Psychometric Validation and Demographic Differences in Two Recently Developed Trait Mindfulness Measures.

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Abstract

Although in recent years an increasingly large body of mindfulness research has accrued, there continues to be a lack of information about how to measure trait mindfulness, as well as whether it varies across demographic variables such as age and gender. Four hundred and six participants from across New Zealand completed a battery of self-report measures in order to examine demographic differences in mindfulness, as well as to look at how mindfulness predicts outcome variables such as happiness and depression. Additionally, psychometric validation was undertaken on two new trait measures of mindfulness: the Toronto Mindfulness Scale, which did not demonstrate good psychometric validity, and the Five Facet Mindfulness Questionnaire, which did demonstrate good psychometric validity. This study found that females reported higher levels of mindfulness than males, though males demonstrated a stronger mediating relationship between mindfulness and happiness. In addition, higher levels of mindfulness were reported by older individuals; however, young adults manifested the strongest negative relationship between mindfulness and depression across the lifespan. These findings are then discussed in the context of clinical utility and future research.

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Psychometric Validation and Demographic Differences in Two Recently Developed Trait Mindfulness Measures.

The role of consciousness in psychology has long been of interest to both the psychologically-minded layperson and researcher alike. One facet of consciousness, mindfulness, has received a considerable increase in attention over the past 10 years. Mindfulness was originally a form of Buddhist meditation, but has been more recently co-opted by contemporary psychology due to its demonstrable benefits on individuals' well-being (e.g. Brown & Ryan, 2003; Carmody & Baer, 2008).

Mindfulness: Definitions and Measurement

Various definitions of mindfulness have been proposed; it is often described as "cultivating awareness" (Kabat-Zinn, 1990, p. 20) and "keeping one's consciousness alive to the present reality" (Hanh, 1976, in Brown & Ryan, 2003, p. 822) in a way that is "characterized by curiosity, openness, and acceptance" (Bishop et al., 2004, p. 232). Defined as such, mindfulness is the act of the individual bringing his or her attention to the present moment in a non-judgemental manner. Mindfulness has recently gained much attention within the positive psychology movement, resulting in an increase in both empirical research and mindfulness-based clinical interventions (Baer, 2003).

Indeed, mindfulness-based treatments have been shown to reduce anxiety (Goldin & Gross, 2010), depression (Hofmann, Sawyer, Witt, & Oh, 2010), and pain (Kabat-Zinn, 1982), and to increase well-being (Grossman, Niemann, Schmidt, & Walach, 2004). Mindfulness based treatments, such as Mindfulness Based Stress Reduction (MBSR; a commonly used program which uses mindfulness as the main focus of therapy), frequently initially emphasize participants' attention on their

breathing, with individuals encouraged to take a non-judgemental stance toward any thoughts that arise. Kabat-Zinn (1990) describes the process as follows:

> We observe the breath as it flows in and out. We give full attention to the feeling of the breath as it comes in and full attention to the feeling of the breath as it goes out... and whenever we find that our attention has moved elsewhere, wherever that may be, we just note it and let go and gently escort our attention back to the breath, back to the rising and falling of our own belly. (p. 64)

From this form of basic mindfulness, other manifestations of practice can be cultivated, in which attention is drawn to other areas, such as one's bodily sensations or the surrounding environment (Kabat-Zinn, 1982).

This increase in empirical research has also required the development of valid and reliable mindfulness measures, in order to monitor participants' pre and post-intervention levels of mindfulness, as well as to understand how varying levels of mindfulness relate to other psychological constructs (e.g. anxiety, depression). Unfortunately, because of the newness of these measures, many have not had time to accumulate sufficient research demonstrating validity, reliability, and other psychometric properties. Some measures of mindfulness have received more attention than others, e.g. the Freiberg Mindfulness Inventory (FMI; Walach, Buchheld, Buttenmuller, Kleinknecht, & Schmidt, 2006), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004), Cognitive and Affective Mindfulness Scale (CAMS-R; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007), and the Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). These measures are backed by a fairly large amount of empirically validated research, while other newer measures such as, in particular, the Toronto Mindfulness Scale

(TMS; Lau et al., 2006) and, to a lesser extent, the Five Facet Mindfulness Questionnaire (FFMQ; Baer, Smith, Lykins, Button, Krietemeyer, Sauer, Walsh, Duggan, & Williams, 2008) – the two mindfulness measures that are the focus of the present research – have received less empirical research to date. Part of the reason for these two measures being chosen for this study was due to the lack of psychometric validation that they have thus far received.

Furthermore, the TMS and FFMQ are both trait measures of mindfulness as opposed to state measures. Trait mindfulness refers to a more stable, enduring, dispositional form of mindfulness, whereas state mindfulness is more transient and changeable. For example, if an individual engaged in15 minutes of mindfulness meditation, they would likely be placed into a temporary 'state' of mindfulness, however the relatively stable day-to-day level is what is referred to as their 'trait' level. Both state and trait levels of mindfulness have been shown to change with mindfulness practice (e.g. Davis et al., 2009). The goal of the present study was to investigate mindfulness as a trait/dispositional factor because: a) the present study was not an intervention study and, thus, participants' general level of mindfulness was more relevant than transitory states, and b) how mindfulness is related with other psychological trait measures, such as depression and happiness, was also of interest. The following section gives more background information on both the TMS and FFMQ, as well as introduces the ways in which they were used in this study.

The Toronto Mindfulness Scale (TMS)

The TMS was initially developed in 2006 as a measure of state mindfulness. In its original form, participants using the measure were asked to "sit quietly and pay attention to their breath for 15 minutes before completing the scale" (Davis, Lau, & Cairns, 2009, p. 187). However, the developers of the scale wished to create an

additional trait measure of mindfulness, so as to have both state and trait versions of the same measure. Both scales are 15 items and only differ in that the state version presents items in the past tense (e.g. “I was curious to see what my mind was up to from moment to moment”) while the trait version is written in the present tense (e.g. “I am curious to see what my mind is up to from moment to moment”), and the trait version does not instruct participants to pay attention to their breath before completing the scale (Davis et al., 2009).

Both versions of the TMS have been divided into two factors: 1) *Curiosity*, which was defined as reflecting “awareness of present moment experience with a quality of curiosity” (Lau et al., 2006, p. 1452) and 2) *Decentering*, as “awareness of one’s experience with some distance and disidentification rather than being carried away by one’s thoughts and feelings” (Lau et al., 2006, p. 1452). Lau et al. (2006) found the two factors to be positively correlated (r = .26), and they also found that the average inter-item correlation of each factor was larger than that of the interfactor correlation; these correlations gave some evidence of discriminant validity for the two factor model (Clark & Watson, 1995, cited in Lau et al., 2006). Furthermore, factor loadings were found to be “at least moderately large in magnitude” (Lau et al., 2006, p. 1453), and ranged from .56 to .82. In addition, a high level of internal reliability was found for both subscales of the trait version of the TMS, with .91 for Curiosty and .85 for Decentering (Davis et al., 2009). Both factors of the trait version of the TMS were also found to have good convergent validity, in that they demonstrated significant positive correlations with the other mindfulness measures that they were associated with (including MAAS, FMI, KIMS, and the FFMQ), however it should be noted that correlations between TMS Decentering and the other measures was generally higher than correlations between TMS Curiosity and the other mindfulness

measures. From this, it can be concluded that the TMS has demonstrated good psychometric validity in existing research, though little of it exists to date.

All further references to the TMS in this paper denote the Trait version of the measure.

The Five Facet Mindfulness Questionnaire (FFMQ)

The FFMQ was developed in response to the question of whether mindfulness ought to be conceptualised unidimensionally (as seen in scales such as the Mindful Attention Awareness Scale) or whether mindfulness is better understood as a multi-faceted construct. Baer et al. (2006) asked a large sample of students to complete five mindfulness questionnaires (Freiburg Mindfulness Inventory, Mindful Attention Awareness Scale, Kentucky Inventory of Mindfulness Skills, Cognitive and Affective Mindfulness Scale, and the Mindfulness Questionnaire) and then performed a factor analysis on the data, which resulted in a five factor representation appearing as the most appropriate factor structure of mindfulness based on these items.

The facets that were identified by Bear et al.'s (2006) research were: *Observing*, which involves "noticing or attending to internal and external experiences, such as sensations, cognitions, emotions, sights, sounds, and smells," *Describing* or "labeling internal experiences with words," *Acting with Awareness*, which involves "attending to one's activities of the moment and can be contrasted with behaving mechanically while attention is focused elsewhere," *Nonjudging of inner experience*, or "taking a nonevaluative stance toward thoughts and feelings," and *Nonreactivity to inner experience*, "the tendency to allow thoughts and feelings to come and go, without getting caught up in or carried away by them" (Baer et al., 2008, p. 330). Baer et al (2008) found an acceptable level of internal consistency within each of the five subfactors, with alpha coefficients ranging from .75 to .91. They also performed a

confirmatory factor analysis (CFA) in order to determine whether the five facets are better conceptualised as distinct concepts or as a single construct of mindfulness. Four of the facets – all but observing – held together reasonably well which suggested that they comprised components of a unified conception of mindfulness. Observing, however, was not found to correlate highly with the other factors, and it demonstrated modest, positive correlations with certain maladaptive variables (such as dissociation, absentmindedness, though suppression, and psychological symptoms), which was not as expected. However, Baer et al. (2008) also looked at the fit of the hierarchical model and found good model fit: CFI = .97, TLI = .96, RMSEA = .06, and SRMR = .05) (Baer et al., 2008).

A Dutch version of the FFMQ also provided further supporting evidence for a five-facet structure of the measure; good model fit was found in a sample of individuals suffering from clinical levels of depression and anxiety (Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011) as well as a sample of individuals with fibromyalgia (Veehof, ten Klooster, Taal, Westerhof, & Bohlmeijer, 2011). Researchers seeking psychometric validation for a Chinese version of the scale also conducted a CFA, which supported the five-facet model of the FFMQ in a non-clinical sample (Deng, Liu, Rodriguez & Xia, 2011). Support for the five-facet structure was also found for the original English version of the FFMQ in a non-clinical, college-aged sample in a study examining the relationship between mindfulness and alcohol abuse (Fernandez, Wood, Stein, & Rossi, 2010).

The FFMQ was examined again in the present research to determine whether the proposed five factor structure of this measure is reliable and valid. As previously described, the FFMQ and TMS have received some psychometric evaluation, within meditating, non-meditating, non-clinical and some clinical samples. The TMS state

version, for example, has been used to measure whether a mindfulness-based stress reduction course successfully reduced non-clinical, non-meditating participants' levels of stress (Anderson, Lau, Segal & Bishop, 2007). However, in the Anderson et al. (2007) study – as in many other mindfulness intervention studies of a similar nature – the psychometric properties of the measures used were not the primary focus of the research. Additionally, the state as opposed to trait version of the TMS was used in this study; given the newness of the trait version of the TMS, there is even less extant research as to its psychometric validity, though there is some evidence that it exhibits good convergent validity and internal reliability (Davis et al., 2009).

Furthermore, although mindfulness is beginning to develop a catalogue of research studies demonstrating its clinical effectiveness, there remains a dearth of information regarding how it is manifested across various demographic groups. Previous research conducted using a Swedish sample has indicated that the FFMQ is psychometrically invariant across age and gender (Branstrom, Duncan, & Moskowitz, 2011). Further confirmation of this finding as well as extending research on how the measure performs across age and gender boundaries would be helpful in building the catalogue of research on the psychometric properties of the TMS and FFMQ. Thus, a primary goal of the present research was to verify whether the TMS and FFMQ (trait versions) manifest acceptable psychometric properties.

Mindfulness and Age

Another goal of the present study was to determine whether the TMS and FFMQ would demonstrate factorial invariance across various age groups concurrently as well as over time. When and if this fact could be demonstrated, then a related goal was to see whether individuals of different ages would report differing degrees of mindfulness.

The topic of how age impacts on reported levels of mindfulness has received little research attention, and those studies which have taken it into account tend to solely examine age as a possible confounding factor to be ruled out, without substantial analysis given to the subject itself. Such studies have found no effects for age (e.g. McCracken, Gauntlett-Gilbert, & Vowles, 2007; Shapiro, Biegel, & Brown, 2007); however, the cursory treatment which the subject has thus far received leaves the topic open for further exploration. Due to the limited research that has yet been conducted in this area, the age effects for analogous psychological constructs were examined in order to generate predictions as to how age may impact on the construct of mindfulness.

One area of research that is comparable to mindfulness is that of affective intensity and emotional control. Prior studies have shown that young people experience greater emotional intensity, and that older adults have a greater propensity for "emotional levelling"; that is, fewer highs and lows (Diener, Sandvik, & Larsen, 1985). Gross, Carstensen, Pasupathi, Tsai, Skorpen, and Hsu (1997) suggest that this levelling of emotional experience is not indicative of older individuals' inability to feel extremes of emotion, but simply a decreased incidence in which these extremes are experienced, suggesting that: "A distinction be made between the capacity to experience emotion and the typical level of experienced emotion" (Gross et al., 1997, p. 591).

The distinction between older adults' ability to experience emotion and the level of emotion they usually experience is salient, because – given that older adults are still capable of having strong emotions – the question becomes: what is the psychological mechanism that results in lowered emotional intensity. One hypothesis is the *environmental change/contextual interpretation* model; this view posits that as

adults age, they actually find themselves in fewer emotionally intense situations, for example, they have left the workplace, children have grown and left the house, etc. (Folkman, Lazarus, Pimley, & Novacek, 1987; Lubin, Zuckerman, Breytspraak, Bull, Gumbhir, & Rinck, 1988 cited in Diener et al., 1985). Another suggestion is a *maturational change/developmental interpretation*, which posits that it is simply the process of aging that results in differences in emotional intensity between younger and older adults – i.e. that it is the natural process of aging itself that results in these changes, and that older individuals are less likely to experience emotional intensity than younger individuals due to acclimation and adaptation (Folkman et al., 1987). A third hypothesis, as put forth by Gross et al. (1997), is that of *emotional control*; that as individuals age, they develop increasingly adept ways of managing their emotions.

Gross et al. (1997) found favourable evidence for the *emotional control* model over the other two conceptualisations. One of the cohorts which they examined was a large sample of 1,080 nuns, a sample not susceptible to the environmental changes such as retirement or grown children. However, the younger nuns in this study still demonstrated significantly higher emotional intensity than did older nuns, which provides evidence against the *environmental change/contextual interpretation*. Furthermore, the *maturational change/developmental interpretation* was called into question because if there was a biological mechanism which dampened the intensity of emotional experiences, then one would expect for this to lessen both positive and negative valences of emotion, however they found that though older individuals experienced significantly lower negative emotions, they also experienced significantly higher levels of happiness also.

Also supporting the *emotional control* theory is Gross et al. (1997)'s finding that increases in emotional experiences led to increases in emotional control, which

suggests that it is not, in fact, simply a decrease in emotional experiences in general that results in increased emotional control, but rather it is the practice in dealing with such experiences – as happens with age, and practice handling emotion-inducing situations – that results in an increased ability for an individual to manage and control their emotions. Given the analogous nature of emotional control and mindfulness, it was expected that because older adults demonstrate higher degrees of emotional control, they would also demonstrate higher levels of mindfulness.

Having established that emotional control is a key component in the decreased intensity of emotions experienced by older adults, it is important to consider the ways in which emotional control is similar to and different from mindfulness. Though they are discrete constructs and ought to be treated as such, mindfulness can be used as a form of emotional control, a usage that has often been associated with stress reduction and pain management (Grossman et al., 2004; Kabat-Zinn, Lipworth, & Burney, 1985). Furthermore, the nonreactivity component of emotional control is comparable to certain aspects of mindfulness (e.g. the *Nonreactivity to inner experience* facet of the FFMQ, and the *Decentering* factor of the TMS). However, there are aspects of mindfulness that differ from emotional control; emotional control is less process-oriented and more focussed on outcomes. Focus of attention and non-judgemental acceptance of emotions is central to mindfulness (Kabat-Zinn, 1994, cited in Baer, 2003), whereas emotional control is concerned less with the internal process that an individual goes through when experiencing an emotion and more concerned about how that emotion is expressed (or, as the case may be in terms of maintaining control, *not* expressed).

An individual's ability to demonstrate emotional control could, theoretically, be linked to an individual's ability to be mindful. Emotional control has been seen as

a correlate for reductions in negative affect and increases in positive affect, however the mechanism by which it functions remains unclear (Gross et al., 1997), and mindfulness provides one possible explanation for this mechanism. This relationship might be understood in light of Folkman et al. (1987)'s observation that "use of emotion-focused forms of coping such as distancing and positive reappraisal helped short circuit the stress process, so that incidents that might otherwise have been hassles were neutralized" (p. 182). Mindfulness can be seen as involving both distancing (via the component in which individuals recognize and acknowledge their thoughts and emotions, e.g. Kabat-Zinn, 1990) and also positive reappraisal (via non-judgment of negative emotions, e.g. Bishop et al., 2004). Therefore, given that young people are more emotionally reactive and expressive (Folkman et al., 1987), one might expect that younger individuals would exhibit lower levels of mindfulness than older adults, for whom emotional levelling is more common.

Savouring is another psychological construct from which comparisons to mindfulness may be drawn. Bryant and Veroff (2007) describe savouring as the way in which people "attend to, appreciate, and enhance the positive experiences in their lives" (p. 2). Savouring is another relatively new area of research, however preliminary age differences in individuals' ability to savour have been found. In particular, older adults were shown to report significantly higher levels of savouring in the areas of Anticipating, Savouring the Moment, and Reminiscing – three areas of past, present, and future-focussed savouring as measured on the Savouring Beliefs Inventory (Bryant, 2003). Most relevant to the comparison to mindfulness is Savouring the Moment, with items endorsed such as "I feel fully able to appreciate good things that happen to me," or a negatively scored "I can't seem to capture the joy of happy moments" (p. 181). The similarity between the constructs of Savouring

the Moment and mindfulness lies in the cultivation of attention necessary to appreciate the present moment – with present moment awareness being a central component of mindfulness (e.g. Hanh, 1976, cited in Brown & Ryan, 2003). Where savouring and mindfulness differ, however, is that savouring places a great deal of emphasis on the positive valence of the current moment and the cultivation of positive feelings, whereas mindfulness is more concerned with paying attention to whatever it is that is occurring in the present, whether it be enjoyable in nature or not. Still, in spite of the differences between the two constructs, older adults' greater tendency to savour the moment gives evidence to suggest that older adults will also demonstrate a greater incidence of mindfulness.

Perhaps the strongest research that has implications for how mindfulness may be manifested by different-aged individuals was conducted by Mogilner, Kamvar, and Aaker (2011), who undertook a self-report survey and found a positive relationship between age and participants' focus on the present. From this result, Mogilner et al. (2011) concluded that "As people get older, they became more present focused" (p. 399). Given that present-focussed attention is a central component to mindfulness (e.g. Kabat-Zinn, 1990; Hanh, 1976, in Brown & Ryan, 2003), it was expected that a similar pattern would occur with the present dataset; namely, that older participants would report higher levels of mindfulness than younger participants.

Therefore, because of older adults' greater tendency to savour the moment, control their emotions, and remain focussed on the present, it was expected that older adults would report the highest levels of mindfulness, with young adults showing the lowest levels of mindfulness, and middle-aged adults falling between the two groups.

Mindfulness and Gender

Our study was also interested in whether males and females report similar or different levels of mindfulness. As was the case with mindfulness and age, there has been little prior research conducted in this area. Therefore, psychological constructs related to mindfulness were examined in order to make predictions regarding how males and females may respond similarly or differently from each other on the TMS and the FFMQ, as well as how these differences may impact on an individual's reported levels of happiness and depression.

Though direct research on mindfulness and gender is scarce, there exists a great deal of previous research regarding gender differences in emotional intensity, with women generally being seen to experience both more positive and negative emotions (e.g. Diener, Sandvik, & Larsen, 1985). Similarly, there is considerable research suggesting that females report higher levels of psychological distress than males, and that this can manifest in higher levels of anxiety, stress, and depression (e.g. Mirowsky & Ross, 1995; Nolen-Hoeksema, 1987; Sowa & Lustman, 1984). There is some debate regarding whether this reflects a genuine difference in levels of distress or whether there is a response bias, in which women are more inclined to report the stress that they do experience (Nolen-Hoeksema, 1987). Mirowsky and Ross (1995) examined the potential mechanisms underpinning the gender difference in distress and ruled out the response-bias theory of the male/female distress discrepancy, concluding that there is a genuine difference in the level of distress experienced by men and women, with women both reporting and actually experiencing higher levels of distress than men. This higher level of distress has also been demonstrated physiologically via EMG reactions to negative emotional stimuli, giving further evidence that the difference in males' and females' levels of distress

exists beyond differences in levels of self-report disclosure (Grossman & Wood, 1993).

Though it is important to consider that men and women appear to experience different levels of distress, it is the ways in which males and females *respond* to their distress that this study is particularly interested in: this is what is most relevant in order to predict potential gender differences in reported levels of mindfulness. It has been suggested that the gender difference in distress is not inherent, but rather hinges upon gender differences in coping styles; that is, coping style may be mediating the relationship between life events and stress outcomes (Myers et al., 1984 in Ptacek, Smith, & Zanas, 1992; Solomon & Rothblum, 1986 in Ptacek, Smith & Zanas, 1992).

A meta-analysis, conducted by Tamres, Helgeson, and Janicki (2002), found that women used more coping strategies than men, across various behavioural domains, including both problem-focused and emotion-focused forms of coping. Tamres et al. (2002) also found indications that men may be more likely to engage in more avoidant or withdrawal styles of coping. Further research has also shown that women demonstrate lower levels of rational coping (a task-oriented or planning style of dealing with difficulties) and detachment coping (attempting to feel independent from one's emotional circumstances) than men (Elklit, 1996; Matud, 2004). Though it is not directly analogous, similarities can be drawn between emotion-focussed coping and mindfulness, in that mindfulness involves a component of recognizing the emotional component of a situation, and this has been linked to a reduction in negative affect (Creswell, Way, Eisenberger, & Lieberman, 2007). Futhermore, the greater incidence of coping strategies used by women increases the likelihood that women would engage in mindfulness-based strategies, whereas men may be more likely to dismiss the emotional experience they are undergoing, as opposed to using a

coping strategy such as mindfulness. Based on this research, it was tentatively predicted that mindfulness would be higher in women.

Previous research regarding gender differences in levels of savouring can also be utilised to make predictions as to gender differences that may be present in reported levels of mindfulness. Bryant (2003) found that women scored higher on all three subscales of the Savouring Beliefs Inventory. Additionally, when looking at the ways in which men and women respond differently to the Ways of Savouring Checklist, Bryant and Veroff (2007) found that men reported significantly greater use of Kill-Joy Thinking (e.g. "reminding oneself of other places one should be and other things one should be doing, thinking of ways in which the positive event could have been better," p. 97). Kill-Joy Thinking is a subset of savouring which is, in many ways, antithetical to Mindfulness. Kill-Joy Thinking involves mentally removing oneself from the present situation and considering the ways in which the current moment could have been different. Mindfulness, on the other hand, involves non-judgemental acceptance of the present moment. Therefore, because men report higher levels of Kill-Joy Thinking, it was predicted that they would also report lower levels of Mindfulness than women, who seem less inclined to negatively appraise their current environment in terms of how it could have been hypothetically improved.

Predictions

In light of the previous research described above, the following predictions were tested:

Psychometric Validity, Measure reliability, and Construct Validity

1) Based on previous research, it was predicted that the FFMQ would exhibit good model fit for the five factor structure stipulated by Baer et al. (2008). It was also predicted that the TMS would demonstrate good model fit for

the two factor structure proposed by Davis et al. (2009) (although no confirmatory factor analysis work has been performed on the TMS before).

2) It was predicted that the TMS and FFMQ would both exhibit factorial invariance across age and gender. Previous research conducted using a Swedish sample showed that the FFMQ was invariant across age and gender (Branstrom, Duncan, & Moskowitz, 2011), and it was expected that that result would be replicated here. Invariance has not been previously demonstrated for the TMS, however it was predicted that the TMS would evidence invariance across different ages and the two gender groups.

Mean group differences

3) Based on research concerning related constructs, such as emotional control and present-focussed attention differing across age groups (e.g. Mogilner et al., 2011; Diener et al., 1985), it was expected that older adults would report higher levels of mindfulness than middle-aged and younger adults, with middle-aged adults reporting higher levels of mindfulness than younger adults.

4) Based on previous research in analogous areas such as emotion-focussed coping and savouring (e.g. Tamres et al., 2002; Bryant, 2003), it was predicted that females would report higher levels of mindfulness than males.

Predictive Validity

5) Because of previous research that demonstrated a positive relationship between mindfulness and well-being (Grossman et al., 2004), it was expected that mindfulness would positively predict happiness.

6) Previous research also showed that mindfulness was able to reduce depression (Hofmann et al., 2010), therefore it was expected that mindfulness would negatively predict depression.
7) It was predicted that the TMS and FFMQ would both be positive predictors of happiness and negative predictors of depression over time.
8) It was predicted that age would significantly moderate the positive relationship between mindfulness and happiness (i.e. older individuals would evidence a stronger relationship), and significantly moderate the negative relationship between mindfulness and depression (i.e. older individuals would evidence a stronger relationship). Similarly, it was expected that females would manifest stronger relationships than males. This pattern was expected to be the same both at particular time points as well as longitudinally across time.
9) Explored whether age moderated the relationships between mindfulness (FFMQ and TMS) and the two outcome variables (happiness and depression) in a curvilinear fashion (i.e., quadratic moderation). It was expected that older individuals would demonstrate a stronger positive relationship between the FFMQ/TMS and happiness as well as a stronger negative relationship between the FFMQ/TMS and depression.

Research Questions

In addition to the planned analyses described above, several additional issues were explored:

1) Gender differences in happiness and depression: given previous research demonstrating that females exhibit stronger intensity of affect

(Diener et al., 1985) it was predicted that females would report higher levels of both happiness and depression than males.

2) Age differences in happiness and depression: Given previous research indicating that older individuals demonstrate greater emotional control (Gross et al., 1997) and more savouring (Bryant, 2003) it was predicted that older participants would report higher levels of happiness and lower levels of depression.

3) Compared the amount of shared and unique variance the FFMQ and TMS account for towards happiness and depression in order to determine which measure is better at predicting these constructs.

Method

Participants

Data were obtained from individuals across New Zealand who participated in the "New Zealand Happiness Study," a battery of measures assessing various psychological constructs within the area of positive psychology. The original sample was composed of 552 New Zealand residents; however, those participants who did not complete at least two thirds of questions at each of the three time points were removed from the dataset, leaving a total of 407 participants. In order to ascertain that there were no group differences present between the completers and non-completers of the study, a MANOVA was conducted in which the fixed variable was "retained" (a variable in which non-completers were coded "0," and completers were coded "1"), and happiness, depression, FFMQ mindfulness, and TMS mindfulness at Time 1 were entered as the dependent variables. No significant group differences were found, and

from this it can be concluded that no significant differences between completers and non-completers were present for this study.

The remaining group of 407 participants was comprised of 31% males and 69% females. Ethnically, 89% of the sample identified as Pakeha/European/New Zealander, 5% as Maori, 1% as Pacific Nations, 2.5% as Asian, and 9% as Other. Participants' age-range was from 16 to 80 years, and from this range, three broad demarcations of age were created: young adults were those individuals between ages 16-26 (which comprised 33.2% of the sample), middle-aged adults were defined as those between ages 26 and 47.5 (33.2% of the sample), and older adults as participants of ages 47.5 to 80 (33.7%). These age divisions were created in order to divide the sample into three approximately equal groups, so that more robust statistical analyses could be performed on the data. There was a reasonably even distribution of income level across participants: 30.3% reported earning between $0 to $25,000 annually, 16.5% said they earned between $25,000 and $50,000, 19.4% said they made between $50,000 and $75,000, 14.5% reported between $75,000 - $100,000, and 19.2% indicated that they earned above $100,000 per annum.

Design and Materials

The design used was a subject variable study. Of primary interest were the psychometric properties of the Toronto Mindfulness Scale and Five Facet Mindfulness Questionnaire, two prominent measures which both claim to assess trait mindfulness (TMS: Davis et al., 2009; FFMQ: Baer et al., 2008). In addition, statistical analyses were performed in order to investigate whether scores varied by gender and age over time. Two outcome measures were also used, one of which was designed to measure happiness (Subjective Happiness Scale, Lyubomirsky & Lepper,

1999) and another that measured depression (Beck Depression Inventory, Beck, Steer, & Brown, 1996). Each of these four scales is described below.

The Trait version of the Toronto Mindfulness Scale (TMS) was developed by Davis, Lau, and Cairns (2009). It is a 15-item scale that the authors believe can be divided into two factors: Curiosity (e.g. "I am curious to see what my mind is up to from moment to moment") and Decentering (e.g. "I am more invested in just watching my experiences as they arise, than in figuring out what they could mean"). Participants responded to the TMS using a 5-point Likert scale from 0 (not at all) to 4 (very much) (Davis et al., 2009). As described in the introduction to this thesis, Davis et al. (2009) found a high level of internal reliability for the trait version of the TMS. A high level of internal reliability was also found in the current study – the TMS demonstrated a high level of internal consistency for both subscales separately (Curiosity $\alpha = .91$, Decentering $\alpha = .87$) as well as the entire scale as a whole ($\alpha = .95$).

The Five Facet Mindfulness Questionnaire (FFMQ) by Baer, Smith, Lykins, Button, Krietemeyer, Sauer, Walsh, Duggan, and Williams (2008), was designed to capture five components of mindfulness: observing ("I notice the aromas of things"), describing ("I am good at finding words to describe my feelings"), acting with awareness ("I find myself doing things without paying attention" – reverse scored), nonjudging of inner experience ("I think some of my emotions are bad and or inappropriate and I should not feel them" – reverse scored), and nonreactivity to inner experience ("I perceive my feelings and emotions without having to react to them"). Items were answered on a 5-point Likert scale, ranging from 1 (very rarely or never true) to 5 (very often or always true) (Baer et al., 2008). Baer et al. (2008) found an acceptable level of internal reliability for the FFMQ and this was replicated in the current study: a high level of internal consistency was found for all five facets

separately (αs ranged from .90 to .94), as well as high internal consistency for the entire scale (α = .97).

The Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999) was designed to measure participants' general level of happiness. It is a four-item measure, with each item using a seven-point Likert scale to gauge the strength of agreement that the participant feels towards each item. The four questions vary in their approach towards assessing the individual's level of happiness. The first asked for a broad measure of the participant's happiness: "In general I consider myself: (1, not a very happy person to 7, a very happy person)," the second asked the individual to compare themself to others: "Compared to most of my peers, I consider myself (1, less happy to 7, more happy)," and the final two items asked how happy the participant considered themselves in a global, trait-like sense, irrespective of what is going on around them. In the present study, this scale yielded a high level of internal consistency, with a Cronbach's alpha of .96. Lyubomirsky and Lepper (1999) also reported a high level of reliability for this scale, finding a sufficient Cronbach's alpha across 14 different samples. Lyubomirsky and Lepper (1999) also found satisfactory convergent validity for the measure, with moderate correlations being found with other comparable measures, such as Diener, Emmons, Larsen, and Griffin's (1985) Satisfaction with Life scale (*r*s ranged from .61 to .69 in three studies) and Bradburn's (1969) Global Happiness Item (*r*s ranged from .57 to .69 in three studies) (Lyubomirsky & Tucker, 1998).

The Beck Depression Inventory, 2nd Edition (BDI-II; Beck, Steer, & Brown, 1996) is a commonly used screening measure for depression, as it covers an array of depressive symptoms, both emotional (e.g. guilt, disappointment in self, feelings of failure) and physiological (e.g. lack of energy, difficulty sleeping, altered appetite).

The BDI-II is a 21-item measure, with respondents rating their agreement to statements on a four-point Likert-scale from 0 – 3, with higher scores indicating a higher likelihood of depressive symptomology. Beck, Steer, and Brown (1996) found a high level of internal consistency for the scale in both a psychiatric outpatient sample ($\alpha = .92$) and a non-psychiatric sample of college students ($\alpha = .93$). In the current study, a similarly high level of internal consistency was also found for the BDI-II ($\alpha = .96$).

Procedure

A link to an online survey web-site (SurveyMonkey.com) was emailed to participants, and they were given a month to complete the survey. Every participant included in this study completed at least two-thirds of all three time points, each of which was separated by 3 months. Participants were recruited from across New Zealand in a variety of ways including letter drops, advertisement, and through clubs and workplaces. Participants were informed at the outset that they would be asked about their "feelings of happiness and unhappiness." They were also assured of confidentiality, and informed that the survey would take 40-50 minutes to complete. Participants received a $20 voucher at the completion of the study as incentive.

Results

Orientation to Results Section

Descriptive statistics were run in order to check for skewness and kurtosis, then model fit of the TMS and FFMQ was examined to test prediction 1 – that the TMS would exhibit good model fit for its two factor structure, and the FFMQ would exhibit good model fit for its five factor structure. Tests of factorial invariance of the TMS and FFMQ were then conducted in order to test prediction 2, that both measures

would exhibit factorial invariance across age and gender. Predictions 3 and 4 – that older adults would report higher levels of mindfulness, and that females would be more mindful than males – were then tested by conducting a repeated-measures MANOVA in order to look for the mean group differences described. Regressions were performed to test predictions 5 and 6: That the FFMQ and TMS would positively predict happiness and negatively predict depression. Regressions were also performed in order to test prediction 7: that the FFMQ and TMS would positively predict happiness and negatively predict depression over time. Prediction 8 – that age would significantly moderate the positive relationship between mindfulness and happiness and significantly moderate the negative relationship between mindfulness and depression – was then tested by performing moderation analyses to determine whether age or gender moderated the relationships between the mindfulness measures and depression/happiness. Quadratic moderations were also performed in order to look at prediction 9: whether older individuals would demonstrate a stronger relationship between the FFMQ/TMS and happiness and that older individuals would also report a stronger negative relationship between the FFMQ/TMS and depression as expected.

The exploratory research questions were then examined. MANOVAs were run to find out whether females reported higher levels of happiness and depression, as was predicted. Additionally, regressions were run to determine the amount of shared and unique variance of happiness and depression that the FFMQ and TMS each accounted for.

Psychometric Validity

Descriptive Statistics

Descriptive statistics were obtained for the data. Table 1 reports the means and standard deviations of all dependent variables at all three time points. In addition, Table 2 reports the correlations among variables averaged across time points.

Table 1
Means and Standard Deviations of Dependent Variables at Time1, Time 2, and Time 3

Dependent Variable	M	SD
FFMQ		
Time 1	3.38	.50
Time 2	3.36	.49
Time 3	3.40	.52
TMS		
Time 1	2.05	.65
Time 2	1.96	.74
Time 3	1.95	.72
Happiness		
Time 1	5.10	1.31
Time 2	5.10	1.24
Time 3	5.23	1.23
Depression		
Time 1	1.35	.40
Time 2	1.32	.37
Time 3	1.28	.32

Table 2
Correlation Matrix of Dependent Variables

	TMS	FFMQ	Hap	Dep
TMS		.341***	.185***	-.082
FFMQ			.558***	-.537***
Happiness				-.638***
Depression				

Significance level: * = .05
** = .01
*** = .001

Skewness and Kurtosis

No excessive skewness or kurtosis was found, which implies that the variables used here yielded normal distributions (Tabachnick & Fidell, 2001). Graphical depictions of skewness statistics can be seen in Appendix A. Table 3 demonstrates both the obtained and expected skewness and kurtosis, using the critieria outlined by Tabachnick and Fidell (2001).

Table 3
Skewness and Kurtosis of FFMQ and TMS at Time 1, Time 2, and Time 3

	Skewness expected	Skewness obtained	Kurtosis expected	Kurtosis Obtained
FFMQ Time 1	<.242	.062	<.482	.024
FFMQ Time 2	<.242	.053	<.482	.307
FFMQ Time 3	<.242	.053	<.482	.093
TMS Time 1	<.242	-.012	<.482	-.014
TMS Time 2	<.242	-.155	<.482	-.091
TMS Time 3	<.242	.062	<.482	.136

Measure Reliability and Construct Validity

Model Fit of the TMS and FFMQ

In order to test prediction 1, that the FFMQ would exhibit good model fit for the proposed five factor structure and the TMS would exhibit good model fit for the proposed two factor structure, model fit was examined using guidelines proposed by Kline (2005). The SEM programme AMOS was used to test the two factor and five factor models of the TMS and FFMQ, as proposed by Davis et al., (2009) and Baer et al. (2008) respectively. All questionnaire items were treated as singly loading items on their respective factors. The overall fit of the model for the TMS was not uniformly acceptable (see Table 4). Expected values were not obtained for the following criteria: Normed Fit Index (expected NFI: >.95, obtained: .87), Relative Fit

Index (expected RFI: >.95, obtained: .91), Root Mean Square Error of Approximation (expected RMSEA: <.07, obtained: .13) and the Hoelter value (expected: >200, obtained: 97).

The overall fit of the model for the FFMQ was found to be good (see Table X). This result indicated that the FFMQ yielded a good fitting model, which substantiated half of prediction 1 – that the FFMQ would demonstrate good model fit, but failed to support the prediction that the TMS, too, would evidence good model fit.

Table 4
Model Fit for TMS and FFMQ

Scale	RMR	GFI	NFI	RFI	IFI	RMSEA	Hoelter
TMS	.04	.95	.87	.91	.96	.13	97
FFMQ	.03	.95	.96	.98	.98	.06	235

Measurement Invariance

In order to test prediction 2 – that the TMS and FFMQ would both exhibit factorial invariance across age and gender – the measurement invariance of both measures was examined. This study sought to determine whether the factorial models of the FFMQ and the TMS would be equally valid for both males and females, as well as valid for all three age groups. In order to test for this, confirmatory factor analyses (CFA) were conducted, which determined whether or not the structures of the FFMQ and TMS were invariant across these demographic groups (Gregorich, 2006).

First, a baseline model was created, which was run on the overall sample. Second, an automated multiple-group approach was performed in AMOS (as specified by Byrne, 2010), which examined differences in coefficients between the stipulated groups. Constraints were placed both on the covariances between latent

constructs (to obtain configural invariance), and then on factor loadings from parcels to each latent construct (to obtain item-level metric invariance). Based on the work of Cheung and Rensvold (2002), the CFI model fit index was examined to see whether it had decreased by more than .01 after equality constraints were placed on the model – if it did, this would indicate that structural invariance had not been obtained for that model.

Factorial invariance was not found for the TMS when comparing young adults with middle adults at Time 1 (obtained CFI change = .018, p = .01), with middle-aged adults showing a stronger relationship in the covariance between curiosity and decentering than young adults (young adults β = .54; middle adults β = .63) (For results on all tests of invariances, please see Appendix B). Factorial invariance was also not obtained for the TMS at Time 1 when comparing young adults and older adults (obtained CFI change = .016, p = .05), with older adults showing a stronger covariance between curiosity and decentering than young adults (young adults β = .54; older adults β = .61). Factorial invariance for the TMS was also not obtained for Time 3 when comparing young adults with middle-aged adults (obtained CFI change = .012), however in a follow-up analysis, comparing the chi-square for the base model with that of the specific constrained covariance, the difference did not prove to be statistically significant (p = .371) in a chi-square difference test. This lack of convergence likely reflects the more stringent criteria when testing for invariance using an automated multiple-group approach, as opposed to a manual equality constraint multiple-group analysis. Furthermore, the analysis reflects a change in CFI of .012, which was only slightly larger than .01 in any case. Factorial invariance was also not obtained for TMS Time 3 when comparing young adults and older adults (obtained RFI change = .019, p = .003), with older adults showing a significantly

stronger covariance between curiosity and decentering than young adults (young adults β = .64; older adults β = .74).

The FFMQ did not obtain invariance at Time 1 when comparing young adults and older adults (expected: <.01, obtained: .0093, p = .03), with older adults manifesting a stronger covariance between nonreacting and describing than young adults (young adults β = .06; older adults β = .37). Here, a similar mixed result can be seen, as above, in that the obtained change in CFI was just slightly below the criteria set by Cheung and Rensvold (2002), yet it obtained significance by another set of criteria. Because of this, the result was considered to be of marginal significance, but worthy of report.

Except for those instances noted above, invariance was obtained for both measures at all time points for age and gender. It should be noted that the majority of non-invariances occurred for the TMS, suggesting that it may not be as invariant as the FFMQ. Therefore, the findings for factorial invariance for the FFMQ were consistent with what was expected for prediction 2, however the lack of consistent factorial invariance for the TMS was not as predicted.

Mean Group Differences

Predictions 3 (that older adults would report higher levels of mindfulness than middle-age and younger adults) and 4 (that females would report higher levels of mindfulness than males) were then tested by looking at mean group differences. To investigate whether scores for mindfulness (FFMQ and TMS), depression (BDI), and happiness (SHS) changed over the six months during which they were measured, or varied by person-level variables, a repeated-measures MANOVA was conducted with gender and age as the fixed factors, income status as the covariate, and time as the

repeated measure factor, with three levels represented by the three times points at which data were collected.

Covariate

The covariate – income – was significant, Wilk's $\lambda = .97$, $F(4, 396) = 2.96$, $p = .02$, partial $\eta^2 = .03$. This result indicated that household income level was associated with participants' responses to the four variables of interest. In order to find out which variables were being impacted by income level, a Pearson's correlation was performed between income and all other variables individually, with the following findings: a significant, positive correlation with age ($r = .42$, $p < .001$), mindfulness as measured by the FFMQ ($r = .19$, $p < .001$), and happiness ($r = .19$, $p < .001$). Income level also yielded a significant negative correlation to depression ($r = -.27$, $p < .01$). No prediction was made for income, however it was included as a covariate in order to remove its effect on the sample.

Multivariate Effects

A multivariate main effect was found for time, Wilk's $\lambda = .94$, $F(8, 392) = 2.90$, $p < .01$, partial $\eta^2 = .06$, gender, Wilk's $\lambda = .96$, $F(4, 396) = 4.12$, $p < .01$, partial $\eta^2 = .04$, and for age: Wilk's $\lambda = .86$, $F(8, 792) = 7.96$, $p < .01$, partial $\eta^2 = .07$.

Univariate Effects

Time: A univariate effect of time on depression was found, $F(2, 798) = 5.45$, $p = .01$, partial $\eta^2 = .01$. This relationship proved to be linear, with respondents' scores of depression decreasing at each time point (see Table 5). In this context, no prediction was made for time.

A univariate effect for time on the FFMQ was also obtained, $F(2, 798) = 2.93$, $p = .05$, partial $\eta^2 = .01$. The FFMQ manifested a quadratic relationship with time, with scores for Time 1 and Time 3 higher than Time 2 (see Table 5).

Table 5
Significant Univariate Effects for Time

Dependent variable	M	SD
Depression		
T1	1.35	.40
T2	1.32	.37
T3	1.28	.32
FFMQ		
T1	3.38	.50
T2	3.36	.49
T3	3.40	.52

Age: Prediction 3 – that age would have a significant univariate effect for mindfulness on the FFMQ – was supported by the data, $F(2, 399) = 25.11$, $p = .001$, partial $\eta^2 = .11$, with scores increasing with age (see Table 5). However, no significant univariate effect for age was found for mindfulness on the TMS, which was not as predicted, $F(2, 399) = .12$, $p = .89$, partial $\eta^2 = .001$.

Here, research question 2 was also examined: that older individuals would report higher levels of happiness and lower levels of depression. This research question was supported, and a univariate effect of age was also found for happiness: $F(2, 399) = 15.49$, $p = .001$, partial $\eta^2 = .07$, with scores increasing with age. Furthermore, a significant univariate effect was also found for depression, $F(2, 399) = 9.73$, $p = .001$, partial $\eta^2 = .05$, with scores decreasing with age, as was hypothesised in the research questions (see Table 6 for means and standard deviations).

Table 6
Significant Univariate Effects for Age

Dependent Variable	M	SD
FFMQ		
Young Adults	3.14	.44
Middle Adults	3.37	.50
Older Adults	3.58	.46
Happiness		
Young Adults	4.69	1.30
Middle Adults	5.04	1.21
Older Adults	5.56	1.11
Depression		
Young Adults	1.41	.44
Middle Adults	1.32	.33
Older Adults	1.22	.25

Gender: As anticipated by prediction 4, a significant univariate effect was obtained for gender on the FFMQ, $F(1, 399) = 4.46$, $p = .04$, partial $\eta^2 = .01$, with females reporting significantly higher levels of mindfulness than males as expected (see Table 7). However, there was no significant effect for gender on the TMS measure of mindfulness, which was not as predicted: $F(1, 399) = .50$, $p = .48$, partial $\eta^2 = .001$.

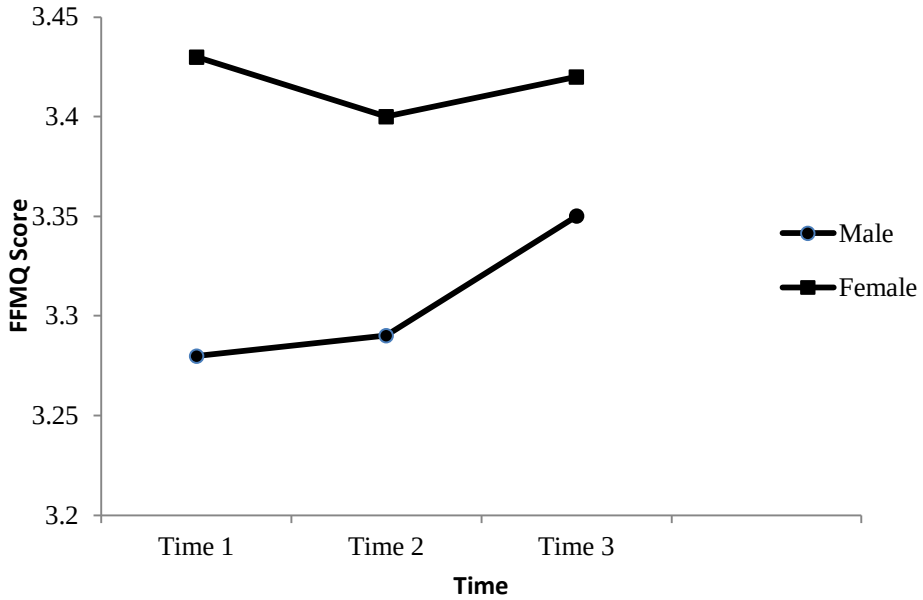
Research question 1 anticipated that females would report higher levels of happiness and lower levels of depression than males. This expectation was partially supported, as a significant univariate effect for happiness and gender was found, in which females reported higher levels of happiness than males, $F(1, 399) = 4.61$, $p = .03$, partial $\eta^2 = .01$ (see Table 7). No significant univariate effect was found for gender and depression, however, which was not as predicted by research question 1.

Table 7
Significant Univariate Effects for Gender

Dependent Variable	M	SD
FFMQ		
Males	3.31	.49
Females	3.41	.51
Happiness		
Males	4.80	1.34
Females	5.22	1.21

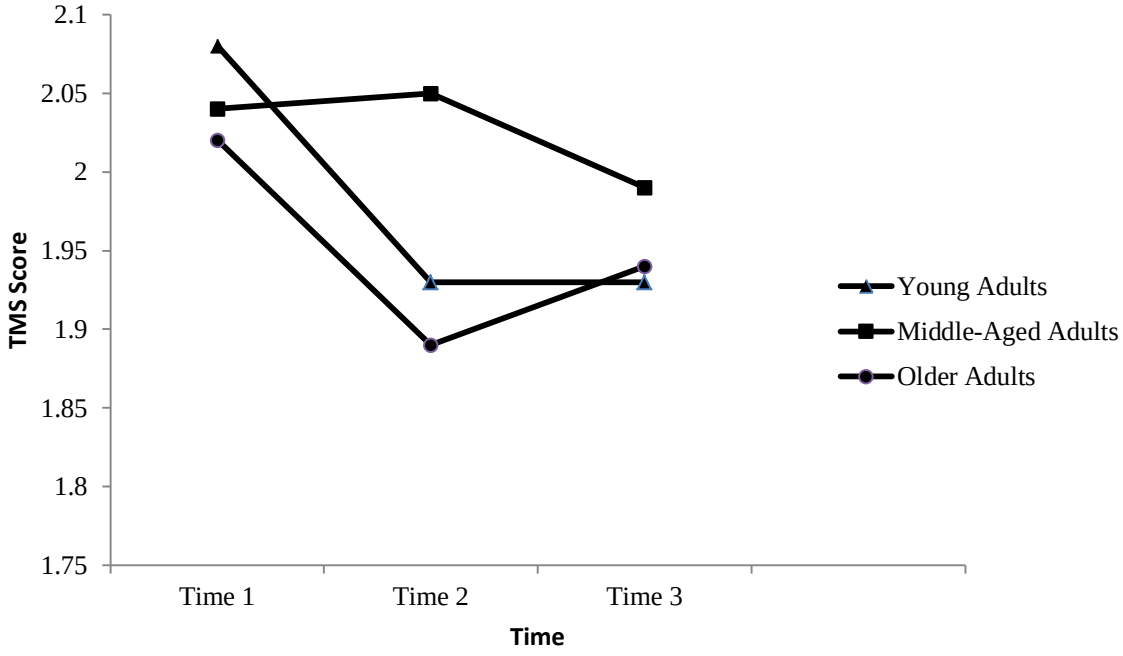
Interactions: Exploratory examinations of the mindfulness measures (TMS and FFMQ), outcome variables (happiness and depression) and demographic variables (age and gender) were also conducted, so as to determine the ways in which these variables were related to each other. Two significant results were found, as described below. A significant interaction was obtained for gender by time on the FFMQ, $F(1, 798) = 6.91$, $p = .01$, partial $\eta^2 = .02$ (See figure 1). Females' scores were significantly higher and more stable across time than males. In contrast, males' reported levels of mindfulness increased over the three time points.

Figure 1: Interaction of Gender by Time on FFMQ scores



A significant interaction was also found for age by time on TMS scores, $F(2, 798) = 5.09$, $p = .01$, partial $\eta^2 = .025$ (see Figure 2). Here, middle-aged adults exhibited a more stable (over time) and higher level of mindfulness as measured by the TMS compared to younger and older adults.

Figure 2: Interaction of Time by Age for TMS scores



Predictive Validity of Mindfulness Measures

Regression analyses were then performed to determine whether the mindfulness measures would predict the outcome measures as expected – both at a single time point and also over time.

Concurrent and Predictive Validity

Regression analyses were conducted to test predictions 5 through 8: that the two mindfulness measures used (FFMQ and TMS) would be significant positive predictors of happiness (SHS) and significant negative predictors for depression (BDI).

The FFMQ and TMS were centred, in order to aid the graphing of the result and avoid multicollinearity (Aiken & West, 1991), and gender was dummy coded, because it is a categorical variable, before analyses were performed. The first set of regressions looked at the amount of unique versus shared variance of the FFMQ and TMS (research question 3) and the degree to which they were predictive of happiness and depression at each individual time point (in order to satisfy predictions 5 and 6). The second set of regressions was performed across time, in order to determine whether the FFMQ and TMS at Time 1 were predictive of depression and happiness longitudinally at Times 2 and 3, as was expected by prediction 7. The third set of regressions looked to determine whether age and gender moderated the relationship between the FFMQ/TMS and happiness/depression at each of the three time points, as was expected by prediction 8.

Do Measures of Mindfulness Predict Happiness and Depression?

Predictions 5 and 6 stipulated that the FFMQ and TMS would positively predict happiness and negatively predict depression. As anticipated, for the concurrent analyses the FFMQ was a significant positive predictor of happiness at all three time points and a significant negative predictor of depression at all three time points (see Tables 8 and 9), which supported predictions 5 and 6 for the FFMQ. The TMS was a significant predictor of depression at Time 2 and a marginally significant predictor of depression at Times 1 and 3, however the relationship found was positive. This result was not as predicted; we expected that if any relationship between the TMS and depression were to exist, that it would be negative. In addition, the TMS was not a significant predictor of happiness at any of the three time points. Therefore, predictions 5 and 6 were supported for the FFMQ, but not for the TMS. This result

suggests that the FFMQ is a better predictive measure of happiness and depression than the TMS.

Shared versus Unique Variance

Research question 3 was interested in the unique and shared variance of the TMS and FFMQ, in order to determine which of these measures was better at predicting the outcome variables of happiness and depression. In order to determine the relative predictive powers of the TMS and FFMQ, separate regressions were run with happiness and depression as the dependent variables. For example, for happiness, the FFMQ was entered as the first predictor, then the TMS as the second predictor, then for a separate regression this order was reversed. The purpose of these two regressions was to determine the amount of unique and shared variance predicted by these two mindfulness measures in the two mood outcomes.

When comparing the amounts of unique and shared variance of the FFMQ and TMS on happiness and depression across all time points, the FFMQ was found to explain far more unique variance in these outcome variables than the TMS (see Tables 8 and 9). Thus, in answer to research question three, these findings give robust evidence that the FFMQ is a better predictor of happiness and depression than the TMS.

Table 8
Regression of Happiness by TMS and FFMQ, Times 1, 2, and 3

Mindfulness measure	*β*	*p*	Unique Variance	Shared Variance
FFMQ T1	.545	.001	.268	.031
TMS T1	.006	.900	.0000274	.031
FFMQ T2	.511	.001	.234	.031
TMS T2	.014	.752	.001	.031
FFMQ T3	.531	.001	.252	.034
TMS T3	.017	.696	.002	.034

Table 9
Regression of Depression by TMS and FFMQ, Times 1, 2, and 3

Mindfulness measure	*β*	*p*	Unique Variance	Shared Variance
FFMQ T1	-.562	.001	.285	.003
TMS T1	.082	.063	.006	.003
FFMQ T2	-.501	.001	.225	-.004
TMS T2	.095	.041	.008	-.004
FFMQ T3	-.491	.001	.216	-.003
TMS T3	.090	.053	.008	-.003

Longitudinal Predictors of Depression and Happiness

Further regressions were then run to test prediction 7: that the FFMQ and TMS would be positive predictors of happiness across time and negative predictors of depression across time. The FFMQ at Time 1 did prove to be a marginally significant predictor of happiness at Time 2, $\beta = .405$, $p = .061$, as well as a significant predictor of happiness at Time 3, $\beta = .511$, $p = .015$. A marginally significant negative relationship was found between the FFMQ at Time 1 and depression at Time 3, $\beta = -.079$, $p = .097$. In all other analyses, no significant relationships were found. Therefore, the FFMQ mostly behaved as predicted (with the exception of not showing a significant negative relationship between FFMQ Time 1 and Depression Time 2), however the TMS did not. Taken in tandem with the regressions performed at individual time points, it is clear that the FFMQ shows better predictive validity than the TMS, both concurrently and longitudinally. As well, the FFMQ explains a higher degree of unique variance on the outcome measures than does the TMS.

Moderations of the Mindfulness to Mood Outcome Relationships

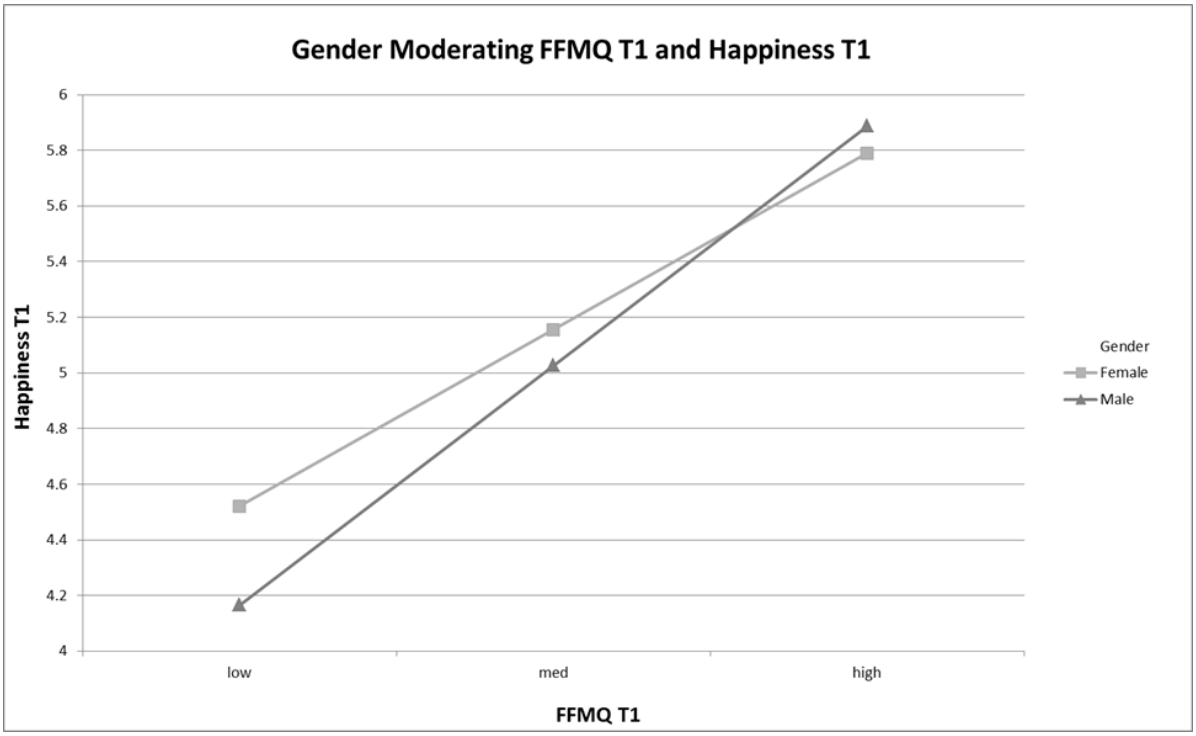
Initially, relationships were examined within each of time points 1, 2, and 3, in order to test prediction 8: whether age and gender moderated the relationships between the mindfulness measures and depression/ happiness. It was predicted that age would significantly moderate the positive relationship between mindfulness and happiness (i.e. older individuals would evidence a stronger relationship) and significantly moderate the negative relationship between mindfulness and depression (again, that older individuals would evidence a stronger relationship). Similarly, it was expected that females would manifest stronger relationships than males. This pattern of moderation was expected to occur both within times 1, 2, and 3, and also across time.

Moderations at Time 1

It was found that gender marginally significantly moderated the relationship between the FFMQ and happiness, β = -.456, p = .054 (see Figure 3), with males demonstrating a slightly stronger relationship between FFMQ and happiness than females, which was not as predicted. Here, it can be seen that although gender significantly moderated the positive relationship between the FFMQ Time 1 and Happiness Time 1, males yielded a steeper slope than females. This result implies that males evidenced a stronger relationship between mindfulness and happiness than females. It should, however, be noted that this moderational relationship was only marginally significant; noteworthy, but not strong (see table 10 for simple slopes, standard error, and t-values).

Table 10
Gender Moderating FFMQ T1 and Happiness T1

Gender	Simple Slope	Standard Error	t-value	p-value
Male	1.73	.195	8.875	<.001
Female	1.274	.134	9.496	<.001

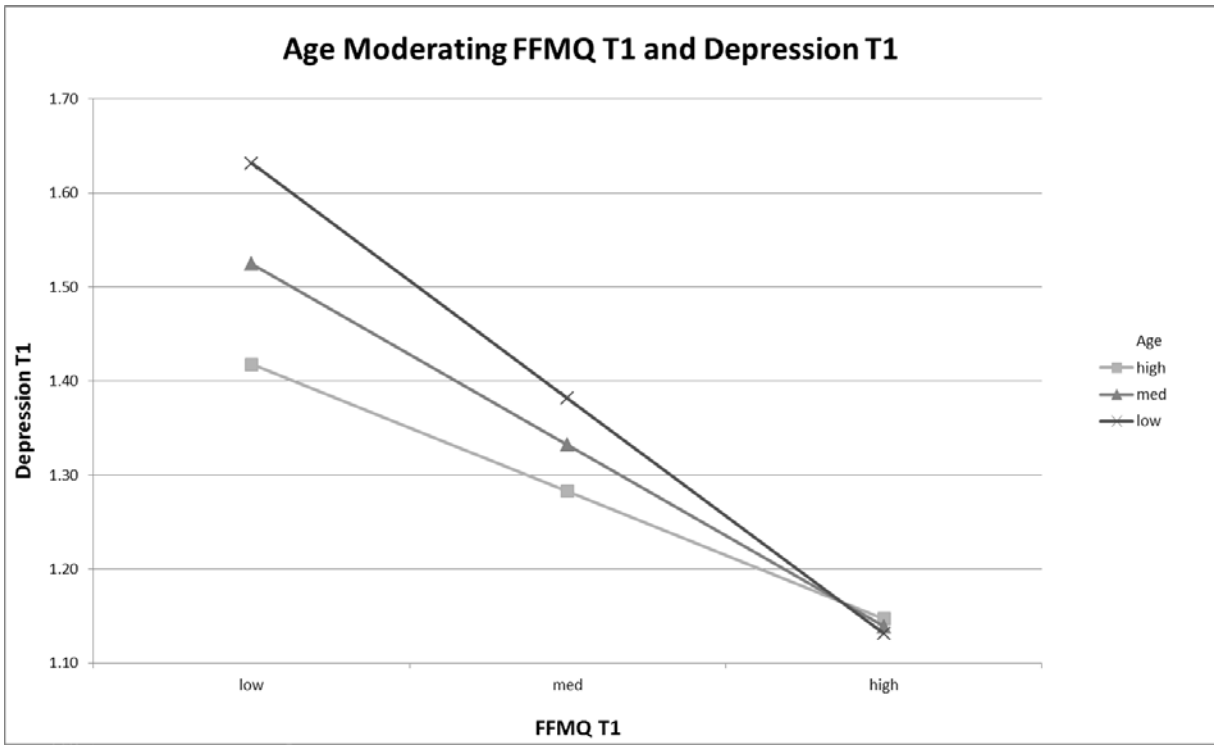


It was also found that age significantly moderated the negative relationship between the FFMQ and depression: $\beta = .136$, $p = .001$ (see figure 4), but the pattern was not as predicted. All three age levels were found to be significant moderators between the FFMQ Time 1 and Depression Time 1, but it was found that young adults exhibited the strongest moderating relationship between the FFMQ Time 1 and Depression Time 1, middle adults showed a lower level of moderation, and older adults showed the lowest level of significant moderation out of the three age groups (see table 11). This implies that for young adults, levels of mindfulness – as measured by the FFMQ – are more strongly negatively related to depression than for older individuals, which was not anticipated by prediction 8.

Table 11
Age Moderating FFMQ T1 and Depression T1

Age	Simple Slope	Standard Error	t-value	p-value
Older Adults	.502	.050	10.108	<.001
Middle Adults	.387	.032	12.223	<.001
Younger Adults	.272	.047	5.761	<.001

Figure 4: Age Moderating FFMQ Time 1 and Depression Time 1



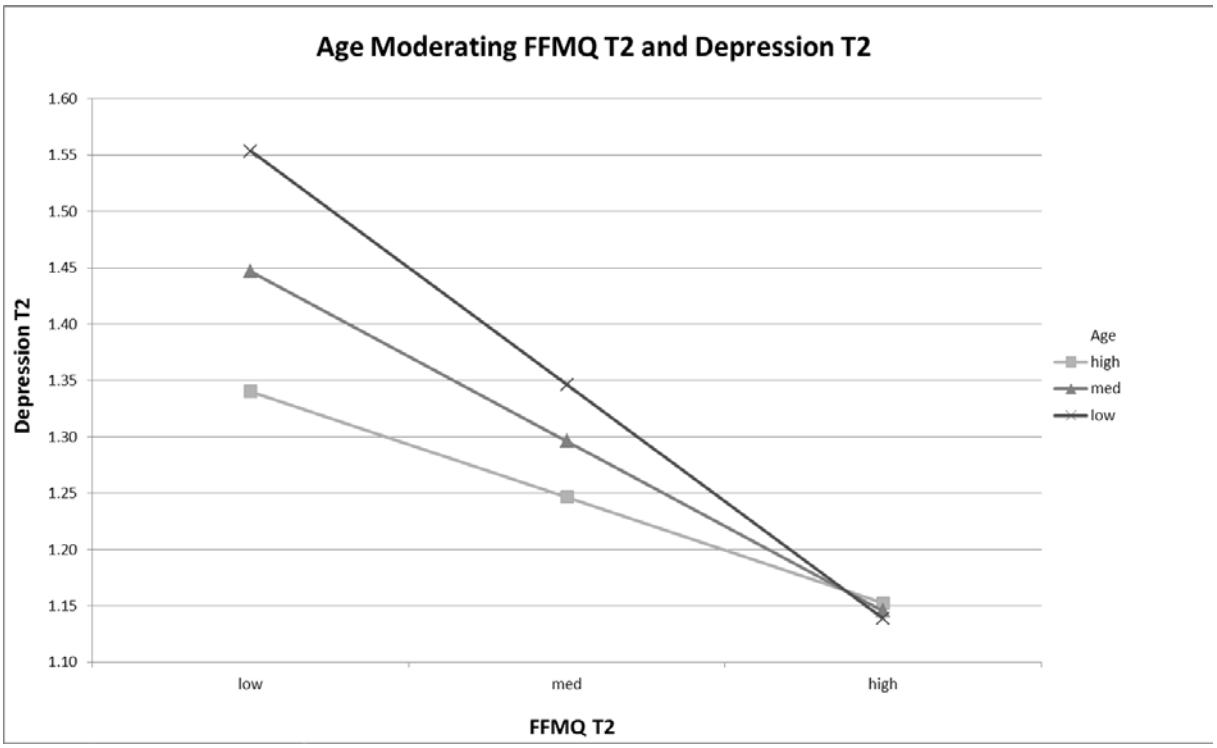
Moderations at Time 2

Age was found to be a significant moderator in the negative relationship between FFMQ at Time 2 and Depression at Time 2, $\beta = .142$, $p = .001$ (see Figure 5). As at Time 1, young adults showed the strongest relationship, and older adults demonstrated the weakest relationship (see Table 12). As with the moderations at Time 1, this pattern was the opposite result of what was expected.

Table 12
Age Moderating FFMQ T2 and Depression T2

Age	Simple Slope	Standard Error	t-value	p-value
Older Adults	-.191	.050	-3.840	<.001
Middle Adults	-.306	.032	-9.692	<.001
Younger Adults	-.421	.046	-9.094	<.001

Figure 5: Age Moderating FFMQ Time 2 and Depression Time 2



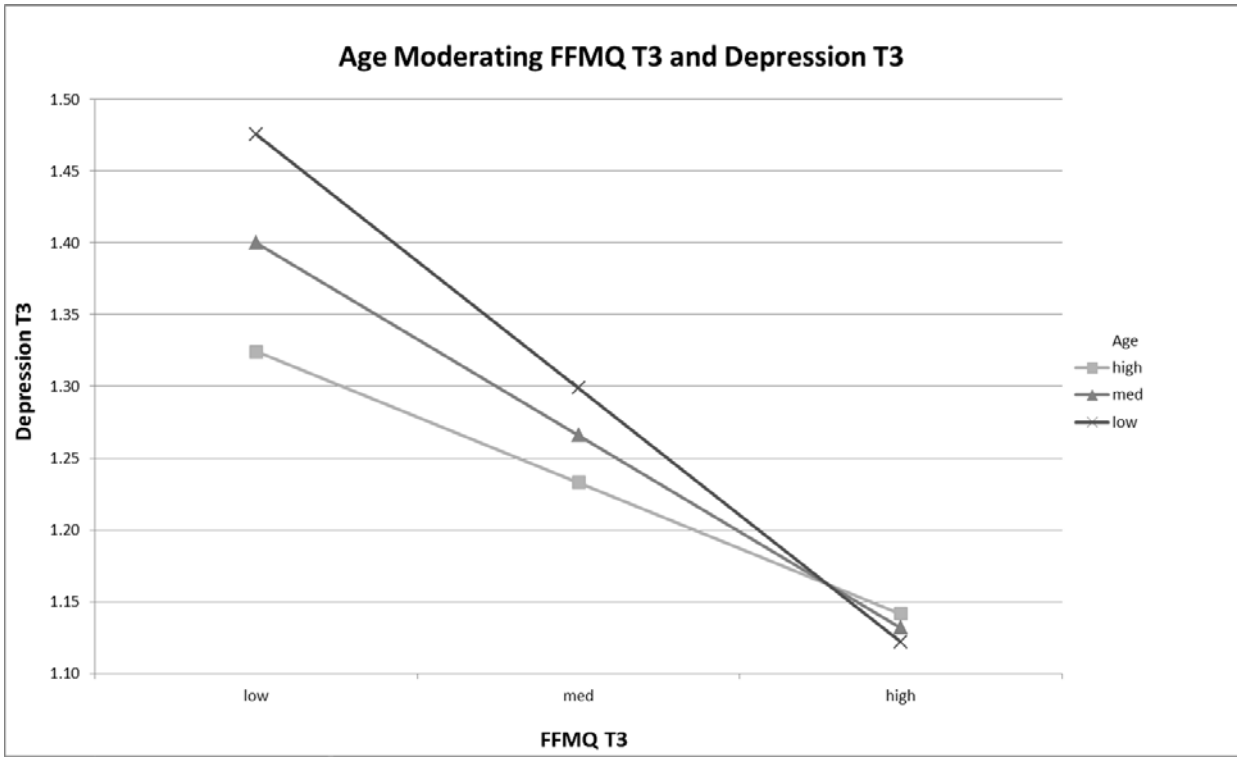
Moderations at Time 3

Age also significantly moderated the negative relationship between FFMQ at T3 and Depression at T3: $\beta = .116$, $p = .009$ (see Figure 6). The same pattern occurred at Time 3 as it did at Time 1 and Time 2 – younger adults yielded the strongest relationship between FFMQ T3 and Depression T3 (see Table 13). Again, this was the opposite of what was predicted.

Table 13
Age Moderating FFMQ T3 and Depression T3

Age	Simple Slope	Standard Error	t-value	p-value
Older Adults	-.176	.045	-3.884	<.001
Middle Adults	-.258	.032	-8.168	<.001
Younger Adults	-.340	.042	-8.079	<.001

Figure 6: Age Moderating FFMQ Time 3 and Depression Time 3



Moderations Across Time

The second component of prediction 8 was then tested: it was predicted that age would moderate the positive longitudinal relationship between the FFMQ/TMS and happiness and the negative longitudinal relationship between the FFMQ/TMS and depression, with older adults evidencing a stronger relationship in both instances. It was also predicted that females would demonstrate a stronger association than males

when looking at these relationships across gender. In order to test this prediction, sixteen separate regressions were performed (2x2x2x2). These regressions reflected the two main effects (FFMQ or TMS), two moderators (age or gender), two outcome variables (depression or happiness), and two time periods (Time 1 predicting Time 2 or Time 1 and Time 2 run together predicting Time 3). In each regression, the mindfulness measure served as the main effect, age or gender was the moderator, and depression or happiness was the dependent variable over time. The regressions were set up by dummy-coding gender (0 = males, 1 = females) and centring age and the main effects before creating the interaction terms. The regressions were run hierarchically, with residualisation of the dependent variable on the first step, the main effects on the second step, and the interaction term on the third step. In the instance of Time 1 and Time 2 predicting Time 3, a fourth step was also included which involved the Time 2 main effect and interaction term. These regressions were conducted in order to determine whether the relationship between the main effect and dependent variable was moderated by age and gender across time points. Two significant moderation effects were found across all time points.

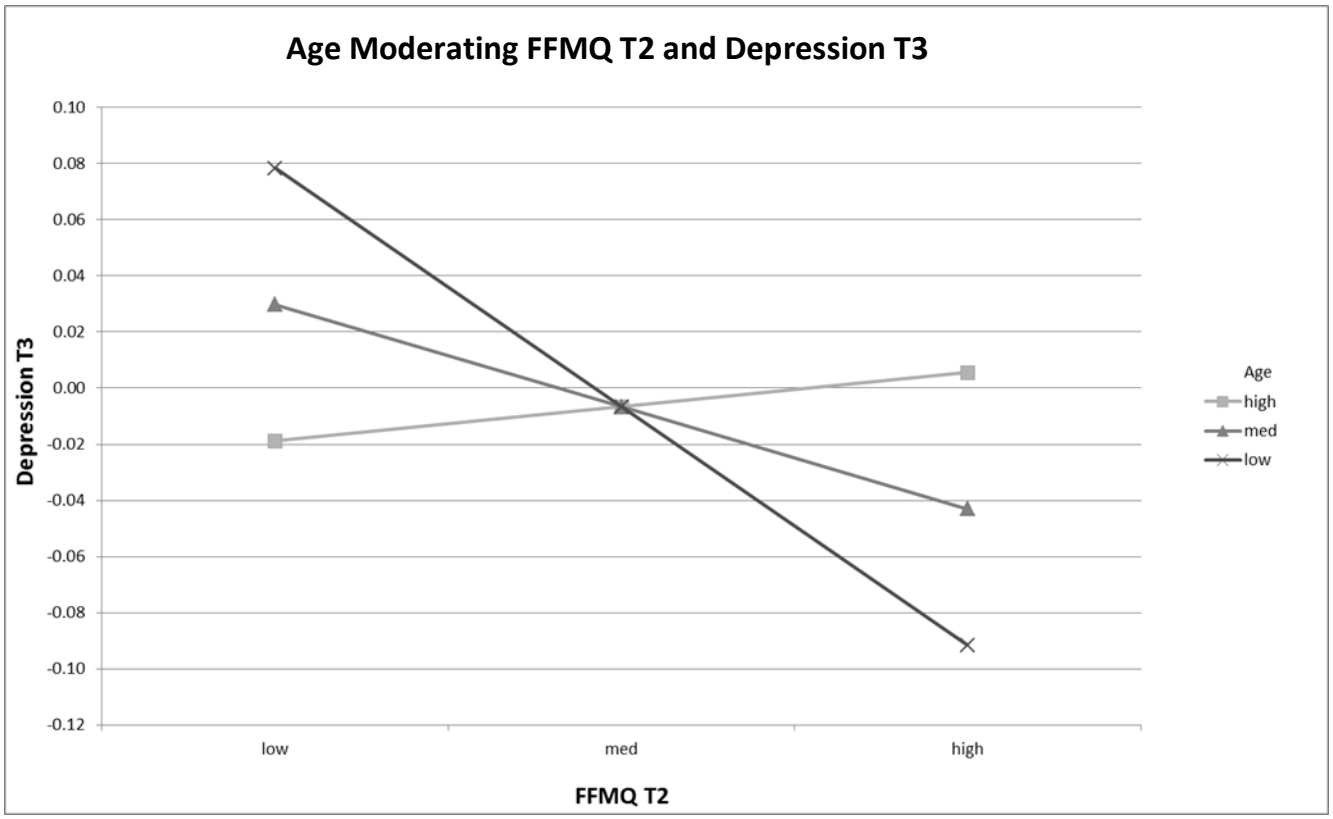
Age was found to significantly moderate the residualised relationship between the FFMQ at Time 2 and Depression at Time 3, $\beta = .132$, $p = .026$ (see Figure 7). Here, only younger adults obtained a significant simple slope in the negative relationship between the FFMQ at Time 2 and Depression at Time 3, whereas the simple slope for middle-aged adults was marginally significant, and the slope for older adults was non-significant (see Table 14). This result was not as predicted, and indicates that the relationship between high scores on the FFMQ at Time 2 and lowered scores for depression at Time 3 was particularly strong for younger adults, though marginally significant for middle-aged adults also. Therefore, the prediction

that older adults would show the strongest relationship across time on these two variables was not supported.

Table 14
Age Moderating the FFMQ at T2 to Depression at T3

Age	Simple Slope	Standard Error	t-value	p-value
Younger Adults	-.173	.058	-2.980	.003
Middle Adults	-.074	.045	-1.657	.098
Older Adults	.025	.066	.376	.707

Figure 7: Age Moderating FFMQ Time 2 and Depression Time 3



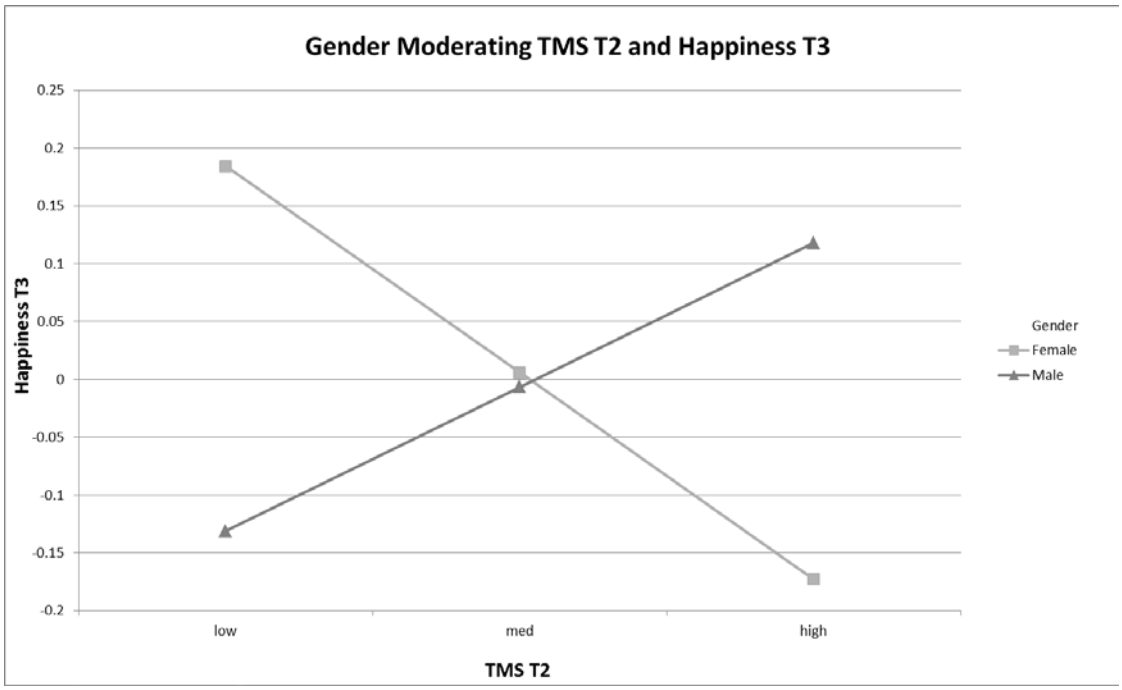
In addition to the above result, gender was found to be a significant moderator in the relationship between TMS at Time 2 and Happiness at Time 3, β = -.198, p = .01 (see Figure 8). Here, females yielded a significant simple slope, moderating the negative relationship between the TMS at Time 2 and Happiness at Time 3 and males

did not yield a significant simple slope (see Table 15). Although the stronger relationship for females was predicted, the negative direction of the relationship between TMS at Time 2 and Happiness at Time 3 was the opposite of that which was expected; it implies that for females, a higher score on the TMS at Time 2 was predictive of lower reported happiness at Time 3, whereas a significant positive relationship (or no relationship at all) is what would have been expected. This finding casts further doubt as to the validity of the TMS, one would expect that an increased score would result in an increase in reported happiness, and since this was not the case, this result is incongruent with expectations.

Table 15
Gender Moderating the TMS at T2 to Happiness at T3

Gender	Simple Slope	Standard Error	t-value	p-value
Male	.169	.105	1.611	.108
Female	-.242	.063	-3.826	<.001

Figure 8: Gender Moderating TMS Time 2 and Happiness Time 3



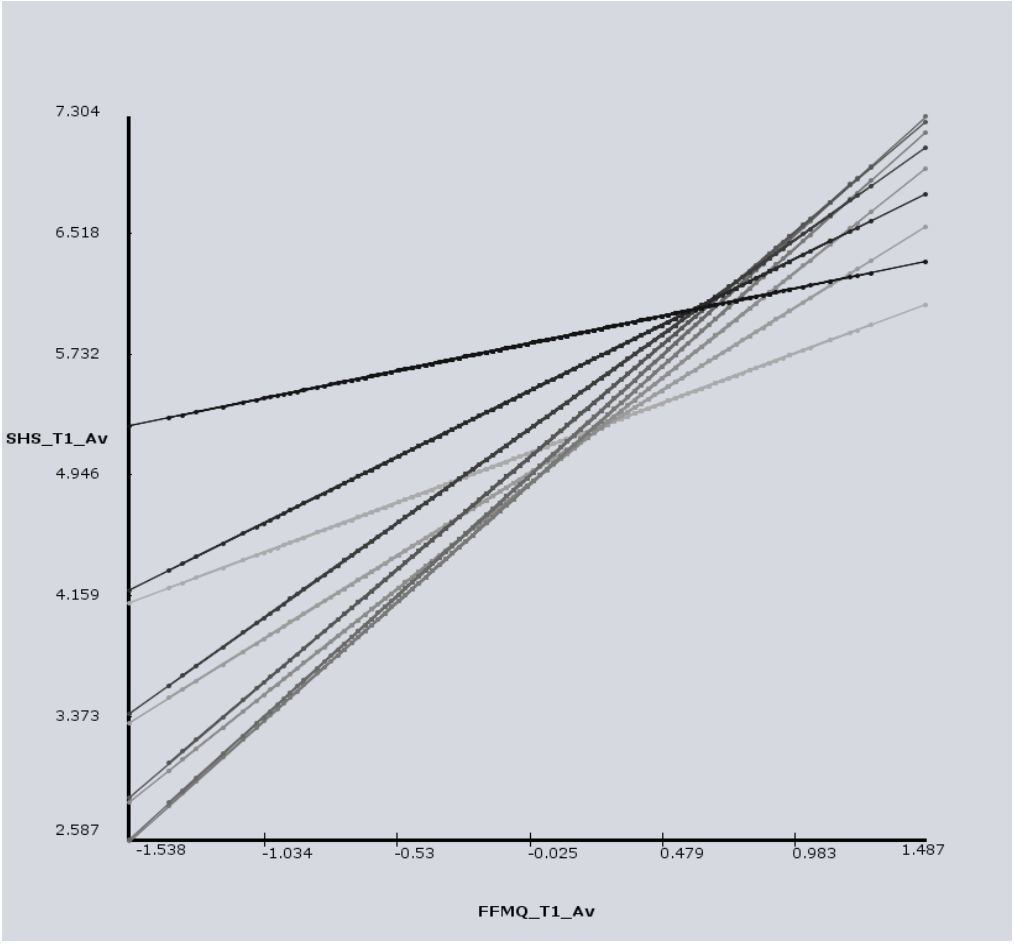
Quadratic Moderation: Does Mindfulness Moderate the Relationship Between Age and Happiness?

Prediction 9 examined whether age would quadratically moderate the TMS and FFMQ on happiness and depression. It was predicted that older adults would demonstrate a stronger positive relationship between the FFMQ/TMS and happiness, and that older individuals would report a stronger negative relationship between the FFMQ/TMS and depression. In order to test this prediction, a regression was conducted where mindfulness (FFMQ and TMS separately) was the predictor variable, age was the moderator variable, and happiness was the outcome. The first step in data preparation was to centre the predictor variables (FFMQ/TMS and age). After this was done, various terms were created by multiplying constituent elements. The quadratic polynomial for age was created by multiplying the trichotomised age variable by itself (age^2). A hierarchical regression was performed in which the following terms were entered in these steps: 1) main effect of mindfulness measure (TMS or FFMQ), 2) main effect of demographic (age), 3) interaction term – product of steps one and two, 4) quadratic term of demographic variable – age squared, 5) mindfulness measure multiplied by quadratic term. In all hierarchical regressions conducted, the dependent variable was either happiness or depression at the same time point as the mindfulness measure entered.

For the quadratic analysis on age, FFMQ at Time 1, and happiness at Time 1, a main effect was found for both the FFMQ at Time 1 (β = -.536, p = <.001) and age (β = .149, p = .001). A significant effect was also found for the quadratic term of the moderator. Additionally, a marginally significant quadratic relationship was found between age and FFMQ Time 1 predicting happiness Time 1 (β = -.126, p = .061). This quadratic relationship was graphed using M&M (Jose, 2012) and the pattern is

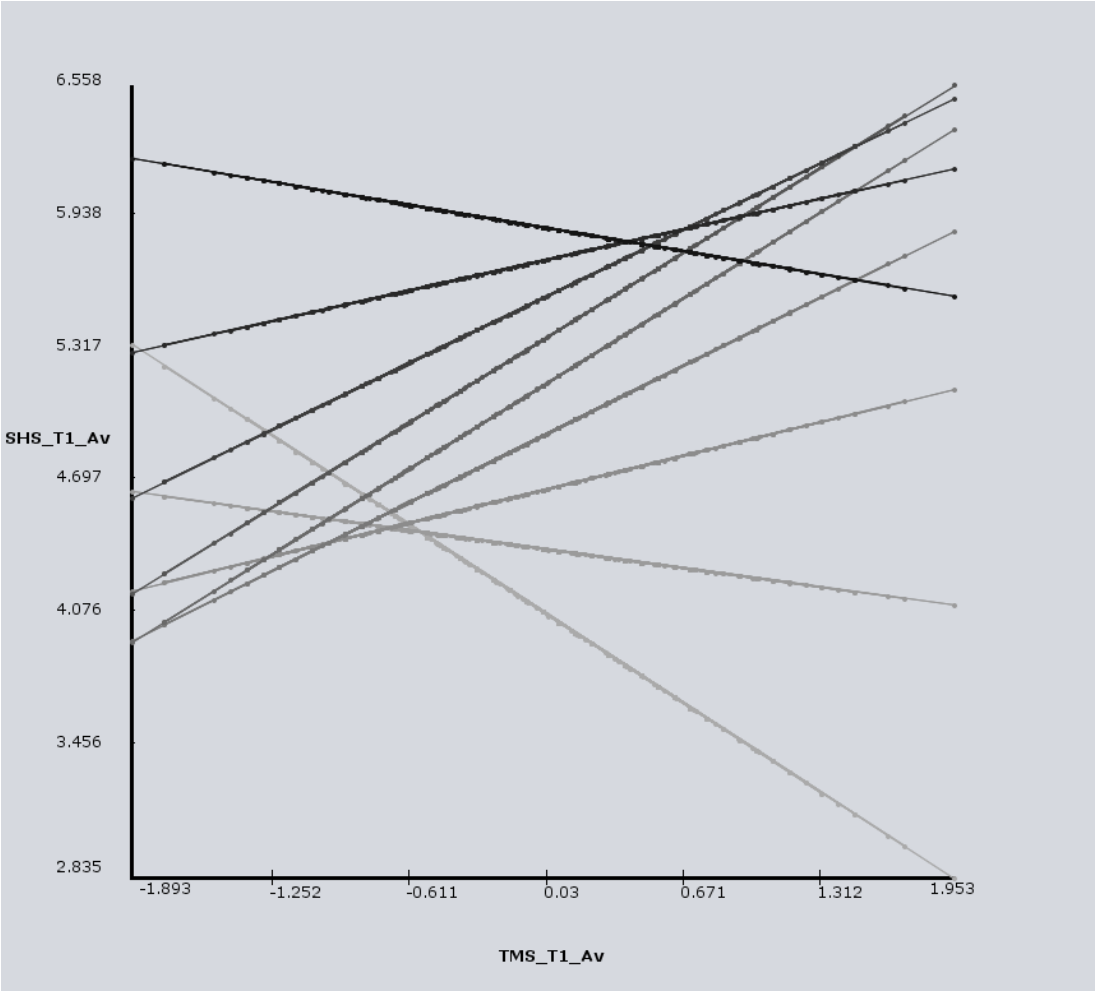
presented in Figure 9. Here, the lightest line represents younger adults, with darker line colour signifying older age. The graphical depiction of the quadratic relationship shows that middle-aged adults demonstrate the strongest positive relationship between happiness and FFMQ mindfulness, with younger adults showing a weaker relationship between happiness and mindfulness and older adults showing a similar weak relationship. This result implies the mindfulness to happiness relationship is particularly strong for middle-aged adults, compared to younger or older adults, where it was found to be weaker, which was not as predicted.

Figure 9: Quadratic Moderation of FFMQ Time 1 and Happiness Time 1 by Age



For the quadratic analysis on age, TMS at Time 1, and happiness at Time 1, a significant main effect was found for the TMS Time 1 (β = .176, p = <.001) and age (β = .342, p = <.001). A significant quadratic relationship was also found for the TMS at Time 1, and age negatively predicting happiness Time 1, β = -.168, p = .035 (see Figure 10). This negative relationship is the opposite of what was expected, which was that the TMS would predict happiness in a positive direction. The graphical depiction of the quadratic moderation shows in greater detail what is occurring: Here, we can see that younger and older adults yield a negative relationship between TMS mindfulness and happiness, with younger adults showing a stronger negative relationship than older adults, who are also demonstrating higher levels of overall happiness. Meanwhile, middle adults demonstrated a positive relationship between happiness and TMS mindfulness. Though middle-aged adults demonstrated the positive relationship that would be expected to be found between mindfulness and happiness, the relationship demonstrated by younger adults and older adults is in the opposite direction from what would be expected.

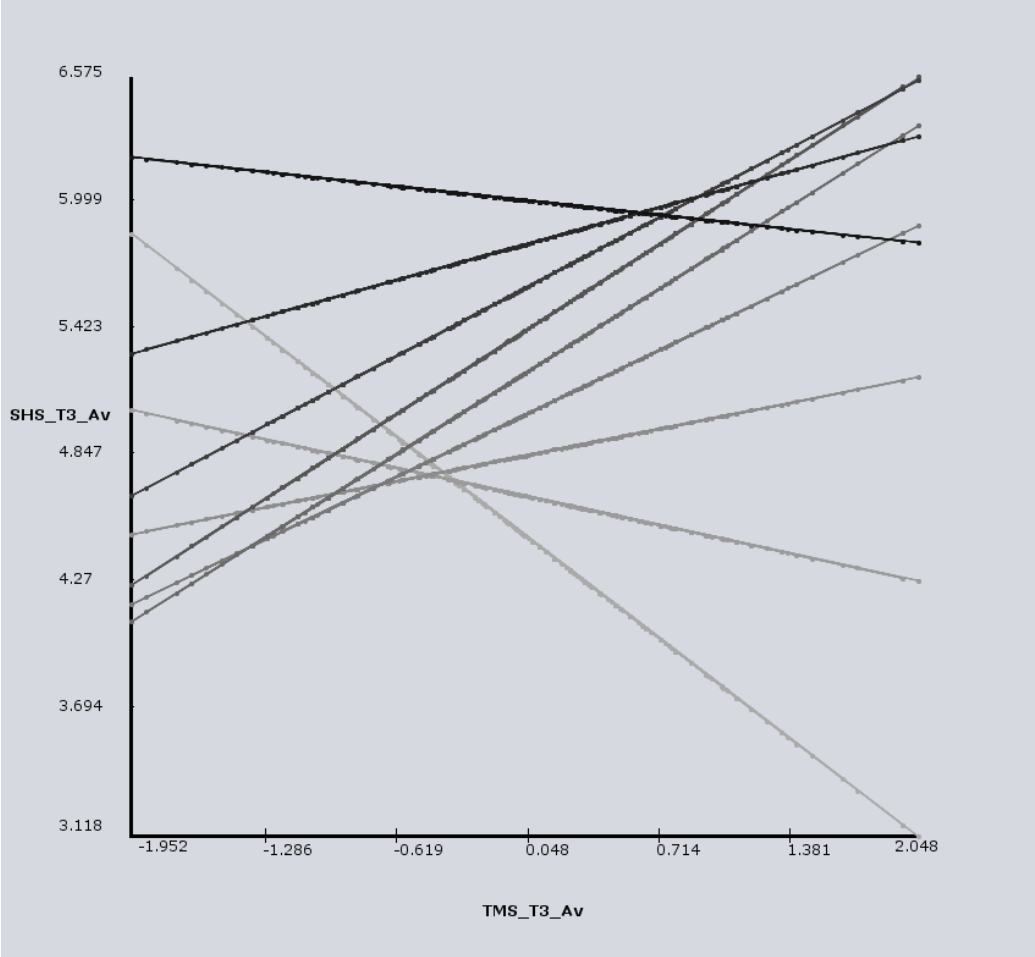
Figure 10: Quadratic Moderation of TMS Time 1 and Happiness Time 1 by Age



For the quadratic analysis on age, TMS at Time 3, and Happiness at Time 3, a main effect was found for the TMS at Time 3 (β = .189, p = <.001) and age (β = .326, p = <.001). An additional significant quadratic relationship was also found for the TMS at Time 3 and age negatively predicting happiness at Time 3, β = -.221, p = .007 (see Figure 11). As noted above with the finding for the same variables at Time 1, for two of the three age groups the significant relationship found was in the opposite direction of that which was expected. As at Time 1, younger and older adults demonstrated a negative relationship between happiness and TMS mindfulness at

Time 3, while middle-aged adults showed the expected positive relationship between happiness and TMS mindfulness.

Figure 11: Quadratic Moderation of TMS Time 3 and Happiness Time 3 by Age



Therefore, for the quadratic moderations performed, it was found that for the FFMQ Time 1, the positive relationship between mindfulness and happiness was strongest for middle-aged adults, which was not as predicted. For the TMS Time 1 and TMS Time 3, a negative relationship between mindfulness and happiness was found for younger and older adults, which was the opposite of what was expected. For the TMS Time 1 and Time 3 there was found to be, however, a positive relationship between mindfulness and happiness for middle-aged adults, which was in the direction that was predicted, though it was expected that older adults would demonstrate the

strongest relationship between mindfulness and happiness, which was not found to be true.

Discussion

The findings of the present study will be reported in three sections. I will begin with an overview of the psychometric validity of both the TMS and FFMQ, then go on to discuss the mean group differences found for age and gender on both the TMS and FFMQ, and then detail the predictive validity of the two measures of mindfulness (TMS and FFMQ) on the outcome measures (happiness and depression). Limitations of the present study are then identified, before finally looking at potential directions for future research in this area.

Psychometric Validity, Measure Reliability, and Construct Validity

Model fit is an important component of psychometric validity, and in order to test prediction one – that the FFMQ would demonstrate a five factor structure (Baer et al., 2008) and the TMS would demonstrate a two factor structure (Lau et al., 2009) – model fit was examined. Part of prediction one was confirmed, as the FFMQ demonstrated good model fit. However, the TMS did not evidence good model fit, which was not predicted. This result indicated that the five factor structure of the FFMQ was appropriate, but that the previously identified two factor structure of the TMS may not be psychometrically valid. The TMS's poor model fit has implications regarding the validity of the further analyses that were then conducted on the measure for this thesis.

In order to test prediction two – that participants' responses to the FFMQ and TMS would not vary across age and gender (factorial invariance) – confirmatory factor analyses were conducted. Factorial invariance has not been previously

examined for the TMS, though a previous study on the FFMQ has shown evidence of factorial invariance for the measure (Branstrom et al., 2011).

Factorial invariance was not found for the TMS when comparing young adults with middle adults at Time 1, nor was it obtained for the TMS at Time 1 when comparing young adults and older adults. As well, factorial invariance was also not obtained for the TMS at Time 3 when comparing young adults and older adults. The FFMQ did not obtain invariance at Time 1 when comparing young adults and older adults; however, this result was only of marginal significance.

Therefore, the majority of non-invariance results was found for the TMS across age, indicating that different age groups may respond differently to the items composing the TMS. These results suggest that there are limitations to the content validity of the TMS between different age groups. The FFMQ obtained invariance at all time points for both age and gender, except for one marginally significant non-invariance for age at Time 1. This result suggests that the FFMQ is invariant to a reasonable degree and is a more robust measure than the TMS, as it appeared to function equally well across different age groups and for both males and females, as was predicted.

Mean Group Differences

Mean group differences between age and gender were examined to determine whether individuals of different ages and genders yielded different scores on the mindfulness measures of interest. Repeated measures MANOVAs were performed in order to test predictions 3 and 4; namely, that older adults would report higher levels of mindfulness than middle-aged and younger adults and that females would report higher levels of mindfulness than males.

Initially, income was entered as the covariate, as it was considered that it may have an impact on the age and gender differences to be examined. Income was found to demonstrate significant, positive correlations with age, mindfulness (as measured by the FFMQ), and happiness. Income also had a significant negative correlation with depression. The correlation between the FFMQ and income is worthy of note, as it is possible that income functions as a moderating variable of the relationship between, for example, the FFMQ and happiness or depression. The way in which income interacts with mindfulness and the outcome variables of happiness and depression may be an area of interest for future research, and though it was not a primary focus of the current study, it was an interesting finding and worthy of note.

A MANOVA was conducted in order to test prediction 3: namely, that older individuals would yield higher scores of mindfulness on the FFMQ and the TMS. This prediction was partially supported, with a univariate effect for age being found for the FFMQ, but not for the TMS. For the FFMQ, it was found that older participants' scores were higher than for younger participants. This result was as predicted and reflects previous research suggesting that older adults demonstrate a higher degree of emotional control (Gross et al., 1997), as well as a greater tendency to focus on the present moment (Mogilner et al., 2010). In contrast, no significant univariate effect was found for the TMS for age, which was not as was predicted. It should be noted that the lack of age differences found for the TMS may be (at least partially) attributable to factorial invariance not being consistently obtained for the measure. The lack of factorial invariance indicated that the three age groups responded differently to the measure, and therefore it is difficult to know conclusively whether age effects would appear on the TMS as was expected had invariance been obtained.

In order to test prediction 4, that females would report higher levels of mindfulness on the FFMQ and TMS than males, a MANOVA was conducted. A significant univariate effect was found for gender on the FFMQ, in which females reported significantly higher levels of mindfulness than males. This result was as predicted, and reflects previous research that has been conducted on similar topics, for example the finding that females use more coping strategies than males (Tamres et al., 2002), as well as previous research that has shown that females reported higher levels of savouring than males (Bryant, 2003).

There was, however, no significant effect found for gender on the TMS, which was not what as predicted. However given the higher degree of psychometric validation of the FFMQ, as well as the larger amount of previous research and validation that it has received, it seems prudent to regard the gender difference found for the FFMQ to be a true demographic difference and to disregard the lack of gender effects found for the TMS.

Exploratory analyses (MANOVAs) were also performed to look for interactions of key variables with time, which uncovered some interesting results. A significant interaction was found for gender by time on the FFMQ. Here, females' mindfulness scores on the FFMQ were significantly higher and more stable across time than males, which were lower but increased over the nine months. This result showed that while females demonstrated a stable, high level of mindfulness, males' scores changed more over time. It is difficult to explain this finding conclusively given the lack of previous research with these specific variables, but it could be that because males have a lesser proclivity to be mindful (as demonstrated by females' higher FFMQ scores), simply being exposed to the questions within the survey generated a greater degree of attention to mindful behaviour in this group. It may also

be that females were demonstrating a ceiling effect for mindfulness and that males, therefore, had a greater scope in which to increase their mindfulness over time.

Predictive Validity

In order to test predictions 5 and 6 – that the FFMQ and TMS would positively predict happiness and negatively predict depression – regression analyses were performed. The FFMQ was found to be a significant positive predictor of happiness at all three time points and a significant negative predictor of depression at all three time points, which was expected. The TMS was found to be a marginally significant predictor of depression at all three time points, however the relationship was positive. This result was not as predicted; it was expected that if any relationship between the TMS and depression existed, it would be negative. In addition, the TMS was not a significant predictor of happiness at any of the three time points, which was not as predicted.

These results indicated that the FFMQ manifested greater predictive validity than the TMS. The fact that the FFMQ predicted the outcomes as expected gives preliminary evidence that it could be used in a research or clinical setting with variables such as happiness and depression in a consistent and reliably predictive way. That scores of mindfulness on the TMS were positively associated with depression was concerning: given previous research demonstrating a link between mindfulness and well-being, the TMS functioning as a positive predictor of depression casts doubt on the validity of the measure and raises questions regarding what psychological construct the TMS is capturing.

Furthermore, when comparing the amounts of unique and shared variance of the FFMQ and TMS on happiness and depression across all time points, the FFMQ was found to explain far more unique variance in these outcome variables than the

TMS. This result indicated that the FFMQ evidenced better predictive validity than the TMS during simultaneous inclusion. This finding provides further evidence that the FFMQ shows a stronger relationship with the outcome variables of happiness and depression than the TMS and has implications for the TMS's clinical and research utility: in order for the measure to have beneficial effects in these settings, it needs to operate in a reliable way, which was not demonstrated here.

In order to determine whether the FFMQ and TMS were valid longitudinal predictors of the outcome variables, a regression across time was performed. This analysis tested prediction 7, namely that the TMS and FFMQ would be positive predictors of happiness and negative predictors of depression over time.

It was found that the FFMQ at Time 1 was a marginally significant predictor of happiness at Time 2 and a significant predictor of happiness at Time 3. A marginally significant relationship between the FFMQ at time one and depression at Time 3 was also found, which was generally consistent with the hypothesis. Ideally, the FFMQ would have also negatively predicted depression at Time 2, however even without this link it is safe to conclude that the FFMQ demonstrated fairly good longitudinal predictive validity.

The TMS, however, did not prove to be a significant predictor of happiness or depression at any of the three time points, which was not as predicted. This result indicated that the FFMQ was a better predictor of happiness and depression than the TMS, both across time points, as well as at each time point.

Moderations were then conducted in order to test prediction 8: that age would significantly moderate the positive relationship between mindfulness and happiness (i.e. older individuals would evidence a stronger relationship), and significantly moderate the negative relationship between mindfulness and depression (again, that

older individuals would evidence a stronger relationship). Similarly, it was expected that females would manifest stronger relationships than males. These moderations were first conducted at individual time points, and then across time, as the predicted pattern of moderation was expected to be the same both at singular points of time as well as longitudinally.

At individual time points. At Time 1, it was found that gender marginally significantly moderated the relationship between the FFMQ and happiness. Here, males demonstrated a slightly stronger relationship between scores on the FFMQ and happiness than females, which was not as predicted. This result indicated that the link between levels of mindfulness and happiness was stronger for males than for females and meant that if males were reporting high scores of mindfulness on the FFMQ, they were also more likely to report a higher level of happiness than females, for whom the link between FFMQ scores and happiness was not as strong.

Age was also found to significantly moderate the negative relationship between the FFMQ and depression at all three time points. Young adults were found to exhibit the strongest of these moderating relationships, with middle adults showing a lower level of moderation and older adults demonstrating the lowest level of significant moderation of the three groups. As with gender, this was not the pattern of moderation that was predicted. This finding indicated that for young adults, a high level of mindfulness had the strongest relationship with decreased depression. This may have occurred because older adults demonstrated higher levels of mindfulness on the FFMQ, so when young adults did engage in mindfulness, it may have proved to have been particularly effective as it was a less utilised coping strategy for younger adults than it was for middle-aged and older adults. This finding appears to be fairly robust, as it was replicated at each time point.

The finding that young adults demonstrated a strong moderating relationship between scores of mindfulness on the FFMQ and depression has implications for how mindfulness could be used in a clinical setting for this age group; teaching young adults mindfulness skills may be particularly effective at curbing their depression.

Across time points. Age was found to significantly moderate the negative relationship between the FFMQ Time 2 and Depression Time 3. However, only young adults yielded a significant moderation of this relationship, with middle-aged adults a marginal moderator, and older adults proving to be non-significant, which was not as predicted. Again, this points to the importance of mindfulness (as measured by the FFMQ) for young people, as for this age group in particular, a higher level of mindfulness appears to have been linked to significantly lower levels of depression.

Gender was found to be a significant moderator in the negative relationship between the TMS Time 2 and happiness at time 3, though the result was not in the expected direction. What this meant was that for females, a higher score on the TMS Time 2 was predictive of significantly lower happiness at Time 3. This negative relationship between the TMS at Time 2 and happiness at Time 3 was the opposite of that which was predicted. Given previous research showing the positive relationship between mindfulness and well-being (e.g. Brown & Ryan, 2003; Carmody & Baer, 2008), as well as the finding in this study that the FFMQ *did* serve as a positive predictor for happiness across all three time points, the validity of the TMS is further called into question. The predictive utility of a mindfulness measure which shows a positive relationship with depression is very low. As a clinical tool, the practice of mindfulness is intended to decrease depression and increase well-being, and the fact that this measure demonstrates the opposite of this relationship calls into question *what*, precisely, the TMS is measuring.

Of further interest in this study was whether any significant quadratic moderations were present; therefore, I explored whether gender and age moderated the relationships between mindfulness (FFMQ and TMS) and the two outcome variables (happiness and depression) in a curvilinear fashion.

A significant quadratic relationship was found between age and scores on the FFMQ Time 1 predicting happiness at Time 1. Here, it was found that middle-aged adults demonstrated the strongest relationship between happiness and FFMQ mindfulness at Time 1, with younger adults showing a weaker relationship between happiness and mindfulness, and older adults showing the weakest relationship of all three age groups. This result indicates that for middle-aged adults, FFMQ mindfulness has particularly strong implications for happiness, and that this relationship is stronger than for younger or older adults.

A significant quadratic relationship was also found for the TMS Time 1 and age negatively predicting happiness at Time 1. This negative relationship was the opposite of what was expected, which was that the TMS would predict happiness in a positive direction. Here, younger and older adults were shown to manifest a negative relationship with the TMS and happiness. Here, younger adults showed a stronger negative relationship than older adults, who also demonstrated higher levels of overall happiness. Meanwhile, middle-aged adults demonstrated a positive relationship between happiness and TMS mindfulness at Time 1. Though middle-aged adults demonstrated the positive relationship that would be expected between mindfulness and happiness, the relationship demonstrated by younger adults and older adults was in the opposite direction of that which was expected.

An additional significant quadratic relationship was also found for the TMS Time 3 and age negatively predicting happiness at Time 3. As noted above with the

finding for the same variables at Time 1, the significant relationship found was in the opposite direction of that expected. As at Time 1, younger and older adults demonstrated a negative relationship between happiness and TMS mindfulness at Time 3, while middle-aged adults showed a positive relationship between happiness and TMS mindfulness. Younger adults showed the strongest negative relationship between the variables, and older adults the weakest. Incongruent findings such as these do not contribute to a sense that the TMS is validly measuring the mindfulness construct as intended.

Exploratory Analyses

This study was also interested in exploring gender and age differences found for the outcome variables of happiness and depression. Though no gender differences were garnered, two age differences were found, described in more detail below.

A univariate effect was found for age on happiness, with older individuals reporting higher levels of happiness. This finding supports previous research conducted by Mogilner et al. (2011), who found the way in which happiness is conceptualised changes with age. They found that younger adults associate happiness with excitement and novelty, whereas older adults associate it with a greater sense of peace and calm. It is possible that the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) taps a peaceful and settled form of happiness that resonates with older adults more than the excited state of happiness which is more consistent with younger individuals' conceptualisations of the construct (Mogilner et al., 2011). It may also simply be that general happiness does increase with age, and in fact there has been previous research which supports this notion (e.g. Sheldon & Kasser, 2001).

A significant univariate effect was also found for age on depression, with older participants reporting lower levels of depression. This result reflects previous

research that has shown that older adults experience fewer highs and lows of emotion (Diener et al., 1985), and it seems likely that depression represents the sort of extremity of emotion that tends to decrease as individuals get older. As well, this is consistent with the finding that older adults report higher levels of happiness; if they are reporting higher levels of happiness, it follows that decreased depression would co-occur.

Overall Validity of the FFMQ and TMS

Based on the analyses performed in this study, it can be concluded that the FFMQ is a psychometrically superior instrument to the TMS. The FFMQ obtained good model fit, had a high level of predictive validity, and – for the most part – interacted with the demographic variables of age and gender in the ways which were predicted based on previous research. The TMS, on the other hand, yielded poor model fit, limited predictive validity, and unpredictable relationships with the demographic variables of age and gender, as well as the outcome variables of happiness and depression. From these results, the validity – and therefore theoretical and practical utility – of the TMS was called into question. Based on the findings of this study and previous research, it can be concluded that the FFMQ is a valid and functional instrument with which to measure mindfulness.

Implications for Age and Gender Effects of the FFMQ and TMS

The analyses conducted in this study also generated various age and gender effects. Given the questionable validity of the TMS, it seems more prudent to refer to the significant results found for the FFMQ, as it is more likely that the findings garnered on this measure were representative of true demographic differences for age and gender.

As predicted, females reported a higher level of mindfulness on the FFMQ than males. Furthermore, gender moderated the relationship between the FFMQ and happiness, showing that males demonstrated a slightly stronger relationship between the FFMQ and happiness than females. This result indicated that although females may have a naturally higher level of mindfulness, when males are mindful, it is more strongly associated with happiness.

The cross-sectional analysis also showed that individuals' degree of mindfulness increased with age. As well, age significantly moderated the negative relationship between the FFMQ and depression, with young adults showing the strongest relationship between these two variables. This result indicates that for young adults, mindfulness may have a particularly strong link to decreased depression. A quadratic moderation also showed a marginally significant finding, in which age moderated the relationship between the FFMQ and happiness at Time 1. This result indicated that middle-aged adults manifested the strongest relationship between FFMQ mindfulness and happiness, so mindfulness may be particularly relevant to levels of happiness for middle-aged adults. More research will need to be employed to verify these age differences, but at this stage they are intriguing.

Limitations and Future Research

This study involved certain limitations which ought to be taken into account when considering the results. One limitation of this study was that it relied on self-report measures, and whether or not participants' self-reports are reflective of reality is inherently uncertain. In some regards, however, self-report seems the most appropriate form of measurement given the variables in question: One's happiness, depression, or degree of mindfulness is primarily a matter of personal perspective, insofar as these terms concern the individual and the individual's internal state of

mind. Therefore, from this perspective, it seems that the individual *is* the best gauge of their own mental state, and attempting to obtain a more objective form of measurement for such subjective concepts seems somewhat futile. On the other hand, future research might consider looking at physiological changes that arise when an individual is in a mindful state and what measures of mindfulness capture these changes most effectively. In addition, it would be useful to look at whether the physiological effects of mindfulness differ based on an individual's age/gender, in order to gain more confirmatory evidence regarding age and gender effects for mindfulness, to show that these differences are not solely due to self-report biases.

Another limitation of this study was that participants who did not complete a substantial (two thirds) portion of the survey at each time point were not included in the final dataset. In order to ensure that there were no significant differences between completers and non-completers, a MANOVA was run to compare the two groups (this analysis was described in more detail in the method section of this thesis). No significant differences were found between completers and non-completers on either of the mindfulness measures (TMS and FFMQ) or the outcome variables (happiness and depression). Though every attempt was made to determine that there was no significant difference between the completers and non-completers, and the analyses conducted determined that no differences were present, there remains the possibility that differences between the two groups were present and went undetected.

Another limitation of this study was that the sample used was comprised of about 1/3rd meditators: This is a higher percentage of meditators than would be present in most community samples. Therefore, a chi-square analysis was conducted to determine whether there were age or gender differences in the meditating and non-meditating components of the sample which may have had an impact on the results of

this study. There was a marginally significant difference ($p = .070$) found for gender, in which more females were found to identify as meditators than males. Additionally, a significant difference ($p = .001$) was found for age, in which a greater number of older individuals were found to meditate, with middle-aged participants reporting the lowest incidence of meditating and younger adults falling between the other two groups. Although differences in the chi-square analyses were found, a repeated-measures MANOVA was run on the TMS, FFMQ, happiness, and depression, in which meditation experience was not found to be a significant covariate. Therefore, it was determined that although demographic differences did appear to be present in the meditating portion of the sample, these differences were not found to have an impact on the results of this study. However, future research may wish to look more closely at whether age and gender differences for mindfulness present differently in meditators versus non-meditators. It would also be beneficial to understand further how meditators and non-meditators respond similarly or differently on the TMS and FFMQ, and future research may wish to address this question also.

Conclusions

Despite these limitations, this research provides some important new evidence that the TMS is of limited utility, given the concerns raised within this study. The FFMQ, on the other hand, looks to be a robust trait mindfulness measure. Furthermore, the age and gender differences found in this thesis ought to be considered, both in future research regarding mindfulness, as well as in clinical settings, as these findings have implications for how mindfulness varies across demographic groups. Future research may wish to look at these demographic differences more closely, as this study provides but a preliminary glimpse into an area that is worthy of more extensive research.

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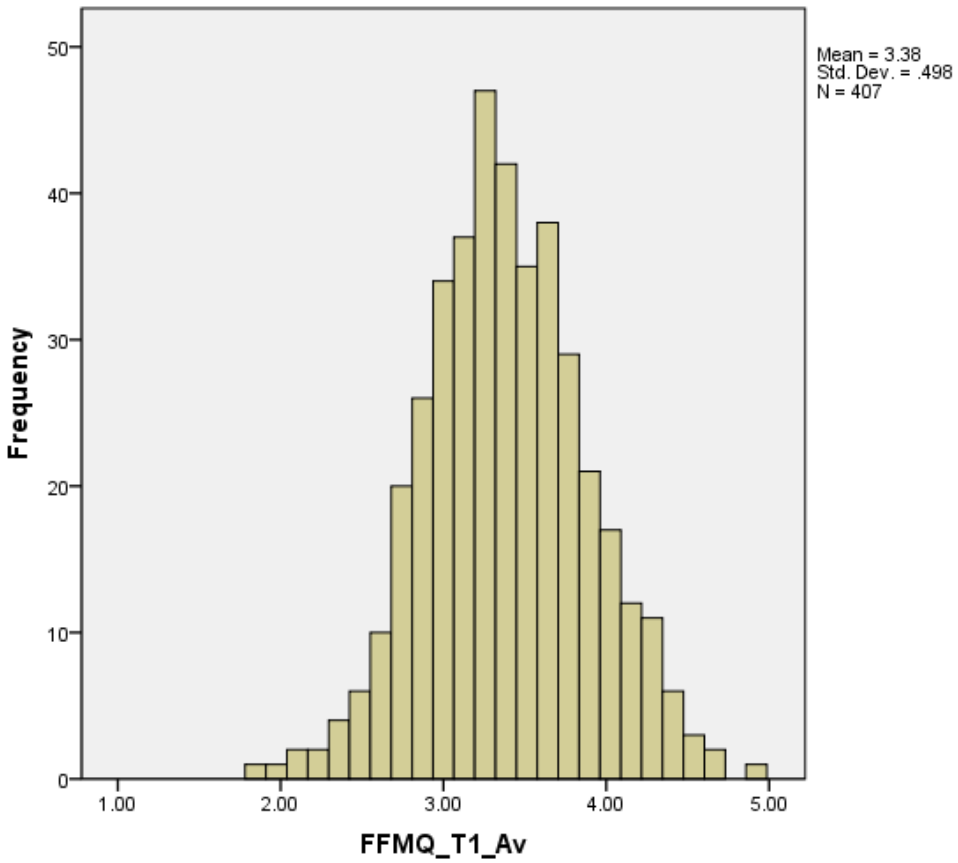
Appendix A

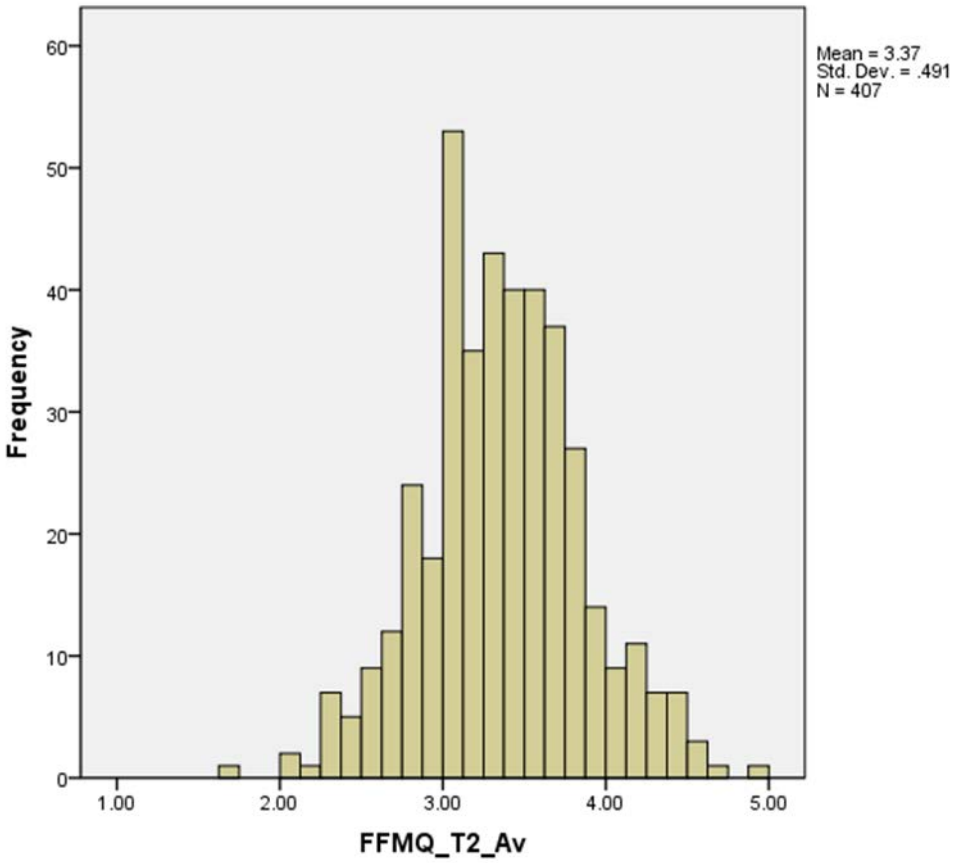
Distribution and Descriptive Statistics of FFMQ Time 1



Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
FFMQ_T1_Av	407	1.85	4.87	3.3843	.49770	.062	.121	.024	.241
Valid N (listwise)	407								

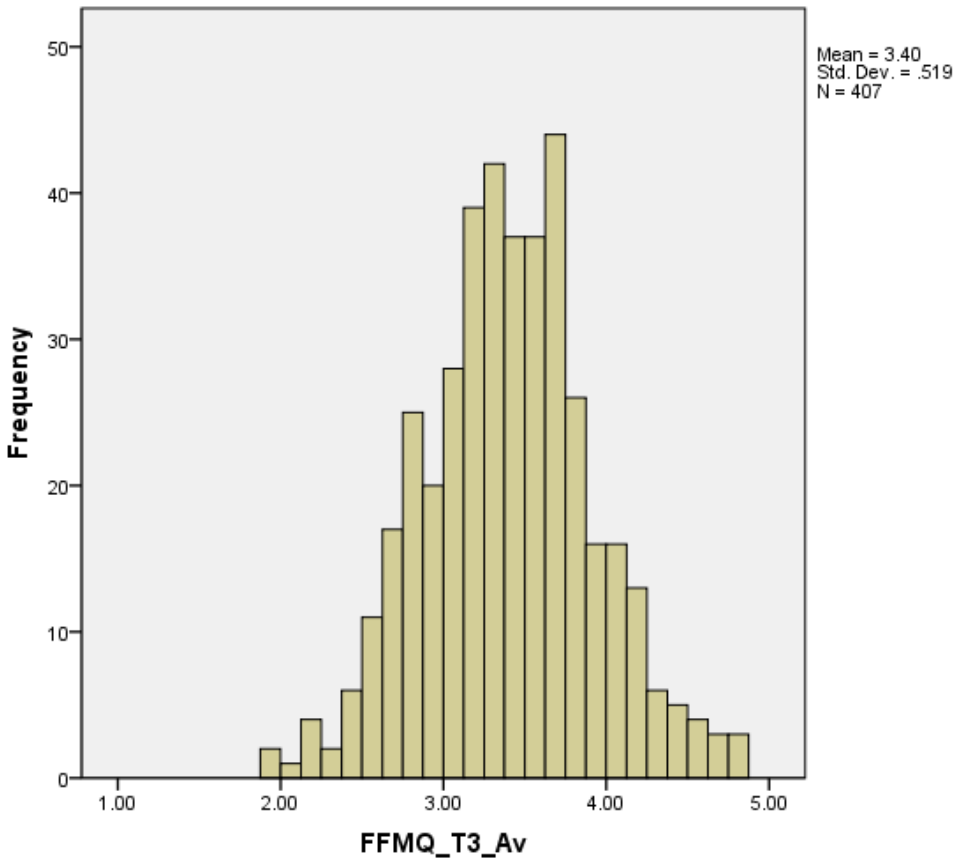
Distribution and Descriptive Statistics of FFMQ Time 2



Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
FFMQ_T2_Av	407	1.64	4.92	3.3656	.49139	.053	.121	.307	.241
Valid N (listwise)	407								

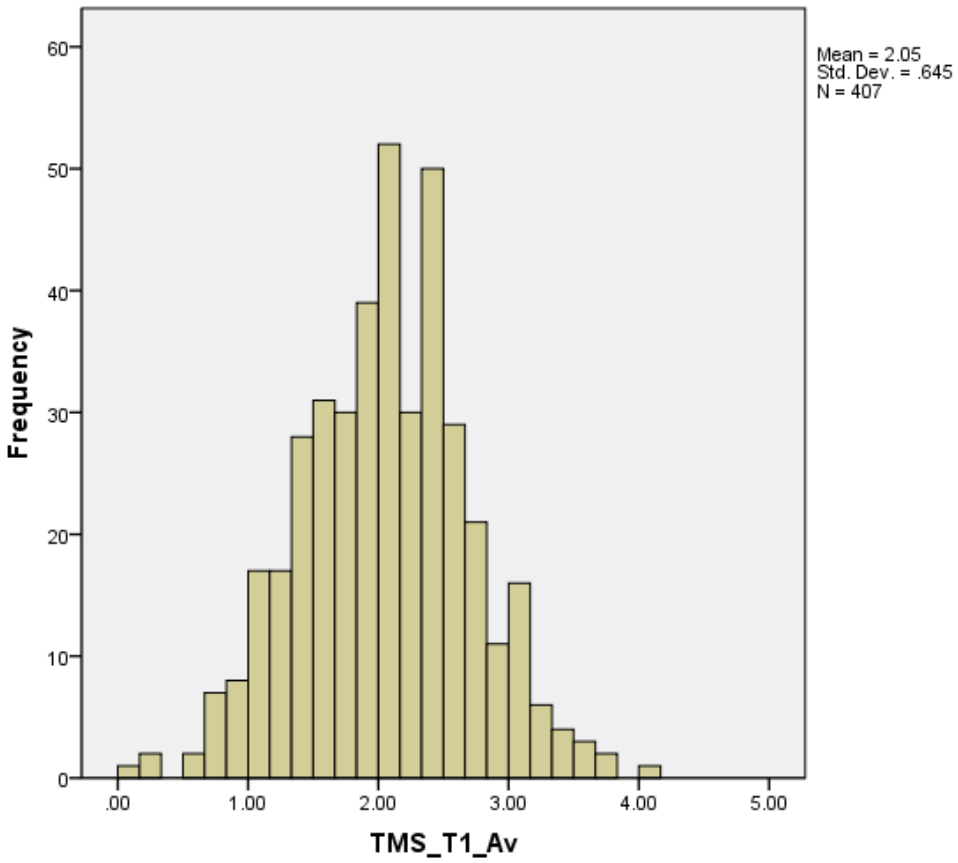
Distribution and Descriptive Statistics for FFMQ Time 3



Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
FFMQ_T3_Av	407	1.92	4.79	3.3978	.51903	.053	.121	.093	.241
Valid N (listwise)	407								

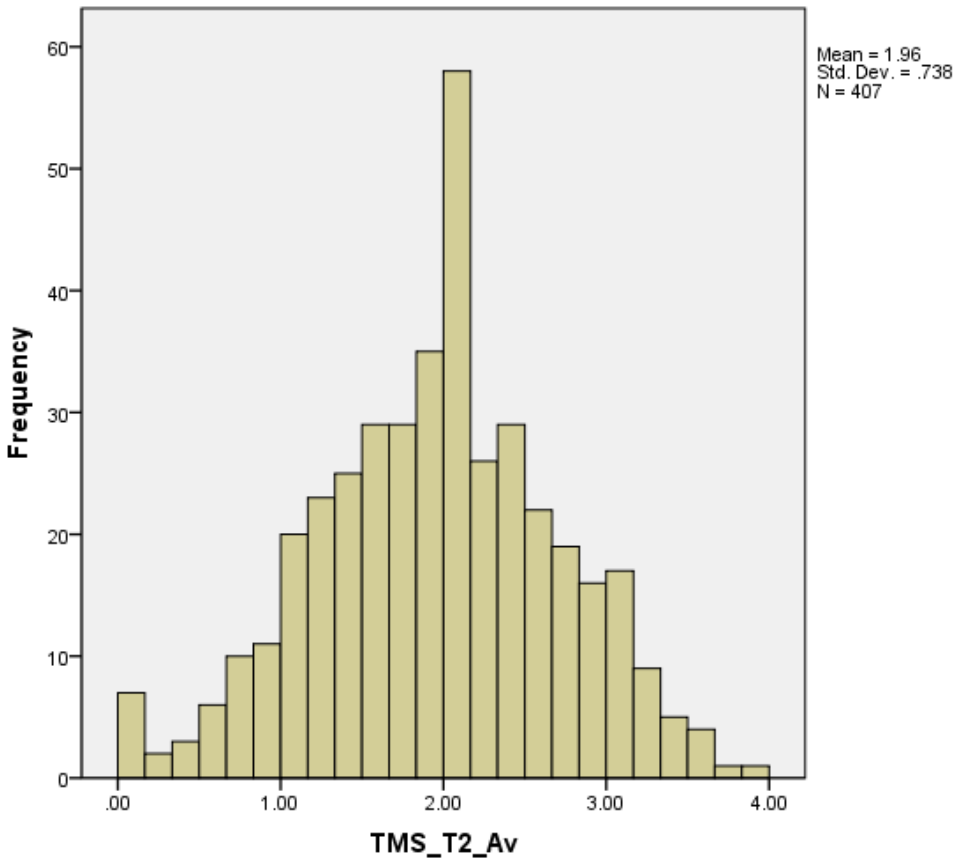
Distribution and Descriptive Statistics for TMS Time 1



Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
TMS_T1_Av	407	.15	4.00	2.0473	.64464	-.012	.121	-.014	.241
Valid N (listwise)	407								

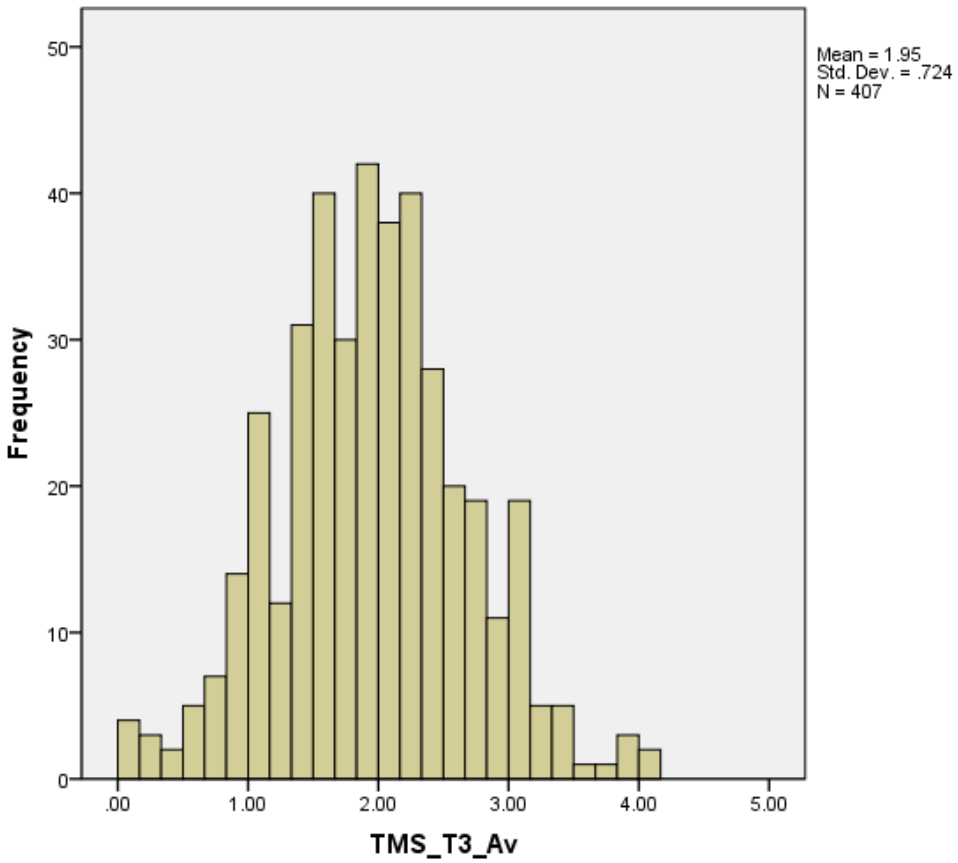
Distribution and Descriptive Statistics for TMS Time 2



Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
TMS_T2_Av	407	.00	3.85	1.9567	.73781	-.155	.121	-.091	.241
Valid N (listwise)	407								

Distribution and Descriptive Statistics for TMS Time 3



Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
TMS_T3_Av	407	.00	4.00	1.9522	.72420	.062	.121	.136	.241
Valid N (listwise)	407								

Appendix B

CFA Tables of Factorial Invariance

Factorial Invariance of TMS by Gender

Model description	CFI	ΔCFI	Statistical Significance
TMS Time 1			
Unconstrained	.967		
Measurement Weights	.966	.001	NS
Structural Covariances	.967	.000	NS
TMS Time 2			
Unconstrained	.982		
Measurement Weights	.983	.001	NS
Structural Covariances	.985	.003	NS
TMS Time 3			
Unconstrained	.980		
Measurement Weights	.981	.001	NS
Structural Covariances	.982	.002	NS

Factorial Invariance of FFMQ by Gender

Model description	CFI	ΔCFI	Statistical Significance
FFMQ Time 1			
Unconstrained	.975		
Measurement Weights	.973	.002	NS
Structural Covariances	.972	.003	NS
FFMQ Time 2			
Unconstrained	.975		
Measurement Weights	.974	.001	NS
Structural Covariances	.975	.000	NS
FFMQ Time 3			
Unconstrained	.974		
Measurement Weights	.972	.002	NS
Structural Covariances	.971	.003	NS

Factorial Invariance of TMS Time One by Age

Model description	CFI	ΔCFI	Statistical Significance
TMS Time 1 YA and MA			
Unconstrained	.972		
Measurement Weights	.971	.001	NS
Structural Covariances	.954	.018	.01 (MA>YA)
TMS Time 1 MA and OA			
Unconstrained	.972		
Measurement Weights	.970	.002	NS
Structural Covariances	.972	.000	NS
TMS Time 1 YA and OA			
Unconstrained	.962		
Measurement Weights	.964	.002	NS
Structural Covariances	.946	.016	.05 (OA>YA)

Factorial Invariance of TMS Time Two by Age

Model description	CFI	ΔCFI	Statistical Significance
TMS Time 2 YA and MA			
Unconstrained	.978		
Measurement Weights	.979	.001	NS
Structural Covariances	.978	.000	NS
TMS Time 2 MA and OA			
Unconstrained	.987		
Measurement Weights	.990	.003	NS
Structural Covariances	.991	.004	NS
TMS Time 2 YA and OA			
Unconstrained	.980		
Measurement Weights	.982	.002	NS
Structural Covariances	.974	.006	NS

Factorial Invariance of TMS Time Three by Age

Model description	CFI	ΔCFI	Statistical Significance
TMS Time 3 YA and MA			
Unconstrained	.978		
Measurement Weights	.977	.000	NS
Structural Covariances	.966	.012	.371 (see in text)
TMS Time 3 MA and OA			
Unconstrained	.991		
Measurement Weights	.992	.001	NS
Structural Covariances	.991	.000	NS
TMS Time 3 YA and OA			
Unconstrained	.982		
Measurement Weights	.983	.001	NS
Structural Covariances	.963	.019	.003 (OA>YA)

Factorial Invariance of FFMQ Time One by Age

Model description	CFI	ΔCFI	Statistical Significance
FFMQ Time 1 YA and MA			
Unconstrained	.985		
Measurement Weights	.983	.002	NS
Structural Covariances	.976	.009	NS
FFMQ Time 1 MA and OA			
Unconstrained	.970		
Measurement Weights	.969	.001	NS
Structural Covariances	.962	.008	NS
FFMQ Time 1 YA and OA			
Unconstrained	.972		
Measurement Weights	.970	.002	NS
Structural Covariances	.962	.01	.03 (OA>YA for nonreacting to describing covariance) covariance

Factorial Invariance of FFMQ Time Two by Age

Model description	CFI	ΔCFI	Statistical Significance
FFMQ Time 2 YA and MA			
Unconstrained	.967		
Measurement Weights	.967	.000	NS
Structural Covariances	.966	.001	NS
FFMQ Time 2 MA and OA			
Unconstrained	.955		
Measurement Weights	.957	.002	NS
Structural Covariances	.955	.000	NS
FFMQ Time 2 YA and OA			
Unconstrained	.962		
Measurement Weights	.959	.003	NS
Structural Covariances	.955	.007	NS

Factorial Invariance of FFMQ Time Three by Age

Model description	CFI	ΔCFI	Statistical Significance
FFMQ Time 3 YA and MA			
Unconstrained	.973		
Measurement Weights	.972	.001	NS
Structural Covariances	.971	.002	NS
FFMQ Time 3 MA and OA			
Unconstrained	.960		
Measurement Weights	.960	.000	NS
Structural Covariances	.956	.004	NS
FFMQ Time 3 YA and OA			
Unconstrained	.969		
Measurement Weights	.966	.003	NS
Structural Covariances	.961	.008	NS