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**WORRY AND ASSOCIATED SYMPTOMS IN YOUNGER VERSUS
MIDDLE-AGED ADULTS WITH
DSM-IV GENERALIZED ANXIETY DISORDER
AT PRE- AND POST-TREATMENT**

A Thesis in

Psychology

by

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ABSTRACT

This study investigated the relationship between worry, depression and associated symptoms (restlessness, difficulty concentrating, insomnia, fatigue, irritability and muscle tension) in young- to middle-aged adults (18-65 years) with and without DSM-IV GAD at pre-treatment, and with GAD from pre-to post-treatment. Data was drawn from a series of three treatment-outcome studies at the Pennsylvania State University investigating elements of Cognitive-Behavioral Therapy alone and in combination. Worry and associated symptom ratings were recorded via semi-structured interviews at pre-treatment, post-treatment, 6- and 12-month follow-ups using the Hamilton Anxiety Ratings Scale (Hamilton, 1959). Depression ratings were recorded with the BDI (Beck, 1978). Results showed that at pre-treatment in the total GAD client group (n=192), worry, depression and all associated symptoms were rated at clinical levels, with the exception of muscle tension. Worry in the total GAD client group was also associated with a specific “hyperaroused/hypervigilant” symptom constellation: restlessness, difficulty concentrating, insomnia, and fatigue. Depression was associated with a largely distinct symptom constellation: irritability and fatigue. Significant reductions in worry, depression and all 6 associated symptoms were found from pre- to post-treatment, and these reductions were maintained across 6- and 12-month follow-ups. Younger and middle-aged adults with GAD were equivalent on presentation and treatment response for worry, depression and associated symptoms, with two exceptions: younger adults with GAD (n=72) were slightly more irritable at pre-treatment, and middle-aged adults with GAD (n=24) showed slightly more difficulty concentrating at post-treatment.

List of Tables

	<u>page</u>
List of Tables.....	v
List of Figures.....	vii
Acknowledgements.....	viii
<u>Chapter</u>	<u>page</u>
Introduction.....	1
Review of literature on worry and associated symptoms	7
Questions and hypotheses.....	15
Relationship between worry and associated symptoms at diagnosis/pre-treatment.....	15
Effects of therapy on worry and associated symptoms.....	18
Effects of therapy on worry and associated symptoms in younger versus middle-aged adults with GAD.....	19
Method.....	22
Participants.....	22
Measures.....	24
Results.....	25
Discussion.....	41
Relationship between worry and associated symptoms at diagnosis/pre-treatment.....	42
Effects of therapy on worry and associated symptoms.....	58
Effects of therapy on worry and associated symptoms in younger versus middle-aged adults with GAD.....	59
References.....	68
Appendix: Tables and Figures.....	74

1.	Table 1: Means and Standard Deviations for the Total GAD Client Sample versus Nonanxious Controls at Diagnosis/Pre-Treatment.....	74
2.	Table 2: Correlations between Worry, Depression and Associated Symptoms for the Total Sample of Study Participants (GAD clients plus Nonanxious Controls).....	75
3.	Table 3: Correlations between Worry, Depression and Associated Symptoms for the Total GAD Client Sample at Pre-Treatment.....	76
4.	Table 4: Correlations between Worry, Depression and Associated Symptoms for Nonanxious Controls.....	77
5.	Table 5: Partial Correlations between Worry, Depression and Associated Symptoms for the Total GAD Client Group.....	78
6.	Table 6: Factor Loadings for Worry, Depression and Associated Symptoms in the Total GAD Client Sample at Pre-Treatment.....	79
7.	Table 7: Factor Loadings for Worry, Depression and Associated Symptoms in Nonanxious Controls.....	80
8.	Table 8: Summary of Repeated Measures ANOVAs for Worry, Depression and Associated Symptoms in the Total GAD Client Sample at Pre-Treatment, Post-Treatment and Follow-Ups.....	81
9.	Table 9: Means and Standard Deviations for Worry, Depression and Associated Symptoms in Younger Adult versus Middle-Aged GAD Clients at Pre-Treatment.....	82
10.	Table 10: Correlations between Worry, Depression and Associated Symptoms in Younger Adult versus Middle-Aged GAD.....	83
11.	Table 11: Factor Loadings for Worry, Depression and Associated Symptoms in the Younger Adult GAD.....	84

Table 12: Factor Loadings for Worry, Depression and Associated Symptoms in the Middle-Aged Adult GAD Client Sample.....	85
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List of Figures

1. Chart 1: Reductions in Worry and Associated Symptom Ratings
For the Total GAD Client Sample from Pre-Treatment
Through Post-Treatment, 6- and 12-month Follow-Ups.....86

Acknowledgements

This is for you, Mom. I wanted so much to show it to you, to let you know I'd finished. I can still see you waving goodbye to me, from the beautiful greenhouse Dad built for you. It is a clear, cool night on Shore Road, sprinkled with stars. You've packed my car with provisions. I'm on my way back to Penn State, any one of so many times. My life has taken so many twists and turns. Thank you for being there in love and spirit, the whole way. I will always remember your voice, your beautiful smile and laughter, all the wonderful things that came to life through your hands, everything you did for me... I am the luckiest son, to have had you as my Mom, and to have you still and always, in Spirit... I feel you with me, and have to believe we will be together again, with Dad. I will have so much to tell you...

This is for you, Dad. Thank you for all you gave me. I will never forget your love for me, your strength, your sense of humour and style. You carried us – Mark, Andrea, Noel and I - as far as you could up the stream of Life. Mom guided us the rest of the way. Now we carry you both in memory, and in our hearts. When you were twenty-four, you worked in Alaska and wrote poems by the fire on cold, solitary nights. One of them you called “To Show I’ve Not Forgotten.” It reads:

A flower's such a pretty thing
When growing in a field in spring
If garden bound, or growing wild
It could be the earth's own child.

A flower's such a useful thing
But makes me wish (if I were king)
For a rarer gift to give it's true
To show I've not forgotten you.

I give this Ph.D. in Clinical Psychology to you also, Dad, to show I've not forgotten you. I have to believe we will be together again, as we were before our struggles drove us apart and you left this world without me being able to say: I'm sorry for my wayward teenage years, and I love you. As I make my rounds and see my patients, I will feel you and Mom with me and will do my best to make you proud.

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Introduction

In 1987, the Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition-Revised (DSM-III-R, American Psychiatric Association) first named pathological worry as the core feature of Generalized Anxiety Disorder (GAD). Since then, there has been substantial clinical research on worry.

Much of the research has focused on worry itself: its nature, origins, potential functions, content, and treatment (see Borkovec, Ray, & Stoeber [1998] for a review of key findings concerning these dimensions of the worry phenomenon). Within this growing literature, part of the research has been devoted to the relationship between worry and the cognitive and/or somatic symptoms closely associated with it (Joorman & Stober, 1999). To date, this literature has established close connections between worry and 6 cognitive/somatic symptoms, as per the current DSM-IV (1994) GAD associated symptom list: restlessness, difficulty concentrating, insomnia, fatigability, irritability and muscle tension. However, there is also a consensus among worry and anxiety researchers that more studies are needed concerning worry and associated processes. Key topics for future research that have been highlighted in the recent literature include the following.

1) Additional research is needed on correlations between worry and associated symptoms in GAD client samples. Such research should help refine the current DSM-IV GAD construct, which has been found to have the lowest interrater reliability of all DSM-IV anxiety disorders (Freeston et al, 1996). This finding of low interrater reliability may be partly based in the associated symptom overlap between DSM-IV GAD and other anxiety and mood disorders (Freeston et al, 1996). Greater discriminant validity for GAD is especially necessary as regards DSM-IV depressive disorders (Major Depressive Disorder, Dysthymia). These latter disorders share a number of associated symptoms with DSM-IV GAD (including restlessness, difficulty concentrating, insomnia and fatigue). The current study will examine and potentially refine the DSM-IV GAD construct through a correlational analysis of worry, depression and associated symptoms at pre-treatment in a carefully diagnosed GAD sample (n = 96; 65 females; mean age = 37.04, SD = 11.27) with Nonanxious Controls matched for age, gender, education and ethnicity (n= 96; 65 females; mean age = 36.22, SD = 11.77). Greater discriminant validity for the DSM-IV GAD construct may be helpful for devising more effective therapies for GAD, targeting its most characteristic, distressing and disruptive symptoms.

2) A second need evident in the literature on worry and associated symptoms is a better understanding of treatment response for these symptoms. Little is currently known about whether reductions in worry severity entail reductions in specific

associated symptoms (cf. Gould et al, 1997). The current study will examine the effects of therapy on worry and associated symptoms by comparing semistructured interview ratings of these symptoms at pre- and post-treatment in this GAD client sample. This analysis should help determine whether state-of-the-art therapy for GAD is effective for reducing not only worry, but distressing and debilitating symptoms such as difficulty concentrating, insomnia, fatigue, etc. It may also eventually pave the way for therapies more effective at reducing such symptoms. For example, a finding that clinical levels of insomnia were significantly reduced for GAD clients at post-therapy and follow-ups would suggest that one or more therapy components (such as progressive muscle relaxation, emotional processing, and/or circumscribed worry periods, etc.) was effective in reducing this particular symptom. Researchers could then focus on determining which therapy component was responsible for this effect, and give it a more prominent place in treatment protocols. Findings that clinical levels of other associated symptoms were reduced for GAD clients at post-therapy could be researched in a similar manner. On the other hand, findings that certain associated symptoms were not reduced through treatment in the current study could prompt research on therapies more effective at targeting and reducing those symptoms. For example, a finding that clinical levels of irritability were closely associated with worry in the current GAD sample, but not effectively reduced through therapy, could lead researchers to focus on adding new therapy elements designed to reduce this distressing symptom and its possible effects. Such new therapy

elements could include self-monitoring techniques for noticing triggers and signs of irritation early, and techniques for diffusing the irritation (e.g., deep breathing, repetition of a mantra as in Transcendental Meditation or Benson's relaxation training, etc.). Such new therapy elements could also include interpersonal communication skills for appropriately expressing irritation and anger. Findings that clinical levels of other associated symptoms were also left relatively unaffected by therapy could lead researchers to focus on adding new therapy elements designed to reduce these, all with a view to developing therapies optimally effective at reducing worry and any of its closely associated symptoms.

3) An additional need evident on reviewing the recent literature is for research on levels of worry and associated symptoms in younger versus middle-aged adults with GAD, at both pre- and post-therapy. A number of GAD treatment studies have included samples of both younger and middle-aged adults (see Chambless & Gillis [1993] and Borkovec & Whisman [1996] for reviews). However, no studies have examined potential differences in presentation and treatment response for worry and associated symptoms in these arguably distinct age groups (roughly, ages 18-44 and 45-65, respectively, as per typical age groupings in the developmental literature, cf. Merrill and Verbrugge, 1999). There is evidence that worry process and severity are similar at pre-treatment in both younger and middle-aged adults with GAD (Beck, Stanley & Zebb, 1996). However, worry content may vary, with younger adults worrying more about family, work and

finances, while older (upper middle-aged and elderly) adults worry more about issues such as health (cf. Person & Borkovec, 1995; Powers, Wisocki, & Whitborne, 1992). Chronic worry in both groups is also frequently comorbid with depressive cognitions and affect (Freeston et al, 1996), although depression is reportedly no more common in middle-aged than in younger adults (Keyes & Ryff, 1999). Chronic worry may also be equally responsive to treatment in both younger and middle-age adults with GAD (Stanley and Novy, 2000). On the other hand, there is reason to believe that the cognitive/somatic symptoms typically associated with worry may present differently in middle-aged versus younger adults with GAD, and be differentially responsive to treatment in these two groups. In particular, physiological changes from younger adulthood to middle age may produce higher levels of certain symptoms at pre-treatment for middle-aged adults, which may not be amenable to reduction through anxiety-focused psychotherapies. There is evidence that both concentration and flexibility of attention diminish from young adulthood (age 20) into middle age (age 60) [Stankov, 1988]. This may be due to age-related reductions in autonomic arousal, which has been tied to quality and flexibility of attention (Broschott and Thayer, in press). There is also evidence that quality of sleep changes dramatically from 20 to about 60 years of age, with more broken sleep, lighter sleep and fewer deep sleep stages for middle-aged adults, possibly due to age-related dysregulation of biological clock mechanisms (Carrier, 1998). There may be other symptoms often associated with worry and/or anxiety that are also related to the physiology of

aging from young adulthood to middle age (see below). Such associated symptoms may therefore be initially higher for middle aged adults with GAD as opposed to their younger counterparts, due to the additive or catalytic effects of worry and age-related physiological changes. Such symptoms may also be more resistant to treatment for GAD, given an at least partial etiology in the physiology of aging, as opposed to the worry/anxiety targeted by psychotherapy. These possibilities are worth investigating for their potential impact on treatment for middle-aged versus younger adults with GAD. For example, middle-aged adults with GAD might have even greater concentration difficulties than their younger counterparts, based not only in the intrusive, off-task cognitions characteristic of worry, but in lower levels of physiological arousal, a key component in sustained attention or concentration (Giambra and Quilter, 1988). These middle-aged adults with GAD may therefore require not only cognitive interventions directed at reducing off-task cognitions, but additional behavioral interventions such as consistent exercise, designed to increase physiological arousal and thereby sustained attentional capacity. A better understanding of treatment effects on worry and associated symptoms in middle-aged adults may aid in tailoring treatment (as needed) for this population. The current study should add to our knowledge of treatment effects, by examining the relationship between worry and associated symptoms in middle-aged (45-65 years old; $n = 24$; 15 females; mean age = 52.25, $SD = 5.85$) versus younger (18-44 years old; $n = 72$; 50 females;

mean age = 31.97, SD = 7.39) adults with GAD at both pre- and post-treatment/follow-ups.

Review of literature on worry and associated symptoms

Worry has long been associated with certain cognitive and/or somatic symptoms. In the 1930's, 40's and 50's, worry was associated in the psychological literature with gastric problems (Ivy, 1933), motoric and glandular problems (Podolsky, 1944), and distraction, motor tension and sleep disturbances (O'Connor et al, 1956). In the DSM-III (American Psychiatric Association, 1980), worry in GAD was diagnostically associated with a variety of symptoms, including autonomic arousal indices such as shortness of breath, tachycardia, and nausea/abdominal distress.

It has been further speculated that worry and anxiety are at the basis for certain restless/agitated behaviors in younger adults, and in older adults with dementia (Mintzer and Mintzer, 1996). There is also an empirically-established connection between worry and attentional difficulties. Eysenck et al (1987) and Mathews et al (1987) found that GAD clients show an attentional bias toward threatening stimuli. Pruzinsky and Borkovec (1990) found that worriers report greater difficulty with attentional control during focused attention tasks. DiBartolo et al (1997) found that GAD clients show impaired performance on an attention vigilance task as compared to nonanxious controls, when neutral

distractor cues are presented. Following an information processing model stressing allocation of attentional resources, DiBartolo et al suggest that GAD clients' cognitive bias toward threat leaves them with fewer attentional resources to direct toward neutral and positive stimuli. Bias towards threat would thus entail deficits in attentional scope and flexibility (the ability to take in all relevant stimuli, perhaps partly by shifting attention as needed to new, non-threatening information). DiBartolo et al also point out that worry-induced attentional difficulties may interfere with performance on various tasks. In fact, worry has been shown to interfere with tasks placing increased demand on attentional resources, such as a decision-making task on inclusion of novel shapes in a pre-determined category (Metzger, Miller, Cohen, Sofka & Borkovec, 1990). Worry has also been shown to interfere with neutral, monotonous tasks from which attention might easily drift or become distracted (Borkovec, Robinson, Pruzinsky & Dupree, 1983).

Worry has also been associated with muscle tension, in both physiological studies (Hoehn-Saric et al, 1989) and by clinician rating on structured and semistructured interviews (Marten et al, 1993; Starcovec et al, 1994; Abel & Borkovec, 1995; Joorman & Stober, 1999). Borkovec (1979) found that worry contributes to the maintenance of insomnia. Insofar as it contributes to restlessness, muscle tension and insomnia, worry may also be contributing to the fatigability often reported by GAD clients (Marten et al, 1993). Finally,

worry/anxiety has been theoretically linked to irritability in demented elderly (Cohen-Mansfield, 1986), as well as to clinician ratings of irritability in younger to middle-aged adults with GAD (Joorman & Stober, 1999; Starcovec et al, 1994).

The mechanisms for any connection between worry and associated symptoms may be cognitive and/or neurophysiological. Worry as perseverative anticipation of threat may convert otherwise transient life events and daily stressors into prolonged physiological activation (Brosschot & Thayer, in press). Worry and its prolonged physiological activation have been associated in turn with the deactivation of certain central nervous system networks (including the "CAN," or Central Autonomic Network) responsible for flexible and adaptive response to environmental demands (Thayer & Lane, in press). These responses include adaptive heart rate variability (HRV) in response to environmental challenge. Chronic worry has been linked to reductions in HRV (Thayer, Friedman, & Borkovec, 1996), and a concomitant increased risk for coronary heart disease (Kubzansky, Kawachi, Spiro, Weiss, Vokonas, & Sparrow, 1997). Reductions in HRV may also compromise other adaptive responses, including emotional regulation and flexibility of attention (Thayer and Lane, in press). Overall, the prolonged physiological activation seen in worry may produce a variety of pathologic cognitive and somatic effects, including long-term decrements in health (Broschott & Thayer, in press). The underlying neural

mechanisms and cognitive/somatic effects of worry are still being explored (for a review of current directions in this research, see Thayer & Lane, in press).

Whatever these underlying mechanisms may be, worry has clearly been associated over the years with a wide range of cognitive and/or somatic complaints.

DSM-III-R attempted to better formalize and refine the relationship between worry and its wide range of associated symptoms. DSM-III-R first named excessive and unrealistic worry as the core feature of GAD. It also established a list of 18 symptoms typically associated with worry in GAD. These symptoms were drawn from three theoretically distinct clusters, including Autonomic Hyperactivity (AH: shortness of breath, tachycardia, sweating or cold/clammy hands, dry mouth, dizziness, nausea/abdominal distress, hot flashes or chills, frequent urination, and trouble swallowing); Muscle Tension (MT: muscle tension, restlessness, trembling, fatigue), and Vigilance/Scanning (V/S: being keyed up or on edge, difficulty concentrating, insomnia, irritability, exaggerated startle). For a diagnosis of GAD, at least 6 out of 18 symptoms from any of these clusters had to be present.

While DSM-III-R arguably offered a more refined conception of worry and associated symptoms than was previously available, subsequent research revealed weaknesses in the GAD construct (Brown, Marten, & Barlow, 1995). Interrater

reliabilities for GAD were lower than for other anxiety disorders (Barlow & DiNardo, 1991). At the same time, overlap with other anxiety disorders and with certain depressive disorders was high (DiNardo et al, 1993; Brown et al, 1994). As Joorman and Stober (1999) have noted, the overlap between DSM-III-R GAD and major depression was particularly high, with estimates of comorbidity ranging from 11% to 46% (Brown et al, 1994). This overlap with depressive disorders was not surprising, given the close associations between worry, depression, and cognitive/somatic complaints. Worry induction had been found to generate moderate levels of both depressive affect and a kind of mixed depressive/anxious somatic response (Andrews & Borkovec, 1988). In addition, GAD, Major Depressive Disorder (MDD) and Dysthymia all shared the cognitive/somatic symptoms of insomnia, fatigue, and difficulty concentrating in their respective DSM-III-R criteria. DSM-III-R GAD and MDD also shared the additional symptom of restlessness.

Certain studies suggested that difficulties with its 18-item symptom list were contributing to the low interrater reliability and poor discriminant validity of DSM-III-R GAD. For example, Mannuzza et al (1989) found that approximately 50% of disagreements concerning a diagnosis of DSM-III-R GAD were due to variance in clinician ratings of associated cognitive/somatic symptoms. In particular, items from the AH cluster (including shortness of breath, tachycardia, sweating or cold/clammy hands, dry mouth, dizziness, nausea/abdominal distress,

hot flashes or chills, frequent urination, and trouble swallowing) were questioned as specific characteristics of GAD. Such items had previously been considered hallmarks of anxiety, and by extension worry. However, by the late 1980's and early 1990's, a series of studies began to suggest that worry and GAD were characterized precisely by a lack or even suppression of AH symptoms (Hoehn-Saric & Masek, 1981; Hoehn-Saric & McLeod, 1988; Borkovec & Hu, 1990). Worriers were shown to have resting levels of autonomic activation equivalent to nonanxious controls, and lower than for Panic Disorder clients (Rapee, 1991). Worriers also showed lower levels of autonomic activation as compared to controls when faced with psychological challenges (e.g., phobic images), as measured by lack of cardiovascular response (Borkovec & Hu, 1990).

Self-report and semistructured interview studies with GAD clients also revealed higher endorsement rates for MT and V/S symptoms than for AH symptoms (Marten et al, 1993; Starcovec et al 1994; Abel & Borkovec, 1995; Freeston et al, 1996). Marten et al (1993) conducted a large multi-site study using semistructured interview data from 204 GAD clients. Their results indicated that GAD was most closely associated with 7 symptoms, exclusively from the V/S and MT clusters: restlessness, feeling keyed up or on edge, muscle tension, difficulty concentrating, insomnia, fatigability, and irritability. All AH symptoms were reported with significantly lower frequency. In a sample of 49 GAD clients, Starcovec et al (1994) found that AH symptoms were reported with significantly

lower frequency and severity as compared to the very same 7 MT and V/S symptoms previously highlighted by Marten et al. In a study of 40 GAD clients, Abel and Borkovec (1995) basically replicated the results of the two previous studies, in finding generally low endorsement for AH symptoms, and the highest endorsement for the same 7 MT and V/S symptoms cited above. One hypothesis concerning the low endorsement of AH symptoms among GAD clients holds that the predominance of verbal-linguistic activity characteristic of GAD serves to distract from or suppress distressing mental imagery (Borkovec & Inz, 1990). Such imagery suppression is in turn theoretically tied to lower levels of emotional activation and autonomic nervous system response (Borkovec, Ray, & Stober, 1998).

Revised criteria for GAD in DSM-IV (American Psychiatric Association, 1994) included the addition of "excessive and uncontrollable" instead of "excessive and unrealistic" worry. Given the evidence pointing to its relative lack of AH symptoms, the revised criteria for GAD also featured a reduced associated symptom list comprised only of MT and V/S symptoms, to the exclusion of AH symptoms. This reduced list was based largely on results of the Marten et al (1993) study, which had found the above 7 MT and V/S symptoms to be highly endorsed by GAD clients, and to possess good interrater reliability. For DSM-IV, "restlessness" and "feeling keyed up or on edge" were considered similar enough to be combined into a single item, despite the fact that the former is from the MT

cluster, while the latter is from the V/S cluster. This left a 6-item associated symptom checklist for DSM-IV GAD: restlessness, difficulty concentrating, insomnia, fatigability, irritability and muscle tension. Three of these highly endorsed symptoms were from the MT cluster (restlessness, fatigability, and muscle tension), while the remaining three were from the V/S cluster (difficulty concentrating, insomnia, and irritability). DSM-IV also instituted a refined associated symptom criterion, calling for only 3 out of 6 symptoms for a diagnosis of GAD.

Although the reduced associated symptom list with its refined 3 out of 6 criterion appears to have improved interrater reliability for GAD in DSM-IV, some problems remain (Brown, Marten, & Barlow, 1995). As Joorman and Stober (1999) note, interrater reliability is still lower for GAD than for other anxiety disorders, and overlap with MDD and Dysthymia is still high (Freeston et al, 1996). It also remains unclear whether one or more of the 6 associated symptoms is most crucial for a diagnosis of GAD. Research findings have been somewhat inconsistent on this last question. Of the current 6 associated symptoms, Marten et al (1993) found that GAD is most highly associated with difficulty concentrating and irritability by clinician rating. Starkovec et al (1994) found that GAD is most highly associated with muscle tension and insomnia by clinician rating. A more recent study by Joorman and Stober (1999) using a nonclinical sample found clinician-rated muscle tension to be the only associated symptom uniquely and

substantially related to worry, after depression scores were controlled for in a partial correlation analysis. Joorman and Stober propose that perhaps muscle tension should therefore be the one cardinal symptom required for a diagnosis of GAD, along with any 2 of the remaining 5 associated symptoms from DSM-IV. This would preclude any client not reporting significant muscle tension from receiving a diagnosis of GAD, whatever their other symptoms might be. Given the divergence between the above results, and the importance of an accurate and appropriately inclusive diagnosis for GAD, more information is needed concerning which cognitive/somatic symptoms are most characteristic of this disorder. In addition, other crucial questions remain concerning worry and its associated symptoms. These questions will be addressed through data in the current study.

Questions and hypotheses

1) Relationship between worry and associated symptoms at diagnosis/pre-treatment

Marten et al (1993), Starcovec et al (1994), Abel and Borkovec (1995) and Joorman and Stober (1999) have previously addressed this question. Their results have been consistent in some ways, divergent in others (see above). Joorman and Stober have consequently suggested that more correlational data is needed, particularly from clinical GAD populations, in order to determine which of the current 6 associated symptoms are mostly closely related to chronic worry.

The Marten et al (1993) multi-site study showed at least 50% endorsement of all 6 DSM-IV associated symptoms among GAD clients. Starcovec et al (1994) and Abel and Borkovec (1995) replicated these results in their clinical samples. It is therefore predicted that in the current study, the total GAD client group's ratings for worry and all 6 associated symptoms (not simply the 3 out of 6 associated symptoms required for GAD diagnosis) will have a mean of at least 2.0 (at least moderate severity) on the Hamilton Anxiety Rating scales (a continuous measure of worry and associated symptom severity, 0 - 4). These ratings are additionally predicted to be significantly higher than the total Nonanxious Control group's ratings for worry and all 6 associated symptoms, which are expected to have a mean below 2.0 on the same scale (i.e., below clinical threshold). It is also predicted that there will be positive and significant correlations between worry and all 6 DSM-IV associated symptoms at pre-treatment in the current total GAD client sample.

Hoehn-Saric et al (1989) found that muscle tension is the only physiological activation system significantly distinctive of GAD participants versus Nonanxious Controls at rest and in response to psychological challenge or stress. Joorman and Stober (1999) found that muscle tension is the only associated symptom uniquely related to worry in a nonclinical sample of college worriers, after depression scores are controlled for on partial correlation analysis. It is

therefore also predicted that worry will correlate more highly with muscle tension than with any other associated symptom in the total GAD client sample from the current study.

There is also an ongoing question in the anxiety literature concerning the contribution of worry versus depression to levels of the 6 DSM-IV GAD associated symptoms (Joorman & Stober, 1999). In studies of depression, difficulty concentrating has been found to be a frequent and troubling symptom (DiNardo et al, 1993). In their study on the relationship between worry, depression and associated symptoms in an analog-GAD sample, Joorman and Stober (1999) used a partial correlation analysis to find that difficulty concentrating shows a unique and substantial correlation with depression, but not with worry. However, their sample consisted of nonclinical college worriers. The sample in the present study consists of carefully diagnosed GAD clients, among whom attentional problems are particularly prevalent (see above). In addition, these clients have been screened for a primary GAD diagnosis, with depression at most a secondary diagnosis or concern. Depression may have been a relatively more salient concern for Joorman and Stober's nonclinical college worriers, and may therefore have contributed as much or more to concentration difficulties in their sample. In the current primary GAD sample, only worry (and not depression) scores are expected to correlate significantly with difficulty concentrating on separate bivariate correlation analyses. It is also predicted that

only worry (and not depression) will correlate uniquely with difficulty concentrating on partial correlation analysis, when worry and depression are each controlled for in relation to the other. Although one might anticipate an additive or catalytic effect of worry and depression on difficulty concentrating, the cognitive similarities between worry and depression (with each being a perseverative, ruminative, intrusive thought process; cf. Broshcott and Thayer, in press) are expected to be overlapping or redundant, such that neither adds to any more difficulty concentrating when paired with the other.

Joorman and Stober (1999) also used partial correlation analyses to find that muscle tension shows a unique and substantial correlation with worry, but not with depression. Given the robust association of worry with muscle tension documented in other studies (see above), it is predicted that this finding will be replicated in the current total sample of GAD clients as well.

2) Effects of therapy on worry and associated symptoms

Besides the above diagnostic questions, a review of the GAD treatment literature also reveals a lack of information concerning the effects of treatment on associated symptoms of worry. While there have been a number of studies affirming the efficacy of cognitive behavioral therapy (CBT) and other treatments for GAD (see Chambliss & Gillis [1993] and Borkovec & Whisman [1996] for reviews), most of these have focused on worry severity outcomes and/or

psychotherapy process variables. Power et al (1989) conducted a comparative study of CBT, Diazepam, and placebo (alone and in combination) for the treatment of DSM-III GAD in 101 adults aged 18-65. They found that reductions in worry and anxiety ratings corresponded to reductions in insomnia and an unspecified aggregate of "somatic" symptoms (as measured by the Hamilton Anxiety Rating scale, HAM-A) for the CBT and Diazepam groups as compared to placebo. Although other GAD treatment studies have also used the HAM-A, none have actually reported on possible reductions in each specific associated symptom. However, based on the above-cited support for efficacy of treatments for GAD, coupled with established connections between worry and its 6 associated symptoms (Hoehn-Saric et al, 1989; Marten et al, 1993; Starcovec et al, 1994; Abel & Borkovec, 1995; Joorman & Stober, 1999), it is predicted that any significant post-treatment reductions in worry will be accompanied by significant reductions in associated symptoms. These reductions are expected to be maintained across 6 and 12 month follow-ups, as occurs with reductions in worry severity (cf. Gould et al, 1997).

3) Effects of therapy on worry and associated symptoms in middle-aged versus younger adults with GAD

Do middle-aged versus younger adults with GAD report similar levels of worry and associated symptoms at pre-treatment? Do they experience similar reductions in worry and associated symptoms at post-treatment and follow-ups?

The answer to these questions could be crucial for tailoring treatment to these two arguably distinct age groups. The current study will address the question concerning worry and associated symptoms at pre- and post-treatment in middle-aged (aged 45-65; $n = 24$; 15 females; mean age = 52.25, $SD = 5.85$) versus younger (aged 18-44; $n = 72$; 50 females; mean age = 31.97, $SD = 7.39$) adults in the current GAD client sample.

A number of treatment studies have shown the effectiveness of psychotherapies for reducing levels of worry in both younger and middle-aged adult GAD clients (see above). Based on these studies, it is predicted that therapy for chronic worry in the middle-aged adults (45-65 years) in the current study will be as effective as therapy for their younger counterparts (18-44 years), with both groups reporting significantly lower levels of worry at post-treatment through follow-ups. However, the middle-aged GAD group's pre-treatment levels of certain associated symptoms may be higher, due to age-related physiological changes (see below). This may be expected for the symptoms of insomnia, fatigue and difficulty concentrating. The post-treatment levels of these same symptoms are also expected to be higher, since a therapy targeting anxiety may not be effective at reducing symptoms at least partly based in the physiology of aging. Several studies have shown incrementally less of the deepest (stage 4) sleep and greater sleep fragmentation starting as early as age 30 (Carrier, 1998), and becoming more noticeable by age 40 and beyond (Dement, Miles, & Bliwise,

1982; Katchadourian, 1987; Webb, 1982). Sleep is apparently more problematic for the middle-aged (Merrill & Verbrugge, 1999), a finding that may be based in the dysregulation of biological clock mechanisms due to aging (Carrier, 1998). It is therefore expected that ratings for insomnia will be higher for the middle-aged GAD clients at pre- and post-treatment. In addition, fatigue is one of the most common complaints reported by middle-aged individuals to general medical practitioners (Calabrese et al, 1992). Sleep difficulties, along with decreases in metabolic rate, oxygen consumption efficiency and overall physical endurance may be contributing to greater daily fatigue for the middle-aged (Merrill & Verbrugge, 1998). It is therefore also expected that ratings for fatigue will be higher for the middle-aged group at pre- and post-treatment. Difficulty concentrating may also be higher at pre- and post-treatment for the middle-aged versus younger adults in the study. Perceptual speed, which has been linked to attentional search and concentration abilities (Stankov, 1988), has been shown to decline steadily and substantially from age 25-65, with the steepest decline in the latter phase of middle age (age 53-60; Seattle Longitudinal Study, Schaie [1996]). It may be that declines in perceptual speed are indicative of an underlying concentration deficit, itself tied to reductions in physiological arousal with aging (Giambra and Quilter, 1988). In any case, declines in perceptual speed and concentration seem to occur together from young adulthood to middle-age. Using 17 different measures of attentional processes, Stankov (1988) found that the attentional factors not only of perceptual speed but of concentration and

attentional flexibility declined steadily and significantly from age 20 to 60 and beyond. It is therefore also expected that ratings for difficulty concentrating will be higher for the middle-aged GAD group than for the younger GAD group at pre- and post-treatment.

Method

Participants

The current study employed archived semistructured interview data from primary GAD clients and Nonanxious Controls matched on age, gender, education and ethnicity. These participants engaged in treatment outcome studies ("GAD-III," "GAD-IV," and "GAD-V") at Penn State University. GAD-III (n = 120; 60 clients + 60 controls) compared a Behavioral Therapy (BT: applied relaxation/coping desensitization) to Cognitive Therapy (CT) and a combination of the two (CBT), with a finding of equivalent effectiveness for all three. GAD-IV (n = 44; 22 clients + 22 controls) was an open trial involving only CBT plus Interpersonal Psychotherapy. GAD-V (in progress; current n = 28, 14 clients + 14 controls) is comparing CBT plus Interpersonal Therapy to CBT plus Supportive Listening. A total of 72 younger adult GAD clients (aged 18-44; 50 females; mean age 31.97 [SD = 7.39]) plus matched Nonanxious Controls (aged 18-44; 50 females; mean age = 30.87 [SD = 7.24]) and 24 middle-aged GAD clients (aged 45-65; 15 females; mean age = 52.25 [SD = 5.85]) plus matched Nonanxious

Controls (aged 45-65; 15 females; mean age = 52.29 [SD = 6.87]) from the above 3 treatment studies contributed data to the current study.

Participants initially completed two semistructured interviews by separate assessors using the Anxiety Disorders Interview Schedule-Revised (ADIS-R; DiNardo et al, 1993). These interviews assessed for characteristics of worry, depression, and associated cognitive/somatic symptoms. GAD clients were then given 14 weeks of therapy in exchange for their participation, followed by a series of ADIS-R interviews at post-therapy, 6- and 12-month follow-ups.

Participant data was divided into GAD clients versus Nonanxious Controls in order to test for pre-treatment differences in levels of worry and associated symptoms in these two groups. In order to test for age differences in response to therapy for worry and associated symptoms, data were also divided into younger adult versus middle-aged GAD clients, based on typical age spans for these two groups in the developmental literature (Merrill and Verbrugge, 1999). Of particular interest for the current study are diagnostic assessor's ratings of worry and associated cognitive/somatic symptoms on the Hamilton Anxiety Rating scale (HAM-A, see below for description), and participants' numerical ratings of depression and associated (mostly cognitive) symptoms on the Beck Depression Inventory (BDI, see below for description). Specific items to be analyzed from the HAM-A include ratings of worry severity, and severity of the associated

symptoms of restlessness, difficulty concentrating, insomnia, fatigue, irritability, and muscle tension. On the BDI, the total item score was used.

Measures

Hamilton Anxiety Rating Scale

The Hamilton Anxiety Rating Scale (HAM-A; Hamilton, 1959) is a clinician-rated instrument designed to assess for severity of anxiety, including its range of cognitive, emotional, somatic and behavioral symptoms. It employs a 5 point Likert-type scale (0 - 4) wherein 0 = absence of symptoms, 1 = mild symptoms, 2 = moderate, 3 = severe, and 4 = very severe or debilitating symptoms. For administration of the HAM-A scale, the 0 - 4 symptom rating scale is explained to participants. They are then asked a series of questions concerning levels of certain symptoms they may have been experiencing over the past month, including the following questions of particular import for the current study: "Over the past month, have you been bothered more days than not by restlessness? Stiffness, soreness, or aches in your muscles? Difficulty concentrating? Difficulty getting to sleep or staying asleep? Tiring easily? Irritability?" These latter questions target the 6 DSM-IV associated symptoms for GAD. Clinicians may elect to add .5 increments to their ratings, expanding variability in the scale.

Beck Depression Inventory (BDI)

The BDI (Beck, 1978) is a self-report measure designed to assess for severity of depression, with an emphasis on its cognitive, affective and behavioral symptoms. Presence of somatic symptoms is not emphasized, with only one such symptom measured (fatigue). The BDI employs a 4 point Likert-type scale (0 - 3) wherein 0 = absence of symptoms, 1 = mild symptom, 2 = moderate, and 3 = severe or debilitating symptom. For the present study, the total BDI score was utilized, with a range of 0 to 63 total score (a score of 15 or higher indicating clinically elevated level of depressive symptoms).

Results

1) Relationship between worry and associated symptoms at diagnosis/pre-treatment

a) Means

At diagnosis/pre-treatment, mean ratings for worry and all 6 associated symptoms were predicted to be above 2.0 on the HAM-A 0 - 4 scale (at least moderate severity) for the total GAD client group (n = 96), and below 2.0 (below clinical threshold) for Nonanxious Controls (n = 96). Means and standard deviations are presented in Table 1. Inspection of Table 1 shows that for the GAD clients, the mean rating for worry was 2.91, or close to the "severe" level. Means

for associated symptoms were also above clinical threshold at the "moderate" level (generally between 2.0 and 2.3), with the exception of muscle tension, which was below clinical threshold at 1.50. The finding of sub-clinical levels of muscle tension was contrary to prediction. Means for worry and associated symptoms in the Nonanxious Control group were all below clinical threshold, at .50 (for worry) or lower (for associated symptoms, generally in the .30 to .20 range).

b) Correlations

Due to concerns about range limitations of ratings for worry and associated symptoms on the HAM-A 0-4 scale, an intercorrelation matrix was run on the total sample of study participants (GAD clients plus Nonanxious Controls, $n = 192$). See Table 2 for this matrix. Inspection of Table 2 shows that on two-tailed tests of Bivariate correlation, worry in the total sample of study participants correlated significantly at the .01 level with 6/6 associated symptoms (restlessness [.77], insomnia [.77], fatigability [.72], difficulty concentrating [.78], and irritability [.71]). The correlation between worry and muscle tension (.49) was lower, but still significant at the .01 level. Depression correlated significantly at the .01 level with 6/6 associated symptoms (restlessness [.66], insomnia [.69], fatigability [.69], difficulty concentrating [.70], and irritability [.68]). Once again, the correlation with muscle tension was the lowest (.50), but still significant at the .01 level.

For the total GAD client group, worry was predicted to correlate significantly at pre-treatment with all 6 associated symptoms, and to have an especially high correlation with muscle tension. On two-tailed tests of Bivariate correlation, worry in the total sample of GAD clients correlated significantly at the $p < .05$ level with difficulty concentrating (.23), insomnia (.25), and fatigability (.24) [see Table 3 for these correlations]. The correlation between worry and restlessness approached significance (.20, $p < .051$). Worry did not correlate significantly with irritability (.16), or muscle tension (-.07). Contrary to prediction, the weakest correlation between worry and any associated symptom was with muscle tension. Depression in the total GAD client group correlated significantly at the .01 level with fatigability (.32) and irritability (.29). Depression also correlated at the .05 level with difficulty concentrating (.20).

For Nonanxious Controls, worry correlated significantly at the .01 level with insomnia (.77), irritability (.28) and difficulty concentrating (.26) [see Table 4 for these correlations]. Depression in Nonanxious Controls did not correlate significantly with any of the 6 associated symptoms (see Table 4).

Partial correlation analyses were run in order to determine strength of relationship between worry and associated symptoms in the total GAD sample at pre-treatment, once depression was controlled for. Results are presented in Table 5. Worry continued to correlate significantly with insomnia on this analysis (.23,

$p < .05$). Contrary to prediction, worry in the total GAD sample did not correlate uniquely with muscle tension ($- .10, p < .33$) once depression was controlled for. It was also predicted that worry would continue to correlate significantly with difficulty concentrating, once depression was controlled for. This prediction was not supported, although the partial correlation of worry and difficulty concentrating approached significance ($.19, p < .055$). Correlations between worry and restlessness ($.19, p < .062$), and worry and fatigability ($.19, p < .055$) also approached significance, once depression was controlled for. The partial correlation between worry and irritability did not approach significance ($.11, p < .27$). Partial correlations were also run for depression and associated symptoms in the total GAD client group, controlling for worry. As predicted, depression did not correlate uniquely with difficulty concentrating ($.15, p < .10$) once worry was controlled for. However, depression continued to correlate significantly with irritability ($.28, p < .01$) and fatigue ($.25, p < .01$).

c) Factor Analysis

Factor analyses were also conducted on worry, depression and associated symptoms for the total GAD client and Nonanxious Control groups, in order to observe loadings and further clarify the relationships between the dependent variables. Principal factors extraction with varimax rotation was performed separately for GAD clients and Nonanxious Controls. Eigen values greater than 1 were extracted.

Three factors were extracted for the GAD clients. Loadings of variables are shown in Table 6. Variables are ordered and grouped by size of loading to facilitate interpretation. For the GAD clients, Factor 1 had an Eigen value of 2.63, and accounted for 33% of the variance. Factor 2 had an Eigen value of 1.11, and accounted for 14% of the variance. Factor 3 had an Eigen value of 1.06, and accounted for 13% of the variance. Together, these 3 Factors accounted for 60.13% of the variance. A loading of at least .40 was used for inclusion of a variable in interpretation of a factor. In addition, variables were included in interpretation of a factor based on their specificity (relatively high loading on that factor, and relatively low loadings on other factors). Factor 1 had loadings of worry (.45), restlessness (.76), difficulty concentrating (.61), and insomnia (.73). Fatigability loaded on this factor (.58), but also had a moderate loading on Factor 2 (.48), and so was not specific to either factor. Factor 1 may be called a "worry and associated hyperaroused/hypervigilant symptoms" factor. Factor 2 had loadings of depression (.80) and irritability (.76). Factor 2 may be called a "depression and associated symptoms" factor, largely distinct from the previous worry factor and having its own specific associated symptom. Factor 3 had a loading of muscle tension (.78), and a negative loading for worry (-.64). Factor 3 may be called a "muscle tension" factor, distinct from the depression factor and especially from the worry factor, given its relatively high negative loading for worry.

Three factors were also extracted for the Nonanxious Controls. Loadings of variables are shown in Table 7. Factor 1 had an Eigen value of 2.22, and accounted for 28% of the variance. Factor 2 had an Eigen value of 1.25, and accounted for 16% of the variance. Factor 3 had an Eigen value of 1.13, and accounted for 14% of the variance. Together, these 3 Factors accounted for 58% of the variance. A loading of at least .40 was used for inclusion of a variable in interpretation of a factor, and variables were again included based on specificity to a given factor. Factor 1 had loadings of restlessness (.68), difficulty concentrating (.74), and irritability (.71). This may be called an "arousal/vigilance" factor, consisting of aroused/vigilant symptoms but not characterized by worry. Factor 2 had loadings of muscle tension (.88). and fatigability (.75). This may be termed a "muscle tension and fatigue" factor. Factor 3 had loadings of worry (.69) and depression (.71). This may be termed a "mixed worry and depression" factor, which is not characterized by the presence of any particular associated symptoms.

2) Effects of therapy on worry, depression and associated symptoms

a) ANOVA

It was predicted that any significant post-treatment reductions in worry would be accompanied by reductions in all 6 associated symptoms. This prediction was supported, for all 6 associated symptoms as well as for depression.

A repeated measures ANOVA on worry in the total GAD client group at time 1 (pre-treatment), time 2 (post-treatment) and times 3 and 4 (6- and 12-month follow-ups) revealed a significant effect for worry, $F(3, 83) = 67.03, p < .001$ (see Table 8 for ANOVA results, as well as means and standard deviations on each measure at each assessment). There were also significant effects across times 1-4 for depression, $F(3, 69) = 67.76, p < .001$; for restlessness, $F(3, 83) = 69.00, p < .001$; for fatigue, $F(3, 83) = 44.72, p < .001$; for difficulty concentrating, $F(3, 83) = 64.60, p < .001$; for irritability, $F(3, 83) = 9.14, p < .001$; for muscle tension, $F(3, 83) = 30.78, p < .001$; and for insomnia, $F(3, 83) = 30.78, p < .001$. Paired Samples T-tests revealed that there were significant reductions for worry from pre- to post treatment, $t(94) = 16.44, p < .001$, as well as for restlessness, $t(94) = 12.71, p < .001$; fatigability, $t(92) = 10.15, p < .001$; difficulty concentrating, $t(94) = 13.48, p < .001$; irritability, $t(94) = 9.65, p < .001$; muscle tension, $t(94) = 7.04, p < .001$; and insomnia, $t(94) = 11.37, p < .001$. These reductions were as predicted. Reductions in worry and associated symptoms were also maintained across 6- and 12-month follow-ups, as predicted. Chart 1 graphically illustrates pre- to post-treatment reductions in worry and associated symptoms, and the maintenance of these reductions across 6- and 12-month follow-ups.

3) *Effects of therapy on worry, depression and associated symptoms in middle-aged versus younger adults with GAD*

a) Means at pre-treatment

Although the middle-aged GAD group's pre-treatment levels of worry were expected to be equivalent to those of the younger GAD group, it was predicted that the middle-aged group's ratings for certain associated symptoms would be higher, due to age-related physiological changes. This was predicted for the symptoms of insomnia, fatigue and difficulty concentrating. This prediction was not supported by *t*-test comparisons. Table 9 shows that pre-treatment means for worry and associated symptoms were generally equivalent for both age groups. Irritability at pre-treatment was higher for the younger ($\underline{M} = 2.22$, $\underline{SD} = 1.0$) versus middle-aged GAD client group ($\underline{M} = 1.75$, $\underline{SD} = 1.0$). However, this difference only approached significance ($t = 1.96$, 94 , $p < .053$). It should be noted that the mean for pre-treatment irritability in the middle-aged GAD client group was below clinical threshold.

b) Correlations at pre-treatment

Although no predictions were made in this regard, it was decided to compare correlations between worry, depression and associated symptoms in the 2 GAD age groups, in order to potentially clarify the relationship between these variables in the 2 groups. Bivariate correlations revealed that at pre-treatment, worry in the younger adults with GAD correlated significantly with restlessness

(.28, $p < .05$), difficulty concentrating (.29, $p < .05$), and insomnia (.28, $p < .05$) [see Table 10 for these correlations]. The remaining associated symptoms of irritability, muscle tension and fatigue did not correlate significantly with worry in this younger group. Muscle tension had the lowest correlation with worry, at $-.02$. Worry correlated significantly with depression in the younger group (.26, $p < .05$). There were also significant correlations between depression and difficulty concentrating (.24, $p < .05$), depression and irritability (.35, $p < .01$) and depression and fatigue (.34, $p < .01$) for these younger adults with GAD at pre-treatment.

Partial correlations revealed that, after depression was controlled for, worry in the younger adult GAD client group continued to correlate significantly with restlessness (.25, $p < .05$), with difficulty concentrating (.24, $p < .05$), and with insomnia (.27, $p < .05$). After worry was controlled for, depression continued to correlate significantly with irritability (.33, $p < .01$) and fatigue (.29, $p < .05$) for the younger adult GAD client group. However, depression no longer correlated significantly with difficulty concentrating in this group, once worry was controlled for (.17, $p < .14$).

For the middle-aged GAD group, worry did not correlate significantly with any associated symptoms (see Table 10 for correlations). The highest correlation with worry in this group was for fatigability (.25, $p < .05$). There was a negative

and nonsignificant correlation between worry and muscle tension ($-.22, p < .307$) in the middle-aged GAD group. Correlations between worry and restlessness ($.05, p < .83$), difficulty concentrating ($.08, p < .69$), irritability ($.13, p < .55$), and insomnia ($.19, p < .38$) were also nonsignificant. The correlation between worry and depression was negative and nonsignificant ($-.40, p < .85$).

c) Evaluation of age relationships to pre-treatment dependent measures via regression analyses

To examine the contribution of age to presentation of worry, depression and associated symptoms, a series of hierarchical regression analyses were calculated. Salient results of these analyses are reported below.

In the first regression analysis, worry was the criterion. In Step 1, a continuous age variable was entered as a predictor. In Step 2, the 6 associated symptoms were entered simultaneously as predictors. 3 associated symptoms accounted for a total 16.6% of the variance, and made significant contributions to the prediction of worry. Insomnia was the most powerful predictor, accounting for 6% of the variance in worry scores and having a positive regression weight of $\beta = .25, p < .05$. This was followed by fatigue, with 5.6% of the variance ($\beta = .24, p < .05$); and difficulty concentrating, with 5% of the variance ($\beta = .23, p < .05$). Neither age ($\beta = -.008, p < .93$) nor any of the remaining 3 associated symptoms were significant predictors of worry.

In the second regression analysis, worry was again the criterion, but depression was added at Step 2, simultaneously with the 6 associated symptoms. 3 associated symptoms accounted for a total of 16.1 % of the variance, and made significant contributions to the prediction of worry. Insomnia was again the most powerful predictor, accounting for 6% of the variance in worry scores and having a positive regression weight of $\beta = .25, p < .05$. This was followed by fatigue, with 5.3% of the variance ($\beta = .23, p < .05$); and difficulty concentrating, with 4.8% of the variance ($\beta = .22, p < .05$). Neither age ($\beta = -.041, p < .68$), depression or any of the remaining 3 associated symptoms were significant predictors of worry.

In the third regression analysis, depression was the criterion. In Step 1, age as a continuous variable was entered as a predictor. In Step 2, the 6 associated symptoms were entered simultaneously as predictors. 2 associated symptoms accounted for a total 11% of the variance, and made significant contributions to the prediction of depression. Fatigability was the most powerful predictor, accounting for 5.7% of the variance and having a positive regression weight of $\beta = .24, p < .05$. Irritability was the second most powerful predictor, accounting for 5.3 % of the variance and having a positive regression weight of $\beta = .23, p < .05$. Neither age ($\beta = .11, p < .24$) nor any of the remaining 4 associated symptoms were significant predictors of depression.

In the fourth regression analysis, depression was again the criterion, but worry was added as a predictor at Step 2, simultaneously with the 6 associated symptoms. 2 associated symptoms accounted for 11% of the variance, and made significant contributions to the prediction of depression. Fatigability was again the most powerful predictor, accounting for 5.7% of the variance and having a positive regression weight of $\beta = .24$, $p < .05$. Irritability was the second most powerful predictor, accounting for 5.3% of the variance and having a positive regression weight of $\beta = .23$, $p < .05$. Neither age ($\beta = .11$, $p < .24$), worry nor any of the remaining 4 associated symptoms were significant predictors of depression.

Additional regression analyses were run to determine the contribution of age versus worry and depression to presentation of associated symptoms. In the first of these additional analyses, restlessness was the criterion. Neither age ($\beta = .05$, $p < .57$) nor depression ($\beta = .05$, $p < .55$) were significant predictors, but worry ($\beta = .20$, $p < .052$) approached significance as a predictor of restlessness on this analysis.

In the second additional analysis, both depression and worry were significant predictors of fatigue, and together accounted for a total 19.8% of the variance. Depression was the most powerful predictor of fatigability, accounting

for 10.2% of the variance and having a positive regression weight of $\beta = .32$, $p < .01$. Worry accounted for an additional 9.6% of the variance, with a positive regression weight of $\beta = .24$, $p < .05$. Age was not a significant predictor of fatigability ($\beta = .002$, $p < .98$).

In the third additional analysis, insomnia was the criterion. In Step 1, age as a continuous variable was entered as a predictor. In Step 2, worry and depression were entered simultaneously as predictors. Together, worry and depression accounted for 9% of the variance in insomnia scores, but only worry was a significant predictor of insomnia. Worry accounted for an additional 6.2% of the variance, with a positive regression weight of $\beta = .25$, $p < .05$. Age was not a significant predictor of insomnia ($\beta = .002$, $p < .98$).

Both worry and depression were significant predictors of difficulty concentrating, and together accounted for 9.6% of the variance in difficulty concentrating scores. Worry was the most powerful predictor of difficulty concentrating, accounting for 5% of the variance and having a positive regression weight of $\beta = .23$, $p < .05$. Depression accounted for an additional 4.6% of the variance, with a positive regression weight of $\beta = .22$, $p < .05$.

Depression was a significant predictor of irritability, accounting for 9% of the variance and having a positive regression weight of $\beta = .30$, $p < .01$.

Neither age ($\beta = -.14, p < .15$) nor worry ($\beta = .15, p < .130$) were significant predictors of irritability.

d) MANOVA at pre-treatment

A 2 x 2 MANOVA (GAD status by Age Group) was also conducted, in order to address main effects of GAD status, main effects of age, and their possible interaction on worry, depression and associated symptoms. This MANOVA revealed only a significant main effect of GAD status, $F(8, 179) = 117.35, p < .001$, and not for Age Group or GAD status x Age Group interaction. Univariate tests indicated significant effects of GAD status on worry, $F(1, 186) = 592.82, p < .001$; depression, $F(1, 186) = 270.43, p < .001$; restlessness, $F(1, 186) = 251.65, p < .001$; fatigability, $F(1, 186) = 157.91, p < .001$; difficulty concentrating, $F(1, 186) = 255.04, p < .001$; irritability, $F(1, 186) = 139.62, p < .001$; muscle tension, $F(1, 186) = 50.35, p < .001$; and insomnia, $F(1, 186) = 223.37, p < .001$, but no significant effects for any of these variables by Age Group or GAD status x Age Group interaction.

e) Factor Analysis at pre-treatment

A factor analysis was also run for younger versus middle-aged GAD clients on worry, depression and associated symptoms at pre-treatment. For the younger adults with GAD, three factors were extracted. Loadings of variables are shown in Table 13. Factor 1 had an Eigen value of 2.53, and accounted for 31.64% of the

variance. Factor 2 had an Eigen value of 1.24, and accounted for 15.51% of the variance. Factor 3 had an Eigen value of 1.05, and accounted for 13.19% of the variance. Together, these 3 Factors accounted for 60.35% of the variance. A loading of at least .40 was used for inclusion of a variable in interpretation of a factor, along with the specificity criterion noted above. Principal component analysis showed that Factor 1 had loadings of muscle tension (.76), fatigability (.65), insomnia (.64) and restlessness (.55). This may be termed a "mixed muscle tension/arousal-vigilance" factor. Factor 2 had loadings of worry (.72), difficulty concentrating (.74) and restlessness (.54). This may be termed a "worry and hyperarousal/vigilance" factor. Factor 3 had loadings of depression (.77) and irritability (.82). This may be termed a "depression and irritability" factor.

For the middle-aged adults with GAD, four factors were extracted. Loadings of variables are shown in Table 14. Factor 1 had an Eigen value of 3.09, and accounted for 38.64% of the variance. Factor 2 had an Eigen value of 1.26, and accounted for 15.85% of the variance. Factor 3 had an Eigen value of 1.06, and accounted for 13.30% of the variance. Factor 4 had an Eigen value of 1.02, and accounted for 12.79% of the variance. Together, these 4 Factors accounted for 80.59% of the variance. A loading of at least .4 was used for inclusion of a variable in interpretation of a factor, along with the specificity criterion. Principal component analysis showed that Factor 1 had loadings of insomnia (.88), difficulty concentrating (.82), fatigability (.48), muscle tension (.44), and

restlessness (.42). This may be termed a "mixed hypervigilant/muscle tension" factor. Factor 2 had loadings of irritability (.94), fatigability (.69) and restlessness (.65). This may be termed a "irritable-restless-fatigued" factor. Factor 3 had a single loading of worry (.89). This may be termed a "simple worry" factor, characterized also by a negative loading of muscle tension (- .60). Factor 4 had a single loading of depression (.89), and a negative loading of restlessness (- .44). This may be termed a "simple depression" factor.

f) ANOVA for treatment effects

A series of 2 (GAD Age Group) X 4 (Time) repeated measures Analyses of Variance (ANOVAs) on worry, depression and each associated symptom revealed a significant main effect of Time, $F(3, 78) = 43.72, p < .001$, but not for GAD Age Group, $F(1, 80) = 1.17, p < .001$; or for the GAD Age Group x Time interaction, $F(3, 78) = 2.02, p < .11$. This suggests that there were no detectable overall differences in treatment response for these two GAD age groups.

It was hypothesized that post-treatment levels of difficulty concentrating, insomnia and fatigue could be higher for the middle-aged versus younger adult GAD group, because a therapy targeting anxiety might not be effective at reducing symptoms at least partly based in the physiology of aging. Independent Samples *T*-tests revealed no significant differences between the middle-aged versus younger adults with GAD on post-treatment levels of insomnia, $t(93) = -$

.74, $p < .46$; fatigue, $t(91) = -.31$, $p < .76$; irritability, $t(93) = -.72$, $p < .45$; muscle tension, $t(93) = .61$, $p < .54$., or restlessness $t(93) = -1.7$, $p < .09$. Mean post-treatment ratings for worry, $t(93) = -.59$, $p < .56$; and depression, $t(93) = -.69$, $p < .49$ were also equivalent. However, the difference between post-treatment ratings for difficulty concentrating in the two GAD age groups approached significance, $t(93) = -1.94$, $p < .055$. The middle-aged GAD clients' mean post-treatment rating for difficulty concentrating ($M = 1.06$, $SD = .87$) was higher than that of their younger counterparts ($M = .69$, $SD = .77$).

Discussion

This study investigated the relationship between worry, depression and associated symptoms (restlessness, difficulty concentrating, insomnia, fatigue, irritability and muscle tension) in young- to middle-aged adults with and without GAD at pre-treatment, and with GAD from pre-to post-treatment. At pre-treatment in the total GAD client group, worry, depression and all associated symptoms were rated at clinical levels, with the exception of muscle tension, which was surprisingly below clinical threshold at 1.5. Worry in the total GAD client group was also associated with a specific (“hyperaroused/hypervigilant”) symptom constellation, consisting of restlessness, difficulty concentrating, insomnia, and fatigue. Depression was associated with a largely distinct symptom

constellation, consisting of irritability and fatigue. Significant reductions in worry, depression and all 6 associated symptoms were found from pre- to post-treatment, and these reductions were maintained across 6- and 12-month follow-ups.

Younger and middle-aged adults with GAD had basically equivalent presentation and treatment response for worry, depression and associated symptoms, with two exceptions: the younger adults were slightly more irritable at pre-treatment, and middle-aged adults with GAD showed slightly more difficulty concentrating at post-treatment. These results are discussed more fully below.

1. Worry, depression and associated symptoms in the total GAD client group (n = 96) versus Nonanxious Controls (n = 96) at diagnosis/pre-treatment

Results showed relatively high levels of worry and (5/6) associated symptoms (restlessness, difficulty concentrating, insomnia, fatigue, and irritability) at pre-treatment in the total GAD client group, as expected. The only exception was for muscle tension, which was rated below clinical threshold at 1.50 (see below for discussion of this result). The overall results for pre-treatment levels of worry and associated symptoms in the total GAD client group would tend to support current diagnostic criteria for GAD, which includes clinical levels of worry and at least 3 out of the 6 associated symptoms.

Besides the generally high levels of worry and associated symptoms at pre-treatment, worry in the total GAD sample was associated with specific symptoms. These symptoms include restlessness, difficulty concentrating, insomnia, and

fatigue. Restlessness loaded heavily and specifically on a worry factor in factor analysis, as did difficulty concentrating and insomnia. Difficulty concentrating, insomnia, and fatigue correlated significantly with worry in the total GAD sample. Insomnia correlated uniquely with worry on partial correlation analysis, controlling for depression. Difficulty concentrating, insomnia and fatigue were significant predictors of worry on regression analysis, with and without depression added as a factor. Worry was also a significant predictor of difficulty concentrating, insomnia and fatigue on regression analysis, and marginally significant as a predictor for restlessness. Taken together, the above analyses suggest a specific constellation of associated symptoms that are most characteristic of worry in the current GAD sample. Two of these symptoms are from the Muscle Tension (MT) cluster (restlessness, fatigue), while the other two are from Vigilance/Scanning (V/S) cluster (difficulty concentrating, insomnia). This finding raises the question of how these particular symptoms might be related to worry, and what they might have in common among themselves.

It may be that restlessness, difficulty concentrating, insomnia and fatigue are all symptoms of the hyperaroused/hypervigilant state often associated with GAD. It has been proposed that chronic worry, the core feature of GAD, supports a hyperaroused/hypervigilant state, focused on external threat cues (Hoehn-Saric et al, 1989; Mathews, 1990; Hoehn-Saric & McLeod, 1991; Borkovec & Whisman, 1996; Aikens & Craske, 2001). It has also been proposed that an

underlying hyperaroused/hypervigilant state, based in an emotional sense of vulnerability, may give rise to worry as a means to cope with impending threats (Eysenck, 1992; Thayer, Friedman, Borkovec, Johnson, & Molina, 2000).

Ultimately, it is possible that worry and hyperarousal/hypervigilance are mutually reinforcing, in that worry about external threats leads to arousal and vigilance against them, while an underlying arousal and hypervigilance based in a felt sense of vulnerability promotes worries about how to cope with impending threats.

Other stress and anxiety syndromes have also been intimately linked to hyperaroused and/or hypervigilant symptoms. "Chronic burnout" syndrome, which theoretically results from ongoing work-related worries and stress, has been associated with physiological hyperarousal, and is characterized by high levels of insomnia and fatigue (Melamed et al, 1999). PTSD, another anxiety disorder often characterized as worried, hyperaroused and hypervigilant to external threat, has been associated with high levels of restlessness, difficulty concentrating, and insomnia (Monnelly and Ciraulo, 1999; Domon and Andersen, 2000). It has been proposed that hyperarousal/hypervigilance in GAD leads to nocturnal insomnia, which in turn results in diurnal fatigue (Saletu-Zyhlarz et al, 1997). In spite of their somewhat artificial separation into MT and V/S clusters, then, restlessness, difficulty concentrating, insomnia and fatigue may all be expressions of an underlying worried/hyperaroused/hypervigilant state. These potentially hyperaroused/hypervigilant symptoms of GAD may also be linked in a specific causal pattern.

It may be that worry as a cognitive expression of hyperarousal/hypervigilance gives rise to restlessness (superfluous flexing and twitching of muscles, frequent scanning motions, nervous tapping and fidgeting, etc.), as a motoric expression of readiness to cope with impending threats, even when such threats are not present or realistic. Such restless motion/scanning may in turn support difficulty concentrating on tasks at hand, since the attention is focused predominantly on impending/non-present threats. In turn, worry, restlessness and difficulty concentrating may promote insomnia, as an inability to settle down, relax and sleep (especially because sleep tends to preclude defense against threat, and may be resisted on that account). Lack of unbroken sleep may in turn promote fatigue in GAD, as found in Saletu-Zyhlarz et al's (1997) study. Whatever the connections between worry and these 4 specific symptoms, their association with worry in the total GAD sample at pre-treatment may warrant further attention, particularly as concerns their relationship to hyperarousal/hypervigilance. It may ultimately prove helpful to develop GAD treatments with additional interventions for hyperarousal/hypervigilance and its possible manifestations in specific associated symptoms, especially for younger adults with the disorder (see below). Such interventions may include additional cognitive training on the accurate assessment of threat, or the dismantling of unrealistic, catastrophizing cognitions concerning potential results of threatened outcomes. They might also include additional behavioral interventions focused on

approach versus avoidance of perceived threats. For example, rather than maintaining the threat involved in a difficult interpersonal situation by avoiding it, clients could be consistently encouraged/trained to approach such situations, engage them in a productive way, and potentially resolve their threatening aspects (e.g., by openly discussing grievances with another person, preparing for their reactions, etc.).

As noted above, the only subclinical symptom rating for the total GAD client group at pre-treatment was for muscle tension, which at 1.5 on the HAM-A scale fell between a "mild" level at 1, and a "moderate" or clinical threshold level at 2. Muscle tension also showed a negative correlation with worry at pre-treatment in the total GAD client group. In addition, muscle tension loaded relatively low on a "worry and associated symptoms" factor in factor analysis with the total GAD client group. It was also not a significant predictor of worry on regression analysis, nor was worry a significant predictor of muscle tension. The relatively low ratings for muscle tension, its low correlations with worry, its low loadings with worry on factor analysis, and its lack of relationship with worry on regression analyses are surprising. These findings run counter to the trend shown in previous physiological and structured interview studies, and contrary to predictions for the current study.

For its part, the physiological evidence concerning elevated muscle tension in GAD is substantial. Since the 1950's, studies using electromyographic measurements (EMG) have found elevated muscle tension to be the most consistent physiological marker distinguishing chronic anxiety/GAD sufferers from nonanxious controls. In the earliest studies, higher muscle tension at baseline was found in "chronic anxiety" sufferers at the forearm (Sainsbury & Gibson, 1954) and frontalis muscle sites (Malmo & Smith, 1955). Higher muscle tension in the chronically anxious was also found during stress-inducing laboratory procedures for the frontalis and forearm sites (Goldstein et al, 1964). The above results were later replicated in DSM-III-R and DSM-IV diagnosed GAD clients at both baseline and during stressful tasks, for the frontalis and gastrocnemius muscle sites (Hoehn-Saric et al, 1989). In addition, Hoehn-Saric et al (1994) investigated the possibility that heightened EMG readings in GAD were due to the rapid micro-movements and postural changes occurring in anxious restlessness, rather than in muscular tension per se. They found that their GAD participants' consistently high EMG readings were more characteristic of muscle tension than of restlessness, which typically results in erratic bursts and peaks in EMG. In sum, the above physiological results suggest that heightened muscle tension is a consistent and reliable symptom of chronic anxiety/GAD, and that it is a distinct symptom, not to be subsumed under restlessness.

Structured interview studies have also found evidence of muscle tension as an at least frequent symptom of GAD. In their multi-site study of 204 participants with DSM-III-R GAD, Marten et al (1993) found that 63% of the sample endorsed muscle tension as a symptom. The criteria for associated symptom endorsement varied across sites, with one site recording endorsement in a yes/no format, and another using a 5-point dimensional scale, with ratings of 1 or greater counting as endorsement. The use of a yes/no format for symptom rating, and of 1 or greater for symptom endorsement, could have inflated ratings for clinical levels of muscle tension (and other symptoms), as compared with the criterion of 2 or greater on a 0 - 4 scale, as used on the HAM-A in the present study. In their study with 40 DSM-III-R GAD participants, Abel and Borkovec (1995) found that 75% of the sample endorsed muscle tension. Their rating system focused on presence and frequency of associated symptoms, without actually assessing for severity. It was therefore not clear whether these clients were experiencing muscle tension or other associated symptoms at a clinically severe level. On the other hand, Starcovec et al (1994) specifically queried for intensity of associated symptoms in a group of 49 study participants diagnosed with DSM-III-R GAD. They found muscle tension endorsed at above clinical intensity ($M = 2.57$, $SD = .87$) on the same 0-4 scale used with the HAM-A in the current study. Starcovec et al also found muscle tension to be the second most frequently reported symptom of DSM-III-R GAD (89.8% of the time, only below "feeling keyed up or on edge," at 100%).

There is also some previous evidence that worry may correlate uniquely with the symptom of muscle tension, but not with any other associated symptoms, once depression is controlled for. Joorman and Stober (1999) made this finding with a nonclinical population of student worriers. Joorman and Stober used a form of the Generalized Anxiety Disorder Questionnaire (GAD-Q; Roemer, Borkovec, Posa, & Borkovec, 1995), adapted to meet DSM-IV GAD associated symptom criteria (assessing for severity of 6 associated symptoms), and employing a 0 - 4 dimensional scale identical to the one used with the HAM-A in the current study. Their finding of heightened muscle tension would appear consistent with the above physiological studies, and with Starcovec's et al's (1994) finding of heightened muscle tension in GAD. However, Joorman and Stober suggest that subclinical worry may not have the same properties and symptom constellation as chronic worry in GAD. Their finding of a unique correlation between subclinical worry and muscle tension should therefore be interpreted with caution, before it is generalized to an actual GAD population. Muscle tension may in fact be a unique symptom of chronic worry versus depression, and possibly other disorders or syndromes. On the other hand, it may be only one consistent symptom among others for individuals with GAD.

Taken together, the above physiological and structured interview findings suggest that muscle tension is at least a frequent symptom of worry/GAD,

whatever its severity levels, whether it is a unique diagnostic marker or not. In light of these studies, the findings of low muscle tension and low correlations between worry and muscle tension in the current GAD sample call for an explanation.

One possible reason for the divergence between previous and current findings on muscle tension in GAD might be differences between the study samples. Joorman and Stober's (1999) sample consisted of subclinical college-age worriers, with a mean age of 25.7 years. These participants' admittedly lower levels of worry may nevertheless have catalysed with an already higher muscle tonus, based in their younger physiology. The current study consisted of a sample of chronically worried adults with a mean age of 37.6 years. A number of physiological studies have found lower levels of baseline physiological arousal for increasingly older adult age groups (cf. Woodruff, 1985, for a review; and Giambra and Quilter, 1988), as will be discussed further below. It is possible that worry in the current sample of GAD participants did not catalyse with their more mature, less-reactive muscle responses. On the other hand, samples in the Hoehn-Saric (1989), Marten et al (1993), Starcovec et al (1994) and Abel and Borkovec (1995) studies appear more similar to that of the current study sample in terms of age (mean ages in the mid-30's) and diagnosis of GAD (by either DSM-III-R or DSM-IV criteria).

The discrepancy between past and current results may also be partly based in artificially high physiological readings for muscle tension in GAD. Hoehn-Saric et al (1989) have suggested that the inherent stress of the laboratory situation could result in heightened muscle tension for GAD clients, such that what is read as a basal on EMG may actually be a phasic response. On this interpretation, true nonlaboratory basal muscle tension in GAD would be closer to that of nonanxious controls, and only peaked in the experimental context. If this were true, it might account for the comparatively lower ratings of muscle tension in the current GAD sample, who were in an arguably less-stressful structured interview context (e.g., with a clinician who they felt was listening to them, rather than measuring them with electrical equipment). In addition, physiological studies typically take measures for periods up to an hour, whereas the GAD clients in the present study were giving their ratings for muscle tension over the past month. The monthly rating is possibly a truer basal time-frame, reflecting generally lower levels of muscle tension. This interpretation, however, is not supported by findings of heightened muscle tension from the Starcovec et al (1994) study, which rated symptoms over the previous six months, an even longer and potentially more representative time-frame than that used in the current study. The Starcovec et al study was otherwise methodologically similar to the current study (employing a 0-4 severity scale for clinician ratings of worry and associated symptoms), and used a similar sample (a DSM-III-R GAD client sample with a mean age in the mid-30's, diagnosed by two separate assessors).

Another possibility is that elevated muscle tension actually occurred in the current GAD sample over the month prior to their interview, without their being explicitly aware of it. GAD clients have a documented difficulty experiencing or at least naming their own internal emotional states (cf. Schut, Castonguay & Borkovec, 2001). Such difficulty may extend to a relatively subtle, internal somatic state like tonic muscle tension. Muscle tension may in fact be the most subtle of the DSM-IV GAD associated symptoms - less noticeable by self and/or others than the potentially more overt or disruptive symptoms of restlessness, difficulty concentrating, insomnia, fatigue and irritability. However, this possibility as well is not supported by evidence from other structured interview studies, wherein GAD clients have apparently had no difficulty recognizing their muscle tension (Marten et al, 1993; Abel and Borkovec, 1995), and have rated it at least moderately severe (Starovec et al, 1994).

A further possibility for the lower muscle tension ratings in the current GAD sample is that these clients were aware of their muscle tension, but did not find it particularly distressing or disruptive, and therefore rated it below moderate levels of severity. Even the consistently heightened muscle tension found for GAD clients in physiological studies does not necessarily indicate heightened distress or disruption from the symptom. It may be that muscle tension in GAD is not so distressing and disruptive, especially when compared with other symptoms.

It is possible that while restlessness, difficulty concentrating, insomnia, fatigue and irritability interfere substantially with social and vocational functioning, muscle tension for many individuals is annoying but not necessarily debilitating. This possibility, however, is countered by the Starcovec et al (1994) study, wherein GAD clients reported that muscle tension (including aches and soreness) was their 3rd most distressing and disruptive symptom, after restlessness and insomnia.

In sum, it is not clear why GAD clients in the current study consistently reported subclinical levels of muscle tension, which in addition did not correlate significantly with worry. Further structured interview studies using both frequency, severity and distress ratings for muscle tension and other associated symptoms, as well as studies comparing physiological ratings with self-report ratings before, during and after physiological testing should help to clarify the status of muscle tension as a symptom of GAD. Hoehn-Saric et al (1989) have also suggested that ambulatory EMG devices be worn by GAD clients throughout the day. Such devices might also help to better determine baseline levels of muscle tension in GAD, as compared to laboratory measurements. In any case, given the divergence between the current and previous findings, more studies should be conducted before it is decided whether muscle tension ought to be named a cardinal diagnostic symptom of GAD, a possibility suggested by Joorman and Stober (1999).

Along with clinical levels of worry and (5/6) associated symptoms in the total GAD client sample at pre-treatment, levels of depression were also clinically elevated (at 16+ on the BDI, indicating mild levels of depression). This finding is in accord with previous studies associating worry process with depressive affect (Andrews & Borkovec, 1988), and documenting high levels of depression in GAD (Brown et al, 1994). Worry and depression were also significantly correlated for the total group of study participants (GAD clients plus Nonanxious Controls) at diagnosis/pre-treatment.

However, worry and depression were not significantly correlated at pre-treatment for the total GAD client group or for the Nonanxious Control group, separately. Worry and depression also showed somewhat distinct associated symptom patterns on bivariate correlation analysis in the total GAD client group, where worry correlated significantly with difficulty concentrating, insomnia, fatigability, and marginally with restlessness, whereas depression correlated significantly with difficulty concentrating, irritability and fatigue. Worry and depression also showed distinct associated symptom patterns on partial correlation analysis in the total GAD client group, where worry correlated uniquely with insomnia, while depression correlated uniquely with fatigue and irritability. In addition, worry and depression in the total GAD client sample showed distinct factor loadings on factor analysis. Worry loaded moderately and

specifically on a factor including the associated symptoms of restlessness, difficulty concentrating, insomnia and fatigue, while depression loaded highly and specifically on a distinct factor including irritability and fatigue. Taken together, these latter findings suggest the possibility that while worry and depression are frequently comorbid in GAD, and include some symptom overlap (specifically, on fatigability), they may be qualitatively distinct processes with largely distinct associated symptom patterns.

Recent studies have focused on similarities between worry and depression, with both states being characterized by perseverative, off-task cognitions generating negative affect (cf. Broschott and Thayer, in press). However, the two pathologies are arguably distinct in terms of their attentional focus and cognitive/somatic effects. Worry tends to be more anxiously focused on the future (Dugas et al, 1998) and generative of arousal (Hoehn-Saric et al, 1989). Depression tends to be more negatively focused on the past, while promoting lack of motivation (Keeler et al, 2000). The fact that they were not significantly correlated in the current study suggests that for a carefully-diagnosed, primary GAD sample, worry and depression may be orthogonal processes. Such an interpretation is partly supported by studies showing different brain activation patterns for worry/anxiety and depression. Anxiety has been linked with left fronto-cortical activation (Heller et al, 1993), while depression has been associated with marked left fronto-cortical hypoactivation (see Davidson &

Henriques, 2000, for a review of the findings for depression). In addition, on studies of cerebral blood flow (Reivich et al, 1983) and glucose metabolism (Wu et al, 1991), anxiety has most often been associated with a relative increase in right posterior activation; while on studies of electroencephalographic (EEG) activity (e.g., Deldin et al, 2000) and regional cerebral blood flow (e.g., Post et al, 1987) depression has been associated with the opposing pattern, a relative decrease in right posterior activation. These distinct patterns of brain activity in anxiety versus depression have been associated with increased and decreased physiological arousal, respectively (Keller et al, 2000). Such results have led Keller et al (2000) to propose that while anxiety and depression may be phenomenologically similar in terms of negative emotional valence, they are distinct in terms of brain activation patterns, and associated symptom presentation. This theory is at least partly supported by the current study's finding of basically distinct associated symptom presentations for worry versus depression.

The potential association of worry with heightened physiological arousal may explain its relationship in the current total sample of GAD clients with restlessness, difficulty concentrating, insomnia and fatigue (with the latter symptom a possible result of prolonged physiological activation). Depression's potential association with lower arousal may explain its own relationship to fatigue (e.g., as an expression of hopelessness and lack of motivation). In

addition, depression's association with irritability may reflect its own peculiar emotional valence, more strongly linked than that of worry to rumination on past failures and an empty future, thereby producing anger, irritation and overt irritability. Joorman and Stober (1999) also found worry and depression to have distinct associated symptom patterns in their sample of nonclinical student worriers, with worry uniquely correlated with muscle tension, and depression uniquely correlated with difficulty concentrating. These associated symptom patterns for worry and depression are different from those found in the current study, which again may be due to differences in the samples used (nonclinical student worriers, as opposed to primary GAD clients in the current study). However, that Joorman and Stober also found distinct associated symptom patterns for worry versus depression supports the idea that these may be orthogonal processes, for both subclinical and clinical populations of worriers. Of course, that worry and depression are partly orthogonal processes would not preclude their being related in certain specific ways, as the literature on their comorbidity suggests. Worry and depression may overlap in terms of negative cognitive-emotional valence and any symptoms associated with it, e.g. fatigue (cf. Heller, 1990; 1993). Alternatively, chronic worry about two or more topics and the resultant distress/disruption of daily activities this entails could understandably lead to becoming down, depressed, irritable and further fatigued. This would be "secondary depression" (cf. Winokur, 1990), following on primary GAD and potentially distinct from it on presentation of associated symptoms. By

the same token, treatment for worry and associated symptoms could lead to less depression, and greater hope and joy in daily living.

2. Effects of treatment on worry, depression and associated symptoms in the total GAD client group

As predicted, worry and all 6 associated symptoms were significantly reduced from pre- to post-therapy. In addition, these reductions were maintained across 6- and 12-month follow-ups (as assumed by a cognitive-behavioral model focusing on the learning, continued practice, and consolidating of increasingly flexible and adaptive anxiety-coping skills; cf. Borkovec & Whisman, 1996). These results suggest that current, state-of-the-art treatment targeting chronic worry in GAD is also effective at reducing associated symptoms. Such a finding is in accord with previous studies indicating overall reductions in worry and associated symptoms after cognitive-behavioral therapy for GAD, many of which also included the HAM-A as a pre-post measure (for a review of studies, see Borkovec & Whisman, 1996). Depression was also significantly reduced at post-treatment and follow-ups, although the current study made no prediction either way in this regard. Reductions for comorbid depression in the current GAD sample appear largely consistent with results from previous treatment studies, many of which also used the BDI as a pre-post measure (cf. Borkovec & Whisman, 1996).

It should be noted that while worry correlated significantly with difficulty concentrating, insomnia and fatigue (and marginally with restlessness) at pre-treatment in the total GAD client group, it did not correlate significantly with depression, irritability or muscle tension. Therefore, reductions in depression, irritability, and muscle tension may not be related to reductions in worried cognitions per se. Reductions in both worry and depression may have occurred through the therapeutic effect of consistently replacing negatively-valenced thoughts (about the past, present and/or future) with more positively-valenced thoughts. Alternatively, depression may have been incidentally reduced through the generation of hope or expectation for improvement associated with the placebo effect of participating in treatment. Given irritability's correlation with depression in the total GAD group at pre-treatment, reductions in depression may have resulted in decrements for irritability at post-treatment as well. Reductions in fatigue may have been due to reductions in both worry and depression, due to fatigue's apparently unique relation with each of these processes, as revealed by partial correlation analysis.

3. Effects of treatment on younger versus middle-aged adults with GAD

There were no differences between the total groups of younger (GAD clients + Nonanxious Controls) versus middle-aged adults (GAD clients + Nonanxious Controls) on levels of worry, depression and associated symptoms at diagnosis/pre-treatment. This suggests that age alone was not a factor in these

overall age groups for presentation of worry, depression and associated symptoms.

Levels of worry, depression and associated symptoms were generally equivalent for younger adult versus middle-aged adults with GAD at pre-treatment. The younger GAD group had marginally higher levels of irritability at pre-treatment. In addition, it is notable that ratings for irritability in the middle-aged GAD group were below clinical threshold (at 1.75). Pre-treatment levels of worry were equivalent for the two GAD age groups. While pre-treatment levels of depression were also equivalent for the two groups, analyses revealed that the younger GAD group's levels of depression were significantly correlated with irritability, although their levels of worry were not. It may be that the younger GAD group's depression was interacting with irritability in such a way as to produce higher levels of this symptom, possibly mediated by another factor(s). Again, it is possible that irritability is associated with the particular cognitive-emotional valence of depression, focused on past failures and a hopeless future, thereby generating anger, frustration and overall irritability. It is also possible that younger adults with GAD do not tolerate depression's negative valence as well as their middle-aged counterparts and are more irritated by it, perhaps because they had higher expectations for a presumably more open and extended future. In any case, the difference between the two GAD age groups in levels of irritability

disappeared at post-treatment, suggesting equal susceptibility to treatment effects for the two groups on this as well as other associated symptoms (see below).

Contrary to prediction, there were no differences in levels of difficulty concentrating, insomnia or fatigue for middle-aged versus younger GAD clients. There were differences in levels of correlation between worry and associated symptoms in the middle-aged and younger adult GAD groups, although no predictions were made explicitly in this regard. Results show that worry in the middle-aged GAD group at pre-treatment did not correlate significantly with any of the 6 associated symptoms, even though worry in this group was rated at clinical levels, along with restlessness, difficulty concentrating, insomnia, and fatigue (but excluding irritability and muscle tension). This finding may be partly based in the relatively low n ($n=24$) for the middle-aged GAD group, which could have prevented detection of significant correlations. On the other hand, it may be partly based in physiological differences between the two age groups. For the younger GAD group ($n=72$), worry correlated with restlessness, difficulty concentrating, insomnia and fatigue. These higher correlations between worry and certain associated symptoms in younger but not middle-aged GAD clients might once again be explained by the hyperarousal/hypervigilant theory mentioned above. As noted, worry and associated symptoms in GAD have been linked to the presence of a hyperaroused/hypervigilant state, possibly in a mutually reinforcing manner. However, physiological arousal has been found to decline across the

adult age-span (cf. Surwillo & Quilter, 1965a, 1965b). Both animal (e.g., using *Aplysia*, cf. Bailey et al, 1983) and human models (cf. Woodruff, 1985) have documented this result. Vigilance and scanning, as well, have been found to decline with age, possibly as a result of reduced physiological arousal (cf. Stankov, 1988; Giambra & Quilter, 1988). By extension, hyperarousal/hypervigilance and its potential symptoms (such as restlessness, difficulty concentrating, insomnia and fatigue) might also decline with age. Such an interpretation would coincide with the underarousal hypothesis of aging, as proposed by Birren (1960). On Birren's hypothesis, aging of the central nervous system results in lower levels of brain wave activity and overall physiological arousal. This hypothesis has been borne out in subsequent EEG studies revealing slowing and lower abundance of the dominant (alpha) brain wave frequency with age (cf. Busse & Obrist, 1963; Hubbard et al, 1976; Roubicek, 1977). Alpha frequencies have been found to peak in the teens and early twenties (at 10 to 10.5 cycles per second), but decline to about 9 cps by age 60 (Obrist and Brusse, 1965). Such declines in alpha and the arousal levels it theoretically represents (cf. Lindsley, 1952) might be part of one explanation for the higher correlations between worry and certain associated symptoms in younger, but not middle-aged adults with GAD in the current study. It is possible that equivalent levels of worry in the younger GAD group are catalysing with higher baseline levels of physiological arousal, to produce increased correlations with restlessness, difficulty concentrating, insomnia and fatigue. Factor analysis on worry,

depression and associated symptoms in the younger GAD group showed that worry in this group loaded heavily and specifically on a factor including a moderate loading for restlessness, and a high and specific loading for difficulty concentrating. On the other hand, factor analysis for the middle-aged GAD group showed that worry loaded highly and specifically on a distinctly "simple" worry factor, characterized only by a high and specific negative loading for muscle tension. This difference between presentation of worry and associated symptoms in these two groups may mean that worry in the younger group is catalysing with restlessness, difficulty concentrating, insomnia and fatigue, whereas these same symptoms, while clinically elevated in the middle-aged group, are not based in worry, but in some other process (e.g., physiological changes due to aging, as per above). Further correlational and factor analytic studies of worry and associated symptoms in younger versus middle-aged adults with GAD should clarify this issue.

The younger GAD group's pre-treatment levels of worry were also significantly correlated with depression, while the middle-aged GAD group showed a nonsignificant and negative correlation between worry and depression. This may mean that the middle-aged GAD group's levels of worry are basically unrelated to their levels of depression at pre-treatment. It may also mean that the relatively low n for the middle-aged GAD group precluded detection of significant correlations between worry and depression. Further studies with a

higher n of middle-aged participants, employing both physiological measures (e.g., PET scans, EEG) and structured interviews may clarify this question of the relation between worry and depression in middle-aged and younger adult GAD clients.

The present study discovered few if any significant differences in treatment response for worry and associated symptoms between the younger adult and middle-aged GAD clients. The single exception was for difficulty concentrating, which in the middle-aged group ($M = 1.06$, $SD = .87$) was higher at post-treatment than for their younger counterparts ($M = .69$, $SD = .77$). This difference, however, was only marginally significant, $t(93) = -1.94$, $p < .055$. The middle-aged GAD group's relatively lower level of treatment response on difficulty concentrating may mean that for them this symptom is based not only in worry, but in some other process associated with aging (e.g., an underlying concentration deficit, based in lowered physiological arousal due to aging [Giambra and Quilter, 1988], etc.). The general finding of equivalent treatment response for worry, depression and the remaining associated symptoms may be due once again to the relatively low n for the middle-aged group, which could have hampered the detection of between-group differences. On the other hand, it may be that treatment was equally effective for both groups, as reported by Stanley and Novy (2000) in their review of CBT treatment studies for GAD.

In summary, the current study found clinical levels of worry and 5/6 of the DSM-IV associated symptoms in the total GAD sample at pre-treatment, as expected. The only subclinical rating was for muscle tension. This finding was surprising, in light of previous physiological and structured interview studies suggesting relatively high baseline muscle tension in GAD. In addition, muscle tension showed the lowest correlations with worry out of all the associated symptoms. It did not correlate significantly with worry in either the total GAD group, or the younger versus middle-aged GAD groups. These findings of low muscle tension in the current GAD sample may be partly explained by sample differences as compared with previous studies, differences in methods of measurement (physiological versus structured interview, etc.), or lack of salience for muscle tension as compared to other, potentially more disruptive associated symptoms. In any case, more studies are warranted on the status of muscle tension in GAD, optimally pairing physiological and structured interview methods. This study also found that worry was associated with a particular symptom constellation, consisting of restlessness, difficulty concentrating, insomnia and fatigue. Depression was also associated with its own particular symptom constellation, consisting of irritability and fatigue. Those symptoms allied with worry may have a common basis in the hyperaroused/hypervigilant state frequently associated with GAD, and may be linked in a specific causal pattern (from restlessness/difficulty concentrating to insomnia, followed by fatigue). On the other hand, those symptoms allied with depression may have a basis in that

pathological processes' lower arousal (fatigue), and its particular negative valence (irritability). For the total GAD client group, therapy targeting chronic worry also appeared effective at reducing all 6 associated symptoms, along with depression, broadly consistent with previous studies. At pre-treatment, the younger GAD group (aged 18-44) had marginally higher levels of irritability than the middle-aged GAD group (aged 45-65). The younger GAD group also showed significant correlations between worry and difficulty concentrating, insomnia and fatigue, and a marginally significant correlation with restlessness; while the middle-aged GAD group showed no correlations between worry and any of the 6 associated symptoms. Factor analysis on worry, depression and associated symptoms in the younger GAD group also showed that worry in this group loaded heavily and specifically on a factor including a moderate loading for restlessness, and a high and specific loading for difficulty concentrating. On the other hand, factor analysis for the middle-aged GAD group showed that worry loaded highly and specifically on a distinctly "simple" worry factor, characterized only by a high and specific negative loading for muscle tension. These results may have been partly due to a higher baseline arousal for the younger GAD group, catalyzing with worry to produce higher levels of such hyperaroused/hypervigilant symptoms as restlessness and difficulty concentrating; while underarousal in the middle-aged GAD group may have precluded a catalytic effect with worry in the production of associated symptoms. They may also have been partly due to a higher n for the younger GAD group (n=72), versus the relatively low n (n=24) for the middle-

aged GAD group. The relatively lower n may not have allowed for detection of correlations between worry and associated symptoms for the middle-aged GAD group at pre-treatment. There were few if any differences between the younger versus middle-aged GAD groups at post-treatment, with the exception of difficulty concentrating, which was marginally higher for the middle-aged GAD clients. This finding may mean that difficulty concentrating for these middle-aged adults with GAD is partly based in the physiology of aging (e.g., lowered arousal), and therefore less susceptible to a treatment targeting worry and anxiety. The finding of overall equivalence in treatment response for the two GAD age groups may have been due to the relatively low n for the middle-aged GAD group, which might not have allowed for the detection of between-group differences. It may also indicate that in spite of any differences in associated symptom presentation at pre-treatment, younger and middle-aged clients with GAD both respond equally well to treatment for chronic worry (cf. Stanley and Novy, 2000), with equivalent reductions in associated symptoms as well as depression. Further treatment studies with younger and middle-aged adult GAD clients should help clarify the questions of associated symptom presentation and treatment response in these two age groups.

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Appendix

Tables and Figures

Table 1 Means and Standard Deviations (SD) for the Total GAD Client Sample (n = 96) versus Nonanxious Controls (n = 96) at Diagnosis/Pre-Treatment

Worry, Depression and Associated Symptoms	Total GAD Client Group	Total Nonanxious Control Group
Worry*	2.91 (.63)	.50 (.54)
Depression**	16.84 (8.01)	1.37 (2.08)
Restlessness	2.23 (.97)	.22 (.45)
Difficulty Concentrating	2.34 (1.01)	.20 (.48)
Insomnia	2.33 (.98)	.30 (.49)
Fatigability	2.22 (1.14)	.29 (.55)
Irritability	2.10 (1.03)	.38 (.51)
Muscle Tension	1.50 (1.26)	.24 (.56)

*Means for worry and associated symptom ratings are on HAM-A (0-4) scale

**Means for depression ratings are on BDI (1-63) scale

Table 2 Correlations between Worry, Depression and Associated Symptoms for the Total Sample of Study Participants (GAD Clients plus Nonanxious Controls, n = 192) at Diagnosis/Pre-Treatment

Associated Symptoms:	Restlessness	Insomnia	Fatigability	Difficulty Concentrating	Irrit	Musc Ten	Dep
Worry	.77**	.77**	.71**	.78**	.71**	.49**	.76**
Depression	.66**	.69**	.69**	.70**	.68**	.50**	1

**Correlation is significant at the .01 level (2-tailed)

Table 3 Correlations between Worry, Depression and Associated Symptoms for the Total GAD Client Sample at pre-treatment

Associated Symptoms:	Restlessness	Insomnia	Fatigability	Difficulty Concentrating	Irrit	Musc Tens	Dep
Worry	.20	.25*	.24*	.23*	.16	-.07	.16
Depression	.06	.17	.32**	.21*	.29**	.16	1

*Correlation is significant at the .05 level (2-tailed)

**Correlation is significant at the .01 level (2-tailed)

Table 4 Correlations between Worry, Depression and Associated Symptoms for Nonanxious Controls

Associated Symptoms:	Restlessness	Insomnia	Fatigability	Difficulty Concentrating	Irrit	Muscle Tension	Dep
Worry	.13	.77**	.08	.26**	.28	.12	.13
Depression	-.15	.01	-.10	-.10	-.08	-.07	1

*Correlation is significant at the .05 level (2-tailed)

**Correlation is significant at the .01 level (2-tailed)

Table 5 Partial Correlations between Worry, Depression and Associated Symptoms for the Total GAD Client Sample at Pre-Treatment

Associated Symptoms:	Restlessness	Insomnia	Fatigability	Diff Con	Irrit	Musc Tens
Worry (controlling for Depression)	.19	.29*	.19†	.19†	.11	-.10
Depression (controlling for Worry)	.03	.07	.29**	.17	.28**	.18

†Correlation is marginally significant ($p < .055$)

*Correlation is significant at the .05 level (2-tailed)

**Correlation is significant at the .01 level (2-tailed)

Table 6 Factor Loadings for Worry, Depression and Associated Symptoms in the Total GAD Client Sample at Pre-Treatment

Factor Number:	Factor 1	Factor 2	Factor 3
Variance:	(33%)	(14%)	(13%)
Eigen Value:	2.63	1.11	1.06
1. worry	.45*	.19	-.64**
2. restlessness	.76**	.02	.05
3. difficulty concentrating	.61**	.16	-.22
4. insomnia	.73**	.07	.15
5. fatigue	.58*	.48*	.11
6. irritability	.11	.76**	-.07
7. muscle tension	.36	.16	.78**
8. depression	.01	.80**	.05

*moderate and/or less specific factor loadings

**high and specific factor loadings

Table 7 Factor Loadings for Worry, Depression and Associated Symptoms in Nonanxious Controls

Factor Number:	Factor 1	Factor 2	Factor 3
Variance:	(28%)	(16%)	(14%)
Eigen Value:	2.22	1.25	1.13

1. worry	.28	.07	.69**
2. restlessness	.68**	-.10	-.15
3. difficulty concentrating	.74**	-.02	.24
4. insomnia	.25	.11	.39
5. fatigue	.33	.75**	-.02
6. irritability	.71**	.16	.25
7. muscle tension	-.09	.89**	.09
8. depression	-.37	-.12	.72**

*moderate and/or less specific factor loadings

**high and specific factor loadings

Table 8 A summary of repeated measures ANOVAs for ratings of Worry, Depression and Associated symptoms at Pre-treatment, Post-treatment and Follow-ups for the total GAD client sample, including means and standard deviations (SD) at each assessment, and post-hoc comparisons of means

<i>Dependent Variable</i>	<i>Pre-tx Mean (SD)</i>	<i>Post-tx Mean (SD)</i>	<i>6-mo Mean (SD)</i>	<i>12-mo Mean (SD)</i>	<i>F Value</i>	<i>Sig Level</i>
worry	2.91 (.63)	1.29 (.69)*	1.44 (.97)*	1.66 (1.23)*	59.92	$p < .001$
depression	16.87 (8.01)	7.32 (6.30)*	7.91 (6.93)*	7.17 (6.08)*	77.47	$p < .001$
restless	2.28 (.97)	.84 (.88)*	1.07 (1.05)*	1.10 (.93)*	59.90	$p < .001$
diff con	2.34 (1.01)	.78 (.80)*	.91 (1.03)*	1.03 (.98)*	65.73	$p < .001$
insomnia	2.33 (.98)	1.01 (.86)*	1.18 (1.01)*	1.17 (1.00)*	48.56	$p < .001$
fatigability	2.22 (1.14)	.90 (.96)8	1.04 (1.09)*	1.15 (1.05)*	43.25	$p < .001$
irritability	2.10 (1.03)	.98 (.82)*	1.16 (.96)*	1.30 (.98)*	9.60	$p < .001$
muscle tension	1.50 (1.26)	.59 (.80)*	.60 (.91)*	.59 (.87)*	33.65	$p < .001$

*Scores significantly lower than pre-tx mean at the .001 level, as per Paired-Samples *T*-tests comparing pre-tx means with post-tx and follow-up means for each dependent variable

Figure 1 Reductions in Worry and Associated Symptom Ratings for the total GAD sample from Pre-Treatment through Post-Treatment, 6- and 12-month Follow-Ups using HAM-A (0-4) scale

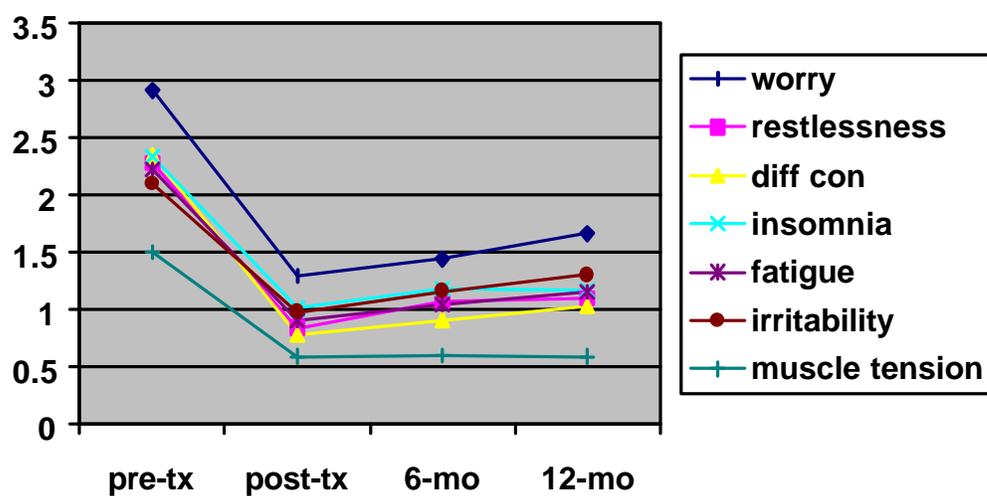


Table 9 Means and standard deviations (SD) for Worry, Depression and Associated Symptoms in Younger Adult GAD clients (age 18-44, n = 72) versus Middle-Aged GAD clients (age 45-65, n = 24) at Pre-Treatment

<i>Worry, Depression and Associated Symptoms</i>	<i>Younger Adult GAD clients</i>	<i>Middle-Aged GAD clients</i>
Worry*	2.93 (.60)	2.85 (.69)
Depression**	16.25 (7.86)	18.75 (8.35)
Restlessness	2.28 (.89)	2.25 (1.19)
Difficulty Concentrating	2.35 (.96)	2.31 (1.18)
Insomnia	2.36 (.93)	2.25 (1.12)
Fatigability	2.26 (1.12)	2.08 (1.21)
Irritability†	2.22 (1.01)	1.75 (1.04)
Muscle Tension	1.54 (1.25)	1.35 (1.28)

*Worry and associated symptom ratings are on HAM-A (0-4) scale

**Depression ratings are on BDI (1-63) scale

†Difference approached significance at the .05 level ($t = 1.96, 94, p < .053$)

Table 10 Correlations between Worry, Depression and Associated Symptoms in Younger versus Middle-Aged GAD Clients at Pre-Treatment

Younger Adults, n = 72

<i>Associated Symptoms:</i>	Restlessness	Insomnia	Fatigability	Difficulty Concentrating	Irrit	Muscle Tension	Dep
Worry	.28*	.28*	.23	.29*	.16	-.02	.26*
Depression	.13	.15	.34**	.24*	.35**	.16	1

Middle-Aged Adults, n = 24

<i>Associated Symptoms:</i>	Restlessness	Insomnia	Fatigability	Diff Con	Irrit	Muscle Tension	Dep
Worry	.05	.19	.25	.08	.13	-.22	-.40
Depression	-.08	.15	.32	.16	.27	.16	1

*Correlation is significant at the .05 level (2-tailed)

**Correlation is significant at the .01 level (2-tailed)

Table 11 Factor Loadings for Worry, Depression and Associated Symptoms in the Younger Adult GAD clients sample

Factor Number:	Factor 1	Factor 2	Factor 3
Variance:	(32%)	(16%)	(13%)
Eigen Value:	2.53	1.24	1.05

1. worry	.08	.72**	.17
2. restlessness	.55*	.54*	-.06
3. difficulty concentrating	-.02	.74**	.16
4. insomnia	.64**	.36	-.09
5. fatigue	.65**	.18	.38
6. irritability	-.04	.12	.82**
7. muscle tension	.76**	-.25	-.04
8. depression	.19	.14	.77**

*moderate and/or less specific factor loadings

**high and specific factor loadings

Table 12 Factor Loadings for Worry, Depression and Associated Symptoms in the Middle-Aged Adult GAD Client sample

Factor Number:	Factor 1	Factor 2	Factor 3	Factor 4
Variance:	(39%)	(16%)	(13%)	(13%)
Eigen Value:	3.09	1.27	1.06	1.02

Worry	.16	.13	.89**	.03
Restlessness	.42*	.65*	-.09	-.44*
Difficulty Concentrating	.82**	.22	-.01	-.06
Insomnia	.88**	.04	.03	.21
Fatigability	.48*	.67*	.22	.22
Irritability	-.03	.94**	-.03	.20
Muscle tension	.47**	.29	-.60**	.25
Depression	.14	.16	-.07	.89**

VITA

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