Anxiety and Intraindividual Variability in Interpersonal Behavior

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Abstract

Individuals with anxiety are at increased risk for rejection, social isolation, and other interpersonal problems which serve as a mechanism for the worsening of anxiety over time. Considerable research has documented the mean-level behaviors characteristic of anxiety which increase risk for interpersonal problems. However, there has not been an investigation of the association of anxiety with intraindividual variability in interpersonal behavior. The present research examines the association of anxiety with forms of intraindividual behavioral variability computed as variability in a specific behavior over time (i.e. flux) or dispersion of behavior over events (i.e. spin). Interpersonal behavior is measured using the interpersonal circumplex model, which operationalizes the assessment of interpersonal behavior along two dimensions: communal (agreeable vs. quarrelsome) and agentic (dominant vs. submissive). Participants recorded their behavior using event-contingent recording; they reported their behavior during the course of daily life following interpersonal interactions. Study 1 replicated prior evidence regarding mean-level behavioral correlates of anxiety. Beyond mean-level behaviors, anxiety was associated with elevated flux and spin at the between-person level in a community sample (Study 1) and decreases in spin followed preceding decreases in anxiety symptoms among individuals diagnosed with social anxiety disorder (Study 2). In both Study 1 and 2 there was no evidence of an association between depression and flux or spin.

Keywords: anxiety, depression, interpersonal behavior, intraindividual behavioral variability, interpersonal circumplex

Résumé

Les personnes souffrant d'anxiété sont à risque plus élevé d'être rejetées, d'être isolées socialement, et d'avoir d'autres problèmes interpersonnels. Ces difficultés sont à leur tour des mécanismes qui mènent à l'aggravation de l'anxiété au cours du temps. De nombreuses études ont préalablement déterminé les niveaux moyens de comportement interpersonnel associés à l'anxiété qui aggravent le risque de difficultés interpersonnelles. Toutefois, il n'existe aucune enquête sur l'association entre l'anxiété et la variation intra-individuelle dans le comportement interpersonnel. La recherche présentée ici a examiné le lien entre l'anxiété et la variation intra-individuelle dans un comportement spécifique, le "flux", et la variation intra-individuelle dans le style interpersonnel, le "spin". Le comportement interpersonnel a été décrit avec le circomplexe interpersonnel. Ce modèle du comportement interpersonnel classe les comportements selon deux axes: la dimension de l'affiliation, caractérisée par la bienveillance et ou l'hostilité, et la dimension du contrôle, caractérisée par la dominance et la soumission. Une méthode de contingence événementielle est utilisée: les participants rapportent leur comportement interpersonnel suivant leurs interactions au cours de leur vie quotidienne. La première étude confirme les données précédentes sur les niveaux moyens des comportements agréables et querelleurs associés avec l'anxiété. Àu-delà des niveaux moyens de comportements interpersonnels, l'anxiété est associée à un degré élevé de "flux" et de "spin" dans un échantillon communautaire. La deuxième étude démontre une diminution de "spin" suite à une diminution de l'anxiété dans un échantillon de personnes ayant reçu un diagnostique de trouble d'anxiété sociale. Il n'y avait aucun lien entre la dépression et la variabilité intra-individuelle dans le comportement interpersonnel dans aucun des deux études.

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Acknowledgements

Preface and Contributions of Authors

The research described was conceived of and carried out by Lance M Rappaport using archival data from research on which Prof. Bianca D'Antono was Principal Investigator (Study 1) and Prof. D. S. Moskowitz was Principal Investigator (Study 2). Collaborators involved in the conceptualization of Study 2 and the subsequent data collection of data were: Dr. Jennifer J Russell, Dr. Pierre Bleau, Dr. Gilbert Pinard, Professor David C. Zuroff and Professor Simon N. Young. Analyses were conceived of and conducted solely by Lance M Rappaport. The material in this thesis was written exclusively by Lance M Rappaport with guidance from Profs. D. S. Moskowitz, David C Zuroff, and Bianca D'Antono.

Studies 1 and 2 involve original scholarship and contributions to knowledge. Study 1 demonstrated a between-person association between elevated anxiety symptoms and elevated intraindividual behavioral variability. Study 2 demonstrated the association between change in anxiety symptoms and change in behavior variability; decreases in intraindividual behavioral variability were predicted by temporally preceding decreases in anxiety symptoms. Moreover, Study 1 was conducted with a community sample whereas Study 2 extended this research to a clinical sample with diagnosed Social Anxiety Disorder.

Study 1 has been published, see Rappaport, L. M., Moskowitz, D. S., and D'Antono, B. (2014). Naturalistic interpersonal behavior patterns differentiate depressive and anxiety symptoms in the community. *Journal of Counseling Psychology*, *61*, 253-263. I am preparing a manuscript about Study 2 which will be submitted for publication.

Work from this thesis has been presented at the annual meeting of the Association for Behavioral and Cognitive Therapies annual meeting, November 2011, in Toronto, Ontario, Canada, at the Society for Interpersonal Theory and Research, May 2012, in Montreal, Quebec,

Canada, and at the Association for Behavioral and Cognitive Therapies annual meeting,

November 2012, in Washington, DC, USA. There have been no previous publications with the

sample described in Study 2. Material included in Study 1 does not overlap with previous

publications conducted using the sample described in Study 1.

Introduction

Anxiety, among other mental health disorders, is marked by deleterious effects on interpersonal relationships (Benazon & Coyne, 2000; Coyne, 1976a; Joiner, 1994). In a seminal theoretical work, Hammen (1991) posited that these deleterious effects may lead to increased stressors which could otherwise be avoided, such as rejection and greater social isolation. Empirical research has provided considerable support for this theory, called the stress generation process, within research on depression (Liu & Alloy, 2010) and anxiety (Alden, Regambal, & Plasencia, 2014; Alden & Taylor, 2004; Conway, Hammen, & Brennan, 2012). Within the stress generation process, mental illness leads to interpersonal behaviors that generate interpersonal problems. Increased interpersonal problems then led to increased physiological and psychological stress along with decreased social resources, such as decreased social support (Cohen & Wills, 1985). Increased stress has been related to worsened physiological and psychological illness (Uchino, Cacioppo, & Kiecolt-Glaser, 1996), which perpetuates maladaptive interpersonal behavior and begets worsened interpersonal problems. In this manner mental illness worsens over time through an important interpersonal mechanism.

The discovery that individuals with depression and anxiety play an active role in generating interpersonal problems led to research on the behaviors and mechanisms by which interpersonal problems are produced. Considerable research describes various behavioral patterns for anxiety (see below). Similar findings have been found for depression (see below), which is closely associated with anxiety. Broadly, research by Hokanson and colleagues (see below) and Alden and colleagues (see below) have demonstrated elevated hostility and submissive behavior individuals with elevated depression symptoms and anxiety symptoms in the community and within clinical settings. However, this research is limited by several factors.

First, much of this research has not adjusted for the comorbidity between depression and anxiety. One study which included this necessary adjustment, Alden and Phillips (1990), corroborates that individuals with social anxiety reported interpersonal problems associated with submissive and quarrelsome behavior.

Second, prior research has been limited by reliance on assessment of behavior in a laboratory task (e.g., Blumberg & Hokanson, 1983; Hokanson, Sacco, Blumberg, & Landrum, 1980) or on single-occasion report of interpersonal tendencies and problems (e.g., Alden & Phillips, 1990). When behavior is assessed over a set of interactions it is possible to assess other features of interpersonal behavior, such as variability over interactions. One method of assessing behavior over a set of interactions is to have participants report on their behavior in naturalistic settings over a variety of interactions over time (Moskowitz & Sadikaj, 2011).

Variability in behavior over events has been characterized as erratic behavior and linked with negative interpersonal outcomes, such as diminished social network size, decreased liking by colleagues, and decreased quality of romantic relationships (Côté, Moskowitz, & Zuroff, 2012; Sadikaj et al., under review). Therefore, it warrants examination whether anxiety is associated with indices of behavior beyond mean level tendencies, particularly with variability in behavior over events. Such research has the possibility to suggest an important mechanism in the stress generation process that has, until now, been unstudied.

The Interpersonal Circumplex Model of Behavior

Investigating the range interpersonal behavioral correlates of anxiety and depression requires a model for assessing interpersonal behavior. The present research used the interpersonal circumplex model of behavior for conceptualizing the domain of interpersonal behavior. The prior literature suggests that elevations in depression and anxiety symptoms are

associated with a tendency towards elevated hostility and elevated submissive behavior. This suggests that the set of behaviors elevated in anxiety and depression can be summarized using the interpersonal circumplex model of behavior (see Pincus & Wright, 2011 for review). The interpersonal circumplex consists of two orthogonal, intersecting dimensions identified as communal and agentic behavior (Leary, 1957; Wiggins, 1991). The horizontal dimension encompasses communal aspects of behavior including the warmth and affiliative quality of behavior. This dimension includes two poles identifies as agreeable behavior (e.g., giving a compliment) and quarrelsome/hostile behavior (e.g., giving non-constructive criticism). The vertical dimension encompasses agentic aspects of behavior including the agency and control expressed in the behavior. This dimension includes two poles identified as dominant (e.g., asserting one's opinion) and submissive behavior (e.g., speaking only when asked a question). Combining these two orthogonal dimensions provides the four behavioral poles of the circumplex: agreeable, quarrelsome, dominant, and submissive behavior. In this context, behaviors such as decreased eye contact and decreased participation in the conversation exemplify high submissive behavior while criticism and increased complaints exemplify high quarrelsome behavior. More complex behaviors, such as excessive reassurance seeking (Joiner Jr. & Metalsky, 2001; Starr & Davila, 2008b), are defined in two-dimensional space as a combination of the two dimensions. For example, frequently asking for reassurance in an increasingly hostile manner can be identified as falling within the submissive-quarrelsome quadrant.

Previous research by Moskowitz and colleagues, among others, has demonstrated that the interpersonal circumplex model of behavior can be used to organize interpersonal behaviors at the event-level, such as at the level of a conversation. Indeed, participants are able to reliably

report on the behaviors in which they engaged using items drawn from each pole of the interpersonal circumplex (Moskowitz, 1994). Importantly, participant self-report of behavior is consistent with observer ratings of participant behavior (Mongrain, Vettese, Shuster, & Kendal, 1998). Participant self-report of behavior is also sensitive to situational influences on interpersonal behavior, such as affect (Moskowitz & Côté, 1995) and attachment dynamics (Sadikaj, Moskowitz, & Zuroff, 2011), while providing robust estimates of mean-level behavior tendencies (Moskowitz, Pinard, Zuroff, Annable, & Young, 2003) and of flux and spin in behavior over interactions (Moskowitz & Zuroff, 2004, 2005).

The Stress Generation Process

Early empirical research (Coyne, 1976a) suggested interpersonal problems associated with internalizing disorders. Hammen (1991) theorized a process wherein individuals with internalizing disorder are at increased risk for stress due to impacting their environment in a negative way. Considerable empirical research has supported this theory, known as the "stress generation hypothesis" (Liu & Alloy, 2010), including among various psychopathologies including anxiety disorders (Alden et al., 2014; Alden & Taylor, 2004; Conway et al., 2012).

When assessed with single occasion self-report, individuals with social anxiety disorder reported greater overall impairment with particularly high impairment in their social life (Aderka et al., 2012), including greater likelihood of being unmarried, decreased likelihood of having at least one close friend, lower quality of friendships, and greater impairment the person's social network (Davidson, Hughes, George, & Blazer, 1994; Furmark et al., 1999; Rodebaugh, 2009). Within the relationships they do maintain, anxious individuals report receiving less support (La Greca & Lopez, 1998) and worsened quality of the relationship (Davila & Beck, 2002; Sanderson, DiNardo, Rapee, & Barlow, 1990; Schneier et al., 1994; Wenzel, Haugen, Jackson, &

Brendle, 2005; Whisman, 2007; Whisman, Sheldon, & Goering, 2000). Findings concerning

interpersonal problems were corroborated by Falk Dahl and Dahl (2010) who demonstrated that

socially anxious individuals reported smaller social networks. Furthermore, interpersonal

behaviors characteristic of anxiety seem to mediate the association between anxiety and

interpersonal problems. For example, decreased self-disclosure, in which an individual discloses

less information (i.e., a form of submissive behavior), led to lower quality romantic relationships

(Cuming & Rapee, 2010; Sparrevohn & Rapee, 2009).

Similar interpersonal consequences have been documented among individuals with

depressive disorders (Liu & Alloy, 2010). The interpersonal consequences include impairment

in forming new relationships (Coyne, 1976b; Strack & Coyne, 1983) and worsened quality of

existing relationships (Fincham, Beach, Harold, & Osborne, 1997).

Interpersonal Behaviors Characteristic of Anxiety

Within the stress generation process, interpersonal behaviors may mediate the association

between mental illness and interpersonal problems. Within anxiety disorders, elevated social

anxiety (Alden & Phillips, 1990; Alden & Wallace, 1995) and generalized anxiety (Eng &

Heimberg, 2006) have been associated specifically with quarrelsome and submissive behavior

(Creed & Funder, 1998). Kachin, Newman, and Pincus (2001) demonstrated that socially

anxious individuals can be classified on the basis of describing predominantly interpersonal

problems related to quarrelsome or submissive behavior. Specific manifestations of submissive

behavior included a preference to cut short interactions with acquaintances (Brown, Silvia,

Myin-Germeys, & Kwapil, 2007), interrupting a conversation partner less (Natale, Entin, &

Jaffe, 1979), talking less overall (Daly, 1978; Heerey & Kring, 2007; Pilkonis, 1977), less

frequently asserting oneself (Grant, Beck, Farrow, & Davila, 2007), and decreased eye contact

(Turner, Beidel, Dancu, & Keys, 1986; Wenzel, Graff-Dolezal, Macho, & Brendle, 2005). These submissive behaviors seem to worsen following rejection (Mallott, Maner, DeWall, & Schmidt, 2009). Moreover, Cuming and Rapee (2010) and Meleshko and Alden (1993) demonstrated that socially anxious individuals had decreased self-disclosure, which led to lower quality of romantic relationships and lower liking on the part of interaction partners. Heerey and Kring (2007) and Wenzel, Graff-Dolezal, et al. (2005) demonstrated that, in a laboratory task, individuals with social anxiety symptoms sought reassurance more often despite participating less overall and engaging in less agreeable behavior (i.e., smiling less).

Manifestations of quarrelsome behavior have been less well enumerated but include behaving in a more intrusive and vindictive manner (Eng & Heimberg, 2006). It may be that evidence is stronger for the association of anxiety and submissive behavior than anxiety and quarrelsome behavior. For example, while socially anxious individuals rated their behavior as less agreeable/more quarrelsome in a laboratory-based interaction, an observer of the interaction disagreed that they showed more quarrelsome behavior than a non-anxious control participant (Oakman, Gifford, & Chlebowsky, 2003).

Interpersonal problems seem to improve following cognitive-behavioral treatment (Eng, Coles, Heimberg, & Safren, 2005). The severity of interpersonal problems remaining after treatment are associated with continued symptoms (Borkovec, Newman, Pincus, & Lytle, 2002). Cognitive-behavioral treatment has been successfully modified to include interpersonal components that decrease submissive behavior (Alden & Taylor, 2011).

Safety Behaviors. The previously described literature primarily concerns individuals with social anxiety and generalized anxiety symptoms. Specific to social anxiety, research on interpersonal behavior patterns frequently addresses a construct of "safety behaviors," behaviors

undertaken with a goal of reducing the threat of negative evaluation and the attendant anxiety. Research has documented that socially anxious individuals engage in such behaviors, which seem to depict submissive behavior (Alden et al., 2014; Rapee & Heimberg, 1997). For example, safety behaviors include speaking less and withholding information about the self. Both behaviors are exemplifiers of submissive behavior. Moreover, this behavioral pattern often engenders interpersonal problems, specifically a more negative evaluation from the interaction partner (Alden & Bieling, 1998). The present study considers that safety behaviors, along with other complex behaviors, can be formulated within the interpersonal circumplex model (see above). Therefore, research on safety behaviors suggests motivational cues for elevated submissive behavior. However, the behavior itself seems to be a proximal cause of interpersonal problems and so is investigated directly in this research.

Interpersonal Behaviors Characteristic of Depression

While the focus of this research is primarily on the interpersonal behaviors characteristic of anxiety, some review of the behaviors characteristic of depression is in order due to the high comorbidity between anxiety and depression. Research on depression has demonstrated elevated mean level quarrelsome and submissive behavior (Zuroff, Fournier, & Moskowitz, 2007). For example, Cain et al. (2012) describes 6 subtypes of depressed individuals based on the interpersonal problems participants reported. Approximately 75% of participants were described by interpersonal problems associated with quarrelsome or submissive behavior.

Research by Hokanson and colleagues has more fully explored the association of depression with quarrelsome and submissive behavior (e.g., Hokanson, Loewenstein, Hedeen, & Howes, 1986). In their work, submissive behavior manifests as verbal submissive behavior (Hokanson & Butler, 1992) and decreased eye contact (Hokanson, Rubert, Welker, Hollander, &

Hedeen, 1989) along with preference for a submissive social role (Hokanson & Meyer, 1984).

Quarrelsome behavior manifests as greater negativity and greater extrapunitiveness (Blumberg & Hokanson, 1983). These findings have been corroborated by others, including less nonverbal communication (Troisi & Moles, 1999) and increased aggressive behavior (Kahn, Coyne, & Margolin, 1985). This tendency towards submissive and quarrelsome behavior is exemplified by evidence that depressed individuals seem to excessively seek reassurance as to the strength of existing relationships in a manner descriptive of submissive and quarrelsome behavior (Joiner Jr. & Metalsky, 2001; Starr & Davila, 2008b). Moreover, this behavior seems to beget interpersonal problems. For example, Joiner, Alfano, and Metalsky (1992) demonstrated that depression symptoms were associated with seeking reassurance to the extent that individuals were rejected by close others.

Intraindividual Interpersonal Behavioral Variability

The previously described research demonstrates the association between mean behavioral tendencies of individuals with depression and anxiety symptoms. Interpersonal behavior can also be characterized by patterns beyond the individual's mean tendency (Fleeson & Gallagher, 2009). For example, two individuals with similar mean levels may differ in the consistency of their behavior (called intraindividual behavioral variability; Moskowitz & Zuroff, 2004) or in their ability to modulate behavior in response to situational or behavioral cues (called behavioral reactivity; Leary, 1957; Tracey, 2005). The consistency of behavior has been studied as variability in behavior over time around an individual's mean (called flux) and dispersion of behavior over events (called spin; Moskowitz & Zuroff, 2004, 2005). For example, flux is computed as the standard deviation of behavior over events. Spin is computed by taking advantage of the two orthogonal dimensions that make up the interpersonal circumplex.

Behavior at each event is aggregated to communal behavior and agentic behavior by subtracting quarrelsome behavior from agreeable behavior (i.e., communal behavior) and submissive behavior from dominant behavior (i.e., agentic behavior). The tangent of agentic behavior and communal behavior is used to compute an angle representing behavior at that event. Spin is computed as the standard deviation of angle over events. Spin represents overall dispersion of an individual's behavior while flux represents variability within a specific behavioral dimension. Spin and flux are computed across all interactions, thus representing variability in an individual's behavior over the set of events on which the individual reported.

Research and theory concerning intraindividual behavioral variability has disputed whether variability reflects adaptation to socioemotional cues or erratic, unpredictable behavior. It has been argued that if variability reflects adaptation to socioemotional cues then restricted variability, called behavioral rigidity (cf., Paulhus & Martin, 1988), may indicate disordered behavior whereas increased variability reflects flexibility and may be adaptive. In support of this position, individuals who report restricted behavioral repertoires tend to report lower well-being (O'Connor & Dyce, 1997; Paulhus & Martin, 1988) and a tendency towards lower cognitive flexibility (Epstein, 1973). Importantly, this research assesses an individual's behavioral repertoire by asking, in a single-occasion, for the individual to endorse behaviors in which they engage. Work by Tracey and colleagues have extended this research into laboratory assessment of behavior. Using single-occasion self-report and laboratory assessment of behavior during participant interactions, Tracey and colleagues suggest that individuals who adapt their behavior less to situational cues report greater distress and are rated less positively by interaction partners (Tracey, 2004; Tracey, 2005; Tracey & Rohlfing, 2010).

An alternative position posits that elevated intraindividual behavioral variability may be indicative of difficulty regulating one's behavior, including interpersonal behavior (Linehan, 1993). In this light, intraindividual behavioral variability reflects an individual's ability to regulate behavior. While restricted variability, i.e., rigidity, may reflect cognitive rigidity, elevated variability may reflect behavioral dysregulation above and beyond adaptation to socioemotional cues. The difference between intraindividual behavioral variability and reactivity has been particularly reinforced by research by Erickson, Newman, and Pincus (2009) who demonstrate an association between interpersonal distress and elevated intraindividual behavioral variability. Erickson et al. (2009) further demonstrated that while interpersonal distress was also associated with greater reactivity to the behavior of the interaction partner, an influential socioemotional cue (Strong et al., 1988), this association only partially mediated the association between interpersonal distress and elevated intraindividual behavioral variability. When adjusting for elevated reactivity, the association between distress and intraindividual behavioral variability remained. Separate research by Sutton demonstrates that greater reactivity explains approximately 30-40% of the variance between persons in intraindividual behavioral variability (Sutton, unpublished doctoral thesis in preparation). While this indicates that intraindividual behavioral variability is due, in part, to modulating behavior in response to socioemotional cues, a substantial proportion of variability may be due to erratic, or dysregulated, behavior around that explained by reactivity.

The notion that elevated intraindividual behavioral variability reflects behavioral dysregulation is further supported by research demonstrating the association of elevated variability with negative outcomes. Elevated spin has been associated with neuroticism (Moskowitz & Zuroff, 2005), self-criticism (Kopala-Sibley, Rappaport, Sutton, Moskowitz, &

Zuroff, 2013), unmet attachment needs (La Guardia, Ryan, Couchman, & Deci, 2000), and interpersonal problems (Block, 1961) including more distant contacts at work (Côté et al., 2012), impairment in completing goals shared with one's partner (Rappaport, Moskowitz, & Zuroff, 2013), and reduced relationship satisfaction (Sadikaj et al., under review). Spin is elevated in clinical groups characterized by high interpersonal distress and dysregulation in other areas of functioning, including Borderline Personality Disorder (Russell, Moskowitz, Zuroff, Sookman, & Paris, 2007). There has not been an investigation of intraindividual behavioral variability within the clinical phenomena of anxiety. There has been some indication in prior research that anxious individuals have greater difficulty regulating emotion (Campbell-Sills & Barlow, 2007; Mennin, Heimberg, Turk, & Fresco, 2002) and therefore may engage in erratic behaviors in an effort to down-regulate negative emotion (Auerbach, Abela, & Ho, 2007). For example, Creed and Funder (1998) reported that close others described anxious individuals as "moody," suggesting the possibility of more erratic behavior. Moreover, Moskowitz and Zuroff (2005) demonstrated that neuroticism is associated with elevated flux and spin. Anxiety and depression represent important clinical manifestations of neuroticism (Trull & Sher, 1994; Watson, Clark, & Carey, 1988). Therefore, examining the association with these clinically-relevant components of neuroticism provides an important test of the notion that intraindividual behavioral variability reflects a maladaptive behavior pattern and the opportunity to specify the association between neuroticism and intraindividual behavioral variability to clinically-relevant constructs.

Distinguishing Anxiety from Depression

Examining the differential association of anxiety and depression with intraindividual behavioral variability presents an opportunity to investigate Clark and Watson's tripartite model of anxiety and depression (Clark & Watson, 1991; Watson et al., 1988; Watson et al., 1995).

They propose general impairment shared by depression and anxiety, which accounts for the high comorbidity between these syndromes (Kendler et al., 2011; Zinbarg et al., 1994). They further suggest specific correlates that distinguish between anxiety and depression. For example, research by Higgins and colleagues demonstrates unique social cognitive representations consistent with anxiety and depressive symptoms (Higgins, 1987; Higgins, Klein, & Strauman, 1985). Moreover, it seems that distinguishing between anxiety and comorbid depression symptoms has important implications for suicide risk assessment. Certain anxiety symptoms are associated with an elevated risk of suicidal ideation and suicide attempt when adjusting for concurrent Major Depressive Disorder (Rappaport, Moskowitz, Galynker, & Yaseen, 2014). Prior research on mean level behaviors suggests common impairment shared by anxiety and depression, namely elevated hostile and submissive behavior (Alden & Phillips, 1990). However, the demonstration of a differential association of anxiety and depression with other measures of interpersonal behavior, such as indicators of intraindividual behavioral variability, may suggest specific correlates distinguishing between anxiety and comorbid depression symptoms.

An Emotion and Behavioral Regulation Model of Anxiety

In recent years, research has examined psychopathology as representing core deficits in regulating emotion (see Gross & Thompson, 2007 for review). For Gross and colleagues emotion refers to momentary affective experiences (e.g., anxiety) while mood refers to stable affective tendencies over time. Affect, within this formulation, refers to both emotion and mood as forms of affective experiences. As conceptualized by Gross and colleagues, individuals regulate affect by either decreasing negative emotions or enhancing positive emotions, though the majority of emotion regulation research to date has focused on decreasing negative emotions.

Gross and colleagues posit that emotion regulation occurs at several points in the process of emotion generation and experience, such as by efforts to reduce the intensity of the emotion as it is generated or by efforts to reduce negative emotion that one is presently experiencing. Emotion regulation deficits have been examined as a core construct underlying Borderline Personality Disorder, Major Depressive Disorder, Bipolar Disorder, Generalized Anxiety Disorder, Social Anxiety Disorder, Eating Disorders, and Substance-use disorders and has generally focused on efforts to reduce negative emotions once a person is experiencing them (see Aldao, Nolen-Hoeksema, & Schweizer, 2010 for review). This has led to a variety of treatments (e.g., Dialectical Behavior Therapy, Linehan, 1993; Emotion-regulation therapy, Mennin, 2004; Mennin & Farach, 2007), and enhancements to existing treatments (Campbell-Sills & Barlow, 2007) designed to enhance the individual's ability to regulate affect, particularly to decrease negative emotion.

With respect to anxiety, Mennin and colleagues have proposed an emotion regulation model of Generalized Anxiety Disorder (Mennin et al., 2002). Within this model, they argue that anxiety, particularly generalized anxiety disorder symptoms, is associated with difficulty regulating emotions, particularly anxiety. Mennin and colleagues demonstrated this association (Amstadter, 2008; Mennin, Heimberg, Turk, & Fresco, 2005; Salters-Pedneault, Roemer, Tull, Rucker, & Mennin, 2006) and further specified that emotion dysregulation is due to heightened intensity of emotions and difficulty managing emotions once they are produced, among other features of the emotion regulation process. This has been further demonstrated among children (Suveg & Zeman, 2004). Moreover, the association with emotion dysregulation seems stronger for the range of anxiety than concurrent depressive symptoms, which are no longer associated with difficulty managing emotions when adjusted for anxiety symptoms (Mennin, Holaway,

Fresco, Moore, & Heimberg, 2007). Cisler, Olatunji, Feldner, and Forsyth (2010) present a

summary of data suggesting emotion regulation difficulties for a variety of anxiety disorders,

including post-traumatic stress disorder, social anxiety disorder, and panic disorder among

others. Mennin and colleagues suggested that the association with emotion dysregulation may be

specific to generalized anxiety disorder compared with concurrent symptoms of social anxiety

disorder (Mennin et al., 2007). However, they measured social anxiety disorder using only the

social interaction anxiety scale (SIAS), which may not fully represent the range of symptoms

experienced in social anxiety disorder. Subsequent research using the Anxiety Disorders

Interview Schedule-IV (ADIS-IV) demonstrated that social anxiety disorder was associated with

emotion dysregulation, though not as strongly as generalized anxiety disorder (Mennin,

McLaughlin, & Flanagan, 2009).

   Theory of emotion dysregulation has proposed concurrent dysregulation of behavior

resulting from frequent, unsuccessful attempts to regulate emotion. The individual may engage

in a variety of behaviors in attempts to regulate intense emotion. This may be experienced by

others as erratic behavior. For example, this view of emotion dysregulation has been presented

as an explanation for suicide and non-suicidal self-injury among individuals with Borderline

Personality Disorder (Linehan, 1993) and may explain the high rates of substance abuse among

anxious individuals (Compton, Thomas, Stinson, & Grant, 2007; Hasin, Stinson, Ogburn, &

Grant, 2007; Kessler et al., 1997). As summarized in Cisler et al. (2010), substance abuse may

represent an attempt to regulate otherwise dysregulated negative emotions. Moreover, Auerbach

et al. (2007) demonstrated that when experiencing negative emotions, individuals with difficulty

regulating emotion engaged in elevated risk taking behavior. Individuals who reported difficulty

down-regulating negative emotion engaged in more risk taking behavior when experiencing

negative emotions than individuals who reported little difficulty down-regulating negative emotions. This further supports the association between emotional dysregulation and erratic, dysregulated behaviors. Mennin et al. (2002) suggested that emotion dysregulation may lead to interpersonal behaviors motivated by an effort to recruit help in regulating emotion. However, these behaviors may, ultimately, prove maladaptive in that they lead to worsened relationships and difficulty forming new relationships.

Theoretical accounts of emotion dysregulation and associated behavioral dysregulation have posited that anxious individuals may show an inflexible style of managing emotions (Campbell-Sills & Barlow, 2007; Cisler et al., 2010; Mennin et al., 2002). However, research on emotion regulation within anxiety disorders has been limited to single occasion self-report of emotion regulation and assessment of emotion regulation to laboratory-based stressors. Naturalistic assessment of behavior and affect over time allows for estimation of whether anxious individuals indeed engage in a restricted set of behaviors or, as suggested by findings with respect to intrapersonal interpersonal behavioral variability (see above), anxious individuals demonstrate dysregulated, erratic behavior. This was assessed in the present line of research by testing whether anxiety symptoms (Study 1) or improvement in social anxiety disorder (Study 2) were associated with elevated intraindividual behavioral variability in interpersonal behavior. Interpersonal behavior was chosen due to its direct, harmful effects on interpersonal functioning and, ultimately, on the progression of anxiety pathology along with the relevance of interpersonal functioning to emotion regulation (Rimé, 2007). Aldao et al. (2010) argue that psychopathology research conducted within only a community or clinical sample has potentially limited generalizability to the development of mental illness. For this reason, they recommend that psychopathology research be conducted with both a community and clinical sample.

A community sample (Study 1) and clinical sample (Study 2) were used to satisfy this recommendation and enhance the generalizability of this research.

The Present Research

The present research was designed to investigate the association of anxiety and concurrent depression symptoms with variability in interpersonal behavior. Behavior was assessed in naturalistic settings using an intensive repeated measures in naturalistic settings (IRM-NS) design, specifically using event-contingent recording (ECR, Moskowitz & Sadikaj, 2011). In this methodology participants report on their interpersonal behavior following interpersonal interactions. This provides information on participant behavior as manifested in naturally-occurring interactions. Moreover, as participants report on their behavior over the course of days or weeks, this methodology can be used to provide robust estimates of mean-level behavior and to estimate other measures of interpersonal behavior, such as variability over interactions.

To estimate mean behaviors, behavioral data was aggregated over measurements to estimate the mean for agreeable, quarrelsome, dominant, and submissive behavior. Moreover, behavioral data was aggregated to estimate variability using two methods: flux and spin (Moskowitz & Zuroff, 2004, 2005). Flux refers to variability, over events, for each type of behavior: agreeable, quarrelsome, dominant, and submissive. This is computed by taking the standard deviation of behavior over events. Spin takes advantage of the circularity of the interpersonal circumplex model of interpersonal behavior. The participant's behavior at each event is plotted on the circumplex to obtain an angle representing divergence from the origin. Spin is then calculated as the standard deviation of angles over events. Therefore, it refers to variability in the dispersion of interpersonal behavior over events.

Study 1 provided the first test of the association between anxiety symptoms and intraindividual behavioral variability, at the between-person level, using a community sample. Participants reported on their behavior over the course of approximately 21 days. Mean behaviors and intraindividual behavioral variability were computed over days as described above. Study 1 began by replicating prior research documenting the association of anxiety and depression with elevated mean quarrelsome and submissive behavior. Study 1 then extended this research to examine the association of anxiety symptoms with elevated intraindividual behavioral variability. Using structural equation modeling (SEM), Study 1 adjusted for the correlation of anxiety and depression symptoms as well as for the association among behavioral variables and between mean level and variability of each behavior (Baird, Le, & Lucas, 2006). Based on some controversy over the measurement of variability, this was repeated estimating variability using the mean square successive differences approach (MSSD; Ebner-Priemer, Eid, Kleindienst, Stabenow, & Trull, 2009; von Neumann, Kent, Bellinson, & Hart, 1941).

Study 2 sought to examine the association of changes in anxiety symptoms and change in intraindividual behavioral variability within a clinical sample. A psychopharmacological agent, Paxil (paroxetine), was used to produce changes in anxiety symptoms. It was then examined whether changes in anxiety symptoms precipitated changes in intraindividual behavioral variability, mean-level quarrelsome behavior, and mean-level submissive behavior. Study 2 also generalized regarding the assessment of anxiety symptoms. Whereas Study 1 assessed anxiety symptoms through participant self-report, Study 2 assessed anxiety symptoms through both self- and clinician-report.

Both Study 1 and 2 were conducted to examine whether anxiety symptoms would be associated with decreased or elevated intraindividual behavioral variability above and beyond

mean quarrelsome and submissive behavior. Moreover, it was hypothesized, based on research by Mennin and colleagues (see above), that this association would be specific to anxiety symptoms, i.e. there would be no evidence of an association between concurrent depression symptoms and intraindividual behavioral variability. To replicate prior research, it was expected that both anxiety and depression symptoms would be associated with elevated mean-level quarrelsome and submissive behavior.

Depression and anxiety symptoms are marked by deleterious effects on interpersonal relationships which maintain and worsen illness (Coyne, 1976b; Hammen, 1991). Symptoms of depression impair the ability to form new relationships (Coyne, 1976a; Strack & Coyne, 1983), worsen the quality of current relationships (Fincham et al., 1997), and reduce the psychological well-being of people close to the depressed individual (Benazon & Coyne, 2000; Joiner, 1994). Impairment in relationships appears to drive a stress generation process by which strain on close relationships and frequent rejection confer considerable stress on the depressed individual (Hammen, 1991). This stress maintains and worsens symptoms, which leads to worsened psychological outcomes including suicide (Joiner, 2007). A similar interpersonal stress-generation process has been described for symptoms of anxiety (Davila & Beck, 2002). Consequently, it is critical to explore the patterns of interpersonal behavior that produce harmful interpersonal outcomes in depression and anxiety. Understanding such behavior patterns may contribute to differentiating anxiety from depression, may contribute to understanding the prognosis of anxiety and depression symptoms, and could inform treatment of individuals with anxiety symptoms, depression symptoms, and interpersonal concerns.

Considerable evidence exists for interpersonal problems and behaviors associated with depression and anxiety symptoms. However, research on interpersonal behavior in depression and anxiety symptoms has examined mean-level behavior and not intraindividual behavioral variability. Moreover, research on the interpersonal correlates of depression and anxiety has

generally not accounted for the high comorbidity between the two syndromes. This precludes documenting the interpersonal correlates specific to each syndrome (Starr & Davila, 2008a). The aim of the present study was to identify patterns of interpersonal behavior specific to depression or anxiety symptoms, particularly examining variability in interpersonal behavior.

Interpersonal Correlates of Depressive Symptoms

Laboratory and longitudinal studies have demonstrated that depressed individuals are commonly rejected by both strangers (Coyne, 1976a) and friends (Joiner et al., 1992). Observational studies of interactions between depressed and non-depressed individuals have identified a range of behaviors associated with elevated depression symptoms. Individuals with elevated depression symptoms report overall elevated quarrelsome and submissive behavior (Blumberg & Hokanson, 1983; Cain et al., 2012; Hokanson et al., 1986; Zuroff et al., 2007). Submissive behavior manifests as increased verbal submissive behavior (Hokanson & Butler, 1992) including excessive reassurance seeking (see Starr & Davila, 2008b for meta-analysis), and decreased nonverbal communication, such as eye contact (Hokanson et al., 1989; Troisi & Moles, 1999). Quarrelsome behavior manifests as increased nonverbal hostile behavior, such as frowning (Troisi & Moles, 1999), and increased verbal hostile behavior (Kahn et al., 1985).

Most of these studies did not adjust for concurrent anxiety (Starr & Davila, 2008a). It remains to be examined whether greater submissive and quarrelsome behavior is associated with depression and anxiety symptoms when accounting for comorbidity.

Interpersonal Correlates of Anxiety Symptoms

There is considerable evidence associating anxiety symptoms with elevated mean quarrelsome and submissive behavior (e.g., Oakman et al., 2003). For example, Eng and Heimberg (2006) report that individuals with generalized anxiety disorder behave in a more

vindictive manner. Submissive behavior manifests as interrupting a conversation partner less (Natale et al., 1979), talking less overall (Daly, 1978), and less frequently asserting oneself (Eng & Heimberg, 2006; Grant et al., 2007). In work by Pincus and colleagues, a large proportion of participants with social anxiety disorder report interpersonal problems associated with quarrelsome and/or submissive behavior (Cain, Pincus, & Grosse Holtforth, 2010; Kachin et al., 2001).

As depression and anxiety symptoms are often comorbid, it is necessary to adjust for concurrent symptoms of depression to study behaviors specific to anxiety. Alden and Phillips (1990) compared the associations of elevated self-reported anxiety and depression symptoms with submissive behavior. They found that both elevated anxiety and depression symptoms were associated with greater submissive behavior, although anxiety symptoms were associated with a greater amount of submissive behavior than depression symptoms.

Differentiating between Depression and Anxiety

Depression and anxiety symptoms are often comorbid, which necessitates adjustments for concurrent depression to study behaviors specific to anxiety (Starr & Davila, 2008a). Research on the mean behavioral tendencies of individuals with elevated depression or anxiety symptoms suggests that both are associated with elevated mean-level quarrelsome and submissive behavior. Accordingly, one would expect the same behavior patterns from an individual with elevated anxiety or depression symptoms. However, these conclusions may be an incomplete picture of patients' interpersonal behavior. Additional ways of characterizing patterns of interpersonal behavior may distinguish between depression and anxiety symptoms. For example, Creed and Funder (1998) suggest that friends described socially anxious individuals as sensitive and moody, which suggests greater variability in behavior. However, the association between

anxiety symptoms and variability in behavior has not been directly examined. To test for greater variability, a design permitting the repeated measurement of behavior is necessary.

Within Person Variability

Research on depression and anxiety has thus far emphasized the mean level of behavior. However, when samples of behavior are measured over time, the distribution of behaviors for each person can be described with a range of moments, including the mean and standard deviation (Fleeson, 2001; Moskowitz & Zuroff, 2004). Most often, variability has been defined as the within-person standard deviation; for example variability in a behavior is defined as the standard deviation of the behavior over events. While intraindividual variability on a given measure is associated with the individual's mean level, elevations in mean level explain only a portion of intraindividual variability (Eid & Diener, 1999; Fleeson & Gallagher, 2009).

It is not yet clear whether greater behavioral variability leads to improved or worsened well-being. Greater variability may reflect adaptability to social information, and less variability may reflect "rigidity," an inability to adapt one's behavior to social and emotional information (Dekeyser, Raes, Leijssen, Leysen, & Dewulf, 2008; Markus & Nurius, 1986; Tracey, 2005). Alternatively, greater variability is thought to reflect instability in behavior and fragmentation of self-concept and attachment (Donahue, Robins, Roberts, & John, 1993; La Guardia et al., 2000). Individuals with higher variability in behavior have been found to be higher on trait-level neuroticism (Moskowitz & Zuroff, 2005) and report greater interpersonal problems (Block, 1961; Foltz, Barber, Weinryb, Morse, & Chittams, 1999) including developing more distant work relationships (Côté et al., 2012) and impairments in close relationships (Rappaport et al., 2013). In clinical populations, behavioral variability is elevated in personality disorders, such as Borderline Personality Disorder (Russell et al., 2007).

As noted previously, it could be inferred from the results of Creed and Funder (1998) that within person variability may be associated with anxiety. Currently there are no reports of elevated behavioral variability for persons with elevated symptoms of depression. The present study is the first to examine whether elevated anxiety symptoms are associated with elevated variability in interpersonal behavior and whether behavioral variability is specific to anxiety.

Modeling Interpersonal Behavior with the Interpersonal Circumplex

Findings of elevated quarrelsome and submissive verbal and nonverbal behavior correspond with dimensions of the interpersonal circumplex model (see Pincus & Wright, 2011 for review). The interpersonal circumplex model has a long tradition of use in personality and clinical psychology to organize a broad range of interpersonal characteristics (Horowitz & Strack, 2010) using two orthogonal, intersecting dimensions (Leary, 1957; Wiggins, 1991). One dimension has been referred to as communion, warmth, and affiliation and refers to the agreeable-quarrelsome dimension of behavior. The other dimension has been referred to as agency, control, and dominance and refers to the dominant-submissive dimension of behavior. In the context of characterizing depression and anxiety, behaviors such as decreased eye contact exemplifies submissive behavior while criticism exemplifies quarrelsome behavior. Complex behaviors, such as excessive reassurance seeking, are described in two-dimensional space as a combination of the two axes. For example asking others for reassurance in an increasingly hostile manner would fall in the submissive-quarrelsome quadrant of the circumplex.

Present Study

The present study sought to establish the characteristic patterns of naturalistic interpersonal behavior associated with symptoms of anxiety and depression, particularly by examining the association between anxiety symptoms and behavioral variability. The use of an

ECR methodology (ECR; see Moskowitz & Sadikaj, 2011) permitted the assessment of behavior following substantial interpersonal interactions in daily life, which permitted the assessment of both mean levels and variability in naturalistic interpersonal behavior. Two methods of measuring within person variability were used: flux and spin (Moskowitz & Zuroff, 2005). Flux, variability in the intensity of a specific behavior, is defined as the standard deviation over events for a kind of behavior. This was computed for agreeable, quarrelsome, dominant, and submissive behavior. Spin takes advantage of the circular model of the interpersonal circumplex and refers to variability in the dispersion of interpersonal behavior over events.

The ECR method differs from other forms of self-report observations of behavior in naturalistic settings (e.g., ecological momentary assessment, Myin-Germeys et al., 2009) by recording information for a target event rather than at intervals of time. The ECR approach permits collecting data about interpersonal behavior and concurrent social cues close in time to the interpersonal event thereby reducing recall bias, which is sometimes found with one occasion measures particularly in distressed samples (Mogg, Mathews, & Weinman, 1987; Segrin, 2011).

Mean levels of behavior and behavioral variability were regressed on anxiety and depression symptoms. By measuring symptom severity the present study treats anxiety and depression as dimensional constructs. Using structural equation modeling, analyses are adjusted for the comorbidity between depression and anxiety to examine associations of elevated anxiety or depression symptoms with mean behaviors and with behavioral variability.

Hypotheses

1. Mean Behavior

a) We expected that higher levels of both depressive symptoms and anxiety symptoms

   would be associated with lower mean levels of communal and agentic behavior, that is,

   higher mean levels of quarrelsome and submissive behavior.

2. Within-Person Variability in Behavior

   a) We hypothesized that anxiety symptoms would be associated with greater fluctuation in

      the intensity of agreeable, quarrelsome, dominant, and submissive behavior over

      interactions (i.e., flux) and greater dispersion of behaviors over interactions (i.e., spin).

   b) We expected that flux and spin would be unrelated to depression symptoms.

Method

Participants

   Participants were recruited from the community through newspaper advertisements and

postings at community centers requesting individuals to contact our lab if interested in a study of

social behavior. There were 199 individuals who enrolled in the study after the study was

described in detail and eligibility criteria were reviewed. This sample has been used in studies of

metabolic burden, depression, gender, and psychophysiological responses to stress (D'Antono,

Moskowitz, & Nigam, in press; Gordon, Ditto, & D'Antono, 2012; Juster, Moskowitz, Lavoie, &

D'Antono, in press; Levesque et al., 2009; Levesque, Moskowitz, Tardif, Dupuis, & D'Antono,

2010). The sample used in SEM and regression analyses consisted of 192 participants, 113

women (58.85%), without missing data on depression, anxiety, or behavior variables, ranging in

age from 19 to 64 years. Demographic information for this sample is presented in Table 1.

Table 1. Descriptive statistics (N = 192)

Variable	*Mean*	*SD*
Age in years	40.98	11.33
Years of schooling	15.89	3.42
Beck Depression Inventory	8.45	7.19
Beck Anxiety Inventory	5.87	6.04
Mean Agreeable	1.55	0.39
Mean Quarrelsome	0.44	0.28
Mean Dominant	1.27	0.36
Mean Submissive	0.80	0.36
Flux Agreeable	0.81	0.10
Flux Quarrelsome	0.64	0.20
Flux Dominant	0.79	0.11
Flux Submissive	0.71	0.16
Spin	0.93	0.27

Variable	N	%
Marital Status		
Single	83	43.23
Married/cohabitating	80	41.66
Separated/divorced/widowed	29	15.1
Annual household income		
$29,999 and below	63	32.81
$30,000 – $59,999	71	36.98
$60,000 and above	58	30.21
Ethnicity		
Caucasian	167	86.98
African-origin	7	3.65
Asian-origin	2	1.04
Hispanic	5	2.60
Other	11	5.73

Participants were excluded based on the following criteria for the metabolic burden and psychophysiological facet of the project: (a) no utilization of mental health services within the

past year, (b) no current/known health problems or use of medication capable of affecting cardiovascular, immune, or neuroendocrine functions, (c) no learning or cognitive disabilities sufficient to impair ability to complete questionnaires or understand instructions, and (d) not currently on hormone replacement therapy.

Despite the criteria excluding participants receiving mental health treatment, examination of scores on the Beck Depression Inventory indicated a substantial number of participants with mild ($N = 26$, 13.54%), moderate ($N = 21$, 10.94%), or severe ($N = 1$, .52%) symptoms of depression (see Table 1). Mild depression symptoms were assessed using a cut off of 13 (Lasa, Ayuso-Mateos, Vázquez-Barquero, Díez-Manrique, & Dowrick, 2000). Moderate depression symptoms used a cut off of 18; severe depression symptoms used a cut off of 29 (Beck, Steer, & Carbin, 1988). Examination of scores on the Beck Anxiety Inventory indicated a substantial number of participants with mild ($N = 43$, 22.40%), moderate ($N = 10$, 5.21%), or severe ($N = 4$, 2.08%) symptoms of anxiety. Mild anxiety symptoms were assessed using a standard cut off of 7 (Beck & Steer, 1990), which may be stringent (Leyfer, Ruberg, & Woodruff-Borden, 2006). Moderate anxiety symptoms used a cut off of 15; severe anxiety symptoms used a cut off of 25.

Procedure

Following informed consent in the laboratory, participants completed self-report questionnaires including demographic information, the Beck Depression Inventory-II (BDI), and the Beck Anxiety Inventory (BAI), along with measures relevant to other facets of the project (e.g., metabolic burden). Participants were then instructed in completing the event-contingent recording (ECR) forms on handheld electronic devices. Participants were asked to complete ECR forms following substantial interactions defined as interactions lasting longer than 5 minutes for the next 21 days. Participants completed between 3 and 242 forms reporting on

social interactions ($M = 86.90$, $SD = 35.55$). This is consistent with previous research using the ECR procedure (e.g., Zuroff et al., 2007). Number of forms completed was not related to anxiety symptoms, r (199) = -.084, $p > .1$ or depression symptoms, r (199) = -.109, $p > .1$, using pairwise deletion and the full dataset.

Participants reported on their behavior by endorsing items from the Social Behavior Inventory (SBI; see below). When provided with the same form daily, participants develop a response set. For this reason, four forms were created with 3 items for each behavior pole and rotated over events, as in prior research from Moskowitz and colleagues (Moskowitz & Sadikaj, 2011). The Research and Ethics Board of the Montreal Heart Institute approved this study.

Measures

Beck Depression Inventory-II (BDI; Beck, Steer, et al., 1988): This is a 21-item self-report questionnaire that instructs participants to rate symptoms of depression experienced over the past two weeks, such as anhedonia, using a 4-point scale ranging from not at all to severely. A French version of the BDI was used. Psychometric properties for the French version are provided by Baron and Laplante (1984) and Byrne and Baron (1994). In the present sample, inter-item reliability was high, α = .89; scores showed considerable range (0 – 32); see Table 1.

Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988): This is a 21-item self-report questionnaire that instructs participants to rate symptoms of anxiety experienced over the past two weeks using items such as "I feel terrified" and "I feel unable to relax" using a 4-point scale ranging from not at all to severely. A French version of the BAI was used. Psychometric properties have been previously established for this version (Freeston, Ladouceur, Thibodeau, Gagnon, & Rhéaume, 1994). In the present sample, inter-item reliability was high, α = .88; scores showed considerable range (0 – 32); see Table 1.

Social Behavior Inventory (SBI; Moskowitz, 1994): The SBI contains 12 behavior items for each of the four poles of the interpersonal circumplex model: agreeable, quarrelsome, dominant, and submissive (Wiggins, 1991). For example, agreeable and quarrelsome behaviors are represented by items such as, "I smiled and laughed with others" and "I made a sarcastic comment," respectively. Dominance and submissiveness are represented by items such as, "I made a suggestion" and "I gave in," respectively. A French translation was used. Participants endorsed behaviors in which they had engaged during each event. Behavior scores are then computed as the number of behaviors endorsed for each pole for each interaction.

There is considerable evidence for the reliability and validity of the SBI when used within an ECR context. Inter-item reliability for the scales ranges from moderate to high. High stability estimates over days for all SBI scales have been found when using a 20-day ECR procedure (Moskowitz, 1994). The relations between SBI scales correspond to the interpersonal circumplex model (Moskowitz, 1994; Moskowitz & Côté, 1995), and SBI scores correlate as expected with a questionnaire measure of the interpersonal circumplex (Moskowitz, 1994). Scores are sensitive to situational and psychopharmacological changes (Moskowitz, Pinard, Zuroff, Annable, & Young, 2001; Moskowitz, Suh, & Desaulniers, 1994). In addition, participant reports of behavior are correlated with observer ratings of participant behavior (Mongrain et al., 1998) Inter-item reliability for the version of the SBI used in the present study ranged from .816 (agreeable behavior) to .867 (quarrelsome behavior).

Data Analysis

Computing behavior scores. Mean scores for behavior were computed by averaging over events within person to establish a mean for each behavior: dominant, submissive, agreeable, and quarrelsome. Flux scores were computed by taking the standard deviation of

scores over events within person for each behavior. Spin over all events was calculated as described in Moskowitz and Zuroff (2004). Reported behavior at each event was consolidated to the two dimensions of the interpersonal circumplex: agency and communion. Behavior was then plotted using a Cartesian plane and the angular position in radians for each event was computed. Spin is calculated as the standard deviation of angular position within person over events.

Model development. Structural equation modeling was used to model the relation of depression and anxiety with behavioral variables while adjusting for 1) the correlation of depression and anxiety symptoms, and 2) the intercorrelation of behavioral variables. Due to strong evidence of an intercorrelation between depression and anxiety symptoms, these variables were allowed to correlate throughout analyses. Previous work with ECR interpersonal behavior data has first ipsatized scores to parcel out a tendency for the participant to endorse a high or low number of behaviors. The present analysis adjusted for participant response tendency by allowing for intercorrelation of the error terms for mean and flux to account for response tendency. Each behavior is predicted while adjusting for intercorrelation with other behaviors.

The first model (Figure 1) evaluated the association of depression and anxiety symptoms with mean level of interpersonal behavior. This model was constructed on the basis of prior literature, which suggests that elevated mean level of quarrelsome and submissive behaviors is associated with both depression and anxiety symptoms. Possible paths to agreeable and dominant behavior were tested and found non-significant.

The second model (see Figure 2) evaluated the ability to differentiate depression and anxiety symptoms by including behavioral variability (i.e., flux). This permitted evaluating the relation between anxiety symptoms and flux in behavior and the specificity of flux to anxiety

30

symptoms. Pathways from depression symptoms to flux variables were tested by inclusion in an alternative model, which was compared against the second model.

A final component of the second model examined the association of mean and flux measures of behavior. Elevated variability has been found to correspond to elevated mean level (Baird et al., 2006), but to also be distinct from mean level (Eid & Diener, 1999). Therefore, variability was adjusted for mean level, and residual errors for mean and flux variables were allowed to correlate for each behavior. This has the effect of adjusting structural paths between anxiety, depression, and flux variables for individuals' mean level and produces a more stringent test of the association between anxiety, depression, and flux.

Model fit was evaluated using the chi-square ratio test, RMSEA, CFI, and NFI. Since models one and two differ considerably in variables included, comparisons based on model fit and comparative fit indices are not appropriate. Rather, fit was assessed for each model, and comparisons were made based on model interpretability. Alternatives to model 2 were compared based on a chi-square difference test and inspection of AIC and BIC fit criteria. All variables were normally distributed, but model 1 and 2 were not multivariate normal. SEM was rerun using bootstrapping and the Bollen-Stine approach (Bollen & Stine, 1993). Model fit was unchanged in model 1 and improved in model 2 ($p = .171$). Regression estimates were unchanged in both models. Linear regression was used to examine an alternative measure of variability and to provide effect size estimates without the assumption of multivariate normality.

Results

Means Only Model

The initial model tested how depression and anxiety are associated with mean levels of interpersonal behavior. The model fit the data well, $\chi^2 (4) = 7.201$, $p = .126$, $RMSEA = .065$,

$p_{close} = .303$, *CFI* = .994, *NFI* = .987. Associations between depression and anxiety with mean

levels of agreeable and dominant behavior were nonsignificant; removing each improved model

fit. This model demonstrates that both anxiety and depression are associated with higher mean

levels of quarrelsome and submissive behavior (see Figure 1).

Figure 1. Mean Level Interpersonal Behavior as a Function of Depression and Anxiety
Symptoms
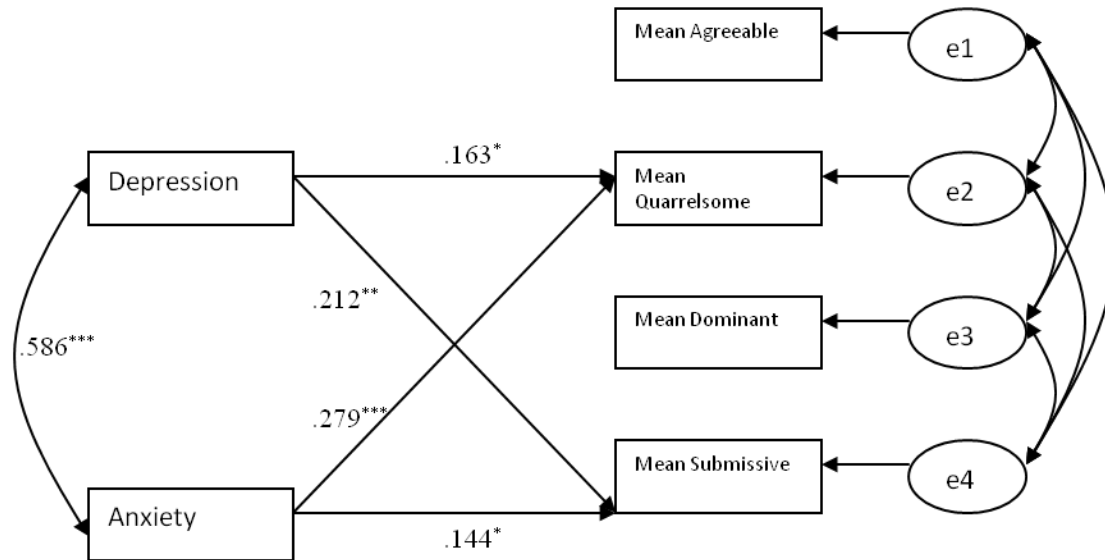
Note. All covariances between connected error terms are significant. * $p \leq .05$, ** $p \leq .01$, ***p

$\leq .001$.

χ^2 (4) = 7.201, *p* = .126, *RMSEA* = .065, p_{close} = .303, *CFI* = .994, *NFI* = .987

Means and Flux model

The second model included the flux variables and examined the relation between mean

behavior and flux in behavior. As expected, flux variables were each predicted by its respective

mean, suggesting that variability in a given behavior is higher for people who engage in that

behavior to a greater degree. This may explain the lack of a structural pathway from anxiety to

flux in quarrelsome behavior. Mean quarrelsome behavior accounted for 75% of variability in flux ($r^2 = .752$) leaving substantially less variance to be explained by anxiety symptoms.

Behavioral differences between anxiety and depression symptoms became apparent in this second model (see Figure 2). This model built on the previous, means only model, by including the associations between depression and anxiety with mean level behavior. To test the association between anxiety symptoms and variability, the structural paths between anxiety symptoms and flux were added first. This model had good fit, χ^2 (16) = 34.520, $p = .005$, $RMSEA = .078$, $p_{close} = .094$, $CFI = .982$, $NFI = .968$, $AIC = 112.52$, $BIC = 239.56$. The association between anxiety symptoms and flux in quarrelsome behavior was nonsignificant; removing this association improved model fit. Figure 2 includes fit indices without the path between anxiety symptoms and flux in quarrelsome behavior. The model demonstrates that anxiety symptoms are associated with flux for agreeable, dominant, and submissive behavior.

The specificity of these findings to anxiety symptoms was tested by including structural pathways from depression symptoms to the flux variables. Model fit worsened when including structural pathways from depression symptoms to flux variables, χ^2 (12) = 32.654, $p = .001$, $RMSEA = .095$, $p_{close} = .029$, $CFI = .980$, $NFI = .970$, $AIC = 118.65$, $BIC = 258.73$. Associations between anxiety and flux variables were unchanged when including paths from depression to flux variables. Associations between depression and flux were non-significant as suggested by AIC and BIC and further evidenced by a chi-square difference test that model fit did not worsen when excluding these associations, χ^2 (4) = 1.866, *n.s.* Excluding these associations provided a more parsimonious model of variability. Individuals who reported elevated anxiety symptoms report elevated behavioral variability independent of concurrent depression symptoms.

Figure 2. Mean Level Interpersonal Behavior and Variability as a function of Depression and Anxiety Symptoms
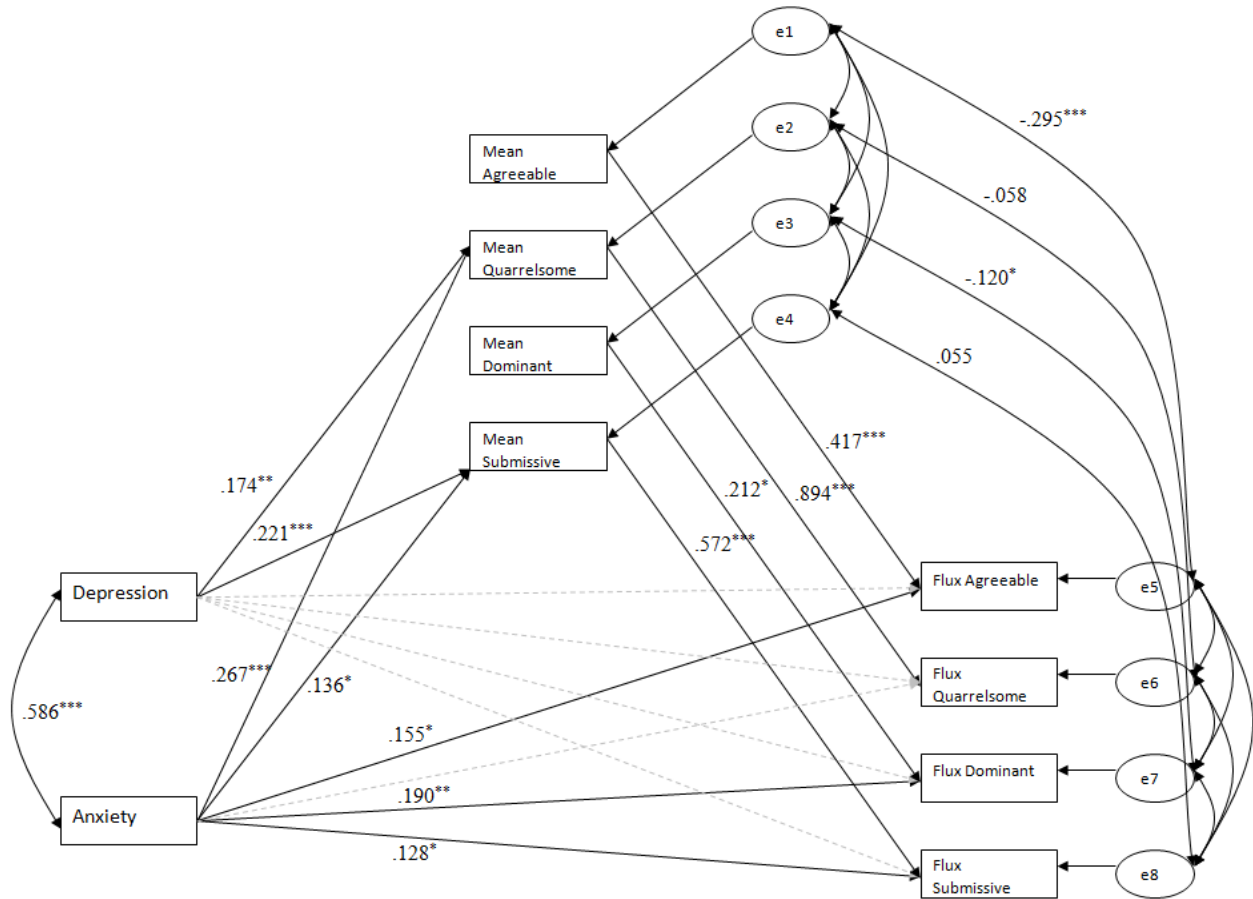
Note. All covariances between connected error terms are significant ($p < .01$) except where

noted. --- indicates non-significant paths. * $p \leq .05$, ** $p \leq .01$, ***$p \leq .001$.

χ^2 (17) = 34.668, p = .007, $RMSEA$ = .074, p_{close} = .124, CFI = .983, NFI = .968

     Ipsatized behaviors. To verify the estimates provided from SEM, behavior scores were

ipsatized according to Moskowitz (1994) and used to recompute flux. Flux on each pole was

regressed on mean level, depression symptoms, and anxiety symptoms. This model explained

between 6.5% and 24.9% of the variance in flux scores: agreeable, F (3, 188) = 4.35, p = .0055,

R^2 = .065, quarrelsome, F (3, 188) = 14.8, $p < .0001$, R^2 = .19, dominant, F (3, 188) = 4.85, p =

.0028, R^2 = .072, submissive, F (3, 188) = 20.73, $p < .0001$, R^2 = .249. Results confirm the SEM

analysis and suggest larger effects size estimates. Anxiety symptoms predicted flux on each behavior pole: $\beta_{agreeableness} = .222$, $p = .012$, $\beta_{quarrelsomeness} = .274$, $p = .0009$, $\beta_{dominance} = .308$, $p = .0006$, $\beta_{submissiveness} = .323$, $p < .0001$. Depression symptoms did not predict flux.

MSSD. We subsequently computed an alternative set of within-person variability scores using the Mean Square Successive Differences approach for each behavior pole (MSSD; Ebner-Priemer et al., 2009; von Neumann et al., 1941). This approach incorporates time-dependency of observations by computing the average degree of deviation of each event from the prior event. Analyses using these scores were consistent with the standard deviation approach.

Variability in Dispersion of Behavior

The association between symptoms of anxiety and variability in behavior was further tested with variability in dispersion of behavior (i.e., spin). Spin constitutes a single measure of variability combining the four behaviors. Therefore SEM was not needed to adjust for correlations among a set of behaviors as in the previous analyses. Spin was regressed on depressive symptoms, anxiety symptoms, and mean levels of agreeable, quarrelsome, dominant, and submissive behavior. This adjusts spin for mean level of each behavior and for the correlation of anxiety and depression, as is done in SEM. This model explained 79.6% of the variance in spin scores, $F (5, 186) = 144.77$, $p < .0001$, $R^2 = .796$. As hypothesized, elevated anxiety symptoms were associated with greater spin, $\beta = .10$, $p = .019$. Depression symptoms were not associated with spin, $\beta = .055$, $p = .191$.

Discussion

The present study examined the interpersonal behavior patterns associated with depression and anxiety symptoms. When modeling behavior as mean levels symptoms of depression and anxiety were found to be indistinguishable. It is notable that elevated symptoms

of depression and anxiety were both associated with greater quarrelsome and submissive behavior even when adjusting for the correlation between depression and anxiety.

The degree to which individuals' behavior was variable over events (i.e., flux and spin) distinguished symptoms of anxiety from symptoms of depression. Elevated anxiety symptoms were associated with greater variability of agreeable, dominant, and submissive behavior over events (i.e., flux on these behavior dimensions) and greater dispersion of behavior over events (i.e., spin). Depression symptoms were not associated with either measure of behavioral variability and associations with anxiety remained when adjusting for depression symptoms and the associated mean level.

The results of this study regarding mean level of behavior are consistent with the association of anxiety and depression symptoms with overall more quarrelsome and submissive behavior (Allan & Gilbert, 1997; Oakman et al., 2003; Zuroff et al., 2007). Individuals in a depressive episode (Cain et al., 2012) and with Generalized Anxiety Disorder (Erickson & Newman, 2007; Przeworski et al., 2011; Salzer et al., 2008) report interpersonal problems related to mean-level quarrelsome and submissive behavior, which decrease following psychotherapy (Borkovec et al., 2002; Salzer, Pincus, Winkelbach, Leichsenring, & Leibing, 2011). For example, Kachin et al. (2001) report that Generalized Anxiety Disorder was associated with interpersonal problems related to cold, vindictive, and unassertive behavior. Among individuals with depression, Cain et al. (2012) suggest six subtypes of interpersonal problems: five of which describe quarrelsome or submissive behavior, encompassing 75% of a clinically depressed sample. The present findings concur that elevated symptoms of anxiety and depression are associated with elevated quarrelsome and submissive behavior.

Past research has generally not examined intraindividual variability in the interpersonal behavior of depressed and anxious individuals. The present results contribute to a growing literature identifying associations of behavioral variability with clinical symptoms. Thus far, greater interpersonal flux and spin has been associated with Borderline Personality Disorder (Russell et al., 2007). The current study extends prior work by demonstrating the association of behavioral variability with anxiety symptoms and specificity of the association compared to concurrent depressive symptoms.

Interpersonal problems are a frequent reason individuals seek psychotherapy treatment and are often a critical mechanism in the worsening of psychological distress (Hammen, 1991). Moreover, individuals often report symptoms consistent with depression or anxiety, including frequently both concurrently. It has been well established that individuals with elevated symptoms of depression and anxiety engage in, overall, greater levels of quarrelsome and submissive behavior. However, research is needed on other measures of interpersonal behavior, including assessment of variability over events such as flux, spin, and sensitivity to social cues.

Causes of behavioral variability. Erickson, Newman and Pincus (2009) examined the impact of variability in perception of others, concluding that it partially accounted for the association between interpersonal problems and variability in behavior (Erickson et al., 2009). Changes in affect mediate between perception of others and behavior (Sadikaj, Russell, Moskowitz, & Paris, 2010). Increased variability in event-level affect and perceptions of others may partially explain increased variability in event-level behavior.

Behavioral variability may also be associated with the heightened physiological responses characteristic of elevated anxiety symptoms. Individuals with elevated anxiety symptoms show heightened physiological sensitivity to potential social threats (Borkovec, Stone,

O'Brien, & Kaloupek, 1974) including heart rate and systolic blood pressure in laboratory stress tasks (Beidel, Turner, & Dancu, 1985). Further research is warranted to investigate the physiological underpinnings of variability in behavior among anxious individuals.

Consequences of behavioral patterns. It has been suggested that the stress generation model is a mechanism by which symptoms of depression and anxiety generate interpersonal stress, which worsens symptomatology (Liu & Alloy, 2010). Worsened symptoms of depression and anxiety then may develop into clinically-relevant syndromes. The current results suggest divergent pathways by which elevated symptoms may generate interpersonal problems. For example, elevated anxiety symptoms may be associated with interpersonal problems related to behaving in an erratic manner, problems which are not associated with depression symptoms.

Thus far, greater behavioral variability has been associated with more negative outcomes, such as increased negative affect in others (Côté et al., 2012) and psychopathology (Russell et al., 2007). However, it remains possible that too little behavioral variability may underlie some psychopathology in which individuals are unable to adapt to the demands of different interpersonal situations (Paulhus & Martin, 1988; Tracey, 2005). In the present community sample, neither symptoms of depression nor anxiety were associated with decreased behavioral variability. Consequences of low variability (i.e. rigidity) should be examined for other forms of psychopathology and for more extreme ranges of behavior.

Limitations and Future Research

Depression and anxiety were treated as dimensional based on symptom severity. Despite use of a community-based sample, the distribution of scores on the BDI and BAI suggest mild and moderate symptoms in a substantial proportion of the sample. In a clinical sample, patterns of behavior have been shaped over time and may be more easily identified than in a non-clinical

sample. Thus, a non-clinical sample provides a more conservative test of the interpersonal correlates that distinguish depression from anxiety symptoms. Nonetheless, these findings are most relevant to the behavior patterns associated with self-reported severity of depression and anxiety symptoms. Replication is warranted with clinician-rated measures of symptom severity in a clinical population.

Future research might consider the import of within person changes in quarrelsome behavior, agreeable behavior, and behavioral variability. It is of particular interest to clarify whether variability increases when symptoms of anxiety worsen and decreases with the reduction of anxiety symptoms and whether this association is specific to anxiety compared to depression. Moreover, future research is needed to establish the direction of the association between anxiety and variability. This could be established by measuring behavioral variability and anxiety symptoms at several time points in a longitudinal design, such as over the course of treatment.

A future avenue to describe the stress-generation process is to further describe the interpersonal consequences of behavioral variability. For example, elevated behavioral variability seems to confer greater risk for interpersonal problems (Block, 1961; Foltz et al., 1999; Rappaport et al., 2013) including social isolation at work (Côté et al., 2012).

Practice Implications

Côté et al. (2012) found that people who work with individuals with high within-person variability, specifically spin, experience more negative affect, and the co-workers' negative affect increases with longer relationships with the highly variables individual. Co-workers also display increased avoidance of the individual, an effect which is explained by the increases in negative affect. Therapists should be sensitive to the possible impact of erratic behavior by the anxious person on others' negative affect. This would include awareness that the therapist may

experience more negative affect with more anxious patients and the experience of negative affect may increase over time disturbing the therapeutic relationship, even leading to subtle forms of disengagement and withdrawal from the patient.

The present results also supports the position that anxiety symptoms are not only associated with problems of affect but anxiety is also associated with social problems that may exacerbate the person's symptoms. For example, social avoidance by others may isolate the anxious individual, reducing social support and thereby increasing the anxious person's vulnerability. While Cognitive Behavioral Therapy has been found to be an effective therapy for anxiety disorders, anxious individuals might also benefit from the addition of techniques that address self-regulation of the patient's interpersonal behaviors, such as Interpersonal Psychotherapy and Dialectical Behavior Therapy.

Conclusion

The current research demonstrates several key patterns of interpersonal behavior characteristic of depressive and anxiety symptoms. Examining both an individual's mean level and behavioral variability extended research on interpersonal behavior in depression and anxiety by demonstrating commonalities and divergence between two highly comorbid phenomena. These findings propose that behavioral variability, quarrelsome behavior, and submissive behavior may be mechanisms in the stress-generation model that beget interpersonal stressors wherein anxiety is uniquely associated with greater behavioral variability. Future research is warranted to build on these findings to investigate the interpersonal problems associated with greater behavioral variability. Evidence of such interpersonal problems would suggest a specific pathway by which anxiety symptoms lead to interpersonal distress and worsened symptomatology. This may inform the patterns of interpersonal behavior of any disorders

characterized by high comorbid levels of anxiety or depression symptoms. These findings may

also inform treatment for anyone presenting with anxiety symptoms and interpersonal problems.

Association of Anxiety and Behavioral Variability: Between-person and analysis of change

Study 1 replicated the expected association of anxiety and depression symptoms with elevated mean-level quarrelsome and submissive behavior. It then built on this research to investigate the association of anxiety and depression symptoms with intraindividual variability in behavior. Consistent with expectations drawn from the emotion regulation literature, Study 1 found that anxiety symptoms, but not depression symptoms, were associated with elevated intraindividual variability as measured using flux and spin. While this research is a potentially important extension of research into the interpersonal behavior characteristic of individuals with elevated anxiety symptoms, Study 1 was conducted at the between-person level of analysis. As such, it demonstrates that individuals with elevated anxiety symptoms demonstrated elevated intraindividual behavioral variability. To further support the association between anxiety and intraindividual behavioral variability, it is important to examine this association of change in anxiety and change in intraindividual behavioral variability. For example, it would be important to examine whether intraindividual behavioral variability increases as anxiety symptoms develop or decreases as anxiety symptoms improve.

In addition to building on the association found in Study 1, an analysis of change in anxiety and intraindividual behavioral variability provides the opportunity to explore the temporal ordering of anxiety and intraindividual behavioral variability. Study 1 suggested that anxiety symptoms predict intraindividual behavioral variability. This is consistent with other research into the interpersonal behavioral correlates of anxiety and depression symptoms (e.g., Coyne, 1976b). However, due to the between-person nature of this research, it is not feasible to infer that this temporal ordering is accurate. A study of the association of change in anxiety and intraindividual behavioral variability over time provided the opportunity to examine whether

changes in intraindividual behavioral variability follow from changes in anxiety symptoms or

whether changes in intraindividual behavioral variability precede changes in anxiety symptoms.

The former would support the temporal association implied in Study 1 and by prior research.

Study 2

Elevated anxiety symptoms are associated with increased risk for interpersonal problems (Alden & Taylor, 2004; Coyne, 1976b; Hammen, 1991). In turn, interpersonal problems, such as the lack of a supportive social network, lead to worsened symptoms and greater vulnerability to stress. Examples of such interpersonal problems include difficulty forming new relationships (Coyne, 1976a), increased frequency of rejection from others (Joiner et al., 1992), and greater distress in existing relationships (Fincham et al., 1997). Increased interpersonal problems may lead to greater vulnerability to acute stressful life events, thereby, elevating risk for worsened symptomatology. This process forms a cycle referred to as the "stress-generation" process in which elevated anxiety symptoms, among other conditions, lead to interpersonal problems, which lead ultimately to worsened symptoms (Conway et al., 2012; Davila, Bradbury, Cohan, & Tochluk, 1997; Hammen, 1991; Liu & Alloy, 2010).

An important contributor to interpersonal problems is the person's interpersonal behaviors (Shahar, Joiner Jr., Zuroff, & Blatt, 2004). Elevation in anxiety symptoms is associated with elevated submissive and quarrelsome behaviors measured using the mean or global tendencies (Rappaport, Moskowitz, & D'Antono, 2014). However, when behavior is assessed over a variety of events other features of behavior can be assessed, such as intraindividual variability (Fleeson, 2001). Such features of behavior may also contribute to interpersonal problems. One kind of intraindividual variability, spin, refers to the extent of dispersion in interpersonal behavior over events (Moskowitz & Zuroff, 2004); this kind of intraindividual variability has been associated with interpersonal problems such as more distant work relationships (Côté et al., 2012) and impaired completion of goals shared with another person (Rappaport et al., 2013).

Theory suggests that interpersonal behaviors characteristic of anxiety (e.g., elevated quarrelsome and submissive behavior) contribute to anxiety symptoms. This notion presents possible targets for the interpersonal treatment of anxiety disorders; however little is known about change in behavior over the course of treatment (Eberhart & Hammen, 2009; Shahar et al., 2004). The present study examined whether change in symptoms was associated with change in mean-level behaviors and change in the dispersion of interpersonal behaviors over the course of treatment.

Interpersonal Correlates of Anxiety Symptoms

The association of anxiety symptom with greater mean-levels of quarrelsome and submissive behavior has been widely demonstrated (e.g., Oakman et al., 2003). Manifestations of increased quarrelsome behavior include greater verbal hostility (Grant et al., 2007) and more intrusive statements (Eng & Heimberg, 2006). Manifestations of greater submissive behavior include less involvement in conversations (Daly, 1978), less assertive behavior (Eng & Heimberg, 2006; Grant et al., 2007), and a lower frequency of interrupting the conversation (Natale et al., 1979). Many of these studies are limited by not assessing concurrent depression symptoms, which may confound the association of anxiety and interpersonal behavior patterns. One study of naturalistic interpersonal behavior patterns among community adults, Rappaport, Moskowitz, and D'Antono (2014), did demonstrate that elevated anxiety symptoms were associated with elevated quarrelsome and submissive behavior and that these results were robust to adjustment for concurrent depression symptoms.

Intraindividual behavioral variability. Research on interpersonal behavior has generally been limited to assessment of behavior at a single-occasion or estimation of an individual's general behavioral tendency assumed to generalize over a set of events. However,

statistical and methodological developments make it possible to examine other features of

behavior, such as intraindividual variability in behavior over events. For example, the standard

deviation of measurements of behavior over time has been studied with respect to single

behavioral dimensions and the dispersion of behavior among dimensions (Moskowitz & Zuroff,

2004, 2005). Moskowitz and Zuroff referred to these measures of an individual's behavior as

flux and spin, respectively.

There is disagreement about the meaning of elevated intraindividual variability. One

interpretation of intraindividual variability is that it reflects greater adaptability to the

environment and socioemotional cues, such that low variability reflects a rigid behavioral pattern

(Leary, 1957). Lower intraindividual variability has been associated with cognitive

perseveration (Epstein, 1973), difficulty integrating social information (Markus & Nurius, 1986),

and lower well-being (O'Connor & Dyce, 1997; Paulhus & Martin, 1988). In an examination of

the specific ability to adapt one's behavior in response to the interpersonal behavior of one's

interaction partner, Tracey (2005) demonstrated interpersonal problems among individuals with

difficulty adapting their behavior. This suggests that the ability to respond to socioemotional

information can be assessed without relying on a restricted range of interpersonal behaviors.

Distress may be associated with both elevated intraindividual variability in interpersonal

behavior and impaired ability to react to socioemotional information. Furthermore, this suggests

that intraindividual variability may be not entirely due to reactions to situational cues.

Alternatively, elevated variability is thought to reflect dysregulation of behavior and

fragmentation of self-concept (Donahue et al., 1993). Elevated spin in interpersonal behavior

has been associated with neuroticism (Moskowitz & Zuroff, 2005), self-criticism (Kopala-Sibley

et al., 2013), and Borderline Personality Disorder (Russell et al., 2007). While it may be possible

that elevated variability is associated with greater reactivity to situational cues (Erickson et al., 2009), greater intraindividual variability is more than reactions to situational cues. Erickson et al. (2009) demonstrated that intraindividual variability in behavior is distinct from changes in behavior resulting from reactions to situational cues, such as the behavior of the other person. Thus, highly variable individuals are not simply more sensitive to situational cues.

The association of intraindividual variability in behavior with anxiety and depression was examined by Rappaport, Moskowitz, and D'Antono (2014) in a community sample. They demonstrated that flux and spin increased with increasing severity of anxiety symptoms but not with increases in depressive symptoms. This study was limited to a between-person analysis of the association between anxiety symptoms and intraindividual variability in behavior. A study with multiple measurements of the individual over time would permit the examination of the association of change in anxiety and change in intraindividual behavioral variability and of the temporal ordering of change in anxiety and interpersonal behavioral. This kind of design could contribute to understanding the temporal order in the association between anxiety and interpersonal behavior.

Anxiety and Behavior Change

The stress generation model suggests that elevated anxiety symptoms, among other conditions, increase the risk for interpersonal problems, which ultimately lead to worsened symptoms. Research (Alden & Phillips, 1990; Rappaport, Moskowitz, & D'Antono, 2014) has demonstrated interpersonal behavior patterns associated with anxiety symptoms that may lead to the interpersonal problems that mediate the stress generation process. As this research has been largely conducted at the between-person level of analysis, an aspect of the model which is

implied but which has not been directly tested is whether reductions in anxiety symptoms lead to improved patterns of social behavior.

Several studies have demonstrated reductions in interpersonal problems subsequent to psychotherapy treatment (Borkovec et al., 2002; Salzer et al., 2010; Salzer et al., 2011). Typically these studies ask patients to report on interpersonal problems at baseline and over the course of psychotherapy treatment. Psychotherapy treatment often addresses interpersonal functioning and interpersonal dynamics. Interpersonal behavior may change during psychotherapy because of the treatment and not because of the change in symptoms. In other words, psychotherapy may directly influence interpersonal behavior in the context of treatment for anxiety symptoms. To study the temporal association of anxiety symptoms and interpersonal behavior patterns, it is necessary to use a treatment which minimizes the risk of the treatment leading directly to changes in interpersonal behavior. This allows for more cautious estimation of the effect of symptom improvement on interpersonal behavior.

Use of a pharmacological treatment has the potential to provide a stringent test of whether change in anxiety symptoms leads to change in interpersonal behavior. There is evidence that pharmacological treatment produces reductions in anxiety symptoms (Liebowitz et al., 2002; Stein et al., 1998; van Vliet, den Boer, & Westenberg, 1994). In the present study, we administered a pharmacological treatment for social anxiety disorder to produce improvement in anxiety symptoms. We then examined whether change in anxiety symptoms led to changes in mean levels of interpersonal behavior and the dispersion of interpersonal behavior.

The Interpersonal Circumplex Model

The interpersonal circumplex model of behavior provides a structure for organizing the specific behavioral tendencies characteristic of anxiety (see Pincus & Wright, 2011 for review).

The interpersonal circumplex consists of two orthogonal, intersecting dimensions describing communal and agentic behavior (Leary, 1957; Wiggins, 1991). Combining both dimensions provides four quadrants: agreeable, dominant, quarrelsome, and submissive behavior. Behaviors such as decreased eye contact exemplify submissive behavior while criticizing the other person exemplifies quarrelsome behavior. Complex behaviors, such as excessive reassurance seeking (Joiner et al., 1992; Starr & Davila, 2008b) are described in two-dimensional space, for example in the submissive-quarrelsome quadrant of the circumplex. By organizing behaviors using the interpersonal circumplex it becomes possible to plot each behavior in two-dimensional space and to assess dispersion in behavior over events.

The Present Study

The present study sought to examine the associations of reductions in anxiety symptoms with changes in mean quarrelsome behavior, mean submissive behavior, and interpersonal spin. A pharmacological agent, paroxetine, was used, which was expected to reduce anxiety symptoms. Considerable evidence suggests that selective serotonin reuptake inhibitors, such as, paroxetine, produce decreases in anxiety symptoms (Liebowitz et al., 2002; Stein et al., 1998; van Vliet et al., 1994).

We first examined whether taking paroxetine led to decreases in levels of anxiety. Second, we examined whether mean levels of quarrelsome or submissive behavior changed as anxiety symptoms changed. We expected that mean quarrelsome behavior and mean submissive behavior would decrease following prior decreases in symptoms of anxiety. Third, we examined whether spin changed subsequent to changes in anxiety symptoms. Lastly, we repeated analyses substituting depression symptoms for anxiety. We expected similar findings for depression

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symptoms except we expected that spin would not be associated with depression symptoms and thus changes in spin would not precede or follow changes in symptoms of depression.

To accomplish these aims, individuals with social anxiety disorder were recruited. Interpersonal behavior was assessed at baseline and at 4 week intervals during treatment using paroxetine. Interpersonal behavior was assessed using an event-contingent recording procedure and the Social Behavior Inventory, which assesses behavior based on the four poles of the Interpersonal Circumplex model of behavior (Moskowitz, 1994). This design permitted examining temporal sequences in changes in anxiety symptoms and changes in interpersonal behaviors over the course of treatment.

The association between change in symptomatology and change in behavior was evaluated using a latent different score model called the "change to change" method (Grimm, An, McArdle, Zonderman, & Resnick, 2012; McArdle & Grimm, 2010). A latent difference score model was first developed to model change over time for behavior and symptoms. Two pathways were then added to compare the relation between change in behavior and prior change in symptoms against the relation between change in behavior and subsequent change in symptoms.

Hypotheses

A. Paroxetine treatment would reduce anxiety symptoms.

B. Reductions in anxiety symptoms would precede reductions in mean quarrelsome behavior, mean submissive behavior, and spin.

C. The association of change in symptoms with change in spin would be specific to anxiety symptoms and would not be present for depression symptoms.

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Method

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Participants

Potential participants were recruited from two sources. Two participants were recruited from a prior study of social anxiety disorder (Russell et al., 2011). The remaining participants were recruited from the community via advertisements, which described symptoms of social anxiety disorder and invited individuals to take part in a study of social interactions. Participants were screened over the phone for social anxiety disorder and provided a description of the study. Interested individuals were invited to an initial meeting, which included diagnostic assessment.

There were 52 individuals who were invited to the initial study session, of whom 40 were considered eligible and enrolled in the study. Participants' ages ranged from 20 to 60 years (M = 33.92, SD = 11.49).

Inclusion criteria for the study were the ability to understand study materials in English, a diagnosis of social anxiety disorder, and suitability to receive paroxetine. Exclusion criteria were: a concurrent diagnosis of bipolar or psychotic disorder or the lack of suitability to receive paroxetine. Participants meeting criteria for concurrent disorders were enrolled when social anxiety disorder was the primary diagnosis. Individuals were determined to be not suitable for paroxetine treatment if they had hypersensitivity to paroxetine or were taking a MAOI medication. Rates of psychiatric comorbidity, established by the MINI, were relatively low, 1 individual (3%) was diagnosed with concurrent dysthymic disorder and 1 (3%) individual was diagnosed with concurrent panic disorder. We used the Montgomery Åsberg Depression Rating Scale (MADRS) to examine the range of baseline depression symptoms. MADRS scores indicated mild depressive disorder in 12 participants (25%) using a cut-off of 10 (Hawley, Gale, & Sivakumaran, 2002; Mittmann et al., 1997). Depression symptoms ranged from 1 to 15. Other demographic information is provided in Table 2.

Table 2. Demographic Information for Study 2 (N = 40)

	N	%
Primary Language		
English	21	53
Other than English	18	45
Not provided	1	3
Education		
Less than high school	1	3
High school or trade school	4	10
Some college	15	38
Bachelor's degree	16	40
Postgraduate degree	3	8
Not provided	1	3
Employment		
30 or more hours per week	12	30
Less than 30 hours per week	24	60
Not provided	4	10

Of the 40 individuals enrolled in the study, 6 withdrew prior to beginning the SSRI treatment. Of those participants who began treatment, 16 were men and 18 were women. There were 9 participants who withdrew during the first two weeks of paroxetine administration due to side effects. This left 27 participants who continued on paroxetine longer than 2 weeks. Participants included did not differ from those who dropped out in age, gender, marital status, level of education, or employment status. Two participants withdrew from the study after the first 2 weeks, one person withdrew due to side effects, and the other person withdrew following marked improvement in mood and symptoms as confirmed by one of the study psychiatrists (P. B.).

Measures

Mini-International Neuropsychiatric Interview (MINI; version 5.0.0) (Sheehan et al., 1998): The Mini-International Neuropsychiatric Interview is a structured clinical assessment for

diagnosis according to the Diagnostic and Statistical Manual, version 4, and the International

Classification of Disease, version 10. Jointly developed in North America and Europe, the MINI

was developed to meet the need for a brief, structured diagnostic instrument for psychiatric

illness. The MINI provides diagnostic information for 19 prevalent psychiatric illnesses.

Liebowitz Social Anxiety Scale (LSAS) (Liebowitz, 1987): The Liebowitz Social

Anxiety Scale is a 24-item clinician-rated inventory representing two domains of social anxiety:

social interaction and performance. For each domain, clinicians rate the participant's fear and

avoidance on a Likert-type scale from 0 to 3 with a higher score representing greater severity.

Overall severity of social anxiety symptoms is computed as the average of fear and avoidance

items. Scores between 52 and 89 are conventionally considered to indicate moderate-to-severe

social anxiety disorder symptoms whereas scores above 89 indicate severe social anxiety

disorder symptoms (e.g., Liebowitz, 1999). LSAS scores in this data set indicate adequate

interitem reliability at each time point (range of coefficient α over time points: .88 – .96).

Social Phobia Scale (SPS) (Mattick & Clarke, 1998): The Social Phobia Scale is

comprised of 20 items to assess fear of being scrutinized by others during daily activities (e.g.,

eating, taking public transportation). Participants indicate agreement with each item based on a 0

(not at all) to 4 (extremely) Likert scale. A cut off of 26 provided high sensitivity and

specificity to the diagnosis of social anxiety disorder in samples with social anxiety disorder,

panic disorder with agoraphobia, or panic disorder without agoraphobia (Peters, 2000). There

was high interitem reliability for SPS items in the present data set (range in coefficient α over

time points: .90 – .95).

Montgomery Åsberg Depression Rating Scale (MADRS) (Montgomery & Asberg,

1979): The Montgomery Åsberg Depression Rating Scale is comprised of 10 clinician-rated

items each representing a core depression symptom. Items are completed on a scale of 0 to 7 with a higher score representing greater severity. Evidence suggests strong validity compared with self-report measures of depressive symptom severity (Svanborg & Asberg, 2001), sensitivity to change during psychopharmacological treatment (Galinowski & Lehert, 1995), and appropriateness to evaluate depression symptoms within a sample diagnosed with other psychological (Allgulander, Florea, & Huusom, 2006) and physiological illness (Leentjens, Verhey, Lousberg, Spitsbergen, & Wilmink, 2000; Razavi et al., 1996). A score under 10 is considered indicative of remission of depressive symptomotology (Hawley et al., 2002). There was moderate to high interitem reliability for MADRS items in this data set (range in coefficient α over time points: .69 – .87).

Event-Contingent Recording with the Social Behavior Inventory (ECR, SBI) (Moskowitz, 1994): Participants indicated their behavior following substantial interpersonal interactions by endorsing items representing each pole of the interpersonal circumplex (Wiggins, 1991). Items were summed at each event and then ipsatized to provide an event-level score for each pole of the interpersonal circumplex centered within the individual, within the event (Horowitz, Rosenberg, Baer, Ureño, & Villaseñor, 1988). Moskowitz and colleagues have shown that this procedure provides data with high interitem reliability for each behavioral dimension (α = .90-.91), strong convergent validity corresponding to interpersonal theory, and stable estimates of participant behavior patterns over days (α = .83-.90) (Brown & Moskowitz, 1998; Moskowitz, 1994; Moskowitz & Sadikaj, 2011). Prior research established the suitability of this instrument and procedure for use in clinical samples (Russell et al., 2011; Russell et al., 2007).

Mean level of behavior was computed by averaging over events within person for each pole of the interpersonal circumplex (i.e., agreeable, quarrelsome, dominant, and submissive). Two measures of behavioral variability were computed, flux and spin (Moskowitz & Zuroff, 2004). Flux for each behavior pole was computed as the standard deviation over events for each pole for each participant. Spin over all events was calculated as described in Moskowitz and Zuroff (2004). Event-level behavior was condensed to two orthogonal intersecting dimensions based on the interpersonal circumplex: communal (agreeable - quarrelsome) behavior and agentic (dominant - submissive) behavior. Angular position was calculated for each event by taking the tangent of communal and agentic behavior. Spin was computed as the standard deviation of the angular position across events.

Design

After diagnostic evaluation, participants and clinicians completed symptom measures at the initial session. Subsequently participants began a baseline one week period of the event-contingent recording procedure. For the two participants drawn from a previously collected sample (Russell et al., 2011), the final week of a prior 20-day event-contingent recording procedure provided a baseline.

Participants then received paroxetine controlled release (Paxil CR) titrated to 25mg DIE. Titration to 25mg DIE was achieved by starting participants on 12.5mg paroxetine controlled release for the first week of pharmacological treatment. Participants were started on a lower dose to minimize potential side effects of initiating treatment (e.g., headaches, nausea).

Following initiation of paroxetine treatment, participants met with the prescribing psychiatrist at 4 week intervals. At each meeting, LSAS, SPS, and MADRS were completed. These self-report and clinician-rated measures were collected 4, 8, 12, and 16 weeks from the

initiation of paroxetine treatment. Information about interpersonal behavior was collected using the event-contingent recording procedure. Participants completed one week of the event-contingent recording procedure following each clinical assessment such that, by the end of the study, participants had completed 28 days of event-contingent recording over four one-week periods. Over the first week of event-contingent recording, participants completed 1 to 5 forms ($M = 4.25$, $SD = 1.58$). Over the second week of event-contingent recording, participants completed 3 to 58 forms ($M = 24.26$, $SD = 14.12$). Over the third week of event-contingent recording, participants completed 4 to 57 forms ($M = 21.63$, $SD = 15.40$). Over the fourth week of event-contingent recording, participants completed 6 to 63 forms ($M = 22.74$, $SD = 15.23$). Over the final week of event-contingent recording, participants completed 3 to 61 forms ($M = 17.10$, $SD = 14.58$).

At the end of treatment participants were debriefed. Participants received $20 after participation in the 7-day pre-treatment baseline event-contingent recording period, $150 after 8 weeks of treatment, and an additional $150 at the last session following 16 weeks of treatment.

Procedure

Following telephone screening, participants attended an in-person diagnostic assessment and information session. Diagnostic assessments were conducted in-person by study psychiatrists (G.P. and P.B.) using the Mini-International Neuropsychiatric Interview (MINI) to establish psychiatric diagnosis and evaluate suitability for treatment with paroxetine. At the beginning of assessment participants provided informed consent. The study procedure and event-contingent recording procedure were explained. To ensure that participants clearly understood when to complete each event-contingent recording period, a calendar was provided including meetings with the study psychiatrist, meetings with the research assistant, and event-

contingent recording periods. The event-contingent recording procedure was then explained, and questions were answered.

Symptom improvement and adverse effects of paroxetine treatment were assessed at monthly meetings with study psychiatrists. Following these appointments, participants completed the self-report measures and began the scheduled week-long period of event-contingent recording. The study was approved by the McGill University Research Ethics Board.

Procedure for Event-Contingent Recording. During each event-contingent recording period, participants were asked to complete an event-contingent recording form following each substantial interaction, which was defined as interactions lasting longer than 5 minutes (Moskowitz & Sadikaj, 2011). Participant behavior was measured through participants endorsing behavior items drawn from the Social Behavior Inventory (SBI; see above). To avoid the potential for participants to develop a response set over forms, SBI items were divided into 4 forms each with 3 items for each pole of the interpersonal circumplex; forms were rotated over days. Participants also indicated contextual details of the event; this information was not used in the present study.

Data analysis

Change in symptom and behavior measures. Change in symptoms and behavior over time was analyzed using multilevel univariate growth curve modeling. This estimates the trajectory of change in symptoms and behavior over time. The shape of change over time was analyzed using linear and quadratic effects to estimate the degree of linear change and deceleration of change between time points 1, 2, 3, 4, and 5 (see Figures 4 and 5). Multilevel modeling is limited in producing standardized estimates as no consensus has been reached regarding a suitable standard error when random effects are included. For this reason, only

unstandardized estimates of change over time are presented. Multilevel modeling was conducted

using SAS software version 9.3 (SAS Institute Inc., 2013).

   Latent Difference Score modeling. To test the hypotheses concerning associations

between symptoms and behavior patterns over time, a structural equation model was fit to model

change in symptoms and change in behavior over time (see Figure 3). Changes in symptoms and

behavior were modelled using a latent difference score approach with a proportional change

model (Grimm et al., 2012).   Evidence of quadratic change in symptoms and behavior support a

proportional change rather than a linear change model to capture the deceleration of change.

Given evidence of linear change as well, a dual-change process model might be considered;

however this was not feasible given the small sample size and the requirements of SEM. Growth

curve models suggested that the majority of change in symptoms and behavior occurred at time

points 1, 2, and 3. Therefore, these time points were included in the latent difference score

models. Inclusion of more time points would have reduced the power to test the appropriateness

of model fit by including a greater number of paths.

Figure 3. Change in Behavior and Symptoms

Notes. B = Behavior, S = Symptoms, t# refers to the corresponding time point

Change in behavior from time 2 to time 3 was regressed on change in symptoms from time 1 to time 2 (denoted as pathway *x* in Figure 3). The competing hypothesis, that change in symptoms follows change in behavior, was tested in the same model; change in symptoms from time 2 to time 3 was regressed on change in behavior from time 1 to time 2 (denoted as pathway *y* in Figure 3). Analyses were conducted for anxiety symptoms and depression symptoms separately. The sample size prevented including both anxiety and depression in the same model.

Model fit was evaluated using a chi-square test (χ^2), comparative fit index (*CFI)*, and root mean square error of approximation (*RMSEA)*. A statistical test on RMSEA was conducted (*pclose*) to estimate whether RMSEA was different from the ideal value of .05. The chi-square test and RMSEA were emphasized as assessments of model fit since CFI is generally used to evaluate the incremental improvement between two nested models (Hu & Bentler, 1999). Structural equation modeling of latent difference scores was conducted using AMOS software version 7 (Arbuckle, 2006).

Computation of confidence intervals requires no missing data. Missing data could have been addressed using listwise deletion of cases; however, this would have reduced sample size further. Missing data could also have been addressed using data imputation; however, given the small sample size, imputed data might yield unstable confidence interval estimates. For these reasons, confidence intervals were not computed.

Results

Change in Symptoms during Treatment

Anxiety. As expected, anxiety symptoms decreased as measured both by the clinician rated Liebowitz Social Anxiety Scale (LSAS) and the self-report Social Phobia Scale (SPS). Following initiation of treatment, symptoms decreased in a monotonically downward, decelerating fashion: LSAS, $B_{linear} = -35.65$, $p < .0001$, $B_{quadratic} = 4.10$, $p < .0001$; SPS, $B_{linear} = -18.20$, $p < .0001$, $B_{quadratic} = 2.01$, $p < .0001$. Random effects analysis indicated a trend for a random linear slope for LSAS scores, $s^2 = 354.90$, $p = .051$ (see Figure 4A). Random effects analysis suggested a random intercept, $s^2 = 338.77$, $p = .003$ and a random linear slope, $s^2 = 144.84$, $p = .009$ for SPS scores (see Figure 4B). These results indicated substantial heterogeneity among participants in the trajectory of change in clinician rated anxiety symptoms

over the course of treatment despite evidence of overall monotonically downward, decelerating change.

Depression. Fixed effects analysis of depression scores, as measured by the Montgomery-Asberg Depression Rating Scale (MADRS), indicated that there was no change following initiation of treatment, B_{linear} = -2.56, p = .085, $B_{quadratic}$ = .25, p = .310. However, random effects analysis demonstrated heterogeneity among participants in linear slopes, s^2 = 50.74, p = .023, and quadratic slopes, s^2 = 1.45, p = .022, such that some participants seemed to show decreased depression symptoms following treatment (see Figure 4C). Despite substantial between-person heterogeneity, latent difference score models (subsequently presented) assess change for each person and then aggregate over persons. For this reason, latent difference scores models were still included to model variability at the between-person level in change over time.

Figure 4. Change in Symptoms over Time
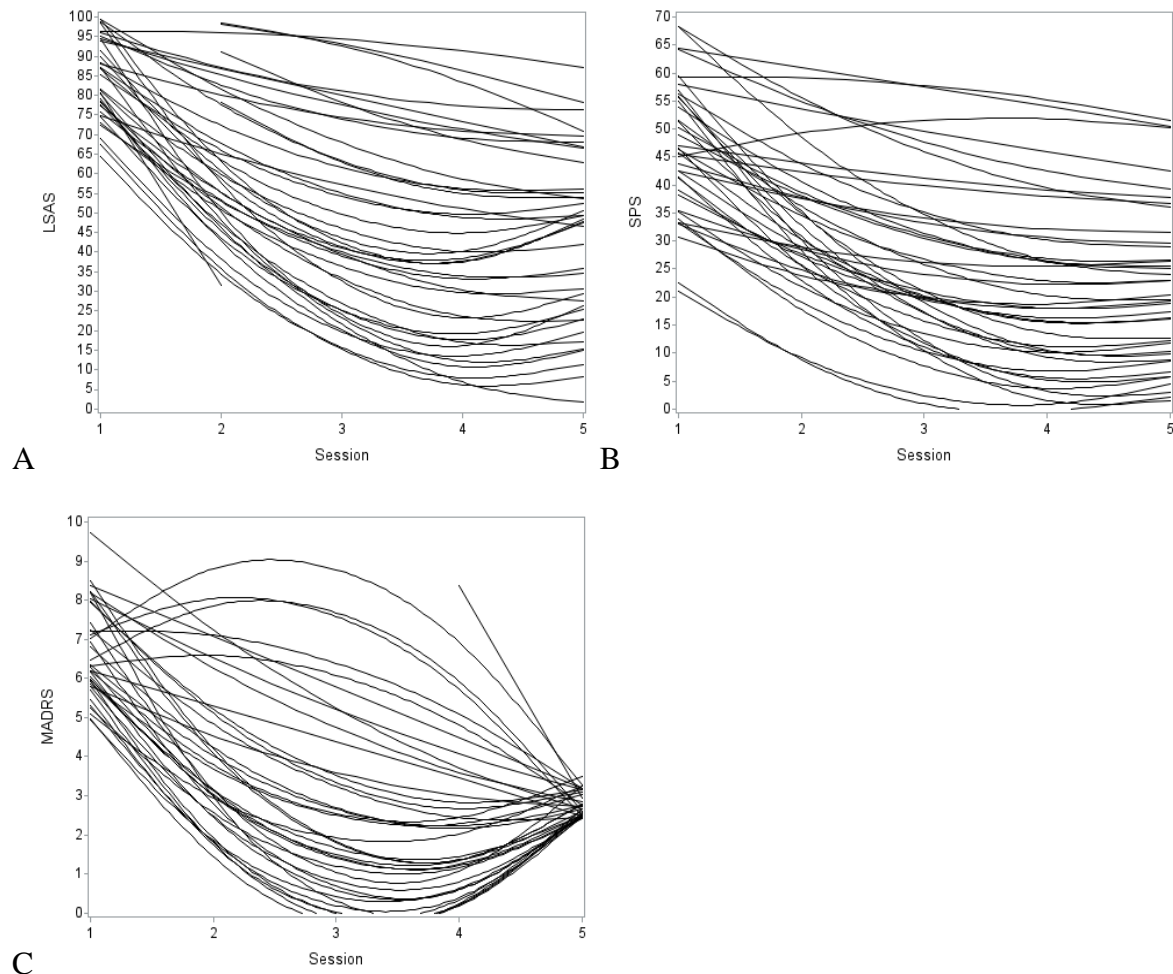
A

B

C

Notes. Session 1 = pre-treatment baseline, 2 = 1 month post-treatment, 3 = 2 months post-treatment, 4 = 3 months post-treatment, 5 = 4 months post-treatment, LSAS = Liebowitz Social Anxiety Scale, SPS = Social Phobia Scale, MADRS = Montgomery-Asberg Depression Rating Scale. Each line represents data for one participant.

Change in Behaviors during Treatment

    Mean Quarrelsome Behavior. Mean quarrelsome behavior decreased following initiation of treatment in a monotonically downward, decelerating fashion, $B_{linear} = -.04$, $p = .03$, $B_{quadratic} = .006$, $p = .03$. Random effects analysis indicated heterogeneity among participants in

intercept, $s^2 = .01$, $p = .008$, linear slope, $s^2 = .006$, $p = .03$, and quadratic slope, $s^2 = .0001$, $p = .046$ (see Figure 5A). Visual inspection of Figure 5A suggested that the majority of change occurred in the first three time points. Follow-up analysis was conducted of mean quarrelsome behavior over the first three time points. When this model was run with random intercept, linear slope, and quadratic slope, the final hessian was not positive definite and did not indicate a random effect for quadratic slope. To produce a better fitting model, the random effect for quadratic slope was fixed to zero. This follow-up analysis suggested that for 2 months following initiation of treatment, mean quarrelsome behavior decreased in a monotonically downward, decelerating fashion, $B_{linear} = -.10$, $p = .014$, $B_{quadratic} = .02$, $p = .028$.

Mean Submissive Behavior. Mean submissive behavior decreased following initiation of treatment in a monotonically downward, decelerating fashion, $B_{linear} = -.10$, $p = .0002$, $B_{quadratic} = .012$, $p = .007$. Random effects analysis suggested heterogeneity in intercept, $s^2 = .023$, $p = .028$, in linear slope, $s^2 = .013$, $p = .041$, and a trend for heterogeneity in quadratic slope, $s^2 = .0003$, $p = .068$ (see Figure 5B). Follow-up analysis was conducted of mean submissive behavior over the first three time points. The initial model produced a final hessian that was not positive definite and did not indicate a random effect for quadratic slope. To produce a better fitting model, the random effect for quadratic slope was fixed to zero. Follow-up analysis suggested that for 2 months following initiation of treatment, mean submissive behavior decreased in a linear fashion, $B_{linear} = -.15$, $p = .020$, with no acceleration or deceleration, $B_{quadratic} = .024$, $p = .14$.

Intraindividual Behavioral Variability. Spin, a composite of variability among interpersonal behaviors, decreased following initiation of treatment in a monotonically downward, decelerating fashion, $B_{linear} = -.26$, $p = .0005$, $B_{quadratic} = .034$, $p = .008$. Random

effects analysis suggested homogeneity among participants in intercept, linear slope, and quadratic slope (see Figure 5C). Follow-up analysis of spin over the first three time points suggested that for 2 months following initiation of treatment, spin decreased in a monotonically downward, decelerating fashion, $B_{linear} = -.56$, $p < .0001$, $B_{quadratic} = .11$, $p = .001$.

Figure 5. Change in Behavior Patterns over Time
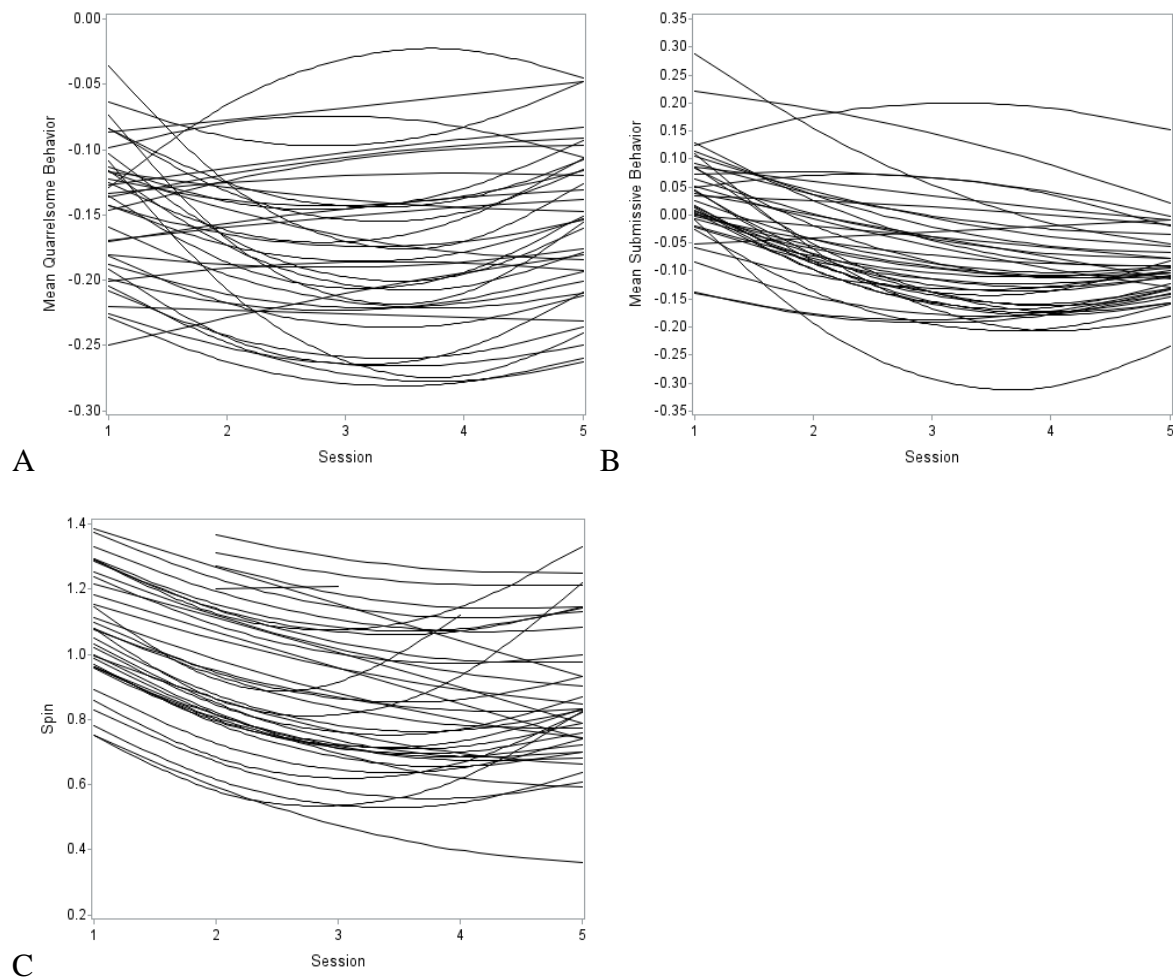
Notes. Session 1 = pre-treatment baseline, 2 = 1 month post-treatment, 3 = 2 months post-treatment, 4 = 3 months post-treatment, 5 = 4 months post-treatment. Each line represents data for one participant.

Temporal Associations of Anxiety with Interpersonal Behavior

Mean Quarrelsome Behavior. The association between anxiety symptoms and quarrelsome behavior was investigated using the LSAS and SPS scores as measures of anxiety. Separate models were run for the two measures to examine consistency of findings over measures of anxiety. The small sample included in this study prevented forming a latent variable for anxiety symptom severity using the two measures, which would have increased the number of parameters to be estimated.

The model using the clinician-rated LSAS to measure anxiety symptoms demonstrated a strong fit to the data, χ^2 (7) = 9.935, p = .192, *CFI* = .964, *RMSEA* = .094, *pclose* = .261 (see Figure 6). Change in mean quarrelsome behavior from time 2 to time 3 was associated with prior change in clinician-reported anxiety symptoms, β = .864, p = .013. Moreover, change in mean quarrelsome behavior from time 1 to time 2 was not associated with subsequent change in anxiety symptoms, β = -.194, p = .495.

Figure 6. Change in Mean Quarrelsome Behavior and Anxiety measured by the LSAS
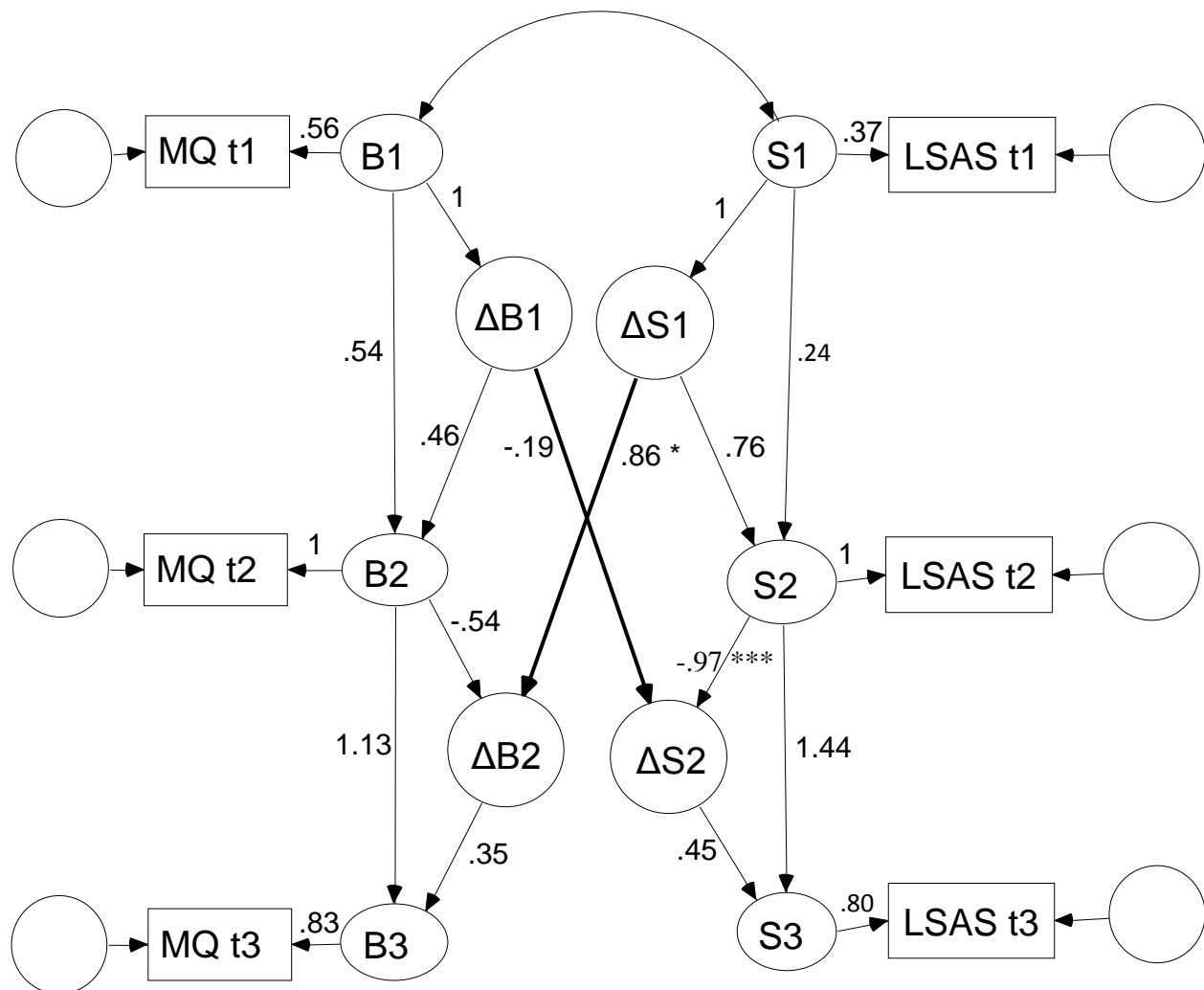
Notes. MQ = Mean Quarrelsome Behavior, LSAS = Liebowitz Social Anxiety Scale, t# refers to the corresponding time point, $^+p< .07$, $*\ p< .05$, $**\ p< .01$, $***\ p< .001$.

The model using the SPS to measure anxiety symptoms also demonstrated a strong fit to the data, $\chi^2 (6) = 6.649$, $p = .355$, *CFI* = .992, *RMSEA* = .048, *pclose* = .430 (see Figure 7). Change in mean quarrelsome behavior was not associated with prior change in self-reported

anxiety symptoms, $\beta = 1.04$, $p = .202$, or subsequent change in self-reported anxiety symptoms, $\beta = -.969$, $p = .199$.

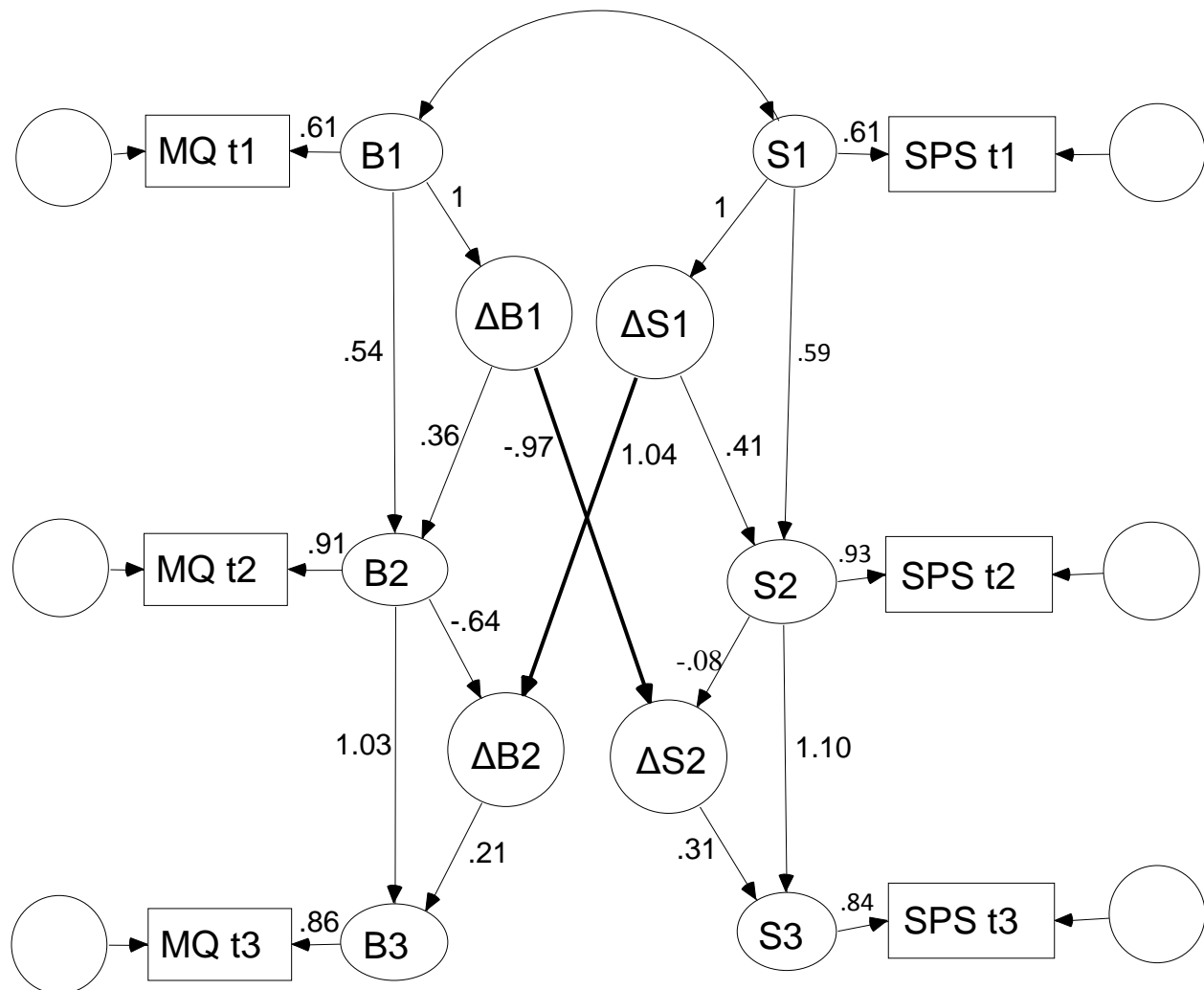*Figure 7. Change in Mean Quarrelsome Behavior and Anxiety measured by the SPS*

Notes. MQ = Mean Quarrelsome Behavior, SPS = Social Phobia Scale, t# refers to the corresponding time point. $^+p< .07$, * $p< .05$, ** $p< .01$, *** $p< .001$.

Mean Submissive Behavior. The association between anxiety symptoms and submissive behavior was investigated using the LSAS and SPS scores as measures of anxiety.

The model using the LSAS to measure anxiety symptoms demonstrated a poor fit to the data, χ^2 (8) = 20.136, p = .01, CFI = .867, $RMSEA$ = .180, $pclose$ = .021. The model using SPS to measure anxiety symptoms similarly demonstrated a poor fit to the data, χ^2 (7) = 28.334, $p <$ .001, CFI = .750, $RMSEA$ = .255, $pclose$ = .001. Based on the univariate growth curve modeling described previously, it was expected that a proportional change latent difference score model would not provide adequate fit to the linear trajectory of mean submissive behavior over the first 3 time points found in the present data. A constant change model may fit this data better; however such a model would not allow for the investigation of temporal ordering.

Spin. The model using the clinician reported LSAS to measure anxiety symptoms demonstrated a strong fit to the data, χ^2 (7) = 2.68, p = .913, CFI = 1.000, $RMSEA$ = .000, $pclose$ = .935 (see Figure 8). Change in spin from time 2 to time 3 was associated with prior change in anxiety symptoms, β = .962, p = .008. Change in spin from time 1 to time 2 was not associated with subsequent change in anxiety symptoms, β = .310, p = .661.

Figure 8. Change in Spin and Anxiety measured by LSAS
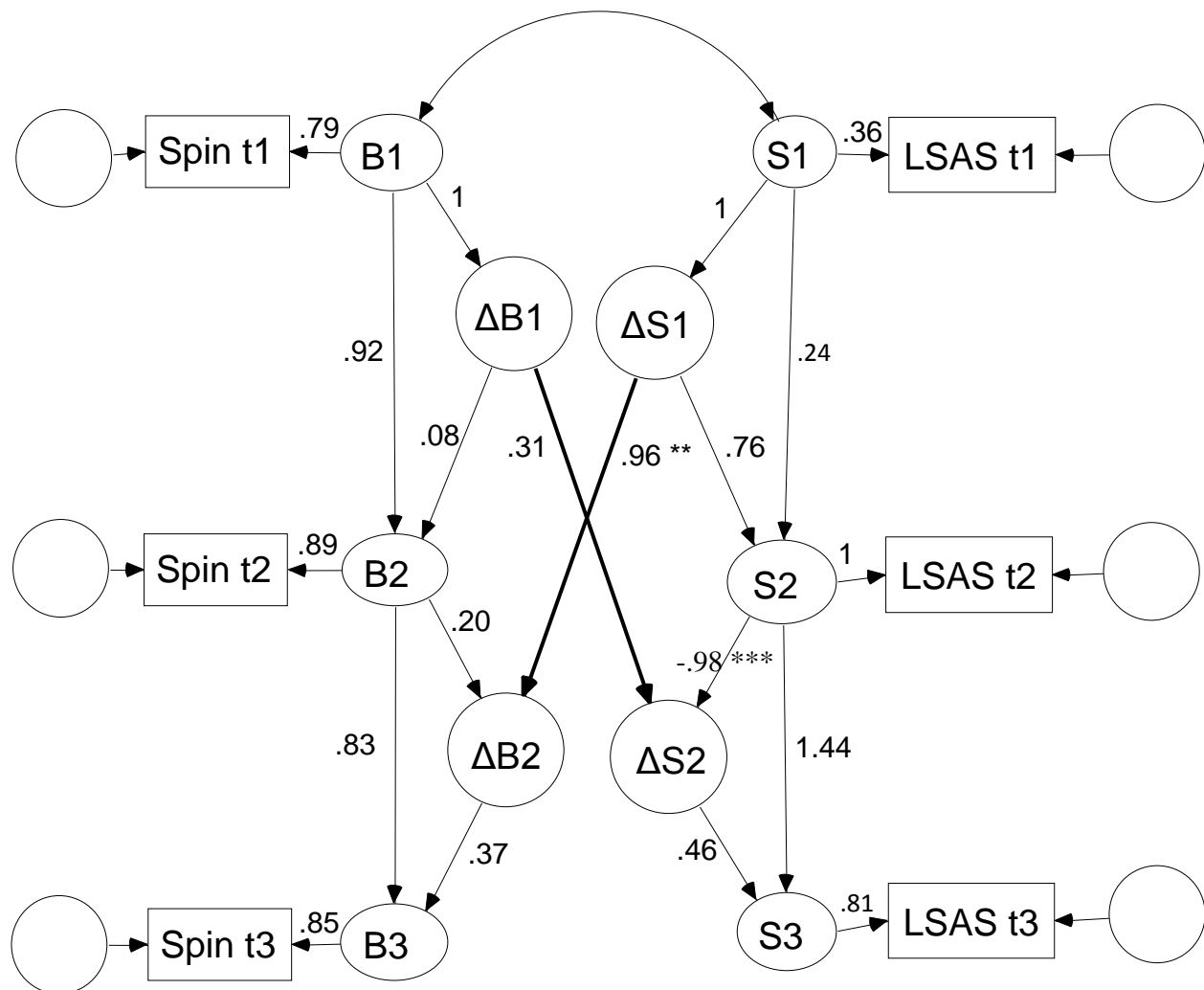
Notes. LSAS = Liebowitz Social Anxiety Scale, t# refers to the corresponding time point. [+]*p<* .07, * *p< .05, ** *p< .01, *** *p< .001.

Results were checked for potential confounding by mean quarrelsome and mean submissive behavior. Separate models were run to adjust for mean quarrelsome and mean submissive behavior. Including mean quarrelsome and mean submissive behavior within the same model produced poor fit to the data. This may be due to estimating too many parameters

given the sample size. Using spin scores adjusted for mean quarrelsome behavior demonstrated

adequate fit to the data according to CFI and RMSEA, χ^2 (22) = 35.52, p = .034, *CFI* = .922,

RMSEA = .114, *pclose* = .08. Using spin scores adjusted for mean submissive behavior

demonstrated poor fit to the data, χ^2 (19) = 36.09, p = .01, *CFI* = .877, *RMSEA* = .138, *pclose* =

.028. Change in spin from time 2 to time 3 was still associated with prior change in clinician-

reported anxiety symptoms when adjusting for mean quarrelsome behavior, β = .957, p = .026,

and when adjusting for mean submissive behavior, β = .985, p = .016. The lack of an association

between change in spin from time 1 to time 2 with subsequent change in anxiety symptoms was

maintained with both models including adjustments.

The model using the self-report SPS to measure anxiety symptoms demonstrated a strong

fit to the data, χ^2 (6) = 2.18, p = .903, *CFI* = 1.000, *RMSEA* = .000, *pclose* = .925 (see Figure 9).

Change in spin from time 2 to time 3 showed a trend towards an association with prior change in

self-report anxiety symptoms, β = .979, p = .061. Change in spin from time 1 to time 2 was not

associated with subsequent change in self-reported anxiety symptoms, β = -.783, p = .842.
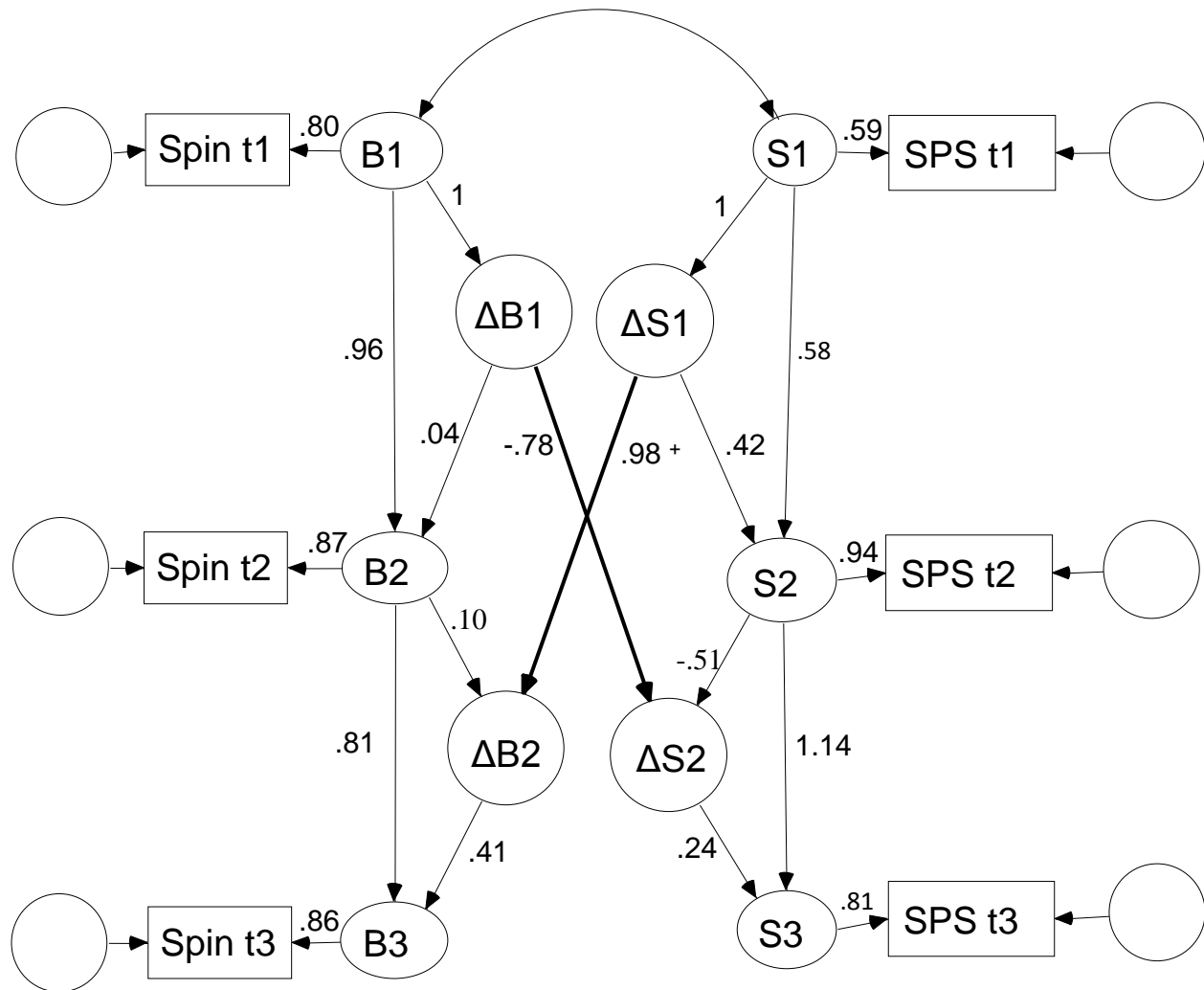
Figure 9. Change in Spin and Anxiety measured by the SPS

Note. SPS = Social Phobia Scale, t# refers to the corresponding time point. $^+p< .07$, * $p< .05$, ** $p< .01$, *** $p< .001$.

Results were checked for potential confounding by mean quarrelsome and submissive behavior. Separate models were run to adjust for mean quarrelsome and mean submissive behavior. The model using spin scores and self-rated anxiety symptoms adjusted for mean quarrelsome behavior demonstrated poor fit to the data based on chi-square test and RMSEA, χ^2

(19) = 33.49, *p* = .021, *CFI* = .919, *RMSEA* = .127, *pclose* = .051. The model using spin scores

adjusted for mean submissive behavior indicated strong fit to the data according to a chi-square

test and RMSEA, χ^2 (19) = 20.66, *p* = .356, *CFI* = .988, *RMSEA* = .043, *pclose* = .491. Change

in spin from time 2 to time 3 was associated with prior change in self-rated anxiety symptoms

when adjusting for mean quarrelsome behavior, β = .881, *p* = .022, and for mean submissive

behavior, β = 1.001, *p* = .031. The lack of an association between change in spin from time 1 to

time 2 with subsequent change in anxiety symptoms was maintained with both models including

adjustments.

Temporal Association of Depression with Interpersonal Behavior

We next analyzed whether the temporal effects associating symptoms and behavior also

occurred for symptoms of depression.

Mean Quarrelsome Behavior. Depression symptoms were assessed using the clinician-

rated Montgomery-Asberg Depression Rating Scale (MADRS). The model testing an

association between depression symptoms and quarrelsome behavior demonstrated an adequate

fit to the data according to a chi-square test and RMSEA, χ^2 (7) = 9.408, *p* = .225, *CFI* = .940,

RMSEA = .086, *pclose* = .297. This good fit suggests that a proportional change model fit the

data well. Change in mean quarrelsome behavior was not associated with prior change in

clinician-reported depression symptoms, β = -.941, *p* = .410, or subsequent change in clinician

reported depression symptoms, β = .137, *p* = .371.

Mean Submissive Behavior. The model testing an association between clinician-rated

depression symptoms and submissive behavior demonstrated a strong fit to the data, χ^2 (8) =

6.892, *p* = .548, *CFI* = 1.000, *RMSEA* = .000, *pclose* = .630. Change in mean submissive

behavior was not associated with prior change in depression symptoms, $\beta = .135$, $p = .500$, or subsequent change in depression symptoms, $\beta = .176$, $p = .163$.

Spin. The model testing an association between clinician-rated depression symptoms and spin demonstrated a strong fit to the data χ^2 (7) = 4.49, $p = .722$, *CFI* = 1.000, *RMSEA* = .000, *pclose* = .779. Change in spin was not associated with prior change in depression symptoms, $\beta = .686$, $p = .621$, or subsequent change in depression symptoms, $\beta = .357$, $p = .566$. Since there was no evidence of an association between spin and depressive symptoms, results were not adjusted for mean quarrelsome or mean submissive behavior.

Discussion

The present study used a pharmacological treatment to examine the association of change in anxiety symptoms with change in mean quarrelsome behavior, mean submissive behavior, and spin. Treatment of socially anxious individuals with the SSRI paroxetine produced decreases in anxiety symptoms along with decreases in mean quarrelsome behavior, mean submissive behavior, and spin.

We made use of these changes in symptoms and behavior patterns to examine whether change in anxiety symptoms was associated with change in behavioral patterns. With respect to mean levels of behavior, decreases in clinician-rated anxiety symptoms were associated with decreases in mean quarrelsome behavior. With respect to intraindividual behavioral variability, decreases in self- and clinician-rated anxiety symptoms were associated with decreases in spin. Findings related to spin were robust to adjustments for concurrent change in mean quarrelsome behavior and mean submissive behavior.

Latent difference score modeling was used to examine the temporal association between anxiety symptoms and behavior, more specifically whether change in mean quarrelsome

behavior and spin precedes or follows from change in anxiety symptoms. We did not find an association between anxiety symptoms and preceding changes in behavior. For both mean quarrelsome behavior and spin, there was evidence that change in behavior followed preceding change in anxiety symptoms.

We further examined whether the association with spin was specific to anxiety symptoms. There was no evidence of an association of change in depression symptoms with change in spin. Thus, the specificity of the relation between change in anxiety and change in spin was supported in the present study.

Interpersonal behavior correlates of anxiety symptoms

The association between anxiety symptoms and mean quarrelsome behavior was consistent with evidence suggesting elevated anger among socially anxious individuals (Erwin, Heimberg, Schneier, & Liebowitz, 2003). The association of elevated anxiety symptoms and quarrelsome behavior has previously been demonstrated in other between-person research (Rappaport, Moskowitz, & D'Antono, 2014). The present study extends past findings by demonstrating the association between reduction in anxiety symptoms and reduction in mean quarrelsome behavior.

The expected association between anxiety symptoms and submissive behaviors was not found. The current study used a proportional change latent difference score model to investigate the temporal patterns. It is possible that submissive behavior follows a linear pattern of change. In this case, change in submissive behavior would be best modeled using a constant change model. However, a constant change model would preclude investigating temporal associations with spin. Plots of submissive behavior over time (see Figure 5B) suggest quadratic change in submissive behavior over the first 2 months of treatment. Use of shorter follow up time intervals

in future research would permit the examination of the association between anxiety symptoms and a more nuanced pattern of change in submissive behavior.

Individuals with severe anxiety symptoms are described as moody by close others (Creed & Funder, 1998) and demonstrate greater intraindividual variability in behavior over events in self-reported naturalistic behavior (Rappaport, Moskowitz, & D'Antono, 2014). Furthermore, Rappaport, Moskowitz, and D'Antono (2014) suggested that this association is specific to anxiety and that assessing intraindividual behavioral variability permits differentiation of concurrent anxiety and depression symptoms, despite a high correlation of the two syndromes. The current study extends past findings to suggest that decreases in spin are associated with improvements in the severity of anxiety symptoms, but not with improvements in the severity of depression symptoms.

Extending evidence of the association of spin with anxiety to the examine the association of changes in spin and anxiety further strengthens the potential for causal inference that elevated anxiety symptoms lead to elevated spin. The result indicate that decreasing anxiety symptoms produce change in spin and quarrelsome behavior and suggest that increasing anxiety may produce increases in spin and quarrelsome behavior.

The present study suggests the importance of assessing spin beyond assessing mean behavioral tendencies to act in a quarrelsome or submissive manner. Recent research (Côté et al., 2012; Rappaport et al., 2013; Sadikaj et al., under review) has suggested negative social consequences of high spin. In light of this emerging literature, identifying an individual as engaging in variable behavior (i.e., high spin) may inform treatment. Specifically, treatments to address social skills deficits may encourage greater consistency in behavior.

Change in behavior patterns

The present study provides an examination of changes in interpersonal behaviors concurrent with a psychopharmacological treatment. The findings are largely consistent with evidence from psychotherapeutic treatments (Borkovec et al., 2002; Salzer et al., 2010; Salzer et al., 2011) and pharmacological treatments (Fava et al., 1996; van Vliet et al., 1994) that have found improvements in interpersonal behavior, such as decreased quarrelsome behavior and decreased submissive behavior, in patients with anxiety and mood disorders. Past research has been primarily based on single-occasion reports of interpersonal behaviors or interpersonal problems. The present study provides an extension of previous research on the interpersonal effects of pharmacological treatment by measuring behavior in naturalistic settings which increases the generalizability of results beyond that which is typically present for laboratory tasks and using a method that reduces recall biases which is a potential limitation of single-occasion self-report measures of behavior. Quarrelsome and submissive behaviors were assessed over a variety of events, which provides a more robust estimate of mean behavior (Moskowitz, 1994). Thus the method used in the present study enhanced validity by measuring behavior over a variety of interactions rather than at a single occasion. Moreover the method permitted the examination of change in both average level of behavior and intraindividual variability in behavior.

Psychotherapeutic treatments often address interpersonal behavior and distress concurrently (e.g., social skills training, Herbert et al., 2005). Thereby, using a psychotherapeutic treatment may artificially increase the seeming correspondence between change in interpersonal behavior and improvement in symptoms. Using a pharmacological treatment, the present study reduced this potential confound between treatment and resulting

interpersonal behavior. Finally, while other studies have examined change in interpersonal

behavior subsequent to treatment, the present study was the first to examine the temporal

association between improvement in anxiety symptoms and change in interpersonal behavior

patterns.

Treatment with the SSRI preceded decreases in spin. This finding was similar to a prior

result demonstrating that spin decreased for irritable individuals during serotonin

supplementation through administering tryptophan (Moskowitz, Zuroff, aan het Rot, and Young

(2011). Thus two interventions presumed to augment serotonergic function with different

samples have been shown to decrease spin. One treatment affects serotonergic function as a

chemical precursor for serotonin production; the other treatment increases serotonergic function

by blocking serotonin reuptake.

Temporal mechanism in stress generation

Within the stress generation theory framework, interpersonal behavior can be

conceptualized as a mechanism through which individuals with psychological symptoms become

more likely to experience interpersonal stressors, such as isolation or rejection (Coyne, 1976b;

Joiner et al., 1992; Meleshko & Alden, 1993; Papsdorf & Alden, 1998). In a review of the

literature, Alden and Taylor (2004) suggested that socially anxious individuals contribute to the

generation of interpersonal stressors in their own lives. A critical question is the identification of

behaviors that follow from anxiety and beget interpersonal problems. Prior research

demonstrated the negative impact of elevated quarrelsome and submissive behavior on

interpersonal relationships (Alden & Capreol, 1993; Erwin et al., 2003). Research by Moskowitz

and colleagues suggested that among community adults elevated intraindividual variability in

behavior produces strain on interpersonal relationships beyond that conferred by elevated

quarrelsome and submissive behavior (Côté et al., 2012; Rappaport et al., 2013; Sadikaj et al., under review).

There is evidence based on between-person designs that individuals with elevated anxiety symptoms engage in detrimental behavior patterns, specifically mean-level quarrelsome and submissive behavior and spin (see Rappaport et al., 2014). Research on change in behaviors and symptoms permits the examination of whether quarrelsomeness, submissiveness, and spin are products of psychological symptoms by testing the temporal ordering of psychological symptoms and patterns of interpersonal behavior. The present study provides one of the first direct tests of the temporal association between psychological symptoms and interpersonal behavior. This was accomplished using a longitudinal burst design to examine lagged temporal relationships between psychological symptoms (i.e. anxiety) and patterns of interpersonal behavior. Using a psychopharmacological treatment to produce change in symptoms, the present data demonstrated that change in behavioral patterns follows prior change in symptoms. This provides support for a potentially critical mechanism of the stress-generation hypothesis. Worsening anxiety may lead to worsened interpersonal behavior and result in increased interpersonal problems. Importantly, while both anxiety and depressive symptoms may lead to increased quarrelsome and submissive behavior, anxiety symptoms may uniquely be associated with elevated intraindividual behavioral variability. Improving these behavior patterns may be a critical mechanism of efficacy for anxiety treatments. For example, Young, Moskowitz, and aan het Rot (2014) proposed a mechanism for the efficacy of serotonergic medications whereby serotonin augmentation leads to improved social behavior which begets more positive interactions with others and which subsequently improves mood.

Limitations and Future Directions

A key limitation of the generality of the present results is its restriction to a diagnosis of social anxiety disorder. Prior research on interpersonal behavior in anxiety suggests that spin is characteristic of anxiety symptoms in general (Rappaport, Moskowitz, & D'Antono, 2014). While the interpersonal symptoms of social anxiety disorder make it suitable for an initial examination of interpersonal processes in anxiety disorders, future research is needed with individuals having a range of anxiety disorder diagnoses. This may help to identify possible differences in the interpersonal behavior patterns characteristic of each anxiety disorder and may demonstrate that intraindividual behavioral variability is specific to certain presentations of anxiety symptoms.

The lack of a substantial number of individuals meeting criteria for major depressive disorder limits the conclusions that can be drawn regarding the association of depression symptoms with interpersonal behavior patterns. The lack of clinically depressed individuals may also be seen in the lack of fixed effects suggesting change following initiation of pharmacological treatment. Therefore, caution is warranted in drawing conclusions from the lack of significant findings related to change in depression symptoms. Future research could address these limitations by recruiting a clinically depressed sample, particularly one with a range of depression severity.

Pharmacological manipulation was used to provide a more stringent test of the association between change in symptoms and change in behavior patterns. It was determined that psychological treatment may confound this association by directly impacting change in both symptoms and interpersonal behavior patterns. While pharmacological treatment may provide a more stringent test of the association between change in symptoms and behavior patterns, there

is the possibility that the pharmacological manipulation used in the present study may have directly impacted on change in behavior patterns along with changes in symptoms. The temporal analyses used here suggest that, while pharmacological manipulation may have impacted on changes in behavior patterns, these changes may be mediated by changes in anxiety symptoms. Whereas pharmacological manipulation may have directly impacted on change in behavior patterns, some of this change is predicted by temporally prior changes in anxiety symptoms.

It might be argued that elevated anxiety symptoms are associated with elevated spin, because anxious individuals react more strongly to situational cues, such as positive or negative affect, which drives larger changes in interpersonal behavior (e.g., Gurtman, 2001). However, prior research on intraindividual behavioral variability has demonstrated that the association between distress and increased behavioral variability is only partially accounted for by increased reactivity (Erickson et al., 2009). Moreover, one theory of social skills deficits among individuals with social anxiety suggests that anxious individuals adapt their behavior less appropriately to features of the situation (see Rodebaugh, Holaway, & Heimberg, 2004). Therefore, it is possible that event-level changes in behavior are incongruent with situational demands. This indicates that elevated behavioral variability among individuals with social anxiety disorder may be, at most, only partially due to adaptation to features of the situation. Further research is needed to replicate Erickson et al. (2009) with groups with varying anxiety disorders, to examine the association between behavioral variability and reactivity to a variety of socioemotional cues.

Conclusion

The present study employed a psychopharmacological treatment to manipulate anxiety symptoms with the goal of examining associations of change in anxiety symptoms and change in

behavioral patterns (i.e., mean-level quarrelsome behavior, mean-level submissive behavior, and spin). The results demonstrate that reduction in spin was associated specifically with preceding reduction in anxiety symptoms as this temporal ordering was not found for spin and depressive symptoms. The present study extends prior between-person research to demonstrate an association between improvements in anxiety symptoms and reductions in intraindividual behavioral variability, providing evidence supporting the unique association between anxiety symptoms and intraindividual behavioral variability. The finding that change in interpersonal behavior patterns follows change in symptomatology is consistent with a causal inference that reductions in anxiety symptoms produce reductions in intraindividual behavioral variability.

General Discussion

The two studies presented sought to examine possible mechanisms for the stress generation process within anxiety. This was accomplished by investigating the naturalistic patterns of interpersonal behavior that characterise anxiety symptoms, particularly features of behavior beyond mean levels. Study 1 replicated longstanding theory and empirical evidence suggesting that anxiety symptoms are associated with elevated mean level hostility and submissive behavior (Rappaport, Moskowitz, & D'Antono, 2014). While it was not the focus of this study, Study 1 also replicated longstanding evidence in depression research that elevated depression symptoms were associated with elevated hostility and submissive behavior. Study 1 then expanded on existing research to examine the association of anxiety symptoms with two kinds of intraindividual variability measures: intraindividual variability in agreeable, quarrelsome, and submissive behavior over events (i.e., flux) and dispersion in interpersonal behavior over events (i.e., spin). Elevated self-report of anxiety symptoms were associated with these indicators of elevated intraindividual behavioral variability. It was further demonstrated that the association with intraindividual behavioral variability was specific to anxiety symptoms; when adjusting for concurrent anxiety symptoms there was no evidence of an association between depressive symptoms and any index of intraindividual behavioral variability. Results held when adjusting indices of intraindividual behavioral variability for corresponding mean levels as recommended by Baird et al. (2006) and when adjusting anxiety symptoms for concurrent levels of depressive symptoms as recommended by Starr and Davila (2008a). Importantly, Study 1 was conducted with a community sample of adults and represents a wide range of clinical and subclinical symptoms of anxiety and depression. Results were analyzed at the between-person level and demonstrated that individuals who reported elevated anxiety

symptoms engaged in greater quarrelsome behavior, submissive behavior, flux in agreeable, dominant, and submissive behavior, and spin.

Study 2 built on Study 1 in several key ways. Pharmacological treatment was used to examine change in symptoms and interpersonal behavior patterns. Symptoms were assessed using participant self-report and clinician-report. A clinical sample was recruited to allow for examination of larger changes in anxiety symptom severity than would be available in a community sample. Study 2 demonstrated that decreases in anxiety symptoms were associated with corresponding decreases in quarrelsome behavior and intraindividual dispersion in interpersonal behavior (i.e., spin). This association between change in anxiety symptoms and change in intraindividual behavioral variability was found when symptoms were assessed with both self- and clinician-report. Further extending the findings of Study 1, Study 2 examined the association of change in depressive symptoms and change in intraindividual behavioral variability. Consistent with Study 1, there was no evidence of an association between depression symptoms and intraindividual behavioral variability. This further supports the finding that intraindividual behavioral variability is associated with anxiety symptoms and not with concurrent depression symptoms.

Because Study 2 employed a longitudinal design, it was possible to examine the temporal ordering in the association between change in anxiety symptoms and change in intraindividual behavioral variability. This was accomplished using a latent difference score, proportional change model, which is also called a 'change-to-change' model (Grimm et al., 2012; McArdle & Grimm, 2010). This permitted a test of a longstanding assumption in interpersonal behavior research that interpersonal behavior patterns follow from clinical symptoms (e.g., Coyne, 1976b). We examined the hypothesized association, that decreases in intraindividual behavioral

variability would follow changes in anxiety symptoms, as well as a competing hypothesis that decreases in intraindividual behavioral variability would precede changes in anxiety symptoms. Results supported the hypothesized temporal ordering; decreases in intraindividual behavioral variability followed change in anxiety symptoms. As such, Study 2 provided the first support for the assertion that interpersonal behavior patterns are a result of clinical symptoms.

The present research builds on a growing literature suggesting that intraindividual behavioral variability is associated with interpersonal distress (Erickson et al., 2009) as reflected in neuroticism (Moskowitz & Zuroff, 2005) and self-criticism (Kopala-Sibley et al., 2013) along with clinical syndromes such as Borderline Personality Disorder (Russell et al., 2007). Beyond demonstrating an association between intraindividual behavioral variability and anxiety, the present research demonstrates a specific association between intraindividual behavioral variability and anxiety that is not present with depression symptoms, though both are considered elements of neuroticism and interpersonal distress (Kendler et al., 2011; Zinbarg et al., 1994).

Mechanism of the Stress Generation Process

A longstanding literature has demonstrated negative interpersonal consequences of both elevated depression and anxiety symptoms (Alden & Taylor, 2004; Conway et al., 2012; Coyne, 1976a; Liu & Alloy, 2010). In a seminal paper, Hammen (1991) posited a stress generation model wherein psychological disorder places the individual at heightened risk for stressful life events. Importantly, Hammen suggested that individuals with psychological symptoms would be at increased risk for so-called dependent stressful life events, stressful events over which the individual has influence (e.g., the breakup of a romantic relationship). The increase in stressful events was hypothesized to decrease resilience to mental illness and lead to worsening symptoms. Worsened symptoms then drive a continued increase in stressful life events, thereby

forming a cycle through which a disorder is maintained and worsened. Since the inception of this idea, considerable research has supported the existence of elements of the stress generation process for various disorders including depression (Liu & Alloy, 2010) and anxiety (see Alden & Taylor, 2004 for a review on stress generation in anxiety; Conway et al., 2012; Starr, Hammen, Brennan, & Najman, 2012).

For example, research has documented that increased symptomatology follows from worsened stress (Cacioppo, Hawkley, & Thisted, 2010; Hawkley, Thisted, Masi, & Cacioppo, 2010), including from decreased social support (Cohen & Wills, 1985). Another line of research has examined the mechanisms by which individuals with various disorders increase risk for interpersonal stress. Hokanson and colleagues demonstrated that individuals with elevated depression symptoms display increased quarrelsome and submissive behavior (Hokanson & Butler, 1992; Hokanson et al., 1986). Others (Cain et al., 2012; Kahn et al., 1985; Troisi & Moles, 1999; Zuroff et al., 2007) have further demonstrated the association of depression symptoms with verbal and nonverbal indices of quarrelsome and submissive behavior. Anxiety disorders have also been associated with elevated quarrelsome (Cain et al., 2010; Eng & Heimberg, 2006; Kachin et al., 2001; Oakman et al., 2003) and submissive behavior (Daly, 1978; Grant et al., 2007; Natale et al., 1979; Russell et al., 2011). In research that adjusted for the comorbidity between anxiety and depression symptoms, Alden and Phillips (1990) reported that both anxiety and depression were associated with elevated submissive behavior, though anxiety symptoms demonstrated a stronger association.

Prior research on the mechanisms by which individuals generate stressful life events has been limited by a focus on mean level behaviors. For example, Joiner and colleagues examined depressed individuals tendency to engage in excessive reassurance seeking to a greater extent

than less depressed participants. Research on the interpersonal behavioral correlates of anxiety symptoms has not examined intraindividual variability in behavior over events. The present studies demonstrate that anxiety symptoms are associated with elevated intraindividual behavioral variability overall and that change in anxiety symptoms are associated with change in intraindividual behavioral variability. This association remains when adjusting for mean level behaviors. Moreover, the association with intraindividual behavioral variability seems to distinguish anxiety symptoms from concurrent depression symptoms. This suggests divergent pathways by which anxiety and depression symptoms lead to increased risk for stressful life events.

Consequences of Intraindividual Behavioral Variability

Research has demonstrated that elevated intraindividual behavioral variability as reflected in spin leads to negative interpersonal consequences. In a series of studies, Côté et al. (2012) examined the work relationships of individuals recruited from the community. Individuals in these studies who demonstrated elevated spin reported greater distance in their social network, were more likely to be avoided by coworkers, and had coworkers who reported liking the individual less. In a subsequent study of the interpersonal consequences of intraindividual behavioral variability among a sample of married or cohabitating couples, individuals who demonstrated elevated spin had greater difficulty completing goals shared with their partner and had decreased relationship satisfaction over time (Rappaport et al., 2013; Sadikaj et al., under review).

Given the negative interpersonal consequences of this form of intraindividual behavioral variability and the results indicating elevated behavior variability among anxious individuals, it seems plausible that elevated spin contributes to a mechanism in the generation of interpersonal

stressors among individuals with elevated anxiety symptoms. This mechanism seems specific to anxiety; it is not present for concurrent depressive symptoms. Young et al. (2014) posit that one mechanism of action for psychopharmacological treatments of affective disorders may be improvements in interpersonal behavior and subsequent improvement in interpersonal functioning. The present results provide empirical support for the assertion that psychopharmacological treatments of affective disorders, namely anxiety, produce improvements in interpersonal behavior. However, it seems that these improvements follow from improvements in anxiety symptom severity. In either order of effects, improvements in interpersonal behavior, particularly decreases in intraindividual behavioral variability, may form a basis for improvement in interpersonal functioning, which may contribute to the prevention of worsening anxiety symptoms.

Distinguishing Anxiety from Depression

The findings of these studies regarding the association between depression and intraindividual behavioral variability warrant replication and examination in a sample diagnosed with a depressive disorder. However, the results of Study 1 and 2 are consistent in suggesting that intraindividual behavioral variability distinguishes between anxiety and concurrent depressive symptoms. This is particularly evident in Study 1 where it was feasible to adjust for the comorbidity between anxiety and depression symptoms. This finding contributes to the understanding of a longstanding issue regarding the frequent comorbidity between anxiety and depressive disorders and the correlation between anxiety and depressive symptoms (Kendler et al., 2011; Zinbarg et al., 1994). Early research by Clark, Watson, and colleagues sought to put forward a "tripartite model" of anxiety and depression, which accounts for a general distress factor common between them along with features specific to each syndrome (Clark & Watson,

1991). Empirical tests of this model seem to support its assertion (Watson et al., 1988; Watson et al., 1995). As one example, research by Higgins and colleagues (Higgins, 1987; Higgins et al., 1985) demonstrated that a cognitive discrepancy between ideal-, actual-, and ought-self representations distinguishes between anxiety and depressive symptoms. The findings of this research seem to further support Clark and Watson's original tripartite model. While anxiety and depressive symptoms were both associated with elevated quarrelsome and submissive behavior, anxiety symptoms alone were associated with elevated intraindividual behavioral variability.

Limitations and Future Directions

It might be argued that elevated anxiety symptoms are associated with elevated intraindividual behavioral variability, because elevated anxiety symptoms are associated with greater reactivity to situational cues, which trigger appropriate changes in behavior. Indeed, individuals appropriately modulate their behavior in response to the behavior of another person (Tracey, 2004; Tracey, 2005), affect (Sadikaj et al., 2011), and other features of the situation (Sadikaj et al., 2010). In particular, Russell et al. (2011) demonstrate elevated reactivity among individuals diagnosed with social anxiety disorder. Further evidence demonstrates elevated reactivity to social cues (Alden & Bieling, 1998) and other anxiogenic stimuli (Borkovec et al., 2002; Mogg, Millar, & Bradley, 2000) among individuals with elevated anxiety symptoms.

Further investigation has reported limited association between reactivity to situational cues and intraindividual behavioral variability. Erickson et al. (2009) reported that heightened reactivity only partially moderated the association between interpersonal distress and intraindividual behavioral variability. Moreover, theory surrounding social skills deficits of individuals with anxiety symptoms (see Rodebaugh, Holaway, & Heimberg, 2004) suggests anxious individuals may not adapt their behavior to others in a consistent manner. It is possible

that changes in behavior, particularly among anxious individuals with social skills deficits, may be incongruent with the demands of the situation. This suggests that elevated intraindividual behavioral variability among individuals with elevated anxiety may be, at most, only partially explained by elevated reactivity to situational cues.

One result found in both studies is that intraindividual behavioral variability is not associated with depression symptoms. However, limitations within Study 1 and 2 indicate the need for this finding to be evaluated in a sample diagnosed with a depressive disorder. Study 1 provided preliminary evidence that intraindividual behavioral variability is not associated with depression symptoms among a community sample. This warrants examination in a sample with a diagnosed depressive disorder. Study 2 provided examination of intraindividual behavioral variability in a sample diagnosed with an anxiety disorder. However, the lack of participants with diagnosed Major Depressive Disorder suggests that the sample in Study 2 does not provide the needed examination within a clinically depressed sample. The community sample recruited in Study 1 included 48 participants meeting the cut off criteria for a diagnosis of at least mild depression using the Beck Depression Inventory. While this suggests that intraindividual behavioral variability is not associated with depression symptoms, follow up between-person investigation is needed with a clinically diagnosed sample.

An additional limitation in Study 2 is that only spin was examined as a measure of intraindividual behavioral variability. Examination of flux in agreeable, quarrelsome, dominant, and submissive behavior was not included due to concerns that inclusion would drastically increase the number of models estimated. This could inflate the type 1 error rate. Spin was chosen as a composite representing dispersion of behavior around the interpersonal circumplex over events.

There has been considerable debate on the implications of intraindividual behavioral variability. One position asserts that elevated variability reflects an ability to adapt to the situation (Leary, 1957), such that individuals who report engaging in a more narrow range of behaviors tend to report decreased wellbeing (O'Connor & Dyce, 1997; Paulhus & Martin, 1988). The opposing position asserts that elevated variability is associated with considerable distress, including neuroticism (Moskowitz & Zuroff, 2005), self-criticism (Kopala-Sibley et al., 2013), and Borderline Personality Disorder (Russell et al., 2007). This position states that elevated variability reflects difficulty regulating behavior over events, including fragmentation of self-concept (Donahue et al., 1993). As a clinical example, Linehan (1993) describes behavioral dysregulation as one core component of Borderline Personality Disorder and suicidal individuals. In her formulation, these individuals, when under distress, attempt to cope using a variety of methods. Linehan (1993) further posits that increased emotional dysregulation leads to difficulty finding a successful and sustainable method of coping with dysregulated emotions, leading to dysregulation of behavior.

The present studies suggest that elevated intraindividual behavioral variability is a feature of anxiety symptoms, which decreases as anxiety symptoms decrease. As such, it provides support for theory suggesting that intraindividual behavioral variability reflects difficulty regulating behavior. Although elevated variability may reflect sensitivity to situational cues, a considerable portion of intraindividual behavioral variability is not explained by reactivity to features of the situation (Erickson et al., 2009). Considerable laboratory-based research suggests that anxious individuals have difficulty regulating their emotional response to provocative social situations (Mennin et al., 2002). Specific to interpersonal behavior, individuals with elevated anxiety symptoms seem to have difficulty regulating hostile behavior (Erwin et al., 2003).

Further research is needed to explore the psychophysiological processes that create difficulty in regulating interpersonal behavior.

Research has suggested the role of specific genetic polymorphisms in influencing interpersonal behavior, including affiliative (Rodrigues, Saslow, Garcia, John, & Keltner, 2009; Ross & Young, 2009) and hostile behavior (e.g., Lesch et al., 1996; Nelson & Trainor, 2007). This research has been limited by a reliance on single occasion self-report of interpersonal behavior or laboratory-based tasks where interpersonal behavior is observed. Genetic research on interpersonal behavior needs to be replicated in a manner where interpersonal behavior can be assessed within a variety of naturalistic settings. Moreover, assessment of behavior over events, as was conducted in the research presented here, allows for estimation of indices of behavior beyond mean levels. For example, little is known about the genetic correlates of intraindividual behavioral variability because previous genetic research has not been able to estimate intraindividual behavioral variability. Further research is needed to evaluate the genetic contribution to interpersonal behavior in naturalistic settings including mean level behaviors and intraindividual behavioral variability.

Potential Clinical Applications

The present research demonstrates the association of anxiety symptoms with elevated behavioral variability. Recent research suggests that elevated behavioral variability is associated with negative interpersonal outcomes, including a small social network and impaired goal completion (Côté et al., 2012; Rappaport et al., 2013; Sadikaj et al., under review). The results presented in Study 1 suggest that elevated mean-level quarrelsome and submissive behavior is characteristic of both depression and anxiety symptoms. This may be one pathway through which depression and anxiety symptoms confer elevated risk for interpersonal problems. The

present research suggests that beyond elevated mean-level quarrelsome and submissive behavior anxiety symptoms may be associated with interpersonal problems resulting from elevated intraindividual behavioral variability. This may be another pathway through which anxiety symptoms confer elevated risk for interpersonal problems. Clinicians would benefit from awareness of the possible impact of erratic behavior by the anxious person on others' negative affect. This may include awareness that the clinician may experience more negative affect with more anxious patients and the experience of negative affect may increase over time. This may lead to disruptions in the therapeutic alliance and even subtle forms of hostility or disengagement and withdrawal from the patient. Moreover, interpersonal treatments which focus on elevated mean-level quarrelsome and submissive behavior may benefit from also addressing dispersion in an individual's behavior over events. Addressing dispersion in behavior may be particularly important given research by Moskowitz and colleagues suggesting that dispersion in behavior over events confers risk for interpersonal problems above and beyond the effects of mean-level behavioral tendencies (Côté et al., 2012; Rappaport et al., 2013; Sadikaj et al., under review).

Moreover, the research presented here demonstrates that individuals with elevated anxiety show greater variability in behavior over events. For example, the behavior of a highly anxious individual at one assessment may vary considerably from the individual's behavior at an assessment the following day or week. This suggests that assessments of behavioral tendencies for anxious individuals ought to be conducted over several occasions to provide more accurate and robust estimates of mean tendencies and to estimate variability around the mean.

An additional potential clinical result of this research is support for the notion that anxiety may be associated with dysregulation of emotion and behavior. For example, Mennin and colleagues have demonstrated emotional dysregulation among anxious individuals (Mennin

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et al., 2002, 2005; Mennin et al., 2009). The present results may indicate that anxiety is associated with elevated erratic behavior resulting from emotional dysregulation. The notion that behavioral dysregulation follows from emotional dysregulation warrants further investigation. However, a potential implication of this line of investigation is support for the use of emotion-regulation treatments for individuals diagnosed with anxiety disorders. For example, Dialectical Behavior Therapy (Linehan, 1993) and Emotion Regulation Therapy (Mennin, 2004) may be useful adjuncts to standard Cognitive Behavioral Therapy for anxiety disorders (e.g., Campbell-Sills & Barlow, 2007). Specific to Generalized Anxiety Disorder, Newman and colleagues have pioneered a cognitive-behavioral treatment which integrates interpersonal and emotional processing into standard cognitive behavioral treatment (Newman, Castonguay, Borkovec, & Molnar, 2004). There is evidence that CBT with interpersonal and emotional processing is associated with improvements in GAD symptoms (Newman, Castonguay, Borkovec, Fisher, & Nordberg, 2008), however it is unclear whether these improvements are greater than those found among standard CBT treatment (Newman et al., 2011).

Conclusion

The two studies reported here demonstrate that elevated anxiety symptoms are associated with elevated intraindividual behavioral variability (i.e. flux and spin) at the between-person level (Study 1) and that decreases in anxiety symptoms, generated from psychopharmacological treatment, lead to subsequent decreases in intraindividual behavioral variability (i.e., spin; Study 2). Both studies suggest that this association is specific to anxiety symptoms; comorbid depression symptoms (Study 1) and concurrent decreases in depression symptoms (Study 2) were not associated with intraindividual behavioral variability. Moreover, both studies demonstrate that the association between anxiety symptoms and intraindividual behavioral

variability is evident beyond the association of anxiety with elevated mean-level quarrelsome and submissive behavior.

These findings suggest that, beyond mean-level behavior, intraindividual behavioral variability may be an important factor in the generation of interpersonal problems among individuals with elevated anxiety symptoms and, therefore, warrants assessment in the evaluation of behavioral tendencies. The two studies reported here suggest a methodology for the assessment of intraindividual behavioral variability, namely the event-contingent recording procedure using the social behavior inventory (Moskowitz, 1994; Moskowitz & Sadikaj, 2011). Future research is warranted to further investigate the interpersonal problems associated with elevated intraindividual behavioral variability and to examine the processes which give rise to elevated intraindividual behavioral variability. This latter aim may include genetic, physiological, and situational factors which engender elevated intraindividual behavioral variability for a given individual. Such research into the causes and consequences of intraindividual behavioral variability may inform assessment of an individual's risk for generating interpersonal problems, which ultimately worsen the presenting syndrome and increase risk for developing comorbid conditions. Hence, this research has the potential to inform the assessment of risk and prognosis for individuals presenting with internalizing disorders. This research suggests novel interpersonal targets for the treatment of anxiety disorders. While interpersonal treatments may address elevated mean-level quarrelsome and submissive behavior, they may benefit from also addressing the dispersion of an individual's behavior over events. This has the potential to reduce the generation of interpersonal problems and, ultimately, worsened illness.

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Appendix A

Event-contingent recording behaviors for Study 1. Items were completed in French only.

Agreeableness
J'ai écouté l'autre (les autres) attentivement
J'ai manifesté de l'affection, que ce soit en paroles ou par gestes
J'ai fait des compromis par rapport à une décision
J'ai souri et j'ai ri avec l'autre (les autres)
J'ai suivi les idées ou vœux de l'autre (des autres)
J'ai complimenté ou félicité l'autre (les autres)
J'ai fait des concessions pour éviter une situation désagréable
J'ai échangé des plaisanteries
J'ai démontré de la sympathie
J'ai parlé favorablement de quelqu'un qui était absent
J'ai dit des paroles rassurantes
J'ai souligné les points sur lesquels nous étions en accord

Quarrelsomeness
J'ai confronté l'autre (les autres) sur un point que je n'aimais pas
J'ai gardé pour moi des informations utiles
J'ai ignoré les commentaires de l'autre (des autres)
J'ai critiqué l'autre (les autres)
J'ai fait un commentaire sarcastique
J'ai fourni de fausses informations
J'ai énoncé avec vigueur que je n'aimais pas ou ne ferais pas quelque chose
Je n'ai pas répondu aux questions ou aux commentaires de l'autre (des autres)
J'ai discrédité ce qu'une personne avait dit
J'ai montré des signes d'impatience
J'ai élevé la voix
J'ai exigé que l'autre (les autres) fasse(nt) ce que je voulais

Dominance
J'ai parlé d'une voix ferme et claire
J'ai pris en charge la planification/organisation d'un projet ou d'une activité
J'ai essayé de faire en sorte que l'autre (les autres) fasse(nt) autre chose
J'ai exprimé une opinion
J'ai critiqué l'autre (les autres)
J'ai été droit au but
J'ai désigné quelqu'un pour faire une tâche
J'ai fait une suggestion
J'ai demandé à l'autre (aux autres) de faire quelque chose
J'ai demandé l'assistance d'une personne volontaire
J'ai donné de l'information
J'ai établi des objectifs pour l'autre (les autres) ou pour nous

Submissiveness

J'ai laissé l'autre (les autres) dresser les plans ou prendre les décisions
Je n'ai pas dit comment je me sentais
J'ai évité de prendre les commandes ou d'agir comme responsable
J'ai parlé doucement
Je n'ai pas exprimé mon désaccord quand je le ressentais
Je n'ai pas fait valoir mon point de vue
J'ai attendu que l'autre parle ou agisse en premier
Je n'ai pas dit ce que je pensais vraiment
Je n'ai pas dit clairement ce que je voulais
J'ai suivi les idées ou vœux de l'autre (des autres)
J'ai cédé
J'ai parlé seulement lorsque l'on s'adressait à moi

Appendix B

Event-contingent recording behaviors for Study 2. Items were completed in French and English depending on participant preference.

Agreeableness
I complimented or praised the other person
I compromised about a decision
I exchanged pleasantries
I expressed affection with words or gestures
I expressed reassurance
I listened attentively to the other(s)
I made a concession to avoid unpleasantness
I pointed out to the other(s) where there was agreement
I showed sympathy
I smiled and laughed with the other(s)
I spoke favorably of someone who was not present
I went along with the other(s)

Quarrelsome
I criticized the other(s)
I confronted the other(s) about something I did not like
I demanded that the other(s) do what I wanted
I did not respond to the other(s) questions or comments
I discredited what someone said
I gave incorrect information
I ignored the other(s) comments
I made a sarcastic comment
I raised my voice
I showed impatience
I stated strongly that I did not like or that I would not do something
I withheld useful information

Dominant
I asked for a volunteer
I asked the other(s) to do something
I assigned someone to task
I criticized the other(s)
I expressed an opinion
I gave information
I got immediately to the point
I made a suggestion
I set goals for the other(s) or for us
I spoke in a clear firm voice
I took the lead in planning/organizing a project or activity
I tried to get the other(s) to do something else

Submissiveness
I avoided taking the lead or being responsible
I did not express disagreement when I thought I did
I did not say how I felt
I did not say what I wanted directly
I did not say what was on my mind
I did not state my own views
I gave in
I let other(s) make plans or decisions
I spoke only when I was spoken to
I spoke softly
I waited for the other person to talk or act first
I went along with the other(s)