International Journal of Psychophysiology 90 (2013) 58–65

Contents lists available at ScienceDirect

International Journal of Psychophysiology

journal homepage: www.elsevier.com/locate/ijpsycho

Is the blunted blood pressure reactivity in dysphoric individuals related to attenuated behavioral approach?

Andreas R. Schwerdtfeger *, Ann Kathrin S. Gerteis

Department of Psychology, Health Psychology Unit, Karl-Franzens-University Graz, Austria

ARTICLE INFO

Article history:
Received 18 September 2012
Received in revised form 25 January 2013
Accepted 28 January 2013
Available online 5 February 2013

Keywords:
Behavioral approach
Blood pressure
Depressive symptoms
Dysphoric mood
Cardiovascular reactivity

ABSTRACT

Depressive symptoms have been related to autonomic nervous system dysregulation. Recent research found attenuated cardiovascular reactivity to self-relevant tasks. The aim of this study was to examine whether blunted blood pressure reactivity in dysphoric individuals is moderated by impaired effort mobilization and behavioral approach. Seventy-five individuals were instructed to sing a song in front of a camera. Depressive symptoms, blood pressure, heart rate, and heart rate variability as well as subjective and other-rated indicators of behavioral approach were recorded. Depressive symptoms were positively correlated with heart rate and inversely associated with heart rate variability during baseline. Moreover, higher depression scores were accompanied by attenuated systolic blood pressure reactivity during singing, thus supporting previous research. This finding was neither mediated by subjective nor other-rated indicators of behavioral approach. Although confirming recent evidence of blunted blood pressure reactivity and altered autonomic baseline function in dysphoric individuals, the findings call for further research on the role of behavioral approach in depression-related blunted physiological reactivity.

1. Introduction

There is converging evidence that depressive symptoms are related to autonomic nervous system (ANS) dysregulation. For example, a recent animal study (Grippo et al., 2011) found that socially isolated depressed prairie voles exhibited elevated heart rate (HR) and attenuated heart rate variability (HRV), indicating impaired parasympathetic efference. Research with humans is largely consistent with this finding. Specifically, dysphoric or depressed individuals have been found to exhibit lower HRV, higher HR, and attenuated baroreceptor reflex function during rest (e.g., Agelink et al., 2002; Broadley et al., 2005; Davydov et al., 2007; Kim et al., 2005; Lehofer et al., 1997; Moser et al., 1998; Udupa et al., 2007; Watkins and Grossman, 1999). Taken together, it may be concluded that depressive symptoms alter the autonomic innervation of the heart such that the organism gets more vulnerable to the development of cardiovascular disease (e.g., Rugulies, 2002).

Importantly, altered ANS function with respect to dysphoric mood has not only been observed during resting periods but also during stressful aversive encounters (i.e., altered reactivity relative to a baseline period). In particular, earlier studies found evidence for elevated cardiovascular reactivity (CVR) in individuals with depressive symptoms (for a meta-analysis, see, Kibler and Ma, 2004), which might imply elevated strain on the cardiovascular system, thus ultimately increasing cardiovascular risk. Of note, this evidence appeared to be not robust and more recent findings challenge this view by suggesting lower – and not higher – CVR in depressed and dysphoric individuals (e.g., Carroll et al., 2007; Phillips, 2011; Salomon et al., 2009; Schwerdtfeger and Rosenkaimer, 2011; York et al., 2007). Although the negative relationship between depression and CVR was rather unexpected, it could be replicated several times by now and seem to contradict the hypothesis of elevated sympathetic nervous system activity in depressed individuals.

It should be emphasized that the mechanisms underlying the blunted CVR in depressed individuals are not clear yet. In a previous publication we have speculated that differences in task engagement or behavioral approach tendencies could moderate the association between depressive symptoms and physiological reactivity (Schwerdtfeger and Rosenkaimer, 2011). This psychological interpretation draws on the fact that most of the recent studies reporting blunted CVR in depressed individuals applied self-relevant social-evaluative stressors, for example, public speaking tasks (e.g., Schwerdtfeger and Rosenkaimer, 2011; York et al., 2007) or mental arithmetics (e.g., Carroll et al., 2007; Phillips, 2011). These are active coping tasks, requiring effort mobilization and behavioral approach tendencies for successful task performance (Obrist, 1981). Consequently, one might propose attenuated task engagement and impaired effort mobilization in depressed individuals, resulting in lower CVR. This interpretation is concordant with the hypothesis of a motivational deficit in depressives (e.g., Treadway et al., 2012). Of note, systolic blood pressure (SBP) reactivity is particularly sensitive to effort-related processes (e.g., Gendolla et al., 2008; Tomaka and Palacios-Esquivel, 1997; Wright and Kirby, 2001), which fits nicely with previous evidence of attenuated SBP reactivity to demanding

* Corresponding author at: Department of Psychology, Karl-Franzens-University Graz, A-8010 Graz, Austria. Tel.: +43 316 380 4953; fax: +43 316 380 9807.
E-mail address: andreas.schwerdtfeger@uni-graz.at (A.R. Schwerdtfeger).

0167-8760/$ – see front matter
http://dx.doi.org/10.1016/j.ijpsycho.2013.01.015

tasks in dysphoric individuals (e.g., Brinkmann and Gendolla, 2008; Brinkmann et al., 2009; Carroll et al., 2007; Schwerdtfeger and Rosenkaimer, 2011).

Importantly, task demand seems to play a critical role in moderating the association between dysphoric mood and SBP reactivity. For example, Brinkmann and Gendolla (2008) found blunted SBP reactivity in dysphoric individuals only when task difficulty was high but not when it was low. In this latter condition dysphoric individuals even exhibited elevated reactivity. According to the informational mood impact hypothesis these findings suggest that negative mood leads to a deterioration of task engagement when the task demand is appraised as being too high.

Although it seems plausible to interpret the blunted SBP in dysphoric individuals as indicating lower approach motivation and effort mobilization, other research challenge this explanation. For example, Schwerdtfeger and Rosenkaimer (2011) analyzed cardiovascular and electrodermal reactivities to different active and passive stressors. In line with recent evidence we found that dysphoric participants exhibited attenuated SBP and electrodermal reactivities to an active stressor (public speaking task). Even more, we could show that blunted reactivity was also evident during the viewing of the speech video, which is a passive stressor. Importantly, there were no differences with respect to a cold pressor task. We interpreted this finding in terms of diminished sympathetic nervous system reactivity in dysphoric individuals to self-relevant encounters only, irrespective of the task being active or passive. We followed the definition of Gendolla and Richter (2010), who defined "self-relevance" as performance conditions with implications for individuals' self-definition and self-esteem. In particular, conditions of social evaluation, self-evaluation, and personal goal pursuit are typical settings for self-relevant tasks.

Our previous finding seemed to be incompatible with the view that impaired effort allocation might have driven the blunted cardiovascular and electrodermal reactivities, because passively viewing the speech video obviously does not require effort allocation. However, methodological peculiarities could have biased the findings. Specifically, the experimenter attended the participant in the lab while the video of the speech was presented, which might have triggered impression management and emotion regulation strategies in some participants (e.g., suppression of emotional responses). Importantly, both these variables have been found to modulate physiological responses to a considerable degree (e.g., Egloff et al., 2006; Gross and Levenson, 1993; Heffner et al., 2002; Roberts et al., 2008).

Hence, we were interested to put the hypothesis of attenuated ANS reactivity in dysphoric individuals to a further test. First, we aimed to replicate previous findings suggesting blunted SBP reactivity to a self-relevant stress task in dysphoric individuals. In order to get a more complete picture of cardiovascular activation throughout different task periods we also exploratively tested for differences during task preparation and recovery. Importantly, we also aimed to examine whether subjective and behavioral indicators of approach behavior could mediate the relationship between depressive symptoms and SBP reactivity. That is, subjective approach-related positive affect (PA) as a major constituent of behavioral approach (e.g., Gable and Harmon-Jones, 2008, 2010; Harmon-Jones et al., 2011) and other-rated loudness of voice, motivation and dominance during the task were analyzed. Both these variables should capture effort-related processes reasonably well. Finally, we aimed to replicate the well-known finding of increased HR and decreased HRV during baseline in a non-clinical sample of moderately depressed individuals, thereby controlling for respiration rate. In doing so, this study is among the first to bring together both lines of research with respect to ANS dysfunction in depressed individuals, altered ANS baseline function and diminished reactivity, respectively. Of note, such an approach could help to elucidate the physiological mechanisms linking depressive symptoms with cardiovascular risk. By examining both sympathetic as well as parasympathetic indicators during baseline and stress the present research could foster our understanding of ANS dysregulation in depression on a methodological and on a theoretical level. With respect to methodology, the combined analysis within the same population could rule out systematic differences between study samples (e.g., due to medication, lifestyle and demographic variables, psychological differences, e.g., habitual use of emotion regulation strategies), thus securing internal validity of the findings. On a theoretical level it could offer heuristic value for theories linking autonomic responses in depressed individuals with neurobiological structures [e.g., by lending support for the assumption of a dynamic interplay of inhibiting and disinhibiting prefrontal cortex (PFC) activation in dysphoric individuals during rest as well as during stressful aversive encounters; e.g., Hilz et al., 2006].

2. Methods

2.1. Participants

Seventy-five individuals (49 females) participated in the study. About 73% of the samples were students. They had a mean age of 27.87 years ($SD = 10.04$) and a mean body mass index (BMI) of 23.13 ($SD = 3.71$). There were 25% smokers and 66% reported regular physical exercise. All participants were free of cardioactive and antidepressive medications. They were not allowed to consume caffeine or cigarettes 2 h prior to the experiment. Participants were recruited through advertisements at the university campus and received course credit when applicable.

2.2. Study design

The study comprised of a stress task (public singing) that was embedded between a baseline period, a preparation period, and a recovery period. Throughout the different phases of the task cardiovascular variables were recorded. Moreover, subjective and other-rated behavioral approach tendencies during task performance were assessed.

2.3. Stress task

A public singing task was implemented as a self-relevant challenge to examine CVR. Participants were requested to sing the song "Yesterday" from the Beatles in front of a camera. They were given instructions emphasizing that they would be videotaped and their performance would be evaluated by experts for clearness of voice and task engagement. They then received the lyrics for 2 min to allow practicing the song in silence (preparation period). After that, the camera was adjusted with ostentation to enhance social-evaluative cues and participants were requested to sing the song for approximately 2 min. Finally, a recovery period of 15-minute duration followed where participants were instructed to listen to an audio file (nature documentary) with their eyes open.

2.4. Depressive symptoms

We assessed depressive symptoms by means of the trait version of the State–Trait Depression Scales (STDS; Spielberger, 1995; German version by Spaderna et al., 2002). The scale has been developed to assess depressive mood in healthy individuals and excludes somatic symptoms, which are more prevalent in clinical depression. It comprises 10 items assessing cognitive–affective symptoms which can be subdivided in dysthymia (e.g., "I feel blue") and euthymia (e.g., "I feel strong"). The euthymia items are recoded prior to aggregating. Participants are instructed to rate how they generally feel. Response options are given on a four point frequency scale between the poles 1 ("never") and 4 ("very often"), resulting in a possible range of scores between 10 and 40. The mean total score for this sample was 17.69 ($SD = 4.67$). The reliability of this scale proved good (Cronbach's alpha = .88).