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The Relationship Between Dispositional Mindfulness Characteristics and
Anxiety in High Functioning Adults Diagnosed with
Autism Spectrum Disorder

Max Emanuel Maisel

A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of
Master of Science

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June 2016

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ABSTRACT

The Relationship Between Dispositional Mindfulness Characteristics and Anxiety in High Functioning Adults Diagnosed with Autism Spectrum Disorder

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Adults with autism spectrum disorder (ASD) experience elevated levels of anxiety and worry compared to neurotypical people. However, there is a dearth of extant research on effective interventions for comorbid anxiety and worry in this population. Mindfulness, which is often defined as paying attention to the present moment in a nonjudgmental manner, has been shown to be a propitious treatment for anxiety, worry, and other psychological ailments in neurotypical people. However, in a relatively new area of study, evidence has been growing which suggests mindfulness can also be effective in helping people with ASD cope with anxiety and worry. The current study had two major aims: 1) to see if a group of high functioning young adults with ASD (n=23) had inherently less dispositional mindfulness abilities than a neurotypical group (n=22) and 2) to see if mindfulness affected trait anxiety and worry differently for the ASD group than for the control group. Results suggested that adults with ASD were less able than neurotypical adults to effectively label and describe their internal experiences, to act with awareness in the present moment, and to allow aversive inner experiences to come and go without struggle. The results also suggested that the one powerful predictor of anxiety and worry in people with ASD was nonreactivity to inner experiences. However, there were three salient predictors of anxiety for neurotypical people: nonreactivity to inner experience, acting with awareness in the present moment, and nonjudging of thoughts and feelings. In the current study, none of the mindfulness facets predicted less worry in the neurotypical group. These results have implications for the development and implementation of mindfulness interventions to more effectively treat anxiety and worry in people with ASD.

Keywords: autism, anxiety, mindfulness

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The Relationship Between Dispositional Mindfulness Characteristics and
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Autism Spectrum Disorder and Anxiety

Autism spectrum disorder (ASD) is a neurodevelopmental disorder with a life-time prevalence rate around 1% (American Psychiatric Association, 2013; Baron-Cohen et al., 2009). The core symptoms of ASD are social and/or communication deficits and repetitive or restricted behaviors or interests. The social or communication deficits often manifest as people having poor non-verbal skills, difficulty building and maintaining relationships, or having a poor understanding of the social rules which come more naturally for many neurotypical people. Moreover, the core symptom of repetitive or restricted behaviors and interests often manifests as people frequently repeating specific behaviors or patterns of speech (e.g., echolalia or flapping of the hands) or having the tendency to order objects in very specific ways. Further, inflexibility is often present, where people with ASD tend to have a difficult time coping with a change in routine.

In conjunction with these defining characteristics of ASD, research has consistently shown that people with ASD tend to experience elevated levels of anxiety and at the same time have a more difficult time coping with stress compared to people without ASD (Lugnegard, Hallerback, & Gillber, 2011; Gillot & Standen, 2007; White, Oswald, Ollendick, & Scahill, 2009). White et al. (2009) reviewed 40 papers from 1990 to 2008 showing that young people with ASD are likely to experience elevated levels of anxiety and poor stress management. The same study also explained that high functioning individuals with ASD may be at a higher risk for anxiety than lower functioning individuals with ASD, because they are more likely to want to

interact with other people, yet at the same time have high levels of social anxiety which is a factor that prevents them from doing so effectively. Moreover, Gillott & Standen (2007) found that compared to people with intellectual disabilities, people with ASD tended to have higher anxiety and were not able to cope with stressful events as well. In a qualitative study Trembath, Germano, Johanson, & Dissanayake (2012) found that two major sources of anxiety for young adults with ASD were unexpected change and social encounters. They also found that external surroundings, personal interactions, concern for other people, fearful anticipation, and serious disappointments were common situations that lead to greater stress and heightened levels of anxiety in people with ASD.

Studies show that some of the most common comorbid anxiety disorders people with ASD experience include intrusive worrying as a major symptom. These include generalized anxiety disorder, which is currently defined by excessive and chronic worry, obsessive compulsive disorder, which often presents with intrusive thoughts and worries which elicit compulsions, and social phobia, which tends to engender worries about being judged or evaluated by other people (American Psychiatric Association, 2013; Gillot & Standen, 2007; White et al., 2009). Bellini (2006) highlighted how worry and stress associated with social phobia often prevented people with ASD from pursuing things they valued in life.

Traditional Treatments for Anxiety in ASD

Most of the extant research on interventions for anxiety and worry in ASD have examined the effects of cognitive behavioral therapy (CBT). CBT is a widely used, evidenced-based psychological intervention that has been shown to be helpful in treating neurotypical adults and children with anxiety disorders (Chorpita 2007; Hofmann & Smits, 2008). It employs various strategies such as psychoeducation, behavior tracking, cognitive restructuring, and

exposure aimed at identifying and changing one's dysfunctional thoughts and behavior patterns (Barlow, 2014; Chorpita, 2007). However, most of the existing CBT studies with people who have ASD have examined children or adolescents (Attwood, 2014; Chalfant, Rapee, & Carroll, 2006; Moree & Davis, 2010; White et al., 2010; Wood et al., 2009). There are very few adult studies in this area, and those that are published suggest that CBT may be helpful in reducing anxiety in adults with ASD (Cardaciotto & Herbert, 2004; Gaus, 2011; Hesselmark, Plenty, & Bejerot, 2013; Weiss and Lunksy, 2010). However, results of these studies are difficult to generalize because of poor methodology and/or lack of randomized control trials (Spain, Sin, Chalder, Murphy, & Happe, 2015). Much more research needs to be done in this area.

Another important consideration of using CBT to treat adults with ASD is that core deficits of ASD often necessitate researchers and therapists to make rather large modifications to existing CBT protocols, which by nature departs from treatment fidelity (Attwood, 2004; Gaus, 2011). For example, Attwood (2004) outlined ways to make CBT more effective considering the deficits people with ASD often have in perspective taking, inflexible thinking, and social communication. They also discussed the importance of including emotion training in CBT, where therapists help clients with ASD recognize and appropriately use emotions in everyday life. Moreover, cognitive restructuring is modified to be explained in more concrete terms to adults and children with ASD as a "tool box", where they can choose the appropriate tool to manage a strong emotion like anxiety (Attwood, 2004). There have been no studies systematically examining the effectiveness of these or other modifications of CBT in samples of adults with ASD. That, in addition to the high prevalence of anxiety in adults with ASD, make it clear that there is a need for more research into ways anxiety can be treated systematically in adults with ASD.

Mindfulness as an Intervention

Mindfulness is an emerging area of interest in the search for effective interventions to assuage the comorbid anxiety which often accompanies ASD. Mindfulness is a concept that originates from an ancient Buddhist tradition, and is often defined in the literature as the ability to purposefully bring one's attention to the present moment in a nonjudgmental and accepting way, and having the ability to maintain this state over time (Kabat-Zinn, 1991).

In the last two decades, there has been a growing body of evidence showing that mindfulness based interventions might be effective in treating neurotypical people with depression, anxiety, and in helping them cope with stress-management (Arch & Ayers, 2013; Britton, Shahar, Szepsenwol, & Jacobs, 2012; Hoffman, Sawyer, Witt, & Oh, 2010; Kabat-Zinn, 1991; Miller, Fletcher, & Kabat-Zinn, 1995). Moreover, higher levels of mindfulness have been shown to correlate with psychologically beneficial characteristics, while lower levels of mindfulness correlate with psychological distress, including anxiety (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Baer et al., 2008; Hoge et al., 2013). Most empirically supported mindfulness interventions conceptualize mindfulness in similar ways as Kabat-Zinn (1991). For example, Acceptance and Commitment Therapy (ACT) is heavily influenced by mindfulness, and clients are taught to become aware of and recognize their inner states in a nonjudgmental and compassionate manner. This enables them to partake in healthy behaviors which are for the sake of pursuing valued behavior. It has been shown to help people with anxiety, depression, and stress management (Hayes, Strosahl, & Wilson, 1999; Luoma, Hayes, & Walser, 2007). Mindfulness-Based Stress Reduction (MBSR) is another intervention that is based on mindfulness and has empirical support of its efficacy for anxiety and depression. MBSR courses require clients to come into treatment sessions once a week for two and a half hours, with a total

of eight sessions. Clients are given a substantial amount of homework in which they practice a variety of mindfulness exercises every-day (Kabat-Zinn, 2003). Baer (2003) conducted a meta-analysis of current mindfulness-based treatments (including ACT and MBSR), and found that there is evidence for their efficacy in treating anxiety, depression, chronic pain, and other psychiatric and medical disorders.

Mindfulness interventions have also been shown to acutely reduce worrying and rumination (Arch & Ayers, 2013; Jain et al., 2007; Ramel, Goldin, Carmona, & McQuaid, 2004; van Aalderen et al., 2011). Arch & Ayers (2013) found that MBSR and group cognitive behavioral therapy were similarly effective in treating anxiety symptoms, but MBSR was more effective in reducing rumination and worry. Jain et al. (2007) compared a mindfulness meditation group, a relaxation group, and a control group, and found that only the mindfulness group reduced worrying. They also found evidence which suggested that a possible mechanism for mindfulness reducing general distress was a reduction in rumination.

Mindfulness for Anxiety in ASD

Throughout the past two decades, mindfulness-based interventions have been accumulating strong evidence in the treatment of many mental health difficulties for neurotypical populations. However, in a nascent area of mindfulness research, there is growing evidence that mindfulness may have similar benefits to people who have ASD and other developmental disorders (Hwang & Kearny, 2013).

In the first randomized controlled trial of its kind, Spek, van Ham, & Nyklicek (2013) examined the effectiveness of a modified version of Mindfulness-Based Therapy (MBT) for people with ASD (MBT-AS). This study utilized therapists who were trained in MBT and who had extensive experience doing therapy with people diagnosed with ASD. Modifications to MBT

included giving participants extra time to do meditation practices, increasing the treatment protocol from 8 weeks to 9 weeks, and avoiding the use of abstract language (e.g., metaphors). The participants learned and practiced various experiential mindfulness exercises and learned how to use mindfulness to reduce stress. They found that compared to a control group, MBT-AS was effective in lowering depression, anxiety, and rumination, along with increasing positive affect, all with effect sizes ranging from moderate to large. Moreover, data from this study showed that a reduction in rumination was significantly related to lower anxiety and depression in people with ASD. This supports the finding of Jain et al (2007) suggesting that rumination may serve as a possible mediator for comorbid symptomology, though this time utilizing a sample diagnosed with ASD.

Kiep, Spek, & Hoeben (2014), conducted a follow up study with 30 more ASD participants who underwent MBT-AS to determine the stability of the therapeutic benefits over time. They found the same results as the original study, and also determined that the reductions in depression and anxiety lasted at least 9 weeks after treatment. However, these results must be interpreted cautiously, as there was no control group and levels of mindfulness were not objectively measured at any point during the study.

Studies have also shown that teaching people with ASD a specific mindfulness practice (i.e., mindful awareness on the soles of one's feet) can reduce physical aggression for long periods of time (Singh et al., 2011). Moreover, in a recent pilot study conducted by Pahnke, Lundgre, Hursti, & Hirvikoski (2013), an ACT protocol for adolescents and young adults with high functioning ASD was shown to be helpful in reducing stress and psychological symptoms, in addition to increasing reported prosocial interactions.

Mindfulness-based interventions may be easier for people with ASD to understand and utilize than some CBT techniques, since the focus is on accepting what is real and present, as opposed to having them go through a more complicated process of identifying and replacing cognitions (Mazefsky & White, 2014). Moreover, when CBT techniques have been modified to fit the needs of people with ASD, there is support that mindfulness techniques may be helpful in these new protocols (McGilivray & Evert, 2014). These findings provide support for the notion that mindfulness has high usability in ASD populations on its own and in conjunction with existing CBT protocols.

There is growing support that both dispositional and practiced mindfulness may provide positive psychological benefits for both neurotypical people and people with ASD. However, there are no extant studies known to this author comparing dispositional levels of mindfulness characteristics in people who have ASD to neurotypical people, and this serves as a major gap in the literature. Interestingly, studies have shown that different groups of people can have different levels of overall mindfulness capabilities. For example, people with mindfulness experience (people who have completed mindfulness-based therapies or courses) tend to have higher overall levels of mindfulness than people with little or no experience with mindfulness (no mindfulness therapies) (Baer et al. 2006; Baer et al., 2008). Also, Hoge et al. (2013) showed that people with generalized anxiety disorder had less dispositional mindfulness traits than a control group. Moreover, Bullis, Boe, Asnaani, & Hofmann (2014) showed that people with more mindfulness characteristics tended to respond to an anxiety induction task with less physiological symptoms and less subjective distress.

Study Objectives

There are two main objectives to the current study. The first objective is to see if high functioning people with ASD have different levels of dispositional mindfulness characteristics than neurotypical people. We hypothesize that since people with ASD tend to experience higher levels of comorbid distress than neurotypical populations, and since higher distress has been shown to relate to lower levels of mindfulness, that people with ASD would have overall less dispositional mindfulness abilities than the neurotypical control group (Baer et al., 2006; Baer et al., 2008; Carmodi & Baer, 2007; Hoge et al., 2013). The second objective is to examine the role that mindfulness plays in reducing overall trait anxiety and worry in people with ASD and neurotypical people, and to determine if there are any interesting differences between these two groups. If mindfulness is shown to affect anxiety and worry differently for people with ASD compared to neurotypical people, this study can help shed light on effective ways to modify both traditional CBT and mindfulness-based therapies to help adults with ASD overcome excess stress, anxiety, and worry.

Method

Participants

The participants in this study were high functioning young adults ages 17-36 with Full Scale IQ from the Wechsler Abbreviated Scales of Intelligence-2nd Edition (WASI-II) of at least 80. The control group (N=22) was recruited via the Brigham Young University (BYU) volunteer research system. They were offered either \$10 or credit for a class. Participants in the control group were excluded from the study if they reported any of the following conditions in a demographics questionnaire: developmental disorders, neurological disorders, schizophrenia, bipolar disorder, or any personality disorders.

The ASD group (N=23) was recruited through flyers at BYU's counseling center and through existing research databases owned by Dr. Mikle South and Dr. Jonathan Cox, both clinical psychologists at BYU. The ASD participants were offered \$10 an hour for their participation. A diagnosis of ASD was confirmed by a semi-structured interview/interaction, the Autism Diagnostic Observation Schedule-Module 4 (ADOS-4; Lord et al., 2000) administered by Dr. South, who is trained to research reliability on the ADOS.

Procedures

This study utilized a cross-sectional case control design. However, before data was collected, both the ASD participants and the control participants came into BYU's MRI Research Facility to determine if they met initial criteria for the study. Diagnosis of ASD was based on DSM-V criteria using data from the ADOS administration. Both ASD and control groups completed WASI-II during this baseline visit.

Participants who met initial criteria for the study were contacted for the data collection phase. Participants in the ASD group were called and invited back into the MRI Research Facility to be given a computerized battery of measures to fill out using Qualtrics online survey software on a laptop computer. There was a research assistant in the room with them to answer any questions they had about the measures. The research assistants were instructed to answer most questions by telling the participant to answer to the best of their ability. The subjects in the control group either took the surveys during their visit or were emailed a link via Qualtrics software to the same battery of measures, and sent a \$10 Amazon gift card upon completion.

Measures

FFMQ. The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006) was used to examine the levels of mindfulness in this study's participants. The FFMQ measures mindfulness as a multifaceted construct which is made up of five distinct facets. We utilized a multifaceted measure of mindfulness to examine more intricate differences between groups. Baer et al. (2008) offers cogent explanations of each facet. First, the nonreactivity to inner experiences facet is the ability for people to not get caught up in their thoughts or feelings (e.g., *usually when I have distressing thoughts or images, I just notice them and let them go*). The observing thoughts and sensations facet describes the tendency for people to notice internal events, like sensations, sounds, thoughts, and emotions (e.g. *when I take a shower or bath, I stay alert to the sensations of water on my body*). The describing facet taps into the tendency for people to describe and label their internal events (e.g., *I'm good at finding the words to describe my feelings*). The acting with awareness facet refers to the tendency for people to attend to the present moment with awareness, in opposition to being on "autopilot" and acting without awareness (e.g., *I find myself doing things without paying attention*). Finally, the nonjudging of experience facet describes people who are not critical or harsh towards their inner thoughts and feelings (e.g., *I tell myself that I shouldn't be feeling the way that I am feeling*).

The FFMQ has 39 items and has shown both convergent and discriminant validity with a variety of psychological measures, including being able to predict psychological well-being and distress (Baer et al., 2006; Baer et al., 2008). Moreover, Baer et al. (2006) found that the facets of nonjudging, nonreactivity, and acting with awareness "were shown to have incremental validity in the prediction of psychological symptoms" (p. 42). The five distinct factors also show good internal consistencies: nonreactivity to inner experiences (alpha = .75), observing thoughts

and sensations ($\alpha = .83$), acting with awareness ($\alpha = .87$), describing/labeling inner experiences ($\alpha = .91$), and nonjudging of experiences ($\alpha = .87$) and are all modestly correlated with one another, ranging from .15 to .34. Importantly, the FFMQ is also sensitive to differences in mindfulness levels between groups of people, an important consideration for the current study. This will make it possible to see if distinct areas of the construct of mindfulness may differ between subjects with and without ASD (Baer et al, 2008). It is important to note that unlike the other facets, higher levels of “observe” are inversely related to psychological well-being in populations with no mindfulness experience. However, as people gain more mindfulness experience the facet of “observe” then predicts higher psychological well-being. Baer et al. (2006) suggested that this may be due to the tendency for the observe facet to be particularly sensitive to mindfulness experience, and becomes a predictor of psychological health as one gains more practice of mindfulness.

STAI Form-Y. The State Trait Anxiety Inventory Form-Y (STAI; Spielberger, Gorsuch, Lushene, & Vagg, 1983) was used to measure symptoms of general trait anxiety. The STAI is a 40 item measure that is widely used in existing anxiety research. It purports to measure anxiety symptoms in the current moment (STAI-S) and as a more stable factor in one’s life (STAI-T). However, the current study only utilized the score from the 20 items on the STAI-T which focuses on how the subject tends to feel every-day as opposed to how they are feeling in the present moment of answering the questions. Test-retest correlations range from .73 to .86 and internal consistency coefficients from .89 to .92 (Creamer, Foran, & Bell, 1995; Spielberger et al., 1983). The STAI-T has been shown to have discriminant validity for older patients with and without anxiety disorders, and to be moderately and significantly correlated with the Beck

Anxiety Inventory (Creamer et al., 1995; Fydrich, Dowdall, & Chambless, 1992; Kabacoff, Segal, Hersen, & van Hasselt, 1997).

SRS-2. The Social Responsiveness Scale, 2nd Ed (SRS-2) was used to assess the severity of core ASD symptoms. The SRS-2 is a dimensional measure consisting 65 questions which assess the severity of ASD symptoms across five scales: Social Awareness, Social Cognition, Social Communication, Social Motivation, and Restricted Interests and Repetitive Behavior. Severity of symptoms is based off of a single T-score. A score of 76 or higher suggests severe symptoms associated with ASD, 66-75 suggest moderate, and 60-65 suggest mild symptoms. The SRS-II has been used extensively in ASD research and has convergent validity with the ADOS and internal consistency ranging from .71 to .96 (Constantino & Gruber, 2012; Wilkinson, 2013).

PSWQ. The Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item questionnaire that measures the severity of worrying in both clinical and non-clinical populations. In a sample of college students, Meyer et al. (1990) showed that the PSWQ has good psychometric qualities with test-retest reliability (ranging from .74 to .92), and internal consistency (Chronbach's alpha ranging from .91 to .95). Moreover, the PSWQ has been shown to discriminate trait worry from anxiety and depression, and also to be able to accurately identify participants who have generalized anxiety disorder, a diagnosis characterized by pervasive worry. It also has convergent validity with measures which logically relate to the construct of worry (i.e., self-esteem, perfectionism, time-urgency) and with other measures of worry. Many of these findings were further supported in a large study examining psychometric properties of the PSWQ with a sample of people diagnosed with various anxiety disorders (Brown, Antony, & Barlow, 1991).

Data Analysis

All statistical analyses were completed with Stata version 13.1 (StataCorp, 2013). Before statistical analyses were conducted, data were examined for outliers, normality, and missingness. Outliers were looked at using boxplots, scatterplots, and the *IQR* program on Stata (Hamilton, n.d.), which denotes the mild and severe outliers for each variable. Outliers ($n=5$) were then fenced to twice the inter-quartile range of the median for the respective variable. Next, all variables for both groups were found to be normally distributed on a univariate, bivariate, and multivariate level. After normality was checked, missing data were examined and we found that two participants were missing data from the SRS. This was due to technical difficulties when they were filling out the electronic survey battery. To increase certainty that the data were missing at random, a dummy variable was coded for the missing SRS data and correlated with all other variables in the ASD group. No significant correlations were found.

After the data were examined, descriptive analyses and demographic differences were explored. Next, to explore the baseline differences in the five facets of mindfulness between the ASD group and the control group, five independent samples *t*-tests were run. The *t*-test for the mindfulness facet of nonreactivity was run with a Welch's approximation to account for unequal variances between groups. Finally, standard multiple regressions were conducted to examine the ways mindfulness predicts anxiety in the ASD group and the neurotypical group, while controlling for ASD core symptoms measured by the SRS-II. We decided to control for the variance of ASD core symptoms because of the previously cited past research that has shown that people with autism tend to have more anxiety than neurotypical people.

Given the small sample size used in this study, undue influence of data points attributed to bivariate outliers and leverage was a concern. This concern was supported by examining

Cook's Distance and leverage plots. To mitigate this issue, robust regressions were calculated with the *rreg* command in Stata (StataCorp, 2013). This approach is more conservative and drops the most influential units of data and then takes into account the weight of the remaining data points (UCLA: Statistical Consulting Group, n.d.; Williams, R., n.d.; Yaffee, R. A., n.d.; Yaffee, R.A., 2002).

All regression assumptions were met with one exception. The PSWQ for the ASD group did not meet the normality of errors assumption according to the Shapiro-Wilk test of normality for the residuals ($W=.95, p=.04$). To determine if this affected the regression results, a quantile regression with bootstrapped standard errors was run, as recommended for this situation by Mooney & Durval (1993) (as cited in Yaffee, R. A., 2002, p.8). The bootstrapped regression had nearly identical results as the non-bootstrapped regression, with no impactful changes. This finding, in addition to the normality residuals being only borderline non-normal, suggested that the violation was not likely impactful to the results.

Results

Preliminary Analyses

Mean scores and standard deviations for the variables in this study can be found in Table 1. An initial two-independent samples *t*-test was calculated to compare the full scale IQ of the ASD group with the control group. The analysis produced a significant *t*-value ($t_{(42)} = -2.10, p = .042$), and an examination of the means showed that the control group had a significantly higher IQ ($M = 114.23$) than the ASD group ($M = 107.55$). While this group difference is important to take into consideration when interpreting the findings of this study, a difference of 6.7 points on the WASI-II is not functionally impactful enough to be considered a major confound. Next, because of the non-normality of the variable, a two-sample Wilcoxon rank-sum test was utilized

to look at group differences of participant age. The results showed that age was equal for both groups ($z = .453, p = .650$). A chi-square test was then run to examine group differences between gender and no significant differences were found ($\chi^2_{(1)} = .008, p = .928$). Finally, two independent sample *t*-tests showed that there was a significant *t*-value for both STAI ($t_{(43)} = 2.58, p = .014$) and SRS ($t_{(41)} = 5.1, p < .001$) scores between groups. The ASD group had significantly higher STAI ($M = 45.09, SD = 10.72$) and SRS ($M = 82.10, SD = 27.70$) than the control group's STAI ($M = 37.14, SD = 9.95$) and SRS ($M = 43.55, SD = 21.65$). These findings were expected, as past research has shown that people with ASD have been shown to have more anxiety than neurotypical people, and of course elevated levels of autism core symptoms. A third independent samples *t*-test showed that there were no significant group differences between the ASD group and control group for trait worry ($t_{(43)} = 1.66, p = .14$).

Baseline Differences in Mindfulness

Five independent samples *t*-tests showed that there were baseline differences between the two groups in three of the five mindfulness facets. These results are reported in Table 1. No significant differences were found between groups for the mindfulness facet of observing and nonjudging of inner experience. However, the analyses showed a significant *t* value between the groups for acting with awareness ($t_{(43)} = -3.13, p < .01$), describing inner experience ($t_{(43)} = -2.26, p < .05$), and nonreactivity to inner experience ($t_{(36)} = -2.25, p < .05$). An examination of the means showed that the for the ASD group, acting with awareness ($M = 22.83, SD = 6.62$), describing ($M = 22.09, SD = 6.19$), and nonreactivity ($M = 21.00, SD = 5.46$) were all significantly lower than for the control group (respectively $M = 27.95, SD = 3.98$; $M = 26.81, SD = 7.81$; $M = 23.95, SD = 3.09$). These results offer preliminary evidence in support of this study's hypothesis that trait mindfulness is different for people with ASD compared to neurotypical people.

Relationship between Mindfulness and Anxiety

To explore the hypothesis that mindfulness affects trait anxiety differently for people with ASD compared to neurotypical people, we ran a standard robust multiple regression to examine the predictors of trait anxiety for each group. Standardized and unstandardized beta coefficients, along with significance values and confidence intervals, are reported in Table 2. Six predictors, the five mindfulness facets and the SRS-II, were simultaneously entered into the model for the ASD group and then the model for the control group. For the ASD group analysis, the predictors accounted for a total of 65% of the variance in anxiety for the ASD group, $F(6, 14) = 4.12, p < .05$. The only variable that significantly predicted less anxiety for the ASD group was the mindfulness facet of nonreactivity to inner experience ($\beta = -.62, p = .05$).

For the control group, the six predictors accounted for a total of 62% of the variance in anxiety, $F(6, 15) = 33.61, p < .0001$. The describing facet was the only variable which did not significantly predict anxiety. The strongest predictors of less anxiety for the control group were the mindfulness facets of nonreactivity to inner experiences ($\beta = -.75, p < .001$), and nonjudging of experience ($\beta = -.46, p = .01$). The mindfulness facet of acting with awareness ($\beta = -.27, p < .01$) and the measure of core ASD symptoms ($\beta = -.34, p < .05$) both mildly predicted less anxiety in the control group. The mindfulness facet of observing was the only variable to significantly predict anxiety in a positive direction ($\beta = .22, p < .05$).

These results shed light on the second objective of this study by providing evidence that mindfulness relates to anxiety differently for people with ASD compared to neurotypical people. Results suggest that for people with ASD, mindfulness primarily attenuates anxiety through helping them not react to their inner experiences. In contrast, mindfulness may assuage anxiety

in people without ASD through multiple avenues, namely nonreactivity, nonjudging, and increased awareness to the present moment.

Relationship between Mindfulness and Worry

After examining differences between groups in how mindfulness relates to a more general trait-anxiety, we then explored the relationship between mindfulness and the magnitude of worry in people with and without ASD. To do this, we again ran a standard robust multiple regression for each group, though this time we used worry as the independent variable, instead of trait anxiety. Standardized and unstandardized beta coefficients, along with significance values and confidence intervals, are reported in Table 3. Together, the predictors accounted for a total of 71% of the variance in worry for the ASD group, $F(6, 14) = 11.65, p = .001$. The mindfulness facet of nonreactivity to inner experience ($\beta = -.77, p < .001$) was again the only variable which significantly predicted worry in the ASD group.

For the control group, the six predictors accounted for a total of 57% of the variance in worry, $F(6, 15) = 8.86, p < .001$. There was no variable which had a significant, negative relationship with worry. However, the mindfulness facet of observing positively predicted anxiety ($\beta = .59, p < .01$). Again, these results offer evidence to the second objective of this study and show that the relationship between worry and mindfulness differs for ASD and non-ASD groups. Specifically, a salient predictor of worry for people with ASD is the mindfulness trait of nonreactivity to inner experiences. However, the only mindfulness trait significantly related to worry for the control group was observing, though it had a positive relationship.

Discussion

The objectives of the current study were two-fold: (1) to examine whether there were differences in dispositional mindfulness between an ASD group and a neurotypical group and (2) to investigate if mindfulness predicted anxiety differently for both groups. We hypothesized that the ASD group would generally have lower levels of mindfulness, due to extant research showing that people with ASD have elevated comorbidity (Lungnegard et al., 2011; Ghaziuddin 2002; Gillot & Standen, 2007; White et al., 2009) and that higher mindfulness characteristics are related to lower levels of psychological distress (Baer et al., 2006; Baer et al., 2008; Carmodi & Baer, 2007; Hoge et al., 2013). Therefore, it seemed likely that people with ASD who experience more distress would also possess lower levels of mindfulness. For the second objective, we refrained from making a hypothesis, as this is the first study known to the author to examine dispositional mindfulness in people with ASD, and all findings are considered exploratory.

Exploring Differences in Mindfulness

Our first hypothesis was partially supported by the data, in that there were group differences for three out of the five mindfulness facets. First, the results suggested that people with ASD were more likely to react negatively when they experienced aversive thoughts or feelings than neurotypical people. Nonreactivity to inner experiences has been shown relate to greater psychological distress and to less subjective feelings of well-being, as well as add incremental validity in predicting psychological symptoms. (Baer et al., 2006; Baer et al., 2008). It has also been shown to be attenuated in people who have generalized anxiety disorder compared to a control group (Hoge et al., 2013). The inflexible thinking patterns and rigidity of interests and behaviors often seen in ASD may be responsible for this attenuated mindfulness

facet, as any unpleasant thought or feeling that goes counter to their interest or behavior may be reacted to in an acutely distressing way.

Next, this study's findings suggested that people with ASD have an attenuated ability to describe and label their feelings and thoughts. Baer (2006) and Veehof, Peter, Taal, Westerhof, and Bohlmeijer (2011) have shown that the describe facet has a moderately strong negative relationship with alexithymia (inability to recognize emotions in oneself or others). Moreover, extant research posits that people with ASD often experience symptoms consistent with alexithymia (Bird et al., 2010; Cook, Brewer, Shah, & Bird, 2013). Therefore, our finding that the ASD group had lower describing skills corroborates with previous findings that alexithymia is often present in people with ASD, which may help to explain some of the social and communication difficulties they experience.

The final difference in mindfulness seen between groups was that people with ASD acted with awareness in the present moment less so than people without ASD. Like the facet of nonreactivity to inner experience, acting with awareness has been shown to add incremental predictive validity to psychology symptoms (Baer et al., 2006; Baer et al., 2008; Cash & Whittingham, 2010) and to predict less subjective anxiety when participants inhaled CO₂ to elicit an anxious response (Bullis et al., 2014). Worrying, especially concerning social situations, is a very common symptom of anxiety amongst the ASD population, and when people frequently worry they are not acting in the present moment, as their attention is focused on their thoughts. Too much worry and rumination may explain why people with ASD have less acting with awareness characteristics than the neurotypical group. However, as Spek et al. (2013) suggested, increasing mindfulness through an intervention might assuage these worry symptoms, in addition to general distress.

Interestingly, there were no significant differences found between the ASD group and the control group on the mindfulness facet of nonjudging of internal thoughts and feelings, which was the third mindfulness facet that has been shown to add incremental predictive validity of psychological symptoms (including anxiety, depression, and stress), and relate positively to psychological well-being (Baer et al., 2006; Baer et al., 2008; Cash & Whittingham, 2010). Hoge et al. (2013) also found that the nonjudge facet of mindfulness was significantly lower in a group of people who have generalized anxiety disorder compared to a control group.

Finally, like the describe facet of mindfulness, there was no difference between groups in the observe facet, though this finding was not surprising, as studies have suggested that this is the one mindfulness facet which is most dependent on mindfulness experience. In people who are unexperienced with mindfulness, the observe facet does not fit as well with the construct of mindfulness (via confirmatory factor analysis), in addition to predicting more psychological distress. However, in people who are experienced with mindfulness the observe facets does fit well with the other mindfulness facets and predicts more psychological health and less distress (Baer et al., 2006; Baer et al., 2008; Bullis et al., 2014; Carmodi & Baer, 2007). Since neither group in the current study underwent systematic mindfulness training, it is understandable that this facet would be roughly equal for both groups.

The Role of Mindfulness in Anxiety and Worry

The second objective of this study, determining the ways in which mindfulness predicts anxiety and worry in both groups, yielded some interesting results. First, findings for the control group corroborated with previous research by Baer et al. (2006, 2008) and Hoge et al. (2013) that elevated levels of the mindfulness facets of nonreactivity, acting with awareness, and nonjudging are able to predict lower levels of anxiety, and elevated levels of the mindfulness facet observe

predicted greater anxiety. However, for the ASD group the only mindfulness facet which predicted lower trait anxiety was nonreactivity to inner experience. Moreover, nonreactivity to inner experience predicted lower levels of worry to an even greater degree than trait anxiety in the ASD group. This was intriguing, as the only relationship with mindfulness and worry for the control group was the observe facet predicting greater levels of worry.

These findings suggested that for people with ASD, having the mindfulness skill of not aversively reacting to one's inner experiences is the most powerful predictor of both worry and general trait anxiety, while for people without ASD acting in the present moment, nonjudging of inner experiences, and not reacting to inner experiences are all strong predictors of trait anxiety, though in this was not the case for worry. As noted previously, the reason nonreactivity might affect the ASD group so saliently is that a major difficulty people with ASD have is rigid or inflexible patterns of thinking. Findings from this study suggest that having the ability to let those rigid thoughts and feelings come and go without reacting strongly to them can help people with ASD overcome anxiety and worry. These findings may help explain why Spek et al. (2013) and Kiep et al. (2014) found that mindfulness is so helpful in reducing anxiety and worry in people with ASD, and even positing that a reduction in worry might be a mediating factor in how mindfulness reduces distress. The current study posits an explanation for those findings, as it suggests that mindfulness may assuage ruminative worry by specifically increasing the participants' ability to react less aversively to rigid and inflexible thoughts and feelings.

While these findings are highly exploratory, they do have serious implications for future work in the field of mindfulness and ASD. Having data which suggests that the mindfulness ability of nonreactivity to inner experiences is the most powerful predictor of anxiety and worry in an ASD sample can drive the development and implementation of future mindfulness-based

interventions for people with ASD. For instance, when traditional CBT is modified for people with ASD or when mindfulness-based interventions are utilized for ASD populations, it may be especially helpful for therapists to focus on teaching mindfulness skills and techniques which act on reducing reactivity to unpleasant internal experiences.

There are many examples of these types of skills in different mindfulness-based therapy programs. For example, in Acceptance and Commitment Therapy, people are taught to see their thoughts from an “outside-in” perspective, and to not take them as the ultimate truth. An example of this is having participants say “I know I am having the thought of...” before they think of something distressing. This allows them to gain separation from their thoughts, ultimately reducing the believability of them and helping people react in less aversive ways (Hayes, Strosahl, & Wilson, 1999; Harris, 2009). In MBSR, people are taught how to focus their attention on specific areas of their body, while allowing all sensations to simply be present without trying to change anything (Kabat-Zinn, 1991). This practice teaches participants that bodily sensations are not harmful, and therefore the need to react negatively in response to them is attenuated. These and other similar mindfulness skills aimed at reducing reactivity to inner experiences may be especially useful in helping people with ASD overcome the anxiety and worry they so often experience.

Limitations and Future Directions

A major limitation of this study was that there was no neurotypical anxious comparison group. As expected, the control group had lower anxiety than the ASD group, which leaves open the possibility that the mindfulness facet of nonreactivity to inner experiences doesn't have so much to do with a diagnosis of ASD, but rather elevated levels of comorbid anxiety in the ASD group. This is a concern, as studies have shown that more anxiety is related to less mindfulness

characteristics (Arch & Craske, 2010; Baer et al., 2006; Baer et al., 2008; Cash & Whittingham, 2010; Hoge et al., 2013). However, there are two reasons why we believe that there is something unique about ASD that explains these differences, rather than simply elevated levels of trait anxiety. First, the pattern and magnitude of nonreactivity to inner experience affecting worry in ASD was the same as the pattern for trait anxiety, and worry was shown to be equal in both of the groups. This suggests that at least for worry, there is something unique about how mindfulness works in people with ASD. Secondly, there was no difference between the ASD group and the control group on the facets of nonjudging inner experience and observing inner experience, both of which have been shown to be different in people with more psychological symptoms (Baer et al., 2006; Baer et al., 2008; Cash & Whittingham, 2010; Hoge et al., 2013). This suggests that people with ASD respond to mindfulness differently than neurotypical people, beyond the elevated comorbid anxiety they often experience. Future research in this area is needed to measure dispositional mindfulness while carefully matching the ASD group with the control group on anxiety measures. This would help attribute differences in mindfulness to a diagnosis of ASD independently, rather than due to elevated levels of comorbidity.

Another limitation to this study is the cross-sectional design, which limits any statements about causal inference than can be made. Unfortunately, there has been no clinical trial at this time measuring how different facets of mindfulness change in people with ASD due to mindfulness interventions. Future research is needed to examine how mindfulness interventions work in people with ASD compared to neurotypical people. While this study suggests that focusing on mindfulness skills that engender nonreactivity to inner experience would be the most helpful, only a randomized clinical trial would be able to confirm this.

Another limitation of this study is shared by most researchers working with ASD participants. While the STAI and PSWQ have been used extensively in previous research with people who have ASD, they have not been validated for this population. Moreover, this is the first study known to the author which has looked at the FFMQ in people with ASD. Since only high functioning people with ASD were used in this study, it is more likely that they fully understood the questions they filled out. Moreover, Berthoz and Hill (2005) found that adults with ASD were able to accurately fill out self-report questionnaires concerning their emotions. However, more research needs to be done on the psychometric properties of these measures with a population diagnosed with ASD. Moreover, mindfulness is a complex construct that has been notoriously difficult for researchers to agree on a definition. While the FFMQ has solid psychometric data and has been utilized often in mindfulness research, there is still question on how well it taps into “mindfulness” as practiced in mindfulness-based interventions like MBSR and ACT.

Finally, the participants in this study were all young adults and high functioning. These findings shouldn't be generalized to people with ASD who are lower functioning. However, since mindfulness techniques are often taught through experiential exercises, it may be easier for people with low functioning ASD to learn these skills than the traditional cognitive techniques.

Summary and Conclusions

People with ASD seem have a deficit in three specific mindfulness abilities compared to neurotypical people: being able to describe and label their feelings and thoughts, acting with awareness in the present moment, and not aversively reacting to inner experiences. However, evidence from this study suggested that only the mindfulness facet of nonreactivity to inner experiences related to anxiety and worry in people with ASD. This study suggested that it may

be helpful for traditional CBT practitioners working with people who have ASD to incorporate mindfulness skills which specifically teach nonreactivity to inner experience. Similarly, for practitioners who work with ASD populations and already utilize a mindfulness-based modality, it will likely be helpful for them to highlight exercises that focus on nonreactivity to inner experience skills and techniques, even more so than they would when working with neurotypical people.

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Appendix

Table 1.

Descriptive and Demographic Information

Measure	ASD <i>n</i> = 23		TYP <i>n</i> = 22		<i>t</i> -test
	Mean (SD)	Range	Mean (SD)	Range	
Age	22.73 (4.54)	18 - 36	21.28 (2.49)	17 - 25	.886 ^a
FSIQ	107.55(12.46)	82 - 130	114.23(8.27)	94 - 131	2.10*
STAI-Trait	45.09 (10.72)	25 - 60	37.14 (9.95)	24 - 56	2.58*
SRS-2	82.10 (27.70)	19 - 139	43.55 (21.65)	11 - 78	5.10***
PSWQ	52.04 (13.87)	21 - 77	44.68 (15.88)	16 - 69	1.66
Observe	27.00 (5.27)	17 - 38	24.60 (6.81)	15 - 39	1.33
Nonreact	21.00 (5.46)	12 - 34	23.95 (3.09)	18 - 30	2.25*
Nonjudge	25.43 (7.00)	9 - 36	27.43 (7.68)	14 - 40	.914
Describe	22.09 (6.19)	9 - 32	26.81 (7.81)	13 - 39	2.26*
Awareness	22.83 (6.62)	9 - 38	27.95 (3.98)	18 - 35	3.13**

FSIQ Full Scale IQ, *STAI-Trait* State Trait Anxiety Inventory-Trait *SRS-2* Social Responsiveness Scale 2nd Edition, *PSWQ* Penn State Worry Questionnaire, *Observe* Mindfulness facet of observing experience, *Nonreact* Mindfulness facet of nonreactivity to inner experience, *Nonjudge* Mindfulness facet of nonjudging of inner experience, *Describe* Mindfulness facet of labeling thoughts and feelings with words, *Awareness* Mindfulness facet of acting with awareness in the present moment

* $p < .05$, ** $p < .01$, *** $p < .001$

^aWilcoxon rank-sum test *z*-score

^b*t*-test with Welch's approximation

Table 2.

Robust Multiple Regression for Predicting Anxiety

Variable	ASD <i>n</i> = 23				TYP <i>n</i> = 22			
	B	SE	β	95% CI	B	SE B	β	95% CI
Observe	-.83	.48	-.41	-.91, .10	.32	.14	.22*	.02, .42
Nonreact	-1.21	.42	-.62*	-1.08, -.16	-2.40	.31	-.75***	-.95, -.54
Nonjudge	-.20	.43	-.13	-.72, .46	-.59	.14	-.46**	-.69, -.22
Describe	.21	.38	.12	-.35, .59	.09	.13	.07	-.15, .29
Awareness	-.52	.50	-.32	-.98, .34	-.68	.18	-.27**	-.43, -.12
SRS-2	.09	.11	.24	-.40, .88	-.16	.05	-.34*	-.58, -.09
<i>R</i> ²	.65				.62			
<i>F</i>	4.12*				33.61****			

Observe Mindfulness facet of observing experience, *Nonreact* Mindfulness facet of nonreactivity to inner experience, *Nonjudge* Mindfulness facet of nonjudging of inner experience, *Describe* Mindfulness facet of labeling thoughts and feelings with words, *Awareness* Mindfulness facet of acting with awareness in the present moment, *SRS-2* Social Responsiveness Scale 2nd Edition

* *p* < .05, ** *p* < .01, *** *p* < .001, **** *p* < .0001

Table 3.

Robust Multiple Regression for Predicting Worry

Variable	ASD $n = 23$				TYP $n = 22$			
	B	SE	β	95% CI	B	SE	β	95% CI
Observe	.28	.39	.11	-.21, .42	1.38	.38	.59**	.24, .94
Nonreact	-1.96	.34	-.77***	-1.06, -.48	.10	.86	.02	-.34, .37
Nonjudge	-.70	.35	-.35	-.73, .02	-.20	.39	-.09	-.50, .31
Describe	.02	.31	.01	-.29, .31	.60	.36	.30	-.09, .68
Awareness	-.35	.41	-.16	-.58, .25	-.94	.50	-.24	-.50, .03
SRS-2	-.08	.09	-.15	-.55, .25	.28	.15	.38	-.05, .81
R^2	.71				.57			
F	11.65***				8.86***			

Observe Mindfulness facet of observing experience, *Nonreact* Mindfulness facet of nonreactivity to inner experience, *Nonjudge* Mindfulness facet of nonjudging of inner experience, *Describe* Mindfulness facet of identifying/labeling inner and outer experiences with words, *Awareness* Mindfulness facet of acting with awareness in the present moment, *SRS-2* Social Responsiveness Scale 2nd Edition

* $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$