing greater impairments in specificity in depressed adults' descriptions of positive episodes (Williams et al., 2007). However, in contrast to previous work, I did not find evidence of specificity impairments in response to negative prompts. Hence, this finding lends support to the capture hypothesis (Williams et al., 2007), which explains deficits in specificity as resulting from a "hijacking" of the retrieval process by negative abstract representations of self (e.g., Beck, 1979; Blatt, 1995). Alternatively, it is possible that these results speak to the unique nature of episodic processing in adults with comorbid GAD and MDD whereby these individuals are unable to prevent (Klenk et al., 2011) the flooding of negative internal imagery.

Similarly consistent with expectations and with previous work (e.g., Mennin et al., 2007), meaning-making was impaired in adults with GAD+MDD, but not in adults with GAD-only. Additionally, impairments in meaning-making were evident only in the happy condition, lending support to the notion that it is the inconsistency with currently-held views of self (Conway et al., 2004) which interferes with effective meaning-making. The finding that meaning-making was greater in response to the sad condition regardless of psychiatric diagnosis is consistent with previous conceptualizations of autobiographical reasoning as mainly occurring in response to

negative experiences (McLean et al., 2007), due to their potential for life lessons and insights about one's self.

In terms of mechanisms underlying episodic dysfunction, I found—as expected—that adults with GAD+MDD utilized greater cognitive efforts at meaning-making (Northoff, 2007) than healthy controls when asked to discuss peak AEs but that adults with GAD-only did not. However, while it has long been suggested that depressed individuals ruminate about the causes of their negative feelings (e.g., Aldao et al., 2010b; Nolen-Hoeksema et al., 2008; Watkins, Moberly, & Moulds, 2011), this study's results suggest that adults with GAD+MDD utilize greater cognitive efforts when discussing happy events than when discussing sad events. One explanation for this finding is that the threat to self-coherence (Conway et al., 2004), and not the negative content, leads to emotional distress which in turn leads to the need to dampen the emotional experience (Mennin & Fresco, 2013b). Alternatively, it is possible that for depressed individuals, processing happy AEs leads to self-criticism (Aldao & Nolen-Hoeksema, 2012; Blatt, 1995). Future research is needed in order to better understand the mechanisms underlying this finding.

The main anxiety-related finding is that adults with GAD talk about peak AEs with less psychological distance than healthy controls. This finding is consistent with Roemer and Orsillo's (2002) conceptualization of individuals with GAD as having little separation from their internal experiences, which some authors suggest may be a result of childhood experiences of enmeshed relationships with caregivers (Cassidy, Lichtenstein-Phelps, Sibrava, Thomas, & Borkovec, 2009). However, since it is widely accepted that adults with GAD reactively use strategies such as worry (Aldao et al., 2010b) to distract themselves from distressing emotional topics (i.e., Borkovec's avoidance theory of worry; Borkovec et al., 2004), I am left with the

question whether in this study efforts at avoidance were unsuccessful, and if so—why. One possible answer is that the explicit instruction to recall and discuss peak AEs led to a failure of avoidance. Alternatively, it is possible that the structured nature of the interview reduced uncertainty, thereby precluding the need to resort to worry and avoidance.

Unlike participants in the GAD-only and the GAD+MDD groups, those in the GAD+dys group did not differ from healthy controls in their psychological distance. This raises the possibility that this group processes AEs in a unique manner. Adding to this notion is the finding that dysthymic adults spoke about AEs in a less specific manner across the entire interview, and that they did not utilize greater cognitive efforts to generate meaning like adults with GAD+MDD. One possible explanation for this finding is that individuals with GAD and chronic depression, perhaps due to repeated failures to process AEs effectively (i.e., failure of promotion goals; Klenk et al., 2011), become disengaged and less likely to try and process AEs (i.e. hypoactivation of promotion system; Mennin & Fresco, 2013b). Although these findings need to be cautiously interpreted within the context of a relatively small sample of GAD+dys patients (n=11), if this pattern of episodic processing is confirmed in future studies, it may help guide therapeutic interventions. For example, whereas it may be beneficial to help adults with GAD-only or GAD with MDD to talk about AEs with more psychological distance, adults with GAD and dysthymic disorder may benefit from learning how to discuss peak AEs in a more vivid way.

Since this is the first study to explicitly examine psychological distance in the context of episodic processing, I can only tentatively speculate as to the possible connections between reduced psychological distance and its impact on the functions of episodic processing (Bluck, 2003): maintenance of a coherent conceptual self (e.g., Prebble et al., 2013), facilitation of social interactions (e.g., Alea & Bluck, 2007; Bluck & Alea, 2009), and guidance of behavior (e.g.,

Pillemer, 2003). First, since psychological distance is required in order to view one's self as an object of inquiry that can be organized and made sense of (Sigel, 1968), in its reduced form, adults with GAD are less likely to utilize their AEs to support their accurate and flexible views of self. Also, if these individuals do not have a sense of agency over their inner experience, they may attribute their thoughts to an external source (Prebble et al., 2013), a common feature in GAD (i.e., uncontrollable worry). Second it is interesting to consider how talking about personally meaningful episodes using an involved linguistic style (i.e., the opposite of psychologically distant) impacts the listener and the ability to generate intimate connections (e.g., Alea & Bluck, 2007; Bluck & Alea, 2009). If indeed this style of narrating negatively impacts the social function of AEs, this may shed some light on the interpersonal difficulties reported in GAD (Borkovec et al., 2002). Finally, inadequate psychological distance from one's experience may hinder the ability to observe, evaluate and reflect on AEs (Prebble et al., 2013) in order to accurately predict future events. Accordingly, the anticipation and fear of future catastrophic events is characteristic of individuals with GAD (Borkovec & Roemer, 1995).

Several limitations of this study should be noted. First, since the sample did not include a group of participants with only depressive disorders, I cannot be certain that reduced psychological distance is not also present in adults with MDD only. Second, since most episodic processing studies relied on human judges and not on computerized text analysis, the discriminant and construct validity of the linguistic measures ought to be verified in future empirical studies. And third, the design included two past-oriented prompts (i.e., happiest and saddest events) and one future-oriented prompt (i.e., anxiety-provoking event). Thus, I was unable to distinguish whether prompt-related findings were due to the prompt's emotional content or its temporal orientation.

Notwithstanding the above limitations, this study is the first to exhaustively study episodic processing in adults clinically diagnosed with GAD and to identify an anxiety-related deficit: reduced psychological distance when discussing peak AEs. Future studies can further clarify whether adults with GAD can speak with greater psychological distance if explicitly instructed to do so. Also, while this study examined the ways in which adults with GAD process AEs in an experimental setting, future investigations can clarify whether in naturalistic settings these individuals process fewer AEs than healthy controls, as indicated by the avoidance theory of worry (Borkovec et al., 2004). Hopefully, this line of research can shed light on this important psychological process and help guide therapeutic interventions for GAD, allowing individuals with GAD to become more effective, less anxious, "time travelers".

Table 3

Demographic and Clinical Characteristics

	Control *(n=28)*	GAD *(n=32)*	GAD+MDD *(n=17)*	GAD+dys *(n=11)*
Demographics				
% Female	60.7	68.8	66.7	54.5
Age (years)	30.21 (9.05)	30.94 (9.93)	31.53 (6.84)	30.45 (9.34)
Racial Distribution				
% White	75	65.6	55.6	54.5
% Black	10.7	9.4	5.6	18.2
% Asian	7.1	9.4	27.8	0
% Hispanic	0	0	5.6	18.2
% Native American	0	3.1	0	0
% Other	3.6	12.5	0	9.1
% Missing	3.6	0	5.6	0
BDI-II Score	9.18 (7.52)[a]	14.43 (8.1)[a]	21.77 (11.01)[b]	23.73 (5.85)[b]
GAD-Q Score	5.02 (3.08)[a]	8.48 (2.23)[b]	9.67 (1.77)[b]	9.52 (1.82)[b]

Note. Different subscripts within rows indicate significant post hoc group differences at $p<.05$. BDI-II = Beck Depression Inventory-II (Beck et al., 1996); GAD-Q=Generalized Anxiety Disorder Questionnaire for DSM-IV-TR (Newman et al., 2002).

Table 4

Intercorrelations among linguistic measures and self-report measures of anxiety and depression

	1	2a	2b	3	4	5
1. Specificity (WRAD)	--	.346**	0.022	-0.095	-0.139	-0.131
2a. Meaning-making (CRF)		--	0.008	0.080	-0.093	-0.136
2b. Attempts at meaning-making (LIWC Cognitive Processes)			--	-.745**	.260*	0.201
3. Psychological Distance				--	-.241*	-.299**
4. BDI-II					--	.739**
5. GAD-Q						--

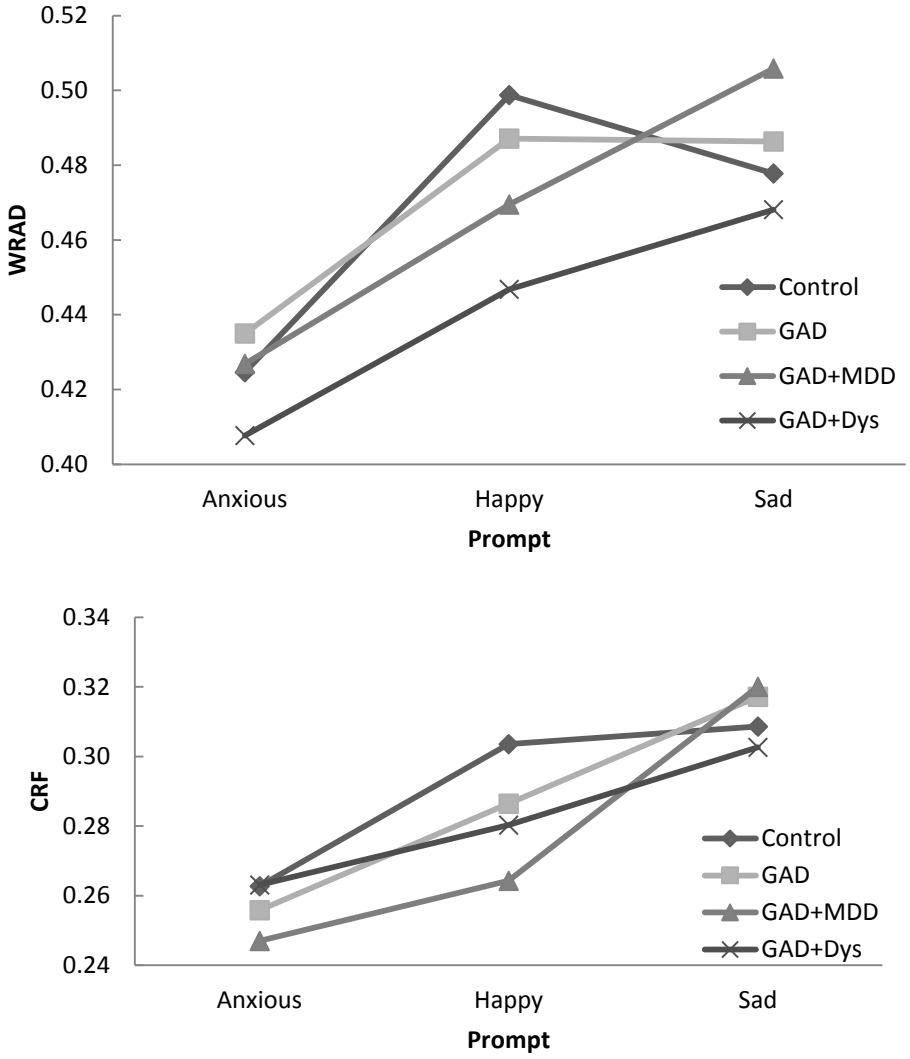
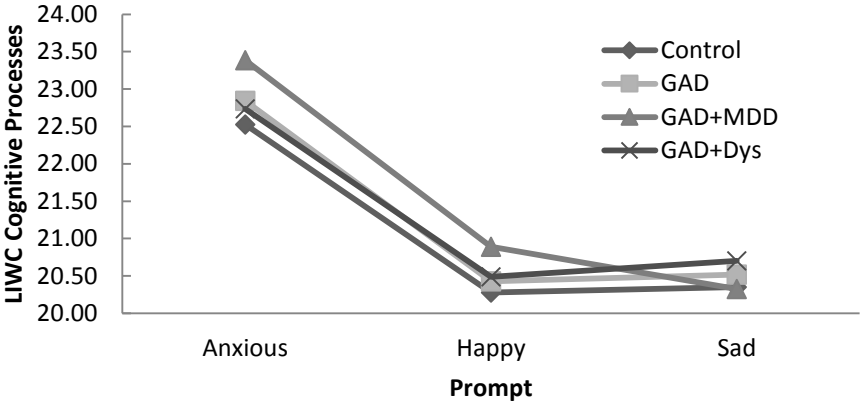


Figure 1. Specificity scores, as measured by the WRAD (Bucci & Maskit, 2006) (above) and meaning-making, as measured by the CRF (Fertuck et al., 2012) (below)



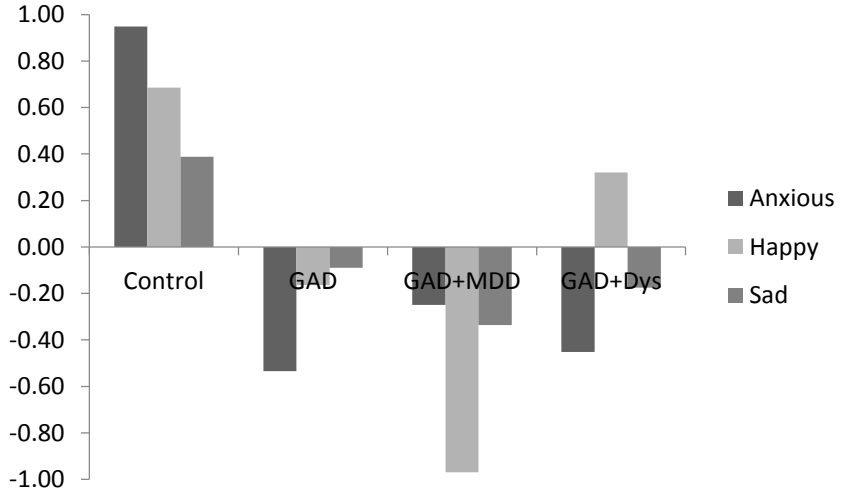


Figure 2. Cognitive efforts at meaning-making, as measured by the LIWC cognitive processes dictionary (Tausczik & Pennebaker, 2009) (above) and Psychological Distance (Pennebaker & King, 1999) (below). Psychological Distance scores are standardized and range from -1 to 1. Higher scores denote greater psychological distance.

Chapter 4: General Discussion

The notion that the words one speaks provide a window into the way he or she thinks and organizes their world has a long history across a range of disciplines within the larger field of psychology (Wilson & Weinstein, 1992). In 'Thought and Language', Vygotsky (1962/2012) poetically described the relationship between word use and underlying thoughts:

> Thought is not expressed but completed in the word. We can, therefore, speak of the establishment (i.e., the unity of being and nonbeing) of thought in the word. Any thought strives to unify, to establish a relationship between one thing and another. Any thought has movement. It unfolds. It fulfills some function or resolves some task. This flow of thought is realized as an internal movement through several planes, as a transition from thought to word and word to thought. (cited in Wilson & Weinstein, 1992, p. 365)

The overarching goal of this dissertation was to better understand how linguistic patterns are impacted by the presence of mood and anxiety disorders. Specifically, I aimed to examine word use in individuals with GAD and depressive disorders. To this end, I conducted two studies. Study 1 synthesized current empirical efforts to identify patterns of word use in individuals with depression and delineated a conceptual and methodological roadmap which could advance future research. Building on the insights from study 1, study 2 empirically assessed word use in individuals with GAD, with or without comorbid depressive disorders, as they spoke about peak autobiographical events in their lives: the happiest event in their life, the saddest event in their life and the most anxiety-provoking situation they could imagine. Below I discuss the conceptual, methodological and treatment implications from these two studies, as well as directions for future research.

Conceptual Implications

Depression. Despite a wealth of psycholinguistic studies in the past two decades, Pennebaker and King's (1999) assertion that "the psychological meaning of language use remains somewhat ambiguous" (p. 1309) appears to still be relevant today. Study 1 showed that most of the linguistic studies of individuals with depression examined word categories that were either not specifically related to depression (e.g., first-person pronouns) or left conceptually vague (e.g., cognitive words and negatively-valenced words). In turn, it had been difficult to ascertain the effect that depression has on one's speech.

In order to advance theoretically-driven investigations, several strategies were proposed in study 1. The first proposed strategy was to examine whether depressed individuals' language is abstract and non-specific, as implicated by the overgeneral memory literature (e.g., Williams et al., 2007). In a way, this line of research is consistent with early accounts of depressed individuals' language being vague and abstract (Beck et al., 1962; Bucci & Freedman, 1982; Schaefer, 1948). Study 2 provided some empirical support for this assumption. Adults with comorbid GAD and MDD used language with lower RA (Bucci, 1997; Bucci & Freedman, 1978)—a linguistic measure of specificity—than healthy controls, though only when discussing their happiest events. Additionally, adults with comorbid GAD and dysthymic disorder used less specific language across the three emotional conditions (anxious, happy, and sad). These results suggest that while it is fruitful to examine specificity in depressed individuals' language, other factors ought to be considered. First, results from study 2 suggest that the nature of the depression (e.g., chronic vs. non-chronic) may impact one's word use. For example, individuals with chronic depression may have a more globalized tendency to use non-specific language. However, since the differences between chronic and non-chronic subtypes of depression found in

study 2 were not predicted, future research is needed to more clearly identify the nature of these differences.

Future research may also clarify whether other aspects of depression, such as Blatt's (Blatt & Luyten, 2009; Luyten & Blatt, 2013) distinction between depression that is focused on issues of self-definition compared to depression that is focused on issues of relatedness, also impact one's language use. Indeed, Fertuck and colleagues (2004) showed that severely depressed patients with greater deficits in relatedness (i.e., anaclitic; Blatt & Shichman, 1983) improved clinically as their language became less evocative (i.e., lower RA), while depressed individuals with greater deficits in self-definition (i.e., introjective) improved clinically as their language became more evocative.

Another factor which ought to be more carefully defined and examined, is the context (Aldao, 2013; Aldao & Nolen-Hoeksema, 2012b) under which language is elicited and examined. Results from study 2 suggest that when asked to talk about happy topics that are incongruent with their views of self (Conway et al., 2004), individuals with MDD show marked impairments in their ability to use specific language, but that they were just as specific as healthy controls when asked to describe sad events. Similarly, Rodriguez and colleagues (2010) found different associations with depression between texts in online blogs and personal diaries. Other aspects of the context of language use such as the interpersonal nature (Aldao, 2013) of the situation (e.g., interview, phone, individual recording) may also help clarify the conditions under which depressed individuals' language becomes vague and non-specific.

In addition to language that lacks specificity, study 2 also provided support for the notion that adults with depression, and particularly adults with MDD, over-utilize cognitive efforts to generate meaning, and that this use of cognitive words may be a sign of the maladaptive emotion

regulation strategy rumination (Aldao et al., 2010b; Mennin & Fresco, 2013b). These results are consistent with—and help provide a conceptual framework for—similar findings presented in study 1. Interestingly, increased use of cognitive efforts at meaning-making were found in happy and anxious descriptions, but not in sad descriptions. This finding lends further support to the notion that threat to self-coherence elicits a need to reduce dissonance and utilize emotion regulation strategies (Conway & Pleydell-Pearce, 2000; Conway et al., 2004).

One limitation of this dissertation that ought to be considered when interpreting the above results is that study 2 lacked a "pure" depression group since all of the depressed participants were also diagnosed with GAD. Thus, it is impossible to determine whether some of these results may be due to the comorbidity between GAD and depression. Future studies are needed to test the above findings in individuals with depression-only.

GAD. As noted in the introduction, research into the nature of language use in individuals with anxiety disorders has been sparse, and very few anxiety-related linguistic hypotheses have been tested. Study 2 provided an in-depth examination of language use in individuals clinically diagnosed with GAD, with or without comorbid depressive disorders. As expected, results showed that certain aspects of language, such as specificity (as measured by a computerized measure of RA; Bucci, 1997) and meaning-making (as measured by a computerized measure of RF; Fertuck et al., 2012), are not impacted by GAD without comorbid depression. Results also showed that a certain aspect of language, the ability to talk about personal experiences with adequate psychological distance (e.g., Kross & Ayduk, 2008; Pennebaker & King, 1999) is impaired in individuals with GAD regardless of their depression status. This finding is consistent with similar linguistic findings in individuals with attachment anxiety (Borelli et al., 2011; Lee et al., 2011). Since study 2 only examined these individuals' language as they spoke about peak

AEs, future research is needed in order to determine whether this aspect of language is also characteristic of individuals with GAD when they speak about more benign topics.

The finding that individuals with GAD speak about AEs with insufficient psychological distance raises several questions. First, since this aspect of language appears automatic, will individuals with GAD be able to talk with greater psychological distance if specifically instructed to do so? And if they are able to do so—what impact will this have on their subjective experience? Previous research has shown that individuals with GAD, as opposed to healthy controls, become more distressed when implementing verbal emotion regulation strategies (Aldao & Mennin, 2012). In contrast, Kross and colleagues (2012) have shown that psychological distance can improve meaning-making and reduce emotional reactivity (Ayduk & Kross, 2010).

Finally, it is unclear what function is served by talking about emotional episodes in such an immediate manner. One possibility is that this way of talking serves an avoidant function (similar to the function of worry; Borkovec et al., 2004) and helps the anxious individual ward off painful experience. Alternatively, it is possible that this way of talking about emotional experiences is aimed at reducing psychological distress, similar to the way an anxious-ambivalent child tries to get closer and closer to his mother in an insistent yet ineffective effort to seek comfort. Some of these questions may be assessed in the context of emotion regulation therapy (ERT; Mennin & Fresco, 2009, 2013a) studies, a treatment for GAD which explicitly targets the ability to enhance psychological distance.

Methodological Implications

In synthesizing previous efforts at identifying linguistic characteristics of individuals with depression, study 1 highlighted several methodological limitations in the literature. Many of

these limitations stemmed from an over-reliance on the LIWC (Pennebaker et al., 2007), its limited features, and its predefined content-based categories. While the LIWC's word categories, which were defined by experts, clearly have content validity, their construct validity may be limited (Bantum & Owen, 2009). Study 2 showed that it is possible, and preferable, to pick and choose word categories which were theoretically constructed and empirically validated. The clearest example for such a category is the WRAD (Bucci & Maskit, 2006) which was inductively constructed to tap into the ability to translate inner experience into verbal form—referential activity (RA; Bucci & Freedman, 1978). Beyond its clear theoretical correlate, the WRAD also utilizes weights, thereby allowing a more nuanced detection of levels of RA in a text. Within the context of this dissertation, the WRAD appears to be particularly useful in assessing specificity in the broad sense of the word, as defined by Conway and Pleydell-Pearce (2000). However, since only one prior study used the WRAD to assess episodic specificity (Maskit & Bucci, 2012), future studies are needed to determine how the WRAD differs from previous measures of specificity (Williams & Broadbent, 1986).

Study 2 also showed that the underutilized psychological distance factor (Pennebaker & King, 1999) can be used to tap into a meaningful psychological construct which is relevant to the study of anxious individuals' speech. This factor, which was shown to be consistent across time and situations (Pennebaker & King, 1999), and was also found in a separate large scale factor-analysis (Biber, 1988), was successfully used in study 2 to identify group differences between healthy controls and individuals with GAD. This dissertation also provided an operational definition for how to calculate this factor, something which was missing from previous investigations using this factor (Borelli et al., 2011; Lee et al., 2011).

A third word category that appears to have utility for future investigations of depressed individuals' language is the LIWC cognitive processes dictionary, which may be used to detect exaggerated cognitive efforts at meaning-making. Similar findings have been reported in a study that used a subset of the cognitive processes dictionary—causal words—as indicative of rumination (Grisham et al., 2011). Taken together, future research would benefit from more clearly identifying the subset of words that tend to accompany maladaptive rumination (Nolen-Hoeksema et al., 2008) and to discriminate between them and words that accompany more adaptive forms of reflection.

With regards to words that accompany reflection, study 2 utilized the CRF (Fertuck et al., 2012) as a measure of effective autobiographical meaning-making. To my knowledge this is the first time that this dictionary is used outside the AAI paradigm (Main & Goldwyn, 1990). Hence, future research is needed to determine whether the CRF can indeed be used as a measure of effective autobiographical meaning-making. Additionally, just as the WRAD (Bucci & Maskit, 2006) was developed as a more nuanced weighted version of the computerized referential activity (CRA; Mergenthaler & Bucci, 1999), a weighted dictionary may help provide a more nuanced measurement of RF and effective autobiographical meaning-making.

Finally, study 2 provided some support for the effective use of the more advanced features of the DAAP (2014a, 2014b). First, the DAAP enabled me to use weighted dictionaries such as the WRAD (Bucci & Maskit, 2006) and the weighted affect dictionary (Murphy, 2014). Additionally, study 2 also utilized time as an independent variable, which presumably enhanced ecological validity since this way of analyzing language more closely resembles the way humans naturally process speech. For example, by assessing speech across time it is possible to take into

account the presence of silences, an aspect of language which had been hypothesized as characterizing depressed individuals' speech (Beck, 1967).

One methodological limitation of this dissertation is its reliance on the diagnostic categories of the DSM-IV-TR (American Psychological Association, 2000). Though these categories have been used in both research and clinical practice for many decades, researchers have called into question their ability to clarify mechanisms of psychopathology (Sanislow et al., 2010). Currently, NIMH is encouraging research efforts based on a framework emphasizing "the integration of knowledge about genes, cells, and neural circuits with knowledge about cognition, emotion, and behavior" (Insel, 2014; Sanislow et al., 2010, p. 634). Accordingly, future research can determine whether and how the linguistic findings reported in this dissertation fit into the new models of psychopathology.

Treatment Implications

Though this dissertation did not directly assess the treatment of GAD or depression, its findings point to possible avenues that may enhance treatment efficacy. First, study 2 showed that individuals with GAD talk about peak AEs with insufficient psychological distance. Though further research is needed in order to better understand the implications of this deficit, it is likely that GAD patients experience these peak AEs as "too real", similar to what Fonagy and colleagues (Fonagy & Bateman, 2006; Fonagy et al., 2003) termed "psychic equivalence" and what Hayes and his colleagues (Hayes, Strosahl, & Wilson, 1999) termed "cognitive fusion". Consequently, treatments for GAD may benefit from explicitly targeting the ability to talk about salient AEs with adequate psychological distance. This can be achieved in various ways, including through interventions aimed at enhancing the capacity for mentalization (e.g., Fonagy & Bateman, 2006), through decentering techniques (e.g., Fresco, Segal, Buis, & Kennedy, 2007),

and through other mindfulness practices aimed at creating "healthy distance" from the product of one's mind (Mennin & Fresco, 2013b).

Findings from study 2 further suggest that individuals with GAD and comorbid MDD also present with significant impairments in their abilities to discuss happy AEs: they talk about these episodes with reduced specificity, are less able to generate meaning, and over-utilize cognitive efforts to generate meaning. Thus, these patients may benefit from intervention aimed at slowly enabling them to recall or imagine specific happy episodes and to integrate them into their views of self. Indeed, research has shown that a therapeutic approach that encourages depressed patients to generate and reflect on AEs is effective in reducing depressive symptoms (life review therapy; Serrano, Latorre, Gatz, & Montanes, 2004). However, no research that I am aware of has examined the impact of interventions specifically targeting the generation of positive episodes.

Finally, findings from study 2 suggest that individuals with GAD and comorbid dysthymic disorder may present with different impairments than those with GAD and MDD: they show reduced specificity across a wide range of emotional topics, but do not talk with reduced psychological distance and do not over-use cognitive efforts to generate meaning. Thus, it is possible that these individuals are less characterized by distress and instead have a "bland" cognitive-emotional style which may indicate drained motivation (Dillon et al., 2014) to work hard in order to enjoy "mental time travel". Consequently, it is possible that the therapeutic goal with these individuals ought to focus on helping them become more engaged with their AEs in an effort to reduce emotional avoidance (Borkover et al., 2004).

Summary and Conclusion

This dissertation provided a multi-method examination of the ways linguistic style is impacted by the presence of GAD and depression. As expected, different aspects of word use were found to be impacted by GAD and depression. When talking about peak autobiographical episodes, GAD patients, regardless of depression status, showed reduced psychological distance from their inner experience. Other aspects of language were found to be impaired in individuals with GAD+MDD, namely the capacity to use specific language and effectively generate meaning when discussing salient happy episodes. Additionally, individuals with GAD+MDD used more cognitive efforts to generate meaning than healthy controls. An unexpected finding from study 2 was that individuals with GAD and comorbid dysthymic disorder showed a unique pattern of word use which appears to be indicative of a "bland" cognitive-emotional style.

In addition to the reported empirical findings, this dissertation also provided a new conceptual and methodological organization for future linguistic studies of individuals with anxiety and depression. Hopefully, the framework provided in this dissertation can lead to more nuanced and theoretically-driven investigations which can help clarify the distinct and overlapping linguistic features in these debilitating, difficult to treat, disorders.

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