1-1-2013

Anger Expression: Evaluating The Construct Validity Of Several Emotion Regulation Measures

Matthew James Jasinski
Wayne State University,

ANGER EXPRESSION: EVALUATING THE CONSTRUCT VALIDITY OF SEVERAL EMOTION REGULATION MEASURES

by

MATTHEW J. JASINSKI

THESIS

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

MASTER OF ARTS

2013

MAJOR: PSYCHOLOGY (Clinical)

Approved By:

_____

Advisor Date

ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Mark Lumley, for his guidance and support through this project and my professional development, and Dr. John Burns for including me on this project. I would also like to thank Deb Latsch, the project coordinator, and research assistants, especially Brett Ankawi, whose excellent organization and hard work allowed me to finish this study. Finally, I would like to thank my wife Sarah, and family and friends for their unwavering support, patience and kind words, which have been instrumental in the completion of this thesis.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

INTRODUCTION

Emotional Expression

Emotional expression has long been studied as an important aspect of human functioning. For example, over 140 years ago, Darwin (1872) addressed the evolutionary adaptation of emotional expression in humans and animals. In recent decades, researchers have refined methods to examine the expression of specific emotions in detail, including coding very subtle differential facial expressions (Ekman & Friesen, 1977). In addition, interventions involving emotional expression have been developed and tested (Greenberg, Wortman, & Stone, 1996; Pennebaker, 1997; Smyth, 1998). Research on emotional expression has become more sophisticated, resulting in specific constructs related to the larger concept of emotion regulation. For example, the constructs of emotional avoidance and confrontation, emotional coping strategies, and the expressivity of individual emotions such as happiness, sadness, and disgust have been studied in recent years (Feldner, Zvolensky, Eifert, & Spira, 2003; Gross, 1998). In this study, the constructs of anger expression, alexithymia, and ambivalence over emotional expression are of particular interest. The following section will review these constructs and their importance.

Emotional Expression Constructs

Research has shown that there is an association between anger and both cardiovascular problems and pain. Anger is correlated with increased heart rate (Rohrmann, Bechtoldt, Hopp, Hodapp, & Zapf, 2011), cardiovascular disease (Suls & Bunde, 2005) including coronary heart disease (Diamond, 1982), and cancer (Deffenbacher & Sabadell, 1992). This research suggests

that anger may have a larger effect than other negative emotions in eliciting physiological arousal and pain.

Yet, the intensity or frequency of anger may be less important to health than how anger is regulated. For example, individuals who suppress anger have higher blood pressure than those who do not suppress (Harburg et al., 1973; Harburg, Blakelock, & Roeper, 1979). Johnson (1984) found that high school students who hold their anger in had higher blood pressure than those who do not, even after controlling for social and demographic variables. Other studies have shown that anger suppression predicts pain. Quartana and colleagues (2007) found that patients with chronic pain are more likely than healthy people to suppress their anger. The converse also appears true, with positive effects of expressing otherwise suppressed emotions, including anger. These benefits have been demonstrated in populations of people with rheumatoid arthritis (Kelley, Lumley, & Leisen, 1997; Smyth et al., 1999), fibromyalgia (Broderick, Junghaenel, & Schwartz, 2005; Gillis et al., 2006), and chronic pelvic pain (Norman, Lumley, Dooley, & Diamond, 2004). Furthermore, specific types of emotional expression such as swearing and powerful posturing help increase pain tolerance (Bohns & Wiltermurth, 2012; Stephens, Atkins, & Kingston, 2009).

Ambivalence over emotional expression is defined as a generalized conflict over whether or not to express one's emotions. Difficulty in this regard can lead to both intrapsychic and situational distress (King & Emmons, 1990). Ambivalence over emotional expression has been linked to restrictive psychopathology in eating disorders (Quinton & Wagner, 2005) as well as pain and poor quality of life in people with gastrointestinal cancer (Porter, Keefe, Lipkus, & Hurwitz, 2005). Ambivalence has also been shown to be an important moderator between emotional therapy and physical health outcomes, such that people who are high in ambivalence

display the most benefit from a type of therapy that facilitates emotional expression (Norman et al., 2004).

Alexithymia is a construct that can be described as having difficulty using language to express one's emotions. There are several facets that are theorized to be part of the alexithymia construct, including difficulty identifying and describing feelings, a deficit in imaginal ability, and a tendency for externally oriented thought or cognition. Alexithymia has been hypothesized as a risk factor for both mental and physical disorders (Taylor, Bagby, & Parker, 1997). Specifically, research has shown that alexithymia is related to chronic pain, illness behavior, symptom unawareness, drug dependence, and eating disorders (Lumley, 2004).

Validation of Measures of Emotion Regulation and Expression

Reliable and valid measurement tools are critical to the accuracy and utility of ongoing research and clinical practice. Several questionnaires have been designed to assess anger expression and suppression, emotional ambivalence, and alexithymia.

Anger Expression Inventory

The most widely used measure for determining individuals' anger expression styles is the Anger Expression Inventory (AEI) section of the State Trait Anger Expression Inventory (STAXI; Spielberger, et al., 1985). The AEI (Spielberger, Krasner, & Solomon, 1988), was designed to differentiate between how much anger people experience and how much they actually express, and is composed of two subscales. The Anger-In subscale measures individual differences in how frequently angry feelings are held in or suppressed. The Anger-Out subscale measures individual differences in the degree to which angry feelings are expressed outwardly to other people or the environment.

Anger expression styles have been assessed using predominantly self-report measures, and therefore most validation evidence for the AEI relies on correlations with measures using that methodology (Eckhardt, Norlander, & Deffenbacher, 2004). Initial validation efforts showed moderate correlations between Anger-Out and trait anger, and small correlations between Anger-In and self-reported trait anger; as expected, none of the subscales were significantly associated with the trait anxiety scale from the State-Trait Personality Inventory (Spielberger et al., 1988), suggesting discriminant validity. Steptoe, Cropley, Griffith, and Kirschbaum (2000) found that Anger-In levels were higher in self-reported high job strain groups than in low ones. Anger-In has also been shown to correlate positively with self-reports of negative emotions, damaged friendships, fights, and self-harm (Deffenbacher, Oetting, Lynch & Morris, 1996). These hypothesized relationships provide some evidence of both convergent and discriminant validity of the AEI. However, the methodology used in these studies provides only weak validation. Correlating questionnaires with other questionnaires can result in associations due to both shared method variance and various response biases.

Although most studies of the AEI examine its correlations with other self-report measures, there also have been some studies that have related the AEI to non-self-report criterion measures. A few studies found that AEI subscales were correlated with physiological measures such as blood pressure, heart rate, and cortisol levels (Everson, Goldberg, Kapnlan, Julkunen, & Salonen, 1998; Keltikangas-Jarvinen, Raikkonen, & Hautanen, 1996; Larson & Langer, 1997). However, Steptoe et al. (2000) found no relationship between cortisol and the anger expression subscales. One unique study found that assaults in a psychiatric inpatient population were moderately positively correlated with Anger-Out and slightly positively correlated with Anger-In (Novaco & Taylor, 2004). Several other laboratory-based studies correlated the AEI with

behavioral measures of hostility and aggression. For example, three different studies found that the AEI subscales were related, as hypothesized, to the number of shocks that participants administered to other people when treated poorly by them (Parrot & Giancola, 2004; Verona, 2005; Verona, Patrick, & Lang, 2002). An additional advantage of these three studies is that they all involved provoking anger in their participants in some manner in order to record live data on the expression of the emotion. However, although these studies provide data about the predictive validity of the AEI for interpersonal hostility and aggression, these studies did not assess facial or verbal aspects of anger expression.

The next group of studies provides further evidence for the construct validity of the AEI. These studies also provoked realistic anger, but additionally provided correlations of the AEI along with measures of angry language and facial expressions. For example, Parrott, Zeichner, and Stephens (2003) provoked intoxicated participants and found a significant relationship between Anger-Out and angry facial expressions, which were coded using the Facial Action Coding System (Ekman & Friesen, 1977). A series of studies utilized both the AEI as well as behavioral measures of anger using the Articulated Thoughts in Simulation Situations (ATSS) paradigm (Davison, Feldman, & Osborn, 1984). These studies (Barbour, Eckhardt, Davison, & Kassinove, 1998; Eckhardt, Barbour, & Davison, 1998; Eckhardt & Jamison, 2002) first generated real feelings of anger in men with histories of violence by showing them tapes of provocative scenarios, such as their wives flirting with other men. These sessions were then videotaped and coded for anger, annoyance, and physical and verbal aggression. Results showed that Anger-Out was positively correlated with ATSS coded anger, but Anger-In was not significantly correlated with any of the four ATSS anger constructs (Barbour et al., 1998). These studies provide the most sophisticated validation evidence to date for the AEI.

In summary, much of the validation evidence for the AEI relies on its correlations with other self-report measures. However, shared method variance likely contributes a substantial proportion of the correlation between these measures, which means that these studies are insufficient to fully establish the validity of the AEI (Lindell & Whitney, 2001). Furthermore, these measures of holding anger in are moderately correlated with negative affect, meaning that the influence of negative affect might explain a significant portion of the variance between anger suppression and the outcome variable. Thus, studies using these self-report measures do not present the relationship between holding anger in and other constructs beyond the effects of negative affect (Gotlib, 1984; Rowlison & Felner, 1988).

Even the studies that did not rely on self-report criterion measures have limitations as well. For example, in the studies that have shown the AEI to be correlated with physiological arousal (Everson et al., 1998; Keltikangas-Jarvinen et al., 1996; Larson et al., 1997), there is no way of knowing whether that arousal is the result of anger or some other emotion such as anxiety. Furthermore, it is also important that all forms of emotional expression be evaluated, including both direct verbal communication and nonverbal communication such as facial expressions, body language, and paralinguistics. One of the limitations of the studies of Barbour and Eckhardt (Barbour et al., 1998; Eckhardt et al., 1998; Eckhardt, 2002) is that they do not take nonverbal communication into account, thus leading to missing data that might affect the reliability and validity of the results.

Though the AEI is widely used, it has not been validated in the most optimal way. Overall, there is a lack of research on coding the suppression of anger by people actively experiencing anger in a controlled research setting. More specifically, no study has ever tested how the AEI predicts behavioral ratings of anger and anger expression that have been coded to

incorporate both verbal and nonverbal anger displays. The result of this is that researchers cannot be entirely sure if the AEI measures what it purports to measure. Further validation of the AEI is necessary in order to improve its interpretation in research.

Ambivalence of Emotional Expression Questionnaire (AEQ)

One measure designed to assess this construct is the Ambivalence over Emotional Expression Questionnaire (AEQ; King & Emmons, 1990), which was published in the same article that introduced this construct to the literature. The AEQ assesses ambivalence over the expression of two components: entitlement (anger) and positive emotions.

Validation efforts during the initial development of the scale involved correlations between the AEQ and other self-report measures. King and Emmons (1990) found that the AEQ was negatively correlated with social desirability, meaning that the latter could be a confound variable. Convergent validity was found with a positive correlation between the AEQ and the Raulin I-A scale (Raulin, 1984), another self-report scale that taps into ambivalence. The authors did use other data collection methods on emotional expression for comparison as well. As hypothesized, they showed that the AEQ was negatively correlated with peer reports of emotional expressiveness. These correlations with the Raulin I-A and peer expressiveness ratings are the only examples in which the authors compared the AEQ to any other measure of ambivalence or expression. No other studies have examined the construct validity of the AEQ in order to determine whether the measure actually assesses either ambivalence or reduced emotional expression.

Researchers have correlated the AEQ with other self-reported variables as well. For example, the AEQ has a moderate positive correlation with negative affect and depression, which suggests some problems with discriminant validity. Additionally, several studies have

examined health correlates of the AEQ (Norman et al., 2004; Porter et al., 2005; Quinton & Wagner, 2005). In these studies, ambivalence was associated with pain, disability in chronic pain patients, and maladaptive eating behaviors. Only one study of criterion-oriented validity of the AEQ has related it to non-self-report criterion measures. In this study, the AEQ was shown to be negatively correlated with the frequency of emotion episodes recorded in a daily diary (Gross, 2002).

However, none of the above criterion measures tap into the specific construct of emotional ambivalence. As explained earlier, validation based on correlations between self-report measures is insufficient because of the confounding influence of shared method variance and underlying constructs such as negative affect. Furthermore, reliance on correlations with peer reports also has major flaws because the peers may be reporting emotional expressiveness in general, as opposed to actually witnessing the participants express their emotions in present time. In conclusion, compared to the AEI, the amount of scientific evidence about the construct validity of the AEQ is minimal. Critically, there are no examples in the literature involving the relationship between the AEQ and any realistic "in vivo" emotional expression data. Clearly, further validation of the ability of the AEQ to predict reduced emotional expression is needed.

Toronto Alexithymia Scale - 20 (TAS-20)

The most popular measure of alexithymia is the TAS-20, which contains three subscales: difficulty identifying feelings (DIF), difficulty describing feelings (DDF), and externally oriented thinking (EOT). The difficulty describing feelings subscale appears to be the most related to the outward expression of emotions and, therefore, should be most predictive of for behavioral coding of emotion expression. Therefore, I will discuss the validation evidence for this subscale in addition to the TAS-20 total score.

As with the AEI and AEQ, most validation studies for the TAS-20 examine its relationships with other self-report measures. During initial development, the full TAS-20 and all three subscales were shown to correlate strongly and negatively with the Need for Cognition Scale (short form) (Cacioppo, Petty, & Kao, 1984) the Psychological Mindedness Scale (Conte et al., 1990, 1995), and the Affective Orientation Scale (Booth-Butterfield & Booth-Butterfield, 1990), which are measures of emotional intelligence, awareness of affects, and affective communication. The TAS-20 also correlates negatively with the Openness to experience and positively with Neuroticism and Introversion dimensions of the NEO Personality Inventory, but not with either Agreeableness or Conscientiousness, thus demonstrating discriminant validity (Costa & McCrae, 1985). All of these results are consistent with the theoretical relationships between alexithymia and the other constructs (Bagby et al., 1994), but the reliance on correlations with other self-report measures limits conclusions about validity.

Several experimental studies have gone beyond self-report comparisons by relating scores on the TAS-20 with lexical decision tasks using emotion words as well as the Stroop paradigm studies (Lundh & Simonsson-Sarnecki, 2001; Parker, Taylor, & Bagby, 1993). These studies suggests that higher TAS-20 scores are related to slower processing of emotion words, which is consistent with the deficits in emotional awareness and processing present in alexithymia. Roedema and Simons (1999) also found that individuals who scored high on the TAS-20 produced fewer emotion-related words in their reactions to emotion-eliciting slides that were presented to them. Luminet, Rime, Bagby, and Taylor (2004) conducted a multimodal investigation of emotional responding as it related to alexithymia among a group of senior citizens. Similar to the above studies, the authors found that the difficulty describing feelings subscale of the TAS-20 was negatively correlated with the number of emotion words used during

the verbalized emotional reaction task that followed the viewing of an emotionally stimulating film. A study by Tull, Medaglia, and Roemer (2005) provided more convergent validity for the TAS-20 by examining its relationship with emotional verbalizations produced by participants. In general, individuals with high overall TAS-20 scores used lower frequency and fewer different positive emotion words when speaking about a personally experienced distressing event. Lumley, Gustavson, Partridge, and Labouive-Vief (2005) also found relatively low correlations between the TAS-20 and observer-reported alexithymia, interviewer-rated alexithymia, emotional awareness in response to vignettes, and emotional intelligence test performance. Although these studies improve upon the validation methodology, their reliance on college student populations and verbal expression coding limits the generalizability of their results.

There are several limitations to these studies that are relevant to the current investigation of the validity of the TAS-20. First, much of the validation evidence for the TAS-20 has been provided by its correlations with other self-report measures. Second, with the exception of Luminet et al. (2004) study, most of the research with the TAS-20 has been done using undergraduate students as participants, and it is unclear how well the findings from these studies generalize to the population at large, or to clinical populations. Third, the validation using emotional coding has relied on computer linguistic analysis measuring the frequency of emotional word use, but has not investigated nonverbal emotional expression. Finally, there is conflicting evidence about the construct validity of the TAS-20. For example, Leising (2009) coded videos of the emotional expressions of participants who were interviewed about their interpersonal relationships, and completed a checklist of which emotions were expressed (Clinical Emotions List; Leising, Rudolf, & Grande, 2004). Contrary to expectations, the authors found that participants with higher TAS-20 scores displayed more overall emotions as well as a

wider range of emotions. Further research on the construct validity of the TAS-20 is necessary to resolve this conflict.

Limitations of the Literature and Goals of this Study

There are several recurring limitations in the previous studies that raise questions about the validity of the AEI, AEQ, and TAS-20 to predict emotional expression. First, most validation studies rely on correlations with other self-report measures, which is a methodology notorious for the confounding effects of shared methods variance and response biases, such as negative affect. Second, although some other studies eliminate these concerns by using non-self-report criteria, measures of these criteria are typically not part of the constructs of interest. Third, some studies involve the participants reminiscing about times they felt emotional, instead of actually experiencing an emotion in a controlled setting. Studies like this lack ecological validity because the participants are not truly experiencing the emotion of interest. Finally, even the most relevant validation studies thus far have used only transcripts of emotional expression, but not direct observation of nonverbal expression. Therefore, there is a need to advance the literature by utilizing more sophisticated methods of validation.

This study sought to evaluate the construct validity of the AEI, AEQ, and TAS-20 by examining how these measures predict actual emotional expression assessed during an anger-eliciting laboratory experience. It also examined whether experimenter guidance / facilitation of anger expression influenced the validity of these measures. The behavioral coding of in vivo emotional expression is the most direct and ecologically valid way to tap into the construct, and improves on the previous research.

In this study, we examined adults who have chronic low back pain. This is a relevant population because anger expression and suppression seems to have implications for pain (Burns

et al., 2008; Quartana & Burns, 2007). Participants completed the AEI, AEQ, and TAS-20 as baseline measures. Then confederates provoked the participants to experience anger during a staged task, and participants were given a chance to express their feelings about the task and their partner, either while guided / facilitated by the experimenter or not guided. Participants' performance was videotaped so that their verbal and non-verbal expressions could be recorded, coded, and analyzed by linguistic analysis software to determine the frequency and amount of anger words they use. In addition to computerized linguistic analysis, their emotional expression was rated by trained judges for quality and quantity of anger expression and nervous affect in three different categories: linguistics, paralinguistics, and motor / muscular expressions.

The main goal of this study was to test the validity of emotion expression measures to predict actual anger expression during the maze task, as coded by our raters. This study also examined the baseline measures' correlations with the actual amount of nervous affect displayed during the maze task, to test the measures' divergent validity. Additionally, this study examined the question of whether the predictive validity of the baseline measure differs depending on whether or not the actual anger is expressed in a facilitated / guided manner or undirected / unguided manner. Finally, the influence of potential confound variables was also analyzed.

I hypothesized the following relationships:

(1) Anger-Out would correlate positively with anger expression, and negatively with nervous affect.

(2) Anger-In, the AEQ (and subscales), and the TAS-20 (and subscales) were expected to correlate negatively with anger expression, and positively with nervous affect. The difficulty describing feelings subscale of the TAS-20 in particular was hypothesized to have

correlations in the same direction as the TAS-20 total scale, but with a stronger magnitude than the total score with the verbal expression components.

(3) Condition assignment (guided vs. unguided expression) was expected to moderate the relationship between the AEQ and anger expression, such that these two measures would be negatively related for the unguided expression condition, but unrelated for the guided condition. The rationale for this is that the guided expression protocol was expected to override the baseline or natural participants' emotional ambivalence, and nullify its expected inverse relationship with emotional expression.

CHAPTER 2

METHOD

Participants

We recruited adults with chronic lower back pain from the Detroit metropolitan area as part of a larger experimental study. Flyers were distributed to local pain clinics, and physician co-investigators working at these clinics aided in recruitment as well. Study inclusion criteria were: a) musculoskeletal pain of the lower back stemming from muscular or ligamentous strain; or from degenerative disk disease, spinal stenosis, or disk herniation; b) the low back was the patient's primary pain complaint; c) pain duration of at least 6 months; d) age between 18 and 69 years. Study exclusion criteria were: a) medical conditions that could put participants at risk from anger induction (such as cardiac disease or uncontrolled hypertension); b) current alcohol or substance dependence; c) any current, untreated psychotic or bipolar disorder; d) pain due to cancer, autoimmune disorders; or e) use of beta-blockers. Inclusion and exclusion criteria were determined both by a phone screen conducted by our lab staff, and by a physical exam conducted by the physician co-investigators.

The final sample was comprised of 75 adults. The sample was 53% women (47% men) and were an average age of 46.9 years old (*SD* = 9.7, Range = 21 to 67), and 83% of them had at least graduated high school. Additionally, participants were 73% Black, 19% White, and 8% other.

Procedure

The study was conducted over two sessions. First, participants provided written consent to the IRB-approved protocol and then completed a packet of questionnaires, including the AEI, AEQ, and TAS-20, which took approximately 90 minutes. Approximately one week later,

participants returned to the lab to complete the anger induction task and emotional expression activity. Participants came individually to the laboratory, and were told that they would be working together with a fellow research participant to make their way through a computerized maze as a test of stress and teamwork. They were then informed that they would alternate with their partner who would be the "guide" and give the instructions versus who would be the "runner" and follow the instructions. The experimenter would next explain (deceptively) that a coin flip had determined that the participant would start as the "runner" and the confederate would start as the "guide." The partners were seated in the laboratory at a table opposite each other, with the confederate looking at a computer screen that the participant could not see. The participants then moved a computer mouse across a white pad according to the instructions given by the confederate, and were told not to speak during this task. Unknown to the participant, there was actually no real maze.

Anger Induction

As the participant attempted to navigate the imaginary maze, the confederate provided guiding instructions, but also followed a standard script and made rude, exasperated comments towards the participant, such as "You're not very good at this" as well as vague, unclear instructions such as, "Move to your left. No, your other left." This task and the harassment manipulation are adopted from Engebretson et al. (1989), and several studies (Burns et al., 2008; Quartana et al., 2007) show that it reliably generates anger, annoyance, and irritability.

Confederates were trained to maintain the standardized script, and treat the participants in a consistently rude and unfriendly manner. Periodically, the experimenters met with the confederates to discuss their performance and prevent drift from standardization. Male, female,

black, and white confederates were used in order to avoid confounds related to the interaction of confederate-participant demographics.

Anger Expression

Following the maze task, the confederate was escorted out of the room while the participant remained seated. Next, as part of the protocol for a larger study on anger expression, participants were randomized into one of four conditions for a 4-minute expression task. This task was videotaped, with the camera showing a close view of the participants' upper body and face. (Two of these conditions were control conditions—silence, and distraction—which prevented or discouraged the expression of emotions. Participants who were assigned to these conditions were excluded from the final sample. The final sample of 75 participants included only those in the two expression conditions.)

The two expression conditions were the unguided and guided conditions. Both conditions began with the experimenter instructing the participants: "For the next four minutes, I would like you to describe all of the thoughts and feelings you had while doing the maze task. Tell me how you feel about what happened, and how you feel about the other person. Don't hold back anything. Please try to talk for the entire four minutes." In the unguided expression group (n = 37), the experimenter listened to the participants attentively, but refrained from making any comments that might influence how the participants chose to express themselves. If the participants stopped talking, the experimenter prompted them up to two times to continue speaking. If the participants still ran out of things to say, they were told to sit quietly for the remainder of the four minutes.

The guided expression condition (n = 38) began with the experimenter giving the same initial instructions as in the unguided condition. After 30 seconds, the experimenter asked the

participants to speak about their thoughts and feelings towards the confederate (that is, the empty chair where the confederate was sitting). However, most participants had difficulty directly and unambiguously expressing their anger. In these cases, the experimenter prompted them with lines such as, "I thought that your partner treated you rudely during the maze task. How do you feel about that?" Eventually, the experimenter attempted to facilitate the participants' anger expression so that they might be able to reach the following goal statement and express something like: "You should not have treated me so badly during the maze, and I'm angry at you for treating me like that." An additional part of the goal was for the participants to be able to talk directly to the chair across from them (where the confederate was sitting) as if the confederate were still there, and clearly communicate via words, tone, face, and posture the fact that they were angry at the person for his or her behavior. The experimenter worked with the participants until they were able to either achieve this goal or come as close as possible to it. Participants were debriefed at the end of the protocol.

Emotion Expression Predictor Measures

Anger Expression Inventory (Short Form) (AEI). The AEI (Spielberger, 1985) is a 16-item self-report measure that assesses how anger is expressed. Response options range from 1 (almost never) to 4 (almost always). High scores on the 8-item Anger-In subscale reflect a tendency to deal with anger when it is experienced by suppressing and hiding the emotion from others. High scores on the 8-item Anger-Out subscale indicate a tendency to deal with anger through outward facial and verbal expressions. Internal consistency estimates fall in the range of α = .74-.83. In this sample, the internal consistency was α = .89 for Anger Out, and α = .86 for Anger In. Structural analyses of the Anger-Out and Anger-In scales have shown that the two scales are largely orthogonal (Knight et al., 1988, Eckhardt et al., 2006).

Ambivalence of Emotional Expression Questionnaire (AEQ). The 14-item short form of the AEQ (King & Emmons, 1990) is a self-report measure that assesses the degree to which participants experience difficulty deciding whether or not to express their emotions. Response options range from 1 (strongly disagree) to 5 (strongly agree). This measure is composed of two subscales, positive emotions and entitlement or anger. The subscales are designed to tap into ambivalence that differs on the type of emotion experienced. The internal consistency estimate during initial development for the total scale was $\alpha = .89$, and in this sample was $\alpha = .78$ for the total scale, $\alpha = .80$ for the entitlement subscale, and $\alpha = .84$ for the positive emotions subscale.

The Toronto Alexithymia Scale-20 (TAS-20). The TAS-20 (Bagby, Parker, & Taylor, 1994) consists of 20 statements to be rated by participants regarding their emotional awareness. Response options range from 1 (strongly disagree) to 5 (strongly agree). Three subscales compose the TAS-20: (1) Difficulty Identifying Feelings (DIF); (2) Difficulty Describing Feelings (DDF); and (3) Externally Oriented Thinking (EOT). The three factor model has been established and replicated in both clinical and non-clinical samples (Bagby, Parker, & Taylor, 1994) as well as across cultures (Taylor, Parker, & Bagby, 2003). High scores on the TAS-20 are indicative of greater alexithymic tendencies. The internal consistency estimate during initial development for the total scale was $\alpha = .81$, and in this sample was $\alpha = .89$ for the total scale, $\alpha = .81$ for the DIF subscale, $\alpha = .73$ for the DDF subscale, and $\alpha = .48$ for the EOT subscale.

Potential Confounding Variables

Negative Affect

The Beck Depression Inventory-II (BDI-II, Beck & Beamesderfer, 1996) and Manifest Anxiety Scale (MAS, Bendig, 1956) were combined into a composite variable to serve as a proxy for negative affect. The BDI-II consists of 21 groups of four statements, rated 0 to 3.

Participants select the one statement from each group that best describes the way they have been feeling over the past week. High scores on the BDI-II are indicative of greater depressive feelings. The historic internal consistency estimate is $\alpha = .86$ (Beck & Steer, 1984), and was $\alpha = .90$ in this sample. The MAS is composed of 20 true false questions to be rated by participants. High scores on the MAS are indicative of greater tendency to experience negative effects of anxiety. The median of historic internal consistency estimates based on a Kuder-Richardson Reliability analysis is $\alpha = .76$ (Bendig, 1956), and was $\alpha = .79$ in this sample.

In this sample, the BDI-II and MAS were strongly positively correlated ($r = .64$, $p < .001$), reflecting their overlap with the larger construct of negative affect (Watson & Pennebaker, 1989). Consequently, a negative affect composite of these two measures was made by transforming the total scores of each scale into z scores and then averaging them together for each participant.

Objective Measures of Anger Expression

Judges' Ratings. Judges assessed the amount of emotional expressions of anger and nervous affect. Coding of the quality of anger expression involved assessing how clearly and directly the participant expressed their anger towards the confederate. Nervous refers to the amount of anxious and avoidant behaviors displayed by the participants while they were asked to express their anger. Both emotions were rated on three subcomponents: verbal language, body language, and paralinguistics. Verbal language includes only the words spoken by the participants, such that ratings for this component could be attained by reading a transcript of the protocol. Facial expressions make up the main component of the body language ratings, which also include any other movements such as scratching or shifting in the chair, and could be coded by watching a silent version of the recording. The paralinguistics category is composed of noises

such as sighs or sharp breaths as well as tone of voice, volume, and rate of speech. In other words, non-English speakers would hypothetically be able to accurately code these ratings just by listening to a tape recording. The ratings are based on a 0 (not present) to 6 (maximum amount present) scale. Total composite ratings for anger and nervous affect were computed by summing the scores of their respective components.

Two judges evaluated the content of the emotional expression task. The judges were individuals who were directly involved in the creation of the coding scheme, so that no additionally training was necessary. A goal was set to achieve an interrater reliability coefficient greater than $r = .80$ for all domains. Judges first trained together to achieve the desired reliability on a subset of the data. Then, each judge independently coded slightly more than half of the remaining protocols, so that there was some overlap in order to calculate the final interrater reliability. In sum, 28% (n = 21) of cases were independently coded by both raters. Intraclass correlation coefficients between ratings from each judge were in the satisfactory range for all variables: total anger, $r = .94$; angry language, $r = .94$; angry facial expressions, $r = .79$; angry paralinguistics, $r = .86$; nervous affect, $r = .71$.

Linguistic Inquiry Word Count. The Linguistic Inquiry Word Count (LIWC; Pennebaker, Francis, & Booth, 2001) is a text analysis computer program used to evaluate verbal and written language. LIWC assesses emotional, cognitive, structural, and process aspects of language samples. The computer program provides frequency data on words used that fit into emotional/affective, cognitive, and perceptual/sensory categories. The LIWC program contains its own dictionary and words that belong to each category are predetermined. This study examined the proportion of the total words that reflect angry emotions.

Data Analyses

Scores from the AEI, AEQ, and TAS-20 were correlated with the judges' ratings of the emotional content from the videos, and the angry language index as measured by the LIWC software. These correlations were also run while controlling for three variables (negative affect, age, and sex) that were theoretically and empirically related to predictors or outcomes (see Results section) in order to determine if they might have a confounding effect on the relationships between the predictor and outcome variables. Finally, these analyses were repeated for the two expression conditions separately. Multiple regression moderation analyses were run to test for expression group differences in predictive ability of the emotional expression variables. To do this, I used SPSS to create an interaction term between the condition and predictor variable, then entered all three of those variables in a regression model with the one behavioral expression variable at a time as the dependent variable.

CHAPTER 3

RESULTS

Preliminary Analyses

Relationships Among Predictor Variables

Table 1 shows the correlations among the various self-report emotion regulation measures as well as sample descriptive data for each measure. Somewhat surprisingly, all correlations were positive, even though some of the constructs appear to be opposite in nature. Most measures correlated highly with their own subscales, and moderately with the other measures. Anger-Out was moderately positively correlated with the TAS-20 total score and its subscales other than EOT, the AEQ total score and its subscales, and, interestingly, anger-in. Anger-In was positively correlated with the TAS-20 total score and its subscales, and the AEQ total score and its subscales. The TAS-20 total score was positively correlated with the AEQ total score and its subscales. The EOT subscale of the TAS-20 tended to have lower correlations with the other scales than DIF and DDF did.

Table 1

Relationships among predictor variables

	Anger Out	Anger In	AEQ	ENT	POS	TAS-20	DIF	DDF	EOT
Anger Out	\	.65***	.34**	.30**	.33**	.46***	.46***	.35***	.20
Anger In		\	.58***	.48***	.58***	.61***	.54***	.58***	.25*
AEQ			\	.91***	.94***	.49***	.45***	.53***	.11
ENT				\	.71***	.35**	.34**	.37**	.07
POS					\	.53***	.48***	.59***	.13
TAS-20						\	.82***	.86***	.59***
DIF							\	.63***	.12
DDF								\	.36**
Mean (SD)	15.2 (5.2)	15.8 (5.5)	39.7 (12.8)	18.6 (6.2)	21.2 (7.6)	51.5 (11.8)	17.6 (6.3)	13.0 (4.5)	20.9 (4.6)

Note: AEQ = Ambivalence of Emotional Expression Total Scale; ENT = AEQ Entitlement Subscale; POS = AEQ Positive Emotions Subscale; TAS-20 = Toronto Alexithymia Scale-20 Total Scale; DIF = TAS-20 Difficulty Identifying Feelings Subscale; DDF = TAS-20 Difficulty Describing Feelings Subscale; EOT = TAS-20 Externally Oriented Thinking Subscale.

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

Relationships Among Behavioral Expression Variables

Table 2 shows the correlations among the various behavioral measures of emotional expression as well as sample descriptive data for each measure. Most anger expression variables correlated positively with each other. As expected, the total anger composite score had strong positive correlations with each of its three subscales: angry language, angry facial expressions, and angry paralinguistics, and a moderate positive correlation with LIWC anger words. The angry language coding was positively correlated with angry facial expressions and angry paralinguistics, which also correlated positively with each other. Nervous affect coding did not correlate significantly with any of the anger measures: total anger, angry language, angry facial expressions, angry paralinguistics, and LIWC anger.

Table 2

Relationships among behavioral expression variables

	Total Anger	Angry Language	Angry Facial Expressions	Angry Paralinguistics	LIWC Anger	Nervous Affect
Total Anger	\	.91***	.78***	.85***	.45***	.10
Angry Language		\	.56***	.66***	.60***	.13
Angry Facial Expressions			\	.54***	.21	.11
Angry Paralinguistics				\	.22	.00
LIWC Anger					\	.15
Mean (SD)	25.4 (12.9)	14.6 (6.7)	5.0 (4.1)	5.8 (4.4)	1.2 (1.0)	11.6 (7.2)

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

Relationships of Control Variables with Predictor and Outcome Variables

Table 3 displays the relationships among potential confound variables with predictor and outcome variables. Negative affect is a common underlying variable that can explain variance between two or more specific constructs. Negative affect was moderately positively correlated with the following predictor (self-report) variables: Anger Out, Anger In, AEQ, AEQ positive emotions subscale, TAS-20, difficulty identifying feelings, and difficulty describing feelings, but did not correlate with any of the outcome (behavioral) variables. Age is another common confounding variable. Age correlated negatively with Anger Out, and was independent of the other variables. Women had significantly higher Anger Out, Total Anger, angry language, and angry paralinguistics than men. Therefore, I statistically controlled for the influence of these variables and examined their influence as compared to the zero-order correlations. Finally, confederate assignment and participant race were also explored as potential confounds, but had no significant relationships with either the predictor or outcome variables, so they were not controlled for in the partial correlations.

Table 3

Correlations between control variables and predictor variables (first table) and outcome variables (second table)

	Anger Out	Anger In	AEQ	ENT	POS	TAS-20	DIF	DDF	EOT
NA	.34**	.49***	.31**	.17	.38**	.54***	.49***	.60***	.12
Age	-.28*	-.19*	-.12	-.06	-.15	-.06	-.08	.00	-.03
Sex	-.25*	-.03	.11	.10	.10	-.03	.02	-.06	-.05

	Total Anger	Angry Language	Angry Facial Expressions	Angry Paralinguistics	LIWC Anger	Nervous Affect
NA	.10	.12	.20	-.08	.09	-.19
Age	.00	-.06	.03	.07	-.14	-.07
Sex	-.25*	-.23*	-.16	-.25*	-.19	-.19

Note: NA = negative affect composite, created using Beck Depression Inventory and Manifest Anxiety Scale; AEQ = Ambivalence of Emotional Expression Total Scale; ENT = AEQ Entitlement Subscale; POS = AEQ Positive Emotions Subscale; TAS-20 = Toronto Alexithymia Scale-20 Total Scale; DIF = TAS-20 Difficulty Identifying Feelings Subscale; DDF = TAS-20 Difficulty Describing Feelings Subscale; EOT = TAS-20 Externally Oriented Thinking Subscale.

Note: Sex was analyzed as a correlation so that we could compare it to the other variables using a common metric. Positive correlations indicate that men scored higher on those variables, and negative correlations mean that women scored higher.

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

Main Analyses

Table 4 shows correlations between predictor self-report variables and anger expression indices from the maze task. Zero-order correlations are listed before the slash, and partial correlations, after controlling for negative affect, age, and sex, are listed after the slash. Overall, anger-out and total alexithymia were the strongest and most consistent predictors of behavioral anger expression. Most correlations were robust to partial correlations controlling for negative affect, age, and sex. None of the self-report measures predicted nervous affect.

Anger Expression

As hypothesized, self-rated anger-out was positively correlated with the total anger expression composite, as well as the angry language and angry facial expression coding scores

and LIWC anger, but did not correlate with nervous affect. Unexpectedly, self-rated anger-out did not correlate with angry paralinguistics.

In contrast to what I predicted, anger-in did not correlate significantly with any of the behavioral measures: anger expression composite, angry language coding, angry facial expression coding, angry paralinguistics coding, LIWC anger words, or with nervous affect coding.

After controlling for negative affect, age, and sex, the correlation between Anger Out and Angry Language (r = .28, p = .015) decreased in magnitude to r = .22, p = .07, and the correlation between Anger Out and LIWC Anger (r = .24, p = .042) decreased to r = .16, p = .18.

Ambivalence over Emotional Expression

None of the correlations between the self-rated ambivalence over emotional expression variables and behavioral expression variables were in the hypothesized direction. The AEQ did not correlate significantly with any of the observer coded behavioral measures: total anger composite, angry language, angry facial expressions, angry paralinguistics, and nervous affect, and did correlate positively with LIWC anger. Both subscales showed this same pattern, being uncorrelated with the behavioral measures, except that the positive subscale correlated positively with LIWC anger. Partial correlations controlling for negative affect, age, and sex, did not change the significance of any of the correlations involving the AEQ or its subscales.

Alexithymia

None of the correlations between the alexithymia scales and the behavioral expression variables were in the direction that I hypothesized. The TAS-20 total scale was *positively* correlated with the total anger composite, as well as with the angry language and angry facial

expression subscales and LIWC anger, but did not correlate with angry paralinguistics or nervous affect.

The difficulty identifying feelings and difficulty describing feelings subscales of the TAS-20 were both positively correlated with facial expression of anger and LIWC anger words, but did not correlate significantly with any of the other behavioral measures: anger total, angry language, angry paralinguistics, and nervous affect.

The externally oriented thinking subscale was the subscale that seemed to contribute most to the positive relationship between the TAS-20 and total anger. The externally oriented thinking subscale was positively correlated with the total anger composite, as well as the language and facial expression subscales of anger, but did not correlate significantly with any of the other behavioral measures: angry paralinguistics, LIWC anger and nervous affect.

After controlling for negative affect, age, and sex, the correlation between DIF and angry facial expressions (r = .23, p = .047) decreased to r = .18, p = .159, and the correlation between DDF and angry facial expressions (r = .27, p = .018) decreased to r = .21, p = .109.

Table 4
Zero-order correlations between predictor variables and outcome variables, and partial correlations after controlling for potential confound variables

	Total Anger	Angry Language	Angry Facial Expressions	Angry Paralinguistics	LIWC Anger	Nervous Affect
Anger Out	.29*/.24*	.28*/.22	.29*/.25*	.16/.17	.24*/.16	-.01/.00
Anger In	.07/.05	.12/.08	.13/.06	-.08/-.03	.22/.21	-.08/.02
AEQ	-.01/.00	.06/.06	.05/.02	-.17/-.12	.26*/.28*	.02/.11
ENT	-.09/-.07	-.02/-.01	-.02/-.03	-.20/-.17	.19/.21	.14/.21
POS	.05/.06	.11/.11	.10/.07	-.21/-.06	.29*/.31**	-.09/.02
TAS-20	.30*/.32**	.30*/.30*	.33*/.29*	.12/.21	.32*/.35**	-.10/.03
DIF	.20/.21	.20/.20	.23*/.18	.08/.17	.23*/.24*	-.21/-.10
DDF	.21/.20	.22/.22	.27*/.21	.02/.08	.29*/.32**	.04/.24
EOT	.28*/.28*	.27*/.26*	.26*/.25*	.19/.20	.22/.21	-.02/.00

Note: Before slash = Zero-order correlations, After slash = Controlling for sex, age, and NA

Note: AEQ = Ambivalence of Emotional Expression Total Scale; ENT = AEQ Entitlement Subscale; POS = AEQ Positive Emotions Subscale; TAS-20 = Toronto Alexithymia Scale-20 Total Scale; DIF = TAS-20 Difficulty Identifying Feelings Subscale; DDF = TAS-20 Difficulty Describing Feelings Subscale; EOT = TAS-20 Externally Oriented Thinking Subscale.

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

Moderation Analyses

Table 5 shows the correlations between predictor and outcome variables for both group conditions: unguided and guided. Correlations within the unguided condition are listed before the slash, and correlations within the guided condition are listed after the slash. Fisher Z tests were run to determine if pairs of correlations differed significantly, which would mean that expression condition moderated the relationship between the predictor and outcome variables. These analyses revealed only one statistically significant difference: that the relationship between the TAS-20 EOT subscale and angry language was stronger in the guided condition than in the unguided condition. However, in contrast to the hypothesis, there was a consistent pattern of the TAS-20 and its subscales having somewhat stronger correlations with Total Anger and its subscales in the guided condition than in the unguided condition. Finally, I also examined

participant sex, participant race, and confederate as potential moderators using the above methods, but found no significant differences in correlations.

Table 5

Moderating effects of expression condition on the relationships between predictor and outcome variables

	Total Anger	Angry Language	Angry Facial Expressions	Angry Paralinguistics	LIWC Anger	Nervous Affect
Anger Out	.31/.29	.35*/.27	.22/.36*	.20/.12	.23/.33*	.11/-.12
Anger In	-.01/.21	.09/.25	.01/.27	-.14/.00	.17/.44**	.08/-.21
AEQ	-.09/.05	.09/.09	.01/.11	-.26/-.09	.31/.32	.19/-.15
ENT	-.17/.03	-.09/.10	-.08/06	-.29/-.09	.21/.31	.27/.00
POS	.00/.05	.11/.08	.06/.13	-.19/-.08	.35*/.29	.09/-.23
TAS-20	.16/.51**	.18/.53**	.25/.43**	-.01/.30	.28/.53**	-.06/-.14
DIF	.15/.38*	.21/.38*	.11/.40*	.04/.18	.21/.50**	-.15/-.25
DDF	.12/.35*	.17/.36*	.17/.39*	-.06/.12	.40*/.38*	.07/.03
EOT	.10/.46**	.02/.50**	.31/.19	-.03/.19	.05/.31	.00/-.05

Note: Before slash = Unguided condition, After slash = Guided condition.

Note: AEQ = Ambivalence of Emotional Expression Total Scale; ENT = AEQ Entitlement Subscale; POS = AEQ Positive Emotions Subscale; TAS-20 = Toronto Alexithymia Scale-20 Total Scale; DIF = TAS-20 Difficulty Identifying Feelings Subscale; DDF = TAS-20 Difficulty Describing Feelings Subscale; EOT = TAS-20 Externally Oriented Thinking Subscale.

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

CHAPTER 4

DISCUSSION

The literature about the validity of the AEI, AEQ, and TAS-20 lacks studies in which these measures are used to predict the actual expression of anger in both verbal and non-verbal domains. In this study, these three measures were used to predict how much anger the participants actually expressed when they were treated rudely by confederates in our laboratory paradigm, and then given a chance to express their thoughts and feelings. The findings of this study extend the validation literature for the three measures by providing the most ecologically valid criterion measure to date for analysis as compared to efforts in previous research. However, there was variable support for the hypotheses, which were that each measure would correlate with behavioral expressions of emotion in the manner suggested by the scale's name and content. Of course, when reviewing the findings of any validity study, it is important to consider the context of the context of the experiment, which in this case focused on the emotion of anger, a sample a chronic low back pain patients, and a laboratory setting.

Anger Expression Inventory

For the Anger Out scale, results supported the hypothesis that this scale would predict the actual outward expression of anger in our laboratory setting, as measured by both objective raters and by the LIWC coding software for the use of anger-related words. These findings corroborate the previous validation studies of the Anger Out scale. Specifically, these studies have shown that Anger Out is correlated with self-report measures of anger (Spielberger et al., 1988), physiological arousal (Everson, Goldberg, Kapnlan, Julkunen, & Salonen, 1998; Keltikangas-Jarvinen, Raikkonen, & Hautanen, 1996; Larson & Langer, 1997), acts of aggression (Parrot & Giancola, 2004; Verona, 2005; Verona, Patrick, & Lang, 2002), and angry language and facial

expressions when provoked (Barbour, Eckhardt, Davison, & Kassinove, 1998; Eckhardt, Barbour, & Davison, 1998; Eckhardt & Jamison, 2002). Taken together, all of this research supports the fact the Anger Out scale does in fact measure what it purports to measure. Furthermore, the fact that Anger Out did not correlate with nervous affect adds evidence for the divergent validity of this scale. This suggests that the scale is tapping into the specific construct of anger instead of other related negative emotions, such as anxiety. This finding is consistent with previous research in which the Anger Out scale did not correlate significantly with self-reported anxiety (Spielberger, 1988). Finally, this scale was robust to the effects of controlling for potential confound variables, which means that these results are more reliable and further suggests that the AEI is successful at measuring the specific construct of anger, rather than a larger underlying construct such as negative affect. Overall, this study extends the validation evidence of the Anger Out scale by correlating it with the most accurate criterion variable representing anger expression that has been used with this questionnaire so far in research.

In contrast, the Anger In scale was not related to the actual anger expression or nervous affect, either before or after controlling for potential confounds; thus, my hypothesis was not supported. These results suggest that Anger In should not be viewed as a measure of the suppression of anger. Yet, these findings are not that surprising given that previous research has found mixed results on how Anger In correlates with behavioral expressions of anger (Barbour et al., 1998; Parrot & Giancola, 2004). The fact that Anger In was unrelated to our behavioral anger measures might mean that the construct that it measures is in some middle range between anger expression and suppression. One explanation for this stems from the fact that previous research has shown that Anger In is moderately positively correlated with trait anger (Spielberger, 1988). Accordingly, Anger In may tap the tendency of people to experience anger

and then try not to show it, rather than purely the tendency to express only low levels of anger. An alternative explanation for these findings is that the Anger In scale might be completely unrelated to the behavioral expression, but this is unlikely given the amount of previous supporting validation evidence.

Toronto Alexithymia Scale-20

I had hypothesized that the TAS-20 and its subscales would correlate negatively with the behavioral anger expression variables, due to the fact that people with more alexithymia would theoretically be less aware of their angry feelings. I also expected that people with higher alexithymia scores would be more uncomfortable expressing their anger, and thus display higher levels of nervous affect during the paradigm. However, the results did not support any of these hypotheses. In fact, all of the relationships between the TAS-20 scales and anger expression scales were in the positive direction, though not all of them were large enough to reach statistical significance. These findings are somewhat contrary to some of the previous literature, in which the TAS-20 was found to be empirically related to introversion (Costa & McCrae, 1985) and low amounts of emotion word content (Lumley, Gustavson, Partiridge, & Labouive-Vief, 2005; Tull, Medaglia, & Roemer, 2005). Additionally, the TAS-20 was independent of nervous affect, contrasting with previous theory, which suggested that the TAS-20 would be related to higher anxiety when conversing about emotional content (Bagby, Taylor, & Parker, 1994). On a more specific level, the difficulty describing feelings subscale was not more predictive of the angry language and LIWC anger scales than were the difficulty identifying feelings and externally oriented thinking subscales. This finding is new to the empirical literature, and casts doubt on the construct validity of the difficulty describing feelings scale, because it is designed to tap into spoken emotion language specifically. One potential explanation for why the TAS-20 is

positively—rather than inversely—correlated with anger expression is that there is an underlying construct of anger experience that explains some of the variance between these two variables. It is possible that people who scored highly on the TAS-20 experienced more anger during the task, and therefore had more anger to express. Furthermore, these results were robust to the potential confounding effects of negative affect, age, and sex. In fact, the previous research has done little to support the ability of the TAS-20 to predict actual reduced emotional expression, with the main objective evidence showing that the TAS-20 is related to lower amounts of verbiage. Still, we would expect people with greater alexithymic tendencies to have great difficulty finding the words and non-verbal communication to express such strong feelings of anger as required by the study paradigm. Perhaps the TAS-20 is not a good predictor of actual emotional expression, because people with higher alexithymia might not have trouble expressing their emotions, and in fact be more likely to express negative emotions than people with low alexithymia. Instead, they may have difficulty with the internal awareness or comprehension of their emotional experience.

Ambivalence of Emotional Expression Questionnaire

Contrary to my hypotheses, the AEQ and its two subscales did not correlate with the observer ratings of anger or nervous affect, and even correlated positively with the LIWC anger score. These results conflict with the theory of the AEQ as well as its limited validation evidence, which suggests that the AEQ should correlate negatively with measures of emotional expressivity (King & Emmons, 1990). Previous research shows that the AEQ is related to lower amounts of peer-reported emotional expressiveness and written emotional content in diaries, and higher amounts of anxiety when attempting to express emotions (Gross, 2002). The positive correlation with LIWC anger is surprising given that the AEQ has not been shown to correlate with anger specifically before in previous research, though in general it does correlate with

depression and negative affect. However, the influence of common confounding variables can be ruled out in these analyses, because they remained unchanged even after controlling for negative affect, age, and sex. These results fail to show conclusively what behaviors the AEQ is actually measuring, and call its construct validity into question, especially given the small quantity of previous validation evidence on this measure. One possible explanation for these findings is that people with high scores on the AEQ experience more negative emotions than those with low scores, and have no trouble using angry words as shown by the LIWC, and that they express these emotions more verbally than nonverbally. On the other hand, nonverbal and verbal expressions of anger were highly correlated, which casts some doubt on this explanation, and, concurrently, the validity of the AEQ.

Moderation Analyses

Moderation analyses concerning expression condition assignment were conducted in an exploratory manner because no research has covered these topics before. Condition moderator analyses revealed that relationships between Anger Out and the behavioral measures of emotion were fairly similar in both the guided and unguided conditions, suggesting the Anger Out scale is valid across both facilitated and naturalistic situations of anger expression. On the other hand, though not statistically significant, the Anger In scale appeared to be a better predictor of anger expression in the guided setting than in the naturalistic setting. An explanation for this might be that the naturalistic expression condition did not provide enough of an opportunity for variance in anger expression styles, because participants expressed less overall anger in this condition than in the guided condition. Of course, it is also possible that these apparent differences might not appear given a larger sample size.

For the TAS-20, although condition was not found to be a statistically significant moderator, a consistent pattern showed that correlations between the alexithymia scales and behavioral anger scales were somewhat greater in magnitude in the guided condition than in the unguided condition. This could be explained by the fact that participants in the guided condition were helped by the experimenter to find the right words to express their feelings. For example, it is possible when the experimenter told the participants the angry words to use, it "overrode" their natural alexithymic tendencies, resulting in an increasing correlation between the TAS-20 and its subscales with the behavioral measures of anger expression. If this is the case, then these results do not refute the validity of the TAS-20 as much as might be expected if one were looking solely at the zero-order correlations. Yet, it must be mentioned that even in the unguided condition, the TAS-20 failed to do what it purports to do, which is to demonstrate an inverse relationship with emotional expressivity.

For the AEQ, condition moderation analyses revealed no findings of note, because they had little effect on the zero-order correlations. Part of this is likely due to the fact that the AEQ had low correlations with behavioral variables. In other words, the AEQ failed to predict behavioral variables, except for angry language as coded by the LIWC software, equally across conditions.

Limitations

First, there are some limitations regarding the sample of participants that must be considered when reviewing the analyses. First, the sample was relatively homogeneous with regard to race and socio-economic status, as most participants were Black, low-income residents of an urban environment. Next, all of the participants were chronic low back pain patients. Although neither the issue of race nor presence of chronic low back pain should be theoretically

expected to influence these analyses in any specific direction, it does mean that this the results of this study should be interpreted as a validity study of the scales in this unique sample.

Second, some participants (around 10%) voiced differing degrees of suspicion regarding the authenticity of our ruse using the confederate. Several participants made comments during the anger expression protocol to the effect of, "I can't help but wonder if my partner was told to be rude to me, because I would never expect a stranger to speak to me that way during a simple task such as this one." In these instances, it seems as though the participants believed that their partner was another real research participant, but that we had given him or her a script to read, and the factor that seemed to be what made the participants suspicious was simply the fact that their partner (our confederate) was treating them rudely. Therefore, I view this limitation as an unavoidable part of our study, because we needed to have the confederates treat the participants rudely enough to provoke the desirable amount of anger. With that being said, we did everything else possible to make our deception go unnoticed. Confederates and experimenters trained to play their roles well so that they could pretend to not know each other, and confederates memorized certain fabricated background information pertinent to their role as a back pain patient, such as how often they took pain medication.

Third, the anger induction protocol was variably successful, with some participants becoming very angry, and others minimally so. Although much of this variance is likely due to the individual personality differences of the participants, some of it could be due to variability in the participants' perception of the confederate's rudeness, or other extraneous events. For example, though most participants reported during debriefing that the task increased their anger, a small subset stated that they found the task to be a distraction from troublesome external life events that they had been experiencing, and actually improved their mood. As described in the

introduction, the best way to study the validity measures of emotional expression is to observe how well they predict the expression of actual emotion. Therefore, data from participants who were experiencing no emotions would be interfering with the predictive ability of the three measures that I was testing. In conclusion, this limitation highlights the difficulty in making the distinction between anger experience and anger expression during research.

Third, anger induction and expression in our controlled laboratory setting might not reflect the naturalistic experiences and expressions of anger. For example, the participants were hooked up to a blood pressure cuff and muscle tension censors as part of our larger experiment on back pain. Additionally, we asked participants directly to talk about their thoughts and feelings during the maze task, and about working with their partner. Therefore, it is possible that these three self-report measures are more valid in a truly naturalistic context. On the other hand, many participants attempted to complain about their partner or the maze before the designated expression exercise, which shows that they wanted to express some emotions even before the experimenter prompted them.

There are also some limitations with our coding scheme that could have affected my results. First, we designed our own completely new emotional coding scheme specifically for use in this experiment, which has not been used in any other setting. In general, the main drawback about designing our own scheme is that we do not know much about its true validity. On the other hand, due to the fact that we tailored it for use in our specific experimental setting, we did not need to accommodate any pre-existing emotion-coding scheme that would have also led to reduced validity. Overall, I believe that we used the best method possible for coding emotions given the variables we wanted to examine. Other existing coding schemes do not meet the criteria of capturing both verbal and nonverbal emotion expression, using metrics of both

frequency of occurrence and intensity of the emotion expressed. For example, we ruled out using the Facial Action Coding System (Ekman & Friesen, 1977), because it looks at minute moments of facial muscles, which would be too complicated for this study.

One limitation of the coding method was that it used some subjective ratings of emotional expression, which might be less reliable than objective methods such as counting frequency. However, it was important to include ratings of emotional intensity in this study, rather than simply how often emotions were expressed. For example, some patients used words such as "a little irritated" to described their anger, whereas others stated that they were "mad." These examples clearly represent different levels of emotional expression, so I needed to use ratings of intensity to distinguish between those them, and thereby provide the most valid rating of emotional expression that is possible.

A final drawback of the coding method that we used is that it was difficult to distinguish anxious affect from positive affect during the anger expression exercise. We assumed that any smiles or laughs were instances of anxiety expression. The reason we did this is because we assumed that the core emotion the participants would be feeling after being treated rudely would be anger, and secondly some anxiety, and that they would have little reason to experience positive emotions. However, it is impossible to know for sure what emotions that participants were truly experiencing, so some positive emotion might have been coded incorrectly as anxiety.

Finally, the attractiveness of the participants is a potential confound variable that we did not control for during the experiment. It is possible that differences in attractiveness might cause the raters to assign different emotional codes to people at different rates.

Implications and Future Directions

The analyses conducted in this study represent a sophisticated validation attempt regarding these three measures. Yet, the results show varying levels of support for the validity of these three measures of emotional expression within the context of this experiment: anger as the primary emotion, a sample of chronic low back pain patients, and a laboratory setting. First, the AEI literature contains the most extensive and sophisticated validation evidence out the three measures, so it is not surprising that our results found by far the best support for it compared to the other two. It should be noted that the correlations between Anger Out and the behavioral ratings of anger explain less than 10% of the total variance, so the scale should not be considered as an absolute predictor of anger expression. On the other hand, correlations between different methods of assessment of a particular construct, such as the self-report measures and objective ratings used in this study, often result in reduced relationships (Bagozzi & Yi, 1990). Taking that fact into consideration, researchers and clinicians should view the Anger Out scale as a successful predictor of anger expression, and continue to use it when assessing that construct. Accordingly, it seems like it is not necessary for much further research to be conducted concerning the validity of this scale. However, Anger-In scores are likely influenced by the experience of anger, rather than whether people decide to suppress that emotion. Based on previous research, a related measure that does tap into the successful suppression of anger might be the Anger Control scale, which is part of the full version of the AEI (Spielberger et al, 1985). It would be interesting to conduct the same experiment including this scale, and see if it correlates negatively with our Total Anger ratings, as might be expected based on previous literature.

Second, the AEQ does not appear to be measuring what it purports to measure, and may even capture some angry language. Based on this fact, and the lack of much previous validation

research, it is important that more research is conducted in order to determine what the AEQ is actually measuring. Perhaps the AEQ is confounded by the experience of negative emotions, but fails to capture people's ambivalence over expressing those emotions. It would also be interesting to conduct a similar study to this one only substituting in positive emotions instead of anger, because the AEQ contains a positive emotions scale in addition to the entitlement scale. In the meantime, these findings cast some doubt over the previous research that uses the AEQ as a representative of emotional ambivalence, so those analyses should be interpreted with added caution.

Third, in contrast to the AEQ, although the TAS-20 did pick up on some of our behavioral ratings of emotional expression, these relationships were not in the relationship expected. These findings shape how the construct of TAS-20 should be interpreted. Similarly to the Anger-In and AEQ scales, perhaps instead of assessing emotional expressivity in general, perhaps the TAS-20 measures the likelihood of people to experience negative emotions and then describe or be aware of them. However, this rationalization of the results attempts to make a fine distinction between these two different constructs, a feat that I have already described in this manuscript as being difficult to do. Therefore, more research should be conducted to try to tease apart the issue between expression and awareness. For example, a study similar to this one could be tried using emotions other than anger, because the TAS-20 is supposed to tap into the lack of awareness of all emotions. In the meantime, other research involving the TAS-20 should be interpreted with some added caution.

APPENDIX

Anger Expression Inventory (AEI)

Everyone feels angry or furious from time to time, but people differ in the ways that they react when they are angry. Statements are listed below that people have used to describe their reactions when they feel ANGRY or FURIOUS. Read each statement and then CIRCLE the number to the right of the statement that indicates how OFTEN you GENERALLY react or behave in the manner described.

WHEN ANGRY OR FURIOUS . . .	Almost Never	Sometimes	Often	Almost Always
1. I express my anger	1	2	3	4
2. I keep things in	1	2	3	4
3. I pout or sulk	1	2	3	4
4. I withdraw from people	1	2	3	4
5. I make sarcastic remarks to others	1	2	3	4
6. I do things like slam doors	1	2	3	4
7. I boil inside, but I don't show it	1	2	3	4
8. I argue with others	1	2	3	4
9. I tend to harbor grudges that I don't tell anyone about	1	2	3	4
10. I strike out at whatever infuriates me	1	2	3	4
11. I am secretly quite critical of others	1	2	3	4
12. I am angrier than I am willing to admit	1	2	3	4
13. I say nasty things	1	2	3	4
14. I'm irritated a great deal more than people are aware of	1	2	3	4
15. I lose my temper	1	2	3	4
16. If someone annoys me, I'm apt to tell him or her how I feel	1	2	3	4

Toronto Alexithymia Scale-20 (TAS-20)

Please indicate how much you agree or disagree with each of the following statements by writing a number from 1 to 5 in the blank in front of the statement. Use this scale:

1 = Strongly disagree
2 = Disagree
3 = Neither disagree or agree
4 = Agree
5 = Strongly agree

_____ 1. I am often confused about what emotion I am feeling.

_____ 2. It is difficult for me to find the right words for my feelings.

_____ 3. I have physical sensations that even doctors don't understand.

_____ 4. I am able to describe my feelings easily.

_____ 5. I prefer to analyze problems rather than just describe them.

_____ 6. When I am upset, I don't know if I am sad, frightened, or angry.

_____ 7. I am often puzzled by sensations in my body.

_____ 8. I prefer to just let things happen rather than to understand why they turned out that way.

_____ 9. I have feelings that I can't quite identify.

_____ 10. Being in touch with emotions is essential.

_____ 11. I find it hard to describe how I feel about people.

_____ 12. People tell me to describe my feelings more.

_____ 13. I don't know what's going on inside me.

_____ 14. I often don't know why I am angry.

_____ 15. I prefer talking to people about their daily activities rather than their feelings.

_____ 16. I prefer to watch "light" entertainment shows rather than psychological dramas.

_____ 17. It is difficult for me to reveal my innermost feelings, even to close friends.

_____ 18. I can feel close to someone, even in moments of silence.

_____ 19. I find examination of my feelings useful in solving personal problems.

_____ 20. Looking for hidden meanings in movies or plays distracts from their enjoyment.

Ambivalence Over Emotional Expression Questionnaire (AEQ)

Below are some statements that refer to how people sometimes feel and act. Using the following scale, rate each statement to indicate how frequently you have felt or experienced each one.

1	2	3	4	5
I have never felt like this				I feel like this a lot

The statement may consist of 2 thoughts. Carefully read the statement as a whole before deciding on how characteristic it is of you. For example, consider the item:

"I try to honestly criticize others for their own good, but I worry they may get angry with me if I do so"

You would give this item a high rating ***if and only if*** both parts of the statement apply to you; that is, you try to honestly criticize others ***and*** you worry about their getting angry. If only one part of the statement applies to you, you would give this item a lower rating. It is important to consider the complete thoughts being expressed before you respond.

_____ 1. I make an effort to control my temper at all times even though I'd like to act on these feelings at times.
_____ 2. Often I'd like to show others how I feel, but something seems to hold me back.
_____ 3. I try to refrain from getting angry at my family even though I want to at times.
_____ 4. I try to show people that I love them, although at times I am afraid that it may make me appear weak or too sensitive.
_____ 5. Often I find that I am not able to tell others how much they really mean to me.
_____ 6. I want to tell someone when I love them, but it is difficult to find the right words.
_____ 7. I would like to express my disappointment when things don't go as well as planned, but I don't want to appear vulnerable.
_____ 8. I would like to be more spontaneous in my emotional reactions, but I just can't seem to do it.
_____ 9. I try to suppress my anger, but I would like other people to know how I feel.
_____ 10. It is hard to find the right words to indicate to others what I am really feeling.
_____ 11. I worry that if I express negative emotions such as fear and anger, other people will not approve of me.
_____ 12. I feel guilty after I have expressed anger to someone.
_____ 13. I often cannot bring myself to express what I am really feeling.
_____ 14. After I express anger at someone, it bothers me for a long time.

Behavioral Research Informed Consent

Title of Study: Stress, Coping and Chronic Low Back Pain

Principal Investigator (PI): Mark A. Lumley, Ph.D.
Department of Psychology
313-577-2773

Funding Source: National Institutes of Health

Purpose

You are being asked to be in a research study because you have chronic low back pain. This study is being conducted at Wayne State University in Detroit and Rush University Medical Center in Chicago. About 360 people with chronic low back pain will be enrolled in the study, about half of them in Detroit. This study will examine whether stressful events and how people cope with these events can influence their back pain. It will also examine how physical reactions, such as blood pressure, heart rate, and muscle tension, are related to stress and to back pain. **Please read this form and ask any questions you may have before agreeing to be in the study.**

Study Procedures

If you agree to take part in this research study, you will be asked to participate in one screening session, which will last about 90 minutes. We will interview you to learn about your medical, social, and psychiatric history. You will then complete a series of questionnaires about your personality and factors that affect pain. This screening session may be completed in person (in the lab or at a convenient location for you), or if transportation/distance is difficult for you, we can send you the session materials for you to complete at home. If you have not been sent to us by your physician, then we would like your written permission to send a letter to your physician, informing him or her that you are participating in our study, and requesting information about your diagnosis of back pain and other medical problems. After the screening session, you will be told whether or not you are eligible for this study.

If you are eligible, you will be asked to come to the lab for one evaluation session, lasting about 90 minutes. For this session, you should avoid drinking any alcohol on the day of the session, and avoid any caffeine for two hours before your session. You should continue to take your other medications as you normally do. Part of the experiment involves performing a computer maze task, which takes about 5 minutes, and will be performed with another research participant. It is intended to be an interesting but slightly difficult task that tests fine-hand coordination. You will be assigned (by the flip of a coin) to serve in one of two roles during this task: the "guide" or the "runner." If you are assigned to be the guide, you will look at a maze on a computer screen, and verbally guide the runner (who cannot see the maze) by providing them with feedback on where they need to proceed to successfully complete the maze. If you are assigned to be the runner, you will use a computer mouse to complete a maze that you cannot see using only the verbal instructions of the guide. This maze task will be timed, and the performance of you and your

partner will be evaluated based upon how quickly the maze is completed and how many mistakes occur.

If you are assigned to be the runner, an automatic blood pressure cuff will be placed on your arm, and 4 sensors will be attached to your upper and lower back to measure muscle tension. Blood pressure, heart rate, and muscle tension will be assessed throughout the maze task and afterward. You also will be asked to rate your pain and your mood after the maze task.

You may or may not be given more instructions on how to respond during the maze task. Also, during a 5-minute period after the task, you will be asked to, talk about your experience during the maze task to the experimenter, talk about objects in pictures, or sit quietly. Whether or not you are given additional instructions during the maze task, and what topic you are asked to talk about, will be determined by a flip of a coin. These tasks will be videotaped.

Following the 5-minute talking period, you will perform an activity task. You will be asked to stand still, sit on a chair, lie on a table, walk around a room, and lift a light object. This task will be videotaped. After this, the study will be over.

This study does not require you to change your usual medical care. Therefore, regardless of whether or not you participate, you should maintain regular medical care with your physician(s).

Benefits

As a participant in this research study, there will be no direct benefit for you; however, information from this study may benefit other people now or in the future.

Risks

By taking part in this study, you may experience the following risks. The blood pressure cuff will inflate every few minutes and may be bothersome, but it automatically deflates and does not cause damage. You may find the computer maze task to be mildly stressful or emotionally upsetting, and you also may find that talking about your experience during the maze task is mildly upsetting. The degree of upset should be limited by the brief duration of these tasks (5 minutes); however, if you find these tasks are too upsetting, you may ask to stop at any time.

You may experience brief, moderate pain while doing the activity task. For most people, this pain should disappear within a few minutes after the task is completed. However, it is possible that the pain will last longer, such as for hours or days. You can skip any activities in the task that you wish, and you can stop the task at any time without penalty. You will still be compensated the full amount of money for participating.

There may also be risks involved from taking part in this study that are not known to researchers at this time.

Study Costs and Compensation

Other than transportation and possibly parking costs, participation in this study will not cost you anything.

You will be paid for your time and inconvenience: $30 for the first session and $60 for the second session. You will be paid for each session completed and can receive up to $90 total.

Research Related Injuries

In the event that this research related activity results in an injury, treatment will be made available including first aid, emergency treatment, and follow-up care as needed. Care for such will be billed in the ordinary manner to you or your insurance company. No reimbursement, compensation, or free medical care is offered by Wayne State University, the Detroit Medical Center or NIH. If you think that you have suffered a research-related injury, contact the Principal Investigator, Dr. Mark Lumley, away at (313) 577-2773.

Confidentiality

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. You will be identified in the research records by a code name or number. Information that identifies you personally will not be released without your written permission. However, the study sponsor, the Human Investigation Committee (HIC) at Wayne State University, or federal agencies with appropriate regulatory oversight [e.g., Food and Drug Administration (FDA), Office for Human Research Protections (OHRP), Office of Civil Rights (OCR), etc.) may review your records.

When the results of this research are published or discussed in conferences, no information will be included that would reveal your identity.

All data and the audio and video-recordings will be kept in your study file until after 6 years after the study findings have been published, and then they will be destroyed. Neither your name nor other personally identifying information will be on the audio or video-recordings or questionnaires. Records that contain your name will be destroyed after the data have been collected.

Voluntary Participation/Withdrawal

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you decide to take part in the study, you can later change your mind and you are free to withdraw from the study at any time. You are free to answer only questions that you want to answer, or engage in treatment activities that you choose. Your decisions will not change any present or future relationship with Wayne State University or its affiliates, or other services you are entitled to receive.

The investigator may stop your participation in this study without your consent. The investigator will make the decision and let you know if it is not possible for you to continue. Such a decision is made to protect your health and safety or because you did not follow the study instructions.

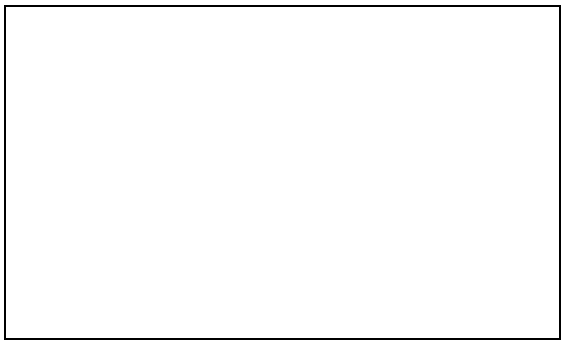
Questions

If you have any questions about this study now or in the future, you may contact Dr. Mark Lumley or one of his research team members at the following phone number: (313) 577-2773. If you have questions or concerns about your rights as a research participant, the Chair of the Human Investigation Committee can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

Consent to Participate in a Research Study

To voluntarily agree to take part in this study, you must sign on the line below. If you choose to take part in this study you may withdraw at any time. You are not giving up any of your legal rights by signing this form. Your signature below indicates that you have read, or had read to you, this entire consent form, including the risks and benefits, and have had all of your questions answered. You will be given a copy of this consent form.

_____	_____
Signature of participant	Date
_____	_____
Printed name of participant	Time
_____	_____
Signature of witness*	Date
_____	_____
Printed of witness*	Time
_____	_____
Signature of person obtaining consent	Date
_____	_____
Printed name of person obtaining consent	Time



*****Use when participant has had this consent form read to them (i.e., illiterate, legally blind, translated into foreign language).

_____ _____

Signature of translator Date

_____ _____

Printed name of translator Time

REFERENCES

Bagby, R. M., Parker, J. D., & Taylor, G. J. (1994). The twenty-item Toronto Alexithymia Scale—I. Item selection and cross-validation of the factor structure. *Journal of Psychosomatic Research, 38*(1), 23-32.

Bagby, R. M., Taylor, G. J., & Parker, J. D. (1994). The twenty-item Toronto Alexithymia Scale—II. Convergent, discriminant, and concurrent validity. *Journal of Psychosomatic Research, 38*(1), 33-40.

Bagozzi, R. P., & Yi, Y. (1990). Assessing method variance in multitrait-multimethod matrices: The case of self-reported affect and perceptions at work. *Journal of Applied Psychology, 75*(5), 547.

Barbour, K. A., Eckhardt, C. I., Davison, G. C., Kassinove, H. (1998). The experience and expression of anger in maritally violent and maritally discordant-nonviolent men. *Behavior Therapy, 29*, 173-191.

Beck, A. T. & Beamesderfer, A. (1974). Assessment of depression: The depression inventory. *Modern Problems of Pharmacopsychiatry, 7*, 151-169.

Beck, A. T. & Steer, R. A. (1984). Internal consistencies of the original and revised Beck Depression Inventory. *Journal of Clinical Psychology, 40*, (6), 1365-1367.

Beck, A. T., Steer, R. A., Ball, R., & Ranieri, W. F. (1996). Comparison of Beck Depression Inventories-IA and –II in psychiatric outpatients. *Journal of Personality Assessment, 67*(3), 588-597.

Bendig, A. A. (1956). The development of a short form of the Manifest Anxiety Scale. *Journal of Consulting Psychology*

Bohns, V. K. & Wiltermurth, S. S. (2012). It hurts when I do this (or you do that): Posture and

pain tolerance. *Journal of Experimental Social Psychology, 48*, 341-345.

Booth-Butterfield & Booth-Butterfield. (1990). Conceptualizing affect as information in communication production. *Human Communication Research, 16*(4), 451-476.

Broderick, J. E., Junghaenel, D. U., & Schwarz, J. E. (2005). Written emotional expression produces health benefits in fibromyalgia patients. *Psychosomatic Medicine, 67*(3), 326-334.

Burns, J.W., Quartana, P.J., Gilliam, W., Gray, E., Matsuura, J., Nappi, C., Wolfe, B., & Lofland, K. (2008). Effects of anger suppression on pain severity and pain behaviors among chronic pain patients: A test of an ironic process model. *Health Psychology, 27*(5), 645-652.

Cacioppo, J. T., Petty, R. E. & Kao, C. F. (1984). The efficient assessment of need for cognition. *Journal of Personality Assessment, 48*(3), 306-307.

Coan, J. A. & Gottman, J. M. (2007). The specific affect (SPAFF) coding system. In J. A. Coan and J. J. B. Allen (Eds.) *Handbook of Emotional Elicitation and Assessment* (106-123), New York, NY: Oxford University Press.

Conte, H. R., Plutchik, R., Jung, B. B., Picard, S., Karasu, T. B., & Lotterman, A. (1990). Psychological mindedness as a predictor of psychotherapy outcome: A preliminary report. *Comprehensive Psychiatry, 31*(5), 426-431.

Conte, H. R., Ratto, R., & Karasu, T. B. (1996). The Psychological Mindedness Scale: Factor structure and relationship to outcome of psychotherapy. *Journal of Psychotherapy Practice & Research, 5*(3), 250-259.

Costa, P. T. & McCrae, R. R. (1985). *The NEO Personality Inventory.* Odessa, FL: Psychological Assessment Resources.

Darwin, C., (1872). The expression of emotions in man and animals. London: John Murray.

Davison, G. C., Feldman, E M., & Osborn, C. E. (1984). Articulated thoughts, irrational beliefs, and fear of negative evaluation. *Cognitive Therapy and Research, 8*(6), 349-362.

Deffenbacher, J. L., & Sabadell, P. M. (1992). Comparing high trait anger individuals with low trait anger individuals. In M. Muller (Ed.), *Anger and Aggression in Cardiovascular Disease*, Bern, Switzerland: Hans Huber.

Deffenbacher, J. L., Oetting, E. R., Lynch, R. S., and Morris, C. D. (1996). The expression of anger and its consequences. *Behaviour Research and Therapy*, *34*(7), 575-590.

Diamond, E. L. (1982). The role of anger and hostility in essential hypertension and coronary heart disease. *Psychological Bulletin, 92*(2), 410-433.

Lindell, M. K. & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, *86*(1), 114-121.

Eckhardt, C. I., Barbour, K. A., & Davison, G. C. (1998). Articulated thoughts of maritally violent and nonviolent men during anger arousal. *Journal of Clinical and Consulting Psychology, 66*(2), 259-269.

Eckhardt, C., & Jamison, T. R. (2002). Articulated thoughts of male dating violence perpetrators during anger arousal. *Cognitive Therapy and Research*, *26*(3), 289-308.

Eckhardt, C., Norlander, B., & Deffenbacher, J. (2004). The assessment of anger and hostility: A critical review. *Aggression and Violent Behavior*, *9*(1), 17-43.

Eisner, L. R. & Johnson, S. L. (2007.) An acceptance-based psychoeducation intervention to reduce expressed emotion in relatives of bipolar patients. *Behavior Therapy, 39*, 375-385.

Ekman, P. and Friesen, W. V. (1977). *Facial action coding system: A technique for the measurement of facial movement*. Palo Alto, CA: Consulting Psychologists Press.

Engebretson TO, Matthews KA, Scheider MF. (1989). Relations between anger expression and cardiovascular reactivity: Reconciling inconsistent findings through a matching hypothesis. *Journal of Personality and Social Psychology, 57*, 513-521.

Everson, S. A., Goldberg, D. E., Kaplan, G. A., Julkunen, J., & Salonen, J. T. (1998). Anger expression and incident hypertension. *Psychosomatic Medicine, 60*(6), 730-735.

Feldner, M. T., Zvolensky, M. J., Eifert, G. H., & Spira, A. P. (2003). Emotional avoidance: An experimental test of individual differences and response suppression using biological challenge. *Behaviour Research and Therapy, 41*, 403-411.

Gillis, M. E., Lumley, M. A., Mosley-Williams, A., Leisen, J. C. C., & Roehrs, T. (2006). The health effects of at-home written emotional disclosure in fibromyalgia: A randomized trial. *Annals of Behavioral Medicine, 32*(2), 135-146.

Gotlib, I. H. (1984). Depression and general psychopathlogy in university students. *Journal of Abnormal Psychology, 93*(1), 19-30.

Gottman, J. M. & Krokoff, L. J. (1989). Marital interaction and satisfaction: A longitudinal view. *Journal of Consulting and Clinical Psychology, 57*(1), 47-52.

Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2*(3), 271-299.

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*, 281-291.

Greenberg, M. A., Wortman, C. B., & Stone, A. A. (1996). Emotional expression and physical health: Revising traumatic memories or fostering self-regulation? *Journal of Personality and Social Psychology, 71*(3), 588-602.

Harburg, E., Erfurt, J. C., Hauenstein, L. S., Chape, C., Schull, W. J., & Schork, M. A. (1973). Socio-ecological stress, suppressed hostility, skin color, and black-white male blood pressure: Detroit. *Psychosomatic Medicine, 35*(4), 276-296.

Harburg, E., Blakelock Jr., E. H., & Roeper, P. R. (1979). Resentful and reflective coping with arbitrary authority and blood pressure: Detroit. *Psychosomatic Medicine, 41*(3), 189-202.

Johnson, E. H. (1984). *Anger and anxiety as determinants of elevated blood pressure in adolescents.* Unpublished doctoral dissertation, University of South Florida, Tampa.

Kelley, J. E., Lumley, M. A., & Leisen, J. C. C. (1997). Health effects of emotional disclosure in rheumatoid arthritis patients. *Health Psychology, 16*(4), 331-340.

Keltikangas-Jarvinen, L., Raikkonen, K., Hautanen, H. A. (1996). Vital exhaustion, anger expression, and pituitary and adrenocortical hormones. *Arteriosclerosis, Thrombosis, and Vascular Biology*, *16*, 275-280.

Knight, R. G., Chisholm, B. J., Paulin, J. M., & Waal-Manning, H. J. (1988). The Spielberger Anger Expression Scale: Some psychometric data. *Journal of Clinical Psychology, 27*, 279–281.

Larson, M. R., and Langer, A. W. (1997). Defensive hostility and anger expression: Relationship to additional heart rate reactivity during active coping. *Psychophysiology*, *34*, 177-184.

Leising, D., Grande, T., & Faber, Rainer. (2009). The Toronto Alexithymia Scale (TAS-20): A measure of general psychological distress. *Journal of Research in Personality, 43*, 707-710.

Leising, D. Rudolf, G., & Grande, T. (2004). The clinical emotions list - a procedure for assessing patients' affective repertoires. *Psychosomatische, 54, (3-4),* 173-178.

Lindell, M. K. & Whitney, D. J. (2001). Accounting for common method variance in cross-sectional research designs. *Journal of Applied Psychology*, *86*(1), 114-121.

Lumley, M. A. (2004). Alexithymia, emotional disclosure, and health: A program of research. *Journal of Personality 72*(6), 1271-1300.

Lumley, M. A., Gustavson, B. J., Partridge, R. T., & Labouvie-Vief, G. (2005). Assessing alexithymia and related emotional ability constructs using multiple methods: Interrelationships among measures. *Emotion, 5*(3), 329-342.

Luminet, O., Rime, Bernard, Bagby, R. M., & Taylor, G. (2004). A multimodal investigation of emotional responding in alexithymia. *Cognition and Emotion, 18*(6), 741-766.

Lundh, L. & Simonsson-Sarnecki, M. (2001). Alexithymia, emotion, and somatic complaints. *Journal of Personality, 69*(3), 483-510.

Mauss, I. B., Evers, C., Wilhelm, F. H., & Gross, J. J. (2006). How to bite your tongue without blowing your top: Implicit evaluation of emotion regulation predicts affective responding to anger provacation. *Personality and Social Psychology Bulletin, 32*(5), 1-14.

Norman, S. A., Lumley, M. A., Dooley, J. A., & Diamond, M. P. (2004). For whom does it work? Moderators of the effects of written emotional disclosure in a randomized trial among women with chronic pelvic pain. *Psychosomatic Medicine, 66*, 174-183.

Novaco, R. W. & Taylor, J. L. (2004). Assessment of anger and aggression in male offenders with developmental disabilities. *Psychological Assessment, 16*(1), 42-50.

Parrott, D. J., Zeichner, A., & Stephens, D. (2003). Effects of alcohol, personality, and provocation on the expression of anger in men: A facial coding analysis. *Alcoholism: Clinical and Experimental Research, 27*(6), 937-945.

Parrot, D. J. & Giancola, P. R. (2004). A further examination of the relation between trait anger and alcohol-related Aggression: The role of anger control. *Alcoholism: Clinical and Experimental Research, 28*(6), 855-864.

Pennebaker, J. W. (1997). Writing about emotional experiences as a therapeutic process. *Psychological Sciences, 8*(3), 162-166.

Pennebaker, J. W., Francis, M. E., & Booth, R. J. (2001). Linguistic Inquiry and Word Count. New Jersey: Erlbaum.

Roedema, T. M. & Simmons, R. F. (1999). Emotion-processing deficit in alexithymia. *Psychophysiology, 36*(3), 379-387.

Rohrmann, S., Bechtoldt, M. N., Hopp, H., Holdapp, V., & Zapf, D. (2011). Psychophysiological effects of emotional display rules and the moderating role of trait anger in a simulated call center. *Anxiety, Stress & Coping: An International Journal*, *24*(4), 421-438.

Parker, J. D., Taylor, G. J. & Bagby, R. M. (1993). Alexithymia and the recognition of facial expressions of emotion. *Psychotherapy and Psychosomatics, 59,* 3-4.

Porter, L. S., Keefe, F. J., Lipkus, I., & Hurwitz, H. (2005). Ambivalence over emotional expression in patients with gastrointestinal cancer and their caregivers: Associations with patient pain and quality of life. *Pain, 177*, 340-348.

Quartana, P., Loon, K.L., & Burns, J.W. (2007). Anger suppression, ironic effects and sensitivity to acute pain. *Journal of Behavioral Medicine*, *30,* 455-470.

Quartana, P. & Burns, J.W. (2007). Suppression of anger and pain sensitivity: A test of an ironic process model. *Emotion, 7,* 400-414.

Quinton, S. & Wagner, H. L. (2005). Alexithymia, ambivalence over emotional expression, and eating attitudes. *Personality and Individual Differences, 38*, 1163-1173.

Raulin, M. L. (1984). Development of a scale to measure intense ambivalence. *Journal of Consulting and Clinical Psychology, 52,* 63-72.

Rohrmann, S., Bechtoldt, M. N., Hopp, H., Hodapp, V., & Zapf, D. (2011). Psychophysiological effects of emotional display rules and the moderating role of trait anger in a simulated call center. *Anxiety, Stress & Coping: An International Journal, 24*(4), 421-438.

Rowlison, R. T., & Felner, R. D. (1988). Major life events, hassles, and adaptation in adolescence: Confounding in the conceptualization and measurement of life stress and adjustment revisited. *Journal of Personality and Social Psychology, 55*(3), 432-444.

Smyth, J. M. (1998). Written emotional expression: Effect sizes, outcome types, and moderating variables. *Journal of Consulting and Clinical Psychology, 66*(1), 174-184.

Smyth, J. M., Stone, A. A., Hurewitz, A., & Kaell, A. (1999). Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis. *Journal of the American Medical Association, 281*(14), 1304-1309.

Stephens, R., Atkins, J., & Kingston, A. (2009). Swearing as a response to pain. *Neuroreport, 20*, 1056-1060.

Steptoe, A., Cropley, M., Griffith, J., & Kirschbaum, C. (2000). Job strain and anger expression predict early morning elevations in salivary cortisol. *Journal of Biobehavioral Medicine, 62*(2), 286-292.

Spielberger, C. D., Johnson, E. H., Russell, S. F., Crane, R. J., Jacobs, G. A., & Wordern, T. J. (1985). The experience and expression of anger: Construction and validation of an anger expression scale. In M. A. Chesney & R. H. Rosenman (Eds.) *Anger and hostility in cardiovascular and behavioral disorders*. (pp. 5-30). New York: Hemisphre.

Spielberger, C. D., Krasner, S. S., & Solomon, E. P. (1988). The experience, expression and control of anger. In M. P. Janisse (Ed.), *Health psychology: Individual differences and stress* (pp. 89-108). New York: Springer-Vertag.

Spielberger, C. D. & Sydeman, S. J. (1994). State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In M. E. Maruish (Ed.) *The use of psychological testing for treatment planning and outcome assessment* (pp. 292-321). Hillsdale, N. J: L. Erlbaum Associates.

Suls, J. & Bunde, J. (2005). Anger, anxiety, and depression as risk factors for cardiovascular disease: The problems and implications of overlapping affective dispositions. *Psychological Bulletin, 131*(2), 260-300.

Taylor, J.A. (1953). A personality scale of manifest anxiety. *The Journal of Abnormal and Social Psychology, 48*, (2), 285-290.

Taylor, G. J., Bagby, R. M., & Parker, J. D. (2003). The 20-Item Toronto Alexithymia Scale: IV. Reliability and factorial validity in different languages and cultures. *Journal of Psychosomatic Research, 55*(3), 277-283.

Taylor, G.J., Bagby, R.M., & Parker, J.D.A. *Disorders of affect regulation: Alexithymia in medical and psychiatric illness.* Cambridge University Press, 1997.

Taylor, J. L. & Novaco, R. W. (2004). Development of an imaginal provocation test to evaluate treatment for anger problems in people with intellectual disabilities. *Clinical Psychology & Psychotherapy, 11*(4), 233-246.

Taylor, S. P., & Leonard, K. E. (1983). Alcohol and human aggression. In R. G. Geen & E. I. Donnerstein (Eds.), *Aggression: Theoretical and empirical reviews* (pp. 77-102). New York: Academic Press.

Tull, M. T., Medaglia, E., & Roemer, L. (2005). A investigation of the construct validity of the 20-item Toronto Alexithymia Scale through the use of a verbalization task. *Journal of Psychosomatic Research, 59*(2), 77-84.

VanCoillie, H., Mechelen, I. V., Ceulemans, E. (2006). Multidimensional individual differences in anger-related behaviors. *Personality and Individual Differences, 41*(1), 27-38.

Verona, E. (2005). Moderating effects of rumination and gender on context-specific aggression. *Aggressive Behavior, 30*(5), 420-436.

Verona, E., Patrick, C. J., Lang, A. R. (2002). A direct assessment of state and trait negative emotion in aggressive behavior. *Journal of Abnormal Psychology, 111*(2), 249-258.

Watson, D. & Pennebaker, J. W. (1989). Health complaints, stress, and distress: Exploring the central role of negative affectivity. *Psychological Review, 96*(2), 234-254.

Whelton, W. J. & Greenberg, L. S. (2005). Emotion in self-criticism. *Personality and Individual Differences, 38,* 1583-1595.

ABSTRACT

ANGER EXPRESSION: EVALUATING THE CONSTRUCT VALIDITY OF SEVERAL EMOTION REGULATION MEASURES

by

MATTHEW J. JASINSKI

December 2013

Advisor: Dr. Mark A. Lumley

Major: Psychology (Clinical)

Degree: Master of Arts

Researchers have used the Anger Expression Inventory (AEI), Ambivalence of Emotional Expression Questionnaire (AEQ), and Toronto Alexithymia Scale 20 (TAS) self-report measures to draw conclusions about relationships between emotion regulation and many other variables, but there is an insufficient amount of validation evidence about these measures. After first filling out the self-report measures, 75 participants with chronic low back pain completed a videotaped anger induction paradigm, in order to provoke the naturalistic experience of anger. Participants were next given the opportunity to express their anger to the experimenter, in either a guided or unguided condition. We then coded the videos to rate the amount of anger and anxiety expressed by the participants both verbally and non-verbally. Correlations among the predictor variables and behavioral variables showed that Anger-Out and TAS were positively correlated with anger, and Anger-In and AEQ were independent of anger. The findings support the validity of Anger-Out, suggest that Anger-In and TAS measure slightly different constructs that than theorized, and calls into question the validity of the AEQ.

AUTOBIOGRAPHICAL STATEMENT

Matthew Jasinski is currently a graduate student in the Clinical Psychology program at Wayne State University. He completed his undergraduate degree in Psychology, with a Biological and Evolutionary Science option at the Pennsylvania State University in 2011.

Matthew's career interests are in the area of health psychology, specifically in the area of treatments for individuals with chronic health conditions. His work and graduate training have provided the opportunity to be an active member of the WSU Stress and Health Research Lab. Matthew is currently working as a research assistant on a study examining the effects of emotional expression and suppression on chronic low back pain.

He has gained additional experience working as a research assistant at Henry Ford Health Systems since 2012. There, he works as the project manager implementing a research protocol for all new patients who are consulting with back surgeons. The goal of the study is to understand how patients make decisions regarding surgery, in order to provide better information in patients in an increasingly consumer oriented health care system.

These research experiences have further developed his goals of becoming a clinical health psychologist with expertise in research, therapy, and assessment while working in a hospital setting.