The Expression and Regulation of Sadness in Complicated Grief

Ashley B. Bullock

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy under the Executive Committee of the Graduate School of Arts and Sciences

COLUMBIA UNIVERSITY

2012
ABSTRACT

The Expression and Regulation of Sadness in Complicated Grief

Ashley B. Bullock

The current study examined the role of context sensitive emotional responding in normal and pathological adjustment to loss among conjugally bereaved persons later in bereavement. We specifically focused on investigating how participants with complicated grief (CG) emotionally responded in comparison to a non-pathological bereaved group. We comprehensively and objectively measured the emotional responding behaviors (i.e., facial displays of emotion and head movements) of participants as they watched an evocatively sad or neutral film. Emotion experience was also measured via self-report. We anticipated that CG participants would show and report less emotional context-sensitivity (i.e. less sadness and more negative emotions other than sadness) than non-pathological bereaved participants in the sad condition.

Our findings demonstrate differences in both the emotional expression and emotional experience of the CG group compared with the non-pathological bereaved group in the context of a sad film. Our findings both support and extend our predictions. While overall participants more commonly expressed the prototypical sadness expressions in the sad condition than the neutral condition, a number of notable interaction effects emerged. Specifically, non-pathological bereaved participants were significantly more likely to express sadness expressions that involved the orbicular oculi muscles (i.e., AU 6 or “the cheek raiser”), the outer muscles that orbit the eyes, than CG participants in the sad condition. Research evidences how the orbicular oculi
muscles are associated with “genuine” or more intense expressions of happiness and the current study suggests that the orbicular oculi muscles also distinguish between sadness expressions. In addition, while both groups were more likely to report feeling greater sadness in the sad condition than the neutral condition, CG participants were more likely to feel disgust and anger than non-pathological bereaved participants in the sad condition, pointing to unique pattern of context insensitive emotional responding.

We found that CG is “complicated” in part due to its high co-morbidity rates with Major Depressive Disorder (MDD) and Post-traumatic Stress Disorder (PTSD). While controlling for the effects of MDD and PTSD did not significantly change our results, the high co-morbidity rate of CG with MDD (74%) and PTSD (68%) begs us to consider the pan-diagnostic nature of chronic grief-related pathology. In sum, the current study highlights grief-related pathology as a distinct clinical problem, and points to how emotion context-insensitivity importantly plays a role in the maintenance of grief-related problems.

*Keywords: complicated grief; facial expression of emotion; context sensitivity*
# TABLE OF CONTENTS

- Introduction .................................................................................................................. 1
- The Current Investigation ............................................................................................... 16
- Methods ......................................................................................................................... 18
- Results ............................................................................................................................ 29
- Discussion ...................................................................................................................... 41
- References ...................................................................................................................... 59
LIST OF TABLES

Table 1 ................................................................................................................. 19
Table 2 ................................................................................................................. 23
Table 3 ................................................................................................................. 24
Table 4 ................................................................................................................. 25
Table 5 ................................................................................................................. 26
Table 6 ................................................................................................................. 33
Table 7 ................................................................................................................. 34
Table 8 ................................................................................................................. 36
Table 9 ................................................................................................................. 41
ACKNOWLEDGEMENTS

I would first like to thank my advisor Dr. George Bonanno who has supported me throughout my doctoral training in numerous ways. He not only introduced me to new research ideas and tools, but he also worked closely with me. His vivacious and curious nature has been an important source of motivation and inspiration. I would also like to thank my now fiancé Brian Sherman who has tirelessly listened to me talk about grief! His clinical and research expertise has enabled me to overcome obstacles along the way. More importantly, his kindness has given me strength. I would also like to thank Whit Mattson, an expert researcher in the facial expression of emotion at the University of Miami who answered numerous late night emails about coding and analysis issues. He always responded quickly and provided new ideas about my complicated dataset. My utmost gratitude extends to Zhuoying Zhu and Jay Lavery, fellow FACS experts, who devoted weeks of their time and invaluable amounts of energy and focus to helping code the nonverbal behavior of participants for this project. My family has also been a steady foundation for me as I pursued a doctoral degree, understanding of my long-term student-status and supporting my dreams. Thank you also to other students and recent graduates in Dr. Bonanno’s Loss, Trauma, and Emotion Lab – I could not have completed this dissertation without the ready support and interest of these other students in the program.
Sadness is a highly useful emotion, drawing attention inwards for reflection while also communicating a need for help from others (Bonanno et al., 2004, 2007; Ekman, 1992, 1993; Frijda, 1986). Furthermore, there is often a lot to be sad about over the lifespan. The loss of a spouse, for example, is typically a significant life event that causes sadness in the bereaved spouse. To date, however, we know little about the role of sadness or other emotions in the course of bereavement. Consequently, investigating and understanding emotional indices of normal and pathological grief is a pertinent area of clinical research.

Based on evolutionary theory, it is widely accepted that emotions serve quick, hardwired, adaptive, and specific functions (Bonanno, 2009; Cole, Michel, & Teti, 1994; Frijda, 1986). It is also widely accepted that emotions are response systems that facilitate adaptation to changing contextual demands (i.e., environmental and interpersonal). As Cole (2004) succinctly states, “emotions are biologically endowed processes that permit extremely quick appraisals of situations and equally rapid preparedness to act to sustain favorable conditions and deal with unfavorable conditions” (p. 319). Emotions are functional and primarily serve adaptive functions when context-relevant.

Extant research broadly defines context-sensitivity as flexible emotional responding that corresponds to the situation (Bonanno et al., 2007; Coifman & Bonanno, 2010; Cole, Michel, & Teti, 1994). As Cole, Michel, & Teti (1994) assert, “When an emotion that is held as typical and appropriate to a particular situation is inaccessible, it is a signal that some basic, adaptive function is blocked” (p. 85). Research demonstrates that a failure to show context-sensitive emotional responding is highly indicative of disordered emotion regulation (for reviews, see Davidson et al., 2000; Kring, 2008). Extending research on the important role of context in
emotion, Rottenberg and Gotlib (2004) proposed the emotional context-insensitivity hypothesis, integrating research and theory on the social and emotional deficits associated with Major Depressive Disorder (MDD). The emotional context-insensitivity hypothesis, based on an evolutionary conceptualization of emotion, argues that poorer emotional reactivity correlates with poorer psychosocial functioning and vice versa. Research has begun to link context-insensitive emotional responding with depression, other emotion disorders, and personality disorders (Gehricke & Shapiro, 2000; Larsen et al., 2007; Rottenberg & Gotlib, 2004; Rottenberg et al., 2005).

Relatedly, Coifman and Bonanno (2010) linked emotional context-insensitivity early in bereavement to worse psychological adjustment later in the bereavement process. The current study extended this research in four important ways. Firstly, by examining emotion responding among bereaved participants later in the bereavement process, we were able to use clearly defined outcome groups (CG and non-pathological) that more specifically link context sensitivity with psychopathology. Previous research prospectively predicted long-term grief course by examining the emotional experiencing and expression of bereaved participants initially after their loss (Coifman & Bonanno, 2010). Secondly, the current study used a clearly defined experimental procedure with random assignment whereas previous research relied on a set order of interview questions (Coifman & Bonanno, 2010). Thirdly, the current study utilized standardized as opposed to idiographic stimuli (i.e., movie film clips versus interviews). The current study randomly exposed participants to either an empirically validated evocatively sad or neutral video clip. Fourth, we utilized an objective and comprehensive measure of facial behavior (FACS) to examine the occurrence of particular prototypical displays of emotion.
whereas Coifman & Bonanno (2010) had untrained observers measure facial expression by valence (i.e., positive or negative). Our method of behavioral observation enabled us to determine how often and how strongly participants displayed discrete facial muscle actions. Coding was done by trained and certified FACS coders who measured facial movements at 30 frames per second and on a 5-point scale of intensity. This coding enabled us to create frequency, intensity, and magnitude scores based solely on objective measures of facial movement to analyze group differences in emotional responding.

Using an experimental design with random assignment, standardized emotional stimuli and an objective measure of nonverbal behavior, the primary aim of the current study was to investigate the role of sadness in addition to anger, fear, shame, contempt and disgust in the maintenance of problems associated with complicated grief. We explored how bereaved participants emotionally responded to a sad or neutral film to better understand how pathological grief impacts emotional context sensitivity.

**Complicated Grief**

Following the loss of a spouse, most individuals recover or show minimal impairment in functioning (Bonanno, 2004, 2005; Bonanno et al., 2007). However, the death of a loved one is a nearly ubiquitous life event that leads to significant long-term problems in functioning for 10-15% of bereaved individuals (Bonanno, 2004, 2005; Bonanno et al., 2007; Horowitz et al., 2003).

The construct of psychopathological grief has typically been understood in terms of trauma, depressive, or anxiety symptoms. During the last decade, however, research demonstrates that individuals suffering for a prolonged period after a loss often struggle with a
unique constellation of symptoms, which researchers in the field typically refer to as complicated grief (CG; Bonanno et al., 2007; Horowitz et al., 1997; Prigerson et al., 1999; Shear et al., 2007). Research suggests that some bereaved individuals who receive a diagnosis of major depressive disorder (MDD) or post-traumatic stress disorder (PTSD) may in fact struggle with CG. Complicated grief is predictive of long-term functioning over and above MDD or PTSD among bereaved participants (Bonanno et al. 2007; Prigerson et al., 1999; Simon et al., 2007).

Debate abounds in the field regarding the diagnostic criteria of CG. Symptoms associated with complicated grief include: strong yearning for the deceased; recurrent and intrusive aspects of the death event; intense distress over symbolic reminders of the loss; preoccupation with thoughts about the loss; recurrent regrets or self-blame about own behavior toward the deceased; difficulty accepting the finality of the loss; marked loneliness; pervasive sense that life is meaningless; unusual difficulty developing new relationships or re-engaging in old relationships; efforts to avoid thoughts, feelings, or conversations associated with the loss; and efforts to avoid activities, places, or people that arouse recollections of the loss (Bonanno et al., 1997; Horowitz et al., 1997; Prigerson et al., 1999, Prigerson et al., 2009; Simon et al., 2011). Past research typically defines complicated grief in terms of total symptom scores (having at least four CG symptoms) or using a categorical symptom criterion in which persons have at least one symptom of separation distress (e.g., yearning, preoccupation, regrets) in addition to other CG symptoms (Prigerson et al., 1999).

Recently, work has been under way to propose a new criterion for complicated grief, and the next edition of the DSM (the fifth edition) is likely to define complicated grief as an adjustment disorder, specifically maladaptive bereavement disorder. The new criterion will
likely require a categorical approach to the diagnosis of maladaptive bereavement disorder such that persons must have at least one symptom of separation distress in addition to at least 6 symptoms of reactive distress (i.e., difficulty accepting finality of the loss, anger related to the loss, difficulty in positive reminiscing about the deceased) and social/identity disruption (i.e., feeling as though part of oneself died with the deceased, loneliness, difficulty in planning for the future).

While CG is often co-morbid with diagnoses of PTSD and MDD, research demonstrates unique maladaptive processes at work in a person presenting with CG. Although CG shares some features of depression (i.e. sadness, loss of interest, feelings of hopelessness, inappropriate guilt or regret, feelings of self-blame), the etiology of CG contrasts with depression in at least one important way. Whereas depression is characterized by a global preoccupation with negative attributions, the preoccupations of CG revolve more clearly around a specific object: the lost loved one. Therefore, the cardinal symptoms of CG reflect a preoccupation with the lost loved one whereas in MDD, the cardinal symptoms are associated with general anhedonia and general feelings of worthlessness and self-blame, for example (Shear et al., 2011). In CG, the ensuing impairment stems from loss-related symptoms, including intense yearning for the deceased, intense distress about the loss, guilt about one’s own behavior toward the deceased, and a marked avoidance of thoughts and feelings associated with the loss, which significantly distinguish complicated grief from depression (Shear et al., 2011).

Some CG symptoms, particularly the avoidance and intrusive ideation symptoms, theoretically overlap with the etiology and symptomatology of PTSD. Shear and colleagues (2007, 2011) highlight that the loss of a loved one meets DSM-IV criteria for a trauma but also
emphasize that the potentially traumatic nature of a loss is distinct from that of a violent event. Furthermore, Shear et al. (2007) argue that following a traumatic event persons may avoid triggers of fear whereas following the loss of a loved one persons may avoid painful and sorrowful feelings. Such patterns of avoidance become maladaptive when the information associated with the violent event or the loss is not integrated, resulting in PTSD or CG, depending on the trauma. Whilst similar in process, the nature of CG presents with distinctly different core symptoms than PTSD.

The cardinal symptoms associated with CG highlight that the bereaved person has not integrated the loss (Shear et al., 2007, Shear et al., 2011). While those suffering from CG tend to avoid people, events, and places that remind them of the deceased, they also experience intense and intrusive thoughts and images about the deceased, the death itself, and other related memories (Horowitz et al., 1997). Avoidance is a coping mechanism developed to deal with the hyper-accessibility of the deceased with the aim of controlling the influx of distressing thoughts and feelings, but grief-related avoidance behaviors are often highly impairing and isolating (Shear et al., 2007). Rigid and extreme avoidance of internal and external reminders of the loss impedes information processing and adaptation, and typically signals an ongoing struggle with the reality of the loss and separation distress (Horowitz et al., 1997; Shear et al., 2007). Evidence suggests that the avoidance characteristics of CG are more “experiential” as opposed to behavioral, implying that bereaved persons with CG struggle to avoid thoughts, feelings, and sensations of the loss more than persons or places that are reminders of the deceased (Shear, 2010, p. 358). Such avoidance is in fact correlated with intrusive and distressing thoughts and images of the deceased; avoidance and intrusive ideations appear to fuel one another (Shear,
EXPRESSION OF SADNESS IN GRIEF

2010). Experiential avoidance presents as a cardinal feature of CG as it is associated with more severe CG (Shear et al., 2007) and worse long-term health outcomes (Bonanno, Papa, Lalande, Nanping & Noll, 2005).

Importantly, recent grief theory and research suggests that grief-related avoidance and intrusive thoughts about the deceased are part of the normal process of bereavement. Grief appears to resolve spontaneously for most through a process of oscillation between avoidance of and reflection on the loss (Bowlby, 1980; Shear et al., 2007). The process is dynamic, and through the natural oscillation between avoidance and reflection, integration of the loss occurs. The idea therein is that bereavement does not occur in stages, but in a momentary wavelike fashion; in one moment, the widow may feel deep sadness over her loss, and then moments later, she may laugh with her children (Bonanno, 2009). Importantly, the oscillatory process is not necessarily evident in the activity of the bereaved person, but rather in the internal experience of the bereaved, how the person is thinking and feeling (Shear, 2010). The Dual Process Model of coping with bereavement (DPM) articulates the two processes associated with the oscillatory nature of grief (Stroebe & Schut, 1999). One process is “loss-oriented” which involves focusing on aspects of the deceased and the other process is “restoration-oriented” which entails focusing on rebuilding a life without the deceased (Shear, 2010). Aspects of the DPM have been modeled into a complicated grief treatment (CGT), which targets these two processes simultaneously to help those struggling with chronic grief-related problems integrate the loss and end the cycle of CG symptoms.

The problems associated with CG present in important ways as distinct from MDD and PTSD in that CG revolves around a preoccupation with the person, yet also an avoidance of
emotions related to the loss. While research has begun to articulate the etiology, symptomatology and treatment of CG, we still know little about how the grief process goes awry for some, and more specifically, we know little about how the emotional processing of the loss becomes dysregulated in CG.

**Emotional Context Sensitivity**

Until recently the literature on bereavement has largely been dominated by one theoretical framework, “grief work” theory, which reflects a narrow and culturally naive understanding of normative emotion regulation in the face of grief. The “grief work” theory emphasizes that emotion expression is an important part of the normal recovery process in bereavement (Bowlby, 1980; Stroebe & Stroebe, 1987). The assumption of bereavement theorists who espouse this perspective is that a failure to express emotions, particularly negative emotions associated with the deceased is a sign of “pathological” grieving (Bowlby, 1980; Stroebe & Stroebe, 1987). Fortunately, recent research has begun to investigate the role of positive emotion and context sensitivity in bereavement, acknowledging that individuals cope with loss in a variety of adaptive ways.

One study importantly examined the role of negative and positive emotion expression in the course of bereavement (Bonanno & Keltner, 1997). Participants were videotaped as they spoke about their deceased spouse at several times points, 6, 14, and 25 months post-loss. The videos were later coded using the Emotion Facial Action Coding System (EMFACS; Frisen & Ekman, 1985), a behavioral measure based on the Facial Action Coding System (FACS; Ekman & Friesen, 1978) in which only emotion-relevant muscle movements are coded. Bonanno & Keltner (1997) tested two hypotheses assumed by the “grief work” perspective: 1) negative...
emotion expression would have salubrious effects on health in the context of bereavement; and 2) expressions of positive emotions would have deleterious effects on recovery from bereavement. Importantly, the results indicate that bereaved individuals express a diversity of emotions while talking about their deceased spouses, including anger, contempt, disgust, fear, sadness, enjoyment, amusement, and interest (Bonanno & Keltner, 1997). Counter to the “grief work” theory, the expression of negative emotions at 6 months post-loss was significantly correlated with increased grief severity (i.e. more psychological symptoms of PTSD, anxiety, and depression) and lower ratings of perceived health 14 and 25 months post-loss (Bonanno & Keltner, 1997). More specifically, expressions of anger, contempt, and fear were significantly correlated with higher rates of pathological grief symptomatology. Interestingly, expressions of sadness were not associated with grief outcome. The expression of positive emotions at 6 months post-loss, however, predicted fewer psychological problems in the course of bereavement. Bonanno & Keltner (1997) thus challenge the “grief work” perspective, which holds that the expression of negative emotion is a fundamental part of grief recovery. In contrast, Bonanno & Keltner (1997) suggest that the expression of positive emotions rather than negative emotions illustrates an adaptive grief reaction.

Recent research further complicates, yet also clarifies the role of emotion and emotion expression in adaptive psychological adjustment to a loss. Contemporary conceptualizations of emotion highlight the important role of context in the expression of emotion (Cole, Michel, & Teti, 1994; Davidson, Jackson, & Kalin, 2000). The question then becomes not simply does the bereaved person show negative or positive emotion, but moreover, in what contexts is it normative to express negative emotion versus positive emotion?
Sadness, for example, is a fundamental human emotion that serves two major functions. Sadness promotes personal reflection, an internal focus that has been associated with decreased physiological arousal, more detail-oriented information processing, and better decision-making (Izard, 1993; Lazarus, 1991; Bodenhausen, et al., 2000; Schwarz, 1998). Another important function of sadness is that the nonverbal expression of sadness elicits support and sympathy from others (Keltner & Kring, 1998; Izard, 1977, 1993; Lazarus, 1991). The emotion of sadness, typically evoked following the permanent loss of an important person, is the core emotion associated with the grief process (Lazarus, 1991). Expression of sadness following a loss may facilitate personal reflection and help a bereaved person obtain social support, but when expressed in contexts that do not revolve around the loss, such as a friend’s birthday party, sadness may be detrimental to maintaining social bonds. More specifically, when sadness becomes a longer lasting dysphoric mood state, significant disruptions in social functioning occur and dysphoric persons often feel or are rejected and withdraw from social activities (Bonanno & Keltner, 1997; Lazarus, 1991). In short, when emotions become extreme, occurring regardless of context, as is the case with most forms of psychopathology, adaptive emotional functioning has become dysfunctional (Kring, 2008). Cole, Michel, & Teti (1997) succinctly state, “emotions are regulatory and regulated. Context provides the frame of reference from which dysregulation is determined” … “dysregulation implies that emotion regulation patterns are interfering with current functioning or jeopardizing development” (p. 84-85). In regards to bereavement, extreme or chronic sadness in regards to the loss impedes integration of the loss and development post-loss.

While current conceptualizations of emotion commonly define emotion as an evolutionary-
based response system built to deal with the changing contextual demands of daily life, surprisingly little empirical research has yet to be devoted to the study of the role of context in adaptive versus maladaptive emotional responding (for a review, see Coifman & Bonanno, 2010). Much of the research on emotional context sensitivity has been in investigations of depression. Rottenberg and Gotlib (2004) proposed the emotional context-insensitivity hypothesis, integrating research and theory on the social and emotional deficits associated with Major Depressive Disorder (MDD). In short, a prevailing hypothesis in depression research has been that since persons with MDD have a negative mood state, they would likely show and report greater negative affect and less positive affect. However, a significant body of research reveals that depressed participants display an attenuated reaction to both positive and negative mood inductions in comparison to healthy participants (Gehrcke & Shapiro, 2000; Rottenberg, Gross, & Gotlib, 2005; Schwartz et al., 1976; Sloan, Bradley, Dimoulas, & Lang, 2002). Rottenberg and Gotlib (2004) suggest that the generalized unresponsiveness of persons with MDD points to a deficit in emotion modulation to different contexts, an emotional context insensitivity. Furthermore, Rottenberg et al. (2002) suggest that context-sensitive emotional responding predicts recovery from MDD. Rottenberg et al. (2002) found that among clinically depressed participants, those who displayed context-sensitive emotional responses showed symptom improvement 6 months later. Research has begun to link context-insensitive emotional responding with anxiety disorders (Mennin, Heimburg, Turk, & Frescor, 2005) and personality disorders (Johnson, Hurley, Benkelfat, Herpertz, & Taber, 2003).

One recent study has addressed the issue of emotional context sensitivity among bereaved persons (Coifman and Bonanno, 2010). In a longitudinal study, Coifman and Bonanno (2010)
examined how bereaved adults emotionally responded while discussing topics related to their loss as well as a negative and positive topics unrelated to their loss. The study investigated how depressive symptomatology in initial bereavement stage (4 months post-loss) and emotion expression related to adjustment over time (18 months post-loss). Participants rated their emotional experience in each context and emotional behavior was measured by blind observers who rated degree of positive and negative facial expression. Importantly, symptomatic bereaved persons at 4 months post-loss who showed and reported more negative emotion during the negative non-loss and loss topic presented with fewer symptoms at 18 months post-loss. Higher levels of positive facial behavior and positive affect in the positive non-loss topic also predicted better health outcomes at 18 months. The ability to modulate emotion expression from the negative non-loss topic to the positive non-loss topic also predicted better functioning at 18 months; participants who showed more positive affect and less negative affect in the positive non-loss topic compared to the negative non-loss topic had better long-term health outcomes. In sum, context-sensitive emotional responding presented as advantageous to improved psychological adjustment, and points to ways in which emotion responding may become problematic during the course of bereavement. Specifically, Coifman and Bonanno (2010) show that context-sensitive emotional responding and emotion modulation between contexts is an early indicator of better psychological adjustment in the bereavement process.

The idea therein in fact merges the “grief work” theory and more contemporary emotion theory, underscoring that emotions function within a context. The expression of negative emotion regarding the loss per se is not key to adjustment, but rather, the expression of negative emotion in a negative context signals better psychological adjustment. Further, the ability to
modulate emotion expression between contexts or conditions also correlates with better psychological functioning.

The capacity to respond in an emotionally context sensitive manner presents as highly important in psychological adjustment to bereavement. Recent conceptualizations of bereavement – namely the Dual Process Model discussed above – highlight that bereavement involves a shifting between two major tasks - mourning a loss and rebuilding a life without the deceased. Inherent to this idea of shifting or oscillating between these tasks is the idea of emotional context sensitivity. Sadness is an important emotion that draws the attention inwards for reflection while also communicating a need for help from others (Bonanno et al., 2004, 2007; Ekman, 1992, 1993; Frijda, 1986). The expression of sadness during bereavement may importantly facilitate adjustment by evoking empathy and support from others. However, mourning the loss is not the only task associated with bereavement. Bereavement also involves modulating emotion depending on context; this ability presents as highly important in rebuilding one’s life after the loss and in the maintenance of existing social relationships.

**Facial Displays of Emotion**

In his seminal work *The Expression of the Emotions in Man and Animals* (1872), Charles Darwin was one of the first to extensively delineate the relationship between specific facial displays and specific emotions. In his discussion of the expression of grief, he writes, “The eyebrows not rarely are rendered oblique, which is due to the inner ends being raised. This produces peculiarly-formed wrinkles on the forehead, which are very different from those of a simple frown; though in some cases a frown alone may be present” (Darwin, 1872, p. 179). Darwin refers to the “peculiar furrows on the forehead” associated with grief as “for the sake of
brevity, the grief-muscles” (Darwin, 1872, p. 181). Despite the early, pioneering work of Darwin and others, namely Duchenne de Bologne who importantly distinguished genuine happy expressions from unfelt ones, research did not focus on the facial display of emotion or even emotion more broadly until the late 1960s (Ekman, Friesen, & Sorenson, 1969; Izard, 1971). An important step in the study of emotion and emotion expression was the development of various objective measures of facial behavior. The most widely used and comprehensive tool is the Facial Action Coding System (FACS) developed by Ekman and Friesen (1978). FACS involves the anatomically based measure of all visible facial movement defined as action units (AUs).

This measure of emotion stems from the most dominant emotion theory today, discrete emotion theory, which holds that emotions are distinctive universal signals and that particular facial behaviors are linked with particular emotions. From extensive research using FACS, certain AUs and AU combinations have been correlated with specific emotions (for a review, see Ekman, 2003).

Importantly, however, the facial displays of some emotions have been studied more extensively than others. Specifically, more empirical research has been devoted to the study of the smile and few empirical studies examine nuances in the expression of sadness. Indeed, research has differentiated several types of smiles, including the Duchenne/genuine/felt smile, polite smile, pain smile, embarrassed smile, and non-Duchenne/false/unfelt smile (for a review, see Amador, Cohn, Reed, 2009; Ekman, 2003). Differences in the specific AUs displayed, the timing of the expression and the presence of other nonverbal behaviors distinguish these different smiles. For example, a smile that includes the contraction of the orbicular oculi muscles (AU 6), the outer muscles orbiting the eye, is now commonly referred to as a “Duchenne
smile” in honor of the pioneering work of neurologist Duchenne de Boulogne who was the first to extensively study the association between the orbicular oculi muscles and displays of true enjoyment. Considerable research has focused on the role of the orbicular oculi muscles in the genuine expression of happiness (Duchenne de Bologne, 1862; Bonanno et al., 2007; Ekman, 2001; Ekman, Davidson, & Friesen, 1990). Likewise, the expression of an embarrassed smile has been shown to unfold in a prototypically different fashion, involving a gaze aversion, a smile control or pressing together of the lips (AU 24), a non-Duchenne smile, head down movement to the left, and face touching (Amador, Cohn, & Reed, 2009; Keltner, 1997).

While variations in expressions of happiness evolved into extensive research programs, scant research has examined variations in the expression of sadness. Ekman (2003) suggests that distress or agony is a more intense form of sadness that involves an open-mouth or jaw drop in addition to the lowering of the lip corners (AU 15), contraction of the chin (AU 17) and raising of the inner eyebrow (AU 1 and AU 4) whereas a closed-mouth display of sadness communicates a resigned sadness or helplessness. Ekman (2003) also states that the orbicular oculi muscles may be evident in sadness expressions and signify a more intense sadness. However, these variations in the expression of sadness have not been empirically studied. The study of sadness has been limited to the study of the proscribed set of “prototypical” sadness AU combinations first articulated by Ekman and Friesen (1972). Indeed, these studies verify that the prototypical sadness expressions signal sadness; however, we cannot assume that we fully understand the extent of sadness facial displays based on these research designs.

The dearth of more nuanced research on sadness displays is surprising and points to important new areas of research, especially considering that sadness is a core negative emotion
related to several emotion disorders most notably depression and complicated grief. Extant research lacks systematic investigation into how sadness displays may vary depending on different forms of psychopathology.

In the current study, we are particularly interested in how bereaved participants with CG compared to non-pathological bereaved participants respond to sad stimuli about loss. Nuanced coding of the various regions of the face was conducted to determine the presence of different movements that are associated with specific prototypical expressions of emotions. In addition, full-FACS coding was completed to enable an investigation of all AUs that may have been expressed by the sample in order to explore more fully how participants struggling with CG express emotion in comparison to non-pathological bereaved.

The Current Investigation

The aim of the current investigation is to better determine how differences in context sensitive emotional responding may be associated with normal and pathological adjustment to loss. Because CG has only recently been articulated, little is known about how emotion processes become dysregulated during bereavement. Importantly, the current investigation was specifically interested in examining the emotional functioning of persons between 1.5 to 3 years post-loss, focusing on persons whose bereavement problems have significantly and chronically impacted their lives since their loss.

Emotional functioning is frequently assessed through the use of emotion elicitation videos or mood inductions that have been shown to elicit specific emotions, such as sadness or disgust (Gross & Levenson, 1995; Rottenberg, Ray, & Gross, 2007). Watching a highly emotional video is a type of task in which participants may become emotional, and how a participant behaviorally
EXPRESSION OF SADNESS IN GRIEF

responds to an evocative film is an important and objective indicator of emotional experience and functioning. Individual differences in emotional responding during such a task provides pertinent information about psychological health, including emotional flexibility and context sensitivity. As sadness is a central emotion in complicated grief, and its regulation is a likely factor in the manifestation and maintenance of CG symptoms, the current study randomly exposed participants to either an evocatively sad film about loss or neutral film. The facial behavior and gross movements of participants was also recorded, and coded using the Facial Action Coding System (FACS; Ekman & Friesen, 1978) in order to comprehensively examine the emotional responding behaviors (i.e., facial displays of emotion) of conjugally bereaved participants. Participants were also given a self-report measure of emotional experience after viewing the video clip.

We anticipated that CG participants would show less emotional context-sensitivity than non-pathological bereaved participants. Specifically, we hypothesized that CG participants would show less sadness in the sad condition than the non-pathological bereaved participants. Considering other characteristic symptoms of CG, such as anger about events related to the loss or self-blame, we also anticipated that in the sad film condition, CG participants would show more facial displays of negative emotions other than sadness than non-pathological participants. In regards to self-report of emotion experience, we anticipated that CG participants would report feeling more negative emotions in the sad film condition compared to non-pathological bereaved participants. Lastly, as an exploratory part of the study, we coded head movements in addition to facial displays, and explored how head movements may interact with facial displays for CG and non-pathological participants by condition.
**Methods**

**Participants**

Participants were part of a larger study on the emotional and cognitive mechanisms related to grief later in the bereavement process. Specifically, participants who had lost a spouse 1.5 - 3 years previously and were middle-aged (25-55 years) were recruited for the larger study. Participants were recruited through Internet and newspaper advertisements, fliers, support group referrals, and letters mailed based on public death listings. Interested participants were encouraged to contact the researchers by phone or email and were then scheduled for an initial phone interview to establish eligibility. The current study was initiated about 1 year after the larger study was initiated and thus includes a portion of participants from the larger study. Also, the current study focused on participants who met criteria for CG (CG group) or who did not meet criteria for CG, MDD, or PTSD (non-pathological bereaved group). The inclusion criteria for the current study thus excluded 3 participants because they met criteria for MDD and/or PTSD, but not CG. A MANOVA to assess demographic characteristics (age, gender, level of education as a proxy for socioeconomic status, racial-ethnic background, length of marriage) between groups (bereaved with CG and non-pathological bereaved) found no significant differences, $F(5, 45) = 1.28, p = .291$. The bereaved with CG group comprised of 19 participants and the non-pathological bereaved group included 32 participants. As indicated in Table 1, the final sample had more women (66.7%) than men (33.3%), was primarily Caucasian (54.9%) and African-American (35.3%), had an average age of 50.2 years old (SD = 9.31). Most participants attended (25.5%) or completed (21.6%) college or obtained a professional degree (21.6%).
Participants had been married to their deceased spouse for an average length of 15.87 years (SD = 10.65).

Table 1

Demographics of participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>N(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>17(33.3)</td>
</tr>
<tr>
<td>Female</td>
<td>34(66.7)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>28(54.9)</td>
</tr>
<tr>
<td>African-American</td>
<td>18(35.3)</td>
</tr>
<tr>
<td>Hispanic American</td>
<td>5(9.8)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Less than HS</td>
<td>6(11.8)</td>
</tr>
<tr>
<td>HS</td>
<td>5(9.8)</td>
</tr>
<tr>
<td>College</td>
<td>13(25.5)</td>
</tr>
<tr>
<td>BA</td>
<td>11(21.6)</td>
</tr>
<tr>
<td>Some graduate</td>
<td>1(2.0)</td>
</tr>
<tr>
<td>MA/Professional degree</td>
<td>11(21.6)</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>4(7.8)</td>
</tr>
<tr>
<td>Age (Years)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>50.2</td>
</tr>
<tr>
<td>SD</td>
<td>9.31</td>
</tr>
<tr>
<td>Length of marriage (Years)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>15.87</td>
</tr>
<tr>
<td>SD</td>
<td>10.65</td>
</tr>
</tbody>
</table>

Structured Clinical Interview Procedure

All eligible participants completed a battery of questionnaires at home, and then visited the laboratory for two sessions that comprised of clinical structured and semi-structured interviews and computerized experimental tasks. Participants received $40 for completion of the questionnaires and $80 for each laboratory session. Experimental sessions and interviews were
conducted by a team of clinical psychologists and advanced doctoral candidates in clinical psychology. Interviews were videotaped and each interviewer coded a randomly selected set of 5 interviews. Inter-rater reliability for the coded symptom items was very high (average $k = .91$).

During the interviews of the first laboratory session, participants were asked a series of questions corresponding to the DSM-IV (American Psychological Association, 1994) symptoms for Major Depressive Disorder (MDD; 9 items, $\alpha = .87$). Participants were also asked questions corresponding to symptoms associated with CG (Bonanno et al., 1997; Horowitz et al., 1997; Prigerson et al., 1999, Prigerson et al., 2009): strong yearning for the deceased; recurrent and intrusive recollections of the death event; intense distress over symbolic reminders of the loss; preoccupation with thoughts about the loss; recurrent regrets or self-blame about own behavior toward the deceased; difficulty accepting the finality of the loss; marked loneliness; pervasive sense that life is meaningless; unusual difficulty developing new relationships; efforts to avoid thoughts, feelings, or conversations associated with the loss; and efforts to avoid activities, places, or people that arouse recollections of the loss (11 items, $\alpha = .82$).

Complicated grief was conservatively defined as debate abounds in the field regarding the diagnostic criteria of CG. Complicated grief was defined in terms of total symptom scores as related to the loss; if bereaved participants met criteria for at least 6 of the 11 CG symptoms; they were defined as meeting criterion for CG. Because an agreed-upon formal diagnosis does not yet exist for CG, we also aimed to examine results for an alternative CG diagnosis. Following Prigerson et al (1999), we created an alternative CG category that required participants to have at least 1 symptom of separation distress (e.g., yearning, preoccupation, distress) in addition to the criteria specified above (at least 6 CG symptoms); however, this
proved unnecessary as all participants in the original CG group also met criteria for at least one separation distress symptom. Bereaved participants with fewer than 6 symptoms of CG as described above who additionally did not meet diagnostic criteria for Major Depressive Disorder (MDD) or Post-Traumatic Stress Disorder (PTSD) as defined by the DSM-IV (American Psychological Association, 1994) were respectively included in the non-pathological bereaved group.

**Emotion Elicitation Procedure**

During the second interview session, participants were asked to sit comfortably in front of a computer screen and watch a short video clip, and then provide a written response to a question as well as rate how they were feeling after the video. Participants were randomly selected to watch a sad or neutral video clip selected from the reliably tested emotion elicitation video clips validated by Gross and Levenson (1995). The sad video was a segment from “The Champ,” a story about a young boy who loses his mentor. The neutral video was an educational clip segment about coral reefs. Participants were video recorded while watching the film clip by an unobtrusive camera.

**Self-report of Emotion**

Participants were also asked to rate from 0 (“no feeling”) to 8 (“the most feeling”) how they were feeling following the movie using the Positive and Negative Affect Schedule (PANAS; Watson, Clark, and Telegen, 1988). The PANAS is a 20-item measure of positive affect (10 items) and negative affect (10 items). For example, participants were asked to rate to what extent they experienced negative emotions, such as disgust, anger, fear, and sadness, while watching the video clip.
Facial Coding

Using the video recordings of participants watching the film clip, participants’ facial behavior during a segment of the video was coded using the Facial Action Coding System (FACS; Ekman & Friesen, 1976). We used the entirety of the neutral video which was 1 minute and 6 seconds as the neutral video segment; the videos of participants’ reactions were digitized at 30 frame rate per second, producing 1980 sequential pictures for each participant. To determine the sad video segment, several coders independently examined a subset of participants’ facial reactions to the sad clip, 3 minutes total, to determine which minute and 6 second segment was the most evocative. The middle minute and 6 second segment of the sad video was selected as the most evocative and digitized at 30 frame per second, producing a set of 1980 sequential pictures for each participant. The segment began as the child approached the deceased Champ and began repeating his name and crying over him, and ended as he was refusing to accept the death.

An anatomically based and well-validated technique for measuring facial movement, FACS involves comprehensive coding of observable action units (AUs), which are anatomically separate and visually distinguishable. FACS also includes actions descriptors (AD), such as head and eye movements. Full FACS coding was completed for all AUs and ADs across the selected film clip. Each movement was coded for intensity on a 5-point scale based on the criterion defined for each AU or AD in Ekman and Friesen (1978). Intensity was coded for each time frame that an AU was visible. Tables 2-4 provide a descriptive reference to the single AUs and AU combinations in the upper and lower face that are the focus of the current study. Table 5 provides a descriptive reference to the head movements examined in the current study.
Table 2

*Descriptions and example images of upper and lower face action units (AUs)*

<table>
<thead>
<tr>
<th>Single AUs: Upper Face</th>
<th>Description</th>
<th>Example Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inner Brow Raiser</td>
<td><img src="example_image_1.png" alt="Image" /></td>
</tr>
<tr>
<td>4</td>
<td>Brow Lowerer</td>
<td><img src="example_image_4.png" alt="Image" /></td>
</tr>
<tr>
<td>6</td>
<td>Cheek Raiser</td>
<td><img src="example_image_6.png" alt="Image" /></td>
</tr>
<tr>
<td>7</td>
<td>Lid Tightener</td>
<td><img src="example_image_7.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Single AUs: Lower Face</th>
<th>Description</th>
<th>Example Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>Chin Raiser</td>
<td><img src="example_image_17.png" alt="Image" /></td>
</tr>
</tbody>
</table>

*Descriptions and example images obtained from FACS Training Manual (Ekman & Friesen, 1978).*
<table>
<thead>
<tr>
<th>Upper Face AU Combinations</th>
<th>Example Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+4</td>
<td><img src="image1" alt="Example Image" /></td>
</tr>
<tr>
<td>1+6</td>
<td><img src="image2" alt="Example Image" /></td>
</tr>
<tr>
<td>4+6</td>
<td><img src="image3" alt="Example Image" /></td>
</tr>
<tr>
<td>1+4+6</td>
<td><img src="image4" alt="Example Image" /></td>
</tr>
</tbody>
</table>

*Example images obtained from FACS Training Manual (Ekman & Friesen, 1978) or produced by a model using FACS Training Manual criterion.*
Table 4

*Example images of upper and lower face action unit (AU) combinations*

<table>
<thead>
<tr>
<th>Upper and Lower Face AU Combinations</th>
<th>Example Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>1+17</td>
<td><img src="image1" alt="Example Image" /></td>
</tr>
<tr>
<td>4+17</td>
<td><img src="image2" alt="Example Image" /></td>
</tr>
<tr>
<td>1+4+17</td>
<td><img src="image3" alt="Example Image" /></td>
</tr>
</tbody>
</table>

*Example images produced by a model with FACS Training Manual criteria (Ekman & Friesen, 1978)*
Table 5

*Descriptions and example images of action descriptors (AD) for head movements*

<table>
<thead>
<tr>
<th>Action Descriptors (AD): Head Movements</th>
<th>Description</th>
<th>Example Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>Head up</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>Head down</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>Tilt right</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>Head Forward</td>
<td></td>
</tr>
</tbody>
</table>

* Descriptions and examples images obtained from FACS Training Manual (Ekman & Friesen, 1978).
Emotion-specific coding of the AUs was completed based on previous research that evidences the muscle movement correlates to specific emotions, including sadness, anger, fear, and disgust (for a review, see Ekman, 2003). Ekman and Friesen (1978) provide a guideline indicating which specific AUs, based on research findings, are associated with specific emotions. Using the empirically based guideline, AUs were recoded into specified emotions. Muscle movements in the brow region, eyelids, and mouth singly or in combination evidence specific emotions. For example, the prototypical expression of sadness is measured by the presence of AU 1 (“inner brow raiser”) and AU 4 (“brow lowerer”) in addition to AUs 11 (“nasolabial furrow deepener”) and/or AU 15 (“lip corner depressor”) and/or AU 17 (“chin raiser”). Partial expressions of sadness are evidenced when only the brow region, eyelids, or mouth region demonstrates a movement associated with sadness. In addition, AU 6 (“cheek raiser”) when combined with AUs associated with happiness or sadness has been shown to signify more intense emotion or “genuine” emotion expression in the case of happiness. The current investigation examined both partial and full-face displays of sadness as well as the role of intensity in the expression. In addition, anger, will be assessed based on the presence of various combinations of AUs: 4 (“brow lowerer”), 5 (“upper lid raise”), 7 (“lids tight”), 10 (“nasolabial furrow deepener”), 22 (“lip funneler”), 23 (“lip tightener”), and 24 (“lip pressor”) (Ekman & Friesen, 1978). Disgust will be assessed based on the presence of various combinations of AUs: 9 (“nose wrinkle”), 10 (“nasolabial furrow deepener”), 15 (“lip corner depressor”), 16 (“lower lip depress”), and 17 (“chin raiser”) (Ekman & Friesen, 1978). Fear will also be assessed based on the combined presence of AUs: 1 (“inner brow raiser”), 2 (“outer brow raise”), 4 (“brow lowerer”) with or without 20 (“lip stretch”) (Ekman & Friesen, 1978).
Recent research, developed using FACS, has explored the facial expression and body movements associated with other emotions, primarily self-conscious emotions, including shame, embarrassment, and pride (Heery, Keltner, & Capps, 2003; Keltner, 1995; Tracy & Robins, 2007). Shame is an emotion that may be relevant to the grief process, and thus the current investigation assessed the specified AUs associated with shame to determine the frequency of its occurrence among participants. Specifically, shame is associated with the presence of action descriptors (ADs) 54 (downward head tilt) and 64 (downward gaze), and these movements were analyzed to explore the co-occurrence of shame and other emotions.

Reliability

Coding of facial movements, blinking as well as gross body movements was completed by 3 FACS-certified coders. Certification for FACS coding entails 100 hours of training and successful completion of an exam. To assess intercoder agreement, the 3 FACS-certified coders independently coded 10% of the taped sessions, which were randomly selected. The coders completed full FACS coding for these reliability sessions, including head and eye positions, miscellaneous action units, and gross behaviors. Intra-Class Correlations (ICC) were calculated for each reliability session separately for each AU, head and eye position, miscellaneous action unit, and gross behavior. ICC is the correlation of absolute agreement between two measurements on the same target (Shrout & Fleiss, 1979) and is the better measure of reliability than the Kappa coefficient due to the continuous ratings of facial expressions (intensity and presence) in this data. We used absolute agreement of ICC, which is a more conservative measure of reliability. Overall intercoder agreement was .82. Intercoder agreement was .64 for upper face AUs, .78 for lower face AUs, .81 for head and eye positions, .94 for miscellaneous
action units, and .93 for gross behaviors. Considering the conservative measure of reliability used, reliability was adequate between coders.

Results

Self-report of Emotion

In addition to videotaping and coding how participants non-verbally reacted to the sad or neutral condition, participants were asked to report on their emotional experience of watching the film clip. We conducted two-way ANOVAs for the mean rating of anger, disgust, sadness, and fear, examining the between-subjects effects of bereavement status group (CG and non-pathological bereaved) crossed with condition (neutral or sad). Significant condition effects were found for sadness, $F(1, 49) = 47.5, p = .01$, and fear, $F(1, 49) = 6.8, p = .01$. Non-pathological and CG groups were significantly more likely to report feeling sadness in sad condition ($m = 4.72, sd = 3.10; m = 5.75, sd = 2.87$) than in neutral condition ($m = .58, sd = 1.12); $m = .80, sd = 1.03$). Likewise, non-pathological and CG participants were more likely to report feeling fearful in the sad condition ($m = 1.50, sd = 1.76; m = 1.38, sd = 1.77$) than in neutral condition ($m = .35, sd = .61; m = .50, sd = .85$). A significant interaction effect was found for self-report of disgust, $F(1, 51) = 7.1, p = .01$, and a marginal interaction effect was found for self-report of anger, $F(1, 49) = 2.7, p = .10$. CG participants were significantly more likely to report feeling disgust ($m = 3.88, sd = 3.90$) than non-pathological participants ($m = .83, sd = 1.47$) in the sad condition. Likewise, CG participants were marginally more likely to report feeling anger ($m = 4.13, sd = 3.14$) than non-pathological participants ($m = 2.22, sd = 2.46$) in the sad condition. In sum, CG participants were more likely to report the experience of negative
emotions other than sadness, specifically disgust and anger, in the sadness condition than non-pathological participants.

**Coding of Facial Expressions**

Frequency and intensity scores were created by calculating the mean frequency and intensity of the single AUs and AU unit combinations associated with the facial expression of emotion. Frequency scores signify the mean number of time frames in which a single AU or AU combination was displayed during the film condition. The videos of participants’ watching the films in the two conditions were digitized at 30-frame-rate per second. Intensity scores are based on a 5-point scale and represent the mean intensity level of a particular expression during the total film clip. To increase the reliability of the measures of facial expression, the frequency and intensity scores for each AU and AU combination were also converted to standardized z scores and then added for each participant into a single magnitude score. We conducted a series of two-way ANOVAs for the mean frequency, mean intensity, and magnitude scores of these single AUs and AU combinations, examining the between-subjects effects of bereavement status group (CG and non-pathological bereaved) crossed with condition (neutral or sad). First, we report all of the main effects for sadness versus neutral film conditions. Second, we report all the main effects for bereavement status group (CG and non-pathological bereaved). Then we report the qualifying interactions between film condition and bereavement status group.

Head and eye movements, which are referred to as “action descriptors” (ADs), were also analyzed to explore role of head and eye movements in the facial expression of emotion. We conducted a series of two-way ANOVAs for the mean frequency of head and eye movements, examining the between-subjects effects of bereavement status group (CG and non-pathological
bereaved) crossed with condition (neutral or sad). Combinations of head and eye movements associated with specific emotions, specifically shame, which is defined as co-occurrence of head down and eye gaze down movement, were also analyzed. Exploratory analyzes were also conducted examining co-occurrence of specific head movements with facial expressions of sadness.

Complicated grief is commonly co-morbid with MDD and PTSD and this study also found that MDD co-occurred with CG in 74% (n=14) of the cases, and that PTSD co-occurred with CG in 68% (n=13) of the cases. Thus, we explored how symptoms of MDD and PTSD may impact the findings, and thus conducted a secondary analysis including total number of MDD and PTSD symptoms as covariates.

**Frequency, Intensity, and Magnitude of Sadness Expressions**

The current investigation examined facial expressions in addition to head and eye movements associated with several emotions, including sadness, anger, contempt, disgust, happiness, fear, and surprise. No significant effects were found except for sadness, and thus the results below focus on facial expressions related to sadness, examining between-subjects effects of bereavement status group (non-pathological and CG) by condition (neutral and sad). We examined various “prototypical” combinations of AUs commonly associated with sadness in addition to the occurrence of single AUs related to sadness.

**Main effects for sad versus neutral film condition.** For single AU mean frequency scores, significant condition effects were found for AU 1 (inner brow raise), $F(1, 47) = 4.5, p < .05$, and AU 4 (brow lowerer), $F(1, 47) = 6.6, p = .01$, with non-pathological and CG groups being significantly more likely to express AU 1 and AU 4 in the sadness condition than in the
neutral condition. A marginal condition effect was found for mean frequency score of AU 7 (lid tightener), $F(1, 47) = 2.8, p = .10$. For single AU mean magnitude scores, a significant condition effect was found for AU 4 (brow lowerer), $F(1, 47) = 4.5, p = .04$, and a marginal condition effect was found for AU 1 (inner brow raise), $F(1, 47) = 2.98, p = .09$. These findings indicate that participants who viewed the sadness film clip showed more incidence of single action units 1, 4, and 7. Mean intensity scores of single AUs did not demonstrate any significant condition effects. The means for the main effect of condition are presented in Table 6.

For AU combination frequency scores, a significant condition effect was found for AU 1 + AU 4, $F(1, 47) = 8.02, p < .005$ and a marginal condition effect was found for AU 4 + AU 7, $F(1, 47) = 2.88, p = .10$. Participants in the sadness film condition were more likely to express AU combinations AU 1 + AU 4 and AU 4 + AU 7. For AU combination mean intensity scores, significant condition effects were found for AU 1 + AU 4, $F(1, 47) = 7.09, p = .01$, AU 4 + AU 17, $F(1, 47) = 6.27, p < .05$, and AU 1 + AU4 + AU17, $F(1, 47) = 5.09, p < .05$, and a marginal condition effect was found for AU 1 + AU 17, $F(1, 47) = 3.20, p = .08$. For AU combination magnitude scores, significant condition effects were found for AU 1 + AU 4, $F(1, 47) = 9.39, p = .004$, and AU 1 + AU 4 + AU 17, $F(1, 47) = 4.13, p < .05$. Participants in the sadness film condition more intensely expressed these AU combinations. As the various combinations of action units 1, 4, 7, and 17 signify sadness, these results indicate that the sadness condition indeed resulted in more sadness expressions among participants than the neutral condition.
Table 6

Main effects of Sadness AUs frequency, intensity, and magnitude scores for neutral vs. sad film condition

<table>
<thead>
<tr>
<th>AUs</th>
<th>Frequency(^a)</th>
<th>Intensity(^b)</th>
<th>Magnitude(^c)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Neutral M (SD)</td>
<td>Sad M (SD)</td>
<td>Neutral M (SD)</td>
</tr>
<tr>
<td>1</td>
<td>92.46 (381.43)</td>
<td>485.56 (711.04)*</td>
<td>.67 (1.18)</td>
</tr>
<tr>
<td>4</td>
<td>406.81 (648.89)</td>
<td>948.32 (809.70)**</td>
<td>1.15 (1.15)</td>
</tr>
<tr>
<td>6</td>
<td>28.65 (73.15)</td>
<td>208.52 (503.76)</td>
<td>.52 (1.09)</td>
</tr>
<tr>
<td>7</td>
<td>22.19 (46.80)</td>
<td>181.20 (454.15)+</td>
<td>.77 (1.14)</td>
</tr>
<tr>
<td>1+4</td>
<td>2.85 (8.57)</td>
<td>461.20 (698.98)**</td>
<td>.47 (1.35)</td>
</tr>
<tr>
<td>1+6</td>
<td>2.12 (10.79)</td>
<td>155.00 (438.95)</td>
<td>.23 (1.16)</td>
</tr>
<tr>
<td>4+6</td>
<td>10.54 (39.53)</td>
<td>167.72 (437.59)</td>
<td>.40 (1.43)</td>
</tr>
<tr>
<td>1+4+6</td>
<td>0 (51.78)</td>
<td>154.72 (438.82)</td>
<td>0 (50)</td>
</tr>
<tr>
<td>4+7</td>
<td>16.35 (45.89)</td>
<td>76.36 (206.65)+</td>
<td>.99 (2.17)</td>
</tr>
<tr>
<td>17</td>
<td>142.58 (397.05)</td>
<td>155.12 (423.37)</td>
<td>.56 (1.93)</td>
</tr>
<tr>
<td>1+17</td>
<td>33.35 (170.03)</td>
<td>20.20 (53.65)</td>
<td>.04 (2.04)</td>
</tr>
<tr>
<td>4+17</td>
<td>63.12 (321.83)</td>
<td>101.16 (394.33)</td>
<td>.04 (2.04)</td>
</tr>
<tr>
<td>1+4+17</td>
<td>.00 (53.50)</td>
<td>19.68 (0)</td>
<td>.00 (0)</td>
</tr>
</tbody>
</table>

Notes. \(^a\)Frequency measures time frames per second (30 time frames = 1 second). \(^b\)Intensity measures level of intensity on a 5-point scale. \(^c\)Standardized total magnitude of expression (Frequency + Intensity). *p < .05. **p < .01. +p < .10.

For head movements, a marginal condition effect was revealed for the mean frequency of AD 56 (tilt right), F(1, 47) = 3.31, p < .10; participants more frequently tilted their head right in
the sad condition. A two-way ANOVA was then run to examine the co-occurrence of AD 56 with AUs associated with sadness, including AU1, AU4, AU15, and AU17 and combinations of these AUs. A significant main effect of condition was revealed for AU1 + AD 56, $F(1, 47) = 6.17, p < .05$, and AU1 + AU4 + AD 56, $F(1, 47) = 6.8, p = .01$. These results indicate that participants in the sad condition were more likely to tilt their head right while expressing sadness in the brow region than participants in the neutral condition. The co-occurrence of AD 56 with AUs 15 and 17 with 56 was too infrequent for analysis. A marginal condition effect was also revealed for the mean frequency of AU 4 + AD 57 (head forward), $F(1, 47) = .097, p < .10$; participants more frequently shifted their heads forward while drawing the eyebrows together in the sad condition. Other head movements, including AD 51 (turn left), AD 52 (turn right), AD 53 (head up), AD 55 (tilt left), and AD58 (head back), were analyzed, but no significant main effects for condition were found. The means for the frequency of head movements by bereavement status group and condition are summarized in Table 7.

Table 7

*Marginal and significant mean frequency scores of head movements alone and co-occurring with AUs related to sadness by film condition and bereavement status group*

<table>
<thead>
<tr>
<th>AUs</th>
<th>Neutral Condition</th>
<th>Sad Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-pathological</td>
<td>CG</td>
</tr>
<tr>
<td></td>
<td>Freq M(SD)</td>
<td>Freq M(SD)</td>
</tr>
<tr>
<td>53</td>
<td>579.93(700.0)+</td>
<td>204.27(294.44)</td>
</tr>
<tr>
<td>54</td>
<td>10.80(22.42)</td>
<td>136.55(379.22)*</td>
</tr>
<tr>
<td>56</td>
<td>402.07(411.84)</td>
<td>331.45(614.12)+</td>
</tr>
<tr>
<td>1+56</td>
<td>33.47(125.80)</td>
<td>0</td>
</tr>
<tr>
<td>1+4+53</td>
<td>2.33(9.04)</td>
<td>2.27(7.54)</td>
</tr>
<tr>
<td>1+4+56</td>
<td>.93(3.61)</td>
<td>0</td>
</tr>
<tr>
<td>4+57</td>
<td>3.60(8.28)</td>
<td>5.0 (16.58)</td>
</tr>
</tbody>
</table>

Notes. *p < .05. **p < .01. +p < .10.
Main effects for bereavement status group. For single AU mean intensity scores, marginal main effects for bereavement status group was found for AU 6 (cheek raiser), $F(1, 47) = 3.30, p < .10$, and AU 4 (brow lowerer), $F(1, 47) = 2.9, p < .10$. These findings indicate that CG participants tended to show less intense expressions of AU 6 and AU 4. For AU combination mean intensity scores, a significant group effect was found for AU 1 + AU 6, $F(1, 47) = 4.63, p < .05$; CG participants showed less intense expressions than the non-pathological bereaved group. For AU combination mean magnitude scores, a significant group effect was found again for AU 1 + AU 6, $F(1, 47) = 3.88, p = .05$. The means for the main effect of group are presented in Table 8. Frequency of single AUs and AU combinations related to sadness did not demonstrate any significant group effects. Intensity of expression thus indicates the significant differences between bereavement status groups with the CG group showing less intense expressions of sadness.

For head movements, a significant group effect was revealed for the mean frequency of 54 (head down), $F(1, 47) = 6.43, p = .01$; CG participants more frequently shifted their head downwards. We could not examine the co-occurrence of AD 54 with AUs associated with sadness because the co-occurrence was too infrequent for analysis. A marginal group effect was revealed for the mean frequency of AD 53 (head up), $F(1, 47) = 3.63, p < .10$; non-pathological participants were more likely to express AD 53 than CG participants. A two-way ANOVA was then run to examine the co-occurrence of AD 53 with AUs associated with sadness, including AU1, AU4, AU15, and AU17 and combinations of these AUs. A significant condition effect, not a group effect, emerged for AU1 + AU4 + AD 53, $F(1, 47) = 4.85, p < .05$; participants were more likely to display AU1 + AU4 + AD 53 in the sad condition.
Table 8

Main effects of Sadness AUs frequency, intensity, and magnitude scores for bereavement status group across both conditions

<table>
<thead>
<tr>
<th>AUs</th>
<th>Frequency&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Intensity&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Magnitude&lt;sup&gt;c&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nonpath M (SD)</td>
<td>CG M (SD)</td>
<td>Nonpath M (SD)</td>
</tr>
<tr>
<td>1</td>
<td>377.16 (690.27)</td>
<td>130.21 (353.00)</td>
<td>.93 (1.20)</td>
</tr>
<tr>
<td>4</td>
<td>763.37 (830.18)</td>
<td>518.79 (663.32)</td>
<td>1.57 (1.18)</td>
</tr>
<tr>
<td>6</td>
<td>170.53 (449.65)</td>
<td>26.37 (82.04)</td>
<td>.85 (1.23)</td>
</tr>
<tr>
<td>7</td>
<td>108.16 (374.43)</td>
<td>86.63 (232.78)</td>
<td>.68 (1.07)</td>
</tr>
<tr>
<td>1+4</td>
<td>297.28 (625.19)</td>
<td>110.05 (322.36)</td>
<td>1.35 (2.10)</td>
</tr>
<tr>
<td>1+6</td>
<td>122.81 (391.24)</td>
<td>0</td>
<td>.97 (1.92)</td>
</tr>
<tr>
<td>4+6</td>
<td>133.84 (390.77)</td>
<td>9.68 (42.21)</td>
<td>1.42 (2.37)</td>
</tr>
<tr>
<td>1+4+6</td>
<td>120.88 (391.54)</td>
<td>0</td>
<td>1.26 (2.73)</td>
</tr>
<tr>
<td>4+7</td>
<td>38.97 (97)</td>
<td>57.21 (217.95)</td>
<td>1.04 (2.07)</td>
</tr>
<tr>
<td>17</td>
<td>190.53 (482.36)</td>
<td>78.32 (221.37)</td>
<td>.64 (.88)</td>
</tr>
<tr>
<td>1+17</td>
<td>41.56 (158.00)</td>
<td>2.21 (9.64)</td>
<td>.19 (.40)</td>
</tr>
<tr>
<td>4+17</td>
<td>128.78 (445.36)</td>
<td>2.58 (7.87)</td>
<td>.22 (.42)</td>
</tr>
<tr>
<td>1+4+17</td>
<td>14.47 (47.80)</td>
<td>1.53 (6.65)</td>
<td>.89 (2.16)</td>
</tr>
</tbody>
</table>

Notes. <sup>a</sup>Frequency measures time frames per second (30 time frames = 1 second). <sup>b</sup>Intensity measures level of intensity on a 5-point scale. <sup>c</sup>Standardized total magnitude of expression (Frequency + Intensity). *p < .05. **p < .01. +p < .10.
No significant group effects were found for 51 (turn left), 52 (turn right), 55 (tilt left), 57 (head forward), or 58 (head back). The means for the frequency of head movements by bereavement status group and condition are summarized in Table 7.

**Interaction effects for film condition by bereavement status group.** Figures 1-4 depict the significant interaction effects. For single AUs related to sadness, a significant interaction effect was found for the magnitude score of AU 6, $F(1, 47) = 4.0, p < .05$. One-sample t-tests for each bereavement group by condition indicated that the non-pathological group had a significantly higher total magnitude score for AU 6 in the sad film condition ($m = .93, sd = 2.40$) than the neutral condition ($m = -.41, sd = 1.06$), $t(22.52) = -2.08, p < .05$ whereas the CG group did not evidence a significant difference in AU 6 expression in the sad condition ($m = -.92, sd = 0$) compared to the neutral condition ($m = -.36, sd = 1.26$).

For AU combinations, significant interaction effects were revealed for mean intensity and magnitude scores of AU 4 + AU 6, $F(1, 47) = 5.30, p < .05$ and $F(1, 47) = 4.72, p < .05$, respectively. One-sample t-tests for each bereavement group by condition revealed that the non-pathological participants more intensely expressed AU 4 + 6 in the sad film condition ($m = 2.37, sd = 2.70$) than the neutral condition ($m = .33, sd = 1.29$), $t(23.54) = -2.78, p = .01$. The CG group did not show any significant difference for mean intensity of AU 4 + 6 in the sad condition ($m = 0, sd = 0$) than the neutral condition ($m = .50, sd = 1.65$). One-sample t-tests for each bereavement group by condition also demonstrated that the non-pathological group had a higher total expression of AU 4 + 6 ($m = 1.20, sd = 2.61$) in the sad condition than in the neutral condition ($m = -.58, sd = .70$), $t(18.61) = -2.70, p = .014$. The CG group did not show any significant difference in AU 4 + 6 total expression in the sad condition ($m = -.76, sd = 0$) than the
neutral condition \( (m = -.47, sd = .99) \). In addition, a significant interaction effect was revealed for mean intensity of AU 1 + AU 4 + AU 6, \( F(1, 47) = 4.15, p < .05 \) and a marginally significant effect emerged for the magnitude score \( F(1, 47) = 3.27, p < .10 \). One-sample t-tests for each bereavement group by condition revealed that the non-pathological participants more intensely expressed AU 1 + 4 + 6 in the sad film condition \( (m = 2.37, sd = 3.41) \) than in the neutral condition \( (m = 0.00, sd = 0.00) \), \( t(16) = -2.86, p = .01 \) and had a higher total expression of AU 1 + 4 + 6 \( (m = 1.22, sd = 2.85) \) in the sad condition than the neutral condition \( (m = -.61, sd = 0.00) \), \( t(16) = -2.54, p < .05 \). The CG group did not show any significant differences in AU 1 + 4 + 6 expression by condition because no CG participants evidenced/showed this sadness expression. Specifically, the CG group did not show any significant difference for AU 1+ 4 + 6 mean intensity in the sad condition \( (m = 0, sd = 0) \) compared to the neutral condition \( (m = 0, sd = 0) \) or in total magnitude of AU 1 +4+ 6 in the sad condition \( (m = -.61, sd = 0) \) compared to the neutral condition \( (m = -.61, sd = 0) \). In sum, these results suggest that non-pathological participants tended to show more of these particular sadness expressions in the sad condition than CG participants. All marginal and significant findings are summarized in Table 9.

**Frequency, Intensity, and Magnitude of Sadness Expressions when controlling for MDD and PTSD symptoms.**

When controlling for MDD symptoms, all previously significant results remained significant. When controlling for PTSD symptoms, all previously significant results remained significant except for two interaction effects became marginal.¹

¹ The interaction effect for AU 6 magnitude score and AU 1 + 4 + 6 mean intensity score were marginal, \( F(1, 46) = 3.23, p = .08 \) and \( F(1, 46) = 3.63, p = .063 \), respectively.
**Figure 1.** Magnitude scores of AU 6 by condition and group

**Figure 2.** Magnitude scores of AU 4 + 6 by condition and group
**Figure 3.** Intensity scores of AU 4 + 6 by condition and group

**Figure 4.** Intensity scores of AU 1 + 4 + 6 by condition and group
Table 9

Summary of marginal and significant effects for frequency, intensity, and magnitude scores

<table>
<thead>
<tr>
<th>AUs</th>
<th>Condition</th>
<th>Group</th>
<th>C X G</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sad &gt; neut (freq)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sad &gt; neutral (mag)+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sad &gt; neut (freq)**</td>
<td>CG &lt; Nonpath (int)+</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sad &gt; neutral (mag)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>CG &lt; Nonpath (int)</td>
<td>CG &lt; sad (freq)+</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CG &lt; sad (mag)*</td>
</tr>
<tr>
<td>7</td>
<td>Sad &gt; neut (freq)+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1+4</td>
<td>Sad &gt; neut (freq)**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sad &gt; neutral (mag)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1+6</td>
<td></td>
<td>CG &lt; Nonpath (int)*</td>
<td>CG &lt; Nonpath (mag)*</td>
</tr>
<tr>
<td>4+6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1+4+6</td>
<td></td>
<td>CG &lt; sad (int)*</td>
<td>CG &lt; sad (mag)*</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1+17</td>
<td>Sad &gt; neut (int)+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4+17</td>
<td>Sad &gt; neutral (mag)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1+4+17</td>
<td>Sad &gt; neut (int)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sad &gt; neutral (mag)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes. *p < .05. **p < .01. +p < .10.

Discussion

We examined the role of context sensitive emotional responding in normal and pathological adjustment to loss among conjugally bereaved persons later in bereavement.

Contemporary theories of emotion posit that a failure to show context-sensitive emotional responding is indicative of disordered emotion regulation (for reviews, see Cole, Michel, & Teti, 1994; Davidson et al., 2000; Rottenberg and Gotlib, 2004). Research has begun to demonstrate how context-insensitive emotional responding corresponds with depression (Gehricke & Shapiro,
2000; Rottenberg and Gotlib, 2004; Rottenberg et al., 2005) and a recent study has examined the role of context sensitivity in psychological adjustment to a loss (Coifman & Bonanno, 2010). Coifman and Bonanno (2010) demonstrate that context-sensitive emotional responding for negative emotions and modulation of emotional response depending on context predicted better long-term psychological adjustment in the bereavement process. The current study supported conceptualizations of emotion that underscore the importance of context sensitive emotional responding and advanced previous research on context sensitivity and bereavement.

By comprehensively examining how persons later in bereavement emotionally responded in two standardized film conditions, the current study expanded upon previous research on context sensitivity in bereavement. Our findings demonstrate differences in both the emotional expression and emotional experience of CG and non-pathological groups in the context of a sad film. These findings both support and extend our predictions.

As predicted, overall participants more commonly expressed the prototypical sadness expressions (i.e., AU 1, AU 1+4, 1+4+17) in the sad condition than the neutral condition. Specifically, overall participants evidenced prototypical upper face sadness expressions, including the raising and drawing together of the inner eyebrows which creates an upside down horseshoe shape in the forehead. Charles Darwin (1872) referred to these eyebrow muscles as the “grief muscles.” Overall participants also showed a prototypical sadness display that involved the “grief muscles” with the raising of the chin boss (AU 17). This evidence validates previous experimental studies in that the sad film elicited significantly more expressions of sadness than the neutral film. These muscle movements are clear, typically involuntary signals of sadness as few can voluntarily make such an expression (Ekman, 2003).
Importantly, while overall there was more sadness expressed in the sad condition than the neutral condition, a number of notable interaction effects emerged. Non-pathological bereaved participants more intensely expressed and had higher total magnitude scores for some sadness expressions that involved the orbicular oculi muscles (i.e., AU 6 or “the cheek raiser”), the outer muscles that orbit the eyes, than CG participants in the sad condition. Specifically, non-pathological bereaved participants more intensely expressed and had higher total magnitude scores for AU 6, AU 4 + AU 6 and AU 1 + AU 4 + AU 6 in the sad condition than CG participants. In short, the interaction effects by condition (neutral and sad) and bereaved group (non-pathological and CG) that we observed all included AU 6 or the orbicular oculi muscles alone or in combination with upper face AUs associated with sadness (AU 1 and AU 4). When contracted, the orbicular oculi muscles create a wrinkling in the eye corners often referred to as “Crow’s Feet” and a slight raising of the cheeks. These findings are consistent with our hypothesis that CG participants would show less sadness in the sadness condition (i.e., less context sensitivity) than non-pathological participants, but interestingly, we did not predict that the CG group would display less of sadness expressions that involved another particular muscle movement. We predicted that the CG group would less frequently and less intensely express prototypical expressions of sadness more generally. In short, to our surprise and interest, CG participants were not less likely to show prototypical sadness expression AU 1 + AU 4, but they were less likely to display AU 1 + AU 4 + AU 6.

Indeed, these findings expand our frame for the study of emotional context sensitivity. The results suggest that variations in the nature of context-sensitive expressions not merely the presence or absence of context-sensitive emotions differentiate normal from pathological
emotional responding. It is widely accepted that emotions primarily serve adaptive functions when context-relevant and that a failure to show context-sensitive emotional responding is highly indicative of disordered emotion regulation (for reviews, see Davidson et al., 2000; Kring, 2008; Rottenberg and Gotlib, 2004). What does our finding that CG participants were less likely than non-pathological bereaved participants to evidence AU 6 (i.e., eye constriction and cheek raising) singly and in combination with prototypical upper face sadness expressions (AU 1 + AU 4) tell us about the emotional functioning deficits associated with CG? Indeed, the current study suggests that the contraction of orbicular oculi muscles in the context of sadness expression is related to better psychological adjustment in the bereavement process.

The orbicular oculi muscles have been shown to occur in both sadness as well as happy expressions (Ekman, Friesen, & Hager, 2002), but previous research focuses on how the orbicular oculi muscles are particularly important in the expression of genuine/ felt/ Duchenne happiness (Ekman & Friesen, 1982; Ekman, Davidson, Friesen, 1990) and some research associates the orbicular oculi muscles with a “pain expression” (Craig, Prkachin, & Grunau, 2001; Kappesser & Williams, 2002; Prkachin, 1992). A smile that includes movement in the orbicular oculi muscles around the eyes is now commonly referred to as a “Duchenne smile” in honor of the pioneering work of neurologist Duchenne de Boulogne who was the first to extensively study the association between the orbicular oculi muscles and displays of true enjoyment. The contraction of the orbicular oculi muscles in concert with the contraction of the zygomatic major muscle (i.e., AU 12 or “lip corner puller”) is widely viewed as the prototypical expression of true enjoyment (Duchenne de Bologne, 1862; Ekman, 2001; Ekman, Davidson, & Friesen, 1990). Research on the facial expression of pain also suggests that the orbicular oculi
muscles (AU 6) in conjunction with the contraction of the lowering of the brow (AU 4),
tightening of the eye lids (AU 7), wrinkling of the nose (AU 9) and raising of the upper lip (AU
10) comprise of the facial expression of pain (Craig et. al., 2001; Kappesser & Williams, 2002;
Prkachin, 1992). In short, the orbicular oculi muscles create the wincing effect witnessed pain
reactions. How do we situate the fact that the orbicular oculi muscles are associated with
seemingly opposite emotional experiences – genuine happiness and pain?

Importantly, a recent study highlights how the orbicular oculi muscles appear to occur
regardless of the positive or negative emotion and index affective intensity as opposed to discrete
emotions or valence (Messenger, Mattson, Mahoor, and Cohn, 2011). Given the importance of
the orbicular oculi muscles in the display of genuine enjoyment coupled with the evidence that
these muscles occur in pained as well as happiness expressions, the current study suggests that
these muscles may differentiate between genuine displays of negative as well as positive
emotion. Ekman (2003) states that the orbicular oculi muscles may be evident in sadness
expressions and signify a more intense sadness; however, scant research has examined the
significance of the contraction of the orbicular oculi muscles in concert with prototypical
expressions of sadness. Potentially the “Duchenne marker” of genuine joy, in the context of
sadness expression, is a marker of genuine or more intensely felt sadness. Indeed, the idea of a
“pained” sadness expression may indicate a more genuine or deeply felt expression of sadness.
Research demonstrates that there are many different types of smiles (for a summary, see Ekman,
2003), might there also be many different types of sorrow?

Indeed, the current study offers evidence in support of this idea that the orbicular oculi
muscles distinguish sadness as well as happiness expressions while also pointing to specific
deficits in the emotional functioning of persons with CG. Specifically, the current study suggests that persons with CG are less likely to express genuine or pained levels of sadness in the context of a reminder of loss.

One way to better understand this finding is to consider the multiple functions of sadness. For one, the facial display of emotion is intrinsically linked to social communication and a significant function of the facial display of sadness is to elicit sympathy and support from others (Bonanno, 2009; Keltner & Kring, 1998; Izard, 1977; Lazarus, 1991). The fact that the CG group demonstrated less genuine or felt sadness in the sad condition potentially points to the primary socioemotional problem associated with complicated grief – avoidance (i.e., avoidance of forming new relationships, avoidance of thoughts, feelings, places related to the loss, denial of the reality of the loss). Showing sadness in reaction to sadness in others is a kind of learned social response. It seems plausible that CG may intrude with normal social functioning, especially in the context of other people expressing sadness related to loss.

Sadness is also associated with a drawing of the attention inwards for reflection and reevaluation (Bonanno et al., 2004, 2007; Ekman, 1992, 1993; Frijda, 1986; Izard, 1977; Lazarus, 1991). It may be that people with CG are less capable of reflecting on their internal experience of loss elicited in the sad film condition. This explanation again underscores the avoidance features of CG as well as how distressing or intrusive memories of the loss may be for people with CG.

Another explanation is that the bereaved groups have differing levels of empathy for the sad people in the film. Viewing the emotion of another can lead to an experiencing of that emotion empathically and such a response is often shown through imitation (Ekman, 2003). The
CG participants may have showed less intense sadness expressions due to the fact that the sad film pales in comparison to the sadness that they feel in regards to their own loss. Alternatively, the CG participants may be too preoccupied and distressed about their own loss to garner feelings of sadness for others. People with CG may not be able to experience as much empathy as the non-pathological people for the sad persons in the film.

Another explanation lies in the idea that facial expressions are responses, sometimes outside the context of social communication. In the current study, participants were alone as they viewed a very sad person on film, which suggests that the observed facial expressions of emotions are equally likely to be indicative of responsiveness as to social communication. We surmise that the emotional responding of participants is a relatively automatic mechanism and the responsive system of the CG group appears to have shut down in comparison to the non-pathological bereaved group. Reciprocal responding points to context sensitivity – it is context sensitive to respond with sad emotion to a sad image. Our study suggests that while all bereaved participants responded to the sad film clip in a context sensitive manner, that is by showing sad facial expressions, the non-pathological group responded in a more sensitive manner than the CG group.

Of note, our CG group presents with high rates of psychiatric co-morbidity with MDD and PTSD. The extant literature on the topic reveals that psychiatric co-morbidity is common among persons with CG (Simon et al., 2007). While controlling for the effects of MDD and PTSD did not significantly change our results, the high rate of psychiatric co-morbidity with CG points to the severity and the “complicated” nature of chronic grief-related pathology. Indeed, as CG persists the risk for co-morbidity with other forms of psychopathology may increase (Angst,
1996; Simon et al., 2007). Our understanding of the underlying emotional responding patterns in CG requires consideration of the role of depression and anxiety in grief-related pathology.

Indeed, psychopathology is typically associated with emotion dysregulation (Kring, 2008) and problems in emotional context sensitivity may provide a broad category in which to understand psychopathology (Coifman & Bonanno, 2010). While emotional context sensitivity may serve as a diagnostic tool, research has only begun to demonstrate how specific patterns in emotional responding distinguish between disorders. Research reveals that depressed participants display an attenuated reaction to both positive and negative mood inductions in comparison to healthy participants (Gehricke & Shapiro, 2000; Rottenberg, Gross, & Gotlib, 2005). While emotional responding behaviors of persons with PTSD have not yet been widely researched, we can consider how the high co-morbidity rate of both depression and anxiety with CG may indeed be impacting the nonverbal behavior of our CG group.

Rumination, which has been associated with depression and anxiety, has also been shown to correlate with grief (Boelen, van den Hout, van den Bout, 2006; Stroebbe et al, 2007; Nolen-Hoeksema, 2000, 2001). Indeed, ruminative processing has been shown to at least partly explain why depression and anxiety are often co-morbid (Nolen-Hoeksema, 2000). Rumination is conceptualized as a response style that involves preoccupation and worry as opposed to an active problem-solving focus (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Nonverbal emotional responding patterns, particularly the capacity to display context-sensitive emotional responding, is likely closely tethered to rumination. Specifically, for those participants with significant grief-related pathology, which presents as CG with frequent co-morbid MDD and PTSD, rumination may be impacting their ability to adaptively respond to loss-related emotional stimuli. Exposure
to sad, loss related emotional stimuli might cause a chain reaction of rumination or passive worry that removes the person from the actual experience of the sad emotion in the film condition. Research has begun to articulate how rumination corresponds with the avoidance characteristics associated with CG and has been argued to involve an avoidance of accepting reality of the loss (Boelen, van den Hout, & van den Bout, 2006; Stroebe et al., 2007). Future research examining rumination in relation to emotional context sensitivity among bereaved persons might help us better understand the etiological and phenomenological overlap between depression, anxiety, and complicated grief.

Importantly, the current study examined both the emotion expression as well as the emotional experience of participants to better understand emotional functioning in the course of bereavement. Considering some of the characteristic symptoms of CG, such as anger about events related to the loss or self-blame, we anticipated that in the sad film condition, CG participants would report feeling more negative emotions other than sadness in comparison to non-pathological bereaved participants. Our hypothesis was supported in that CG participants were more likely than non-pathological bereaved participants to report experiencing disgust and anger in the sadness condition. Both groups were more likely to report feeling greater sadness in the sad condition than the neutral condition. These results indicate that CG participants’ emotional experience was context sensitive in that they felt sadness in the sad condition. However, CG participants were more likely to feel disgust and anger than non-pathological bereaved participants in the sad condition, pointing to unique pattern of context insensitive emotional responding.

These findings augment our earlier discussion of explanations as to why CG participants
displayed less contraction of the orbicular oculi muscles. Importantly, these results demonstrate that the CG group felt sadness and thus had empathy for the sad people in the film. Furthermore, while CG participants showed less intense and sensitive sadness displays, they were equally responsive in their sadness experience as the non-pathological bereaved participants, pointing to some possible discrepancies in emotion dimensions (nonverbal expression versus self-report experience). It is plausible that their capacity to show more intense and sensitive expressions of sadness was impeded by their equally high experience of anger and disgust. Indeed, it is also plausible that this mix of negative emotions intrudes upon social functioning of persons with CG in the context of loss-related sadness. Furthermore, due to the highly complex mix of feelings, CG persons may be more inclined to avoid processing their internal experience of loss.

What is the significance of our finding that CG participants experienced more disgust and anger in the sad film condition than the non-pathological bereaved group? It is widely accepted that emotions are functional, and have evolved over time as tools to help us navigate and successfully adapt to changing environmental demands (Keltner & Haidt, 2001; Tooby & Cosmides, 1990). Anger is a highly mobilizing emotion that enables us to remove an obstacle and defend oneself in the face of danger. Disgust has been implicated as the emotion most closely related to both mortality and morality (Cox et al., 2007; Goldenberg et al., 2001; Rozin, Haidt, & McCauley, 2000). Disgust, for example, arises in reaction not only to toxic substances, but also to reminders of the animal nature of the human species, such as death (Cox, Goldenberg, Pyszczynski, & Weuse, 2007; Goldenberg et al., 2001; Rozin, Haidt, & McCauley, 2000). The sad film used in the current study depicts a young boy as he was confronted with the loss of his father figure. In the film clip, he was highly distraught and struggled to accept the reality of his
loss as he approached various adult figures for support. Previous research validates this film clip as a strong elicitor of sadness, not anger or disgust (Gross and Levenson, 1995). For CG participants, however, the sad film condition elicited heightened feelings of anger and disgust in addition to sadness. Why might such a context-insensitive response be associated with CG?

Complicated grief disorder revolves around problems related to the lost loved one, such as strong yearnings for the deceased, self-blame about own behavior toward the deceased, and difficulty accepting the finality of the loss. One possibility is the sad film ignited CG participants own anger and sense of injustice about their loss. People with CG often hold significant feelings of anger towards themselves and others about their loss. Persons with CG may also feel angry with the deceased spouse for leaving them. Indeed, participants with CG are likely to be particularly sensitive to reminders of loss, and thus may be angry with the experimenters for exposing them to such a film clip. Disgust may be elicited as a distancing and seemingly protective response from thoughts or feelings associated with death. The death of a spouse may potentially elicit more fears of mortality than other losses in that the spouse is typically a same-age peer. In contrast to non-pathological bereaved participants who did not report these emotional experiences, such reactions of anger and disgust to a sad film clip, present as highly context insensitive, and indicative of grief pathology.

Such a pattern of response evidenced by participants with CG differs from previous research on emotion responding in MDD. Some studies demonstrate that depressed participants report as much emotion as non-depressed controls in response to happy and sad stimuli (Gehricke & Shapiro, 2000) while other studies show that depressed participants report less sadness and less happiness reactivity than non-depressed controls to emotional stimuli.
Furthermore, Rottenberg, Kasch, Gross and Gotlib (2002) found that depressed persons report feeling more sadness in neutral and amusing film conditions than in the sad condition when compared to a control group, and less amusement in an amusing film condition than other conditions (Rottenberg, Kasch, Gross and Gotlib, 2002). In light of these studies, the current study demonstrates that persons with CG have a unique emotional experience in the context of sad stimuli about loss.

In addition to our prediction that CG participants would report feeling more negative emotions than sadness in the sad condition, we anticipated that in the sad film condition, CG participants would show more facial displays of negative emotions other than sadness than non-pathological participants. Too few participants evidenced prototypical expressions of emotions other than sadness for analysis. This points to a significant limitation of the current study – the small sample size. Due to avoidance characteristics of CG, we also anticipated that CG participants would show more controls of sadness expression in the sad condition than non-pathological participants. However, again, too few participants evidenced facial movements correlated with “control” for analysis.

An exploratory part of the study included analysis of other nonverbal behaviors (i.e. head and eye movements) in addition to facial expressions. Most extant research on the nonverbal display of emotion focuses on the facial expression of emotion. While FACS includes criteria for measuring head and eye movements in addition to facial displays, research has only begun to examine the role of head and eye movements in emotion expression. Considering the role of head and eye movements, research has now documented the prototypical expression of pride (Tracy & Robins, 2007), embarrassment (Keltner, 1995) and shame (Heery, Keltner, & Capps,
2003). The current study examined head movements and the co-occurrence of head movements with facial expressions of emotion to examine any nuances in the nonverbal display of sadness.

Shame, which is associated with the presence of head down tilt (AD 54) and downward gaze (AD 64), was displayed by too few participants for analysis. While head down tilt has also been associated with the expression of sadness (Darwin, 1862; Ekman & Friesen, 1978), little empirical research has examined the co-occurrence of head movements with sadness facial expressions. Surprisingly the current study found no significant findings for the co-occurrence of head down tilt with sadness expressions. However, a significant group effect was found for the occurrence of head down tilt (AD 54): CG participants were more likely to display AD 54 than non-pathological bereaved participants, regardless of condition. The fact that the CG group displays a head down tilt, a movement associated with sadness and shame expressions, regardless of condition, highlights another nonverbal dimension of the emotional context insensitivity of persons with CG. That the head down tilt also did not frequently occur with sadness facial expressions suggests that the head down tilt evidenced more frequently by CG participants occurred possibly in place of facial expressivity.

The head up tilt overall co-occurred with prototypical upper face sadness expression, the drawing up and together of the inner eyebrows, significantly more commonly in the sad condition than the neutral condition. Head up tilt and head down tilt movements are often theorized in terms of dominance displays with head up tilts being associated with higher displays of dominance (Mignault & Chadhurni, 2003). For example, pride is associated with a head up tilt and embarrassment or shame, associated with signs of appeasement, has been associated with head down tilt. It is unclear theoretically why head up tilt would be associated with the
expression of sadness in the sad film condition. Interestingly, Krumhuber and Scherer (2011) recently showed that the head up tilt was associated with the expression of relief. It is possible that by the head up tilt while expressing sadness provided some distance or relief for participants from the sad film.

Our study also found that overall several other head movements (head forward tilt and head right tilt) co-occurred frequently with prototypical upper face sadness expressions in the sad condition. The current study found that participants were marginally more likely to demonstrate a drawing down and together of the corrugator muscles (AU 4) combined with head forward tilt (AD 57) in the sad condition, a combination that has been previously defined as sympathy or “concerned attention” (Eisenberg & Fabes, 1990; Fabes, Eisenberg, & Eisenbud, 1993). The drawing down and together of the corrugator muscles (AU 4) has also been shown to signal concentration or focus (Ekman, 2003). In addition, head forward movements have been associated with higher arousal (Lance & Marsella, 2007). Thus, it is plausible that our findings suggest that persons are showing more heightened concentration and arousal, or “concerned attention” during the sad condition.

Our study also suggests that the head right tilt is associated with sadness facial displays among bereavement persons. The head down tilt and to the left has been associated with the expression of embarrassment (Amador, Cohn, & Reed, 2009; Keltner, 1997); however, previous research has not shown the head right tilt to be important in the facial expression of emotion.

While the current study provides a preliminary examination of the role of head movements in the nonverbal display of sadness among bereaved participants, we highlight how head movements frequently co-occur with sadness displays. Further research that explores the
temporal dimension of head movements and facial expression would importantly highlight the relationship between these two dimensions of nonverbal behavior. As emotion theory articulates and research has begun to demonstrate, the temporal unfolding of facial expressions can punctuate shifts between emotions, emotion blending, and the intensification or masking of emotion expression (Ekman, 2003). Further research on how the co-occurrence of facial expressions and head movements related to sadness unfold temporally would enhance our understanding of these behaviors. Furthermore, the fact that CG participants demonstrated a head down tilt regardless of condition may possibly reveal a more nuanced view of how emotional responding can be context-insensitive.

**Limitations**

The current study advances our understanding of grief-related pathology by examining emotional context sensitivity later in bereavement. Furthermore, the current study extends previous research by using an experimental design, randomized assignment, standardized emotional stimuli as well as a comprehensive and objective measure of nonverbal behavior. However, there are several important limitations to the study.

As previously mentioned a particular limitation of the current study is the small sample size. Since each participant was also only exposed to one film condition, our sample size was further decreased when looking at facial behavior or emotional experience across conditions. Also, as this was a between-subjects research design, we were unable to determine a baseline level of expression for each participant. Our analysis would have benefited from exposing each participant to the neutral and sad condition, and then creating change scores between the conditions to account for individual differences in facial expressivity.
The current study focused on bereavement status and specifically focused on individuals who presented with complicated grief. While we were able to examine how depression and post-traumatic stress disorder in the context of CG impacted emotion responding, our sample size was small, and most participants who had MDD or PTSD also had CG. The study would have benefited from having a comparison group of individuals who only presented with MDD and only with PTSD. Such diagnostic groups, however, may be hard to find among bereaved persons. Depression is not uncommon among bereaved individuals with CG, and co-morbidity is associated with greater severity of grief (Simon et al., 2007). Like mood and anxiety disorders, as CG persists the risk for co-morbidity with other forms of psychopathology may increase (Angst, 1996; Simon et al., 2007). Nonetheless, adding comparison groups of individuals with major depression or clinical anxiety would greatly enhance our ability to compare the emotion responding of these groups, and to better understand how emotion becomes dysregulated in complicated grief above and beyond other forms of psychopathology. The current study provides evidence that CG involves a distinct pattern of context insensitive emotion responding. Further clarification of the distinct emotion problems associated with CG will enable researchers and clinicians alike to better suit treatment interventions to individuals whose functioning is uniquely impaired by deficits associated with CG.

We used a standardized emotion elicitation paradigm, and the sad film clip has been empirically validated to elicit sadness. Indeed, our results demonstrate that the sad film clip elicited sadness among our participants; however, few participants exhibited full-face sadness expressions, which suggests that the sad film did not elicit intense sadness. If sadness only appears in the eyelid, eyebrow or forehead region, it is still clearly indicative of sadness;
however, if sadness expressions are evident in all facial regions, the emotion is likely more intense (Ekman and Friesen, 2003). Thus, while participants are clearly showing sadness in response to the sad film, the lesser incidence of full-face sadness expressions suggests that the film may not elicit the most extreme or even deep levels of sadness in our sample. Or, participants may be self-conscious about showing full expressions of sadness due to the experimental nature of the activity. The experimental nature of the study thus limits our ability to make conclusions about how participants may function in more naturalistic settings.

**Future Directions**

Emotion and its expression is inherently linked to social communication. Future research examining how social context impacts emotion expression of bereaved participants may help us better understand the socioemotional deficits associated with complicated grief. In the current study, participants are alone as they view a sad film, which likely impacts the nature and intensity of emotion expression. One possible future study might be to repeat this experimental design with and without other people in the room. The presence of another person may impact emotion expression and help us better understand the socioemotional deficits associated with complicated grief.

Because sadness is a central emotion in complicated grief and its regulation is a likely factor in the manifestation and maintenance of CG symptoms, the current study utilized an empirically validated sad film clip as the emotional stimulus. Importantly, this study points to how other emotions, namely anger and disgust, were elicited within a sad context among CG participants. By including film conditions for other emotions, future research may augment our understanding of the emotion responding patterns of bereaved persons in the context of other
emotions. How would CG participants emotionally respond in a context designed to elicit anger and disgust? Does anger and disgust emerge for CG participants in a context insensitive manner only in the context of a reminder of loss? Also, the sad film condition is specifically about loss, which directly speaks to the concerns of our study sample. Future research would benefit our understanding of how sadness is dysregulated in CG by including a sad film context that does not have to do with loss. Indeed, do persons with CG demonstrate emotion context-insensitivity only in the context of a reminder of loss, or in other sad-provoking contexts?

**Conclusion**

In sum, the current study extended context insensitivity research by investigating how conjugally bereaved persons later in bereavement emotionally responded in a sad or neutral context. The CG group of bereaved persons who are suffering from long-term problems associated with the loss of their spouse, including difficulty accepting the finality of the loss, estrangement, emotional loneliness, strong yearnings for the deceased, and avoidance of reminders of the deceased, demonstrated a unique pattern of less emotional reactivity for particular sadness expressions when confronted with a sad film about loss. Complicated grief appears to be associated with a deficit in showing more intense and even possibly “genuine” sadness expressions. Furthermore, CG participants experienced anger and disgust in addition in the context of a sad reminder of loss, pointing to need for future research exploring the role of emotions other than sadness in the bereavement process. These findings highlight the well-established basis for grief-related pathology as a distinct clinical problem, and point to how emotion context-insensitivity importantly plays a role in the maintenance of chronic grief-related pathology.
References


Schwarz, N. (1998). Warmer and more social: Recent developments in cognitive social


