EGO DEPLETION AS A MEASURE OF EMOTION PROCESSING DEFICITS AMONG PEOPLE WITH MEDICALLY UNEXPLAINED SYMPTOMS

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ABSTRACT

Medically unexplained symptoms (MUS) are problematic because they are both common and costly. Furthermore, patients with these symptoms suffer from interpersonal problems, functional impairments and psychological problems. One hypothesis explaining the underlying mechanisms of MUS is that these patients find it difficult to process or regulate emotions effectively.

Even though previous studies found a link between emotion processing deficits and MUS, results were inconsistent and contradictory. By using an ego depletion task as a measure of emotion processing deficits, this study compared performance on different aspects of emotion processing of people who scored high on a MUS measure with the people who scored low on the same measure. Results show that high symptom reporters were not significantly different from the low ones in terms of their performance on emotion experience, emotion expression and self-monitoring of their emotional experiences. However, along the same lines with the literature, high symptom reporters could not effectively regulate their negative emotions.

DEDICATION

This thesis is dedicated to my son Ali Ismail. He came to the world in the middle of my work and brought me motivation, happiness and luck. I hope he will affect his own life in the same way…

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INTRODUCTION

'I used to be considered a pretty articulate person, but I noticed it at the other session too at the other hospital. When it comes to describing feelings, I seem to be at a loss for words.'

38 year-old female patient with medically unexplained symptoms

(Nemiah & Sifneos, 1970, p.29).

Medically unexplained symptoms (MUS) represent an important problem in clinical medicine. Patients with MUS typically suffer from interpersonal problems, functional impairments and psychological problems. Furthermore, these patients intentionally place themselves at risk by exposing themselves to unnecessary medical assessments and treatments. Although the problems of these patients are well documented, they are not well understood. One hypothesis explaining MUS is that these patients are somehow unable to effectively process or regulate their emotions. However, research on the relationship between MUS and emotion processing is confusing and sometimes contradictory. The aim of this dissertation research is to better understand this relationship by applying previously untapped social psychological theories and methods.

Overview of Medically Unexplained Symptoms

Physical symptoms for which no medical explanation can be found are called 'medically unexplained symptoms' (MUS). Approximately 20% of patients in primary care settings have one symptom that is not medically explained (Fink, 1992). Frequent hospitalization and excessive use of medical treatments by these patients create high medical costs both in Europe and in the US (Barsky, Orav & Bates, 2005; Bermingham, Cohen, Hague & Parsonage, 2010).

Different theories have been developed to understand this common problematic medical condition. According to 'the interpersonal theory', MUS patients may exaggerate symptoms to manage their interpersonal relations and enhance their self-esteem (Bauer & Boegner, 1996; Phillips, 2001; Hamilton, Deemer & Janata, 2003). On the other hand, 'the social pain/physical pain overlap theory' claims that since social pain and physical pain share the same neural architecture in the brain, situations inducing social pain (e.g. separation from a loved one) trigger physical pain (e.g. headache), or vice versa (e.g. painful surgery causing depressive symptoms). Therefore, physical distress is a byproduct of brain activation; it is a real and automatic response (Eisenberger, Lieberman, & Williams, 2003; Eisenberger & Lieberman, 2004; Eisenberger, Jarcho, Lieberman, & Naliboff, 2006). Lastly, according to the information processing theory, MUS patients have increased sensitivity towards their bodily sensations and they interpret those signals as abnormal and pathologic (Taylor & Brown, 1988; Barsky, Wyshak & Klerman, 1990).

Another line of research focuses on the possibility that these patients have impaired emotion expression and regulation skills (Landa, 2012; Sifneos, 1972). Specifically, in addition to problematic emotion regulation strategies, they cannot effectively identify and express their emotions. However, research on the relationship between MUS and emotion related problems

has produced confusing and contradictory results. Furthermore, experimental studies using social psychology theories are limited in this area. The present study will focus on these problems.

Theories of Emotion Related Problems in Persons with MUS

Psychopathology involves problems with emotional experiences and emotion regulation. Many psychological disorders are characterized by problematic emotional intensity (e.g. increased anxiety among social anxiety patients or lack of remorse among people with antisocial personality), emotional duration (e.g.. prolonged negative emotions among people with specific phobia), emotion frequency (e.g. problematic infrequency of positive emotions among dysthymia patients) and emotion type (e.g. inappropriate emotions of schizophrenia patients) (Gross & Jazaire, 2014).

According to one of the earliest explanations of MUS, when people cannot express distress related emotions directly, they express them physically. Symbolic representation of emotions has been one of the essential topics of psychology for years. According to Freud, people repress their unwanted desires and feelings. Through psychoanalysis, psychologists can help their patients to bring this unconscious content into conscious awareness and solve their conflicts. Otherwise, unexpressed psychological distress may be expressed as medical problems (Gazzaniga, Heatherton & Halpern, 2010). In addition, dissociative disorder, which is characterized as being out of touch with emotions, has been linked to MUS. Specifically, somatic symptoms are very common among people with dissociative disorders, and research indicates that dissociative disorders predict somatization disorders (Tsar, Kundakci, Kiziltan, Bakim, & Bozkurt, 2001; Sar, Akyuz, Kundakci, Kiziltan & Dogan, 2004). Nevertheless, the underlying processes connecting these two mechanisms are not well explained. One common process that unites them is the lack of integration between implicit and explicit perceptual processes, e.g.

dissociative amnesia (preventing memories from reaching conscious awareness) and memory loss among MUS patients (Brown, Cardeña, Nijenhuis, Sar, & Hart, 2007; Saxe, Chinman, Berkowitz, Hall, Lieberg, Schwartz & Kolk, 1994). Other lines of research connect dissociation and MUS via alexithymia, which refers to difficulties in describing and identifying emotions, and elaborating fantasies (Kooiman, Bolk, Rooijmans & Trusburg, 2004; Taylor, 1984). Particularly, research shows that pathological dissociation is related to alexithymic traits (Grabe, Rainermann, Spitzer, Gänsicke, & Freyberger, 2000) and alexithymia is very common among MUS patients (De Gutch & Heiser, 2003).

Two clinical observations also validate the relationship between emotional distress and MUS. First, people with MUS have problems in expressing their emotions in psychotherapy. In the view of psychoanalytic theory, since MUS patients cannot solve their intrinsic conflict via effective communication, they use symbolization to manage their conflict. In this case, symbolization refers to physical symptom reporting. Secondly, people benefit from emotion expression in psychotherapy. It helps people to relieve their tension. Therefore, a lack of emotion expression is related to more distress. Consequently, emotion expression difficulties contribute to somatic illness and prevent people from benefitting from insight-oriented psychotherapies (Kirmayer, 1987). Similarly, in 1972, Sifneos noted that patients with MUS are limited in their abilities to express and describe their emotions, and argued that they are not appropriate for dynamic psychotherapy because of this reason. To sum up, emotion expression is a way of effective communication during psychotherapy, but MUS patients lack these skills and cannot benefit from psychotherapy as much as other people do.

From a developmental perspective, recent theories cite childhood experiences as a contributor to the relationship between emotion-related problems and MUS. Medically

unexplained symptoms are very common among insecurely attached people (Stuart & Noyes, 1999; Ciechanowski, Katon, Russo & Dwight-Johnson, 2002; Hunter & Maunder, 2004). Several studies show that insecure attachment, emotion expression and regulation problems coexist among MUS patients (Gil, Scheidt, Hoeger, & Nickel, 2008**;** Scheidt et al., 1999). Research from Wearden and his colleagues (2005) and Maunder and Hunter (2001) suggests that alexithymia and negative affect mediates the relationship between insecure attachment and MUS. Two review articles explain this complicated relationship between attachment, MUS and emotion related problems. According to Landa (2012), expressing distress somatically is very normal during infancy. With the guidance of the caregiver, children learn how to express and regulate their emotional distress, so the level of somatic complaints decreases with age. However, rejecting and abusive parents do not have these skills and may fail to teach emotion regulation skills and instead reinforce somatic expression of distress. These early experiences negatively affect neural functions and hormonal changes involved in emotion regulation. Therefore, somatic expression of distress is carried over into adulthood. Alternatively, according Waller and Scheidt (2006), MUS is related to both insecure attachment and emotion regulation and expression problems. However, affect regulation deficits themselves are not sufficient to trigger MUS. It is actually people with poor attachment who suffer from both emotion expression and regulation problems and MUS. To sum up, MUS, attachment security and emotion regulation mechanism are all related. However, the way they affect each other is not clear.

Lastly, MUS may originate from unacceptability or denial of negative emotions. According to Rimes and Chalder, 2010, societies value positive emotions. Consequently, the unacceptability of negative emotions feeds medically unexplained symptoms. People prefer to express their emotional distress via physical symptoms. Along the same lines, Corbishley and

her colleagues (1990), found that depressed females with MUS view emotional expression as dangerous and thus deny their emotional needs. Additionally, the desire to express one's emotions, combined with the fear of doing so, is related to higher pain complaints among patients with MUS (Lumney et al., 2011).

To sum up, early theories and clinical observations underline the importance of appropriate emotion expression for psychological wellbeing. Expectedly, many psychological disorders involve emotion expression and regulation problems, so it is not surprising to find a correlation between MUS and emotion related problems. Furthermore, social values (i.e. societies that value positive emotions) and quality of the attachment to the caregiver shape people's emotion regulation skills. In conclusion, MUS and emotion regulation mechanisms are related, however, the way they affect each other is not clear. It is important to review the literature on the relationship between emotion related psychological processes and MUS, to understand how this relationship operates.

Emotion Related Psychological Processes and MUS

Emotions are complex processes, and to be able to determine what emotional functions or processes are related to MUS, I will first define the emotional processes and then review the literature on MUS related emotional processes.

Emotion has multiple aspects (e.g. physiological component, subjective feeling component, cognitive component, behavioral component, etc.) and functions (e.g. motivates cognition and action, organizes and coordinates behaviors, etc.) therefore it is a complex concept (Izard, 2010).

According to Schachter and Singer, an emotion is determined by two factors: physiological arousal and cognitive interpretation of the situation. Their study showed that, if a

person has no immediate explanation for his state of physiological arousal, he evaluates available cognitive cues to label his feelings. If he already has an explanation for the arousal, then he uses these cognitions to describe his feelings (Schachter & Singer, 1962).

Emotion is composed of three functions: *emotion experience* (e.g. feeling happy), *emotion expression* (e.g. smile) and *emotion regulation*. Even though they are closely connected, they do not always occur together. In other words, external and internal emotional cues trigger emotional response tendencies, but do not guarantee emotional action. Through emotion regulation, these responses can be inhibited or exaggerated (Lewis & Brooks, 1998; Kring, & Gordon, 1998; Gross, John, & Richards, 2000; Gross et al., 1997).

There are complex nuances of emotion and emotion related processes which have not been taken into account in the literature linking MUS to emotion problems. Still, there is limited research on specific emotion related problems of people with MUS.

In addition to the problems on emotion expression, experience and regulation, emotion awareness and self-monitoring problems are discussed in the following section because these are necessary for emotion regulation, and impairment of these skills predicts psychological disorders (Sim & Zeman, 2004).

Alexithymia. As indicated before, *alexithymia* is a personality trait that is characterized by difficulties in cognitive processing and regulation of emotions (Kooiman, Bolk, Rooijmans & Trusburg, 2004; Taylor, 1984). It is related to poor ability to recognize emotions, for both verbal (i.e. narratives) and nonverbal presentations (i.e. facial expressions) (Parker, Taylor, & Bagby, 1993; Mann, Wise, Trinidad & Kohanski, 1994; Lane, Lee, Reidel, Weldon, Kaszniak, Schwartz, 1996). Alexithymia is correlated with low self-efficacy, high pain catastrophizing (exaggerating

pain and perceived inability to cope with pain), high depression and high physical impairment (Lumney, Smith, & Longo, 2002). In addition, alexithymia relates positively with pain severity and duration of pain (Lumley et al., 2005; van Middendorp et al., 2008; Celikel & Saatcioglu, 2006).

Emotion Experience and Awareness. *Emotion experience* starts with the evaluation of external and internal emotional cues and continues until/after emotional actions. Several processes (e.g. perceiving, feeling, thinking) are activated during an emotion experience and they are interrelated (Gross, John, & Richards, 2000; Frijda, 2009). According to the alexithymia research, MUS patients have difficulty processing and identifying their emotions (Sifneos, 1972; Ak, Sayar, & Yontem, 2004; Celikel & Saatcioglu, 2006; Sayar, Gulec, & Topbas, 2004; Bagby, Taylor, Ryan, 1986; Subic-Wrana, Bruder, Thomas, Lane, & Kohle, 2005).

For effective emotion regulation, *emotion awareness*, which refers to the conscious experience of emotions, is essential (Lambie & Marcel, 2002). According to Scherer and Ceschi (2000), emotion awareness involves subjective feeling after observing physiological and motivational changes in one's body.

Problems in emotion differentiation and awareness are common among MUS patients, but awareness does not always lead to proper expression and control of distress (Scherer & Ceschi, 2000). Increased pain blocks differentiation of emotions; patients become less able to differentiate positive affects from negative ones (Lumney, 2011). In 1985, Catchlove could not find a correlation between emotion awareness and appropriate expression of emotions. Participants were asked to imagine an anger-provoking situation and to state their possible responses in that case. Some participants who were aware of their negative feelings were not able

to demonstrate appropriate expression of those feelings. Furthermore, some participants who were able to demonstrate an appropriate behavior were not aware of what they were feeling. Relatedly, when MUS patients were asked to predict the origins of their symptoms, almost half of them could relate those to their mental and emotional problems such as anxiety problems and self-confidence (Hiller, Cebulla, Korn, Leibbrand, Röers, & Nilges, 2010). Therefore, some patients are aware of their emotional distress and its relationship with their physical complaints, but they cannot control or regulate that distress.

In summary, research on emotion experience and awareness shows that people with MUS have difficulty with identifying and differentiating their emotions in general. Therefore, in this study, it is expected that the high symptom reporters would have problems in emotion experience.

Emotion Expression. *Emotion expression* has two components: verbal and nonverbal expression. Verbal expression refers to the ability to identify one's own emotions via retrospection and then use of language to clearly express those emotions to others. The nonverbal part basically involves the use of body language (e.g. facial expressions) for emotion expression (Salovey & Mayer; 1990).

Alexithymia research shows that, compared to healthy people or people with other psychiatric disorders, the verbalization of emotions are more problematic among MUS patients. In general, MUS patients describe their emotional experiences in physiological terms (e.g. feeling sick) and they rarely identify mixed emotions in their descriptions (Sifneos, 1972; Ak, Sayar, & Yontem, 2004; Celikel & Saatcioglu, 2006; Sayar, Gulec, & Topbas, 2004; Bagby, Taylor, Ryan, 1986; Subic-Wrana, Bruder, Thomas, Lane, & Kohle, 2005).

In general, patients with MUS benefit from written emotional expression. Their symptoms and reported pain severity decrease by expression of emotional distress (Broderick, Junghaenel, & Schwartz, 2005; Gillis, Lumley, Mosley-Williams, & Roehrs, 2006). However, not all patients can benefit from emotion expression treatments. In one study, MUS patients, who want to express their emotions but fear doing so, who were high in catastrophizing and negative affectivity could benefit from emotion expression more than their counterparts who were low on those measures (Norman, Lumley, Dooley & Diamond, 2004).

Specific emotions. In general, MUS patients experience more negative emotions, but they tend to suppress these (Pilowsky & Spence, 1976; Calikusu, Yucel, Polat & Baykal, 2002; Raphael, Marbach, & Gallagher, 2000). However, they are not always successful (Merten, & Brunnhuber, 2004; Steimer-Krause, Krause & Wagner, 1990, Rieffe, Terwogt & Bosch, 2004). During therapeutic interaction, they could not control their negative emotions. According to the therapist's ratings, their expressed and experienced negative emotions were higher than that of healthy controls. They facially expressed more contempt and reported that they experienced more fear and shame (Merten, & Brunnhuber, 2004). In addition, in terms of verbal expression, children with MUS reported more fear (Rieffe, 2004); in terms of non-verbal expression, adults with MUS expressed more fear and disgust than healthy controls (Steimer-Krause, Krause, & Wagner, 1990).

In summary, people with MUS have difficulty describing and verbalizing their emotions. However, they tend to express negative emotions more than healthy controls do. Therefore, in this study, it is expected that high symptom reporters (HSR) would score low on expression of positive emotions, but score high on expression of negative emotions compared to the low symptom reporters (LSR).

Emotion Regulation and Suppression. Emotion regulation involves the control of emotion experience and expression, and when and under what conditions they will take place (Gross, 1998). According to Gross, emotion regulation can take place in five different ways: selection of situation, modification of situation, deployment of attention, change of cognitions and modulation of responses (Gross, 1998). Emotion regulation may be automatic or controlled and may operate both at conscious and unconscious levels (Scherer & Ceschi, 2000; Gross, 1998).

As indicated above, many psychological disorders involve emotion related problems. These mainly result from impaired emotion regulation, which can occur in two ways: using an inappropriate emotion regulation technique or not being able to engage in an appropriate one when it is necessary (Gross & Jazaiere, 2014).

When emotional distress is not regulated, it may negatively affect bodily systems, and physiological and psychological development of the body (Taylor, Bagby & Parker, 1997). Along the same lines, emotion regulation problems are correlated with greater pain and daily dysfunction. Specifically, children who scored high in both positive and negative affect instability reported more overall pain and functional limitation (Connelly et al., 2012). In addition, patients with MUS benefit from emotion regulation interventions (Allen, Tsao, Seidman, Ehrenreich-May, Zeltzer, 2012).

Some emotion regulation strategies are healthier than others. Inhibition and suppression are active emotion regulation strategies, but they are not particularly healthy ones. *Emotion suppression* is the deliberate inhibition of one's emotion expression and experience when emotionally aroused (Gross, & Levenson, 1993). It has two types: passive inhibition (i.e. distraction) or active inhibition (i.e. suppression) (Power & Dangleish, 1997).

Emotion suppression negatively affects sympathetic and cardiovascular systems. Specifically, it leads to greater physiological responding such as high skin conductance and heart rate. Relatedly, many research shows that it creates a risk for many disorders such as cancer and heart attack (Egloff, Schmukle, Burns, et al., 2006; Cox, 1982; Gross & Levenson, 1993; Gross & Levenson, 1997).

Even though people with MUS generally express negative emotions more than others, this does not apply to anger. Compared to healthy people or people with medically explained symptoms, MUS patients are angered more easily but are less willing to express their anger (Pilowsky &Spence, 1976; Franz, Paul, Bautz, Choroba, & Hildebrandt, 1986). In 2001, Brosschot and Aarsse found that people with MUS report lower levels of anger compared to healthy control in response to emotion eliciting videos. There was no significant difference for anxiety and sadness.

To sum up, MUS patients have problems in controlling their negative emotions in general. Therefore, it is expected that the high symptom reporters would have problems with control of their negative emotions in this study.

Self-monitoring. In this study, self-monitoring is defined as the correspondence between emotion expression and emotion experience. Previous studies show that emotion experience (i.e. self-report) and emotion expression (i.e. facial electromyogram, coded emotion expression from video tapes) are positively correlated but the size of correlation is modest (Gross, John, & Richards, 2000).

In general, MUS patients have self-monitoring problems. De Greck and his colleagues found that even though MUS patients reported that they could better empathize with angry and

sad faces presented, the fMRI results revealed diminished responsiveness in several brain regions for these emotions (De Greck et al, 2012). In addition, compared to healthy controls, self-reported affect intensity of MUS patients did not match with physiological reactions to the emotion eliciting videos. Specifically, their recorded heart rates were high, but they reported low rates of anger experience during the anger eliciting video (Brosschot & Aarsse, 2001).

In short, previous research shows that MUS patients cannot monitor their emotions effectively. Consequently, in this study, I expected not to find a poor correspondence between emotion experience and emotion expression for high symptom reporters.

Problems with Previously Used Measures

Even though previous studies found that emotion processing difficulties and MUS are correlated (Sifneos, 1972; Ak, Sayar, & Yontem, 2004; Celikel & Saatcioglu, 2006; Sayar, Gulec, & Topbas, 2004; Bagby, Taylor, Ryan, 1986; Subic-Wrana, Bruder, Thomas, Lane, & Kohle, 2005), studies using different methodologies revealed inconsistent results.

The Toronto Alexithymia Scale (TAS) is the oldest and most commonly used alexithymia scale. It is a self-report measure designed to understand personal judgments about emotion related performance. The Levels of Emotional Awareness scale (LEAS) have been used since 1990s and aimed to measure people's emotion related performance via a narrative task. Lastly, implicit measures have been used to test the relationship between MUS and emotion related cognitive performance. Results of previous studies using these three methods do not correspond with each other. While the TAS and the LEAS measures found a correlation between MUS and emotion processing problems in general, the research using the implicit measures found that emotion related words do not interfere MUS patients' performance on implicit tasks. In addition,

there are concerns about the reliability of the TAS, and it reveals inconsistent and inconclusive results compared to the LEAS.

Direct Measures. Toronto Alexithymia Scale (TAS) is the most commonly used alexithymia scale. It has three subscales: difficulty identifying feelings (DIF), difficulty describing feelings (DDF) and externally oriented thinking (EOT). Its psychometric features have been developed with its subsequent versions: TAS-R and TAS-20. Total number of items and factor structure of each version differs, but they all included those three factors. Although research shows that it is a valid and reliable construct (Bagby, Taylor & Ryan, 1986; Parker, Eastabrook, Keefer & Wood, 2010), studies using this measure on MUS patients revealed inconsistent results.

Some research using the TAS measure found a strong correlation between MUS and alexithymia (Bagby, Taylor & Ryan, 1986; Sriram, Chaturvedi, Gopinath, & Shanmugam, 1987, Fernandez, Sriram, Rajkumar, & Chandrasekar, 1989; Lumney, Asselin, & Norman, 1997; Kosturek, Gregory, Sousou, & Trief, 1998; Ak, Sayar, & Yontem, 2004; Celikel & Saatcioglu, 2006), but the correlation was weak for others (Cox, Kuch, Parker, Shulman, Evans, 1994; Bach, Bach, Bohmer, Nutzinger, 1994; Cohen, Auld, Brooker, 1994; Kooiman, Bolk, Brand, Trijsburg, Rooijmans, 2000). Additionally, Porcelli and his colleagues found that TAS scores were not correlated with the duration of MUS (Porcelli, Zaka, Leoci, Centonze, Taylor, 1995)

The TAS scores were positively correlated with depression, negative affectivity, neurotic traits and high emotion suppression, and negatively correlated with positive affectivity (Kirmayer & Robbins, 1993; Kirmayer, Robbins & Paris, 1994, Mann, Wise, Trinidad & Kohanski, 1994; Parker, Taylor, & Bagby, 1989). Although Mattila and his colleagues, 2008,

found that the TAS scores and MUS are correlated independent of depression and anxiety, other studies show that when either depression or positive affect was controlled for, this relationship became nonsignificant (Rief, 1996; De Gucht, Fischler, & Heiser, 2004).

In terms of pain experience, the TAS scores are correlated with illness severity, physical impairment and the sensory component of pain (Bach & Bach, 1995; Lumney, Smith, & Longo, 2002). However, according to Lumney, 2002, alexithymia was not the only predictor of physical impairment but also depression, self-efficacy and catastrophizing were.

There are some concerns about validity and reliability of TAS too. Of the three alexithymia subscales, only the DIF correlated strongly with MUS (Lumney, Smith, & Longo, 2002; De Gutch & Heiser, 2003; Grabe, Spitzer, Freyberger, 2004; De Gucht, Fischler, & Heiser, 2004; Mehling & Krause, 2005; Mattila et al., 2008). The EOT factor was low in internal reliability both on clinical and healthy adults (Bach &Bach, 1996; Loas et al., 2001). Different factors were correlated with different psychological variables. While the DIF and DDF were correlated with depressed mood, neuroticism, anxiety and a tendency to express negative emotions to cope with health problems, (Kirmayer & Robbins, 1993; Kirmayer, Robbins & Paris, 1994; Deary, Scott, Wilson, 1997, Tuzer et al., 2011), the EOT was correlated with low levels of openness to experience, (Kirmayer, Robbins & Paris, 1994). In addition, high scores on specific factors resulted in different tendencies for health care usage (Lumney, Norman, 1996).

The TAS does not consistently differentiate people with MUS from others. When healthy controls were compared to the patients with MUS, patients reported significantly higher degree of alexithymia (De Gucht & Heiser, 2003; Waller, Scheidt & Hartman, 2004). However, studies revealed inconclusive and inconsistent results when they compared MUS patient with patients

whose illnesses were medically verified (De Gucht & Heiser, 2003; Waller, & Scheidt, 2006; Bach, Bach & Zwann, 1996; Kooiman, Bolk, Brand, Trijsburg, & Rooijmaans, 2000; Lumley, Asselin, & Norman, 1997) or with psychiatric patients (De Gucht & Heiser, 2003; Cohen, Auld, & Brooker, 1994; Kosturek, Gregory, Sousou, & Trief, 1998; Subic-Wrana et al., 2002).

In 2003, De Gucht and Heiser reviewed the studies that used three different versions of the TAS (TAS, TAS-R and TAS-20). Results show that the correlation between MUS and alexithymia is small to moderate. However, this poor correlation was related to some other factors besides the measures used. Most of these studies only assessed if the patient had any physical symptoms and did not specifically check for medically unexplained symptoms. Furthermore, they generally used student population, therefore most results cannot be generalized to other populations.

Narrative Measures. Compared to the TAS studies, research using the levels of emotion awareness scale (LEAS) provides more consistent results. The LEAS is composed of 20 scenes involving social interaction between the respondent and another (i.e. boss, neighbor). It is constructed to elicit four basic emotions: fear, happiness, anger and sadness. For each scene, the participant is asked to respond to two open ended questions asking for their and the other person's emotional reaction in that particular situation (Lane, Quinlan, Schwartz, Walker & Zeitlin, 1990). The coding system is hierarchically organized in a continuum from 1 to 5. Responses are rated with higher scores as they become less procedural and sensory-motor, and as the complexity of emotions increase (Level 1: I would feel ill vs. Level 5: My friend will be proud and happy, but also concerned about me) (Subic-Wrana, Beutel, Garfield, & Lane, 2011). It has a good inter-rater reliability, test-retest reliability, internal consistency, and discriminant and construct validity (Lane, Quinlan, Schwartz, Walker & Zeitlin, 1990; Subic-Wrana, Beutel,

Garfield, & Lane, 2011) and it is unrelated to negative affect and anxiety (Lane, Carmichael, & Reis, 2011; Waller, Scheidt, & Hartmann 2004).

Research shows that MUS is negatively correlated with LEAS scores (Bagby, Taylor, Ryan, 1986), and MUS patients score generally lower on the LEAS than the normal population (Subic-Wrana, Bruder, Thomas, Lane, & Kohle, 2005). Even though studies using the TAS scale resulted in inconclusive or inconsistent results when comparing patients with various psychiatric disorders and the ones with MUS, the LEAS could successfully differentiate them (Waller, & Scheidt, 2006; Subic-Wrana, Beutel, Garfield, & Lane, 2011).

In short, the LEAS is a more reliable and valid measure compared to the TAS. It might be because the LEAS is a direct measure of emotion processing ability, whereas the TAS relies on self-reports of those abilities (Lane, Lee, Reidel, Weldon, Kaszniak, Schwartz, 1996).

In conclusion, some studies using the TAS and/or the LEAS suggest that people with MUS are out of touch with their emotions. Some studies show that level of emotional awareness is correlated with being in touch with emotions. However, it is ironic to ask people who are not in touch with their emotions to self-report on how much they are in touch with their emotions, as in the case of TAS measure. In addition, a person with MUS has to be in touch with emotions because MUS is correlated with high rates of emotional problems (i.e. anxiety, depression).

Implicit Measures. Cognitive bias is prevalent among people with psychological disorders. For example, on a Stroop test patients react to the words related to their condition more slowly than their healthy counterparts do (Williams, Mathews & MacLeod, 1996).

Previous research revealed mixed results in terms of the relationship between alexithymia and cognitive bias. In 2006, Mueller and his colleagues examined emotion processing of

alexithymia patients. They used psychosomatic inpatients who scored high in alexithymia and administered a Stroop test which included neutral (i.e. interpreter), positive (i.e. happiness), negative (i.e. sadness), and body-related (i.e. dizziness) words. Contrary to expectations, their results showed a negative relationship between alexithymia and emotional bias; people who scored high in alexithymia had lower interference for body-related and negative words. Even after controlling for anxiety, depression and somatization, the effects remained significant.

On the contrary, Lundh and Simonsson-Sarnecki found a significant performance difference on a cognitive task when people scored high and low in alexithymia were compared. Their sample was consisted of healthy people and they used a similar method with Mueller and his colleagues: a combined Stroop and implicit memory task including three word categories: illness-related words (i.e. pain, cancer), negative emotion words (i.e. anxiety, panic) and neutral words (i.e. cable, clothes). Their results show that high alexithymia group named illness-related words slower than they did negative emotion words, even after controlling for anxiety.

Later in 2012, Wingenfeld and her colleagues showed that people with MUS show cognitive avoidance (a desire to forget, but an inability to do so) to the illness-related words specifically. By using a directed forgetting task, participants were instructed to either forget or remember 36 words, 6 from each of 6 categories: neutral, negative, positive, illness (somatoform) related, depression related and anxiety related. Their results show that in general MUS patients had difficulty remembering anxiety and depression related words, but they had difficulty suppressing illness-related words.

Lastly, in 2011, Wingenfeld and her colleagues compared MUS patients with healthy adults to investigate other psychological variables associated with cognitive bias. Participants

completed the measures of childhood trauma, depression, anxiety, dissociation, bodily symptoms, alexithymia and emotion suppression. Then, a Stroop test including neutral (i.e. window, short) and negative words (i.e. murder, envious), words related to depression (i.e. gloom, worthless), anxiety (i.e. fearful, panic) and somatization (i.e. painful, doctor) and individually chosen words related to the person's subjective main problems, was administered. Even though measurements of psychopathology (depression, anxiety and somatoform disorders) were not associated with Stroop test performance, specific indicators of psychopathology predicted participants' performance. Childhood trauma was associated with response latencies for all word categories, and emotion suppression predicted less Stroop interference for negative and anxiety related words.

To sum up, even though cognitive and attention bias is associated with psychopathology, research shows that people with alexithymia are not sensitive to emotion related words, so they are not distracted by them at a Stroop test. In addition, research also shows that MUS patients are not sensitive to emotion related words, however, a subgroup of them, who report a history of childhood trauma and also suppress their emotions less, might be.

In conclusion, MUS people might perform as well as healthy controls at some form of emotional processing (i.e. lower emotional bias and cognitive avoidance for emotion-related words) and not perform well at others (i.e. identifying and describing emotions). This research is aimed to clarify these areas since it is designed to include several emotion processing mechanisms.

MUS and Mood Problems

Negative affect, depression and different types of anxieties are related to MUS and chronic pain problems. In general, MUS patients report high rates of mood disorders (Banks &

Kerns, 1996; Dersh, Gatchel, Mayer, Polatin, & Temple, 2006). Mood problems and pain experience mutually reinforce each other. According to Von Korff and Simon, while psychological distress amplifies pain and impairs coping mechanisms, chronic pain creates another stressor impairing patients' psychological and behavioral functions (Korff & Simon, 1996). However, one study shows that mood problems and MUS are not directly connected. Depression is linked to MUS via perceived self-control and life-interference (Rudy, Kerns, & Turk, 1988). Additionally, mood and anxiety disorder patients tend to see their negative emotions as less acceptable, so suppress them more (Campbell-Sills, Barlow, Brown & Hoffmann, 2006). Anxiety sensitivity, which refers to the fear of having injurious consequences as a result of unpleasant physical reactions, is related to pain experience (Asmundson, Wright, & Hadjistavropoulos, 2000). Anxiety also affects the number of days of hospitalization and effectiveness of treatments (Kerns, & Haythornthwaite,1988; DeGroot, Boeke, van den Berge, Duivenvoorden, Bonke, & Passchier, 1997). According to Katon and his colleagues (1982), if physicians cannot recognize the mood component of MUS, patients continue the somatic manifestation of mood problems. To sum up, mood disorders are highly prevalent among MUS patients and related to their pain experience. However, it is odd that MUS patients, who have emotion expression and regulation problems, score high in depression and anxiety.

Neuroticism and MUS. Neuroticism is defined as 'a broad dimension of individual differences in the tendency to experience negative, distressing emotions and to possess associated behavioral and cognitive traits' (Costa & McCrae, 1987, p. 301). People who are high in neuroticism are characterized by having strong, changeable and negative emotions (Goldberg, 1992). Even though people who are high in neuroticism are characterized by depressive and anxious symptoms, mean levels of neuroticism are quite stable across a lifespan contrary to those

two (Costa & McCrae, 1987). Several studies indicated that neuroticism predicts MUS and illness behavior, however, the way they relate each other, whether it is a direct or indirect relationship, is not clear (Costa & McCrae, 1987; Russo et al., 1997; De Gucht, Fischler, & Heiser, 2004).

Emotion Related Problems and Gender

Another underlying mechanism tying the emotion regulation problems to MUS is gender related differences in both areas of study. Women are more emotional than men, but women are also more likely to have MUS.

First of all, women report high rates of MUS (Kroenke & Spitzer, 1998). By using data from 1000 studies, Kroenke and Spitzer tested the gender effect on the report of 13 common physical symptoms. They found that, women rate higher than men on 10 of 13 symptoms including medically unexplained symptoms.

In addition, men and women differ in terms of the level of emotion expression and emotion regulation strategies they use. Generally, women rates themselves as high in emotion expression and recognition of others' emotions (Brody, & Hall, 2008). Particularly, the frequency of positive emotions, specifically calm and excitement, is high among men and the frequency of negative emotions, specifically sadness, is high among women (Simon & Nath, 2004). Women are also more likely to refer to emotions in their writing and conversations more than men, however, there is no significant difference between their facial expression levels, other than the expression anger. Men express anger more than women do. (Brody, & Hall, 2008). However, there are inconsistent findings in terms of the relationship between anger expression and gender. Some studies show that men are more prone to express their anger than women (Fischer, Smith, Leonard, & Fuqua, 1993), but others show either no difference (Averill, 1983;

Stoner & Spencer, 1987, Simon & Nath, 2004) or opposite findings (Hashida & Mosche, 1988). Within each gender, there should be a subgroup who are more prone to anger expression than others (Gatchel, Peng, Peters, Fuchs, & Turk, 2007), or there might be other psychological variables mediating this relationship. For example, Liu found that the relationship between MUS and insecure attachment is mediated by anger proneness for men, and anger suppression for women (Liu, Cohen, Schulz, & Waldinger, 2011).

To sum up, women report more medically unexplained symptoms. They tend to process emotions differently from men, and are more neurotic and emotional than men. It may be these specific differences between men and women that point the possible specific mechanisms relating MUS to emotion processing.

Self-Regulation

Emotion regulation is an important aspect of self-regulation (Gross & John, 2003). *Self-regulation* is defined as 'the process by which people initiate, adjust, interrupt, terminate or otherwise alter actions to promote attainment of personal goals, plans or standards'. *Self-regulation failure* refers to 'problems that arise when one intentionally tries to initiate, alter or inhibit a specific response or behavior and fails to do' (Heatherton & Baumeister, 1996, p.91-92).

Effective self-regulation has positive outcomes such as good interpersonal relationships (DeWall, Baumeister, Stillman, & Galliot, 2007), accomplishment of goals (Duckworth & Seligman, 2005), less conflict with moral standards and social norms (Finkel & Campbell, 2001), better psychological health (Galliot, Schmeichel, & Baumeister, 2006) and coping skills (Shoda, Mischel, & Peake, 1990).

Ego Depletion. Humans can regulate their thoughts, feelings, impulses, and task performances (Muraven & Baumeister, 2000) however self-regulatory strength is a limited resource (Baumeister & Heatherton, 1996). Specifically, self-control efforts have a psychic cost and diminish a scarce resource (Baumeister, Bratlavsky, Muraven & Tice, 1998). Here, psychic cost implies an outflow or reduction of an important resource. In other words, engaging in self-regulation impairs one's performance in subsequent tasks requiring self-regulation and this is called as *ego depletion*.

MUS and Self-Regulation. Patients with MUS may suffer from self-regulation fatigue because they use their self-regulatory resources more to decrease their anxiety and depression, to control ruminative thoughts and to strengthen their social bonds. Consequently, coping with physical pain and emotional distress can lead to depletion of self-regulatory resources. This increases the aversiveness of their pain experience and impairs their executive functions (i.e. attention, problem solving, planning). Therefore, self-regulation, executive functions and MUS feed each other in a circular way (Nes, Roach, & Segerstrom, 2009).

Research on ego depletion and MUS revealed that MUS subjects were more easily depleted on a self-regulation task than healthy controls did. Specifically, for MUS subjects, engaging in an attention task resulted in less capacity to persist on an anagram task (Solberg Nes, Carlson, Crofford, Leeuw, & Segerstrom, 2010). However, they selected a random ego-depletion task (i.e. attention task) to test the effect. In this study, I intentionally used a task which required emotion regulation related to the area in which this specific group has problems. Even though previous studies showed that the MUS patients are generically more depletable, I aimed to understand whether emotion regulation cause greater depletion.

PRESENT STUDY

Previous research shows that people with MUS have problems with emotions, but emotion processing is multi-faceted. In this study, I used an experimental design to determine what specific aspects of emotion processing they are bad at. This was tested via the relation of two key variables: 1) emotion regulation and 2) self-regulation. Emotion regulation was measured as the ability to control emotional experiences during short video clips inducing both positive and negative emotions. Self-regulation was assessed through an ego depletion task.

Participants were grouped into either low or high physical symptom groups depending on their scores on a physical symptom scale. Participants in each group were randomly assigned to either an experimental or control condition. The ones in the experimental group watched video clips designed to evoke positive and negative emotions. Before they watched the videos, they were asked to either fully suppress or openly experience any emotions they might feel during the videos. At the end, they were asked to complete a word task as means of measuring their level of ego depletion. The ones in the control group only completed the word task .

Overall, I aimed to test two main hypotheses. First, people who reported more physical symptoms would have more difficulty controlling their emotions. Second, people with high symptom reporting would have greater difficulty regulating their emotions, and so would show greater ego depletion. Specifically, I aimed to answer the following questions:

1. Does the HSR group *experience* their emotions less than the LSR group?
    a. Is this the same or different for different video conditions: positive vs. neutral vs. negative emotion videos?

        For this analysis, I expected to find a significant difference between groups because alexithymia research suggests that the HSR group would have difficulty with the ability to identify and recognize their emotions, so they would rate their emotions lower than the LSR group would do.

2. Does the HSR group *express* their emotions less than the LSR group?
    b. Is this the same or different for different video conditions: positive vs. neutral vs. negative emotion videos?

        Previous research shows that, in general, MUS patients have difficulty with the ability to describe and identify their emotions. They experience more negative emotions and tend to control them, but they are not successful at this (Sifneos, 1972; Ak, Sayar, & Yontem, 2004; Celikel & Saatcioglu, 2006; Sayar, Gulec, & Topbas, 2004; Bagby, Taylor, Ryan, 1986; Subic-Wrana, Bruder, Thomas, Lane, & Kohle, 2005; Merten, & Brunnhuber, 2004; Greck et al, 2012, Brosschot & Aarsse, 2001). Therefore, I predicted that, in general emotion expression level of HSR group would be lower than LSR group. However, this difference would be small in the negative video condition.

3. Does the HSR group *self-monitor* less than the LSR group?
    c. Is this the same or different for different video conditions: positive vs. negative emotion videos?

Previous research shows a mismatch between subjective (self-reports) and objective (observer ratings, physiological measures such as heart rate and fMRI) ratings of MUS patients' emotion expression and experience, specifically for negative emotions (Merten & Brunnhuber, 2004; Greck et al, 2012; Brosschot & Aarsse, 2001). Therefore, I predicted that the HSR group would have a self-monitoring problem only when negative emotions were elicited.

4. Does the HSR group show lower levels of emotional reaction in the *suppress* condition?
   d. Is this the same or different for different video conditions: positive vs. negative emotion videos?

      Previous research shows that in general, MUS patients experience more negative emotions. They tend to control them, but they are not successful at this (Merten, & Brunnhuber, 2004). Therefore, I predicted that the HSR group would be particularly poor at suppressing their *negative* emotions than the LSR group.

5. Is the HSR group *more depleted* by the emotion suppression task than the LSR group?

Even though existent research on the relationship between ego depletion and MUS is limited, one study shows that MUS patients have difficulty in persisting on a subsequent task after engaging in self-regulation (Solberg Nes, Carlson, Crofford, Leeuw, & Segerstrom, 2010). Therefore, I expected that the HSR group would be more depleted than the LSR group in the suppress condition.

6. Do emotion-eliciting conditions have a priming effect on participants' performance at emotion related anagrams?

MUS patients are characterized by emotion suppression and they are out of touch with their emotions along the same lines with alexithymia research. However, research shows that neither MUS patients nor people with alexithymia are sensitive to emotion related words, so they do not show a cognitive bias for these words (Wingelfel et al., 2012; Mueller, Alpers, Reim, 2006; Lundh and Simonsson-Sarnecki, 2002). Therefore, for this specific study, I did not expect HSR group would show an attention bias for emotion related words during the anagram task.

While testing these relationships, I controlled for depression, attachment quality, and self-esteem since previous literature shows a correlation between these variables and the MUS.

METHOD

Design

The experiment employed a 2 (symptoms: high vs. low physical symptom reporting) X 3 (emotion regulation: suppress vs. allow vs. control) X 3 (valence of video: negative vs. neutral vs. positive emotion videos) mixed factorial design, with video valence as a within subject factor. Participants were randomly assigned to either the full emotion regulation condition or an ego-depletion (anagram) task only condition. Participants in the emotion regulation condition watched three video clips and completed an ego-depletion task. Participants in the control condition completed only the ego-depletion task.

Participants

The participants were 239 undergraduate introductory psychology students from The University of Alabama who received course credit for their participation. Seven of them, who did not watch one or more of the three video clips, intentionally or by mistake, were eliminated from the analyses. Four participants were eliminated from the emotion regulation analyses because the camera did not capture their face completely and made it difficult for observers to rate their emotion expression level. Lastly, nine participants were eliminated from the ego depletion analyses because they either did not volunteer for the anagram task or could not complete the anagram task because of technical difficulties. There were 145 participants (HSR=64, LSR=81) to test the emotion regulation hypotheses, and 222 participants (HSR=97, LSR=125) to test the ego depletion hypotheses. See Tables 1 and 2 for sample size details.

The sample was 75% female (86 females and 48 males for the LSR group, 94 females and 10 males for the HSR group), with a mean age of 19 yrs. Their ethnic ratio was as follows: 44% European American, 12% African American, 3% Asian American, 5% Hispanic and Latinos and 36% other. The average symptom level of the LSR group was 2.15 (*SD*=1.63) and it was 12.63 (*SD*=2.86) for the HSR group.

Table 1: Sample Size for Emotion Regulation Analyses

	SUPPRESS	ALLOW	TOTAL
HSR	34	30	64
LSR	41	40	81
TOTAL	75	70	145

Table 2: Sample Size for Ego Depletion Analyses

	SUPPRESS	ALLOW	ANAGRAM ONLY	TOTAL
HSR	33	31	33	97
LSR	41	39	45	125
TOTAL	74	70	78	222

Measures

At pretest, all participants completed The Center for Epidemiologic Studies Depression Scale (CES-D), The Experiences of Close Relationships Scale-Revised (ECR-R), The Screening for Somatoform Symptoms (SOMS-7), The Rejection Sensitivity Questionnaire (RSQ) and The Patient Health Questionnaire-15 (PHQ-15) online.

The Center for Epidemiologic Studies Depression Scale (CES-D). This 20-item symptom checklist is designed to measure depressive symptomology. It is high in internal consistency across different ethnic groups (Roberts, 1980) and has a good external validity and test-retest reliability across different illness populations (Devins et al., 1988).

The Experiences of Close Relationships Scale-Revised (ECR-R). The revised version of Brennan, Clark, and Shaver's (1998) Experiences in Close Relationships (ECR) questionnaire is used to assess individual differences in anxious and avoidant attachment via a 7-point scale (Fraley, Waller & Brennan, 2000). The ECR-R is a valid and reliable measure of adult romantic attachment (Sibley, Fischer & Liu, 2005).

Rejection Sensitivity Questionnaire (RSQ). RSQ is designed to test people's rejection sensitivity in interpersonal relationships (Downey & Feldman, 1996). For this study, the 18-item version developed for college students was used. Participants rated the possibility and their level of concern about 18 possible real-life situations on 6-item scale (1=very concerned/ very unlikely; 6=very concerned/very likely). Research shows that it has good construct validity (Brookings, Zembar, & Greta, 2003). Downey and Feldman (1996) found that people who are high on rejection sensitivity expect rejection from their partners and interpret any possible sign as rejection leading to higher dissatisfaction in their romantic relationships.

The Screening for Somatoform Symptoms (SOMS-7). The SOMS-7 is composed of 53 somatoform symptoms. Participants are expected to select the symptoms they had during the last seven days and rate their severity. In 2003, Rief and Hiller showed that it is high in reliability and validity. Even though, the PHQ-15 is used to measure common somatic symptoms, it does not directly ask whether the physical symptoms were medically explained or not. This measure is used to test whether the PHQ-15 was good at detecting people with medically unexplained symptoms.

The Rosenberg Self-Esteem Scale (SES). The self-administered Rosenberg SES is designed to measure self-satisfaction, self-worth, self-respect and personal pride (Rosenberg, 1965). It is composed of 10 items that are rated on a 4-item scale. Research shows that it is easy to administer and high in unidimensionality and face validity (Robinson, Wrightsman & Andrews, 1991).

The Patient Health Questionnaire-15 (PHQ-15). At pretest, all participants completed The Patient Health Questionnaire-15 (PHQ-15) online. This self-administered questionnaire comprises 15 somatic symptoms scored on 3-point scale (0=not bothered at all; 2: bothered a lot). This scale has well-established psychometric features and contains relevant somatic symptoms (Zijlema, Stolk, Löwe, Rief, White & Rosmalen, 2013). Therefore, it is used both clinically and in research to screen for somatization.

To be able to determine the most practical and usable self-report measure to assess MUS, Zijlema and her colleagues (2013), compared 40 MUS measures in a systematic review. They concluded that the PHQ-15 and the SCL-90 SOM are better than others, in terms of validity and reliability (i.e. internal consistency, factor structure, construct validity) and PhenX criteria (i.e.

usability, relevance to a variety of populations). PhenX criteria are used to determine the measures that should be used in large-scale studies. The PHQ-15 and the SCL-90 SOM are relatively short, understandable and easy to use by scientists with no specific expertise. They also differ in some aspects and the main difference is the symptoms they assess. The PHQ-15 is used in US primary care and measures common somatic symptoms whereas the SCL-90 SOM includes somatic symptoms associated with psychopathology (Zijlema, Stolk, Löwe, Rief, White, & Rosmalen, 2013). In this study, I am mainly interested in common physical symptoms which are not medically explained, among college population. Therefore, I decided to use the PHQ-15.

Using the PHQ-15, research on 6000 inpatients revealed cutoff points for low, moderate and high somatic symptom severity as 5, 10 and 15 respectively (Kroenke, Spitzer & Williams, 2002). For this study, I recruited college students who scored lower than 6 (low physical symptom group) and higher than 9 (high physical symptom group).

Procedure

Participants were able to register for this study after they completed the pretest measures online. At the end of the pretest, only the ones who scored lower than 6 (the LSR group) and higher than 9 (the HSR group) on the PHQ-15 received a code that they could use to register for the actual study.

Subjects were tested individually in one-on-one sessions with a research assistant. Upon arrival to the lab, participants were welcomed and presented an informed consent statement outlining the purpose of the study and their rights as a research participant. They were then presented with the study's cover story.

Cover story. The participants were told that the study concerned perspective taking skills and emotion related experiences. To create the same expectations for the study for all participants, all participants were led to believe that they would complete the same procedures. They were told that they would watch some video clips, have a resting period and complete a perspective-taking task, and the order of these would change depending on their assigned condition. Particularly, participants in full experimental condition were told that they would watch the video clips first followed by rest period and perspective taking task. Participants in the ego-depletion task only condition were told that they would have the rest period first followed by the perspective taking task and video clips. Actually, there was no perspective-taking task. When participants reached that phase of the study, debriefing started. The ego-depletion task was introduced as an optional task that participants could complete to help another researcher during their rest period.

Emotion Regulation Manipulation. Participants assigned to the full experimental condition watched three video clips with a duration of 4 minutes for each. The positive video was designed to elicit positive emotions such as happiness and joy. The negative video was designed to elicit negative emotions such as disgust, fear and sadness. There was also a neutral video including scenes of machines and origami. All of these videos were created using youtube videos and pre-tested to establish their emotional effects in terms of pleasantness (1= extremely unpleasant, 10: extremely pleasant). Mean for the pleasantness of these three videos were as follows: 2, 6.4, 8.4, for negative, neutral and positive videos respectively. Order of the presentations was randomized. Participants watched either the positive video or negative video first. The neutral video was always presented second.

Participants were randomly assigned to either an emotion suppression or a control condition. Subjects in suppression condition were asked to fully suppress and resist any emotional experiences or expressions they might have during the videos. In contrast, subjects in the control condition were asked to fully experience and accept their emotional experiences.

Emotional experience was measured in two ways; self-ratings and observer-ratings. First, after each video, participants rated the level of their current emotional experience and how successfully they regulated their emotions, on 11-item scale (-5=very unpleasant, +5=very pleasant; -5=very unsuccessful, +5=very successful respectively). Second, participants were surreptitiously video recorded while they were watching the clips. At the end of the study, two research assistants, who were blind to the conditions, watched the recordings and rated participants' facial expressions in terms of the intensity and valence of the expressed emotions on 11-item scale (-5=very unpleasant, +5=very pleasant) and rated participants' emotion suppression level (i.e. turning their eyes away, covering their face) on 10-item scale (0=not suppressing at all, 10=completely suppressing). For 145 participants with three video clips for each, I had 435 clips in total. They were randomly ordered and grouped into the blocks of 20. Research assistants were asked to rate each block at one time and finish all the ratings within two weeks.

Ego-depletion Assessment. To test the extent of ego depletion, participants were asked to complete a 40-word anagram task. The task included 10 emotion words (i.e. angry, cheerful), 10 unsolvable anagrams and 20 object names (i.e. experiment, pizza). They were presented in a mixed order; in every 5 words, there was at least one emotion word, one unsolvable item and one object name. All emotion words and unsolvable items were presented within the first 30 words

because participants were provided a limited time and some participants might not be able to reach the end of the task within that time.

This task was presented as a part of another study. During the rest period, participants were told that before they could start the perspective-taking task, they needed to take a rest period to clear their mind. They needed to wait for 20 minutes. The experimenter asked if the participant would like to help her collect preliminary data for another study while waiting. The task was introduced as a verbal ability task comprised of 40 anagrams. Subjects were told that each question had only one solution and if they could not solve anagram, they could just skip it.

The ego-depletion effect was measured by participants' performance on the anagram task. Specifically, the program that executed the anagram task recorded total time spent, percent correct, the number of items attempted and the number of skipped items in general, and for emotion words and unsolvable items specifically.

The experimenter waited outside of the lab room during the video presentations and anagram task. If the participant could not complete the anagram task in 20 minutes, the experimenter asked him or her to stop.

Debriefing. When participants completed the anagram task, debriefing started. First, participants were asked questions to assess their suspiciousness. Then, they were told that the study was over and the real aim of the study was explained. After explaining why deception was used in the study, the subject was asked for permission to retain their data. No participants asked to expunge their data or for their surreptitiously recorded video not to be used in the coding.

RESULTS

Data Analysis

In this study, my main goal was to test whether the level of symptom reporting is related to people's emotion processing abilities, measured as follows:

Emotion experience – self-reported pleasantness ratings for the three video clips.

Emotion expression – observer rated pleasantness of the three video clips

Emotion suppression – self-reported success at emotional suppression, the self-reported pleasantness and observer coded pleasantness ratings.

Self-monitoring – the correspondence between the self- and observer-rated pleasantness.

The ego depletion effect was used as another way to test the relationship between emotion processing and the level of symptom reporting. Being less persistent (spending a short time for the whole anagram task and responding only a few items) and scoring low on the anagram task were used as indicators of ego depletion.

1. Preliminary Analyses

I completed two preliminary analyses. First, I performed an inter-rater reliability test for the observer ratings. Then, I tested the validity of the symptom reporting measure I used, the PHQ-15.

Inter-rater reliability of observer ratings. Participants were video recorded when they watch the video clips. Two research assistants who were blind to the participants' assigned conditions rated those videos. Before analyzing the data, I tested the reliability of these ratings. Since I had two raters using a continuous scale (10-item), I used the intraclass correlation analysis. A high degree of correlation was found between the two raters. The average measure ICC was .91 with a 95% confidence interval from .883 to .935, p=.000.

Construct validity of PHQ-15. To test whether the PHQ-15 was successful in defining distinct high and low MUS groups, the two symptom-reporting groups were compared with a t-test using their SOMS scores at the pretest. I found that the HSR group scored significantly higher on somatization than the LSR group did, $t(232)=11.687$, p=.000. In other words, the HSR group was not only reporting high levels of physical symptoms, they also endorsed more medically unexplained symptoms.

Research shows that insecure attachment, depression and low levels of self-esteem are highly prevalent among MUS patients and people with somatic symptom disorder (Stuart & Noyes, 1999; Ciechanowski, 2002; Hamilton, Deemer & Janata, 2003; Rudy, Kerns, & Turk, 1988). To test whether my sample represented these associated features of MUS, t-tests were run using the pretest measures. Results show that the HSR group scored significantly higher on *depression*, $t(234)=8.330$, p=.000; *rejection sensitivity*, $t(226)=3.503$, p=.001; both *anxious and avoidant attachment*, $t(233)=4.626$, p=.000 and $t(233)=3.449$, p=.001 respectively; and significantly lower on *self-esteem*, $t(231)=4.524$, p=.000, than the LSR group did. See Table 3 for details.

To sum up, the PHQ cut off scores successfully defined high and low symptom reporting groups that approximated the clinical distinction between people with somatization and healthy controls. Not only did these groups differ on symptom reporting, they differed in a range of characteristics that are associated with medically unexplained symptoms.

Table 3: MUS Related Differences Between Two Symptom Reporting Groups

	Depression	Anxious Attachment	Avoidant Attachment	Rejection Sensitivity	Self-Esteem	Somatization
HSR	*M*=40.82 *SD*=9.56	*M*=68.82 *SD*=22.17	*M*=67.41 *SD*=13.51	*M*=10.67 *SD*=3.66	*M*=19.28 *SD*=5.20	*M*=12.46 *SD*=8.51
LSR	*M*=31.17 *SD*=8.2	*M*=55.53 *SD*=21.64	*M*=61.5 *SD*=12.66	*M*=9.18 *SD*=2.77	*M*=22.4 *SD*=5.24	*M*=2.65 *SD*=3.96

Note: All comparisons were significant at .05 level, in the predicted direction.

2. Emotion Regulation Effects

As a data analysis strategy, specifically for the *manipulation check, emotion suppression and self-monitoring* analyses, instead of running multiple small analyses, I ran an omnibus mixed ANOVA. Specifically, I tested the effects of symptom reporting (HSR vs. LSR), emotion regulation manipulation (suppress vs. allow vs. anagram only), the valence of the video clips (positive vs. neutral vs. positive), rating source (observer ratings vs. self ratings) and the order of video presentations (positive video first vs. negative video first) on the level of emotion processing. If this analysis revealed a significant interaction, I retested that relationship with

additional analysis to detect the direction of significant effects. For *emotion expression and experience*, I used separate analyses because each test involves a specific DV: observer-ratings for emotion expression and self-ratings for emotion experience.

The omnibus mixed ANOVA analysis included two within- and three between-subject variables. In this analysis, the *rating source* (observer ratings vs. self ratings) and the *video valence* (positive vs. neutral vs. negative) were used as within-subjects variables, and the *emotion regulation* (allow vs. suppress), the *symptom level* (HSR vs. LSR) and the *order of video presentation* (positive clip first vs. negative clip first) were used as between-subjects variables.

Main analyses using the raw scores revealed an unexpected effect for the neutral video condition for both the HSR and the LSR groups. Therefore, using the level of emotion processing during the neutral condition as the control, I calculated the neutral-corrected positive and the neutral-corrected negative scores. Then, using them as the DV, I repeated the analyses for emotion expression, emotion experience, self-monitoring and emotion suppression hypotheses.

Manipulation Check. Using mixed ANOVA analyses, I checked the effectiveness of video valence and the emotion regulation manipulations.

Video valence manipulation. As expected, the omnibus mixed ANOVA analysis revealed a main effect for the video clip valence, $F(2,278)= 584.075$, $p=.000$. In general, ratings for the positive video were highest in pleasantness, $M= 2.77$, $SD= .07$, followed by the ratings for the neutral video, $M= .35$, $SD= .08$ and the ratings for the negative video, $M= -1.9$, $SD= .14$. Pairwise comparison showed that emotion processing across three different video conditions were significantly different, $p=.000$ for each comparison.

Emotion regulation manipulation. In the second part of the manipulation check, I tested whether the emotion regulation manipulation was successful or not. This was tested by examining the main effect of emotion regulation on subject- and observer-reported affective extremity scores.

First, I calculated affective extremity scores by taking the absolute value of each observer- and self-rating. Then, using the *video valence* as within- and the *emotion regulation* as between-subject variables, I ran mixed ANOVA analyses for each rating source separately.

Results revealed a main effect for emotion regulation only for observer ratings, $F(1,143)= 19.77$, $p=.000$: $M=1.39$, $SD=.09$ for allow; $M=.84$, $SD=.08$ for suppress. Even though observer-rated pleasantness significantly differed across two emotion regulation conditions, this difference was not significant enough for self-reported pleasantness scores. In other words, the emotion regulation manipulation affected participants' emotion expression level, but not the level of emotion experience. See Figure 1 and 2.

Figure 1: Affective Extremity for Observer-Ratings

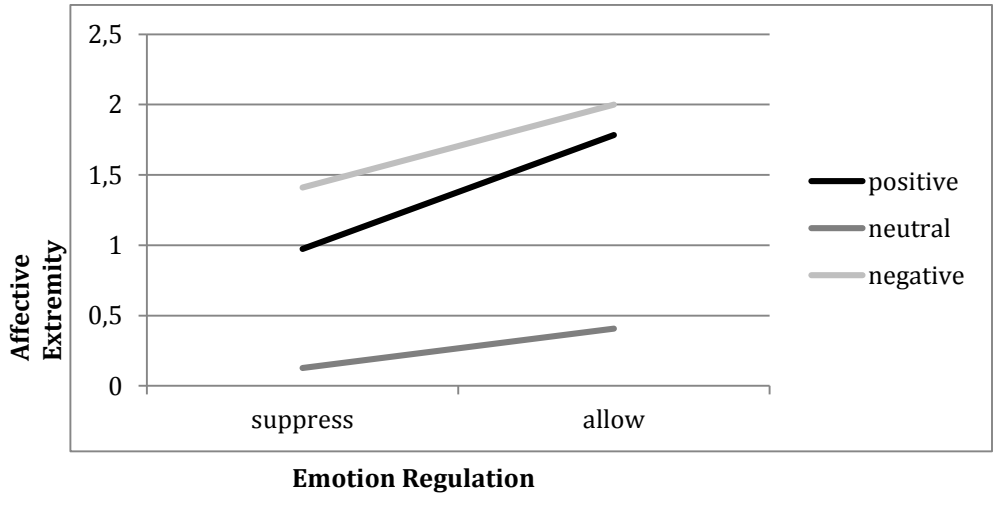
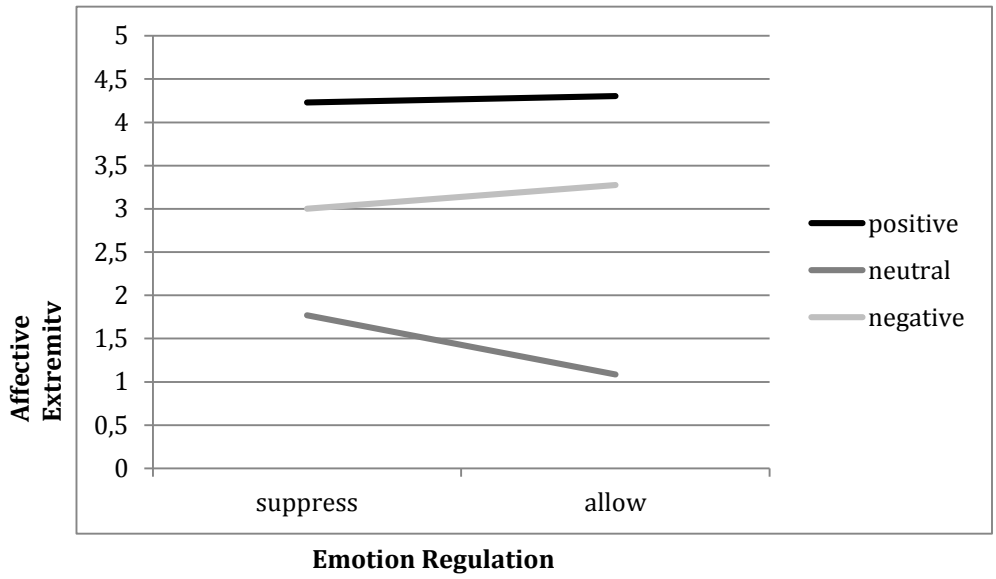


Figure 2: Affective Extremity for Self-Ratings



Main Analyses.

Emotion experience. Alexithymia research shows that people with MUS have problems in emotion experience. By using the self-rated current emotions as a measure of emotion experience, I ran a mixed ANOVA to test the effect of symptom reporting on self-rated pleasantness across three video valences. Results did not reveal a significant two-way interaction between symptom reporting and video valence. Using the neutral-corrected positive and negative self-ratings, I repeated the analysis, but the interaction remained insignificant. Contrary to alexithymia research, there was no significant difference between symptom reporting groups in terms of emotion experience level.

Emotion expression. Previous research shows that high levels of MUS are correlated with problems in emotion expression. Even though people with MUS have problems in emotion expression in general, they express their negative emotions more than healthy controls.

Specifically, they cannot express their emotions as much as healthy controls. To test this relationship, I ran another mixed ANOVA using the observer emotion expression ratings as the DV, testing the effects of symptom reporting group and the video valence. Results did not reveal a significant two-way interaction between symptom reporting and video valence. Using the neutral-corrected positive and negative self-ratings, I repeated the analysis, but he interaction remained insignificant. To sum up, unexpectedly, the level of emotion expression did not differ across two symptom-reporting groups.

Emotion suppression. I tested the hypothesis that the HSR subjects would have difficulty suppressing their negative emotions compared to the LSR subjects. This was tested through three analyses. First, by using the omnibus mixed ANOVA analysis, I examined the three-way interaction effect of symptom reporting, video valence and emotion regulation instructions on subject and observer reported pleasantness ratings together. This analysis resulted in a three-way interaction between these three IVs. Then, I ran a mixed ANOVA analysis for each rating source separately, to test the same three-way interaction effect. Lastly, using participants' own ratings for their emotion regulation performance as the DV, I ran another mixed ANOVA to test the same effect on subject reported emotion regulation performance.

As expected, the omnibus mixed ANOVA analysis revealed a significant three-way interaction between these three conditions, $F(2,278)= 4.86$, $p<.01$. For the positive video condition, emotion intensity level was higher in the allow than in the suppress conditions for each symptom reporting group. However, for the negative video conditions, while the scores for the LSR-allow group were higher than the LSR-suppress group, it was the reverse for the HSR group. For both symptom reporting groups, extremity of emotion ratings was the highest for the positive video condition, followed by the negative and neutral emotion processing, for both

allow and suppress conditions. Using the neutral-corrected positive and negative self-ratings as the DV did not alter the results. The same three-way interaction was found, $F(1,139)= 5.24$, $p<.05$. See Table 4 for the interaction effect.

Table 4: Emotion Processing Level for Each Symptom-Reporting Group, Across Video Valence and Emotion Regulation Conditions

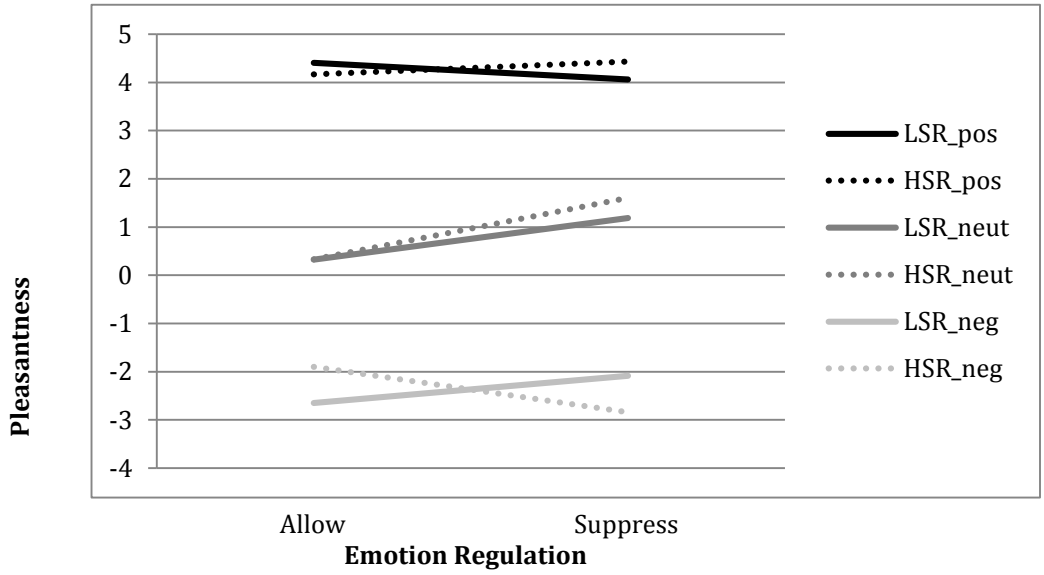
	Positive video		Neutral video		Negative video	
	HSR	LSR	HSR	LSR	HSR	LSR
Suppress	M=2.66[a,e]	M=2.51[b,e]	M=.75[a,f]	M=.59[b,f]	M=-2.15[a,g]	M=-1.52[b,g]
	SD=.14	SD=.13	SD=.17	SD=.15	SD=.28	SD=.26
Allow	M=2.95[c]	M=2.98[d]	M=.03[c]	M=.03[d]	M=-1.65[c,h]	M=-2.32[d,h]
	SD=.15	SD=.13	SD=.18	SD=.16	SD=30	SD=.27

Note: Same letter signs indicate the significant differences across symptom reporting groups and video valence conditions.

To be able to determine whether the difference was specific to self- or observer-ratings, I ran a mixed ANOVA analysis for each rating source separately. There was a significant three-way interaction effect on the *self-ratings* only, $F(2,286)= 4.16$, $p<.05$. The direction of the effect was in the expected direction for the LSR group for the negative (M=-2.64, SD=.41 for allow; M=-2.02, SD=.39 for suppress) and positive video clip conditions (M=4.41, SD=.15 for allow; M=4.07, SD=.14 for suppress). Specifically, participants in the allow condition scored higher than their counterparts in the suppress condition. However, it was the reverse for the HSR group

across all video valence conditions. Participants in the suppress condition scored higher (*M*=4.43, *SD*=.16 for positive, *M*=1.49, *SD*=.34 for neutral, *M*=-2.94, *SD*=.43 for negative) than their counterparts in the allow condition (*M*=4.17, *SD*=.17 for positive, *M*=.33, *SD*=.36 for neutral, *M*=-1.9, *SD*=.46 for negative). To be able to detect specific video valence conditions where this three-way interaction was significant, I ran a multivariate analysis using the self- and observer-ratings as the DV, and emotion regulation and symptom reporting as the IV. Results revealed a marginally significant two-way interaction between symptom reporting and emotion regulation on self-reports for the positive, $F(1,143)=3.69$, $p=.057$; and negative video conditions, $F(1,143)=3.87$, $p=.05$. Using the neutral-corrected positive and negative self-ratings as the DV for the same multivariate analysis revealed a significant interaction for the negative video condition only, $F(1,143)= 3.85$, $p<.05$. To sum up, the LSR group could control their emotional experiences when they were asked to do so, but the HSR group could not. Specifically, the HSR group had problems in controlling their negative emotions. See Figure 3 for the effect.

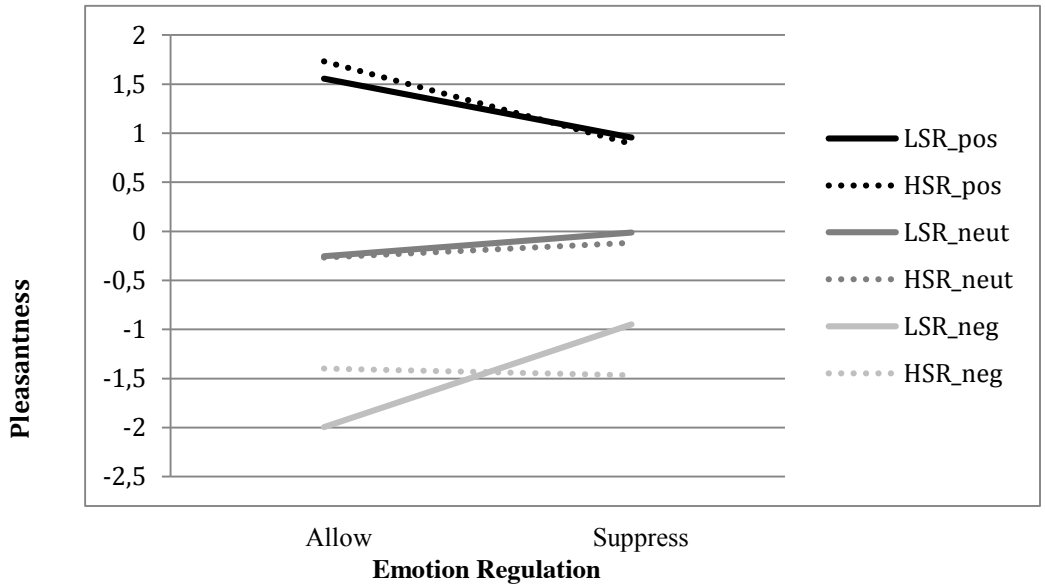
Figure 3: Self-rated Current Emotions Across Video Valence, Symptom Reporting and Emotion Regulation Conditions



Even though the same three-way interaction effect was not significant for *observer ratings*, the direction of the effect shows that people in the HSR condition have a similar problem during the negative video condition. During the negative video, subjects in the HSR group were less emotional in allow condition and more emotional during the suppress condition compared to their counterparts in the LSR group. The same multivariate analyses that was mentioned above revealed a significant interaction between emotion-regulation and symptom reporting on the observer ratings for the negative video condition only, $F(1,143)=4.27$, $p<.05$. Using the neutral-corrected positive and negative self-ratings as the DV for the same multivariate analysis revealed a marginally significant interaction between emotion regulation and symptom reporting for negative video condition only, $F(1,143)=4.27$, $p<.05$. Particularly, the HSR group in the suppress condition did not resist their negative emotions and the ones in the allow

condition did not express their negative emotions as much as their counterparts in the LSR group did. See Figure 4 for the effect.

Figure 4: Observer-rated Emotion Expressions Across Video Valence, Symptom Reporting and Emotion Regulation Conditions



Using another mixed ANOVA analysis, I also tested whether participants' own ratings on their emotion regulation performance during each video clip were affected by the emotion regulation conditions they were assigned to. However, results did not reveal a three-way interaction.

In conclusion, even though the level of symptom reporting affected participants' emotion processing abilities, it did not affect their personal ratings on how successfully they regulated their emotions. In general, the LSR group was able to control their emotions, but the HSR group had difficulty to control their negative emotion experience and expression specifically.

Self-monitoring. I predicted that the HSR group would have a self-monitoring problem during the negative video condition, but the LSR group would not. This was tested by examining a three-way interaction effect between rating source, video valence and symptom reporting group on the pleasantness ratings.

The omnibus mixed ANOVA analysis did not reveal a significant 3-way interaction between rating source, video valence and symptom reporting. I used the neutral-corrected positive and negative scores as the DV and repeated same analysis. Again, it did not reveal a significant 3-way interaction between those variables. To be able to test the moderation effect of symptom reporting between the self- and other-ratings, I ran a regression analysis using the Process module created by Hayes (2012) for each video valence condition separately. None of these tests revealed a significant moderation effect. To sum up, the level of symptom reporting did not affect the level of self-monitoring, as indicated by the self-other agreement.

Video order effect. To be able to test whether the order of video presentations (positive clip first vs. negative clip first) affected emotion processing levels, I examined any significant interaction of video order with other variables in the omnibus mixed ANOVA analysis. Results show a significant three-way interaction between the video valence, the video order and the rating source, $F(2,278)= 11.01$, $p=.000$, and a significant two-way interaction between rating source and video order, $F(1,139)= 7.51$, $p<.01$ and lastly a main effect for the video order, $F(1,139)= 14.75$, $p=.000$.

First of all, results showed a main effect for the video order. In other words, participants who watched the negative video in the beginning scored higher in pleasantness of emotion

processing in general (*M*=.65, *SD*=.09) than their counterparts (*M*=.16, *SD*=.09). Two-way interaction between rating source and video order showed that even though there was not a significant difference between *observer-rated pleasantness* scores across two video orders, participants who watched the negative video first rated their emotional experiences (*self-rated pleasantness*) as more pleasant (*M*=1.32, *SD*=.15) than participants who watched the negative video at the end (*M*=.52, *SD*=.15) .

Lastly, I had a three-way interaction between rating source, video valence and video order. In terms of *observer ratings*, participants who watched the positive video last expressed higher levels of pleasantness during the positive video (*M*=1.61, *SD*=.15) than their counterparts who watched the positive video first (*M*=.96, *SD*=.15). The difference was small for the neutral (*M*=-.22, *SD*=.07 vs. *M*=-.11, *SD*=.06, respectively) and negative video clips (*M*=-1.47, *SD*=.19 vs. *M*=-1.44, *SD*=.19, respectively). On the contrary, in terms of *self-ratings*, participants who watched the negative clip at the end rated their emotion experience as more unpleasant (*M*=-2.84, *SD*=.3) at the end of negative video than participants who watched the negative video in the beginning did (*M*=-1.89, *SD*=.3). For the neutral and the positive video, participants who watched the negative clip at the end rated the related video as less pleasant than their counterparts who watched the negative video in the beginning (neutral: *M*=.17, *SD*=.22 vs. *M*=1.55, *SD*=.22; positive: *M*=4.22, *SD*=.11 vs. *M*=4.31, *SD*=.11, respectively).

To sum up, the order of the video clips interacted with the rating source and video valence and affected participants' ratings of pleasantness for each video clip. Specifically, participants reacted to the positive video more with higher pleasantness ratings when they watched the negative video first, and they rated their emotional state as more unpleasant after the negative video when they watched the positive first. In other words, the order of the videos the

valence of the first video they watched magnified the effects of the second video, reflecting some type of contrast effect.

3. Ego Depletion Effects

Since the HSR group was expected to have more emotion processing problems, it is hypothesized that they would be more ego depleted by watching the videos than the LSR group, particularly when they were asked to regulate their emotions. The ego depletion effect was measured through three variables: total time spent for the whole anagram task, the number of items attempted, and percent correct. If participants spent less than 5 seconds for any anagram, that was recorded as the skipped item. Total attempted item scores were calculated by subtracting total number of skipped items from total number of completed items. The percent correct scores were calculated by dividing the total number of attempted items by the total number of correct responses. Before I started the data analysis, I created another variable by taking the square root of total time variable to address positive skew. I used that variable in my analysis in place of the total time variable.

With a multivariate analysis, I tested the effects of symptom reporting, emotion regulation and the video order on total time spent, percent correct and total number of attempted items. There was a significant interaction between symptom reporting and emotion regulation only for total time spent, $F(1,211)=7.21$, $p<.01$, and a main effect for symptom reporting, $F(1,211)=6.13$, $p<.05$. In general, the LSR group spent a longer time for the anagram task, $M=27.5$, $SD=.5$, than the HSR group, $M=26$, $SD=.6$. Specifically, the HSR group spent more time on the anagram task in the suppress condition, $M=27.9$, $SD=.9$, than in the allow condition, $M=24.7$, $SD=.9$, or in the anagram-only conditions, $M=24.7$, $SD=.9$. On the other hand, the LSR

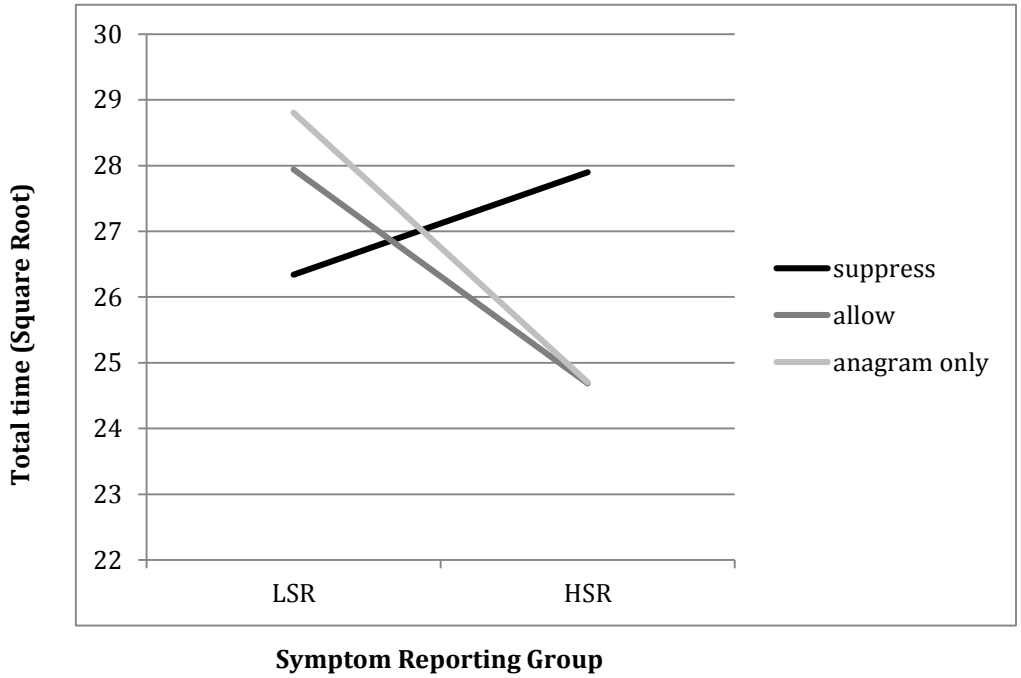
group spent more time in the anagram-only condition M=28.8, SD=.8, followed by the allow, M=27.9, SD=.9, and the suppress conditions, M=26.3, SD=.8. Tukey test shows that, for the LSR group, the difference between the suppress and anagram only conditions are marginally significant; for the HSR group, the suppress condition was marginally different from both the allow and anagram only conditions, p=.06 for all comparisons.

As seen in Figure 5, for each symptom reporting groups, there was no significant difference between participants' performance during allow and anagram-only conditions. Even though emotion suppression led to low levels of persistency for the LSR group as a sign of ego depletion, the HSR group tended to spend a longer time for the anagram task after an ego depleting exercise. Importantly, their scores in the allow and anagram-only conditions were significantly lower than their scores in the suppress condition. In other words, the suppress condition had a restorative effect on the HSR group.

For the total number of attempts, there was a marginal main effect for symptom reporting, $F(1,211)=3.35$, p=.069. Specifically the LSR group attempted to solve more anagrams, M=35, SD=.8, than the HSR group did, M=33, SD=.8.

In other words, when participants were asked to suppress their emotions, unexpectedly, it was the LSR group who showed a lower persistency on the anagram task as a sign of ego depletion effect; the suppress condition improved the HSR group's performance.

Figure 5: Total Time Spent for the Anagram Task Across Symptom Reporting Groups and Emotion Regulation Conditions



4. Emotion Related Performance

I used another multivariate analysis to test whether symptom reporting and emotion regulation variables affected participants' ability to unscramble the emotion related words. For this analysis, the DV was the *percent correct* for all emotion words and for positive and negative emotions separately. Results did not reveal a significant interaction between symptom reporting and emotion regulation for percent correct; but I found a main effect for symptom reporting showing that in general the LSR group solved more emotion related anagrams (all emotions, *M*=.53, *SD*=.02; negative emotions, *M*=.42, *SD*=.03) than the HSR group did (all emotions, *M*=.45, *SD*=.02; negative emotions, *M*=.32, *SD*=.03). In other words, symptom reporting negatively affected participants' performance on emotion related words.

5. Control for Associated Features of MUS

To be able to test whether it was symptom reporting or the associated variables that were responsible for the group difference effects, I repeated the omnibus mixed ANOVA analysis several times while controlling for features associated with symptom reporting group membership: depression, insecure attachment, rejection sensitivity and self-esteem. The most important finding of the previous analysis was the interaction effect of emotion regulation, video valence and the symptom reporting on both self- and observer-rated pleasantness. That relationship remained significant after controlling for depression, $F(2,270)=5.11$, $p<.01$; rejection sensitivity, $F(2,270)=4.61$, $p<.05$; anxious attachment, $F(2,270)=5.11$, $p<.01$; avoidant attachment, $F(2,270)=4.88$, $p<.01$; and self-esteem, $F(2,270)=5.65$, $p<.01$. To sum up, even though previous findings indicate that depression and insecure attachment mediate the relationship between symptom reporting and emotion processing difficulties (van der Veek, Nobel & Derkx, 2012), this study shows that group differences were not accounted for by MUS related characteristics.

DISCUSSION

In this research, I expected to see a symptom reporting effect on the level of emotion processing (experience, expression, self-monitoring and emotion suppression), specifically for negative emotions. In addition, I expected to see a stronger ego depletion effect for the HSR group because of their problems in emotion procession. However, they were not expected to be sensitive to emotion words used in the anagram task along the same lines with the previous findings. For emotion processing, the results supported the emotion suppression hypotheses only. In addition, unexpectedly, emotion suppression resulted in ego depletion effect for the LSR group only. Contrary to the previous findings, the HSR group performed worse than the LSR group on emotion related anagrams.

Manipulation check analyses showed that the selection of video clips was successful because they could activate related emotions for each emotion valence condition: more pleasant emotions during the positive and more unpleasant emotions during the negative video conditions. The neutral video clip resulted in very minor emotion reactions. In terms of instructions for emotion regulation, the emotion regulation manipulation affected observer ratings only. In other words, instructions for participants to control their emotions affected how they looked but not how they felt.

Preliminary analyses show that the HSR group had other MUS related characteristics: high depression, high insecure attachment, and low self-esteem. Importantly, they scored high on medically unexplained symptoms too, showing that the HSR group was also endorsed more medically unexplained symptoms. Even though this shows that the PHQ-15 is a useful tool to

detect people with MUS, a possible interpretation might be that any group difference I found in this study may have resulted from these MUS related characteristics. Similarly, van der Veek and her colleagues (2012) found that anxiety and depression mediate the relationship between emotion awareness problems and MUS. However, after I ran the same analysis controlling for the associated characteristics, the group difference remained significant across two emotion regulation conditions: suppress and allow. Therefore, it is likely possible that the group difference was resulted from the MUS itself.

Previous studies revealed mixed findings in terms emotion expression. According to the alexithymia research, people with MUS have problems verbalizing their emotions. Compared to the healthy controls, they tend to use physiological terms to describe their emotions. On the other hand, they were rated as high on the expression of specific negative emotions such as fear and contempt (Sifneos, 1972; Ak, Sayar, & Yontem, 2004; Celikel & Saatcioglu, 2006; Sayar, Gulec, & Topbas, 2004; Bagby, Taylor, Ryan, 1986; Subic-Wrana, Bruder, Thomas, Lane, & Kohle, 2005; Merten, & Brunnhuber, 2004; Steimer-Krause, Krause, & Wagner, 1990; Corbishley et al., 1990). Along the same lines with the previous findings, in this study, high symptom reporters were expected to express their negative emotions more extremely, but would have difficulty expressing their positive emotions, compared to the low symptom reporters. On the contrary, the results did not reveal a significant difference between the low and high symptom reporters in terms of emotion expression. This might have resulted from the differences in methodology used. I used a complete experimental design to measure nonverbal expression of emotions, contrary to the previous research that was mainly based on the self-report measures on both verbal and nonverbal emotion expression.

In terms of emotion experience, the alexithymia research shows that the high symptom reporters have difficulty identifying and recognizing their emotions (Sifneos, 1972; Ak, Sayar, & Yontem, 2004; Celikel & Saatcioglu, 2006; Sayar, Gulec, & Topbas, 2004; Bagby, Taylor, Ryan, 1986). Contrary to alexithymia research, this study did not reveal a group difference on emotion experience. Response bias might be activated in this study. It was apparent that the positive video with the joyful and happy scenes was used to activate positive emotions, and the negative video with sad and fearful scenes was used to activate negative emotions. Therefore, after each video clip, participants probably provided the expected and socially desirable responses, and this decreased any possible difference across two symptom reporting groups.

In terms of self-monitoring performance, some studies using physiological measures revealed an inconsistency between the reported experience of specific emotions and the activation of the related brain areas and heart beat ratios in response to emotion eliciting situations (Brosschot & Aarsse, 2001; Greck et al, 2012). In this study, the level of symptom reporting did not affect the level of self-monitoring. Previous studies used the inconsistency between self-reports and physiological measures as a measure of self-monitoring and found a significant difference between those two measures. In this study, I used the inconsistency between observer- and self-rated emotion processing. Therefore, the results of this study and previous studies should be interpreted separately. Information processing theory claims that these people focus on their physiological changes more than healthy controls, but they generally misinterpret those changes as abnormal and pathologic. Relatedly, people with MUS may have a hard time processing any physiological changes during emotional experiences and they may not connect those to changes in their moods. In contrast, this study shows that the HSR group is able to monitor their emotional experiences and express them accordingly.

Emotion suppression analyses show that the HSR group had problems with the regulation of negative emotions. In terms of emotion experience, they reacted contrary to instructions, they stated that they experienced negative emotions more intensely during the suppress condition than they did during the allow condition. In terms of emotion expression, they could neither express their negative emotions nor suppress them as much as the LSR group did. These problems may be explained by 'paradoxical effects of thought suppression' phenomenon. In the original experiment, Wegner and his colleagues asked the half of their participants not to think of a white bear and asked to the other half to think about a white bear, for a period of time (Wegner, Schneider, Carter & White, 1987). Their results showed that the participants who were instructed to suppress their thoughts were preoccupied with the suppressed thought, but the other group was not. In the same experiment, people benefited from using a distractor and became less occupied with the target object. Similarly, the HSR group may be using a maladaptive way to control their feelings. Consequently, even though they aim to suppress their negative feelings, they become preoccupied with them.

In terms of ego depletion, I found that the LSR group was less persistent during the suppress condition, but in general they attempted to solve more anagrams than the HRS group did. There is only one study showing that engaging in self-regulation negatively affects high symptom reporters' performance; they are generally more easily depleted (Solberg Nes, Carlson, Crofford, Leeuw, & Segerstrom, 2010). This study shows they are depleted more than the LSR group, but not because of emotion regulation. That study differs from this one in many ways. In that research, the self-regulation manipulation was an attention task. Specifically, participants were asked to focus on a video clip and not to read or look at any words that might appear on the screen. They used the persistency on the first unsolvable anagram as a measure of ego-depletion.

Lastly, they compared healthy controls with patients diagnosed with a somatic disorder. Therefore, results of each study should be interpreted separately. Another interesting finding of the ego depletion analysis was the restorative effect of suppression condition on the HSR group's performance. According to Muraven and Slessareva (2003), people can compensate their lack of self-control and perform better on a task following a depleting task if they are motivated enough. Similarly, the HSR group might appreciate the anagram task as an opportunity to get rid of their strong emotions and to distract themselves after the emotion suppression task. In other words, they were motivated to spend a longer time on the anagram task. Alternatively, they might work harder on the anagram task to feel better after the failure on the emotion suppression task.

Previous research indicates that high symptom reporters are not sensitive to emotion related words, so do not show a cognitive bias (Wingelfel et al., 2012; Mueller, Alpers, Reim, 2006; Lundh and Simonsson-Sarnecki, 2002). In contrast, the HSR group scored lower than the LSR group did on emotion related items. This might be resulted from the difference in the methodology. Previous studies mainly used the STROOP task compared to the anagram task I used.

LIMITATIONS AND FUTURE DIRECTIONS

This study had some limitations in terms of the methodology and the sample used.

First of all, this study tested the emotion processing differences in one way (i.e. reacting to emotion eliciting video clips). To be able to understand any differences in the use of emotions during personal interactions, future studies may involve a face-to-face interaction.

Furthermore, asking participants to watch a positive video and to rate their current mood after it might have created a response bias in this study. Future studies should involve a design where the emotion elicitation manipulation is disguised in some way. By this way, we can measure the level of emotion experience and self-monitoring more effectively.

Previous studies show that women report high rates of MUS and somatic symptoms (Kroenke & Spitzer, 1998). In this study, about 90% of the HSR group was women while almost half of the LSR group were women. Therefore, this study represents real life gender disproportion among MUS patients. Still, future research should include more men with high symptom levels. Lastly, I only used a college sample, so the results cannot be generalized to other populations. People who are diagnosed with a MUS disorder and healthy controls from other age groups should be included in the future studies.

CONCLUSION

This study tested whether people with high levels of physical symptoms differ from low symptom reporters on the level of emotion expression, emotion experience, emotion suppression and correspondence between emotion experience and expression (self-monitoring). Contrary to previous findings, results did not reveal a significant difference between these two groups in terms of emotion experience, expression and self-monitoring. However, I found that high symptom reporters have problems with the regulation of negative emotions along the same lines with the previous findings.

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Office for Research

Institutional Review Board for the
Protection of Human Subjects

THE UNIVERSITY OF
ALABAMA
RESEARCH

February 27, 2014

Melike Eger
Department of Psychology
College of Arts and Sciences
Box 870348

Re: IRB # 14-OR-056, "Do Emotion Regulation Problems Increase Ego Depletion Risk for People with Excessive Symptom Reporting?"

Dear Ms. Eger:

The University of Alabama Institutional Review Board has granted approval for your proposed research.

Your application has been given expedited approval according to 45 CFR part 46. You have also been granted the requested waiver of informed consent. Approval has been given under expedited review category 7 as outlined below:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Your application will expire on February 25, 2015. If your research will continue beyond this date, please complete the relevant portions of the IRB Renewal Application. If you wish to modify the application, please complete the Modification of an Approved Protocol form. Changes in this study cannot be initiated without IRB approval, except when necessary to eliminate apparent immediate hazards to participants. When the study closes, please complete the Request for Study Closure form.

Please use reproductions of the IRB approved stamped information statement.

Should you need to submit any further correspondence regarding this proposal, please include the above application number.

Good luck with your research.

Sincerely,

Stuart Usdan, Ph.D.
Chair, Non-Medical IRB
The University of Alabama

358 Rose Administration Building
Box 870127
Tuscaloosa, Alabama 35487-0127
(205) 348-8461
FAX (205) 348-7189
TOLL FREE (877) 820-3066

Information Statement

Please read this agreement carefully.

Purpose of the research:

You are being asked to participate in a research study which concerns people's emotions and perspective taking skills. We are interested in the psychological processes that are involved in people's reactions to emotion inducing situations.

What you will do in this study:

We will ask you to do two tasks, and there will be one rest period. Different participants will do the tasks in different orders. The tasks are (a) watching video clips and answering questions; (b) completing a survey. The whole procedure takes 30-45 minutes.

Risks:

There are no anticipated risks associated with participating in this study beyond those encountered in daily life.

Benefits:

At the end of the study, you will receive an explanation of the study and the hypotheses. This will provide you some information about psychological concepts and theories. We also hope that you will learn a little about how psychological research is conducted.

Compensation:

The study will take under 30-45 minutes to complete. You will receive 1.5 Introductory Psychology research requirement credit(s) for participating in this study.

Voluntary Withdrawal:

Your participation in this study is completely voluntary, and you may withdraw from the study anytime without penalty and receive credit for the amount of time you participate. You may skip over any question or procedures, or you may withdraw by informing the research associate that you no longer wish to participate (no question will be asked). Your decision to participate, decline, or withdraw participation will affect no effect on your status at or relationship with the University of Alabama.

Confidentiality:

Your participation in this study will remain confidential, and your identity will not be stored with your data. Your responses will be assigned a code number that is linked to your name or other identifying information, but the file linking your name to your personal information is kept separate from the file with your responses in it. All data and assent forms will be stored in a locked room. Results of this study may be presented at conferences and/or published in books, journals, and/or in the popular media, but no one will be able to identify your information in the publications.

Further information:

If you have questions about this study, please contact James Hamilton, Department of Psychology, University of Alabama, Tuscaloosa, AL 35487. Email: jchamilt@bama.ua.edu; phone: 205.348.0189. Alternatively, you can contact Melike Eger or Katie Kucharski (meger@crimson.ua.edu or klkucharski@crimson.ua.edu) or at (205-348-5083).

Who to contact about your rights in this study:
If you have questions about your rights as a person taking part in a research study, make suggestions or file complaints and concerns, you may call Ms. Tanta Myles, the Research Compliance Officer of the University at (205)-348-8461 or toll-free at 1-877-820-3066. You may also ask questions, make suggestions, or file complaints and concerns through the IRB Outreach Website at http://osp.ua.edu/site/PRCO_Welcome.html. You may email us at participantoutreach@bama.ua.edu.