Personality and Individual Differences 138 (2019) 69–74

Contents lists available at ScienceDirect

Personality and Individual Differences

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

Resting heart rate variability moderates the relationship between trait emotional competencies and depression

Elise Batselé[a,b,*], Nicolas Stefaniak[c], Carole Fantini-Hauwel[a]

[a] Fund for Scientific Research (FNRS-FRS), Brussels, Belgium
[b] National Fund for Scientific Research, FNRS, Belgium
[c] University of Reims Champagne-Ardenne, Cognition, Health and Society Lab (C2S), France

ARTICLE INFO

Keywords:
Heart rate variability
Emotional competencies
Parasympathetic nervous system
Vagal tone
Depression
Anxiety

ABSTRACT

Objective: A lot of studies have shown that low Emotional Competencies (EC) is associated with depression and anxiety. However, little is known about the psychophysiological processes accounting for these relationships. As heart rate variability (HRV) is thought to be a measure of top-down self-regulatory mechanisms it could impact the link between EC and depression/anxiety. Thus, the aim of this study was to disentangle the interplay between EC and HRV on depression as well as anxiety.
Method: Resting HRV was collected among 97 undergraduate students that filled out EC, depression and anxiety measures.
Results: We observed negatives associations between EC and depression/anxiety. HRV was negatively associated with depression but not with anxiety. There was an interaction effect between EC and HRV showing that EC and depression were associated only at low levels of HRV.
Conclusions: Our study suggests that HRV could be a protective factor against the negative consequences of low EC such as depression.

1. Introduction

All human beings experiment emotions, but individuals differ in how they manage and process these emotions (Petrides & Furnham, 2003). EC – also called "emotional intelligence" (EI) – offer a theoretical conceptualization of this idea and are defined as the way individuals identify, understand, express, regulate and use their own and others' emotions (Mayer & Salovey, 1997; Petrides & Furnham, 2003). Although the term EI is more commonly used in scientific literature, the term EC is preferable because it is more consistent with recent results indicating that EC can be trained and improved (Kotsou, Grégoire, Nelis, & Mikolajczak, 2011). It's also important to highlight the distinction between trait EC, usually measured with self-report questionnaires (i.e. PEC: Brasseur, Grégoire, Bourdu, & Mikolajczak, 2013) and ability EC, assesses with performance-based measures (i.e. MSCEIT: Mayer, Salovey, & Caruso, 2002) as suggested by Petrides and Furnham (2001). Indeed, the former refers to stable dispositions and self-perceived competencies while the latter encompasses actual abilities, in fact what EC people really have and not what they think about their own EC. The current study focused on the trait EC as ability EC is known to overlap with many others cognitive intelligence indices (Webb et al., 2013) and to be less or unrelated with affective disorders (Goldenberg, Matheson, & Mantler, 2006).

EC are essential to cope adequately with the environment. For instance, a recent cumulative meta-analysis showed that EC have a moderate and positive relationship with physical, psychosomatic and mental health suggesting that EC should be an important health predictor (Martins, Ramalho, & Morin, 2010). More specifically, lower levels of trait EC have been associated with internalizing disorders such as depression and anxiety (Lizeretti & Extremera, 2011; Lloyd, Malek-Ahmadi, Barclay, Fernandez, & Chartrand, 2012), even after controlling for age, gender, personality and cognitive abilities (Davis & Humphrey, 2012). Furthermore, recent research suggests that trait EC should be a vulnerability factor to such psychopathological issues (Gomez-Baya, Mendoza, Paino, & de Matos, 2017).

EC is also related to an important concept largely known to be a transdiagnostic marker of psychopathology. Indeed, emotion regulation, defined as the processes by which an individual manages its emotional responses, have been widely investigated in mental health and there are evidences of a broad deficit of emotion regulation in

* Corresponding author at: Center of Clinical Psychology, Psychopathology and Psychosomatic Research, Université Libre de Bruxelles, Av. F. Roosevelt 50, 1050 Brussels, Belgium.
E-mail address: elise.batsele@ulb.ac.be (E. Batselé).

https://doi.org/10.1016/j.paid.2018.09.020
Received 14 April 2018; Received in revised form 12 September 2018; Accepted 17 September 2018

anxiety and depression (i.e. Aldao, Nolen-Hoeksema, & Schweizer, 2010). To date, most studies have established a positive relationship between EC and functional emotion regulation strategies and a negative link with dysfunctional ones (Peña-Sarrionandia, Mikolajczak, & Gross, 2015). However, these studies mainly rely on self-perceived emotion regulation and rarely account for more objective emotion regulation markers such as parasympathetic nervous system (PNS) activity, which is measured through vagally mediated heart rate variability (HRV[1]), i.e. the change in the time interval between successive heartbeats. Two major theories have led researchers to consider HRV as reflecting top-down self-regulatory processes (i.e. executive functioning, emotion regulation, working memory, attentional regulation) (Holzman & Bridgett, 2017). According to Porge's polyvagal theory (Porges, 1995; Porges, 2001), the ability of the ventral vagal complex to rapidly withdraw its inhibitory influence allows humans to rapidly engage and disengage with their environment without the metabolic cost of activating the slower-responding sympathetic nervous system. Indeed, many social processes (i.e., nonverbal communication, romantic courtship) require this rapid management of metabolic resources (24). Thus, the polyvagal theory emphasizes the relationship of ventral vagal complex activity and the regulation of the emotional processes underlying social behavior. Secondly, Thayer and Lane's neurovisceral integration model (Thayer & Lane, 2000) states that HRV is influenced the central autonomic network (CAN), the stellate ganglia and the vagus nerve. The CAN receives information from internal and sensory external environment (input) and sends output that directly influences heart rate. This is the reason why HRV is considered to be a reflection of the CAN output and more specifically, the index of the physiological responses regulation when emotions arise. As such, HRV's level appears to be a good indicator of the ability to regulate emotions as it assesses the strength of vagal influence to adjust the cardiac reaction when emotions arise (Thayer, Hansen, Saus-Rose, & Johnsen, 2009).

As HRV is thought to be a transdiagnostic biomarker of psychopathology reflecting emotion regulation abilities (Beauchaine & Thayer, 2015), its relationships with depression or anxiety have been widely studied. Decreased HRV has often been associated with those two disorders (Brunoni et al., 2013; Chalmers, Quintana, Abbott, & Kemp, 2014). Interestingly, a longitudinal study has shown that participants free of depression and exhibiting lower HRV at baseline, were more prone to develop depressive symptoms after 10 years, even after controlling for potential cofounding variables (Jandackova, Britton, Malik, & Steptoe, 2016). So, HRV may be a trait biological marker, increasing the vulnerability to develop affective disorders (Brunoni et al., 2013), whose heritability is estimated between 47 and 60% (Golosheykin, Grant, Novak, Heath, & Anokhin, 2017). Although these studies displayed significant relationships between depression/anxiety and HRV, other researchers have found contradictory results (Hammel et al., 2011; Moser et al., 1998).

So, an interesting question arises about the interplay between trait EC and HRV on depression and anxiety as they are both known to have consequences on them. To date, there are only two studies about trait EC and HRV. They evidence inconclusive results but the two studies (Craig et al., 2009; Laborde, Brüll, Weber, & Anders, 2013) rely on HRV markers that reflect a mixture of PNS and sympathetic nervous system (SNS) influences (LF/HF ratio and SDNN). Recent recommendation states to use HRV indices that refer to clearly identified physiological systems (Laborde, Mosley, & Thayer, 2017).

The aim of this study was to disentangle the interplay between trait EC and HRV, as a measure of top-down self-regulatory mechanisms, on depression and anxiety. Indeed, how HRV influence the relation between trait ERC and psychological disorders remains unclear. HRV could be a moderator of the relationship between trait EC and depression/anxiety. For example, neuroticism has less detrimental consequences on life outcomes at higher level of HRV but not at low (Ode, Hilmert, Zielke, & Robinson, 2010). Further, it has also been shown that the consequences of thought suppression efforts on emotional distress are more likely to appear at low HRV level but not at high level (Gillie, Vasey, & Thayer, 2015). Thus, a moderation effect could not be excluded highlighting the flexibility and protective role of HRV. An alternative hypothesis posits that HRV is a mediator between trait EC and depression/anxiety. Indeed, some studies have revealed that the effect of emotion regulation on affective disorders is partially indirect through HRV (Appelhans & Luecken, 2006; Thayer et al., 2009). Emotion regulation difficulties could lead to a lower HRV and then to negative consequences. As trait EC and emotion regulation are partly entangle, this hypothesis needs to be assessed.

2. Method

A total of 108 participants took part in the experiment. Due to the exclusion criteria, 7 subjects were excluded and 4 other subjects were removed due to missing data. Thus, the final sample was composed of 97 undergraduate students, who participated in the study in order to validate credits for a psychology course (82 females, mean age = 22.05 ± 3.47). Exclusion criteria were: (1) having a chronic somatic disease, (2) having a psychiatric diagnosis and (3) having difficulty understanding the French language. We have determined the required sample size with an a priori power analysis (G power) with 4 predictors (HRV, CE, HRV X CE and age as control variable). 85 participants were necessary to achieve a power of 0.80, with an alpha of 0.05 and a medium effect size of 0.15. The study was approved by the faculty ethic committee.

2.1. Procedure

Participants were instructed not to smoke, engage in physical exercise or drink coffee/alcohol/energizing drinks 3 h before undergoing the experiment. They were seated in an experimental room during 30 min, which was equipped with a computer. An electrode belt was first attached to the participant's chest to complete a 5-min HRV resting period. The measure started 3–4 min after they seated in front of the screen of the computer (blank screen), just after they were given a detailed explanation of the procedure. Participants were sitting with hands on the knees and bent legs. They were spontaneously breathing and were instructed not to move. After the HRV measure, participants were asked to complete a set of online questionnaires.

Questionnaires

Trait emotional competencies. We used the French version of the PEC (Brasseur et al., 2013), a 50 items scored on a five-point Likert scale (from *strongly disagree* to *strongly agree*). We focused on the two main factor scores: intrapersonal EC (α = 0.85), an interpersonal EC (α = 0.84) and the total EC factor score (α = 0.86).

Depression and anxiety. We used the French validated version of the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), a 14-item scale (7 for anxiety and 7 for depression) scored on a 4-point Likert scale ranging from 0 to 3. The two-dimensional structure of the HADS exhibits a good internal consistency (α anxiety = 0.77; α depression = 0.72).

Heart rate variability. HRV was measured by using a Polar® V800 heart rate monitor allowing to extract HRV parameters. The measure taken by the Polar® V800 has been validated as comparable to an electrocardiograph (Giles, Draper, & Neil, 2016). The electrode belt was dampened and placed following Polar's guidelines, tightly but comfortably just below the chest muscles. Measurements were conducted during 5 min (spontaneous breathing and resting state), according to the recommendations of the Task Force of The European Society of Cardiology and The North American Society of Pacing and Electrophysiology (1996). The variability between successive R-spikes

[1] For clarity reasons, we will use the HRV acronym to refer to the vagally mediated HRV.