

TRAIT MINDFULNESS AND EMOTION REGULATION
IN AN OLDER ADULT POPULATION

By

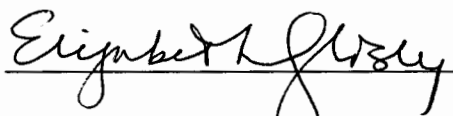
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Abstract

Mindfulness is a multifaceted construct defined as a state of present-moment focus and nonjudgmental awareness of the current experience. It can be assessed in various ways including as a trait or dispositional characteristic. Mindfulness is associated with emotion regulation abilities but to date there is limited evidence for specificity of facets in this association and fewer studies examining this in older adults. The current study examined age differences in trait mindfulness and the association between (a) specific facets of mindfulness and (b) emotion regulation, in older and younger adults. We used the Five Faceted Mindfulness Questionnaire (FFMQ; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006) and both objective and subjective measures of emotion regulation. Ten older adults and 39 younger adults completed the FFMQ and subsequently performed an Emotional Stroop task following negative mood induction. Results demonstrated significantly higher levels of trait mindfulness in older adults, particularly in the nonjudgment facet. Despite some indication of an association between nonjudgment and reduced emotional response for older adults, no correlations between FFMQ facets and emotion regulation measures were significant. These results suggest that older adults are more mindful than younger adults, and there is reason for further exploration of specific facets of mindfulness.

Trait mindfulness and emotion regulation in an older adult population

Mindfulness is a concept derived from Buddhism that has recently received increased attention in the scientific community. Mindfulness is a multifaceted construct that can be defined as a state of present-moment focus and awareness of the current experience, while maintaining a nonjudgmental attitude toward all aspects of the experience (Kabat-Zinn, 1990). The practice of mindfulness is rooted primarily in traditional Buddhist spiritual beliefs and attitudes (Bishop et al., 2004), and is typically cultivated through breathing and meditation techniques that encourage a state of nonjudgmental focus on the present experience (Sauer et al., 2011).

Several studies have investigated the relation between mindfulness and emotion and suggest that mindfulness may enhance emotion regulation abilities (e.g., Arch & Craske, 2006; Farb, Anderson, Mayberg, BeanMcKeon, & Segal, 2010; Lutz et al., 2014; Ortner, Kilner, & Zelazo, 2007). These studies have utilized primarily self-report (but occasionally behavioral and physiological assessment) to measure emotion regulation in long-term meditators and individuals undergoing short-term meditation interventions. Although mindfulness is cultivated by certain meditation practices, it also exists as a dispositional trait though few have examined it as such. Trait mindfulness includes the same aspects emphasized in mindfulness meditation practices, but these are considered personal characteristics rather than a process developed by practice (Radford et al., 2014). Measuring trait mindfulness reduces some of the confounds and challenges in interpretation that are inherent in using long-term meditators and brief interventions (e.g., variability in quality of practice). An even further limited area of research has addressed trait mindfulness and its role in emotion regulation in aging adults.

The current study aims to address some of these gaps in the literature by exploring the relation between trait mindfulness and emotion regulation, particularly in older adults. In

addition, this study will examine the construct of mindfulness itself to determine which particular facets of mindfulness may be related to emotion regulation. The strengths of the current study are in the use of trait mindfulness as opposed to mindfulness produced by meditation practice, and the use of objective testing to measure emotion regulation. As mentioned above, there are multiple confounds that can arise in the examination of meditation-based mindfulness and measuring trait mindfulness circumvents these issues. Additionally, the use of an objective measure for emotion regulation, the Emotional Stroop, should provide a more accurate measure of emotion regulation than previously used self-report measures.

Literature Review

Mindfulness

Mindfulness is typically described as a focus on present moment awareness while maintaining a nonjudgmental, open view of the present experience (Kasznik, 2011). It is an increased focused attention on all aspects of moment-by-moment observations (Kabat-Zinn, 1990) and involves self-regulation of attention combined with open acknowledgment and acceptance of all present experiences without judgment (Bishop et al., 2004). Mindfulness is typically cultivated through specific meditation techniques.

Common mindfulness meditation practices involve breathing patterns requiring a complete present self-awareness with careful observation of both body and mind during breathing (Kabat-Zinn, 1990). These meditation and breathing practices emphasize the importance of a sense of focus on every aspect of one's experience. Although the practices of breathing and sitting may seem common and insignificant, mindful breathing and mindful sitting are different from ordinary breathing and sitting, due to this aspect of heightened self-awareness (Kabat-Zinn, 1990). Sitting and breathing practices emphasize the importance of proper posture

to allow optimal airflow, as practitioners focus on observation of every detail of these simple actions of sitting and breathing, noting every sensation and thought throughout the experience (Kabat-Zinn, 1990).

Seemingly paradoxical, mindfulness involves a mindset that is both alert and relaxed; a calm acceptance of the present without judgment or reaction (Kabat-Zinn, 1990). In other words, while mindfulness encourages an aspect of nonreactivity and avoiding judgment, it does not discount nor ignore any aspect of experience. Rather, mindfulness requires full observation of all aspects of perception in the present – thoughts, sensations, images, and emotional experiences – and a nonjudgmental acceptance of these, without allowing distraction or negative effects (Kaszniak, 2011).

Previous research has primarily examined mindfulness, as developed by these specific breathing and meditation practices, by comparing long-term meditators to meditation-naïve individuals or by administering brief mindfulness-based interventions to previously meditation-naïve individuals. In an example of the former, Ortner, Kilner, and Zelazo (2007) compared meditators with varying degrees of experience on their performance in emotion regulation tasks. As predicted, Ortner and colleagues found that practitioners of meditation experienced reduced emotional interference in these tasks. In a similar study, Moore and Malinowski (2008) compared a group of experienced Buddhist meditators to a group of non-meditators in their performance on attentional and cognitive tasks. Results showed that previous experience in mindfulness meditation practices was related to better attentional skills and cognitive flexibility. In an example of brief mindfulness interventions, Arch and Craske (2005) examined the effects of mood induction on an undergraduate population with no previous meditation experience. Participants were assigned to one of three conditions in which they spent 15 minutes practicing

focused breathing (i.e., a mindfulness-based technique), worry (e.g. ruminating on current life concerns), or unfocused attention (e.g. mind wandering) and were then exposed to a negative mood induction. Results demonstrated that the focused breathing group reported overall lower emotion response and higher willingness to view negative photos, suggesting that mindfulness-based breathing practices facilitate emotion regulation.

As demonstrated above, most of the existing literature and experimental studies on mindfulness have involved either participants with previous meditation experience (e.g., expert meditators) or some form of meditation intervention for meditation-naïve participants. Although these studies are important, certain limitations exist in their methodology. First, intervention methods range among different studies and groups of researchers (Chiesa & Malinowski, 2011) and include everything from brief mindfulness inductions lasting 10-20 minutes to six-month intensive retreats. Second, just as variable as the length of time spent in the intervention are the traditions on which the meditation or mindfulness practices are based (e.g., Zen, loving-kindness, yogic meditation) as well as the participant's degree of compliance to the practice. This results in a great degree of variability, making comparisons across studies and drawing general conclusions about the efficacy of mindfulness-based practices difficult. Finally, the use of brief interventions may not accurately represent mindful practices, as participants are not likely to fully grasp the concept of mindfulness with such little exposure (Davidson & Kaszniak, under review). Similar issues exist when using individuals with previous meditation experience. It is difficult to control and quantify the duration, frequency, and quality of an individual's personal practice in order to make comparisons across groups. Moreover, the type of practice is often highly variable and fidelity to one particular practice is difficult to assess (Eberth & Sedlmeier, 2012). Finally, meditation experience is confounded with age and self-selection biases.

Specifically, one can only become an experienced meditator with time and so age becomes a confounding variable in interpreting effects of mindfulness. Similarly, individuals who choose to meditate for a number of years may be different in many ways from individuals who do not choose to meditate and therefore isolating any between-group differences to mindfulness, specifically, is challenging (Davidson & Kaszniak, under review). However, examining trait or dispositional mindfulness allows for individual assessment of mindfulness characteristics, independent of meditation experience and thus avoids the confounds and variability inherent in intervention and expert meditation studies. By measuring aspects of mindfulness as a trait, rather than as developed practice, discrepancies resulting from the variability of quantity, quality, and type of practice are avoided.

Measuring the Facets of Mindfulness

Though mindfulness may appear to be a unified construct, many researchers theorize that it is in fact comprised of different facets, which are uniquely predictive of different outcomes related to cognitive and emotional functioning (e.g., Shapiro, Carlson, Astin, & Freedman, 2006). Several authors have attempted to operationalize mindfulness as a multidimensional construct through various self-report measures (Baer, Smith, & Allen, 2004; Dimidjian & Linehan, 2003; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007). One heavily researched measure is the Five Facet Mindfulness Questionnaire (FFMQ) created by Baer, Smith, Hopkins, Krietemeyer, and Toney (2006). The FFMQ was derived from exploratory and subsequent confirmatory factor analysis of items from previously developed mindfulness questionnaires including the Mindfulness Attention Awareness Scale (MAAS; Brown & Ryan, 2003), the Freiburg Mindfulness Inventory (FMI; Buchheld, Grossman, & Walach, 2001), the Kentucky Inventory of Mindfulness Skills (KIMS; Baer et al., 2004), and the Cognitive and

Affective Mindfulness Scale (CAMS; Feldman et al., 2007). From these factor analyses Baer and colleagues (2006) identified five latent facets that significantly contributed to the higher-order construct of mindfulness; observing, describing, acting with awareness, nonjudgment of inner experience, and nonreactivity to inner experience.

‘Observing’ involves an openness to experience and an attentiveness to both internal and external stimuli. In non-meditators, this facet is positively correlated with the other facets except nonjudgment, as observation seems to encourage an assessment of perceived experience and consequent formation of judgment. Baer et al. (2006) clarifies that while beginning mindfulness practitioners might be inclined to make judgments in their practice of observation, experienced meditators are able to observe without judging, evidenced by the positive correlation between the observing and nonjudgment facets in this population.

‘Describing’ involves the ability to identify, recognize, and explain one’s own emotions upon observation and acting with awareness (Baer et al., 2006). This particular facet was positively correlated with constructs of openness to experience, emotional intelligence, and self-compassion. While Describing encourages awareness of feelings and sensations, ‘nonjudgment’ and ‘nonreactivity’ require *acceptance* of these observed feelings and sensations.

‘Acting with awareness’ refers to a sense of focus and attentiveness to one’s own activities and “avoiding automatic pilot” (Baer et al., 2006). This facet illustrates the aspect of centered focus involved in mindfulness, which requires detailed observation of every aspect of the present experience.

Finally, ‘nonjudgment’ and ‘nonreactivity’, which are particularly relevant to emotion regulation, are two facets involved in control and regulation of thought and emotion upon observing oneself and others. Nonjudgment and nonreactivity correspond to observation and

recognition of emotions and actions while reserving judgment and avoiding negative or “maladaptive” responses (Baer et al., 2006).

The combined facets of mindfulness promote a self-awareness and focus, which leads to nonjudgmental acceptance of personal experiences. Importantly, the nonreactivity facet of mindfulness involves observing experiences while avoiding consequent negative or maladaptive behaviors. Specifically, this facet of mindfulness relates to emotion regulation, as nonreactivity emphasizes non-attachment to experience. Additionally, the nonjudgment facet showed strong negative correlations with aspects related to emotion including thought suppression and difficulties with emotion regulation (Baer et al., 2006). Thus, it is likely that these two specific facets of mindfulness are most relevant to results of emotion regulation seen in the literature.

Emotion regulation in mindfulness

As previously discussed, existing literature demonstrates a relation between mindfulness and emotionality, specifically that mindfulness is positively correlated with emotion regulation, and reduced reactivity to emotional experiences. In a correlational study, Hill and Updegraff (2012) found that self-reported mindfulness as measured by the FFMQ (Baer et al., 2006) was related to lower levels of self-reported emotion lability and general emotion dysregulation. Other studies have found similar results suggesting that mindfulness is a predictor of emotion regulation (e.g., Sauer et al., 2011).

Further, higher levels of self-reported mindfulness are associated to decreased perceived emotional intensity (Sauer et al., 2011). In a correlational study, Ortner, Kilner, and Zelazo (2007) found that with more experience in mindful meditation (MM) individuals were less affected by emotional interference. These experienced meditators ranged in age from 19 to 71 with 1 month to 29 years of Buddhist-based meditation practice. They completed an emotional

interference task for which they were asked to identify, as quickly as possible, the pitch (high or low) of a tone immediately following either an arousing and emotional picture or a neutral picture. Duration of meditation experience was negatively correlated with interference scores (RT arousing stimuli – RT neutral stimuli), suggesting that increased MM experience is associated with reduced emotional interference and reactivity to emotional stimuli.

The association between mindfulness and emotionality can be observed even following simple manipulations that encourage nonreactivity and focus through breathing techniques. Arch and Craske (2006) used a mindful-breathing induction to show that breathing reduced negative response following exposure to negative stimuli (compared to a no-intervention group). Negative response was measured using self-report affect scales, a behavioral measure of negative stimuli viewing (i.e., length of time), and a physiological measure of heart rate. In a second, experimental, study, Ortner and colleagues (2007) randomly assigned meditation-naïve participants to a MM intervention group, relaxation meditation (RM) only group, or a waitlist control group (WLC). The MM and RM training consisted of a 7-week course, which included 1.5-hour classes and daily meditation practice. Importantly, the RM group focused only on breathing practices encouraging a state of relaxation, while the MM group emphasized specific characteristics of mindfulness such as self-awareness, acceptance, and nonjudgment. These participants completed the same emotional interference tasks outlined above, before and after intervention. Results showed that only those assigned to the MM group demonstrated reduced emotional interference to negative stimuli following intervention as well as a significant decrease in intensity ratings for negative photos. The results again suggest a relation between emotion regulation and mindfulness that are importantly not due to simple relaxation practices.

The existing literature provides support for mindfulness contributing to general emotion regulation. However, thus far, research in this area has focused on mindfulness cultivated by meditation practice or brief mindfulness intervention, and further exploration of this relation using trait mindfulness would provide new insight. Furthermore, few studies have examined mindfulness and emotion in an older adult population. Those studies that have been conducted generally include older adults as part of a larger group of meditators (e.g., Ortner et al., 2007) and have not examined potential age differences. Given the changes in cognitive and emotional abilities that occur with age, including emotion regulation, it is important to examine the potentially unique contributions of mindfulness in this population.

Aging, Emotion, and Mindfulness

Past research on emotion and aging finds that older adults are better emotional regulators than younger adults and demonstrate a preference for processing positive over negative information (Carstensen, Fung, & Charles, 2003). These findings have been widely attributed to Socioemotional Selectivity Theory (Carstensen, Isaacowitz & Charles, 1999), which posits that younger adults are focused on goals that prepare them for the future while older adults are motivated to focus on the present and derive emotional meaning from current life experiences. Carstensen and colleagues (1999) propose these age-related goal differences are due to differences in perception of time; whereas younger adults perceive time as open-ended, older adults perceive time as limited. The tendency for older adults to be more present-focused is hypothesized to result in the findings that they have better regulation abilities, fewer negative emotional experiences, less attachment to negative emotions, and more positive emotional experience (e.g., Carstensen, Mikels & Mather, 2006). This present-focus that occurs with age may be similar to that which occurs in mindfulness and comparable emotional benefits are

reported in both cases. This suggests that in meditation naïve individuals, older adults may be more mindful than younger adults but as of yet no studies have examined this age difference. Further, it suggests the importance of considering age in the link between mindfulness and emotion regulation.

Similar to studies in younger adults, mindfulness has been found to benefit self-reported well-being and emotion regulation in older adults. Some have even gone so far as to theorize that mindfulness may be a fruitful mechanism for supporting successful aging, especially in the realm of emotion (Gallegos, Hoerger, Talbot, Moynihan, & Duberstein, 2013). Following mindfulness-based interventions, older adults demonstrate reductions in self-reported emotional distress and improvement in self-reported emotion regulation. For example, in an experimental study, Turner (2014) examined changes in mindfulness and emotion regulation in older adults following an eight-session mindfulness meditation (MM) training intervention compared to a control group that received nutrition education (NE) training. The MM training intervention consisted of meditation, yoga postures, and breathing exercises, while the NE control training consisted of instruction and education on nutrition. Participants in the MM intervention group showed improved emotion regulation as measured by the General Emotion Dysregulation Measure (GEDM; Newhil et al., 2004) and the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). This provides evidence for mindfulness as a potential mechanism for improving emotion regulation abilities in this population.

To date, very limited research exists on mindfulness and emotion specifically in an older adult population. Further, the existing studies have relied primarily on self-report for measures of emotion regulation, and brief interventions or comparison of long-term and naïve meditators for mindfulness. As previously discussed, the use of mindfulness cultivated by practice can be

difficult to interpret due to inherent biases (e.g., differences in the type and quality of meditation practice) and confounds (e.g., age).

Current Study

The current study explored the association between trait mindfulness and emotion regulation in older and younger adult populations. This study had three overarching goals. First, to extend the literature on trait mindfulness, which has been relatively under-studied thus far. Second, as few studies have examined mindfulness in older adults, we will examine potential age differences in self-reported trait mindfulness as well as correlations between mindfulness and emotion regulation. Third, to our knowledge, few studies have validated the FFMQ facets as specific predictors of behavior. The current study will examine whether specific facets of mindfulness are uniquely correlated to emotion regulation in an attempt to more clearly define the conceptualization and distinctiveness of individual facets of mindfulness.

The current methodology used in the study has several strengths. While previous studies have relied on self-report measures to assess emotion regulation, which are highly subject to biases including demand characteristics and self-presentational concerns, the current study utilized an objective measure of emotion regulation; the Emotional Stroop. Many mindfulness researchers have argued that more studies utilizing objective measures are needed to fully explore the conceptualization of mindfulness and validate the construct (e.g., Davidson & Kaszniak, under review). Another strength is in the use of trait mindfulness as a measure of mindfulness rather than relying on mindfulness developed over a lifetime (i.e., long-term meditators) or via brief interventions. As previously mentioned, there are many biases, confounds, and uncontrolled variability inherent in examining mindfulness via long-term meditators or brief interventions. For example, studies focusing on meditation-based mindfulness

are likely inherently biased by the self-selection associated with individuals who choose to participate in long-term meditation practice. Additionally, age is confounded with long-term practice, as experience and practice come with time. Brief interventions may be less optimal measures for conceptualizing mindfulness as some may argue that these interventions do not actually cultivate the principles of mindfulness that come with lifetime practice. Furthermore, in both cases (long-term meditation and brief interventions) the duration, frequency, and quality of an individual's practice is difficult to control and assess, which leads to difficulties with interpretation. Trait mindfulness, though limited in some ways, addresses many of these issues.

Hypotheses. We hypothesized that older adults will generally show higher levels of trait mindfulness in comparison to younger adults. Second, we predicted that the nonreactivity and nonjudgment facets of the FFMQ would be more highly correlated with emotion regulation, compared to the overall FFMQ total, demonstrating specificity of these scales in their relation to emotion regulation. Specifically, that nonreactivity and nonjudgment would be negatively correlated with reactions to emotional stimuli on an Emotional Stroop task. Finally, that nonreactivity and nonjudgment would be negatively correlated with experience of negative emotion following a negative mood induction.

Methods

Participants

The current study consists of 10 older adult volunteers (mean age = 73.0, SD = 4.37) and 39 younger adults (mean age = 19.41, SD = 2.49) from the University of Arizona. Older adults were local residents of the Tucson area, registered with the Senior Learning Project (SLP) in the Aging and Cognition Lab at the University of Arizona (UA). The SLP is a longitudinal study measuring cognitive changes occurring across the natural aging process. Every two years,

participants of the SLP receive a battery of neuropsychological tests measuring various aspects of cognition, including memory and executive functioning. These data have been collected since 1995 and stored in a large database over the years. Participants for the present study were selected based on whether they had undergone neuropsychological testing in the past 15 months. Younger adult participants were registered in an introductory psychology course at the University of Arizona and received course credit for their participation. Exclusion criteria for participants included traumatic brain injury, loss of consciousness, stroke, neurodegenerative disease (e.g. Alzheimer's disease), neurological disorders, history of drug abuse, psychiatric history (participants with history of anxiety and major depressive disorder were still included), current depression or anxiety disorder, and more than one month of previous meditation experience. To ensure that information regarding these criteria was current, participants were asked a series of general questions regarding their physical and mental health, prior to their participation.

Materials

The following measures were administered to each participant.

The Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). The FFMQ was used as a measure for trait mindfulness. This measure is a questionnaire consisting of 39 items that measure five latent factors that characterize mindfulness. These five factors are describing, observing, acting with awareness, nonreactivity to inner experience, and nonjudgment of inner experience.

The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). The PANAS was used to measure baseline and post-mood induction affect. The PANAS consists of 20 total affect words (e.g. "proud", "angry"): 10 negative and 10 positive. Participants rate the

degree to which they are experiencing each emotion at that current moment on a scale from 1 (not at all) to 5 (extremely). The PANAS is a unique mood questionnaire in that it measures levels of both positive and negative affect, rather than focusing on one or the other. Separate scores for positive and negative affect are calculated by adding the 10 responses for each valence category such that higher scores indicate greater levels of positive and negative affect.

Mood induction. To induce negative mood, participants were exposed to two short film clips. These select film clips have been normed for their level of negative affect, specifically sadness (Dieckman, Zambrano-Vazquez, & Allen, unpublished) and included a 2.5-minute scene of the film *The Champ* and a 2.5-minute scene from the film *Old Yeller*.

Emotional Stroop task. We used an Emotional Stroop task as a measure of emotion regulation. The task consisted of 120 emotional words (40 positive, 40 negative, and 40 neutral) presented in one of four colors (see Appendix A for word list). Participants were asked to identify the correct color of the word as quickly as possible. The Emotional Stroop effect occurs when words that are more related to an individual's mood significantly interfere with naming the color the words are printed in and produce longer reaction times when compared to neutral words (Strauss, Allen, Jorgensen, & Cramer, 2005). Emotional words that produce significant interference are thought to reflect an "attention bias" toward a particular emotion or mood state.

Words were selected from the Warriner, Kuperman, and Bryspaert's (2013) list of over 13,000 words that have all been normed for valence, arousal, and dominance. To obtain norms for each scale, participants rated words using a Likert scale ranging from 1 (unhappy, calm, out of control) to 9 (happy, excited, in control) with 5 (neutral, not excited or calm, not in or out of control) representing the mid-point. For the purposes of the current study, words were chosen

based on valence and arousal norms. The following steps and criteria were used to select words with number of words that met the criteria in parentheses.

1. Valence: words with ratings falling between 1 and 2.5, 4.5 and 5.5, and 7.5 to 9 were selected for the negative, neutral, and positive words, respectively.
2. Valence and age: Words that had within a 0.5 discrepancy between average younger adult and average older adult ratings were selected.
3. Frequency and Familiarity: Words were then matched based on frequency and familiarity in the English language from the MRC psycholinguistics database (Colheart, 1981).
4. Length: A final list of words was generated based on length of each word.

Procedure

Participants gave informed consent upon arrival in the laboratory, before performing any tasks. These individuals then completed a general health questionnaire to ensure their eligibility for the study. Following the health questionnaire assessments for exclusion criteria, participants were asked to complete the first PANAS to assess baseline negative and positive affect prior to the mood induction. Following this, participants were given instructions to complete the mood induction and Emotional Stroop task and the experimenter left the room. Participants then watched the 5 minutes of negative film clips to induce negative mood. Mood induction was followed by a second PANAS as a manipulation check.

After completing the second PANAS, participants completed the Emotional Stroop task, administered at a computer using DMDX, a presentational software that allows the recording of reaction times. Participants were informed that they would see words; presented on the screen one at a time, in one of four colors (red, blue, green, or yellow). They were told that their task was to press, as quickly as possible, the button on the keyboard that corresponded to the color of

ink seen on the screen. For this task, we used buttons on the keyboard and each button had a colored square that corresponded to one of the four ink colors. The program advanced to the next word once the participant responded but if no response was detected, the program would automatically move on after 3000ms. An inter-stimulus interval of 500ms was used between word presentations. The Emotional Stroop task began with four practice trials in order to familiarize participants with the procedure. The practice trials consisted of only neutral words and provided correct/incorrect feedback. Following completion of the practice trials, participants began the task. Neutral, negative, and positive words were randomly presented using DMDX scramble programming (i.e. a different order for every participant).

Following the Emotional Stroop task, participants completed a third PANAS to assess changes in negative and positive affect over time (i.e. affective recovery). Once this third PANAS was completed, participants were instructed to notify the experimenter, who rejoined the participant to complete the remainder of testing. Participants then completed a brief personality questionnaire, the Ten Item Personality Inventory (TIPI). Following this, they were asked to complete a Familiarity with Meditation Questionnaire to briefly describe any previous meditation experience. Participants then completed a fourth and final PANAS assessment to obtain a final measure of affective recovery. The session lasted approximately one hour and took place in the Evelyn F. McKnight Brain Institute at the UA.

Measures

Mindfulness: Mindfulness scores were calculated using responses on the FFMQ. We calculated the score for each of the five factors by summing all of the items that loaded on each factor (reverse scoring where appropriate), such that higher scores indicated greater mindful tendencies. A total mindfulness score was also calculated from all 39-item responses.

Emotional Regulation: We calculated two measures of emotion regulation: one involving the Emotional Stroop task and one using the PANAS.

To obtain a measure of emotional regulation on the Emotional Stroop task, we subtracted the average reaction time (RT) of neutral words from the average RT of negative words. For example, if the average RT of neutral words was 750ms and the average RT of negative words was 850ms then the difference would be +100ms. In this way, greater discrepancies between the conditions produced higher numerical values while the direction of the difference (positive or negative) indicated whether the participant's neutral or negative RTs were longer. As participants completed the Emotional Stroop task after a negative mood induction, we would expect participants to show positive discrepancies suggesting preoccupation with negative affect and mood.

The second measure of emotional regulation was calculated from the change scores on the PANAS using the first PANAS as a baseline and the second PANAS as the change following mood induction. We calculated change scores by first subtracting negative from positive affect scores on the first and second PANAS to obtain one affective value score for each PANAS time point that encompassed both positive and negative. We then subtracted the affective value score on the second PANAS from the first PANAS to obtain an affective change score. Low affective change scores indicated little affective change across time points while high scores indicated great affective change. For example, if a participant scored 35 and 10 on the positive and negative affect scales, respectively, on the first PANAS and scored 22 and 21 on the positive and negative scales, respectively, on the second PANAS, their affective value scores would be 25 and 1, respectively. We would then subtract 1 from 25 to obtain an affective change score of 24.

Results

Participant demographics

Independent samples *t*-tests showed that older adults were significantly older, $t(47) = 52.01, p < .001$, and had significantly higher education, $t(47) = 10.43, p < .001$, compared to younger adults. Older and younger adult groups had comparable sex distributions but the younger adult group was more racially diverse. Participant demographics are presented in Table 1.

Main analyses

An independent samples *t*-test showed age-group differences in trait mindfulness such that older adults reported significantly higher levels of overall mindfulness compared to younger adults, $t(47) = 3.73, p = .001$. We then conducted follow up exploratory analyses to examine age-group differences in the specific facets of mindfulness. Independent samples *t*-tests showed that older adults scored significantly higher specifically on the describe, $t(47) = 2.49, p = .016$, act with awareness, $t(47) = 2.53, p = .015$, nonreactivity, $t(47) = 2.32, p = .025$, and nonjudgment, $t(47) = 3.10, p = .003$, facets but only the nonjudgment facet was significant after Bonferroni correction ($\alpha' = .01[.05/5]$). FFMQ data are presented in Table 1.

We used Pearson's bivariate correlations to examine the hypothesis that the nonjudgment and nonreactivity facets of the FFMQ are better correlated with measures of emotion regulation than total FFMQ score. We correlated the nonjudgment, nonreactivity, and total FFMQ score with the Emotional Stroop and PANAS change scores, in both older and younger adults. For older adults, the pattern of the correlation between the nonjudgment facet of the FFMQ and PANAS change score suggested a negative association however, it was not significant, $r = -.55, p = .10$. No other correlations were significant or suggested any pattern of association for older

or younger adults. The scatterplots for the association between PANAS change score and nonreactivity and nonjudgment facets are shown in Figures 1 and 2 for both older and younger adults. The scatterplots for the association between the Emotional Stroop and nonreactivity and nonjudgment are shown in Figures 3 and 4 for both older and younger adults. Pearson correlations are presented in Tables 2 (older adults) and 3 (younger adults).

Follow-up analyses

From the scatter plots it appeared that older adults might have an overall higher PANAS change score compared to younger adults, suggesting overall poorer emotion regulation ability (regardless of FFMQ scores). However, when we conducted an independent *t*-test to compare older ($M=11.80$, $SD=5.22$) and younger adults ($M=7.44$, $SD=7.84$) on their average PANAS change score, there was no difference between groups, $t(47) = 1.66$, $p = .101$.

To verify that the emotional regulation tasks worked, we performed a manipulation check for both the mood induction and the Emotional Stroop task. We performed a 2 (group: older, younger) \times 2 (time: pre mood induction, post mood induction) mixed model ANOVA with the difference between positive and negative affect scales on the PANAS as the dependent variable. There was a main effect of time, $F(1,47) = 53.63$, $p < .001$, $\eta^2 = .53$, and group, $F(1, 47) = 25.47$, $p < .001$, $\eta^2 = .35$, but the time by group interaction was not significant, $F(1, 47) = 2.76$, $p = .103$. Consistent with the manipulation, negative affect increased and positive affect decreased, demonstrated by a smaller affective difference score, following the mood induction ($M_{pre} = 18.22$, $SD_{pre} = 1.60$; $M_{post} = 8.64$, $SD_{post} = 1.64$), $t(48) = 7.73$, $p < .001$. In addition, older adults reported more positive and less negative affect ($M=20.90$, $SD=2.65$) compared to younger adults ($M=6.03$, $SD=1.34$) across both time points.

As a manipulation check for the Emotional Stroop we used a 2 (group: older, younger) x 2 (valence: negative, neutral) mixed model ANOVA. Contrary to expectation, there was no main effect of valence, $F(1, 44) = .432, p = .52$, suggesting there was no Emotional Stroop effect. The main effect of group was significant, $F(1, 44) = 26.48, p < .001, \eta^2 = .38$, such that older adults ($M=752, SD=40$) were slower than younger adults ($M=719, SD=21$). The valence by group interaction was not significant $F(1, 44) = .120, p = .73$.

Discussion

The aim of the current study was to explore age differences in levels of trait mindfulness and to examine the relation between specific facets of trait mindfulness and emotion regulation, specifically in an older population, and. As expected, older adults reported higher levels of trait mindfulness compared to younger adults, especially on the nonjudgment facet. Contrary to expectation, we did not find significant correlations between specific facets of mindfulness (i.e. nonreactivity and nonjudgment) and measures of emotion regulation in either older or younger adults. However, the pattern of the association between nonjudgment and affect change following negative mood induction suggested that higher levels of nonjudgment may be associated with better emotion regulation in older adults but not younger adults.

We found that older adults scored higher on the FFMQ than younger adults, suggesting that older adults are, on average, more mindful than younger adults. Furthermore, exploratory analyses showed that older adults scored significantly higher than younger adults in the nonjudgment facet, specifically. These findings suggest mindfulness as a potential factor of the positivity bias found in older adults. The use of meditation naïve individuals also provides support for trait mindfulness existing as an important construct outside of mindful meditation practice. Furthermore, the nonjudgment scale specifically is important for self-acceptance and

emotion regulation (Baer et al., 2006), and our findings provide support for this particular facet of mindfulness as a factor for the improved emotion regulation abilities discussed in Socioemotional Selectivity Theory. In other words, high levels of trait mindfulness and specifically nonjudgment in older adults might explain the present-focused perspective and reduced negative emotional experiences found in later life.

Our second hypothesis was that individuals who scored higher in emotion related facets of mindfulness (i.e. nonreactivity and nonjudgment) would be less affected by negative stimuli on the Emotional Stroop task and less effected by negative mood induction. None of the correlations were significant, but older adults showed a pattern suggesting that higher levels of nonjudgment are associated with better emotion regulation following a negative mood induction. Though underpowered and non-significant, these results potentially suggest an association between the individual facet of nonjudgment and emotion regulation abilities, at least in older adults. This potential association could suggest that the self-accepting nature of the nonjudgment facet of mindfulness might explain improved emotion regulation abilities found in later life (i.e. positivity bias, Socioemotional Selectivity Theory), given that the nonjudgment facet involves openness and acceptance toward internal experiences (Baer et al., 2006). Based on our results, we might expect that individuals who show higher levels of nonjudgment would be less affected by negative experiences and life events, observing negative emotions without judgment and without rumination or self-pity (Baer et al., 2006). Further, although our interpretation of these results is limited, the specificity of the nonjudgment facet warrants further exploration of the conceptual diversity of individual facets of mindfulness.

Although one of our emotion regulation measures worked as intended (i.e., the negative mood induction), the manipulation check for the Emotional Stroop showed that there was no

effect for this task. Thus, it is not surprising that we did not find even a pattern of results suggesting an association could exist given sufficient power. In addition, we conducted a follow-up correlational analysis between change scores on the PANAS following negative mood induction and the Emotional Stroop task to examine the impact of mood induction on the Emotional Stroop. Based on Strauss and colleagues (2005) work, as well as others, we would expect that the more impacted an individual is by the mood induction, the slower their reaction times on the the negative emotion words of the Emotional Stroop. However, there was no association, $t(46) = -.057, p = .701$, providing additional evidence suggesting that the Emotional Stroop task did not work as intended.

Limitations

Our small sample size and failure to elicit the Emotional Stroop effect limit interpretation of the correlational data for this study. Due to the small sample size, our results were underpowered and it is difficult to draw meaningful assertions from the data. Finally, it is possible that the film clips used for negative mood induction may have had differential impact on participants based on age. The clips used were from films that originally showed in 1957 (Old Yeller) and 1979 (The Champ) and therefore they may have contained additional context and meaning (e.g., nostalgia) for older adults compared to younger adults.

Conclusions and Future Study

Although most of our results were not significant, our findings suggest that older adults are more mindful than younger adults, particularly in emotion relevant facets of mindfulness (i.e. nonjudgment) and this may have implications for the positivity bias in aging. Further studies are needed to explore this association. One important direction might be the further development and improvement of the Emotional Stroop task to fully examine the association between emotion-

related facets of mindfulness and objective measures of emotion regulation. Additionally, future studies using a larger sample size are needed to further explore the potential association between the nonjudgment facet of mindfulness and emotion regulation. Finally, preliminary findings for significantly high scores in one specific facet of mindfulness in older adults suggest an important direction for further examination of the individual facets of mindfulness within this population.

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Table 1. Demographics and FFMQ Scores

	Older adults (N=10)	Younger adults (N=39)	
	Mean (SD)	Mean (SD)	<i>p</i>
Age (years)	73.0 (4.37)	19.41 (2.49)	<.001
Gender [female]	50%	51%	
Race/Ethnicity	90% Caucasian 10% Biracial	69% Caucasian 5% Biracial 8% African American 8% Asian American 2% American Indian 8% Other	
Education	17.6 (2.22)	13.13 (.80)	<.001
Total FFMQ	150.40 (17.38)	128.26 (16.58)	.001
Describe	31.4 (5.21)	26.7 (5.29)	.016
Observe	27.4 (4.97)	25.0 (4.67)	.159
Act with Awareness	31.5 (5.74)	26.1 (6.07)	.015
Non-reactivity	25.0 (4.90)	20.87 (5.05)	.025
Non-judgement	35.1 (3.73)	29.5 (5.33)	.003 *

Note. * = Significant after Bonferroni correction ($\alpha' = .01[.05/5]$) for analysis of five individual scales of FFMQ

Table 2. Correlations between FFMQ facets and performance on the Emotional Stroop and PANAS change scores for Older Adults

	1	2	3	4	5
(1) Emo Stroop difference	--	0.05(.90)	0.35(.33)	0.07(.86)	0.10(.79)
(2) PANAS total change score		--	0.12(.75)	-0.55(.10)	-0.09(.81)
(3) FFMQ Nr			--	0.57(.08)	.82(.00)
(4) FFMQ Nj				--	0.61(.06)
(5) FFMQ total					--

Note. Pearson correlation (sig.)

Table 3. Correlations between FFMQ facets and performance on the Emotional Stroop and PANAS change scores for Younger Adults

	1	2	3	4	5
(1) Emo Stroop difference	--	-0.10(.56)	-0.21(.22)	0.09(.60)	-0.09(.58)
(2) PANAS total change score		--	0.02(.91)	-0.09(.60)	0.05(.76)
(3) FFMQ Nr			--	0.10(.56)	.65(.00)
(4) FFMQ Nj				--	.60(.00)
(5) FFMQ total					--

Note. Pearson correlation (sig.)

List of Figures.

Figure 1. Scatterplot of nonreactivity facet for the FFMQ and PANAS change scores following mood induction for older and younger adults.

Figure 2. Scatterplot of nonjudgment facet of the FFMQ and PANAS change scores following mood induction for older and younger adults.

Figure 3. Scatterplot for nonreactivity facet of the FFMQ and Emotional Stroop difference scores for older and younger adults.

Figure 4. Scatterplot for nonjudgment facet of the FFMQ and Emotional Stroop difference scores for older and younger adults.

Figure 1.

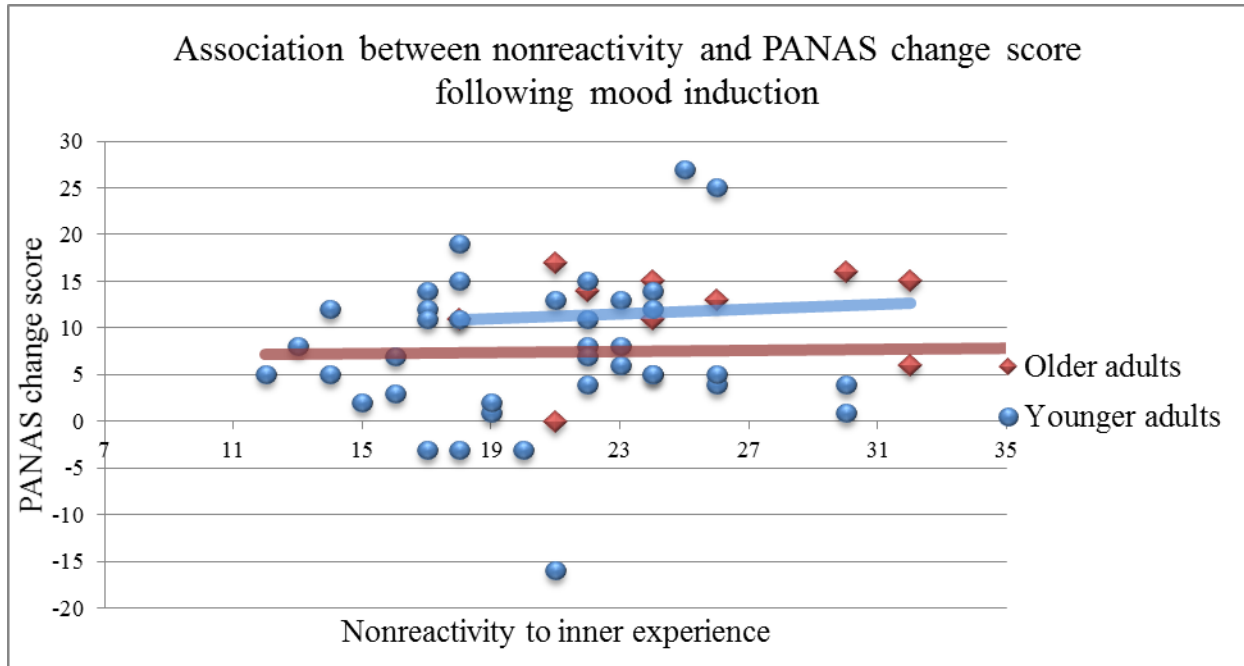


Figure 2.

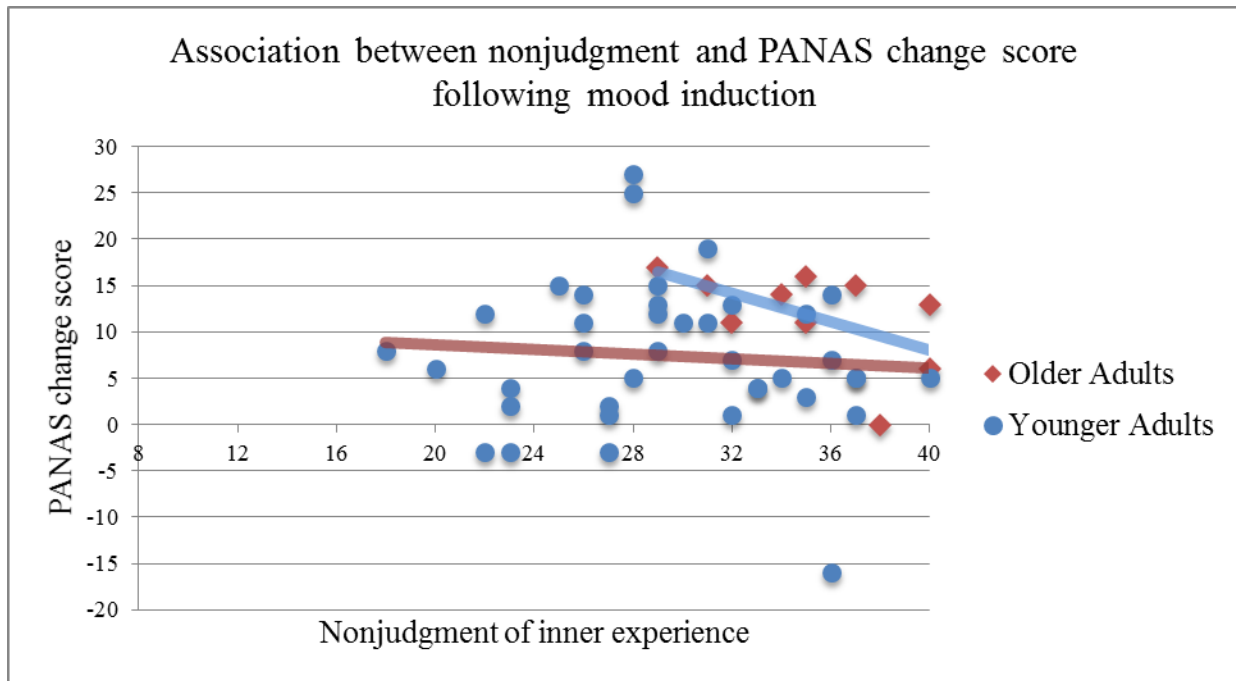


Figure 3.

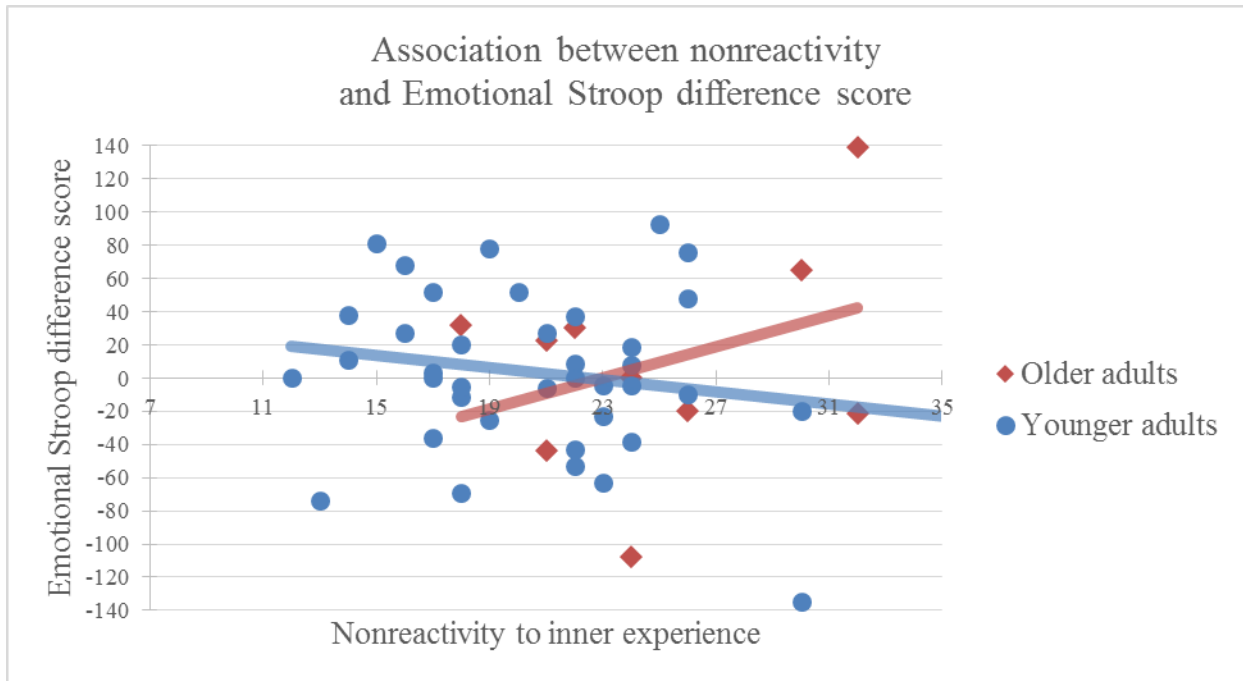
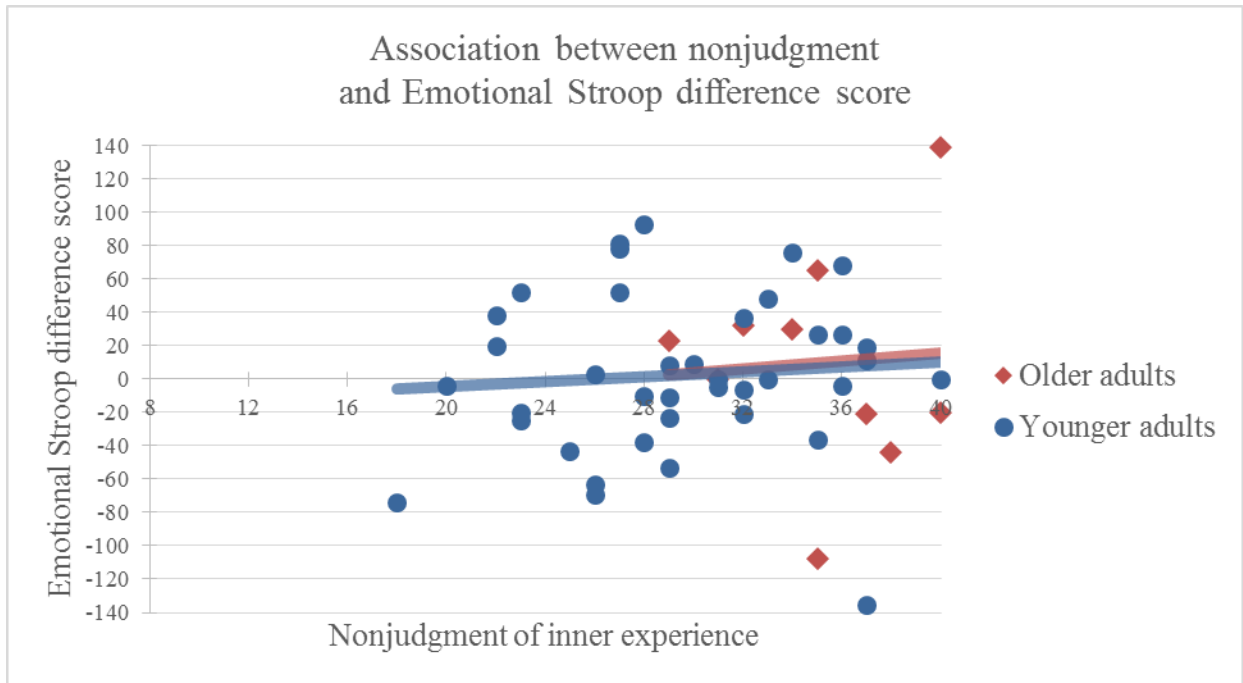


Figure 4.



Appendix A. Emotional Stroop Words

Positive words	Negative words	Neutral words
happy	lifeless	cupboard
fun	suffer	button
enjoyment	grief	stick
happiness	kidnapper	grounding
lovable	torture	slicker
free	rape	pail
hug	die	fig
magical	disease	dynasty
joy	sad	cow
joyful	homicide	preserve
relaxing	unhappy	academy
sunshine	abuse	suede
excited	wreck	panel
bonus	murder	eleven
comedy	starvation	microphone
courageous	unhappiness	correlation
celebration	hopeless	civilian
love	mourning	backseat
relaxation	parasite	promoter
giggle	assassination	mathematician
exciting	nausea	cement
faithful	worthless	detection
talented	loneliness	spokesman
wisdom	manslaughter	anthropology
compassion	harm	chin
companionship	killer	rating
good	tragedy	pointer
joke	illness	ceiling
excellence	hate	boot
grin	virus	steam
award	stress	second
bliss	deadly	dodger
awesome	death	habit
winnings	massacre	mainland
friendly	murderer	scissors
sweetheart	infidelity	insulation
laugh	hateful	fashion
euphoric	dead	heed
blissful	mistrust	industry
kind	misery	poster