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Research paper

Emotional and physiological reactivity in Complicated Grief

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ABSTRACT

Background: Grief is a psychobiological response to the loss of a loved one. Some grief theorists suggest that this predictable response may arise from withdrawal of psychobiological regulation previously provided by the deceased (e.g. assistance with emotion regulation). Accordingly, recovery from loss may require bereaved individuals to re-establish self-regulatory control to avoid developing Complicated Grief (CG). This model implies that adults with CG may exhibit aberrant emotional responding to environmental stimuli. The present study was designed to test this hypothesis.

Methods: We recruited a sample of 23 bereaved adults with CG and 26 healthy bereaved adults to complete an emotional reactivity paradigm. Participants watched a series of emotional film clips and provided measures of their self-reported emotional response. We also assessed their heart rate, respiratory sinus arrhythmia (RSA), and skin conductance level in response to these clips.

Results: Though emotional and physiological differences between the groups were rare, the CG group exhibited attenuated RSA reactivity to some emotional film clips, suggesting blunted parasympathetic nervous system reactivity in those with the disorder.

Limitations: Limitations include the modest sample size and unequal group sizes.

Conclusions: Individuals with CG do not exhibit pervasive differences in emotional and physiological reactivity compared to healthy bereaved individuals. However, we did observe evidence of blunted parasympathetic nervous system reactivity in individuals with CG, which may mediate emotional inflexibility among those who develop the disorder.

1. Introduction

Grief is a psychobiological response to the death of a loved one characterized by sadness, yearning, waves of emotional pain, and loss of appetite and sleep (Clayton et al., 1968; Lindemann, 1944; Parkes, 1972). Although symptoms usually abate with time (Bonanno et al., 2002), about 6.7% of bereaved individuals experience them for a year or longer (Kersting et al., 2011). The syndrome comprising disabling, chronic grief symptoms is known as Complicated Grief (CG) or Persistent Complex Bereavement Disorder (PCBD; American Psychiatric Association, 2013).

Research on maternal-infant separation has deepened our understanding of grief. When infant mammals are deprived of maternal contact, they display separation distress (e.g. facial expressions of sadness, vocalization, agitation, decreased social interaction and decreased/dysregulated food intake) resembling the human grief response (Hofer, 1984). This separation reaction is triggered by the simultaneous withdrawal of multiple maternal psychobiological regulators (e.g. body warmth, tactile stimulation, nutrition, etc.; Hofer, 1984). Accordingly, Hofer (1984) suggested that termination of hidden regulators provided by a deceased loved one may mediate the human grief response.

Consistent with his hypothesis, research has shown close relationships serve a co-regulatory function for both partners. Perhaps the best evidence for co-regulation between close relationship partners comes from the literature on stress-buffering. Specifically, numerous studies have demonstrated that both children and adults in the presence of a close relationship partner have reduced emotional and physiological reactivity to stressors (Carter et al., 1995; Coan et al., 2006; Feldman et al., 2010). Furthermore, even when the partner is absent, adults in a state of romantic love experience reduced physiological reactivity to negative emotional stimuli (Schneiderman et al., 2011). This outcome is likely mediated in part by the anti-stress effects of the neuropeptide oxytocin (Uvnas-Moberg, 1998). In addition, comforting thoughts and memories of an individual's close relationship partner may support emotion regulation through the instantiation of non-threatening appraisals (Mikulincer and Shaver, 2008).

Hence, the death of a loved one may dysregulate psychobiological systems that were previously under co-regulatory control (e.g. emotional regulation; Sbarra and Hazan, 2008). Recovery

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from loss is then predicated on the bereaved person's ability to re-establish self-regulation over these systems. An individual unable to do this may be at risk for CG (Sbarra and Hazan, 2008).

Theoretical work notwithstanding, there are scant data on emotional or physiological reactivity to emotional stimuli in people with CG. Individuals with CG do report experiencing intense negative emotions and physiological reactions in response to reminders of the deceased and the death (Horowitz et al., 1997; Shear et al., 2011). However, it remains unknown how individuals with CG respond to negative cues unrelated to their loss. Research on the stress-buffering effects of close relationships suggests that those with CG likely experience heightened emotional and physiological reactivity to negative emotional stimuli in daily life. However this hypothesis remains untested.

Individuals with CG also report symptoms of emotional numbing, loss of interest in relationships and activities, and difficulty experiencing positive memories of the deceased (APA, 2013; Horowitz et al., 1997; Prigerson et al., 2009; Shear et al., 2011). These symptom reports suggest that emotional dysregulation in those with CG might also include blunted emotional and physiological reactivity to positive environmental stimuli. These observations lead to a second untested hypothesis that individuals with CG will demonstrate blunted emotional and physiological reactivity to positive emotional stimuli in daily life.

To test these hypotheses, we had bereaved participants with and without CG watch a series of emotional film clips (sad, scary, funny, and neutral) while we measured their self-reported emotional and autonomic reactivity. Autonomic outcome measures included heart rate (HR), skin conductance level (SCL), and respiratory sinus arrhythmia (RSA, i.e. high frequency heart rate variability). HR is affected by both the sympathetic and parasympathetic branches of the autonomic nervous system (Andreassi, 2007; Stern et al., 2001), thus increases in HR reflect participants' general physiological reactivity. In contrast, SCL is a relatively pure measure of sympathetic nervous system (SNS) activity (Andreassi, 2007) and thus increases in SCL reflect participants' SNS reactivity. Finally, RSA reflects parasympathetic nervous system (PNS) inhibitory control of HR via the vagus nerve, which is withdrawn in response to stress (Porges, 2011). Decreases in RSA therefore provided a measure of participants' PNS reactivity.

2. Methods

2.1. Participants

We recruited bereaved adults via advertisement and referral. To meet inclusion criteria, all participants must have experienced the death of a close relationship partner (i.e. a parent, child, sibling, or romantic partner) more than 12 months prior to the study. Loss of a biological grandparent was also allowed ($n=2$) if the grandparent was the participant's primary parental figure. Exclusion criteria were lifetime psychosis, lifetime manic episode, lifetime hypomanic episode, past 12-month substance dependence, or past 12-month alcohol dependence, as assessed by the MINI International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). Individuals were also excluded if they reported characteristics that could affect cardiac measures of physiological reactivity (HR and RSA), including a physician-diagnosed heart murmur, a pacemaker, body mass index (BMI) greater than 33, or if they were taking medications whose side effects affect the speed or pattern of the heartbeat.

Eligible participants were assigned to the bereaved with CG or the healthy bereaved group based on the following criteria. Participants who scored >4 on the Brief Grief Questionnaire (BGQ; Shear et al., 2006) at phone screen and also scored >25 on the Inventory of Complicated Grief (ICG; Prigerson et al., 1995) during the lab visit were assigned to the CG group. Participants who scored ≤ 4 on the BGQ at phone screen and ≤ 25 on the ICG during the lab visit were assigned to the healthy bereaved group. Participants with discrepant group placement based on their BGQ and ICG scores were excluded. We also administered the DSM-5 PCBD criteria (APA, 2013) during the lab visit. However, as these criteria have not been empirically validated, we did not limit participation based on whether participants met these criteria.[1]

Fifty-five participants qualified for the study. Data for six were excluded from analyses. Two refused to complete the emotional reactivity paradigm, two were excluded for equipment difficulties, one was excluded because of an inability to wear the respiration band, and one was excluded for excessive movement which rendered his data unusable. Hence, we analyzed data for 23 participants with CG and 26 healthy bereaved participants.

2.2. Procedure

The Harvard University Committee on the Use of Human Subjects approved the protocol. Participants were prescreened by phone and those potentially eligible completed a 2.5-h lab session. After obtaining written informed consent, we administered a clinical interview to all participants that included the ICG (Prigerson et al., 1995), the DSM-5 PCBD criteria (APA, 2013), and the MINI (Sheehan et al., 1998).

After the clinical interview, participants completed the emotional reactivity paradigm in a testing room where they sat opposite a desktop computer. We attached electrocardiogram electrodes (BIOPAC Systems Inc. EL503 general-purpose disposable electrodes) to participants' left and right wrists as well as electrodermal activity electrodes (BIOPAC Systems Inc. EL507 electrodermal activity electrodes) to the medial volar phalanges of their left middle and left ring fingers. We also attached a respiration band (BIOPAC Systems Inc. SS5LB respiratory effort transducer) around participants' chests at the point of maximum respiratory expansion. These electrodes and respiration band measured participants' physiological reactivity during the paradigm via a BIOPAC MP100A system (BIOPAC Systems Inc., Goleta, CA).

The task instructions and emotional film clips were presented on a desktop computer via Superlab 4.5 stimulus presentation software (Cedrus Corporation, San Pedro, CA). Participants were instructed to sit quietly for five minutes to allow for baseline data collection. Participants then began the emotional film clips task, which involved watching four film clips and rating their emotional responses to these film clips. We selected four film clips based on recommendations by Gross and Levenson (1995). The sad clip was a 2 min and 44 s segment from the movie *The Champ*, in which a boy watches his father die (Zeffirelli, 1979). The scary clip was a 1 min and 23 s segment from the movie *The Shining*, in which a boy has a paranormal experience while playing in a hallway (Kubrick, 1980). The funny clip was a 2 min and 35 s segment from *When Harry Met Sally*, in which a woman simulates an orgasm in a restaurant (Reiner, 1989). The neutral clip was a 2 min and 49 s segment of waves crashing on a beach (Amiri, 2013).

The order of the film clips was randomly assigned per participant (order counter-balanced between groups). Before each film clip, participants had 2 min to rate their pre-clip emotions. Specifically participants rated their subjective experience of the target emotion for each film clip (sad film – sad, scary film – afraid, funny film – amused, and neutral film – calm) on Visual Analogue Mood Scales (VAMS; Bond and Lader, 1974). Participants were then given

[1] Among CG participants, 10 met current DSM-5 PCBD criteria, whereas 13 did not; 3 missed Criterion B, 9 missed Criterion C, and 1 denied Criterion D.