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Coping with Psychosocial Stress: Examining the Roles of Emotional Intelligence and Coping Strategies in Germany and Pakistan

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Teach the people of your knowledge, and learn from their knowledge. Hence you would have become adept and learnt that which you do not know.

(Imam Hassan AS)

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Abstract

Maladaptive coping mechanisms influence health-related quality of life (HRQoL) of individuals facing acute and chronic stress. Trait emotional intelligence (EI) may provide a protective shield against the debilitating effects of maladaptive coping thus contributing to maintained HRQoL. Low trait EI, on the other hand, may predispose individuals to apply maladaptive coping, consequently resulting in lower HRQoL. The current research is comprised of two studies. Study 1 was designed to investigate the protective effects of trait EI and its utility for efficient coping in dealing with the stress caused by chronic heart failure (CHF) in a cross-cultural setting (Pakistan vs Germany). N = 200 CHF patients were recruited at cardiology institutes of Multan, Pakistan and Würzburg as well as Brandenburg, Germany. Path analysis confirmed the expected relation between low trait EI and low HRQoL and revealed that this association was mediated by maladaptive metacognitions and negative coping strategies in Pakistani but not German CHF patients. Interestingly, also the specific coping strategies were culture-specific. The Pakistani sample considered religious coping to be highly important, whereas the German sample was focused on adopting a healthy lifestyle such as doing exercise. These findings are in line with cultural characteristics suggesting that German CHF patients have an internal locus of control as compared to an external locus of control in Pakistani CHF patients. Finally, the findings from study 1 corroborate the culture-independent validity of the metacognitive model of generalized anxiety disorder.

In addition to low trait EI, high interoception accuracy (IA) may predispose individuals to interpret cardiac symptoms as threatening, thus leading to anxiety. To examine this proposition, Study 2 compared individuals with high vs low IA in dealing with a psychosocial stressor (public speaking) in an experimental lab study. In addition, a novel

physiological intervention named transcutaneous vagus nerve stimulation (t-VNS) and cognitive reappraisal (CR) were applied during and after the anticipation of the speech in order to facilitate coping with stress. *N*= 99 healthy volunteers participated in the study. Results showed interesting descriptive results that only reached trend level. They suggested a tendency of high IA individuals to perceive the situation as more threatening as indicated by increased heart rate and reduced heart rate variability in the high-frequency spectrum as well as high subjective anxiety during anticipation of and actual performance of the speech. This suggests a potential vulnerability of high IA individuals for developing anxiety disorders, specifically social anxiety disorder, in case negative self-focused attention and negative evaluation is applied to the (more prominently perceived) increased cardiac responding during anticipation of and the actual presentation of the public speech. The study did not reveal any significant protective effects of t-VNS and CR.

In summary, the current research suggested that low trait EI and high IA predicted worse psychological adjustment to chronic and acute distress. Low trait EI facilitated maladaptive metacognitive processes resulting in the use of negative coping strategies in Study 1; however, increased IA regarding cardioceptions predicted high physiological arousal in study 2. Finally, the German vs. the Pakistani culture greatly affected the preference for specific coping strategies. These findings have implications for caregivers to provide culture-specific treatments on the one hand. On the other hand, they highlight high IA as a possible vulnerability to be targeted for the prevention of (social) anxiety.

Keywords: Psychosocial stress, coping, trait emotional intelligence, cross-cultural differences, interoception

Zusammenfassung

Maladaptive Copingmechanismen beeinflussen die auf die Gesundheit bezogene Lebensqualität (HRQoL) von Individuen, die akutem oder chronischem Stress ausgesetzt sind. Emotionale Intelligenz (EI) im Sinne eines Persönlichkeitsmerkmals (Trait) könnte gegen schwächende Einflüsse maladaptiven Copings schützen und so zur Aufrechterhaltung einer hohen HRQoL beitragen. Andererseits könnte niedrige EI Personen dazu prädisponieren, dass sie maladaptives Coping anwenden, was wiederum eine niedrige HRQoL zur Folge hätte. Die vorliegende Forschungsarbeit umfasst zwei Studien. Studie 1 ist konzipiert, um schützende Einflüsse von Trait EI und deren Nutzen für wirkungsvolles Coping im Umgang mit Stress zu untersuchen, welcher durch chronische Herzinsuffizienz (CHF) verursacht wurde. Für diese kulturvergleichende Stude (Pakistan vs. Deutschland) wurden 200 Patienten mit CHF an kardiologischen Kliniken in Multan (Pakistan), sowie in Würzburg und Brandenburg (Deutschland) rekrutiert. Eine Pfadanalyse bestätigte den erwarteten Zusammenhang zwischen niedriger Trait EI und niedriger HRQoL. Bei Patienten aus Pakistan, nicht aber bei deutschen CHF Patienten, wurde diese Assoziation durch maladaptive Metakognitionen und schlechte Coping Strategien mediiert. Interessanterweise waren auch die spezifischen Coping Strategien stark kulturspezifisch. Die pakistanischen Probanden bewerteten religiöses Coping als sehr wichtig, wohingegen die deutschen Teilnehmer darauf bedacht waren, einen gesunden Lebensstil zu entwickeln, wie z.B. Sport zu treiben. Diese Befunde entsprechen kulturellen Charakteristika: Während deutsche CHF Patienten eher einen internen „Locus of Control“ haben (d.h. Patienten such die Ursache für Probleme eher bei sich selbst), ist für die pakistanische Kluter ein externer „Locus of Control“ typisch (d.h. Patienten schreiben eher den Umständen die Verantwortung für Probleme zu). Die Ergebnisse von Studie 1 untermauern auperdem kulturunabhängig die Validität des metakognitiven Models der generalisierten Angststörung.

Neben zu niedriger Trait EI könnte eine hohe Genauigkeit der Wahrnehmung von Körpersignalen, d.h. Interozzeption (IA), Personen dafür prädisponieren, kardiale Symptome als bedrohlich zu interpretieren, was wiederum zu Angstzuständen führen kann. Um diese Hypothese zu prüfen, wurde in Studie 2 der Umgang von Personen mit hoher vs. niedriger IA mit einer psychosozialen Stresssituation (öffentliches Sprechen) in einem Laborexeriment verglichen. Zusätzlich wurde eine innovative, physiologische Intervention, die transkutane Vagus Nerv Stimulation (t-VNS), sowie kognitives Reappraisal (CR) während der Antizipation und der Durchführung der öffentlichen Rede durchgeführt, um den Umgang mit Stress zu verbessern. N=99 Freiwillige nahmen an der Studie teil. Einige Ergebnisse waren erreichten Trend Nivea, waren deskriptiv aber sehr interessant und wiesen konsistent in eine Richtung, die im Einklang mit einschlägigen Theorien steht. Demnach tendierten Personen mit hoher IA dazu, die Situation als bedrohlicher wahrzunehmen. Dies schlug sich in einem erhöhten Puls, reduzierter Herzfrequenzvariabilität im Hochfrequenzspektrum sowie hoher subjektive Angst während Erwartung und tatsächlichen Darbietung der Rede nieder. Dies deutet auf eine mögliche Vulnerabilität von Personen mit hoher IA hin, Angststörungen zu entwickeln, besonders eine soziale Angststörung. Falls Personen mit hoher IA und dementsprechend einer stärkeren Wahrnehmung der stärker auftretenden physiologischen Symptome während der Antizipation von sozialem Stress diese aufgrund von selbstfokussierter Aufmerksamkeit hypervigilant beobachten und negativ bewerten, könnte dies zu Vermeidung führen, die durch operante Verstärkung in soziale Angst münden könnte. Die Studie fand keine signifikanten protektiven Effekte von t-VNS und CR.

Zusammenfassend legen die vorliegenden Studien nahe, dass niedrige Trait EI und hohe IA eine schlechte psychologische Anpassung an chronischen und akuten Stress voraussagen. Low Trait EI begünstigte maladaptive metakognitive Prozesse, die sich in Studie 1 in dem Gebrauch ungünstiger Coping Strategien zeigten. Weiterhin prädizierte in

Studie 2 eine erhöhte IA in Bezug auf die Wahrnehmung der eigenen Herztätigkeit eine hohe physiologische Erregung. Schließlich beeinflusste die deutsche bzw. pakistanische Kultur stark die Wahl der spezifischen Bewältigungsstrategien. Diese Befunde unterstreichen die Notwendigkeit kulturspezifischer Anapssungen von Psychotherapie und Prävention. Weiterhin betonen sie die Rolle hoher IA als mögliche Vulnerabilität für (soziale) Ängstlichkeit, so dass hohe IA als Indikator für präventive Maßnahmen genutzt werden könnte um ein eventuelles Aufkeimen (soziale) Ängstlichkeit zu verhindern.

Schlüsselwörter: Psychosozialer Stress, coping, emotionale intelligenz, interkulturelle unterschiede, interoception

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General Introduction

1.1 Stress and Coping

Stress refers to pressure or tension exerted on something or somebody. Ancient philosophers like Aristotle, Hippocrates, had known about stress and its adverse effects. The line of researchers continued with famous names such as Claude Bernard (1859), Walter Bradford Cannon (famous for homeostasis in 1931 and fight or flight phenomenon) to Hans Hugo Bruno Selye. He coined the term heterostasis, which refers to homeostasis achieved through external sources. This heterostasis is considered as the basis of allostasis, a term coined by Peter Sterling and Joseph Eyer in the 1980's describing stability through change and is essential from the perspective of stress as it allows a change in already balanced situations (Fink, 2009).

There exists a lack of consensus on a single definition of stress but the term can be applied equally to a response (both psychological and biological) towards any stimulus and the associated process of change (adaptation). The definition is further enhanced by adding individual differences to susceptibility and response towards stressful stimuli. Selye suggested that despite differences in nature and intensity, stressful events activate almost similar patterns of biochemical, functional, and structural changes to cope with external demands (Fink, 2009). He introduced the *General Adaptation Syndrome* (GAS), which states that chronic exposures to stress lead to the development of the disease of adaptation explaining that chronic stress may result in increased overproduction of chemicals consequently causing life reduction illnesses (Selye, 1946).

Lazarus and Folkman (1984) explained psychological stress as a relationship with the environment that the person appraises as significant for his or her well-being and in which the demands tax or exceed available coping resources. According to their perspective, *appraisal and coping* are two integral factors of any psychological stress. The concept of

appraisal underlines that any emotional processing response is highly dependent on the degree of significance of the stimulus being evaluated and on one's outcome expectation. Lazarus has explained two basic types of appraisals namely primary and secondary. Primary appraisal evaluates the situation in reference to well-being such as how much a situation is important and in accordance with the personal goals of an individual. Whereas secondary appraisal determines various coping options to alter and/or control the situation (Folkman, Lazarus, Dunkel-Schetter, DeLongis, & Gruen, 1986). Stressful environmental situations could range from simple social interactions such as meeting a friend, starting a conversation, appearing in an interview, and even to different transitions in life such as marriage, loss of loved ones and so on. Both primary and secondary appraisals influence the ability of individuals to perceive the stress created by either minor or major events in life. For example, the individual either perceives a distressing event, situation, or stimulus as *harm* (refers to the already happened damage or loss), *threat* (explains the anticipation of forthcoming harm) or *challenge* (develops if the person feels confident in overcoming any forthcoming or already happened loss or damage).

Based on the perceived threat appraisal, the choice of coping can be influenced to alter the threatful situation by proper utilization of available resources. Additionally, it is important to note, that the perception of threatful stimuli, generated by mental events and failure to cope may make individuals vulnerable to psychological or physiological problems or might cause mortality.

Coping is a fundamental component of stress and appraisal theory. Effective coping is considered a universal protective factor for dealing with distress (Graven & Grant, 2013; Tung, Hunter, Wei & Chang, 2009). In general, coping helps managing emotions by thinking constructively, regulating, directing and controlling autonomic activity, and by seeking situations that reduce stress (Lazarus & Folkman, 1984). Lazarus and Folkman have defined

it as “the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands and conflicts among them” (Lazarus & Folkman, 1984, p.141). This definition implies that coping is observed by the behavioral and cognitive reactions within individuals hence pointing towards both automatic physiological and learned psychological responses.

However, the reasons why some individuals cope successfully while others fail are not well understood. It is expected that the nature of a situation, its frequency of occurrence, and the general characteristics of an individual can influence the choice and effectivity of coping strategies. Krohne (2001) further pointed out that several relevant personal and situational factors such as motivation, personality, personal goals, control and imminence of a stressful event determine the specific pattern of an appraisal. Therefore, a situation that is perceived as controllable will more likely direct a person towards a challenging appraisal, while an uncontrollable situation may rather result in threat appraisal. Individuals also have preferred styles of thinking. Thus, it is an interaction of habitual thinking styles, coping preferences and the particular features of a situation that collectively contribute to adapt successfully or fail in a stressful situation.

1.2 Psychological Correlates of Stress and Coping

In response to a threatful situation, certain inbuilt or learned psychological mechanisms facilitate the coping process. Pearlin and Schooler (1978) have identified three protective functions of coping namely a) altering the threatful situation, b) reappraising a situation to reduce its negative impact, and c) managing emotional consequences of problems after facing the stressful situation. These three functions of coping have been elaborated extensively in the process model of emotion regulation (ER) which constituted five temporal sequences involved in emotion generation and management namely: situation selection, situation modification, attention deployment, cognitive change, and response

modulation (Gross, 1998). Among them, situation modification, cognitive change, and response modulation are similar to the three protective functions of coping as explained by Pearlin and Schooler (1978).

Coping, as evident from earlier empirical findings, has transitioned from psychological defense mechanism by Freud, stress and coping by Lazarus, attachment by Bowlby, and self-regulation by Mischel, until it reached ER as explained by Gross (Gross, 2014). A growing body of psychological research in reference to emotions and its regulation has explained coping as an outcome of ER responding (Gross, 1998). Coping however is different from ER in its predominant focus on decreasing negative affect including its emphasis on longer durations. However, it is still debatable whether coping and ER are more similar or more different (Gross, 2014). In general, the use of effective ER strategies allows coping with stress and performance under pressure (Gross, 1998) by identifying a stressful situation, selecting a particular strategy (appraisal, suppression) to modify the situation and finally implementation of the actual coping behavior.

1.2.1 Emotion regulation

ER, however, has been defined as regulating one's emotions considering its type (sad to pleasant), time of occurrence (at the attention selection stage such as distraction to late semantic meaning stage such as reappraisal), and the method of influencing the experience and expression of the emotion (Gross, 1998). In other words, ER is a process in which an emotional response may activate another emotional response that modifies the earlier one.

ER can be characterized as intrinsic (regulating one's own emotions) and extrinsic (regulating others' emotions), and can take place on a continuum of explicit (conscious and effortful ER as in case of anticipating a speech and regulating to overcome performance anxiety) to implicit (unconscious, effortless and automatic; for review see Gyurak, Gross, &

Etkin, 2011). Depending upon the goals, ER can increase or decrease the emotion dynamics (latency, magnitude, duration, etc.).

Gross and Thompson (2007) differentiated between antecedent-focused and response focused ER strategies. Antecedent focused ER strategies occur before the emotion has fully evolved (such as situation selection, modification, deployment, and cognitive reappraisal). In contrast, response focused ER strategies may be applied after the emotion has been generated (e.g. suppression) and respective strategies focus on modulating one's emotional response. The focus of this research, however, is one of the antecedents focused ER strategy known as cognitive reappraisal (CR).

1.2.2 Cognitive reappraisal

Various authors have contributed to explaining different types of coping mechanisms considering their respective roles. For instance, Lazarus and Folkman have explained that coping sometimes is directed at changing external situations such as person-environment context behind negative emotions and are known as problem-focused coping. On the other hand, it targets the internal personal state by changing the appraisal by targeting the cognitions to regulate associated emotions and reconceptualizing the problem in hand hence known as emotion-focused coping. It is quite similar to the well-researched strategy at the cognitive change phase in the process model of ER known as *CR.* It has been considered an adaptive ER strategy as opposed to *expressive suppression* from the response modulation family (John & Gross, 2004).

A large number of support in reference to reappraisal is evident both from correlational studies using self-report measures (Aldao & Nolen-Hoeksema, 2012; John & Gross, 2004) and laboratory experiments evaluating spontaneous use of ER strategies in a stress-inducing tasks (Aldao & Nolen-Hoeksema, 2012; Gruber, Harvey, & Gross, 2012). Reappraisal has been reported leading to decreased negative emotions (e.g., Ray, McRae, Ochsner, & Gross,

2010; Szasz, Szentagotai, & Hofmann, 2011), have almost no impact or decreased sympathetic activity as a consequence (Kim & Hamann, 2012; Shiota & Levenson, 2012), encouraged improved memory (Richards & Gross, 2000) and finally causing better social affiliation (Gross & John, 2003). Hofmann, Heering, Sawyer, & Asnaani, (2009) suggested in an experiment that both reappraising and accepting negative emotions such as anxiety are more effective than suppression. Reappraising tends to be more effective than accepting for moderating subjective feelings of anxiety.

However, the less effectivity of apparently adaptive reappraisal strategy is clearly visible during high-intensity emotional situations (Sheppes, Catran, & Meiran, 2009; Sheppes & Meiran, 2007). In the process of regulating one's emotions, apart from the emotional intensity of the situation, the cognitive complexity of generating an ER strategy along with the motivational goals influence the choice of a strategy. For instance, an important motivation followed by decision making in the choice of ER strategy is evaluating whether the situation will be faced once or multiple times. It has been investigated that reappraisal is the optimal strategy for stressful stimuli encountered multiple times because it allows intense emotional processing resulting in progressive long-term adaptation (e.g., Blechert, Sheppes, Di Tella, Williams & Gross, 2012; Wilson & Gilbert, 2008). Thus, it can be inferred that intense stressful situations primarily allow either suppressing or distracting from the situation.

The definition of coping also indicates that whenever a threat is perceived, a response will be developed and executed to manage the threat. That is pointing towards associated changes in physiological mechanisms within the body in an alarming situation. It also predicts an apparent connection of emotion with the human nervous system that adds further implications (Larsen, Berntson, Poehlmann, Ito & Cacioppo, 2008).

1.3 Physiological Correlates of Stress and Coping

Our central nervous system works in an integrated manner to provide coping resources. For instance, perceiving environmental threats may result in physiological arousal of variable intensity and magnitude (Levenson, 2003). For this purpose, the autonomic nervous system (ANS) plays a crucial role in the interplay of somatic and psychological mechanisms to maintain health (Thayer & Lane, 2000; Thayer & Lane, 2007). The ANS has two subdivisions namely an excitatory sympathetic nervous system (SNS) and an inhibitory parasympathetic nervous system (PNS). Both SNS and PNS act antagonistically in the development of autonomic arousal. Thus, during non-aversive, controllable situations or periods of relative safety, the PNS activity is increased, while aversive, uncontrollable and stressful situations enhance the sympathetic activity, leading to increased arousal as evident for example from increased heart rate (HR) and decreased heart rate variability (HRV). The SNS prepares the body for intense physical activity often referred to as the fight or flight response. The PNS relaxes the body and inhibits or slows down many high-energy functions (Berntson et al., 1997).

According to the neurovisceral integration model (Thayer & Lane, 2000), an individual's neural mechanism enables him/her to combine all the interoceptive, cognitive, affective and perception-based information for preparing appropriate (re-)actions in order to maintain homeostasis that is constantly challenged subsequent to any threat from the external or internal environment. HRV provides an index of the capacity of an individual for adaptation and regulation following a challenging task (Appelhans & Luecken, 2006; Thayer & Brosschot, 2005; Thayer & Lane, 2009). In other words, it represents autonomic flexibility as it depends largely on the interplay of sympathetic and parasympathetic influence on HR. Hence, it can be said that it reflects healthy vs non-healthy cardiac functioning (Thayer & Sternberg, 2006; Weber et al., 2010).

1.3.1 Heart rate variability and physiological arousal

HRV is computed from a set of interbeat intervals derived from consecutive R-peaks corresponding to the contraction of the heart's ventricles. This process is influenced by the ANS. Both sympathetic and parasympathetic branches of the ANS innervate the heart. Altogether, they exert regulatory influence by operating on the primary pacemaker of the heart known as the sinoatrial node. This node generates action potentials affecting cardiac tissue and then the myocardium that contracts to form a heartbeat. Sympathetic and parasympathetic nerves, acting antagonistically, result in an increase and decrease of HR respectively. Knepp, Krafka, and Druzina (2015) found that HR during a stress task was significantly higher compared to baseline and recovery phases, validating the physiological response to stress. A sympathetic influence on HR acts slowly in comparison to the rapid modulation of cardiac activity by the PNS, which creates the basis for HRV analysis within specific frequency spectra.

Within this approach, HRV is quantified by a frequency-based power spectral analysis. The power spectral analysis shows HR differences within distinct frequencies with HR oscillations occurring between 0.15 - 0.40 Hertz, the so-called high frequency (HF) HRV, which is an index of parasympathetic influences on heart rate. The so-called low frequency (LF) covers 0.04 – 0.15 Hertz and displays both SNS and PNS activities (Task Force, 1996). Therefore, a ratio of low to high frequency (LF/HF) has been calculated as a marker of sympathovagal balance (Eckberg, 1997). Research indicates that high HRV (and particularly HRV-HF) is an indicator for a mental and somatic setup or interaction that allows an individual to better attend to aspects of situations, enabling adaptive responding to situational or internal challenge (Malik et al., 1996; Thayer & Lane, 2000). For example, high HRV is correlated with good performance in studies of attention, memory and executive function (Hansen, Johnson, & Thayer, 2003; Thayer & Brosschot, 2005).

Friedman (2007) suggested that low HRV-HF is associated with psychopathologies such as panic disorders. Critchley and colleagues (2005) showed the predictive value of low HRV-HF for evoked cardiac responses. Empirical evidence illustrating that a healthy heart has high HRV compared to unhealthy or diseased heart that has almost no HRV (Thayer, Ähs, Fredrikson, Sollers & Wager, 2012; Thayer, Yamamoto & Brosschot, 2010) further supported these findings.

Thayer and colleagues (2012) showed that at rest, executive brain areas such as active cortical and sub-cortical executive structures are responsible for the inhibition and regulation of the ANS via vagally mediated HRV. Williams, Cash, Rankin, Bernardi, Koenig, and Thayer (2015) further showed that individuals with low vagally mediated HRV reported difficulties in emotional clarity, emotional impulse control, and engaging in goal-directed behaviors due to lack of concentration. All these results demonstrate the protective role of high HRV distinctly in the high-frequency spectrum representing PNS influence and dominance of tonic inhibitory cardiac control through its most important pathway, which is the vagus nerve that is involved in regulating almost all internal organs.

1.3.2 Transcutaneous vagus nerve stimulation

The vagus nerve is the 10^{th} cranial nerve, and it is distributed broadly in the body, extending from the head via neck and thorax to abdomen, with a larger proportion of this nerve performing only afferent function i.e., information from innervated organs is transmitted to the brain. A smaller portion, however, is concerned with efferent information (i.e., information from the brain is sent to the innervated organs). Thus, there is a bidirectional flow of information (Breit, Kupferberg, Rogler, & Hasler, 2018). Reduced vagus nerve activity has been observed in anxiety patients (Friedman, 2007) whereas high levels are associated with anxiolytic effects (Fang et al., 2016; Rong et al., 2016).

Earlier, stimulating the vagus nerve was possible only invasively and required the surgical implantation of a bipolar electrode around the cervical branch of the vagus nerve. This has, however, resulted in various complications such as wound infection, electrode malfunction (Spuck et al., 2010), cough, mouth dryness, and pain (Elliott et al., 2011) to name a few. Recently, a non-invasive method for direct manipulation of HRV by transcutaneous vagus nerve stimulation (t-VNS) has been developed. It involves the stimulation of the auricular branch of the vagus nerve (ABVN; which innervates 45% of the vagus) distributed to the external ear particularly over the regions of cymba concha (having 100% of ABVN fibers) and tragus (Peuker & Filler, 2002). Afferent signals from the ABVN reach the brain stem and eventually cortical and subcortical structures. Functional magnetic resonance imaging studies have shown that such progression of nerve signals excites the brainstem regions, particularly the nucleus of the solitary tracts and the locus coeruleus. In effect, this is similar to the (invasive) stimulation of the cervical branch of the vagus nerve (see Kraus, Hosl, Kiess, Schanze, Kornhuber, & Forster, 2007; Frangos, Ellrich, & Komisaruk, 2015).

According to the neurovisceral integration theory (Thayer & Lane, 2000), the high vagal tone has a stress-buffering effect and produces various beneficial effects along the presumed cortico-autonomic pathways (Benarroch, 1993). Notably, it has been shown that high vagal tone helps individuals to cope better with stress and cognitive disturbances. Electrical stimulation of the vagus nerve has been approved as a current gentle therapeutic option for the treatment of epilepsy (He et al, 2013; Stefan et al, 2012), depression (Fang, et al, 2016; Hein et al, 2013), heart failure (De Ferrari et al., 2011), alzheimer's disease (Merrill et al., 2006) and obesity (Val-Laillet, Biraben, Randuineau, & Malbert, 2010). Vagal nerve stimulation also reduces pain perception (Busch, Zeman, Heckel, Menne, Ellrich, & Eichhammer, 2013) and can induce positive mood changes (Kraus et al, 2007). Evidences

that are more recent support the role of the vagus nerve in promoting inhibitory control that is compromised in anxiety patients. For example, Clancy, Mary, Witte, Greenwood, Deuchars, & Deuchars (2014) showed that 15 minutes of t-VNS (200 μs pulses at 30 Hz, 0.1- 0.5 mA) helped to reduce sympathetic activity as indicated by a lowered LF/HF ratio during stimulation in comparison to baseline. Likewise, Napadow and colleagues (2012) showed a reduction in anxiety (as compared to baseline) during, immediately after and 15 minutes after applying respiratory-gated auricular vagal afferent nerve stimulation.

Until now, investigators have applied t-VNS in the treatment of various psychological disorders and physical conditions yet the results are mixed. For example, t-VNS considered albeit a promising tool for fear extinction has failed in the consolidation of extinction (Burger et al., 2016). They adjusted vagus nerve stimulation within the range of 0.1 to 0.5 mA. Similalrly, Genheimer, Andreatta, Asan, and Pauli (2017) observed no effects of t-VNS on extinction and consolidation of contextual anxiety in a virtual reality-based experiment. The stimulation current was adjusted individually for each participant and stimulation was applied for 20 minutes (with 30 sec on and 30 sec off). Perhaps shifting the paradigm from the classical surgical procedure to recently approved t-VNS and from animal models to human models might have caused mixed results. In addition, the mixed findings limit the description of optimal parameters for t-VNS. Nevertheless despite presence of mixed findings, several findings clearly support that t-VNS stimulation can be expected to help buffer the various effects of vagal withdrawal on cognitive and emotional processing (for example, De Ferrari et al., 2011; Fang et al., 2016; He et al., 2013; Stefan et al., 2012). These findings suggest that physiological changes taking place in response to a stressful event (high HR & low HRV) can be reversed by directly influencing the brain areas via electrical stimulation through t-VNS.

1.4 Bidirectional Relationship between Psychological and Physiological Correlates of Coping and Stress

It has been suggested that the ANS is strongly involved in the regulation of emotion (Thayer, Friedman, Borkovec, Johnsen, & Molina, 2000). Cardiac vagal tone, which can be indexed by measures derived from HRV, has been described as an indicator of ER ability in the sense that it represents physiological flexibility. This flexibility is associated with the high vagal tone, which leads to attenuation of HR at rest, and a related increase in HRV, particularly in the HF range (Berntson, et al., 1997). As, low HRV has been associated with unfavorable stress regulation (Streeter, Gerbarg, Saper, Ciraulo, & Brown, 2012), one may expect associations of lowering HRV with limited ER skills (Appelhans & Luecken, 2006). There is further evidence encouraging that low HRV is related to difficulties in the ER (Aldao & Nolen-Hoeksema., 2012; Lane, McRae, Reiman, Chen, Ahern, & Thayer, 2009). Most notable, Vögele, Sorg, Studtmann, and Weber (2010) found that good ER associated positively with HRV and Denson, Grisham, and Moulds (2011) showed that conscious emotion control in aggression provoking situations is associated with increased HRV. These findings support the suggested bidirectional relationship between ER and HRV.

Knepp and colleagues (2015) indicated that low trait worriers who greatly used emotion reappraisal had significantly higher RMSSD and HRV-HF. In this study, the use of emotion reappraisal came out to be a benefit by maintaining the parasympathetic balance throughout the experiment, representing autonomic flexibility that acts as a barrier against the daily stressors affecting the cardiovascular system. Williams and colleagues (2015) have used self-report measures showing a negative association between general anxiety and rumination with vagally mediated HRV (as assessed by the root mean square of successive difference; RMSSD) at baseline during an experimental procedure. Thus emphasizing that higher the self-reported anxiety and rumination greater would be the perceived difficulties in

ER (such as difficulties with emotional clarity and emotional impulse control). Moreover, Stewart, and colleagues (2017) have reported that moderate or severe levels of psychosocial stress over a period of four years would increase the risk of coronary heart diseases.

To summarize, inhibitory control of PNS is a key mechanism in ER (Lane et al., 2009; Thayer et al., 2012) and disturbed emotional responses is a consequence of the use of maladaptive ER leading to disease and mortality (Thayer and Lane, 2000; Thayer et al., 2012). Therefore, it can be assumed that ER helps to modify emotional experiences along with subsequent physiological responses and health outcomes (Thayer & Lane, 2000, 2007, Thayer & Sternberg, 2006; Weber et al., 2010), thus enabling the individual to cope with a stressor.

1.5 Other Factors affecting Coping

Other personal and situational factors could influence the choice of coping apart from the appraisal of the situation. The awareness or lack of information regarding both psychological and physiological processes occurring in response to stressful situations can contribute to selecting a particular coping strategy. For instance, emotional intelligence and interoception involve awareness at the emotional and physiological levels respectively. In contrast, alexithymia explains the difficulty in identifying and describing feelings that could also have an impact on the selection of coping. Along with all these individual factors our cognitions at the meta-level and the cultural experiences we have learned throughout the life span in terms of values, norms, and beliefs have their own contribution in choosing and implementing coping strategies. A brief account of all these factors is illustrated below.

1.5.1 Emotional intelligence

One factor underlying the individual ability to identify appropriate coping strategies and implement them efficiently is emotional intelligence (EI; Coetzee & Harry, 2013; Davis & Humphrey, 2012, see also Mayer & Salovey, 1997; Zeidner, Matthews, & Roberts, 2006).

Moradi, Pishva, Ehsan, Hadadi, and Pouladi (2011) have reported a positive relationship between EI and adaptive coping mechanisms (e.g., problem-solving, cognitive appraisal and social support). EI is considered a coherent quality to deal with challenges in all domains of life including education (Tok & Morali, 2009), health (Butt, 2014), interpersonal adjustment (Summerfeldt, Kloosterman, Antony, & Parker, 2006), interpersonal quality relations (Brackett, Mayer, & Warner, 2004; Extremera & Fernandez-Berrocal, 2005), marital quality (Batool & Khalid, 2012), and workplace (Siegling, Nielsen & Petrides, 2014).

Mayer and Salovey first introduced the term EI in 1990 but it gained popularity with the publication of Goleman's bestseller book *Emotional Intelligence* describing its role in various domains of life. Goleman's model of EI (1995) focuses on competence in terms of EI variables such as assertiveness, empathy, impulse control, flexibility and so on. These competencies are considered capabilities that can be learned, contributing to general intelligence, but they are not elements of current models of EI. Nowadays, EI has been predominantly conceptualized as ability (Mayer, Salovey, 1997) and trait (Petrides, Pita, and Kokkinaki, 2007), with the former aiming at perceiving, understanding, and managing emotions in self and others while the latter emphasizes trait like self-perceptions. Ability EI includes cognitive intelligence and is assessed with performance-based measures (for example, Mayer Salovey Caruso Emotional Intelligence Test *MSCEIT*; Mayer, Salovey & Caruso, 2002). Trait EI on the other hand has been explained under the umbrella of individual differences and is considered a constellation of self-perceptions that are located at the lower levels of personality hierarchies. It has been assessed using self-report measures (e.g., Trait emotional intelligence questionnaire-short form, TEIQue-SF; Petrides, 2009). Regardless of assessment with self-report measures or via observer report, trait EI has been characterized as the identification, understanding, and regulating emotions along with strategically using feedback for adaptation.

Warwick and Nettelbeck (2004) demonstrated low correlations between ability and trait EI constructs. The common criticism is on the use of self-report for assessment, because reporting bias may be a confounder. However, this criticism has diminished over the years perhaps due to the current increasing interest in the theory of trait EI (Petrides & Mavroveli, 2018).

Individuals high in trait EI typically utilize emotional information intelligently (Ciarrochi, Forgas, & Mayer, 2006) and are capable of preventing the development of maladaptive emotional states (Schneider, Lyons & Khazon, 2013). In a multinational company of Europe, leaders were found to score higher on trait EI as opposed to non-leaders (Siegling, Nielsen & Petrides, 2014). The study also revealed a positive association between trait EI and leadership quality. Similarly, Mavroveli, Pterides, Rieffe, and Bakker (2007) in a sample of Dutch adolescents found that trait EI was negatively associated with depression, somatic complaints, maladaptive coping styles and peer-related social competence. Mavroveli and colleagues (2007) also revealed that trait EI was protective against depression and psychosomatic complaints. In the same way, Sanchez-Alvarez, Extremera, and Fernandez-Berrocal (2015) have shown that emotionally intelligent individuals displayed less negative emotions.

Work has also been carried out in particular reference to health-related quality of life (HRQoL) and EI. For instance, higher trait EI accounted for higher HRQoL in the general population (Extremera & Fernandez-Berrocal, 2002) and positive health-related outcomes (Schutte, Malouff, Thorsteinsson, Bhullar, & Rooke, 2007). Likewise, Mikolajczak and colleagues (2015), in an extensive study of a large nationally representative sample, have established the relationship of emotional competence (a typical characteristic related to high trait EI) and health. Their results indicated that an individual's health is influenced both directly by emotional competence and indirectly by the presence of positive and negative

affect as well as social support and health behaviors. Moreover, emotional competence also moderated the impact of risk factors (age, diet, BMI, education, drug intake, etc.) for health. Trait EI may, therefore, help to counterbalance the effect of maladaptive beliefs on the mental and physical health of individuals encountering stress.

In a clinical sample comprised of Axis I disorders, Petrides, Gomez, and Perez-Gonzalez (2017) suggested an important role of possible pathways (mindfulness and irrational beliefs) and trait EI in precipitating psychopathology. The model suggested that trait EI either directly or indirectly (by increasing irrational thinking and decreasing awareness) resulted in psychopathology. These results are also in line with earlier research (e.g., Martins, Ramalho, & Morin, 2010). In a similar fashion, Andrei and Petrides (2013) demonstrated low trait EI to be a significant predictor of somatic complaints (explaining 3.8% of variance) when controlling for both positive and negative affect. It not only supports the incremental validity of trait EI over two affect dimensions (positive and negative) but also suggests its positive role in maintaining the mental and physical health as well as the selection of appropriate coping strategies to alleviate the negative effects of stress. Likewise, Smith, Petrides, Green, and Sevdalis (2012) also provided evidence validating the positive role of trait EI in maintaining mental health. They reported a negative correlation between trait EI and worry during the early stages of cancer diagnosis among urology outpatients.

Furthermore, relationships between trait EI and personality are considered important. The trait EI factor is oblique to the Giant three and Big Five personality factors (as explained in Petrides, Mikolajczak, Mavroveli, Sanchez-Ruiz, Furnham & Perez-Gonzalez, 2016). Trait EI represents the beliefs of an individual and involves the perception of one's own emotional mechanisms. Vernon, Villani, Schermer, and Petrides (2008) have suggested that similar genes play a role in trait EI that also contribute to individual differences in Big Five. This highlights a similar biological basis of trait EI and personality domains. Researchers

have also emphasized the role of individual differences (personality trait) in human performance under pressure (Allen, Greenlees, & Jones, 2013). These individual differences might affect performance directly or via other mechanisms such as using specific ER strategies. Various studies indicated that trait EI has a positive effect on ER (Kotsou, Nelis, Gregoire, & Mikolajczak, 2011; Laborde et al., 2011). Increased cortical activity was found positively associated with trait EI scores in resting states (Mikolajczak, Bodarwe, Laloyaux, Hansenne & Nelis, 2010) as opposed to reduced activity in brain regions during the stressful task (Killgore & Yurgelun-Todd, 2007). It emphasized the positive impact of high trait EI on brain regions involved in up and down-regulation of emotions subsequent to EI training (Hansenne, Nelis, Feyers, Salmon, & Majerus, 2014).

In addition, a series of experimental studies suggest that trait EI is relevant in anxious conditions involving physiological stress responding. For instance, Mikolajczak, Roy, Luminet, Fille, and de Timary (2007) demonstrated an association between high trait EI and reduced mood deterioration and cortisol production during stressful public speaking. Following these findings, Mikolajczak and Luminet (2008) using exploratory studies confirmed the moderating effect of trait EI in appraising a stressful situation as challenging rather as a threat. These results also suggest the possibility of higher perceived control among high trait EI individuals, who should have a greater perceived ability to cope with novel and unpredictable situations. Laborde, Brüll, Weber, and Anders (2011) attempted to expand these results by linking trait EI with HRV. The main motivation was to assess the role of trait EI in coping with stress using biological indices namely HRV. The analysis indicated that a higher LF/HF ratio was evident in the low trait EI group, indicating increased sympathetic dominance among low trait EI individuals. The study also replicated the earlier cortisol findings of Mikolajczak and colleagues (2007), suggesting an association of high

trait EI with decreased cortisol secretion and lower LF/HF ratio thus representing greater coping with stress.

Finally, the role of EI as a universal coping strategy has been confirmed across different cultures. For example, an inverse association between low EI assessed with a custom-developed questionnaire and increased use of negative coping strategies has been found in student samples from India (Kulkarni, Sudarshan & Begum, 2016) and Tehran (Noorbakhsh, Besharat, and Zarei, 2010). Utilizing emotional information to choose suitable coping strategies maximizes chances of protection against the immediate negative effects of stress (both physiological and emotional). According to such accounts, EI encourages the accurate perception and appraisal of one's emotional state and facilitates the appropriate expression of feelings as well as effective regulation through adaptive coping. In contrast, low EI may impair an individual's ability to select and implement appropriate strategies to cope with stress (Salovey, Bedell, Detweiler, & Mayer, 1999). In other words, maladaptive coping that perpetuates an aversive stimulus may be the result of difficulties in emotional processing (Salovey et al., 1999) commonly known as alexithymia, a construct that is closely related to EI. Ghiabi and Besharat (2011) in a sample of university students found a negative association between EI and alexithymia.

1.5.2 Alexithymia

Alexithymia was introduced by Nemiah and Sifneos (1970) and has been characterized by difficulty in identifying and describing feelings as well as externally oriented thinking (Bagby, Parker & Taylor, 1994). Alexithymia, as distinguished clearly by cognitive and affective deficits (Bermond et al., 2007), has been associated with depression (Honkalampi, Hintikka, Saarinen, Lehtonen, & Vinamäki, 2000), suicide (Hintikka, et al., 2004), psychosomatic complaints (Lane, 2008), and autism spectrum disorder (Bird & Cook, 2013).

Empirical evidence have proven that alexithymia individuals have limited ability in describing (Bydlowski et al., 2005) and understanding (Swart, Kortekaas & Aleman, 2009) other's emotions, (otherwise notable components of EI), suggesting that deficits in emotional processing are paramount to alexithymia (Cook, Brewer, Shah & Bird, 2013). In addition, alexithymia individuals do not represent a complete loss of knowing their feelings and using imagination but they have problems appropriately processing the obtained information. This also implies low EI in alexithymia individuals suggesting an inverse relationship between these two independent constructs. Parker, Taylor, and Bagby (2001) confirmed this negative association using the Toronto Alexithymia Scale and the Bar-On EI inventory. They found strong negative correlations among the alexithymia factors and the predominant factors of EI such as emotional awareness, empathy, adaptability and stress management, emphasizing the protective role of high EI. Successive investigations using trait EI in association with alexithymia also validated the negative correlation (Austin, Saklofske & Egan, 2004; Mikolajczak et al., 2007; Saklofske, Austin, Minski, 2003). This relationship was also supported by a study using the EI scale by Schutte (see Grieve & Mahar, 2010). Baughman, Schermer, Veselka, Harris, & Vernon (2013) have demonstrated correlations between alexithymia, trait EI and behavioral genetics among monozygotic and dizygotic twins suggesting the presence of biological underpinnings for this association.

Correspondingly, several studies on physiological measures indicated higher baseline levels of sympathetic arousal as indicated by higher skin conductance (Infrasca, 1997) in individuals with alexithymia. With the advancement in studying alexithymia, Swart, and colleagues (2009) have validated the reduced ability of an alexithymic to express and regulate emotion in a study. They reported that individuals with alexithymia have poor ER as indicated by their low reappraisal scores and high suppression scores on the ER questionnaire. Further Larsen, Brand, Bermond, and Hijman (2003) also identified the

involvement of corpus callosum, the frontal lobe and prefrontal cortex in ER and facial expression identification, suggesting common biological underlying factors in ER and alexithymia.

Recent research has also demonstrated a connection between interoception accuracy (IA) and alexithymia as assessed by a heartbeat perception task. IA has been inversely associated with alexithymia (Herbert, Herbert & Pollatos, 2011; Ricciardi et al., 2016). Bornemann and Singer (2016) have demonstrated a significant decrease in alexithymia and an increase in IA over a training period of 6 and 9 months linking increased emotional awareness with body awareness reflected in activation of the anterior insula (Bird et al., 2010). Additionally, Shah, Hall, Catmur, and Bird (2016) provided evidence that alexithymia was a significant predictor of impaired IA. Thus, Alexithymia may be characterized by a lack of perception of body signals due to reduced conscious access of emotional information, therefore, impairing coping processes.

1.5.3 Interoception

Interoception is defined as a sense of the physiological conditions of the body i.e., conscious awareness, emotional processes, and behavior related to afferent physiological information arising from the body (Vaitl, 1996; Cameron, 2001; Craig, 2002). It refers to sensing the internal state of the body via signals generated internally and are involved in the maintenance, propagation, and regulation of the internal bodily mechanisms (Cameron, 2001). There has been a gradual advancement in investigating the role of interoception particularly in reference to the interplay among mind, body and well-being to know how interoception influences emotion processing, regulation, decision making, and psychopathology (for example, Garfinkel, Minati, Gray, Seth, Dolan, & Critchley, 2014; Garfinkel, Seth, Barrett, Suzuki, & Critchley, 2015; Okon-Singer et al., 2014). It supports the already established mediating role of interoception between the perception of internal cues

and subsequent coping with everyday stressful life activities. In addition, it also highlights the neural correlates of interoception particularly the role of the mid-insula (Kelly et al., 2012). In line with it, a recent metaanalysis suggested the dominance of the right hemisphere insula in cardioceptive attention and accuracy (Schulz, 2016).

Most of the interoceptive processing is involuntary and below the conscious level. However, some interoceptive processes are experienced within consciousness such as bloating, breathlessness, nausea. The interoceptive information traveled from different organs through ganglia and autonomic nerves to the ascending spinal cord and cranial vagal nerves and finally reaching the cortical and sub-cortical regions in the brain thus supporting the regulation of physiology and behavior (Critchley & Harrison, 2013). Similar viscero-afferent feedback to emotional experience has been supported by several emotional theories (Cannon, 1931; James, 1884; Lange, 1885) and the modern theories of an embodiment of cognitions (Barsalou, 2008) proposing that emotions and cognitions are the results of physiological changes in the body. Thus, emotional awareness results from the neural representations of cognitions evoking feelings with the help of somatic markers thus influencing cognitions and behavior (Damasio, 1999).

Individuals differ in their perception of internal physiological changes. Some may perceive them with greater accuracy and are more confident about their interoceptive decisions however, others may face certain difficulty as evident in the discrepancy of their actual and subjective reporting. Garfinkel and Critchley (2013) have introduced three dimensions of interoception namely IA (objective assessment via heartbeat tracking task), awareness (confidence on interoceptive decisions i.e., meta-awareness) and sensibility (subjective perceptions regarding one's ability to differentiate and be aware of different internal bodily mechanisms). Individuals high in IA can better regulate their emotions. Fustos, Gramann, Herbert, and Pollatos (2013) investigated that IA is the positive predictor

of down-regulating emotions (arousal) particularly using CR (Gross & John, 2003). These findings imply that individuals high in IA perceive discrimination in their internal states thus can timely apply countermeasures for controlling arousal. It represents IA as protective against negative affect. Kever, Pollatos, Vermeulen, and Grynberg, (2015) extended these findings and demonstrated that IA facilitates the selection and implementation of both habitual use of CR and suppression. In a large sample of healthy participants, they found positive correlations between IA, CR, and suppression as assessed by heartbeat perception task and ER questionnaire respectively. Females were observed to be high in the use of suppression as compared to males. It also suggests that increased awareness of bodily states may enable the individual to select appropriate coping (regulatory) mechanism considering the context and demands of the situation.

Empirical evidence also has unfolded links between IA and psychopathology. Dunn, Dalgleish, Ogilvic, and Lawrence (2007) demonstrated an inverse relationship between IA and depression. On similar lines, Fairclough and Goodwin (2007) revealed that heartbeat detection accuracy of females declined in a stressful laboratory task which is contrary to the findings that increased emotional reactivity during stressful task increases IA (Barrett, Quigley, Bliss-Moreau & Aronson, 2004). Nevertheless, an extensive body of literature indicates a positive association between IA and anxiety (see, Domschke, Stevens, Pfleiderer & Gerlach, 2010; Herbert et al., 2011). However, there exists an inconsistency of results in reference to panic disorder suggesting no interoceptive difference between clinical and healthy participants (Pauli, Marquardt, Hartl, Nutzinger, Hölzl, & Strian, 1991; Craske, Lang, Tsao, Mystkowski & Rowe, 2001). This is at odds with pronounced over-estimation of interoceptive cues in anxious individuals in general (Pennebaker, 1982). In addition, the coexistence of depression has directed scientists to investigate the role of interoception on a dimensional model of disorders. Following this model, Dunn, Stefanovitch, Evans, Oliver,

Hawkins, and Dalgleish (2010) have examined the roles of arousal (anxiety-related) and anhedonia (depression-related) in relation to IA. They found an association between higher anxiety specific arousal and high IA. In addition, they observed an interaction effect of anhedonia, arousal and IA suggesting that in the presence of heightened anhedonia both the arousal and IA were reduced. These findings endorse previous results of Dunn and colleagues (2007) who established an inverted U shaped relation of IA and depression indicating that those suffering from clinical depression might be high on arousal, therefore, have better IA. Limmer, Kornhuber and Martin (2015) further validated these findings in an extensive investigation. They noted that depression has an attenuated effect on IA when comorbid with panic. Moreover, they also observed that IA might generally accompany interoceptive sensibility. All these results revealed the presence of heightened interoception among anxious individuals (with the exception of PD).

Stevens, Gerlach, Cludius, Silkens, Craske, and Hermann (2011) showed that individuals having high social anxiety were high on IA, which is in line with Clark, and Wells social anxiety model (1995), that highly socially anxious individuals perceive changes in their physiology as a sign of anxiety due to their negative self-evaluation. It also reflects the positive association between high IA and social evaluative fear (Wild, Clark, Ehlers, & McManus, 2008). Durlik, Brown, and Tsakiris (2013) further validated the link between IA and fear of social evaluation by demonstrating that IA increased in an anxiety-provoking (such as speech anticipation) task in a sample of healthy individuals. It also points out the state-dependent nature of IA.

Earlier findings from Stevens and colleagues (2011) stated that high IA was more stable and constituted trait-like characteristics as it marginally increased from baseline to anticipation and then returned to baseline during the anticipation. The trait-like characteristics of IA was supported by previous results suggesting that cognitive behavior

therapy did not change the cardiac awareness in Panic patients (Antony, et al., 1995; Ehlers, 1995). However, Ainley, Tajadura-Jimenez, Fotopoulou, and Tsakiris (2012) challenged this finding by noticing an increase in IA during mirror self-observation in people with low IA similar to what was observed by Durlik and colleagues (2013).

The mental tracking task (MTT) introduced by Schandry (1981) can be used to assess attentional differences in interoceptive accuracy. For example, Sütterlin, Schulz, Stump, Pauli, and Vögele (2013) showed that individuals with high IA were better ignoring task-irrelevant emotional cues during risky decisions. In contrast, Wölk, Sütterlin, Koch, Vögele, and Schulz (2014) have found detrimental effects of high IA in patients suffering from panic disorder highlighting why they frequently face problems with decision making in their everyday life. Domschke and colleagues (2010) also noticed increased alexithymia along with heightened IA in anxious individuals proposing that anxious individuals focused more on their heartbeats which results in elevated IA. However, this could not be generalized to the detection of other bodily signals (such as gastrointestinal, etc). Recently Zamariola, Vleminex, Corneille, and Luminet (2018) analyzed the relationship between IA and alexithymia using both objective and subjective assessment. They concluded that IA was not the predictor of alexithymia. The findings further revealed that self-reported alexithymia correlated significantly negatively with self-reported IA as opposed to objectively assessed IA indicating that high alexithymic may underestimate their interoceptive abilities however, no actual deficits exist.

Hence, interoception represents an important factor regarding the connection between physiology and psychology (Schandry, 1981; Critchley, Wiens, Rotshtein, Ohman, & Dolan, 2004). ER has been associated with attention and awareness of the emotional state, which is further assumed to be linked to the awareness of one's bodily states as indicated by IA, sensibility, and awareness. For successful implementation of ER, awareness of the emotional

and physiological changes taking place inside one's body may be helpful. Therefore, it can be assumed that increased IA may contribute to optimized ER abilities hence leading to better adaptability and effective coping.

1.5.4 Metacognitions

Metacognitions, as defined by Flavell (1979), are any knowledge or cognitive process that is involved in controlling, monitoring and modification of primary cognition. This emphasizes the major role of appraisal in the alteration and adjustment of thoughts at hand. Metacognitions help to evaluate the useful or threatening and uncontrollable aspects of mental events. They are comprised of cognitive confidence (involving beliefs about cognitive abilities such as attention) and cognitive self-consciousness (tendency to remain aware). Metacognitions are shaped by metacognitive knowledge and metacognitive regulation. Metacognitive knowledge/awareness is knowledge about cognition. It has been related to complex decision-making by increased monitoring of task learning, identifying errors in the performance and adjusting to learning activities, thus helping to improve self-efficacy (Ford, Smith, Weissbein, Gully & Salas, 1998). Similarly, metacognitions have been positively related to better physical education lessons and exercise (Theodosiou & Papaioannou, 2006). These notions highlight the importance of having awareness of the cognitions behind emotional and physiological reactions in improving self-efficacy as well as conscious regulation of these reactions (Delahaij, van Dam, Gaillard, & Soeters, 2011; Ford et al., 1998). On the other hand, metacognitive regulation involves the response patterns resulting from metacognitive knowledge/awareness and usually comprises of coping mechanisms. Delahaij and van Dam (2016) in a sample of individuals under military training observed greater metacognitive awareness to reflect more adaptive responses towards stress and improved coping.

Metacognitions can be both positive and negative. Primarily the latter is involved in

the maintenance of emotional disorders. According to the metacognitive model of generalized anxiety disorder (GAD), a person may believe that his worry is uncontrollable and dangerous which has been shown to contribute to the maintenance of worry, rumination and sustained negative affect (Wells, 2000). Yilmaz, Gencöz, and Wells (2011) in a prospective stress-vulnerability study found the predictive value of metacognitive beliefs about uncontrollability and danger for anxiety and depression. They also found that a lack of cognitive confidence (positive metacognitive belief) might lead to a diminished ability to cope with the negative situation. The study explained that after controlling for life stress events anxiety and depression were caused by metacognitive beliefs about uncontrollability and danger. Most recently, Ramos-Cejudo and Salguero (2017) in a longitudinal study also demonstrated a positive relationship between high metacognitive beliefs about uncontrollability and danger with high anxiety and perceived stress. These findings also highlighted a moderating effect of metacognitive beliefs on the longitudinal link between perceived stress and subsequent anxiety. Similarly, these dysfunctional metacognitive beliefs are involved in the etiology and maintenance of negative emotions (Spada, Nikcevic, Moneta & Wells, 2008) and GAD (Sun, Zhu, & So., 2017), thus indicating maladaptive coping via negative metacognitions in emotional disorders. Chang (2001) has explained the role of personal flexibility in applying coping strategies according to situations and demands. As already has been established that problem-focused coping are helpful in combating negative effects of stress when in a controllable situation (Gilbar, Ben-Zur & Lubin, 2010). However, it is not '*the worry*' alone that is responsible for negative outcomes but the involvement of negative metacognitions that significantly predict anxiety symptoms (Ryum, Kennair, Hjemdal, Hagen, Halvorsen, & Solem, 2017). This research emphasizes the importance of metacognition in the maintenance of clinical symptoms.

Developing appropriate coping styles is of utmost importance also for those

suffering from chronic illness. However, maladaptive metacognitions particularly those related to uncontrollability and danger of the situation might increase the severity of chronic conditions. For example, Maher-Edwards, Fernie, Murphy, Wells, and Spada (2011) in a clinical sample of chronically fatigued patients revealed positive correlations among symptom severity, negative beliefs about thoughts of uncontrollability, cognitive confidence and beliefs about the need to control thought. Furthermore, Ziadni, Sturgeon, & Darnall (2017) showed that negative metacognitive beliefs about uncontrollability and danger of thought have a direct influence on everyday psychological distress related to catastrophizing and negative affective states. Additionally, it has been shown that dysfunctional metacognitive beliefs about uncontrollability and danger aggravate emotional distress in chronic physical health conditions namely cancer (Cook et al., 2015). All these findings underscore the relevance of metacognitive beliefs about uncontrollability and danger in the development and maintenance of negative emotions through maladaptive coping strategies.

The link between metacognition, negative affect and resulting psychopathologies have also been established across different cultures (Sica, Steketee, Ghisi, Chiri, & Franceschini, 2007). Sica at al (2007) showed that negative beliefs about uncontrollability and danger were associated with worry in a sample of Italien undergraduate students. A treatment aimed at maladaptive metacognition could reduce negative affect (depression and anxiety) as evident from the positive relationship between maladaptive metacognitions and negative affect (Tajrishi, Mohammadkhani & Jodidi, 2011). More recently, Wells and colleagues (2018) have devised a protocol to see the effectiveness of home-based metacognitive therapy for cardiac rehabilitation patients experiencing anxiety and depression; thus emphasizing to control dysfunctional metacognitions for better health.

1.5.5 Cultural differences

Culture is a fundamental context influencing the phenomenon of coping and stress by shaping the individual and his social environment. Culture has been defined as a "highly complex and continually changing system of meaning (norms, beliefs, and values) that is learned, shared, transmitted and altered from one generation to another" (Triandis, 1995). Every individual's life is faced with major transitions (such as marriage, birth, migration, illness, death) that are faced either as a threat or challenge based on the extracted meaning that has been learned in a cultural context. This appraisal of the situation leads to the selection of appropriate coping strategies whose successful implementation influences the health system (Moos, 2002).

Primarily there are two main descriptions of cultures based on the values, attitudes and belief systems namely individualism and collectivism. For the former category, a person's self is the central unit of society promoting personal autonomy, independence, and nuclear family systems. In contrast, in collectivist societies, the focus is ingroup encouraging social conformity, interdependence, and joined extended families. Noticeable cultural differences in terms of individualism versus collectivism determine the stressors and pressures, for example, the nuclear family system, which is commonly part of individualistic societies, reinforces living with immediate family members (Keesing, 1975). In contrast, joined family systems (mostly in collectivistic societies) support living in family systems that consist of at least two and (usually) more parties (Levinson, Malone, & Brown, 1980). Joined family systems typically maintain a positive attitude for sharing the home but also for helping each other financially (Fuligni & Pederson, 2002) and serve as a significant support system for health care (e.g. in Pakistan; Itrat, Taqui, Qazi & Qidwai, 2007). Of note, this system may also instigate stress depending on available resources. In contrast, individuals

living in nuclear family systems particularly at an older age may develop stress due to loneliness (Kotlikoff & Morris, 1988).

Markus and Kitayama (1991) elaborated characteristics related to collectivistic versus individualistic societies. The former has an external locus of control focusing more on the environmental demands in comparison to the internal locus of control among individualistic societies. This is considered to influence the selection of coping strategies and associated health and well-being. In line with this notion, individuals from individualistic societies use more behavioral and approach-focused coping strategies to affect the external environment. Conversely, individuals belonging to collectivistic cultures use cognitive and avoidant focused strategies to influence their internal states for achieving coping goals. For instance, passive and avoidant coping were more prevalent in Korean-Americans (Bjorck, Cuthbertson, Thurman, & Lee, 2001) whereas children and adults of European Americans and Germans used action-oriented and problem-focused coping (Cole, Martin & Dennis, 2002). Similarly, the combined effect of culture along with EI subsequently influenced the selection of coping strategies. In a cross-cultural comparison between European- Americans and Japanese populations, Nozaki (2018) found that individuals with high trait EI were less likely to use maladaptive strategies (i.e. suppression of emotion) and that these results were more prominent in European Americans in comparison to Japanese group. In another cross-cultural study, Gökcen, Furnham, Mavroveli, & Petrides (2014) have shown that British participants had higher scores on trait EI, well-being, self-control, emotionality and sociability factors as compared to Chinese participants. They concluded that positive self-relevant information prevails more in individualistic societies as compared to collectivistic ones. On similar lines, cross-cultural comparison between Germany and India revealed that EI was a better predictor of life satisfaction in Germany (Koydemir, Simsek, Schütz, & Tipandjan, 2013).

Moreover, cultural differences are also manifest in religious orientations and explicitly influence the selection of coping strategies. Khan and Watson (2006) have found strong associations of the Islamic beliefs with mental health and well-being among Muslim countries. However, in secular societies such as Germany concrete engagements in religious activities (conventional practices), developing personal insight (existentialistic practice), meditation (spiritual mind-body practice), and caring for others (humanistic practices) are all fundamental components of the religious paradigm (Büssing et al., 2009). It represents their internal locus of control in contrast to an external locus of control by trusting the most powerful, loving and responsive GOD (Krause, 2002).

Oyserman, Coon, and Kemmelmeier (2002) have highlighted the three principal methods to measure culture-based differences. It includes country based cross-cultural comparison, direct assessment of cultural attributes using self-report measures and experimental methods. However, in the current study, there is no direct assessment of any cultural (individualistic and collectivistic) characteristics. Nevertheless, the difference between two countries (Germany and Pakistan) will be indirectly observed in coping with the stressful situation (chronic heart failure; CHF) using self-report questionnaires measuring factors affecting coping and their combined effect on HRQoL. In addition, the influence of an acute stressor on healthy participants from Germany was studied in an experimental protocol.

In addition, to all the above-mentioned factors influencing the selection of coping strategies, there are certain other personal determinants of coping such as personality traits. However, these are not focused separately in the current research but may be covered altogether under the umbrella of cultural influences to see how these individual characteristics were influenced by the learned cultural norms and how they affect the health system.

1.6 Combined Effect of Coping and Associated Factors on Health Related Quality of Life

Human beings have complex biological and psychological systems sensitive to both their internal and the external environment. Those who fail to face stress successfully have a weak immune system and coping mechanisms resulting in various physiological and psychological illnesses by affecting the neuroendocrine, cardiovascular, metabolic and immune systems; ultimately contributing to disease progression, morbidity, and mortality. This warrants scientific approaches focusing on improving the otherwise disrupted quality of life of these individuals.

According to the World Health Organization (1998), health has been referred to as "a state of complete physical, mental and social well-being not merely the absence of disease and infirmity". Health is one aspect of quality of life that incorporates economic and social aspects of an individual's life as well. HRQoL encompasses the overall functioning and well-being of an individual in the physical, emotional, and social domains. In addition, cultural values and norms may also affect one's perception of well-being (Haas, 1999). These points are highly important for physical and mental health practitioners for the treatment of bodily and associated psychological disorders respectively.

Prior research suggests that coping with depression and anxiety influences psychological and emotional well-being (Trivedi et al., 2009; Vollman, Lamontagne, & Hepworth, 2007), concepts that are related to HRQoL. Similarly, coping enables a person to manage himself appropriately thus influencing HRQoL. A recent meta-analysis by Graven and Grant (2013) explored coping and its effects on HRQoL of heart failure (HF) patients. Their findings suggested that problem-focused coping had a positive while emotion-focused coping exerted a negative impact on HRQoL. Likewise, problem-focused coping in the form of social assistance and active coping strategies resulted in decreasing HF symptoms hence

improving HRQoL.

Similarly, EI may govern coping choices and determine HRQoL. For example, Extremera and Fernandez-Berrocal (2002) examined the relationship of perceived EI with HRQoL endorsing the role of EI in coping and HRQoL. Likewise, higher EI was positively associated with a higher mental component summary of HRQoL among cancer patients (Rey, Extremera, & Trillo, 2013).

In a similar way, interoception also influences the HRQoL. Increased interoception could also increase negative affect during acute stress (Kinderman & Werner, 2014) causing physiological dysregulation of stress axes ultimately producing physical symptoms. In other words, improved cardiac accuracy may result in heightened stress affecting the well-being of the individual.

Moreover, Moos (2002) has established that within the context of cultural learning, appraisals are formed and implied subsequently to a stressful situation; thus, they affect the physical, social and emotional functioning of individuals. For instance, various aspects of religion have been related positively to mental health and well-being (Büssing, et al., 2009; Khan & Watson, 2006). Similalry social relationships (family, friends and significant others) have a central role in health and well-being across the life span (Antonucci, Ajrouch, & Birditt, 2013).

Thus, coping along with its associated factors, help improve the HRQoL of individuals suffering from physical or psychological problems.

1.7 Rationale of the Current Research

Research evidence supports that exposure to stressful events (either chronic or acute) may cause major medical illness (Cassem, 1995) accompanied by depression and anxiety (Hammen, 2005). Acute time-limited stress commonly known as acute stress can be examined in short duration laboratory experiments where stress is induced for example with

the well-researched public speaking task, a part of the commonly known Trier social stress task (TSST; public speaking task). Segerstrom and Miller (2004), in a meta-analysis, asserted that acute stressors are generally helpful in the upregulation of the immune system. A more recent meta-analysis further elaborated that among executive functions, acute stressors enhanced inhibitory responses such as engaging in goal-directed behaviors (Shields, Sazma, Yonelinas, 2016).

In contrast, chronic stress (e.g., CHF) is usually temporally not limited therefore, the person is uncertain about the time required to eliminate the stressor. As a result, the individual accepts that the stressor has fully invaded his life forcing him to adjust his preferences by influencing his cognitions and behaviors; thus accordingly changing the lifestyle usually in the negative direction. For instance, Segerstrom and Miller (2004) corroborated that chronic stressors that usually prevail over a longer duration result in significant detrimental changes badly affecting the psychological and physiological adaptation.

With regards of the different effects of acute vs chronic stressors, Folkman and Moskowitz (2000) present a different narrative, such that perhaps during acute exposure to a stressor, the urgency and immediacy to indulge in positive coping is not necessary, because the individual believes that it will not be there for a lifetime and generally does not need any long-term adjustment. In contrast, during exposure to a chronic stressor, individuals try different and novel coping mechanisms because the stressor is persisting over a long period and the individual needs moments of relaxation to respite from distress in order to remain alive.

To date, most studies focus on either acute or chronic stressors. However, in contrast to the already existing mainstream literature, the present research focuses on both chronic and acute stressors in studies 1 and 2 respectively. Study 1 was a cross-cultural cross-

sectional survey between Germany and Pakistan to see how individuals suffering from chronic illness (in the current case, CHF) cope with the distress caused by CHF and how the choice of coping influenced the HRQoL of these individuals. Whereas, study 2 was an experimental manipulation to explore the factors responsible for coping with an acute stressor. The main idea was to deduce how individuals with high vs low IA, in the presence of immediate direct biological and cognitive help resources could sustain the acute stressor.

The main emotion or distressing consequence in both cases was expected to be anxiety (GAD in CHF and social anxiety in case of TSST public speaking task). Anxiety disorders emerge from the combination of biological and psychological vulnerabilities along with the stress. Emotions experienced during anxious situations are reported to be excessive often increasing subjective distress (in the form of emotional reactivity & physical changes), attentional biases towards the threat, other negative thinking and finally interfere with adaptive functioning (Beck & Clark, 1997; Pineles & Mineka, 2005). Barlow (2002) proposed the triple vulnerability model of anxiety wherein biological and psychological vulnerabilities when combined with life stress may result in specific anxiety disorders. For example, social anxiety disorders develop from learning experiences that focus on heightened social evaluations and bodily sensations in particular situations (Suarez, Bennett, Goldstein, & Barlow, 2009). The underlying features of anxiety disorders such as attention and automatic responses towards threat occur in milliseconds and may provoke subsequent responses such as the selection of a particular ER strategy to reduce the negative threatful experience.

To summarize, the research was designed to have an in depth exploration of coping mechanisms in the light of personal and environmental factors. The purpose was to identify the cultural differences in terms of personal characteristics such as trait EI, metacognitions and coping with chronic stress (in the present case CHF). Moreover, the role of trait EI and

IA in an effort to handle acute stress during an experiment was also analyzed to understand the expected bidirectional connection between psychosocial stress and heart failure (e.g., Stewart et al., 2017). The study will help to enhance knowledge not only at the cultural level but also encourage trying new mechanisms (t-VNS) in combination with a well-researched method of CR. It might help to upgrade or validate the already existing literature on coping with stress and might deploy the obtained knowledge for future clinical trials particularly in reference to the use of trans-cultural methods of assessment and novel therapeutic interventions.

Study 1.1

2.1 Background and Hypotheses

CHF is a chronic condition involving a progressive weakening of the heart muscle, leading to the insufficient blood supply to the body (American heart association, 2017). It has recently been classified into three categories based on ventricular ejection fraction namely, 1. Heart failure with reduced ejection fraction (HFrEF), 2. Heart failure with preserved ejection fraction (HFpEF), and 3. Heart failure with mid-range ejection fraction (HFmrEF; Ponikowski et al., 2016). In addition, heart failure patients are classified into four classes representing their functionality according to New York Heart Association (NYHA). CHF is highly prevalent universally affecting circa 26 million individuals worldwide (Ambrosy et al., 2014) and is a major reason for hospitalization and morbidity (Ambrosy et al., 2014), particularly in the elderly (Christ et al., 2016). In Germany, the point prevalence (2008-2013) of CHF has been estimated to be 3.96 % (Störk et al., 2017). For Pakistan, no reliable prevalence rates based on any national registries have been reported (Rajadurai et al., 2017); however, estimates may be based on the overall prevalence of cardiovascular disease (CVD) in a lower middle-class urban community of Karachi, Pakistan. There, the prevalence rates of CVD following myocardial infarction and possible ischemia were 1.9 % and 2.5 % respectively (Aziz, Faruqui, Patel, & Jaffery, 2008). Likewise, Usman, Ahmad, and Hussain (2014) have reported prevalence rates for *ischemic heart disease* in patients aged 55-65 years (54.4 %) as compared to patients aged 85-95 years (2.8 %) in the Hayatabad Medical Complex and the Lady Reading Hospital of Peshawar Pakistan. This indicates a dramatic increase of *ischemic heart disease* in young Pakistani that is not found in Germany. In these clinics, the percentage of CHF patients comprised 14.75 % and 17.25 % in 2008 and 22.87 % and 22.35 % of all cardiac patients in 2010 respectively (Noor et al., 2012). This suggests relatively low but increasing prevalence rates of CHF patients in Pakistan.

However, a nationwide survey in Germany by the German Heart Failure Competency Network revealed that over the age of 65 years heart failure was more frequently diagnosed than diseases of the nervous system; over the age of 80 years, it was more common than ischemic heart diseases (Neumann, Biermann, Neumann, Wasem, Ertl, Dietz & Erbel, 2009). According to Neumann and colleagues (2009) the number of cases per 100,000 populations was highest in the state of Brandenburg (29%; particularly in females in comparison to the average number of cases in all [old: 296 cases vs new: 368 cases] federal states of Germany; male to female ratio = approximately 400 to 450).

CHF has proven to be a huge economic burden, primarily due to repeated hospitalization. The average cost of hospitalization was reported to be approximately 10,000 € per person in developed countries like the United States (O'Connell & Bristow, 1994) whereas in Germany, it costs 1.1 % of health cost (2.9 billion euros in the year 2006; Neumann, et al., 2009). The high economic burden has been accounted for increased hospital readmissions explicitly after 12 weeks of discharge in 24% of outpatients as reported in the EuroHeart Failure survey program (Bundkirchen & Schwinger, 2004). In 2006, 27% of biennial nationwide health care cost was related to heart failure outpatient treatment (Neumann, et al., 2009). Despite improvements in pharmacotherapy, and a potential decrease in the risk associated with high blood pressure due to the implementation of preventive measures against CHF, mortality is high in these patients particularly in patients classified as NYHA functional class IV (Massie, & Shah., 1997).

Patients with CHF also suffer from a high rate of physical and psychological comorbidities (Chapa, et al., 2014; Chong, et al., 2015). While anxiety and depression independently contribute to increased frequency of hospitalization and mortality of CHF patients (Dogar et al., 2008; Friedmann et al., 2006; Suzuki et al., 2014), psychopathology and cardiovascular disease are considered to be bi-directionally linked (Elderon & Whooley,

2013). Alves and colleagues (2006) have described a causal relationship between heart failure and depression. Similarly, anxiety disorders (particularly GAD) are reported to predict cardiovascular and coronary artery diseases (Barger & Sydeman, 2005; Celano, Daunis, Lokko, Campbell, & Huffman, 2016). However, little is known about their functional role in the development of CHF. Parallel to the detrimental effects on health, presence of depression and anxiety and anxious worry along with the burden of other physical and psychological symptoms in CHF patients lead to low HRQoL (Calvert, Freemantle, & Cleland, 2005; Zambroski, Moser, Bhat, & Ziegler, 2005). In the Interdisciplinary Network for Heart Failure study conducted at two medical centers of the University Hospital Würzburg, Faller, Störk, Schowalter, Steinbüchel, Wollner, Ertl, and Angermann (2007) have illustrated associations of major and minor depression with reduced HRQoL. Furthermore, they elaborated that HRQoL was a predictor of survival in univariate analysis. When they controlled for other prognostic factors (age, gender, level of ventricular ejection and fraction, NYHA functional class), only the mental component summary of HRQoL was predictive of survival in CHF patients. They further explained that the addition of depression scores in the regression model eliminated the predictive value of all HRQoL factors thus explaining the negative impact of depression on HRQoL (i.e., possible bidirectional relationship) in CHF individuals. Likewise, Fotos, and colleagues (2012) demonstrated the role of psychiatric illnesses along with other physical problems (such as hypertension, diabetes mellitus) in predicting poor HRQoL.

In addition, the choice of coping strategies may contribute to anxiety and depression, which in turn may contribute to detrimental clinical CHF outcomes. Vollman, Lamontagne, and Hepworth (2007) demonstrated that individuals with heart failure reported high depression, in particular, when using avoidance and less active coping mechanisms. Trivedi and colleagues (2009) showed similar results suggesting that elevated

depressive symptoms in CHF along with lower social support and selection of avoidant coping styles adversely influenced the disease management and prognosis. Detrimental disease outcomes (in case of CHF) are due to various social, physical and psychological factors for example, age, anxiety, depression, coping styles, high blood pressure, problems in lungs, kidneys, liver, gastrointestinal and inflammation (Metra et al., 2013) suggesting that CHF is systematic instead of cardiac disorder (Davison & Cotter, 2015). This research unravels information in the etiology of CHF and suggests different pathways for the treatment of CHF. It also shows that identifying psychological mechanisms that cause elevated distress in CHF individuals will not only increase our understanding of bidirectional associations but may guide prevention and intervention to overcome the detrimental effect of psychosocial distress on CHF.

The metacognitive model of GAD may be a valuable approach for addressing this issue. It states that stressful situations may elicit two types of worry to cope with anticipated dangers and threats. Type I worry is concerned with external events and non-cognitive internal events (e.g., physical symptoms). When this leads to a sense of coping, anxiety decreases. It follows that the duration of an anxiety response linked to Type I worry is associated with the length of time taken to meet the goals of coping. However, Type II worry in individuals with GAD appears to block this resolution due to negative secondary beliefs about worrying as uncontrollable and potentially harmful. This results in elevated anxiety. These Type II thoughts are considered metacognitions, defined by Flavell (1979) as any knowledge or cognitive process that is involved in controlling, monitoring and modifying primary cognitions. Further, the use of dysfunctional coping processes such as avoidance of situation, reassurance-seeking, or thought suppression indirectly aggravate GAD by reinforcing the metacognitive belief that worry is uncontrollable and dangerous (Wells, 2000).

Borkovec, Alcaine, & Behar (2004) have suggested worry to be a cognitive avoidance strategy in order to keep the physiological arousal associated with anxiety that might otherwise result from worry content, under control. Ottaviani and colleagues (2014) demonstrated that pathological worry was related to high anxiety (both on a subjective level as assessed by self-report as well as a physiological level as indicated by decreased HRV-HF and increased LF/HF ratio) in a sample of pathological worriers. In addition, they have illustrated that intolerance of uncertainty moderated the relationship between worry and LF/HF ratio of HRV suggesting that higher intolerance for uncertain situations would result in physiological arousal when faced with threatful situations, particularly in pathological worriers.

The metacognitive model of GAD states that metacognitions about uncontrollability and danger help to select a maladaptive coping mechanism, which maintains the anxiety (Wells, 2009; Sun, Zhu, & So., 2017). Dragan and Dragan (2014) found a mediating role of these maladaptive metacognitions in the relationship of temperament with anxiety. They have explained that maladaptive metacognitions significantly mediated the relationship of emotional reactivity with anxiety particularly in females. Similarly, comparison of Turkish and British sample further equally validated the role of maladaptive metacognitions leading to increased anxiety thus support the universality of the metacognitive model (Yilmaz et al., 2007). This underlines the role of maladaptive metacognitions in emotional disorders. Since EI provides a coping resource (as discussed earlier), it might be helpful for alleviating the effects of associated anxiety and ultimately distress caused by CHF thus influencing the HRQoL of CHF individuals positively.

Markus and Kitayama (1991) have argued that individuals' differences in terms of cultural orientations (i.e., independent and interdependent self) influence their cognitions, emotions, and motivation. Individualistic cultures prioritize personal goals and reinforce the

independent self (rather than interdependent characteristics prominent in collectivistic cultures). Following this, Brycz, Rozycka-Tran, and Szczepanik (2015) have demonstrated significant differences in metacognitive self (self perception that serves self regulatory functions for human behaviors) between individualistic societies (USA, England, Spain) practicing a 'sense of independence' in comparison to collectivistic nations (India, Vietnam, China, Japan) who prioritize interdependence.

Germany and Pakistan are two countries with marked distinctions in terms of individualistic and collectivistic cultures respectively. Migration from Pakistan to Germany has increased considerably since 2010 due to a relative decline in the demand for the Pakistani labor force in gulf countries. Germany benefits from the influx of skilled workers. Pakistani immigrants experience higher living standards, economic success and last but not least hope to find highquality medical care (e.g. Mazhar, 2018). Yet, disparate expectations and behaviors, shaped by culture, pose a threat to this win-win situation. Improved understanding of these cultural differences and their effect on how German vs. Pakistani patients deal with CHF, challenging their QoL, which will help to improve psychosocial aspects of the treatment of the CHF patients by culture-specific tailoring. In addition, Germany can be considered a prototypical example for individualistic westernized nations, which are secular, yet influenced by Christian values and beliefs. In contrast, Pakistan is dominated by collectivistic ideals reflected in a mostly joint family system and the conjoint and often public practice of Islam. Therefore, this comparison may serve as a template for the global challenge of transcultural treatment of CHF patients from Islamic collectivistic versus secular individualistic societies (e.g., Giacco, Matanov, & Priebe, 2014).

In the current study, the roles of metacognitions and coping strategies for the relationship between trait EI and mental and physical component summaries of HRQoL among individuals suffering from CHF were examined and compared between Germany and

Pakistan. We expected that low trait EI will be associated with lower self-rated mental and physical component summaries of HRQoL. Metacognitive beliefs about uncontrollability and danger along with negative coping strategies may mediate this relationship. However, high trait EI may counteract these effects on mental and physical component summaries of HRQoL of CHF individuals via alternative pathways. Additionally, we predicted that Pakistanis and Germans might differ regarding the selection and effectivity of specific coping strategies.

2.2 Methods

2.2.1 Study design

In this cross-sectional, cross-cultural survey, socio-demographic data and associations between trait EI, HRQoL (mental and physical component summaries), severity of depression and GAD, worry, anxiety sensitivity, and metacognitions were compared among CHF individuals (of any etiology and severity) between two cultures (Germany vs. Pakistan).

The participants ensured their participation after signing the consent form. However, they were allowed to withdraw their consent at any point without giving any reason. Each participant was referred to the experimenter by the consultant cardiologist on duty.

The study was approved by all responsible ethics commissions and was carried out in accordance with the American psychological association ethical principles (APA, 2016) and the declaration of Helsinki (WMA, 2001).

2.2.2 Settings and participants

Two-hundred CHF patients were recruited at two German study centers (University Hospital, Würzburg [*n* = 75]; Campus Brandenburg Clinic [*n* = 25]), and the CPE Institute of Cardiology in Multan, Pakistan (*n* = 100). Power analysis (G*Power 3.1; Faul, Erdfelder, Buchner, & Lang, 2009) indicates that the sample size allows identifying medium global effects (group differences) in multivariate analysis with power = .80 and alpha = .05. Recommended sample size for structural equation modeling is *N*=150 to *N*=400 (Wolf, Harrington, Clark, & Miller, 2013).

To assure equivalence of samples concerning their medical profiles as best as possible, we applied detailed briefing of each recruiting cardiologist regarding exact implementation of inclusion and exclusion criteria with particular attention to diagnosis and severity of CHF. All the participants were adults with current diagnosis of CHF, LVEF ≥

30%, no heart transplant, sufficient language and cognitive abilities. *Exclusion criteria* were current or prior psychotic disorder as well as alcohol and/or substance dependence. Individuals with current or prior psychotic disorder as well as alcohol and/or substance dependent were not included in the study.

2.2.3 Measures

The *Trait Emotional Intelligence Questionnaire-Short Form* (TEIQue-SF, Petrides, 2009) was used to measure trait EI. It consists of 30 items, summed up for a global score and four factor scores ranging from 1 (low trait EI) to 7 (high trait EI). In the present study Cronbach's Alpha for global score was α = .88 for both Pakistan and Germany. For individual scales, Cronbach's alphas were .65 and .74 (wellbeing), .64 and .71 (self-control), .64 and .60 (emotionality), .50 and .51 (sociability) for Pakistan and Germany respectively.

The *Stress Coping Questionnaire-English Version* (SVFe, Erdmann & Janke, 2008) was used for differentiated assessment of coping preferences on 20 subscales with six items each. These subscales comprise of summaries for positive, negative and neutral coping strategies. Internal consistency in the present samples was excellent (α = .95 Pakistan; α = .97 Germany). For scales summarizing positive, negative and neutral coping mechanisms, Cronbach's alphas were .95, .97, .87 for Pakistan and .96, .96 and .87 for Germany respectively. Higher scores reflect more frequent use of a particular strategy.

The *Metacognitions Questionnaire* (MCQ, Cartwright-Hatton & Wells, 1997) was used to assess metacognitive dimensions on five subscales. The MCQ-subscales show good reliability, concurrent and discriminant validity (Cartwright-Hatton, & Wells, 1997). In the present sample, internal consistency for the full scale was excellent (α = .91 Pakistan, α = .96 Germany). Internal consistency for subscales was .85 and .90 (positive worry beliefs), .91 and .92 (beliefs about uncontrollability and danger), .89 and .83 (beliefs about cognitive

competence), .80 and .83 (general negative beliefs) and .50 and .57 (cognitive self-consciousness) for Pakistan and Germany respectively.

The 7-Item *Generalized Anxiety Disorder Scale* (GAD-7, Spitzer, Kroenke, Williams & Lowe, 2006) is a valid and reliable scale with high sensitivity (89%) and high specificity (82%) for screening patients with possible GAD. Internal consistency in the present sample was very good (α = .81 in the Pakistani and α = .87 in the German sample). Scores range from 0 to 21 with higher scores indicating more likely presence of GAD.

The *Beck Depression Inventory-Second Edition* (BDI-II, Beck, Steer, & Brown, 1996) was used as a dimensional measure of depression severity that has excellent psychometric properties (Storch, Roberti, & Roth, 2004). The sum score, computed from 21 items ranges from 0 (no depression) to 63 (highly depressed). In the present sample, internal consistency was excellent (α = .90 Pakistan, α = .93 Germany).

The *Penn State Worry Questionnaire* (PSWQ, Meyer, Miller, Metzger, & Borkovec, 1990) is a 16-item self-report questionnaire for comprehensive assessment of worry phenomena. Of note, it has been shown to be valid in cross-cultural research (Zhong, Wang, Li & Liu, 2009) and shows very good reliability (Molina & Borkovec,1994), convergent and discriminative validity (Brown, Antony, and Barlow, 1992), and treatment sensitivity (Borkovec & Costello, 1993). Internal consistency in the present sample was excellent (α = .95 for Pakistan and α = .85 for Germany). Scores range from 0 (no worry) to 96 (highly worried).

The *Anxiety Sensitivity Index* (ASI, Alpers & Pauli, 2001) is an 18-item scale containing items specifying different concerns someone could have regarding their anxiety. The construct measured by the ASI is discussed as an endophenotype for being at risk for developing anxiety disorders, in particular panic disorder and agoraphobia. Cronbach's alpha

in the current sample was high (α = .87 for Pakistan and α = .90 for Germany). Scores range from 0 (no) to 64 (high).

The *36-item Short Form Health Survey Questionnaire* (SF-36, Wäre, Snow, Kosinski, Gandek, 1993) is composed of 36 items assessing eight physical and mental dimensions for comprehensive assessment of HRQoL. For each of the scales, scores are transformed linearly to a scale ranging from *0* (maximal impairment) to *100* (no impairment). They are conveniently summarized in a mental and physical component summary score. Cronbach's alpha in the current sample was excellent (α = .83 for Pakistan, α = .96 for Germany).

All questionnaires were administered in the national languages of Germany and Pakistan (i.e., German and Urdu) respectively. For this purpose, the measures were translated following international guidelines for transcultural adaptation of questionnaires when necessary (Beaton, Bombardier, Guillemin, & Ferraz, 2000).

2.2.4 Procedure

In all hospitals, CHF patients were referred by the responsible cardiologist during ambulatory medical appointments to the researcher who then approached them at regular outpatient visits and provided written and verbal information about the study. Once signed informed consent was obtained, the participants were asked to complete the self-report measures. Throughout the administration process, the researcher was present to answer participant's questions and concerns to the best possible extent. In Germany, patients were allowed to take along the measures and fill them out at home; in that case, a free pre-stamped addressed return-envelope was handed out to them for free.

Study participation was voluntary, participants received no compensation for their participation, and they were informed about their right to cancel participation at any time without having to give reasons.

2.2.5 Statistical analysis

All analyses were carried out using IBM SPSS Statistics 23 (SPSS Inc, 2015). For reporting sample characteristics and comparison of German vs. Pakistani CHF patients, means, standard deviations, and Student's t-tests were computed for metric variables, and percentages and Chi^2-tests were computed for categorical variables. To examine relationship between trait EI with psychological burden, pearson product-moment correlation analysis was carried out. In addition, Fischer z tests were performed to examine whether these correlations differed between cultures. To investigate the role of mediators in the relationship between trait EI and both mental and physical components of HRQoL among CHF patients and to compare these associations between the two cultures (Germany vs Pakistan), path analysis was carried out using Structural Equation Modeling and Analysis of Moment Structure (AMOS Graphics v.24, 2016). First, a measurement model was fitted using confirmatory factor analysis (CFA) and factorial invariance was established. Next, structural models (both unconstrained and constrained) were fitted across both groups. Constraints on parameters were sequentially relaxed, based on modification indices, until further removal of equality constraints did not significantly improve the model. Moderation for specific paths was assessed by constraining individual paths and comparing chi-square differences. To evaluate absolute model fit, $Chi^2(p > .05)$, Goodness of Fit Index (GFI) $\geq .95$, Comparative Fit Index (CFI) $\geq .95$, Normed Fit Index (NFI) $\geq .90$, and Root Mean Square Error of Approximation (RMSEA) $\leq .08$ were considered. The Akaike information criterion (AIC) is a fit index founded on information theory and aims for a balanced estimation avoiding both under- and overfitting; lower scores indicate higher parsimony (Hooper, Coughlan & Mullen, 2008). For model comparison, the maximum likelihood estimate was used (Byrne, 2004; Hair, Black, Babin & Anderson, 2010; Preacher, Rucker, Hayes, 2007). Indirect effects were tested using percentile based bootstrapped confidence intervals, to avoid

potential issues with inflated type 2 error (see MacKinnon, Lockwood & Williams, 2004). Moderated mediation analysis was carried out using MyModMed.Amos estimand (Gaskin, 2016).

2.2.6 Data integrity, and treatment of missing data

All data was normally distributed as evident from the values of skewness and kurtosis within an acceptable range (between -2 and +2; Field, 2013; George and Mallery, 2010). According to Littles's test (Little, 1988), missing values were missing completely at random ($Chi^2(248) = 274.38$, $p = 1.20$) and accounted for only 1.85 % of the data. Missing values were imputed with the 'series means methods' (Little & Rubin, 2002). Overall, the response rate in Germany was low (40%) as compared to Pakistan where it was nearly 90%.

2.3 Results

2.3.1 Sample characteristic

The sample comprised of 100 Pakistani (*n* = 36 female, 36 %) and 100 German (*n* = 26 female, 26 %) CHF outpatients. The mean age of the Pakistani and German sample was *M* = 53.79 years (*SD* = 13.75) and *M* = 65.98 years (*SD* = 12.20) respectively. Most of the Pakistani CHF patients were Muslim (*n* = 97, 97 %) Sunni (*n* = 78, 90 %), unemployed (*n* = 44, 47 %), married (*n* = 78, 78 %). In the German sample, the majority of CHF patients was Christian (*n* = 68, 82 %) Caucasian (*n* = 46, 88 %) not working (*n* = 71, 78 %), and married (*n* = 65, 67 %).

Medical data was available for German CHF patients only. The means and standard deviations of the important medical variables were as follows: height (*n* = 97, *M* = 173.21 cm, *SD* = 9.23), weight (*n* = 96, *M* = 90.29 kg, *SD* = 25.53), heart rate (*n* = 80, *M* = 71.95/min, *SD* = 17.83), systolic and diastolic blood pressure (*n* = 82, *M* = 128.01 mm Hg, *SD* = 19.40 and *M* = 76.67 mm Hg, *SD* = 11.19) respectively. LVEF (*M* = 41.43, *SD* = 16.10) was available only from *n* = 42 patients. Class III comprised the leading fraction of

NYHA levels (*n* = 19, 50 %). In terms of localization of heart insufficiency *left HI* (*n* = 51, 68 %) comprised the largest category. Stress dyspnea (*n* = 40, 46 %) was the most frequently reported cardiac symptom whereas hypertension (*n* = 71, 75 %) was the most frequent risk factor. The most common cardiologic diagnosis was cardiomyopathy (*n* = 43, 47 %) with dilated form (*n* = 15, 34 %). Measures taken to treat CHF patients included implantable cardioverter defibrillators (*n* = 40, 43.5 %) followed by right ventricular pacemakers (*n* = 39, 40.6 %). Renal insufficiency (*n* = 60, 61.9 %) was the most prevalent somatic comorbidity. Most patients received beta-blockers (*n* = 72, 82.8 %) along with diuretics (*n* = 51, 61.4 %).

For the Pakistani sample, however, an informed guess was made on the basis of available prior published information. In a representative sample (*N* = 2000) of Islamabad, Abbas, Riaz and Abbas (2009) determined the prevalence of Ischemic heart disease by evaluating different medical parameters. From the results of the study, a cautious guess based on mean age was made about systolic and diastolic blood pressure (S/DBP). For both rural and urban sample, the systolic and diastolic blood pressure was estimated to be high as compared to the current German sample (Urban: males SBP 167.4 and DBP 101.8 vs females SBP 154.7 and DBP 99.5; Rural: males SBP 155.3 and DBP 96.7 vs females SBP 143.7 and DBP 91.4). Similarly, Sheikh (2006) in a multidisciplinary study surveyed heart failure patients (*N* = 209). Mean age of the sample was 54 years (almost similar to the current Pakistani sample) and the most common symptom presentation was dyspnea. Most of the patients were classified into class III (*n* = 109, 52 %) according to NYHA classification. Dilated cardiomyopathy was the common type with a documented EF < 30 (*n* = 91, 43 %). Diuretics were the most common class of drugs used (*n* = 140, 67 %), followed by beta-blockers (*n* = 119, 57 %) and ACE-inhibitors (*n* = 65, 31 %). Similarly, Ahmad, Munir, Bhatti, Aftab, and Raza (2017) while examining the death rates and associated risk factors of heart failure (*N* = 299) in Faisalabad Pakistan, reported an ejection fraction (EF) of 40.2 in

those who survived. Further, in a cross sectional study (Ahmad, Ahmad, Shah, Hayat, & Adnan, 2014) conducted at the department of cardiology, Lady Reading Hospital Peshawar Pakistan, mean age of the sample was 56.64 (*N* = 139, *SD* = 10). The majority of the patients were classified as NYHA class II (*n* = 72 [51.8 %]) followed by NYHA class III (*n* = 37 [26.6 %]). Among other risk factors hypertension was the most prominent (*n* = 83 [59.7 %]).

2.3.2 Differences between Germany and Pakistan in psychological variables

Pakistani CHF patients showed higher psychopathological burden, less use of positive coping and lower HRQoL (both mental and physical component summaries, using SF-36; Wäre, Snow, Kosinski, Gandek, 1993) as compared to the German CHF patients. Of note, the groups did not significantly differ in terms of trait EI (TEIQue-SF, Petrides, 2009). See Table 1 for a comparison of further variables between cultures. Cultural differences of particular negative coping mechanisms are presented in Table 2.

Table 1

Means (M) and standard deviations (SD) of psychological variables for the two cultures (Pakistan vs. Germany) as well as results of group comparisons

	Pakistan (*n* = 100)	Germany (*n* = 100)			
	M (SD) *Range*	*M(SD)* *Range*	*t*	*p*	*d*
PSWQ	52.19 (18.43) 62	42.12 (11.23) 60	4.66	.001***	.68
ASI	27.64 (12.94) 58	22.00 (11.32) 59	3.27	.001***	.46
BDI-II	19.13 (10.89) 39	12.33 (9.92) 58	4.61	.001***	.65

GAD-7	12. 32 (5.66) 21	6.76 (4.62) 19	7.62	.001***	1.08
TEIQue-SF	4.69 (.92) 4	4.70 (.86) 5	-.11	.90	.01
Factor 1 MCQ	25.27 (6.22) 32	34.29 (9.63) 44	-7.87	.001***	1.14
Factor 2 MCQ	38.35 (11.78) 46	26.60 (9.19) 42	7.86	.001***	1.12
Factor 3 MCQ	16.49 (7.47) 30	16.18 (4.78) 25	.35	.73	.05
Factor 4 MCQ	24.60 (7.32) 32	21.38 (6.04) 37	3.39	.001***	.48
Factor 5 MCQ	18.82 (3.68) 16	15.10 (3.38) 16	7.44	.001***	1.05
SVFe (Positive Coping)	8.84 (3.94) 18	11.47 (3.76) 19	-4.81	.001***	.68
SVFe (Negative Coping)	9.26 (6.64) 22	7.61 (4.66) 21	2.02	.04*	.29
SF-36 (PCS)	30.85 (13.44) 64	49.20 (26.63) 90	-6.15	.001***	.92
SF-36 (MCS)	47.15 (14.93) 64	58.66 (21.38) 91	-4.41	.001***	.63

Note: ASI = Anxiety Sensitivity Index, BDI-II = Beck Depression Inventory-II, Factor 1 = Positive Worry Beliefs, Factor 2 = Beliefs about Uncontrollability and Danger, Factor 3 = Beliefs about Cognitive Competence, Factor 4 = General Negative Beliefs, Factor 5 = Cognitive Self-Conscious, GAD-7 = 7- item Generalized Anxiety Disorder Scale, MCQ = Metacognitive Questionnaire, MCS = Mental Component Summary, PCS = Positive Component Summary, PSWQ = Penn-State Worry Questionnaire, SF-36 = The 36-item

Short Form Health Survey Questionnaire, TEIQue-SF = Trait Emotional Intelligence Questionnaire-short form, SVFe = Stress Coping Questionnaire (English Version). * $p \leq .05$; *** $p \leq .001$.

Table 2

Means (M) and standard deviations (SD) of negative coping mechanisms (from SVFe) for the two cultures (Pakistan vs. Germany) as well as results of group comparisons

	Pakistan	Germany			
Negative Coping Scales	*M (SD)* *Range*	*M(SD)* *Range*	*t*	*p*	*d*
Escape	10.40 (8.63) 24	6.39 (4.62) 21	4.09	.001***	.61
Social Withdrawal	8.97 (8.96) 24	6.58 (4.90) 24	2.34	.02*	.34
Rumination	11.21 (7.71) 24	10.51 (6.62) 23	.69	.48	.09
Resignation	9.03 (7.16) 24	5.86 (4.67) 24	3.70	.001***	.54
Self-pity	10.02 (8.64) 24	8.68 (5.72) 24	1.29	.198	.19
Self-blame	6.26 (5.28) 20	7.68 (5.63) 24	-1.83	.06	.26

Note: SVFe = Stress Coping Questionnaire (English Version). * $p \leq .05$; *** $p \leq .001$

High trait EI was associated with lower psychological burden in both samples. For worry, anxiety sensitivity, GAD, the benefit associated with higher EI appeared similar in both cultures. However, German CHF patients with high EI were significantly less depressed

(BDI-II) as compared to Pakistani patients with similar high levels of EI (Table 3). Only in German CHF patients, depression was significantly negatively associated with trait EI. Further, components of trait EI, namely well-being and self-control, were significantly negatively correlated with depression in German CHF patients (Table 4, see also Figure 1 & 2).

Table 3

Correlations of psychological variables and Trait EI for Pakistani and German CHF patients, and results of Fisher's z-tests, comparing correlations between the two samples

		PSWQ	BDI-II	ASI	GAD-7
TEIQue-SF	Pakistani	-.50**	-.31**	-.37**	-.52**
	Germany	-.55**	-.61**	-.46**	-.51**
	p	.31	.01**	.22	.46

Note: ASI=Anxiety Sensitivity Index, BDI-II=Beck Depression Inventory-II, GAD-7= 7-item Generalized Anxiety Disorder Scale, PSWQ=Penn-State Worry Questionnaire, SF-36=Health-related Quality of Life Questionnaire short form 36, TEIQue-SF=Trait Emotional Intelligence Questionnaire-short form. $^{**}p \leq .01$

Table 4

Correlations of Depression and components of Trait EI for Pakistani and German CHF patients, and results of Fisher's z-tests, comparing correlations between the two samples

		BDI-II		
		Pakistan	Germany	*p*
TEIQue-SF	Well-being	-.27**	-.55**	.01**
	Self-control	-.35**	-.54**	.04*

Note: BDI-II=Beck Depression Inventory-II, TEIQue-SF=Trait Emotional Intelligence Questionnaire-short form. $^{*}p \leq .05$, $^{**}p \leq .01$

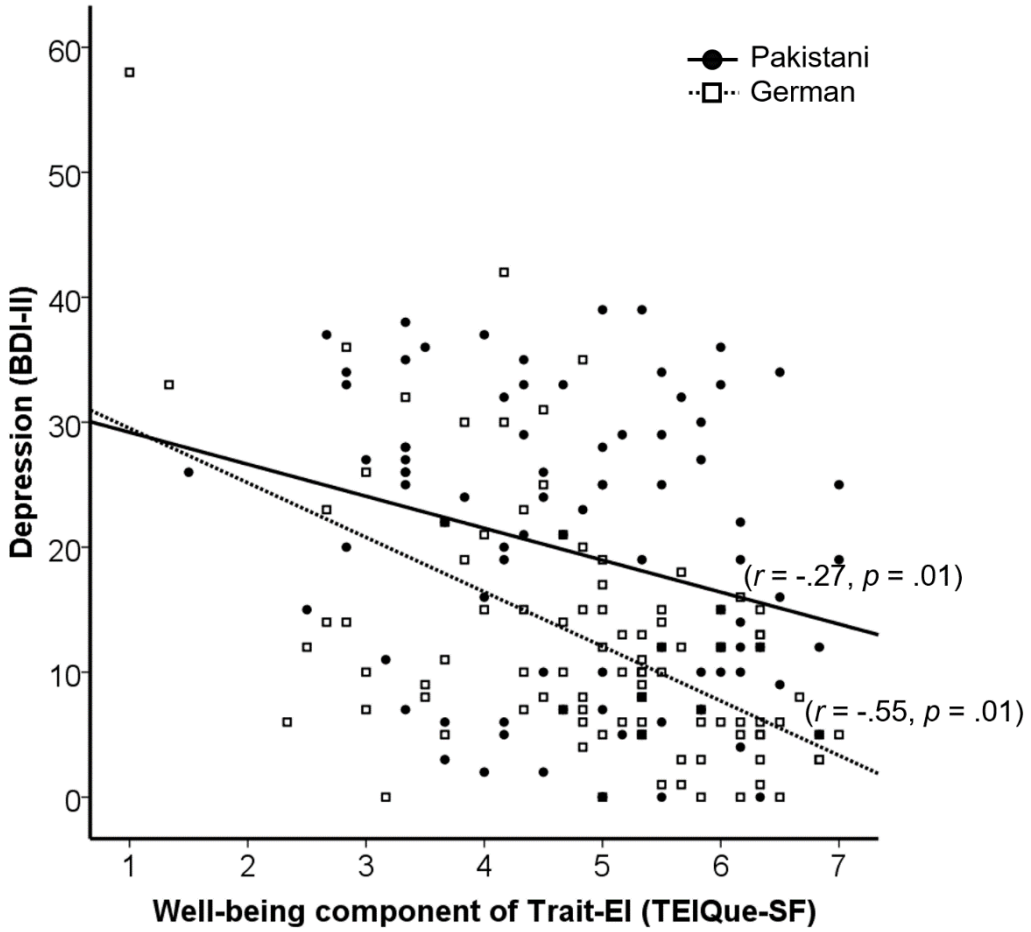

Figure 1: Significant inverse correlation between depression and well-being component of trait emotional intelligence in Pakistani and German chronic heart failure sample (Ghafoor, Ahmad, Nordbeck, Ritter, Pauli, & Schulz, 2019).

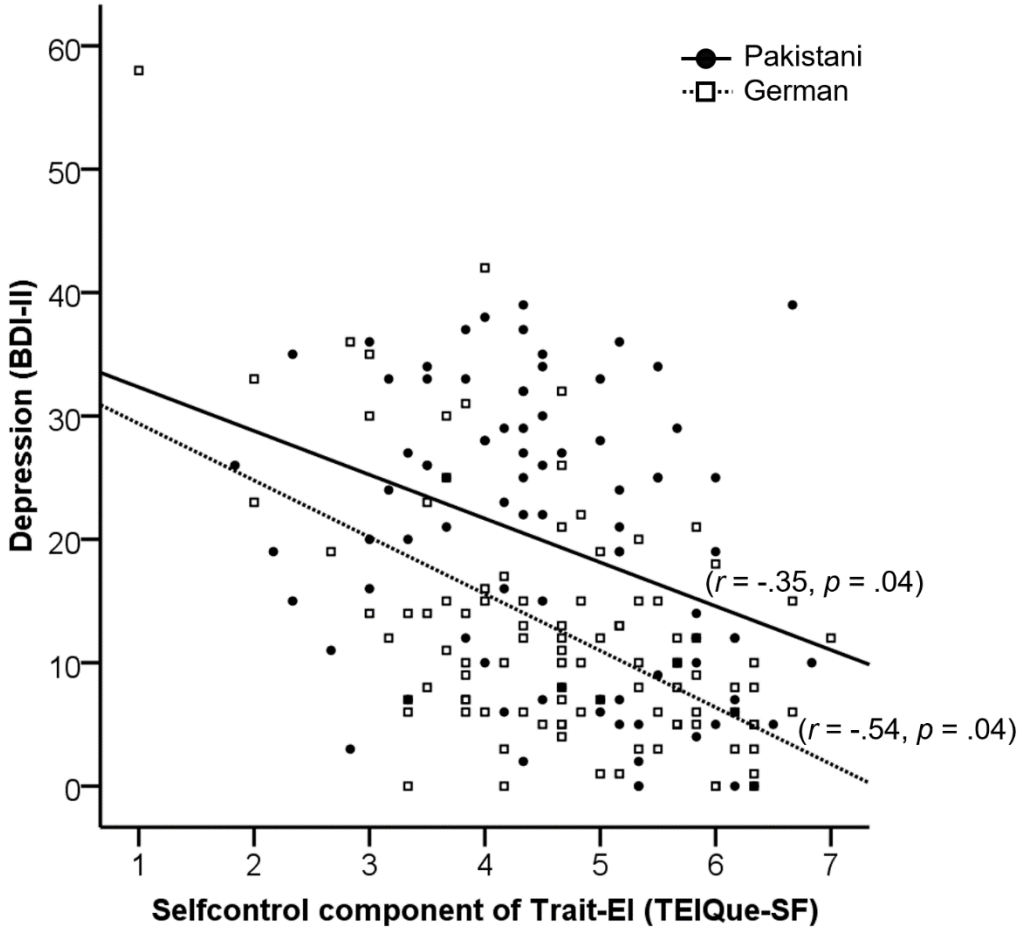

Figure 2: Significant inverse correlation between depression and self-control component of trait emotional intelligence in Pakistani and German chronic heart failure sample (Ghafoor, Ahmad, Nordbeck, Ritter, Pauli, & Schulz, 2019).

German CHF patients showed higher use of self-aggrandizement, denial of guilt, substitute gratification, search for self-affirmation, situation control, response control and positive self-instructions as positive coping strategies as compared to the Pakistani CHF patients who use relaxation (see Table 5). Moreover, in terms of neutral coping mechanisms, need for social support is highly preferred in Pakistani CHF patients as compared to the use of avoidance in German CHF patients (see Table 6). The groups did not significantly differ in terms of using minimization, distraction, aggression and drug intake as coping strategies.

Table 5

Means (M) and standard deviations (SD) of possitive coping mechanisms (from SVFe) for the two cultures (Pakistan vs. Germany) as well as results of group comparisons

	Pakistan	Germany			
Positive Coping Scales	*M (SD)* *Range*	*M(SD)* *Range*	*t*	*p*	*d*
Minimization	11.84 (5.65) 22	11.41 (4.86) 22	0.57	.56	.08
Self-aggrandizement	5.41 (6.45) 24	10.40 (4.44) 21	-6.37	.001***	.91
Denial of guilt	7.05 (5.55) 24	10.60 (4.83) 23	-4.82	.001***	.68
Distraction	10.60 (7.51) 24	10.27 (4.54) 22	.37	.70	.05
Substitute gratification	6.27 (4.28) 19	8.49 (4.52) 22	-3.56	.001***	.50
Search for self affirmation	3.38 (3.53)	10.16 (5.06)	-10.98	.001***	1.58

	19	21			
Relaxation	13.77 (5.71)	12.22 (4.90)	2.05	.04*	.29
	24	24			
Situation control	10.23 (6.96)	13.70 (5.42)	-3.93	.001***	.56
	24	24			
Response control	11.22 (4.82)	13.19 (5.27)	-2.75	.006**	.39
	22	24			
Positive self-instructions	7.56 (6.15)	14.55 (5.07)	-8.76	.001***	1.24
	24	24			

Note: SVFe = Stress Coping Questionnaire (English Version). * $p \leq .05$; *** $p \leq .001$

Table 6

Means (M) and standard deviations (SD) of neutral coping mechanisms (from SVFe) for the two cultures (Pakistan vs. Germany) as well as results of group comparisons

	Pakistan	Germany			
Neutral Coping Scales	*M (SD)*	*M(SD)*	*t*	*p*	*d*
	Range	*Range*			
Need for social support	14.50 (9.20)	11.42 (5.28)	2.90	.004**	.42
	25	23			
Avoidance	9.26 (6.36)	12.38 (5.44)	-3.73	.001***	.53
	24	24			
Aggression	7.49 (5.70)	6.10 (4.87)	1.85	.06	.26
	24	23			
Drug-intake	2.00 (3.95)	1.71 (2.25)	.64	.52	.09
	17	9			

Note: SVFe = Stress Coping Questionnaire (English Version). * $p \leq .05$; *** $p \leq .001$

High trait EI was associated with higher search for substitute gratification, self-affirmation, relaxation, situation control and response control in Pakistani CHF patients as compared to lower substitute gratification in German CHF patients (see Table 7). Whereas, higher trait EI was associated with lower need for social support and drug intake among German CHF individuals (see Table 8).

Table 7

Correlations of positive coping mechanisms and Trait EI for Pakistani and German CHF patients, and results of Fisher's z-tests, comparing correlations between the two samples

		1	2	3	4	5	6	7	8	9	10
TEIQue-SF	Pakistani	.31**	.43***	.07	.18	.22**	.20*	.43***	.36***	.28**	.26**
	Germany	.13	.34***	.09	.06	-.22*	-.03	.08	.09	-.12	.24*
	p	.09	.23	.44	.19	.001	.05	.004	.02	.002	.44

Note: TEIQue-SF = Trait emotional intelligence questionnaire-short form, 1= Minimization, 2 = Self-aggrandizement, 3 = Denial of guilt, 4 = Distraction, 5 = Substitute gratification, 6 = Search for self-affirmation, 7 = Relaxation, 8 = Situation control, 9 = Response control, 10 = Positive self-instructions. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

Table 8

Correlations of neutral coping mechanisms and Trait EI for Pakistani and German CHF patients, and results of Fisher's z-tests, comparing correlations between the two samples

		1	2	3	4
TEIQue-SF	Pakistani	.12	.07	-.40***	-.02
	Germany	-.22*	-.14	-.48***	-.24*
	p	.008	.07	.24	.05

Note: TEIQue-SF = Trait emotional intelligence questionnaire-short form, 1= Need for social support, 2 = Avoidance, 3 = Aggression, 4 = Drug intake. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$

2.3.3 Moderated mediation model on the relationship between trait emotional intelligence and health related quality of life

The SEM consisted of one exogenous variable (trait EI) and seven endogenous variables (metacognitive beliefs about fear of uncontrollability and danger, negative coping [escape, social withdrawal, rumination, self-blame], mental and physical component summaries of HRQoL) with error terms. See Figures 3 and 4 for a graphical representation of the model for Pakistani vs German CHF patients. CFA indicated good model fit: $Chi^2(1.50)$, $p = .28$, CFI = .92, and RMSEA = .05. Composite reliability (>.7) and average variance extracted (>.5) established convergent validity. Maximum-shared variance less than average shared variance established discriminant validity (Hair, et al., 2010).

Table 9

Reliabilities and validities for the factor structure of measurement model

	CR	AVE	MSV	MaxR(H)
Factor 2 MCQ	.91	.62	.49	.92
PCS	.93	.59	.56	.94
Trait EI	.93	.59	.16	.94
Social withdrawal	.86	.51	.18	.87
Escape	.92	.71	.46	.94
Self-blame	.92	.67	.47	.94
MCS	.82	.53	.45	.82
Rumination	.91	.73	.56	.93

Note: AVE=Average variance extracted; ASV=Average shared variance; CR=Composite reliability; MSV=Maximum shared variance

For analyzing factorial invariance, measurement model fit was satisfactory (Chi^2 = 1.3, p = .99, CFI = .93, and RMSEA = .04) indicating configural invariance. The chi-square difference comparing unconstrained to constrained regression weights showed no difference across groups (Chi^2 = 31.23, df = 20, p = .06), thus meeting the test for metric invariance. However, the scalar invariance test was met only partially (Chi^2 = 38.37, df = 29, p = .11) by un-constraining the HRQoL questionnaire.

The structural model fit indicated an absolute fit (unconstrained: [Chi^2(7.59), df = 4, p = .11, Relative Chi^2(1.89), GFI = .99, NFI = .99, TLI = .94, CFI = .99, and RMSEA = .06, SRMR = .01, AIC = 143.59] vs fully constrained: [Chi^2(182.02), df = 38, p < .001, Relative Chi^2(4.79), GFI = .85, NFI = .80, TLI = .77, CFI = .83, and RMSEA = .14, SRMR = .06, AIC = 250.02]). Sequentially releasing the constraints improved the model fit of the fully constraint model (Chi^2(43.62), df = 29, p = .04, Relative Chi^2(1.50), GFI = .95, NFI = .95, TLI = .96, CFI = .98, and RMSEA = .05, SRMR = .05, AIC = 129.61). Overall, the chi-square difference between unconstrained and constrained models showed group differences

(i.e. moderation: Germany and Pakistan; $Chi^2(36.02)$, $df = 25$, $p = .07$). Constraining individual paths one by one and comparison with the unconstrained model revealed cultural effects of metacognitions about uncontrollability and danger on escape ($Chi^2(4.58)$, $df = 1$, $p = .03$), trait EI on physical component summary ($Chi^2(6.75)$, $df = 1$, $p = .009$) and trait EI on mental component summary ($Chi^2(6.07)$, $df = 1$, $p = .01$) of HRQoL.

2.3.3.1 Significant relationships between observed variables.

In the Pakistani sample, higher trait EI was significantly associated with less use of metacognitive beliefs about uncontrollability and danger ($\beta = -.45$, $t = -4.98$, $p \leq .001$), escape ($\beta = -.25$, $t = -2.83$, $p = .005$), and social withdrawal ($\beta = -.23$, $t = -2.37$, $p = .02$). Additionally, the higher the metacognitive beliefs about uncontrollability and danger, the higher the selection of negative strategies ($p = .001$).

Among German CHF patients, trait EI was inversely related to metacognitions about uncontrollability and danger ($\beta = -.46$, $t = -5.18$, $p = .001$), escape ($\beta = -.34$, $t = -3.79$, $p = .001$), social withdrawal ($\beta = -.44$, $t = -5.26$, $p = .001$), and self-blame ($\beta = -.27$, $t = -3.08$, $p = .001$). Additionally, higher trait EI was correlated with higher physical component summary ($\beta = .25$, $t = 2.09$, $p = .03$) and mental component summary of HRQoL ($\beta = .31$, $t = 2.85$, $p = .004$). Higher metacognitive beliefs about uncontrollability and danger were significantly associated with higher negative coping strategies ($p = .001$). Among these negative strategies, rumination was negatively correlated to mental component summary ($\beta = -.35$, $t = -2.13$, $p = .03$) and physical component summary ($\beta = -.42$, $t = -2.47$, $p = .01$) of HRQoL in German CHF patients.

2.3.3.2 Indirect paths from trait emotional intelligence to health related quality of life via mediators.

In the Pakistani sample, metacognitions partially mediated the relationship of trait EI with escape ($b^*_r = -.21$, $p = .001$ [-.31 to -.13]) and social withdrawal ($b^*_r = -.16$, $p = .002$ [-

.26 to -.07]). They fully mediated the relationship of trait EI with rumination (b^*_r = -.33, p = .001 [-.45 to -.23]) and self-blame (b^*_r = -.27, p = .001 [-.38 to -.17]).

In the German sample, metacognitions fully mediated the relationship between trait EI and rumination (b^*_r = -.26, p = .001 [-.38 to -.14]). Paths from trait EI to escape (b^*_r = -.16, p = .001 [-.26 to -.07]), social withdrawal (b^*_r = -.16, p = .001 [-.25 to -.07]); and self-blame (b^*_r = -.16, p = .001 [-.34 to -.11]) were partially mediated by metacognitions. Lower trait EI was related to lower mental component summary (b^*_r = .24, p = .001 [.12 to .37]) and physical component summary of HRQoL (b^*_r = .14, p = .03 [.03 to .26]) when mediated by maladaptive metacognitions and negative coping strategies in the Pakistani sample, indicating full mediation. In contrast, in the German sample, no such mediation occurred (p > .05).

The moderated mediation analysis indicated significant differences between groups regarding escape when mediated by metacognitions (b^*_r = -1.11, p = .05 [-2.26 to -.17]); this effect was stronger in the Pakistani sample.

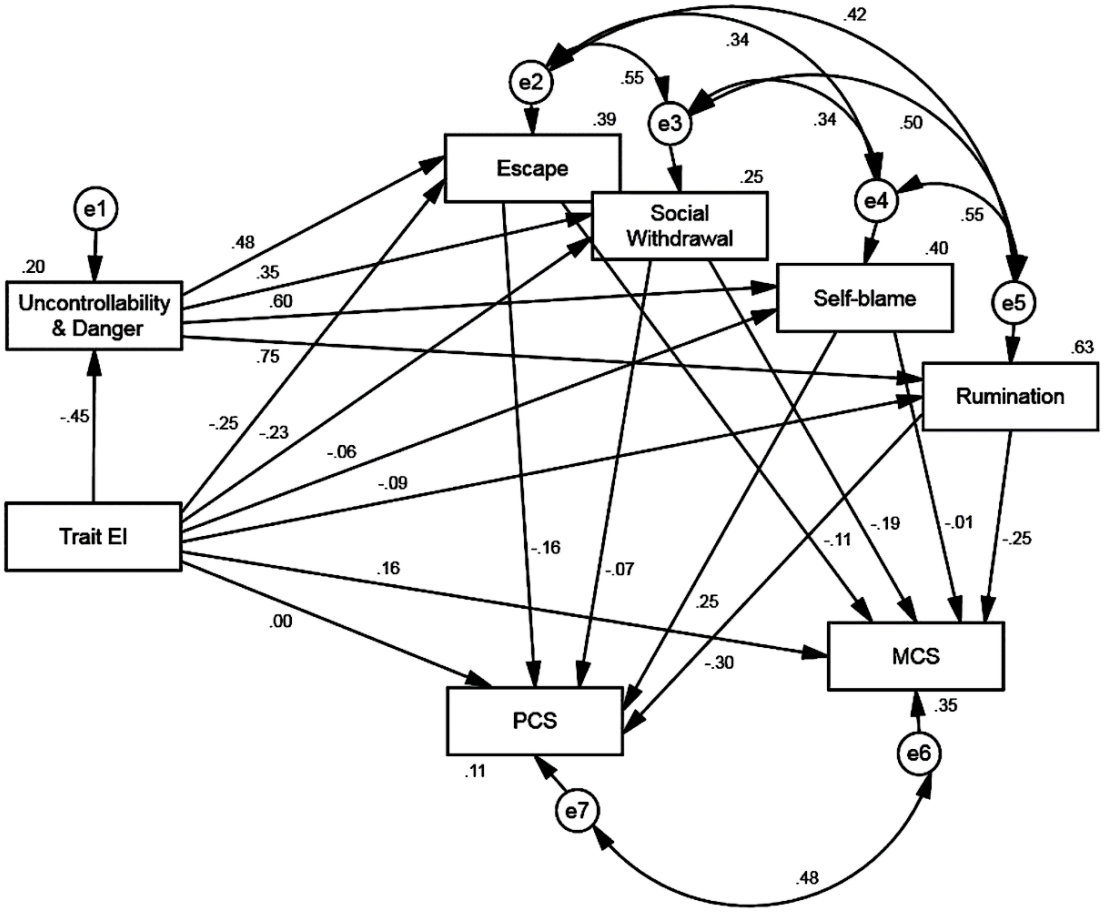

Figure 3: Relationship between trait emotional intelligence (Trait EI) and mental and physical component summaries (MCS, PCS) of health related quality of life through metacognition about uncontrollability and danger and negative coping in the Pakistani sample of chronic heart failure (N=100). e1 to e9 represent error terms (Ghafoor, Ahmad, Nordbeck, Ritter, Pauli, & Schulz, 2019).

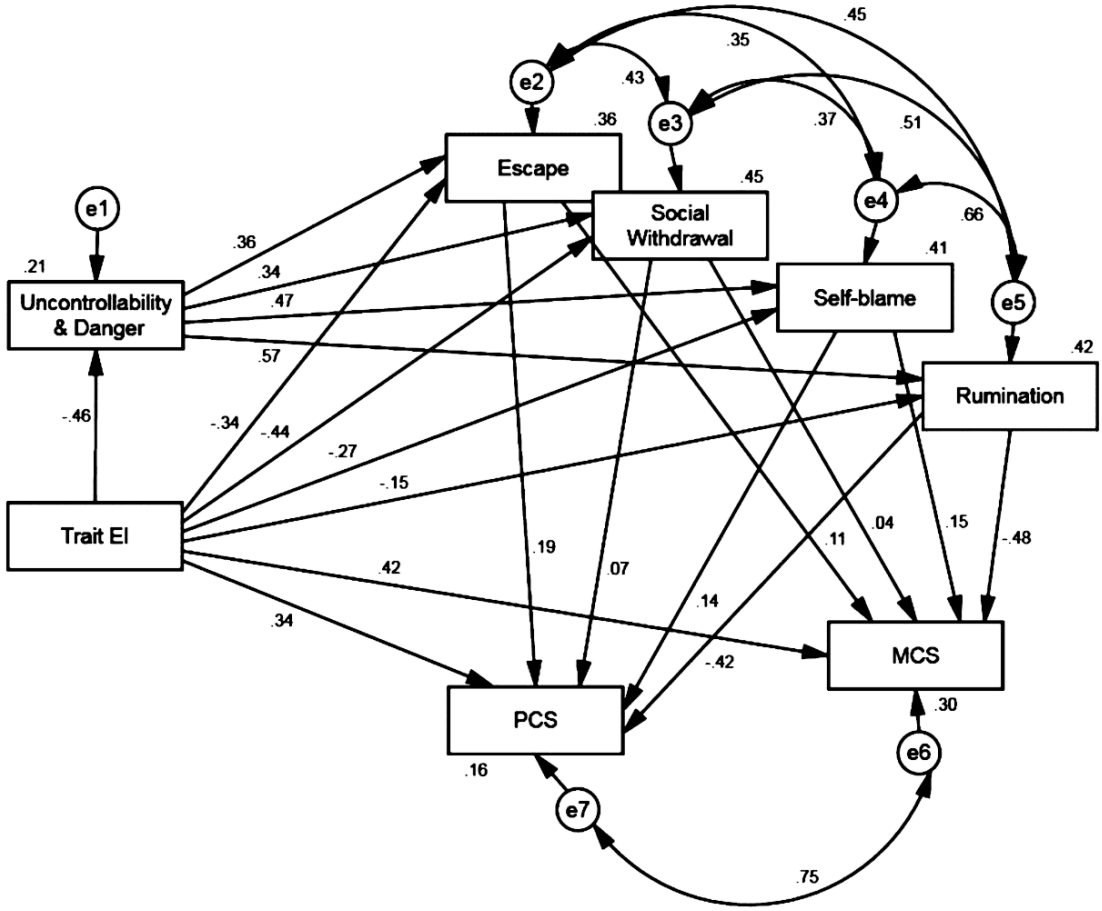

Figure 4: Relationship between trait emotional intelligence (Trait EI) and mental and physical component summaries (MCS & PCS) of health related quality of life through metacognition about uncontrollability and danger and negative coping in the German sample of chronic heart failure (N=100). e1 to e9 represent error terms (Ghafoor, Ahmad, Nordbeck, Ritter, Pauli, & Schulz, 2019).

2.4 Discussion

The present study was a cross-cultural survey designed to examine whether the relationship between trait EI and mental and physical component summaries of HRQoL was mediated by metacognitive beliefs about uncontrollability and danger and the application of culture-specific negative coping strategies in individuals suffering from CHF in Germany vs Pakistan.

Both samples comprised largely typical groups of CHF patients. As expected, our findings confirmed a culture-independent protective effect of high trait EI, leading to higher mental and physical component summaries of HRQoL. Interestingly, both countries had equal levels of trait EI highlighting that both samples may be indistinguishably competent utilizing emotional information and implementing this information to choose appropriate coping strategies. In line with previous research on trait EI and mental health (Martins, Ramalho, & Morin, 2010; Petrides et al., 2017), as well as subjective well-being (Sanchez-Alvarez, Extremera, & Fernandez-Berrocal, 2015), our study also confirmed that high trait EI was significantly associated with low levels of psychological burden in both countries with one exception: In German CHF patients, higher trait EI had a much stronger alleviating effect on depression compared to Pakistani CHF patients with similar levels of trait EI. This suggests that German CHF individuals might be more efficient in understanding and management of their emotional information. Another explanation could be that in the German sample, the effect of high trait EI was not mediated by other variables in the model. In contrast, in Pakistani CHF patients, the effect of trait EI was indirect (via maladaptive metacognitions and negative coping). Future research, for example looking at clinical variables prospectively, might reveal the processes exploring whether these effects are translated into reduced medical and somatic symptoms in German CHF patients with high EI. Gökcen and colleagues' (2014) found that individualistic societies tend to use positive

self-relevant information to cope with stressors. In line with these findings, higher levels of well-being and use of self-control in the German sample might also have contributed to lower depression. Moreover, the current sample also indicates that with higher levels of trait EI, German CHF patients preferred to use positive coping strategies, which could also be a possible reason for reduced depression. It is also consistent with earlier findings specifying the use of action-oriented coping in Germans in particular (Cole et al., 2002) and approach focused coping among individualistic societies in general (Markus & Kitayama, 1991).

Our findings also confirmed the central assumptions of the metacognitive model (Wells, 1999). Metacognitive beliefs about uncontrollability and danger were positively related to all negative coping strategies in both the Pakistani and German samples. It validated earlier findings revealing role of metacognitions about uncontrollability and danger into negative coping thus maintaining stress and anxiety (to name a few, Ramos-Cejudo & Salguero, 2017; Spada et al., 2008; Sun, Zhu & So, 2017; Yilmaz et al., 2011; Ziadni et al., 2017). Moreover, higher trait EI was found to be helpful in lowering the use of metacognitive beliefs about uncontrollability and danger as well as the culture-dependent negative coping strategies in both cultures. This confirms previous studies supporting that EI predicts adaptive coping (Smith et al., 2012; Zeidner, Matthews, & Roberts, 2006). Trait EI supported less use of self-blaming in German CHF patients in comparison to Pakistan in the current study. Hofmann and Doan (2018) have stated that autonomy and independence are hallmarks of individualistic societies as compared to relatedness in collectivistic cultures. In addition, Koydemir and colleagues (2013) in a cross-cultural study revealed EI as a better predictor of life satisfaction in Germany as compared to India. Hence, it could be inferred that high trait EI in combination with cultural characteristics of individualistic societies (i.e., high autonomy and independence) leads to reduced use of self-blaming.

On the one hand, this indicates that the treatment of psychosocial issues in CHF patients may benefit from using culture-specific ER strategies. On the other hand, cultures may learn from each other, and Pakistani CHF patients might benefit from strengthened autonomy and independence that might, in turn, contribute to more efficient use of EI via reduced self-blaming.

Metacognitive awareness helps in developing coping strategies as established recently by Delahaij and van-Dam (2016). Following this supposition, the present study also investigated the role of metacognition in the selection of corresponding coping mechanisms. The findings revealed major cultural differences with regards to the implementation and effect of specific maladaptive metacognitions. Pakistani CHF individuals used rumination, and self-blame when they considered their worries uncontrollable and dangerous. In contrast, in German CHF individuals, the association between trait EI and rumination was fully mediated by the maladaptive metacognition about uncontrollability and danger. However, the moderated mediation analysis confirmed that the two countries differed significantly in the use of escape. Although in both samples, mediation was partial, the effect was stronger in the Pakistani sample, with a greater tendency to escape when low trait EI was present. This could be interpreted in light of earlier studies emphasizing the role of metacognitive beliefs about uncontrollability and danger leading to interpreting worry-topics as more threatening and leading to the selection of negative coping strategies (Sun, Zhu, & So, 2017; Wells, 2000) among Pakistani CHF individuals. Furthermore, the presence of co-morbid anxiety and depression might aggravate dysfunctional metacognitions, in turn leading to the use of negative coping strategies (Hirsch, Mathews, Leqertier, Perman & Hayes, 2013).

In the German sample, however, lower use of rumination was associated with better mental and physical component summaries of HRQoL. This may highlight the fact that the German CHF individuals intentionally avoid traumatic thoughts to remain in a relaxed state

(Buetow, Goodyear-Smith and Coster, 2001). However, it should be noted that unconstraining HRQoL scales in the current SEM suggests that the concept of health could be perceived differently in both countries. Hence, outcomes related to HRQoL should be interpreted with caution.

In addition, the proposed model indicated full mediation in the Pakistani sample, revealing that the relationship between low trait EI and low mental and physical component summaries of HRQoL was explained by the presence of metacognitive beliefs about uncontrollability and danger as well as negative coping strategies. On the contrary, the model showed no such mediation in the German sample. Higher trait EI directly led to the better mental component summary (not the physical component summary) of HRQoL in German CHF patients. The effect of metacognitions about uncontrollability and danger as well as certain negative coping mechanisms did not weaken the positive relationship between trait EI and mental component summary of HRQoL in German CHF patients. This confirms that despite the presence of negative metacognitive beliefs as well as negative coping strategies, trait EI helps to neutralize these adverse effects by maintaining the HRQoL in the German sample. It is an important issue for future research to unravel the mechanisms behind this direct effect. One possibility could be increased metacognitive and meta-emotional awareness as explained by Brinol, Petty, and Rucker (2006).

The study is not without limitations. One limitation of study 1 is the low response rate in Germany (40%). This may have introduced selection bias. For the Pakistani sample, it was not feasible to obtain medical data as planned. This limits the appropriate sample description. However, an attempt was made to make an informed guess based on the setting of recruitment. The estimated values highlighted the standard picture of Pakistani CHF patients in terms of age, blood pressure, NYHA class, common symptom and risk factor of CHF but those were not based on a national registry hence lack generalizability to the current sample.

In addition, this prevented examining associations with objective measures of somatic health. Future studies are required to examine for example if the strategy of escape found in the German sample ultimately may have detrimental effects on CHF that would contrast with the positive effect on HRQoL found in the current study.

Furthermore, the relatively small sample size, which however was typical for clinical samples, has influenced the scalar factorial invariance, which decreases confidence in the interpretation of HRQoL. Increasing sample size and developing a transcultural HRQoL questionnaire may resolve this issue.

Future studies should also investigate the effects of positive and neutral coping mechanisms. We excluded this examination from our analysis, one, because of our theory-based focus on the metacognitive model that highlights negative strategies as reported above. Secondly, because our limited sample size did not allow testing more complex models. It may be noted, that we ran preliminary analyses also including the positive coping strategies as assessed with the SVF. As expected, these models did not achieve an appropriate fit. Yet, it may be noteworthy that the observed relationships did not change in a way that would compromise the current interpretations and positive coping played a negligible role.

Hence, the study revealed that low trait EI and poor mental and physical component summaries of HRQoL were mediated by maladaptive metacognitions and subsequent negative coping mechanisms. However, this relationship was fully mediated in Pakistani CHF patients only suggesting cultural differences in the effects of trait-EI on HRQoL, which was direct in the case of German CHF patients.

Study 1.2

3.1 Background and Hypotheses

Germany and Pakistan are two countries with distinguished cultural differences. German society reinforces an autonomous and independent self as compared to Pakistani culture where an individual grows with a relational and interdependent self. Among other important aspects of culture, the two countries predominantly differ in terms of both religion and social support system.

In Pakistan, religion has influenced every dimension of living from birth until death such as *Azaan* (i.e. call to prayer) or arranging religious sermons. In addition, *Piri-mureedi* is the most prevalent aspect that influences Pakistani Muslim society even before its creation. *Pir* is the title given to the hereditary descendants of the Islamic saint whereas *mureed* are their followers. Those who have a belief on *Piri-mureedi* follow them in every aspect of life even for the treatment of illnesses particularly in Multan, Pakistan. Multan, where this study recruited Pakistani patients, is famous as city of saints as there are more than 20 shrines of Sufis, which have been owned by the *Gaddinashine/Pirs*. A large population residing in Multan and further followers from across the country visit the city to celebrate annual ceremonies of these saints as well as to consult the native healers.

In Germany, religion differs considerably between regions. The Politbarometer survey (2016) reported 68.1 % of Catholics vs 22.3% Protestants and 8.2% non-religious in Saarland (Western Germany); 61.5% Protestants vs 3.2% Catholics and 31.2% non-religious in Schleswig-Holstein (Northern Germany); 74.7 % non-religious population vs 5.1% Catholics and 18.8% Protestants in Saxony-Anhalt (Eastern Germany). Würzburg, where we recruited most German patients, is famous for the presence of approximately 70 churches and hence named ‘the city of churches’. Yet, legally and practically, Germany became a highly secular state after World War II. Whether one is Catholic, Protestant or atheist is a

private matter in Germany, whereas in Pakistan religious belongingness is discussed and practiced in public.

Pargament, Koenig and Perez (2000) have explained the explicit role of religion in coping with stress and have identified two main types of religious coping, namely positive and negative ranging from active religious participation and spiritual connection with the supreme power to interpersonal religious discontent and the vision of a punishing God. In a meta-analysis, Ano and Vasconcelles (2005) have established that individuals who used positive religious coping accomplished more stress related growth and experienced less depression and anxiety. Similarly, both intrinsic (personal relationship with GOD) and extrinsic (performing religious rituals and relationships with others) aspects of religion have been found to be strongly associated with mental health and well-being (Khan & Watson, 2006). In addition, religiosity was significantly positively associated with higher self-esteem, highlighting the positive effect of religion (Ghafoor & Mohsin, 2013).

Büssing and colleagues (2009) searched for religious and spiritual coping in secular societies (such as Germany) and explained that concrete engagements in religious activities (conventional practices), developing personal insight (existentialistic practice), meditation (spiritual mind-body practice), and caring for others (humanistic practices) are fundamental components of religious paradigm. These components are reflections of ones' *locus of control*. For instance, external locus of control in religion is to develop a sense of more control over ones' lives by trusting the most powerful, loving and responsive GOD (Krause, 2002). In contrast, an internal locus of control is characterized by a conscious and healthy way of living and positive attitudes as evident from existentialistic and humanistic practices (Büssing et al., 2009). Hence, religion and its associated beliefs influence overall living quality of an individual by enabling individuals to perform their assigned duties. However, there are also studies, which claim that religion is not always a supportive coping strategy

(Chapman & Steger, 2010; Ghafoor, Schulz, Mohsin, 2018). This suggests that not all who suffer from difficult life events find peace in religion. On the one hand, these mixed results may in part be explained by differences in the operationalization of constructs. On the other hand, differences in the importance given to religion in one's life and the evaluation of oneself as a religious person may help to further understand these variations. In particular, the discrepancy of believing something and the failure to follow it through in practical implementation (e.g. because one's disease is a hindrance) might influence HRQoL of individuals considerably.

Pertaining to these differences with regards to locus of control, there could be differences of patient's reported reasons of heart failure underscoring individual's general awareness regarding their physical illness. More recently, Timmermans, Denollet, Pedersen, Meine, and Versteeg (2018) have explained patient reported causes of heart failure in a sample of large the European randomized REMOTE-CIED study. In this study, responses were differentiated into the following categories alongwith the most frequently reported cause per category: *physical illnesses* (46%; hypertension, diabetes = 30%), *natural causes* (32%; hereditary = 16%), *behavioral causes* (20%; smoking = 20%), *psychosocial causes* (35%; stress = 20%), *supernatural causes* (2%; bad luck = 1%) and other causes (25%; unknown = 9%). In addition, they found association of physical causes with poor health status and psychosocial causes with increased psychological burden.This highlights that there could be cultural differences in terms of patient's understanding of their illness.

Pakistan and Germany also differ considerably in the role of social relationships, which may provide coping resources in the form of social support. According to the social convoy model, social relationships (family, friends and significant others) have vital influence on health and well-being across the life span (Antonucci, Ajrouch, & Birditt,

2013). A convoy is defined as a group of individuals that provides support and shelter in crisis. The model is dynamic across age, life roles and different contexts (Sherman, Wan, & Antonucci, 2016). Living in a joint family system and with large families is considered a powerful support group and may play a significant role in health care (Itrat et al., 2007). However, nowadays this system has been transforming and shifting to the nuclear family system (Itrat et al., 2007). While living in a joint family is a common trend in Pakistan, Germans mostly maintain a nuclear family living style. The healthy living style adapted by the family helps to remain organized and stable in times of crisis (Martinez-Montilla, Amador-Marin, & Guerra-Martin, 2017) or for example when confronted with a chronic illness such as CHF. Fotos and colleagues (2012) have showed poor HRQoL in unmarried CHF patients emphasizing the importance of spousal role in providing social support to the patients.

However, cultural and environmental factors including religion and social support may only support well-being when an individual is capable of tapping into these resources appropriately. As shown above, religiosity is not a supportive resource for everyone (e.g. Ghafoor, Schulz, Moshin, 2018). One of the best studied and most influential personal factors contributing to overall mental and physical health – presumably via the competent recruitment of coping resources - is trait EI.

Trait-EI has been defined as constellation of self-perceptions that are located at the lower levels of personality hierarchies (Petrides, 2009). There is an extensive literature supporting the fact that trait-EI plays a significant role in ameliorating the negative effects of physical and psychological stressors in all domains of life (Martins, Ramalho, & Morin, 2010; Smith, et al., 2012). Notably, self-reported EI was positively associated with increased religious practice (Paek, 2006) and intrinsic religiosity (Butt, 2014). Religious beliefs have been shown to be a source of better social functioning by influencing the well-being, and

various processes of ER due to their involvement in self-control and increased emotional awareness (McCullough & Willoughby, 2009). Trait-EI has been shown to be also positively associated with social capital which is the use of resources and support by means of the relationship with significant others in a particular context (Bozionelos & Bozionelos, 2018). These findings indicate that positive effects of high trait-EI on well-being may be explained at least partially by religious affiliation and social support.

CHF has been called a global pandemic (Savarese & Lund, 2017). It is characterized by inadequate blood supply due to weakening of heart muscles (American heart association, 2017) and contributes to high mortality and a relative increase in disease burden all over the world (Ambrosy et al., 2014). The prevalence rate for CHF in Germany has been reported to be 3.96% (Störk et al., 2017) whereas in Pakistan the prevalence of cardiovascular diseases (CVD) following myocardial infarction and possible ischemia has been reported to be 1.9% and 2.5% respectively (Aziz, Faruqui, Patel & Jaffery, 2008). CHF may be accompanied by risk factors such as hypertension, diabetes, cardiomyopathy, depression and anxiety (Chapa, et al., 2014). These associated risk factors may disrupt the HRQoL of an individual in addition to the challenge imposed by CHF per se (Zambroski et al., 2005).

The research reviewed above suggests that a person may find solace in religion both in Western and non-Western societies. Moreover, trait-EI might help individuals to cope with the challenges associated with CHF. Specifically, trait-EI may help to recruit support by family or friends, who may serve as a source for increased life satisfaction and happiness (Nguyen, Chatters, Taylor, & Mouzon, 2016). Simialrly, Sullivan and colleagues (2009) conducted treatment sessions with CHF patients in which they focused on improving self-regulation, emotional management, self-esteem and relaxation. In addition, new coping skills targeting diet, exercise, social support stress management, as well as patient's own non-

denominational spirituality were used. All of them collectively resulted in reduced distress and anxiety and consequently improved HRQoL.

The present study aimed at examining these relationships, specifically, the relationship of religiosity, social support and HRQoL with trait-EI, in CHF patients in Germany and Pakistan. Furthermore, it was examined whether trait-EI, discrepancy between religious belief and practice, as well as social support predicted HRQoL. Moreover, considering the differences of both societies, we added qualitative exploration of the patients' insight into mechanisms underlying CHF as well as traditional/typical ways to cope with their illness in both societies.

3.2 Methods

The study was a cross-sectional survey conducted in Germany and Pakistan. *N* = 200 CHF patients aged 18 years and above with no current or prior diagnosis of psychosis and substance abuse were recruited from the cardiology centers in Pakistan and Germany. Participants were referred to the experimenter by the consultant cardiologist on duty. All participants provided signed-informed consent prior to study participation. The study protocol was approved by local ethics commission, complied with the regulations of the declaration of Helsinki, and adhered to guidelines for good clinical practice.

3.2.1 Measures

The *Trait Emotional Intelligence Questionnaire-Short Form* (TEIQue-SF, Petrides, 2009) was used to measure trait-EI. It is the shorter version of TEIQue, which has 150 items and 15 facets. The TEIQue-SF is comprised of 30 items, representing 2 items from each facet calculating a global trait-EI score as well as four factor scores of well-being, self-control, emotionality and sociability. Scores are ranged from 1 (low trait EI) to 7 (high trait EI). In the present study Cronbach's Alpha was $\alpha = .88$ for both the Pakistani and the German sample.

The *36-item Short Form Health Survey Questionnaire* (SF-36, Wäre, Snow, Kosinski, Gandek, 1993) is a 36 items questionnaire aiming at assessing eight physical and mental dimensions of HRQoL. Scores are ranged from *0* (maximal impairment) to *100* (no impairment) and summarized in a mental and physical component summaries score. Cronbach's alpha in the current sample was excellent ($\alpha = .83$ for Pakistan, $\alpha = .96$ for Germany).

Additionally, general information on religion and social support was gathered using four single item questions in the German and Urdu respectively, to be answered on 10-point Likert scales. Higher values indicate higher levels of general religiosity and social support.

From two questions on religion (‘importance of religion in one’s life’, and ‘personal evaluation of religious affiliation/practices’) a discrepancy score (DS) was calculated by subtracting the self-rating of how important religion is for one’s life minus the self-rating of oneself as a religious practitioner. Higher scores indicate that a person falls short of their ideal when it comes to actual religious practice. Similarly, from two questions on the role of family and friends for coping, an index of quality of social support (QSS) was obtained by adding them. Higher scores indicate better social support.

Finally, qualitative information was obtained via four open questions concerning illness knowledge, culture specific methods of treating illness, frequent worries and culture specific preferred methods of dealing with worries.

All questionnaires were administered in the national languages of Germany and Pakistan (i.e., German and Urdu) respectively. For this purpose, the measures were translated following international guidelines for transcultural adaptation of questionnaires when necessary (Beaton et al., 2000).

3.2.2 Statistical analysis

The analyses were conducted with SPSS (version 23, 2015). Means, standard deviations, and independent sample t-tests were used for continuous variables (e.g., age). Frequencies, percentages, and Chi^2 tests were carried out for categorical variables. Correlation analysis was carried out to examine the relationship of all variables with trait-EI. Later, stepwise regression analysis was conducted to check the predictive value of trait-EI, DS, QSS, regarding mental and physical component summaries of HRQoL.

For the qualitative responses to the four open questions, two reviewers recoded the content into major uniform semantic categories. Then, Chi^2 tests were used to identify differences between Germany and Pakistan. Next, to identify differences between individual categories in the two countries, post hoc analysis was carried out. For this purpose, adjusted

residuals for each category were transformed into *p*-values and the *p*-value was adjusted by dividing 0.05 by the number of rows x columns for each theme (Grande, 2016).

3.2.3 Data integrity, and treatment of missing data

All data was normally distributed as evident from the values of skewness and kurtosis within an acceptable range (between -2 and +2; Field, 2013; George and Mallery, 2010). According to Littles's test (Little, 1988), missing values were missing completely at random ($Chi^2(248) = 274.38$, $p = 1.20$) and accounted for only 1.85 % of the data. Missing values were imputed with the 'series means methods' (Little & Rubin, 2002). Overall, the response rate in Germany was low (40%) as compared to Pakistan where it was nearly 90%.

3.3 Results

3.3.1 Sample characteristic

The sample comprised of 100 Pakistani (n = 36 female [36 %]; Age: M = 53.79 years SD = 13.75) and 100 German (n = 26 female [26 %]; Age: M = 65.98 years SD = 12.20) CHF outpatients. The two samples differ significantly in terms of family system: $Chi^2(12.85)$, $df = 1$, $\phi = -.27$, $p < .001$. Most of the patients in Pakistan reported living in joint family system (Pakistan: n = 49, 49 % vs Germany: n = 19, 19 %) as opposed to the nuclear family system, which is prevalent in Germany (Germany: n = 62, 62 % vs Pakistan: n = 50, 50 %; missing data: Germany n = 19, 19 % vs. Pakistan: n = 1, 1 %). Both samples differ significantly $Chi^2(134.10)$, $df = 39$, $\phi = .81$, $p < .001$) regarding authoritative family members in terms of earning and providing support to the family, which, in the Pakistani sample was mostly the patients themselves (n = 46, 46 % self, and n = 37, 37 % children [mostly son: n = 30, 81.08 %]) compared to both spousal partners in the German sample (n = 36, 36 % self and n = 42, 42% both spousal partner). Similarly, significant differences were observed regarding the authoritative figure who made important family decisions ($Chi^2(90.99)$, df = 39, $\phi = .67$, $p < .001$). It was found that in the Pakistani sample, most of

the important family decisions were made by the patients themselves and their children (*n* = 54, 54 % self, and *n* = 12, 12 % children [mostly son: *n* = 11, 91.66 %], while in the German sample patients alone or along with their spousal partners made important decisions (*n* = 54, 54 % self and *n* = 20, 20 % both spousal partner).

3.3.2 Cultural differences regarding the importance of religion, social support and psychological variables

Table 10 indicates that the Pakistani CHF patients rated themselves as more religious and religiosity as significantly more important as reflected in the IOR score. In addition, the DS was significantly higher in the Pakistani than in the German sample indicating discrepancy between religious beliefs and practices. Moreover, the German sample considered friends as support group, gave quality of social support (QSS) significantly higher ratings, and were characterized by better physical and mental component summaries of HRQoL as assessed by the SF-36 (Wäre, Snow, Kosinski, Gandek, 1993).

Table 10

Means (M) and standard deviations (SD) of psychological variables for the two cultures (Pakistan vs. Germany) as well as results of group comparisons

	Pakistan (*n* = 100)	Germany (*n* = 100)			
	M (SD, R)	*M(SD, R)*	*t*	*p*	*d*
IOR	2.61 (2.12, 9)	-2.55 (3.60, 10)	12.33	.001***	1.75
Religiosity	1.36 (3.16, 10)	-1.30 (3.36, 10)	5.75	.001***	.81
Family	.01 (3.30, 10)	.02 (2.84, 10)	-.02	.98	.003
Friends	-.85 (3.63, 10)	.88 (3.01, 10)	-3.66	.001***	-.51
DS	1.26 (4.05, 18)	-1.25 (1.56, 10)	5.77	.001***	.81
QSS	-.84 (5.39, 20)	.89 (5.07, 20)	-2.33	.02*	-.33

TEIQue-SF	4.69 (.92, 4)	4.70 (.86, 5)	-.11	.90	.01
SF-36 (PCS)	30.85 (13.44, 64)	49.20 (26.63, 90)	-6.15	.001***	-.87
SF-36 (MCS)	47.15 (14.93, 64)	58.66 (21.38, 91)	-4.41	.001***	-.62

Note: DS=Discrepancy Score in Religious Beliefs and Practices, IOR=Importance of Religiosity, MCS = Mental Component Summary, PCS = Positive Component Summary, QSS=Quality of Social Support, SF-36 = The 36-item Short Form Health Survey Questionnaire, TEIQue-SF = Trait Emotional Intelligence Questionnaire-short form. * $p \leq .05$; *** $p \leq .001$.

Table 11 shows significant differences of correlations of trait-EI with other psychological and cultural variables between the two cultures. In the Pakistani CHF patients, significant positive correlation existed only between trait-EI and importance given to religiosity indicating that higher trait-EI was linked to higher importance given to religion among the Pakistani sample only.

Table 11

Correlations of psychological variables and Trait-EI for Pakistani and German CHF patients, and results of Fisher's z-tests, comparing correlations between the two samples

		IOR.	Religiosity.	Family.	Friends.	DS.	QSS.	MCS.	PCS.
TEIQue-SF	Pakistani	.24*	.09	.14	.11	.06	.15	.14	.39**
	Germany	-.01	.009	-.02	-.01	-.05	-.02	.31**	.46**
	p	.03*	.28	.13	.20	.22	.12	.10	.27

Note: DS=Discrepancy Score in Religious Beliefs and Practices, IOR=Importance of Religiosity, MCS= Mental Component Summary, PCS=Physical Component Summary, QSS=Quality of Social Support, TEIQue-SF=Trait Emotional Intelligence Questionnaire-short form. **$p \leq .01$

3.3.3 Regression Analyses

Stepwise regression analysis revealed that trait-EI (β = .31, *p* = .002) appeared to be the potential predictor of physical component of HRQoL only for the German CHF patients. However, in case of mental component both trait-EI (β = .41, *p* = .001) and discrepancy score (β = -.25, *p* = .007) were the predictors in the Pakistani CHF patients whereas only trait-EI (β = .46, *p* = .001) predicted mental component of HRQoL in the German CHF patients (see Table 12). It revealed that the German CHF patients will have better physical and mental component summaries of HRQoL if they have high trait-EI. It is also true for the Pakistani sample but is only limited to the mental component of HRQoL. However, lower the discrepancy score higher would be the mental component of HRQoL in the Pakistani CHF patients.

Table 12

Stepwise regression analyses predicting HRQoL of Pakistani and German CHF patients, and results of Fisher's z-tests, comparing R^2 between the two samples

		Pakistan			Germany				
		R^2	*F*	*p*	R^2	*F*	*p*	*z*	*p*
PCS	Trait-EI	-	-	-	9.70	10.56	.002**	-	-
MCS	Trait-EI	15.8	18.32	.001***	21.1	26.27	.001***	-.67	.24
	DS	21.9	13.61	.001***	-	-	-	-	-

Note: DS=Discrepancy Score in Religious Beliefs and Practices, MCS=Mental component summary, PCS=Physical component summary. ** $p \leq .01$, *** $p \leq .001$

3.3.4 Qualitative difference between Pakistan and Germany for attributed reasons of chronic heart failure

The qualitative analyses revealed 13 prominent categories that the patients considered as a reason for their CHF (see Figure 5). A considerable number of participants, in particular Pakistani, responded that they did not know the reason behind their illness (unknown). Category 'others' subsumes rarely mentioned factors such as age, medications, and excessive work. Overall comparison of these data suggested that the Pakistani CHF patients were significantly different from the German sample regarding awareness of the illness ($Chi^2(68.50)$, $df = 12$, $\phi = .58$, $p < .001$). However, post hoc analyses showed that there were no significant differences among individual categories between the two cultures (all p's > .001).

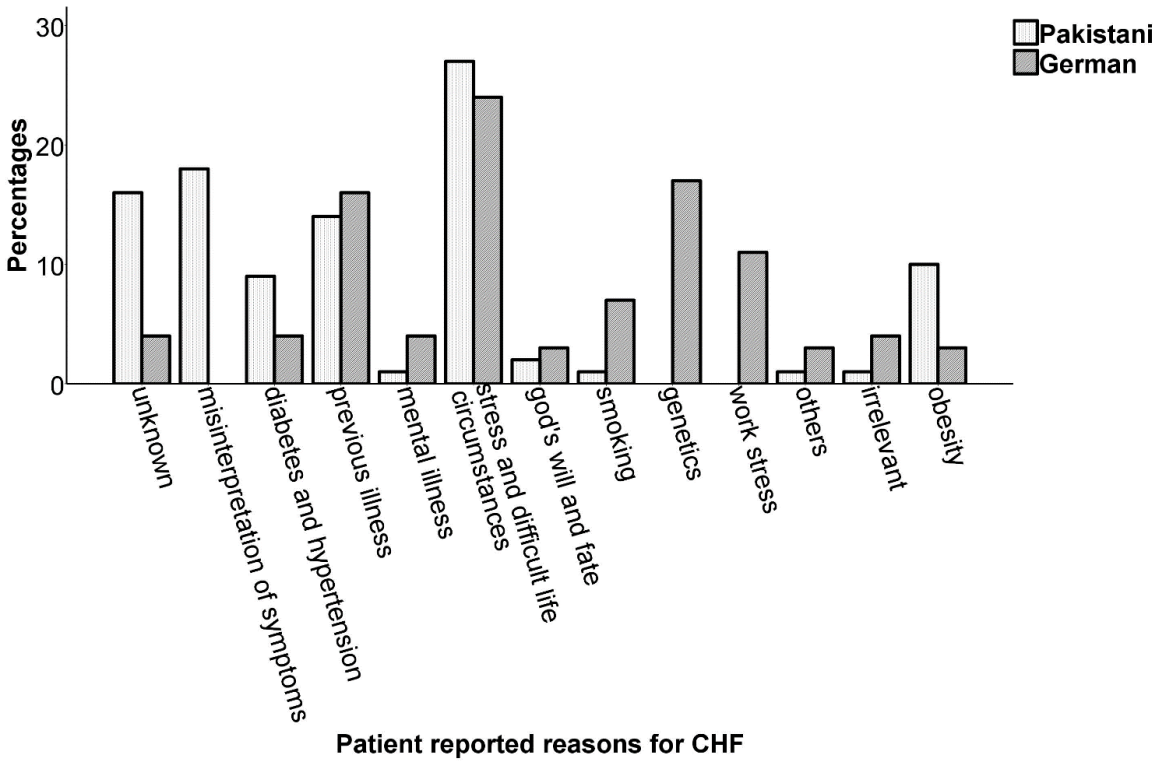

Figure 5: Percentage of patient reported reasons for chronic heart failure (CHF)in the sample of Pakistani and German CHF individuals (N= 200).

3.3.5 Measures taken to treat chronic heart failure

The two cultures differed with regards to the type of treatment obtained (Chi^2(144.29), df = 9, ϕ = .85, p < .001). Figure 6 shows that the Pakistani sample primarily sought treatment from religious native healers and homeopathic. In contrast, the German CHF patients showed a tendency to take precautionary measures to maintain healthy living such as maintaining healthy life styles (e.g., exercise, no smoking), adherence to medication and balanced diet. Post hoc analysis indicated that the two countries significantly differed in terms of follow-up visits to the hospital that were reported frequently by the Pakistani CHF patients (Pakistan n = 77, 77 % vs Germany n = 17, 17 %, p < .0025).

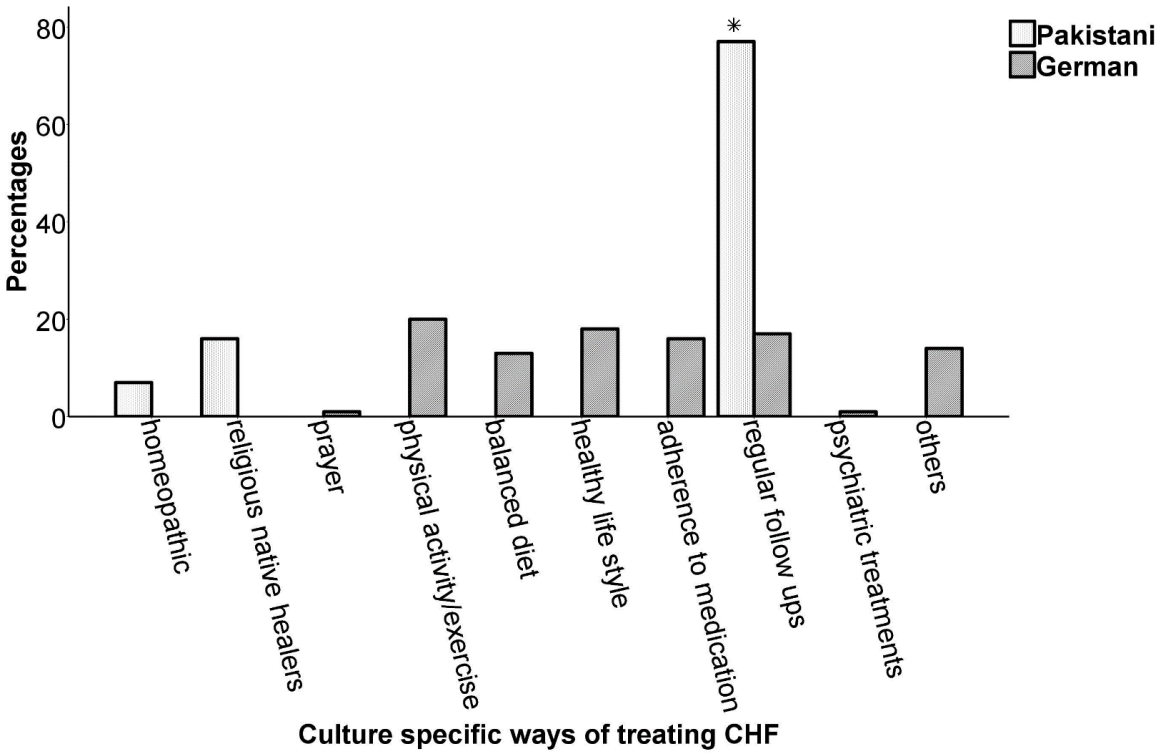

Figure 6: Percentage of culture specific treatments for chronic heart failure (CHF)in the sample of Pakistani and German CHF individuals (N= 200).

3.3.6 Presence of common worries in life

Participant's responses were coded into 12 categories as evident from Figure 7. Chi square analysis indicated significant overall differences between Pakistan and Germany ($Chi^2(57.16)$, $df = 11$, $\phi = .53$, $p < .001$). Family-related worries were the most common in both cultures. However, fear of deteriorating health was more prevalent in the German CHF patients as opposed to fear of GOD in the Pakistani sample. However, Post hoc analysis did not show any significant differences among individual categories between two cultures ($p > .002$).

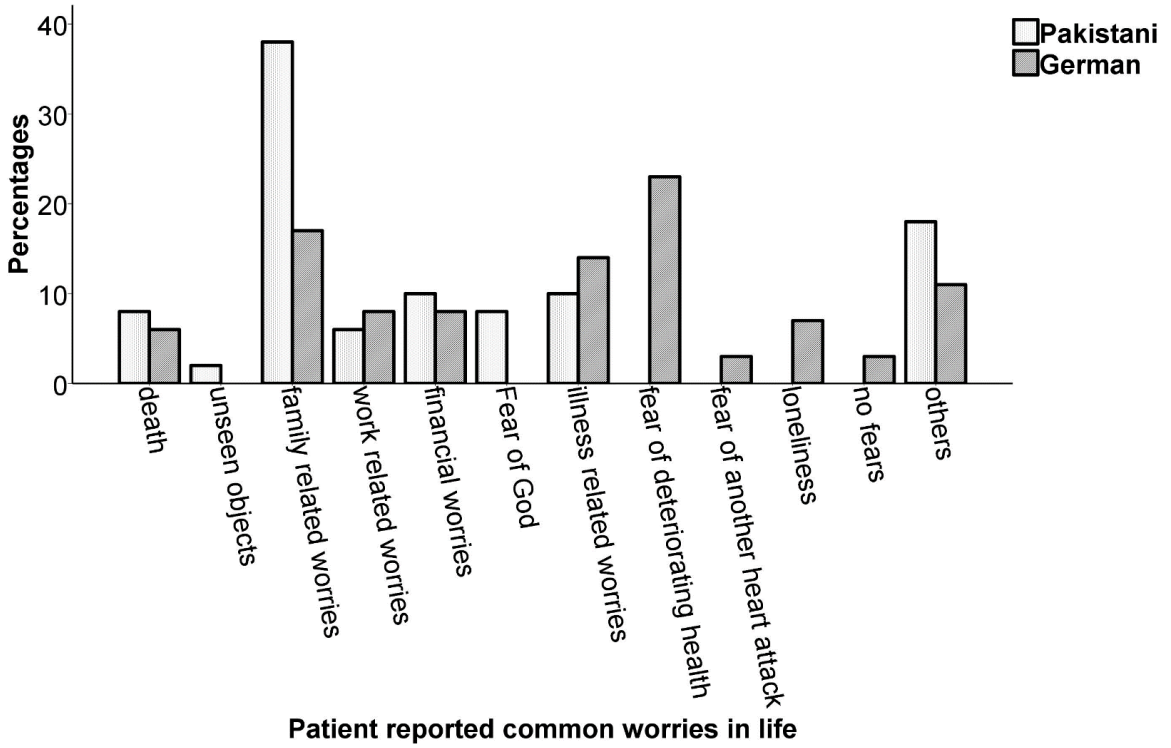

Figure 7: Percentage of patient reported worries in the sample Pakistani and German chronic heart failure (CHF) individuals (N= 200).

3.3.7 Measures taken to overcome worries in life

Figure 8 shows the ten categories revealed by analysis of measures to overcome worries in life. Chi square analysis indicated significant differences between the two cultures ($Chi^2(93.28)$, $df = 9$, $\phi = .68$, $p < .001$). Post hoc analysis showed that Germany and Pakistan differed significantly in terms of religious coping (Pakistan $n = 58$, 58 % vs Germany $n = 3$, 3 %, $p < .0025$) and exercise (Germany $n = 22$, 22 % vs Pakistan $n = 0$, 0 %, $p < .0025$).

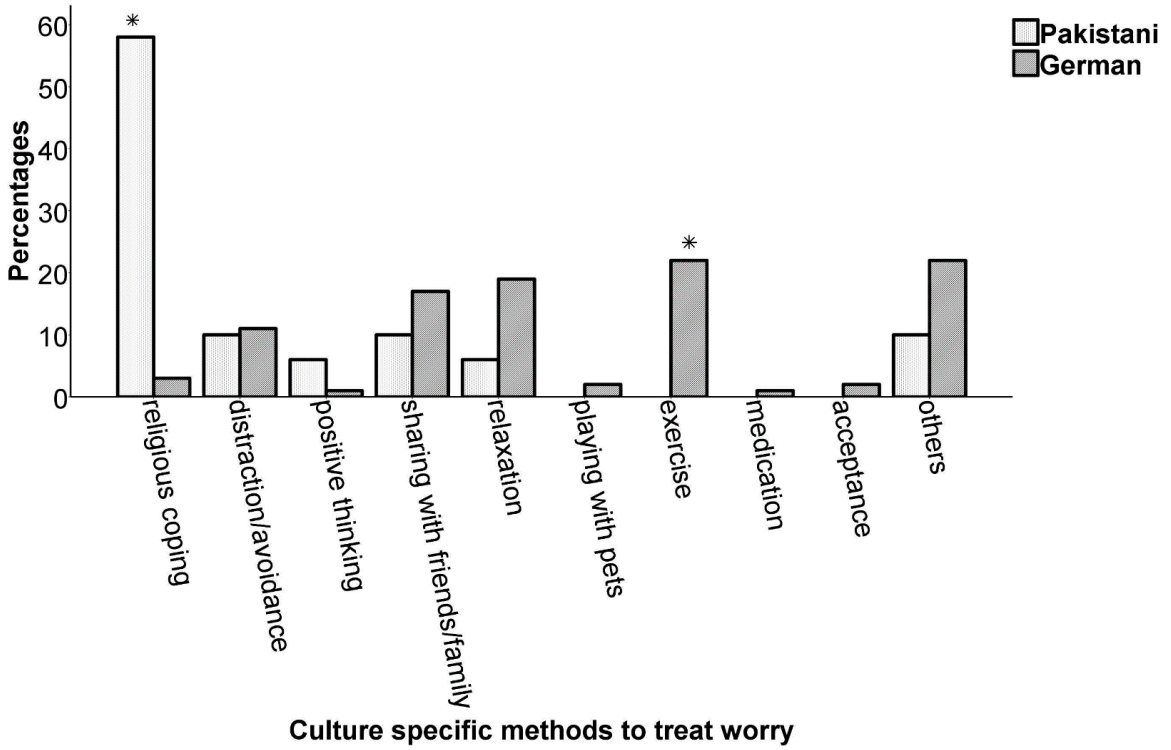

Figure 8: Percentage of culture specific ways to overcome worry in the sample of Pakistani and German chronic heart failure (CHF) individuals (N= 200).

3.4 Discussion

The present study was a cross-cultural comparison between German and Pakistani cardiology patients on the roles of religion, social support and trait-EI as coping mechanisms in maintaining HRQoL. Additionally, the roles of trait-EI, discrepancy score in religious beliefs and practices (DS) as well as quality of social support (QSS) in predicting HRQoL were explored.

The results revealed that despite similar levels of trait-EI, religion was more prevalent in the Pakistani sample. Yet, in the Pakistani CHF patients, the higher their trait-EI, the greater was the importance given to religion. This confirms earlier findings supporting the relationship between EI and religiosity (Butt, 2014). However, the current

findings did not support any significant relationship between trait-EI and self-rating of oneself as a religious practitioner in Pakistan, which is contrary to the results of Paek (2006). Interestingly, also the DS was higher in the Pakistani sample. This may be a source of distress, because the Pakistani CHF sample considered religion as very important, yet seemed to fall short of their values in terms of practical implementation. None of these relationships were found to be significant among the German CHF patients. This may be an expression of the mostly secular character of Germany.

Another important difference between cultures was that most of the Pakistani CHF patients lived in a joint family system as an active member. Part of the sample from Pakistani community also reported to be dependent on their children who were the primary financial supporter and decision-maker in a considerable number of families. First, this underlines the major impairment created by CHF. Second, these socio-economical and family factors might have resulted in a failure to maintain a balance between the rights owed to GOD and the rights towards humanity and consequently in high DS for the patients themselves.

In the German sample, the patient alone or mutually with the spousal partner was the authoritative person. In addition, the majority of the German CHF patients lived in a nuclear family system. Interestingly, the German CHF patients comparatively reported better physical and mental component summaries of HRQoL. Perhaps living in a large family with limited financial resources in combination with physical and psychological health problems has fostered dysfunctional family coping after the onset of illness, financial burden, and less knowledge regarding illness in the Pakistani CHF patients. This may have affected the emotional processing of the Pakistani CHF patients and contributed to poor HRQoL. In contrast, the shared responsibility in German spousal relationships may have contributed to more healthy social roles and interactions that focus on finding an adequate level of support. In large family systems, overprotective social support may be more common. According to

the self-determination theory (Ryan & Deci, 2000) and the stress buffering social support hypothesis this could even be a factor promoting the progression of CHF (Zniva, Pauli, Schulz, 2016). Future studies should therefore examine the cultural difference regarding the relationship between family systems, type of social support and underlying factors as for example suggested by the self-determination theory (Ryan & Deci, 2000).

This view is further in line with the evaluation of social support in the two cultures. First, overall social support appeared to be a hallmark of German society. Although no cultural differences were observed regarding the importance assigned to their families, the German CHF patients assigned more importance to friends as a social support group. This strengthens the argument, that for the Pakistani patients, problems may arise due to limited resources and the associated negative consequences of ill-adjusted coping within their family systems, warranting the attention of health practitioners towards this issue.

Higher trait-EI predicted better mental component in both German and Pakistani CHF patients, but only in the German sample, it also predicted better physical component of HRQoL. In the Pakistani sample, better mental component of HRQoL was also predicted by lower DS. Since absolute levels of trait-EI were similar in both countries, other characteristics are likely to explain these cultural differences. It is evident from the current qualitative data that the German CHF patients have a high internal locus of control, reflected in their high consciousness regarding healthy living styles and a positive attitude regarding exercise as well as mental and physical component summaries of HRQoL. In contrast, the Pakistani CHF patients showed an external locus of control reflected by the importance they assigned to religion and putting their trust and the associated control into the hand of “GOD” (Krause, 2002). Locus of control theory (Rotter, 1966) suggests that the Pakistani patients therefore took a less active role in dealing with stress, which has been confirmed by the current findings (i.e., poor mental and physical component summaries of HRQoL, less

exercise, and more religious coping in an effort to overcome worries in life). In line with this view, the results also indicated that the Pakistani CHF patients sought external help (medical, religious native healers, homeopathy, and/or religion itself) to cope with CHF.

Another interesting finding was that the Pakistani patients worried more about their family ("what will happen to them if I die") than their own health. This attitude fits a collectivistic ideology that is obviously more prominent in Pakistan than Germany. Unfortunately, this may contribute to a more interdependent self-image, or in other words stronger external locus of control, which may undermine experiences of autonomy and self-efficacy.

Although these may be important and theoretically well-supported aspects that could explain the cultural differences found in the current study, other characteristics may also contribute. For example, considering Germany one of the leading industrialized nations, while Pakistan is counted under the developing countries, future research should focus on factors such as feasible access of professional support (appointment, medicine). Moreover, provision and implementation of modern web-based intervention can help improve psychosocial well-being of CHF individuals. Recently a multi centered six weeks web-based randomized controlled trial was found significantly effective in alleviating anxiety and depression and improving psychosocial well-being of heart failure patients. The patients showed significant improvement (compared to the control group) at six weeks and one year post assessment (Schulz, Ritter, Zniva, Nordbeck, et al., 2019). Similar trials focusing factors responsible for escalating psychosocial burden in CHF patients should be implemented cross-culturally.

Albeit we aimed for parsimonious, yet plausible and ecologically valid explanations, all causal interpretations need to be made with caution. Future research with prospective and experimental designs will show whether the hypotheses generated from these approaches can

be confirmed. In these studies also the situation specific importance of religion, in particular concerning how religion and the importance associated with it contributes to each person's life individually, may be an important issue. In this respect, it is suggested to replicate the study, however with not only a dimensional but temporal focus on religion and its associated adaptive outcomes in CHF individuals. Finally, it should be noted that the current findings cannot be generalized to all socioeconomic classes as well as all Muslims and Christian communities across the globe, since religious believe and practice greatly varies along with nationalities and associated cultures.

The current findings highlight the role of higher trait-EI for better mental component of HRQoL in the Germany and Pakistani CHF patients. In the German CHF patients, high trait-EI also predicted better physical component of HRQoL. In the Pakistani CHF patients, higher DS and external locus of control may explain the lack of the positive effect of high trait-EI on HRQoL. These findings show options for culture specific tailoring of therapeutic and social support that may aim for strengthening self-efficacy and lowering the distress created by high levels of DS in the Pakistani sample. In the German CHF patients, resource oriented approaches may further strengthen the positive effects of problem-solving oriented strategies such as implementing a healthy life style and may further optimize the utility of social support. Future studies may confirm the effectiveness of such approaches in experimental and prospective designs.

Study 2

4.1 Background and Hypotheses

According to the traditional psychological model of stress and coping, appraisal of the situation as threatening or challenging leads to concomitant emotional responses (Lazarus and Folkman, 1984). These emotional responses may trigger physiological processes that may place the individual at greater risk for disease. It has been shown empirically that the anticipation of a stressor can be more threatening because of threat appraisal (expecting the personal harm is imminent) and threat-related emotions (anxiety and fear; Lazarus and Folkman, 1984). Clark and Wells (1995) proposed a cognitive model to explain the distorted processing underlying the anxiety maintaining effects of the negative appraisal. This encompasses biased information processing at several stages such as an anticipatory phase followed by in-situation and post-event processing. According to Clark and Wells (1995), socially anxious individuals dwell in anticipatory thoughts of being evaluated (based on their previous failures) before entering a situation. This results in anticipatory anxiety that is maintained in a vicious circle by avoiding the situation, which prevents the processing of potentially corrective experiences. Vassilopoulos (2004) stated that pre-event anticipatory processing was significantly associated with social anxiety. In addition, Vassilopoulos (2004) documented that highly socially anxious individuals reported intrusive thoughts during anticipation that resulted in high anxiety interfering with their concentration. Moreover, the less socially anxious group was anticipating more positive information suggesting that low socially anxious individuals might prepare themselves for the upcoming (stressful) situation that is public speaking.

Public speaking is a particular and the most common form of social anxiety (Kozasa & Leite, 1998), which typically involves concerns that one's performance may be judged as inadequate, incompetent, boring, and stupid. Therefore, socially anxious persons have

trouble in dealing with social stress when their performance is evaluated by others (Kozasa & Leite, 1998).

Prior to a social event, the socially anxious individual is preoccupied with thoughts of previous failures, catastrophizing poor performance and rejection that leads to the excessive increase in anticipatory anxiety (Feldman, Cohen, Hamrick, and Lepore, 2004; Hinrichsen & Clark, 2003). Hinrichsen and Clark (2003) showed that negative thoughts about evaluation resulted in increased anticipatory processing as well as higher peak anxiety during actual public speaking. Subsequently, Vassilopoulos (2005) demonstrated that highly socially anxious individuals when exposed to a facilitated anticipation condition (recalling past events and ruminating about being evaluated), had longer anticipation times and heightened anxiety. Brown and Stopa (2007) validated these findings explaining that increased anxiety leads to subsequent avoidance and safety behaviors.

Schulz, Alpers, and Hofmann (2009) further documented that self-centered negative thought while anticipating a public speech mediated increased self-reported anxiety and decreased HRV-HF, an index of parasympathetic withdrawals that is related to increased physiological stress. This was found to be true for both healthy and socially anxious people, but the association was stronger in individuals with high social anxiousness. Similarly, Visla, Cristea, Tatar, and David (2013) reported the mediating roles of situation-specific (pertaining to public speaking) response expactancies and automatic thoughts in the relationship of irrational beliefs and public speaking anxiety. They showed that these response expectancies generated automatic thoughts that are contiguous to public speaking anxiety. The authors concluded that multiple encounters with the same threatful situation (appearing in a job interview) might have given rise to the response expectancies (e.g., “It is the point to get anxious”) that further primed the negative automatic thoughts (e.g., “I am not performing well”).

Kirschbaum, Pirke, and Hellhamer (1993) used a public speaking task protocol to assess changes in cardiovascular and neuroendocrine systems. Socially anxious individuals experience heightened anxiety in stressful situations due to fear of evaluation (Clarks & Wells, 1995; Weeks, Heimberg, & Rodebaugh, 2008; Wild, et al., 2008). This assumed fear of evaluation and subsequent increase in anxiety may also be due to increased attention towards interoceptive cues such as increased heart rate (Kirschbaum, Pirke & Hellhamer, 1993). This suggests that the higher the IA, the greater would be the attention given to the interoceptive cues, and the higher would be the anxiety due to increased fear of evaluation (Stevens et al., 2011). To date, interoception studies using public speaking protocols have observed an increase in IA following anticipation of a public speech in highly anxious people. This suggests a positive association between anxiety and IA (Herbert, et al., 2011); however, the reverse relationship appears to also be a possibility. Individuals with high IA might be prone to notice the anticipatory increase in physiological arousal. Once the individual interprets this as unwanted and/or threatening, this might lead to avoidance and compensatory behavior including safety behaviors (Durlik, et al., 2013; Stevens, et al., 2011). Therefore, high IA could be a risk factor for developing social anxiety. This is also consistent with Barlow's triple vulnerability model (2002) which underlines that biological and psychological vulnerabilities in combination with life stress may result in anxiety disorders. For example, social anxiety disorder develops from previously learned experiences of focusing on heightened anxiety (Suarez et al., 2009).

This is in line with data showing that socially anxious individuals are more vigilant to negative stimuli due to their negative automatic thoughts explaining their attentional bias (Mogg & Bradley, 2002), which is also consistent with the cognitive model of social anxiety (Clark & Wells, 1995; Rapee & Heimberg, 1997), posing that attention can be directed to negative stimuli but safety behaviors can elicit avoidance as a behavior. Pineles and Mineka

(2005) further supported this argument showing that highly socially anxious individuals exhibited greater internal attention during a stressful task consequently increasing anticipatory anxiety. Maladaptive coping such as avoidance, suppression may maintain anticipatory processing, dominated by fear, anxiety, and insecurity, as is evident in individuals with social or GAD (Mennin, Heimberg, Turk & Fresco, 2005; Turk, Heimberg, Luterek, Mennin, & Fresco, 2005). Mansell, Clark, Ehlers, and Chen (1999) demonstrated that these attentional biases precipitating avoidance of negative stimuli remained significant even after controlling for both trait anxiety and negative affect, highlighting individual differences in susceptibility to social anxiety. Sluis and Boschen's (2014) reported different findings, suggesting that fear of negative evaluation, trait anxiety, and negative affect all contributed equally to attentional biases (both internal and external) and consequently to social anxiety. Deiters, Stevens, Hermann, and Gerlach (2012), further showed that individuals with high speech anxiety directed their attention more towards internal physical cues during anticipation of a speech task, a finding that is also in agreement with Stevens and colleagues (2011) findings. This shows that anticipation of a speech task is highly distressing and triggers underlying mechanisms shifting the focus of attention towards internal physical cues, a hallmark of IA. This processing results in heightened anxiety alongside negative evaluation of the situation through negative thought mechanisms, thus maintaining the social anxiety. While transient exposure to an acute stressor, does usually not impair health and its quality, intense anxiety may represent a vulnerability to disrupt physical health and HRQoL. Likewise, Barrera and Norton (2009) have indicated that excessive anxiety limits HRQoL, and may increase the risk of other serious physical illnesses such as cardiac problems.

In the present study, we aimed to examine differences between healthy individuals with high vs low IA in dealing with stress induced by the anticipation of and performing a public speaking task. We speculated, based on earlier findings that higher IA (as assessed by

the MTT; Schandry, 1981) might result in increased emotional awareness, leading to increased stress and anxiety in the context of anticipating public speaking. In a vicious circle, this would further increase symptoms of anxiety on subjective, physiological and behavioral levels.

To counter these effects we applied both physiological (t-VNS) and psychological (CR) strategies for coping with the stress induced by the anticipation of and performing a public speaking task. We expected that CR would help participants to reduce distress prior to public speaking and that this would carry over into the actual public speaking situation. We further hypothesized that t-VNS would ameliorate parasympathetic withdrawal during anticipation of public speaking, thus primarily reduce the physiological aspect of anxiety. In particular, individuals with high IA might benefit from this intervention, because physiological arousal as a more prominent source of conscious perception of distress signals would be reduced. In addition, we speculated that t-VNS might increase ER capacity, thus increasing resources for implementing CR.

4.2 Methods

4.2.1 Design and participants

The experiment was a 2 (between-subject factor high vs low *IA*) x 7 (within-subject factor *experimental phases*: baseline, anticipation phase 1,2 & 3, intervention based on ER, actual speech, recovery phase) factorial design. In total $N = 99$ volunteers participated in the study however, due to some technical reasons physiological data of $n = 12$ participants were lost. Participants were recruited by advertising via displays on university notice boards along with the circulation of an email to the psychology student community of the University of Würzburg, Germany. In addition, Würzburg's local city advertising system (www.*wuewowas.de*) was used to recruit volunteers from the general population (other than

students). Those suffering from any psychotic, neurological, cardiovascular or addiction problems were excluded from the study. Moreover, females during the gestation period were not allowed to participate. The participants received either two hours of "course credit" or 18 € for participating in a two-hour experiment at the Department of Psychology I, University of Würzburg, Germany. Written informed consent was obtained from each participant prior to study participation.

The study was approved by the medical ethics board of the Julius-Maximilians-University of Würzburg and was carried out in accordance with the *Declaration of Helsinki* (World Medical Association, 2001), the *Guideline for Good Clinical Practice*, and regulations of the '*European (EU) general data protection regulation'* laws.

4.2.2 Material

All instructions were presented on a cathode ray tube screen (screen size: 19" Resolution: 1024 x 768).

4.2.2.1 Physiological measures.

The following physiological measures were used to evaluate the effects of experimental manipulation via psychosocial stress induction using the TSST public speaking task.

A lead-II electrocardiogram (ECG) was measured via a BIOPAC ECG100C module (BIOPAC Systems, Inc., USA) using sanitized reusable Ag-AgCl electrodes (OD: 8mm) filled with standard electrolytic paste. The electrodes were placed on the right and left clavicle, and the left lower rib cage after cleaning these areas with alcohol pads.

Electrodermal activity (EDA) was recorded via a BIOPAC EDA100C module (BIOPAC Systems, Inc., USA). Two sanitized reusable Ag-AgCl electrodes (OD: 5mm) were attached to the index and the ring finger of the subject's non-dominant hand.

Continuous blood pressure (CBP) was recorded via photo-plethysmographic finger cuff sensors on the middle finger of the non-dominant hand via an Ohmedia finapress 2300 (cuffs: No. 6050-001-971 / 972).

ECG, EDA, and CBP were sampled at 1250 Hz, (16 bit A / D converter) with a BIOPAC MP-150, and stored to hard disk. Relevant events in the test sequence were marked via the TTL signal that was transmitted to the BIOPAC MP-150 data recorder. This way, exact time synchronization of events and recorded data from all devices was possible.

4.2.2.2 Self-report Measures

A socio-demographic questionnaire was used to collect general information on sample characteristics (such as age, height weight, family status, etc). Subjective anxiety levels were recorded via an ad-hoc rating scale ranging from *0* = no anxiety to *100* = maximal anxiety. In addition, the following set of questionnaires was applied.

The *Trait Emotional Intelligence Questionnaire-Short Form (TEIQue-SF;* Petrides, 2009*)* is the short form of the "TEIQue" (Petrides, 2009). It has 30 items directed to measure trait EI (e.g., "I'm generally aware of my emotions as I experience them") on a Likert-scale range from 1 ("completely disagree") to 7 ("completely agree"). TEIQue-SF yields a global trait EI score and four sub-scores for well-being, self-control, emotionality, and sociability (Cooper & Petrides, 2010). The internal consistency was reported to be .81 and the test-retest reliability was .86 (Deniz, Özer, & Isik, 2013).

The *Short-Form Health Survey Questionnaire (SF-36*; Wäre et al., 1993*)* consists of 36 items (e.g., "Compared to one year ago, how would you rate your health in general now?"), which measures the health-related quality of life (Wäre et al., 1993). The SF-36 profile calculates two broader scores, namely mental component summary and physical

component summary (Wäre, 2000). This questionnaire has high internal consistency, with the Cronbach alpha being $\alpha \geq .80$ (Jenkinson, Wright, & Coulter, 1994). Many studies support the reliability statistics, which have surpassed the minimum standard requirement of $\alpha = 0.70$ (Tsai, Bayliss, & Wäre, 1997).

The *Toronto Alexithymia Scale (TAS-20*; Bagby et al., 1994) was used to measure Alexithymia. It consists of three scales; seven items for *difficulty identifying feelings (DIF*), five items for *difficulty describing feelings (DDF)*, and eight items for *externally oriented thinking (EOT*; Leising, Grande, & Faber, 2009). According to Bagby and colleagues (1994), this questionnaire is reliable with a good internal consistency (Cronbach's $\alpha = .81$).

The *Body Perception Questionnaire (BAQ*; Porges, 1993) consists of five sub-tests namely awareness, stress response, ANS reactivity, stress style, and health history inventory. There are 122 items that are supposed to be answered on the 5-point scoring scale which ranges from 1 ("Never") to 5 ("Always"). The internal consistency was assessed for all the subscales and ranged from Cronbach's $\alpha = .68$ to .97 (Cabrera, et al., 2017). The *awareness* subscale of the questionnaire has been considered valuable for the subjective assessment of one aspect of interoception namely interoceptive sensibility (as cited in Garfinkel & Critchley, 2013).

The 7-Item *Generalized Anxiety Disorder Scale* (GAD-7, Spitzer, Kroenke, Williams & Lowe, 2006) is a valid and reliable scale with high sensitivity (89%) and high specificity (82%) for screening patients with possible GAD. Scores range from 0 to 21 with higher scores indicating more likely presence of GAD.

The *Emotion Regulation Questionnaire (ERQ*; Gross & John, 2003) has 10 items and it is intended to measure the tendency in which the person is regulating his or her emotions

through either CR (e.g., “When I want to feel more positive emotion, I change what I’m thinking about the situation”) or expressive suppression (e.g., “I keep my emotions to myself”). The response option format is designed in a 7-point Likert-style which ranges from 1 (“Strongly Disagree”) to 7 (“Strongly Agree”). Suppression subscales show that the internal reliability was at Cronbach’s alpha $\alpha = .75$ and for the reappraisal subscales the Cronbach’s alpha was assessed to be $\alpha = .79$ (Cabello, Salguero, Fernández-Berrocal, & Gross, 2013).

The *Social Phobia and Anxiety Inventory (SPAI*; Turner, Beidel, Dancu, & Stanley, 1989) is to evaluate specific somatic symptoms, cognitions, and behavior considering only a certain amount of potentially fear-producing situations. The SPAI consists of 22 items that have a response option format on a 7-point Likert scale ranging from 0 (“Never”) to 6 (“Always”). The SPAI has an internal consistency score of Cronbach’s alpha $\alpha = 0.96$ for the social phobia subscale and for the agoraphobia subscale it is assessed to be $\alpha = 0.87$ (Turner et al., 1989).

4.2.3 Mental Tracking Task

The MTT (Schandry, 1981) was used to determine the IA of the participants. MTT helps determine the interoception ability of an individual, which refers to the knowledge of one’s internal changes (Garfinkel, et al., 2015). It has been suggested that interoceptive abilities influence emotional experiences (perception, regulation) decision making and psychopathologies (Critchley & Harrison, 2013; Okon-Singer et al., 2014).

During MTT, participants were instructed to count their heartbeats during the time interval specified by a start and stop signal without using additional assistance such as tapping of the pulse. The task consisted of a non-evaluated practice trial comprised of 60 sec rest and 20 sec time interval for counting one’s heartbeat.

It was further followed by the actual task consisting of three time intervals of varying lengths (25, 35 and 45 seconds) that were randomly presented. The participants had to tell the number of perceived heartbeats verbally to the experimenter after each time interval. Each time interval was followed by a 30 sec rest period. During the rest period, participants were asked to close their eyes, relax and breathe consistently. In addition to the manual counting of heartbeats, the actual number of heartbeats per interval were also objectively assessed via ECG. After the end of this part, a confidence rating was obtained regarding the correct recording of actual heartbeats on a scale of *0* (no confidence) to *10* (fully confident). This is known as metacognitive awareness related to individual's own interoception ability (Garfinkel et al., 2015). For each trial an accuracy score was calculated using the formula "*1-(n beats* $_{real}$ *- n beats* $_{reported}$*)/((n beats* $_{real}$ *+ n beats* $_{reported}$*)/2)"* following Hart, McGowan, Minati, and Critchley (2013). Later, the average of all accuracy scores of each trial was calculated to obtain a single IA score.

During the second half of the MTT, participants were asked to estimate the length of three time intervals of varying lengths (23, 56, 40 seconds) that were again presented randomly. Almost the same procedure was followed and in the end again, they were asked to report the level of confidence regarding these estimates, generally known as a confidence judgment score obtained on a visual analogue scale (VAS) ranging from *0* = no confidence to *10* = fully confident in calculating accurate number of heartbeats. This confidence score was taken as masure of metacognitive awareness in terms of interoception.

4.2.4 Transcutaneous vagus nerve stimulation

t-VNS was applied with a *Cerbomed (Erlangen),* allowing the stimulation of the right auricular branch of the vagus nerve, which runs under the ear, by applying a light current via external ear-electrode. The device was programmed for stimulation in the cycle of alternative 30-sec stimulation and 30-sec pause. This is in accordance with the criteria set for epileptic

patients by *Cerbomed*. It is a preinstalled program that runs automatically and is in control of the user (when to start and stop). The certificate to use the device with epileptic patients obtained in the year 2011 shows the recommended time of stimulation i.e 4 to 5 hours throughout the day. In the present study, recommendations of the CE markings were followed at every step. However, the total time to stimulate a person in this study was no longer than 25 minutes which was within the range of recommendations.

Stimulation took place on the left ear via rectangular pulses of 250 μs and 25 Hz (Busch et al., 2013). It has been reported to cause small side effects, such as itching, dysesthesia in the outer ear canal and local pain at the stimulation site, which cannot be excluded. However, the side effects usually disappear rapidly after the completion of the stimulation. Moreover, before the experiment, the participants were given a chance to try out the vagus nerve stimulation. On one hand, on the basis of this trial, they showed their consent to participate in the study. While on the other side, after obtaining their consent, individual stimulation was set for each participant. Each participant went through the procedure of feeling the stimulation (starting from the lowest 0.1 to moving towards the highest until he/she felt uncomfortable) twice. With every increase in the current intensity, the subject rated it on a VAS saying if it was painful or not. The VAS had a rating of 1-10 with 1 representing no pain, 5 moderately painful and between 7-10 was considered extremely painful. After these two trials, the average intensity of the stimulation was calculated and applied throughout the experiment. Since the vagal nerve stimulator was controlled externally by the computer, extremely well-controlled stimulation was used. If, however, problems occurred in the subject even after individual adjustment of the current, the current flow was immediately up or down-regulated. This method reduced the risk of exclusion from the experiment at an early stage. As a result, the stimulation current that was executed ranged from 0.3 to 3.3. In addition the two groups did not differ significantly in

the intensity of the stimulation (high IA: M = 1.10, SD = .69; low IA: M = 1.07, SD = .53, t = .23, p = .81, d = .05). No electrodes were placed on diseased or sore spots.

4.2.5 Cognitive reappraisal

In the current experiment, participants were allowed to cognitively reappraise the stress they felt during the anticipation phase of public speaking. CR is aimed at reinterpreting the situation that triggers distressing thoughts. The method was introduced in the experiment with a set of examples such as seeing an injured person and associating a new value or meaning to it such as, it may not be real or help has already been sought and so on. Later the participants were guided to think about the anticipatory phase again and imagine to react less negatively and seeing the situation in a neutral, more realistic and rational way. In the end, individuals report on how would they reflect back on the situation sometimes later (such as after 1 year) was also discussed as part of CR procedure.

4.2.6 Trier social stress task

The TSST public speaking task is one of the best evaluated methods for inducing social distress usually including anxiety (Kirschbaum, Pirke, & Hellhammer, 1993; Kudielka, Hellhammer & Kirschbaum, 2007). In the present study, a part of this task, namely the so called "job interview situation" was used. The participants were asked to deliver a speech specifying why they wanted a fictive job and why they might be a suitable candidate. The stress induction task consisted of a *baseline* of 6 minutes followed by a 20 minutes *anticipation phase* in which they were asked to think about a previous unpleasant job interview experience (for detailed description, see Schulz, Alpers and Hofmann, 2009). These 20 minutes were further subdivided into 6 minutes rest, 8 minutes of anticipation, and then 6 minutes of rest. After that, the participants were requested to deliver the above-mentioned *speech* for 10 minutes (a minimum of 3 minutes speech was mandatory) in front

of a video camera and the experimenter as an audience. According to the cognitive model of social anxiety (Rapee & Heimberg, 1997), an audience may comprise of one person or a group of people that can interact and have the potential to elicit fear of evaluation. Moreover, the examiner also evaluated them again to generate fear of evaluation in the participant (Kirschbaum, 2015). The speech was followed by a *recovery phase* of 6 minutes (relaxing while sitting on the chair). The maximum fear experienced was rated on a scale of 0-100 before baseline, after baseline, after 6, 14 and 20 minutes of anticipation, after speech and finally after the recovery phase. The recorded speech was deleted immediately after debriefing at the end of experiment.

4.2.7 Procedure

The participants were seated behind a screen placed such that they were not seeing the experimenter during the actual experiment in order to minimize potential *Rosenthal effect*. The participants were seated on a comfortable chair with arm rests in front of a cathode ray tube screen with a distance of about 40 cm between eye and monitor. Their left hand was rested with palms upward on a cushioned armrest. The right hand of the participants were free to move and use the computer keyboard.

After the electrodes for ECG were attached and they were asked to fill out the bio-data (socio-demographic information) form, the MTT was carried out followed by an ad-hoc rating about their current anxiety.

Next, the full procedure was disclosed to the participants and a second signed consent was obtained. Moreover, all questions of the participants were answered in order to remove any ambiguities. The purpose of separating the consent form into two parts was to measure IA without any anticipatory fear induced by being informed about the upcoming speech task.

Then, all the remaining electrodes were attached and they were asked to fill out the following set of questionnaires (TEIQue-SF, SF-36, TAS-20, BAQ, ERQ, GAD-7, and SPAI) followed later by the following experimental procedure:

1. Baseline phase (6 minutes). Participants were instructed to close their eyes and to breathe normally.
2. Anticipation of public speaking phase (20 minutes). During this phase, either t-VNS stimulation or sham stimulation remained active (random between-subjects assignment). Participants were asked to think of a previous bad experience in which they felt uncomfortable and left a bad impression on people for a duration of 20 minutes. Then the participants were provided either with CR sheet and instructed to write those negative feelings/thoughts to reappraise them in a less threatening way, or they awaited at least for five minutes (random between-subjects assignment). For the analysis, t-VNS vs. sham stimulation and CR vs. waiting conditions were collapsed since no differential effects were found.
3. Speech Task (10 minutes): Participants delivered a speech. At this stage of the experiment, a video camera was used to give the impression of an actual job interview task. The camera was turned on and the video was recorded (however, the recordings were removed/deleted at the end of the experiment after a debriefing of the participants). The experimenter shifted her place and sat opposite to the participant. The experimenter evaluated the speech by filling out the speech evaluation form, which served the sole purpose of creating an atmosphere of evaluating the speech to induce stress. However, alike video recordings they were also discarded.
4. Recovery Phase (6 minutes): Participants were asked, again, to sit quietly with their eyes closed and to breath normally. At the end of the experiment, all electrodes and sensors for assessing physiology were removed. Participants were again de-briefed regarding the

experimental task and its purpose. They were also asked about the intrusiveness of worries during the experimental periods. Further, at the end of each successive stage, ad-hoc ratings were taken regarding the current state of the participant's anxiety.

4.2.8 Statistical analysis

All psychological data were analyzed using SPSS (version 23, 2015). All variables were checked for normal distribution. There were no outliers in the data. However, heart rate variability (HRV) measures during all experimental phases for the LF/HF ratio were positively skewed. Log transformation was carried out to overcome skewness after which the Shapiro-Wilk test showed normal distribution ($p > .05$). In addition, all the scores were intra-individually transformed into their respective z-scores before analyzing.

Sample characteristics ($N = 99$) were identified using frequencies and percentages for categorical data and t-statistics for continuous variables. The group was divided by median-split in individuals with high vs low trait EI scores (cutoff score: 5) to assess specific differences of psychological constructs.

IA and metacognitive awareness were assessed using the MTT (Schandry, 1981); subjective interoceptive sensibility was calculated using the Awareness subscale of the BAQ (Porges, 1993). The median of the average IA score (cutoff: 0.24) was taken to divide the sample into low and high IA groups.

Relationship of trait EI with all the important variables of interoception such as awareness, TAS-20, IA as well as metacognitive awareness and interoceptive sensibility was evaluated, and hierarchical regression analysis was carried out to check if there was/were any predictors of IA and metacognitive awareness.

In addition, the relationship of trait EI with other psychological variables such as CR, expressive suppression, GAD, social phobia and anxiety inventory (SPAI), physical and mental component summaries of HRQoL was calculated. Additionally, a stepwise regression

analysis was carried out to check the predictor value of age, gender, awareness, alexithymia, and trait EI in predicting IA and metacognitive awareness.

Later the physiological data of *N* = 87 participants (the data from 12 participants had to be excluded due to technical problems in the physiological data) were processed using a 2x7 repeated measure analysis of variance. One between-subject factor named IA had two levels (high vs low). Whereas one within-subject factor named experimental phases had seven levels (baseline 1, anticipation phase 1, 2, 3, intervention phase, speech and recovery phase).

Similarly, a 2 x 8 repeated measure analysis of variance was carried out with one between-subjects factor named IA (high vs low) and one within subject factor named measurement time with eight levels (before baseline 1, after baseline 1, after anticipation phase 1, 2, 3, after intervention phase, after speech, and after recovery). Greenhouse-Geisser corrected values are reported whenever Mauchly's test indicated that the assumption of sphericity was violated. For all ANOVAs baseline was entered as a covariate.

Finally, stepwise regression analysis was conducted to check the predictor value of psychological variables in predicting the physiological variables during different phases of the experiment.

4.3 Results

4.3.1 Sample characteristics

In the current sample (*N* = 99), there were mostly females (*n* = 79, 79.8 %) and the average age was *M* = 25.74 (*SD* = 8.13). Most of the sample belonged to the Christian community (*n* = 58, 58.6 %) followed by representations from the Muslim community (*n* = 12, 12.10 %) and other religions (*n* = 25, 25.3 %). The majority of the sample was unmarried (*n* = 61, 61.60 %) followed by those who were single but living with significant others (*n* = 22, 22.20 %). Most participants were living in a nuclear family system (*n* = 82, 82.80 %) and

were non-smokers (*n* = 82, 82.80 %). The participants did not report any negative side effects associated with the use of t-VNS.

4.3.2 Comparison of psychological characteristics between participants with high versus low interoception accuracy

Questionnaire subscales self-control, difficulty identifying feelings, physical and mental component summaries of HRQoL as well as metacognitive awareness differed significantly across the two groups (high vs low IA); all other p's > .05. Those high on IA had more self-control, faced less difficulty in identifying feelings, were more confident in counting their heartbeats and had better physical and mental component summaries of HRQoL, (see Table 13).

Table 13

Means (M) and Standard Deviations (SD) for psychological variables in participants with high vs low IA

	IA	*M*	*SD*	*t*	*p*	*d*
Well-being	High	5.69	.82	1.35	.17	.28
	Low	5.43	.99			
Self-control	High	4.87	.78	2.27	.02*	.49
	Low	4.45	.93			
Emotionality	High	5.29	.78	.59	.55	.12
	Low	5.19	.82			
Sociability	High	4.92	.74	.72	.47	.16
	Low	4.79	.89			
global TEI	High	5.20	.54	1.84	.06	.37
	Low	4.98	.62			
Cognitive reappraisal	High	29.57	6.55	1.17	.24	.24
	Low	28.09	5.48			
Expressive suppression	High	13.09	5.28	-.11	.90	.02
	Low	13.21	4.90			
DDF	High	11.41	4.90	-.65	.52	.07
	Low	11.04	4.41			
DIF	High	13.00	5.43	-1.98	.05*	.41

	Low	15.30	5.61			
EOT	high	16.98	3.76	-.05	.95	.01
	Low	17.02	4.24			
TAS-20	High	41.39	11.96	-1.25	.21	.26
	Low	44.36	10.64			
Awareness	High	2.31	.83	-.83	.41	.17
	Low	2.45	.77			
PCS	High	82.49	16.92	2.81	.006**	.59
	Low	71.68	19.56			
MCS	High	63.99	24.42	2.17	.03*	.46
	Low	51.64	28.78			
Metacognitive awareness	High	5.82	1.98	5.07	.001***	1.07
	Low	3.68	2.03			
GAD-7	High	6.23	4.61	-.84	.40	.17
	Low	6.98	3.87			
SPAI	High	1.93	.94	-.67	.50	.16
	Low	2.09	1.07			

Note: DDF = Difficulty Describing Feelings; DIF = Difficulty Identifying Feelings; EOT = Externally Oriented Thinking; GAD-7 = Generalized anxiety disorder scale; global TEI = global Trait Emotional Intelligence; MCS = Mental Component Summary; PCS = Physical Component Summary; SPAI = Social phobia and anxiety inventory; TAS-20 = Toronto Alexithymia Scale-20. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

4.3.3 Comparison of psychological characteristics between participants with high versus low trait emotional intelligence

Table 14 indicates that participants with high trait EI had higher well-being, self-control, emotionality, sociability, and metacognitive awareness. In contrast, those with low trait EI have high expressive suppression, alexithymia (as assessed by TAS-20) and anxiety (both as assessed by GAD-7 and SPAI).

Table 14

Means (M) and Standard Deviations (SD) for psychological variables in participants with high vs low trait EI

	trait EI	*M*	*SD*	*t*	*p*	*d*
Well-being	high	6.34	.36	9.58	.001***	1.96
	low	5.16	.84			
Self-control	high	5.22	.73	4.93	.001***	1.06

	low	4.39	.83			
Emotionality	high	5.85	.47	6.99	.001***	1.46
	low	4.97	.77			
Sociability	high	5.51	.64	6.56	.001***	1.43
	low	4.55	.71			
Cognitive reappraisal	high	30.54	4.82	1.87	.06	.41
	low	28.16	6.60			
Expressive suppression	high	11.14	4.12	-3.15	.002**	.64
	low	14.14	5.17			
DDF	high	8.26	2.53	-7.43	.001***	1.49
	low	13.45	4.41			
DIF	high	10.14	2.81	-6.87	.001***	1.38
	low	15.95	5.58			
EOT	high	15.11	3.26	-3.47	.001***	.75
	low	17.86	3.99			
TAS-20	high	33.51	5.59	-8.59	.001***	1.72
	low	47.27	10.33			
Awareness	high	2.23	.90	-1.27	.20	.26
	low	2.45	.75			
PCS	high	76.24	19.91	-.30	.76	.06
	low	77.46	18.54			
MCS	high	65.07	28.43	1.84	.06	.38
	low	54.50	25.82			
Metacognitive awareness	high	5.49	2.07	2.14	.03*	.46
	low	4.47	2.35			
IA	high	.20	.35	.12	.91	.05
	low	.18	.46			
GAD-7	high	3.80	2.66	-5.80	.001***	1.17
	low	7.84	4.24			
SPAI	high	1.38	.68	-4.70	.001***	1.13
	low	2.32	.98			

Note: DDF = Difficulty Describing Feelings; DIF = Difficulty Identifying Feelings; EOT = Externally Oriented Thinking; GAD-7 = Generalized anxiety disorder scale; MCS = Mental Component Summary; PCS = Physical Component Summary; SPAI = Social phobia and anxiety inventory; TAS-20 = Toronto Alexithymia Scale-20. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

4.3.4 Relationship of interoceptive domains with trait emotional intelligence

The correlations between trait EI, alexithymia, IA, metacognitive awareness, and interoceptive sensibility are shown in table 15. The analysis confirms that trait EI was significantly negatively related to the total and all subscales of alexithymia as well as awareness subscale of BAQ (Porges, 1993; representing interoceptive sensibility). Trait EI was significantly positively correlated with metacognitive awareness.

Table 15

Correlations between trait emotional intelligence and interoception domains

		trait EI	DDF	DIF	EOT	TAS-20	Awareness	IA	MA
1	trait EI	1	-.68***	-.62***	-.43***	-.74***	-.22*	.07	.21*
2	DDF		1	.63***	.41***	.87***	.21*	-.11	-.17
3	DIF			1	.20*	.83***	.29**	-.19	-.25**
4	EOT				1	.63***	.11	.06	.04
5	TAS-20					1	.27**	-.11	-.18
6	Awareness						1	-.10	.15
7	IA							1	.51***
8	MA								1

Note: DDF = Difficulty Describing Feelings; DIF = Difficulty Identifying Feelings; EOT = Externally Oriented Thinking; global TEI = global Trait Emotional Intelligence; IA = Interoception Accuracy; MA = Metacognitive Awareness; TAS-20 = Toronto Alexithymia Scale-20. * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

4.3.5 Relationship of psychological variables with trait emotional intelligence

The correlations between trait EI and psychological variables indicated that trait EI was significantly negatively related to expressive suppression and anxiety (both as assessed

by GAD-7 and SPAI). It was significantly positively correlated with CR and mental component summary of HRQoL.

Table 16

Correlations between trait emotional intelligence and psychological variables

		global TEI	CR	ES	GAD-7	SPAI	PCS	MCS
1	global TEI	1	.26**	-.43***	-.50***	-.54***	-.001	.22*
2	CR		1	.08	-.14	.07	-.01	.09
3	ES			1	.25**	.38***	-.04	-.10
4	GAD-7				1	-.33**	-.19*	-.48***
5	SPAI					1	-.05	-.20*
6	PCS						1	.81***
7	MCS							1

Note: CR = Cognitive Reappraisal; ES = Expressive Suppression; GAD-7 = Generalized anxiety disorder -7; global TEI = global Trait Emotional Intelligence; MCS = Mental Component Summary; PCS = Physical Component Summary. ** $p < .01$

4.3.6 Physiological stress indicators

4.3.6.1 Mean heart rate

The participants were divided into high ($n = 43$) and low ($n = 44$) IA groups based on the median split. The main effect for experimental phases ($F(3.81,320.27) = 96.96$, $p < .001$, $\eta^2_p = .54$) was significant. However, the main effect of IA group and the experimental phases x group interaction effects were non-significant (all $p > .05$ and $\eta^2_p < .01$).

Analysis of planned contrasts indicated a significant increase of mean heart rate (HR) from anticipation phase 1 to anticipation phase 3 ($F(1,84) = 12.36$, $p = .001$, $\eta^2_p = .12$) and speech ($F(1,84) = 190.35$, $p < .001$, $\eta^2_p = .69$) and a decrease at recovery ($F(1,84) = 35.48$, $p < .001$, $\eta^2_p = .29$), see Figure 9.

Repeated contrasts revealed a significant successive increase from anticipation phase 2 to anticipation phase 3 ($F(1,84) = 14.66$, $p < .001$, $\eta^2_p = .15$), followed by a decrease from anticipation phase 3 to intervention ($F(1,84) = 9.13$, $p = .003$, $\eta^2_p = .09$), an increase from intervention phase to speech ($F(1,84) = 136.24$, $p < .001$, $\eta^2_p = .61$), and a final decrease from speech to recovery ($F(1,84) = 454.41$, $p < .001$, $\eta^2_p = .84$). Testing the interaction of‘experimental phases x IA group revealed significantly stronger increase of HR from intervention to speech ($F(1,84) = 5.93$, $p = .02$, $\eta^2_p = .06$) in the low IA group followed by significantly stronger decrease from speech to recovery ($F(1,84) = 4.33$, $p = .04$, $\eta^2_p = .05$) in the group as compared to the high IA group.

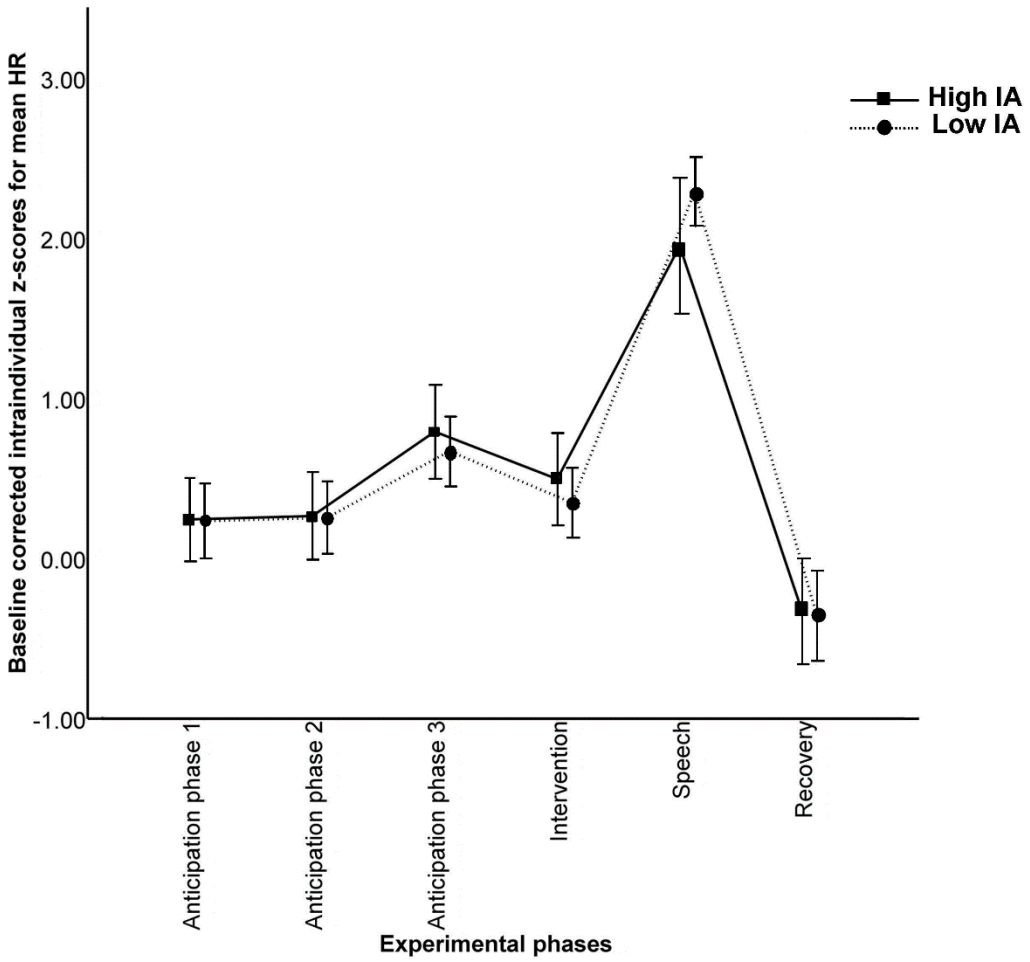

Figure 9 Baseline corrected intraindividual z-scores of mean heart rate for groups with high vs low interoception accuracy. Error bars indicate standard errors.

4.3.6.2 Heart rate variability-low frequency spectrum

For heart rate variability in the low frequency spectrum (HRV-LF), main effect for experimental phases was significant ($F(4.29,360.39) = 4.19$, , $p = .002$, $\eta^2_p = .04$). The group and interaction effects were non-significant (all $p > .05$ and $\eta^2_p < .01$).

Analysis of planned contrasts indicated significant increase of HRV-LF from anticipation phase 1 to anticipation phase 3 ($F(1,84) = 7.21$, $p = .009$, $\eta^2_p = .08$), intervention ($F(1,84) = 4.75$, $p = .03$, $\eta^2_p = .05$), and speech ($F(1,84) = 14.91$, $p < .001$, $\eta^2_p = .15$), see

figure 10. Interaction effect of experimental phases and IA group revealed a significantly stronger decrease of HRV-LF from anticipation phase 3 to intervention phase ($F(1,84) = 7.07$, $p = .009$, $\eta^2_p = .09$) in the low IA group.

Repeated contrasts showed a significant subsequent decrease from speech to recovery ($F(1,84) = 9.15$, $p = .003$, $\eta^2_p = .09$).

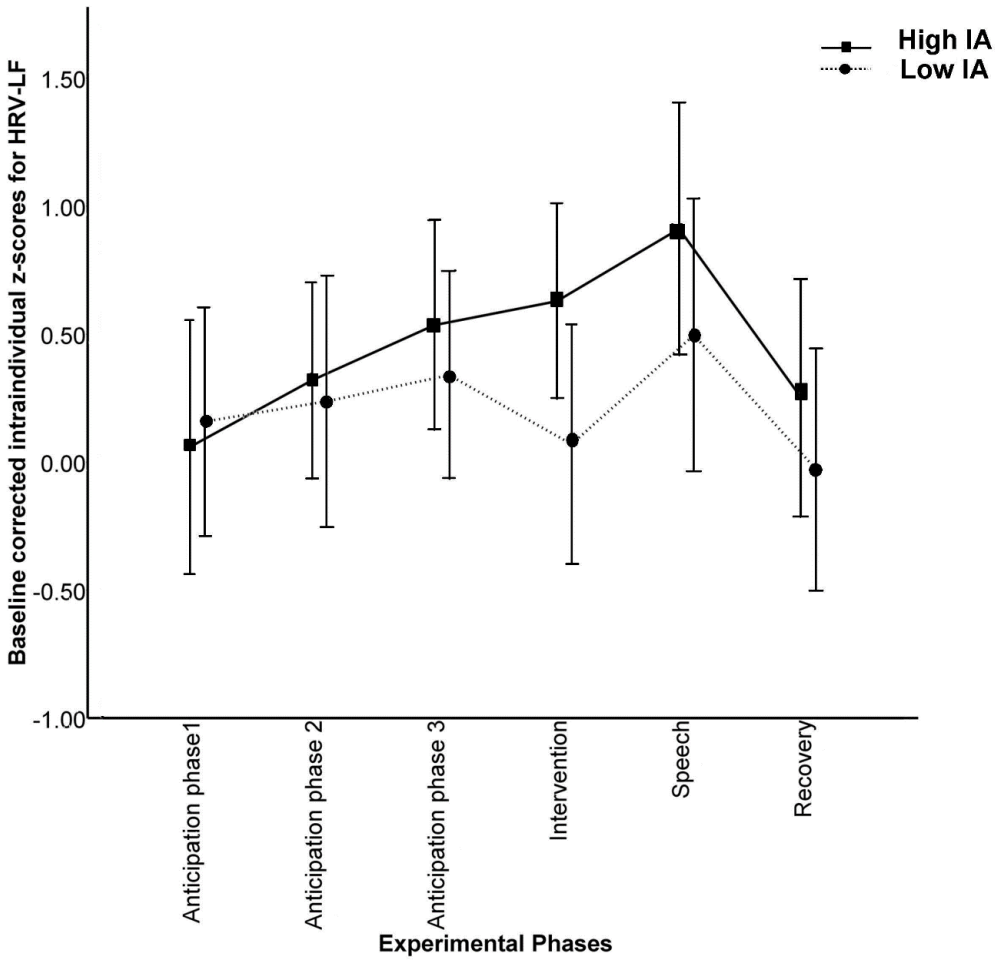

Figure 10 Baseline corrected intraindividual z-scores of heart rate variability in the low frequency spectrum for groups with high vs low interoception accuracy. Error bars indicate standard errors

4.3.6.3 Heart rate variability-high frequency spectrum

For HRV in the high frequency spectrum (HF), main effect for experimental phases was significant ($F(4.33,364.36) = 3.92$, , $p = .003$, $\eta^2_p = .04$) but the group and interaction effects were non-significant (all $p > .05$ and $\eta^2_p < .01$).

Analysis of contrasts indicated significant HRV-HF change (see figure 11) from anticipation phase 3 to intervention ($F(1,84) = 4.49$, $p = .03$, $\eta^2_p = .05$), and speech ($F(1,84) = 14.95$, $p < .001$, $\eta^2_p = .15$). Testing the interaction effects of experimental phases and IA groups revealed a significant increase of HRV-HF from anticipation phase 3 to intervention ($F(1,84) = 6.85$, $p = .01$, $\eta^2_p = .07$) in the low IA group.

Repeated contrasts indicated significant decrease of HRV-HF from intervention to speech ($F(1,84) = 3.90$, $p = .05$, $\eta^2_p = .04$), followed by a significant increase from speech to recovery ($F(1,84) = 9.60$, $p = .003$, $\eta^2_p = .10$).

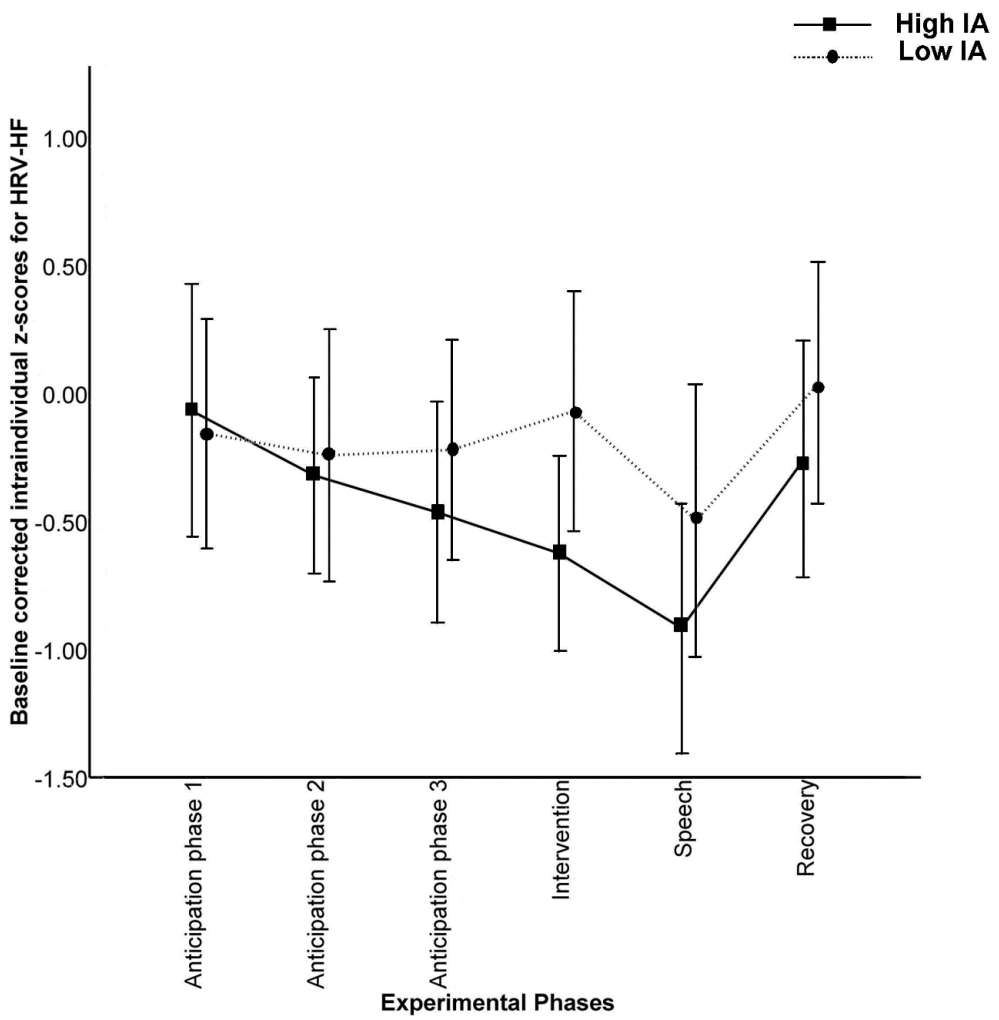

Figure 11 Baseline corrected intraindividual z-scores of heart rate variability in the high frequency spectrum for groups with high vs low interoception accuracy. Error bars indicate standard errors

4.3.6.4 Heart rate variability-low to high frequency ratio

Main effect for experimental phases was observed to be significant ($F(4.19,352.52) = 3.43$, , $p = .008$, $\eta^2_p = .04$). However, main effect for group and interaction effects were non-significant (all $p > .05$ and $\eta^2_p < .01$). Analysis of planned contrast indicated significant change of LF/HF ratio from anticipation phase 3 to intervention ($F(1,84) = 4.43$, $p = .03$, $\eta^2_p = .05$) followed by significant increase from intervention to speech ($F(1,84) = 11.70$, $p = .001$, $\eta^2_p = .12$) as shown in figure 12. Testing interaction effects for experimental phases and IA groups revealed a significant increase of HRV-LF/HF from anticipation phase 3 to intervention ($F(1,84) = 5.60$, $p = .02$, $\eta^2_p = .06$) in low IA group. Repeated contrast revealed a significant successive decrease of LF/HF ratio from speech to recovery ($F(1,84) = 7.68$, $p = .007$, $\eta^2_p = .08$).

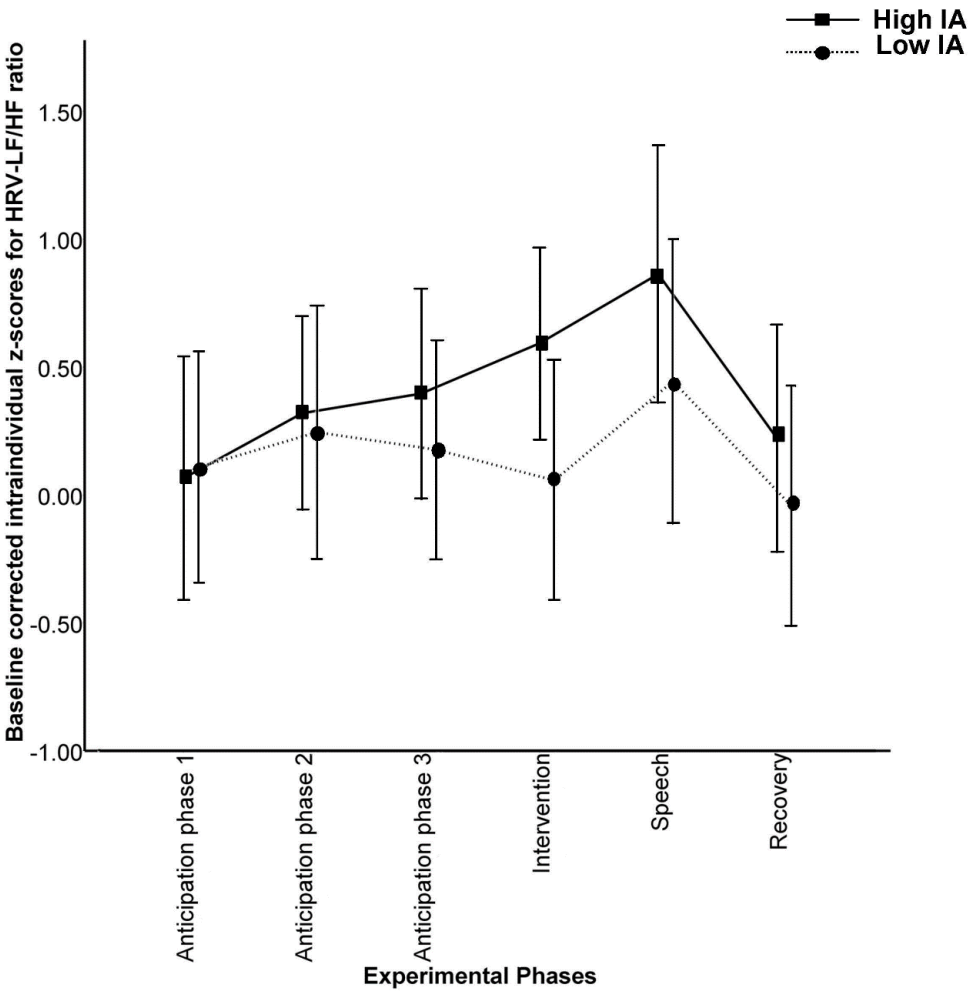

Figure 12 Baseline corrected intraindividual z-scores of heart rate variability-low to high frequency ratio for groups with high vs low interoception accuracy. Error bars indicate standard errors

4.3.7 Psychological stress indicators

4.3.7.1 Anxiety ratings

For high (n = 40) and low IA (n = 47) group, main effect for experimental phases was found significant (F(4.19,352.43) = 17.93, , p < .001, η^2_p = .17). Remaining main and interaction effects were observed to be non-significant (all p > .05 and η^2_p < .01). Analysis of planned contrast indicated significant decrease of anxiety from anticipation phase 3 to intervention (F(1,84) = 4.77, p = .03, η^2_p = .05), followed by an increase from intervention to speech (F(1,84) = 9.27, p = .003, η^2_p = .09) and a decrease from speech to recovery (F(1,84) = 42.55, p < .001, η^2_p = .33) as shown in figure 13. Repeated contrasts revealed a significant increase of anxiety from intervention to speech (F(1,84) = 27.92, p < .001, η^2_p = .25) and a decrease from speech to recovery (F(1,84) = 131.80, p < .001, η^2_p = .61).

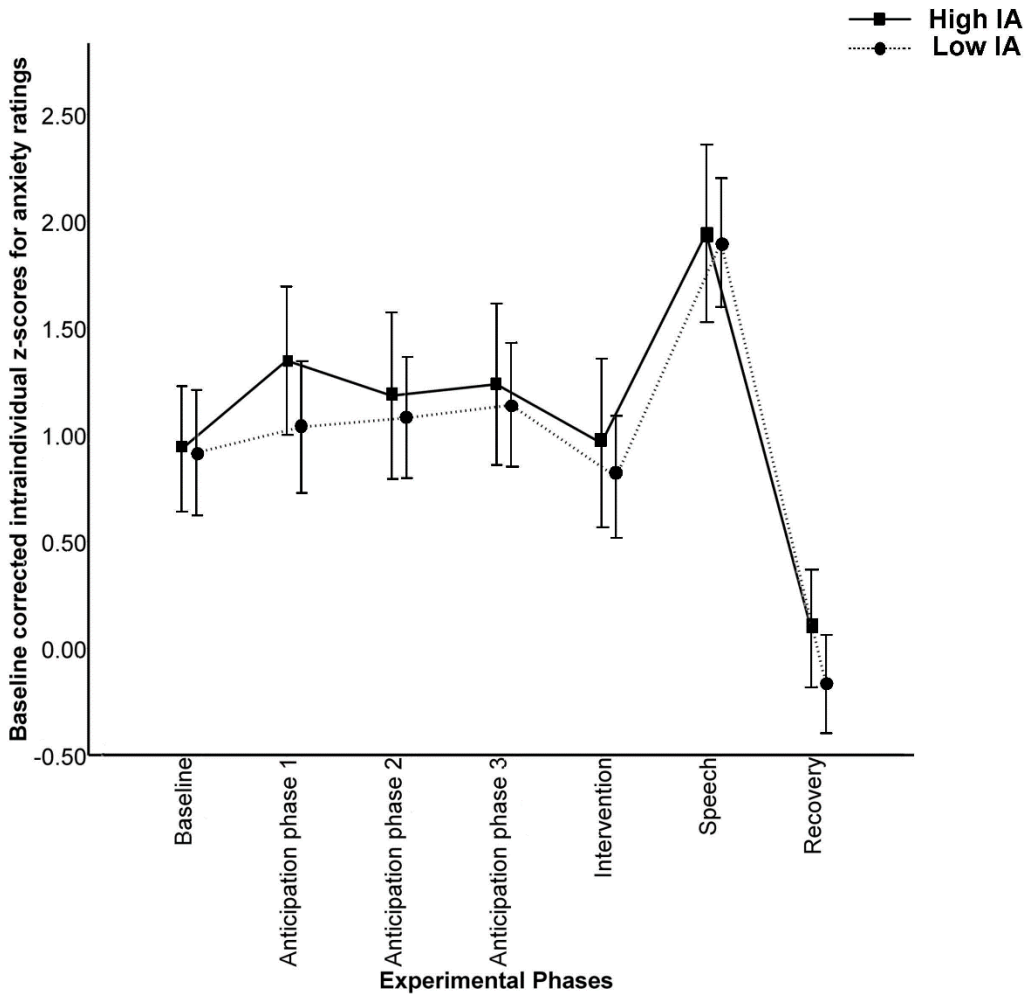

Figure 13 Baseline corrected intraindividual z-scores of anxiety ratings for groups with high vs low interoception accuracy. Error bars indicate standard errors

4.3.7.2 Confidence ratings

For high (n = 42) and low (n = 47) IA group, main and interaction effects were non-significant ($p > .05$). Analysis of planned contrast revealed a significant increase of confidence ratings from anticipation phase 1 to anticipation phase 2 ($F(1,86) = 74.82$, $p < .001$, $\eta^2_p = .55$) and from anticipation phase 3 to intervention ($F(1,86) = 54.21$, $p < .001$, $\eta^2_p = .47$), see figure 14.

Repeated contrasts showed a significant increase of confidence ratings from anticipation phase 1 to anticipation phase 2 ($F(1,86) = 5.84$, $p = .02$, $\eta^2_p = .06$), followed by a decrease from anticipation phase 2 to anticipation phase 3 ($F(1,86) = 6.49$, $p = .01$, $\eta^2_p = .07$), and an increase from anticipation phase 3 to intervention ($F(1,86) = 11.91$, $p = .001$, $\eta^2_p = .12$).

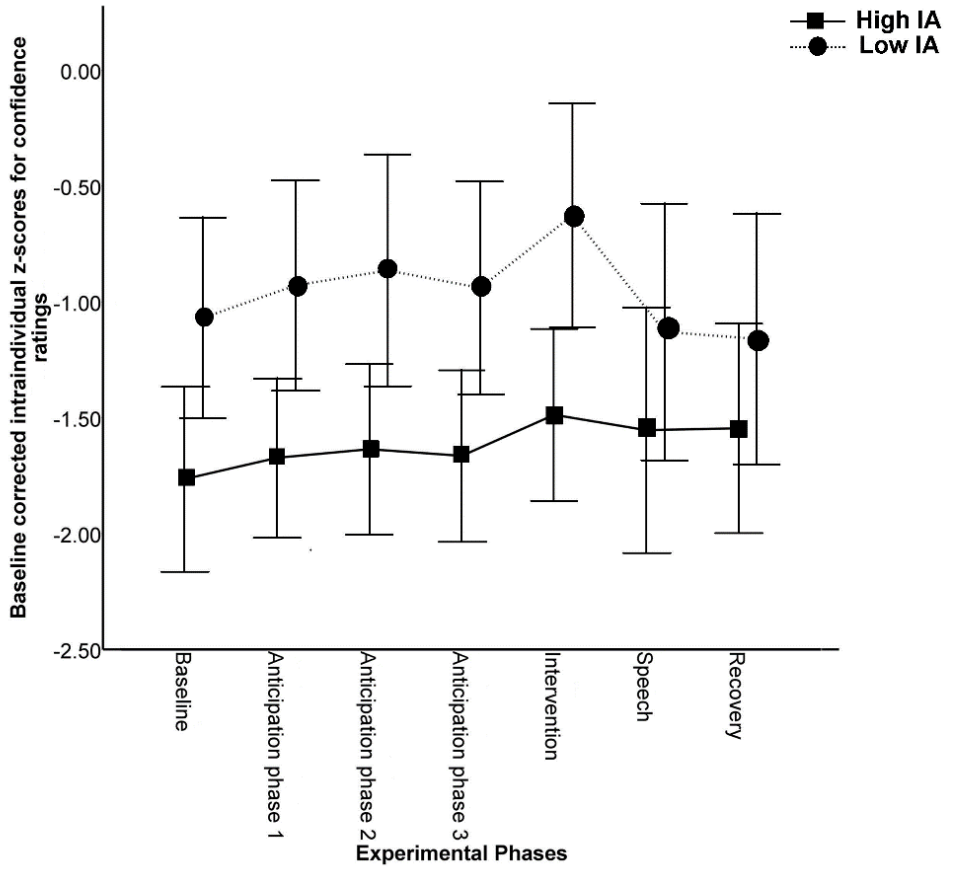

Figure 14 Baseline corrected intraindividual z-scores of confidence ratings for groups with high vs low interoception accuracy. Error bars indicate standard errors

4.3.8 Predictors of physiological variables

Stepwise regression analysis showed that increased HR during anticipation phase 3 was predicted by the emotionality subtest of trait EI (R^2 = 4.8, F(1,85) = 5.34, β = -.24, t = -2.31, p = .02).

Metacognitive awareness predicted changes in mean HR (R^2 = 9.2, F(1,85) = 9.66, β = -.32, t = -3.11, p = .003), HRV-LF (R^2 = 10.1, F(1,46) = 5.18, β = -.318, t = -2.27, p = .02), HRV-HF (R^2 = 9.7, F(1,46) = 4.95, β = .312, t = 2.22, p = .03), subjective anxiety (R^2 = 8.6, F(1,76) = 8.23, β = .31, t = 2.86, p = .005) at actual speech performance. Metacognitive awareness also predicted changes in confidence at anticipation phase 3 (R^2 = 8.5, F(1,48) = 4.43, β = -.291, t = -2.10, p = .04), intervention phase (R^2 = 7.8, F(1,48) = 4.06, β = -.279, t = -2.01, p = .04), and speech (R^2 = 12.3, F(1,48) = 6.73, β = -.351, t = -2.59, p = .01) phases. At anticipation phase 3, decrease in confidence was also predicted by IA (R^2 = 3.6, F(1,87) = 4.24, β = -.21, t = -2.06, p = .04).

4.4 Discussion

In this experiment, differences of individuals with high vs low IA were observed during anticipation and actual performance of as well as following public speaking. It was hypothesized that higher IA might result in increased emotional awareness leading to heightened stress and anxiety in the context of public speaking.

The results showed that participants had increased emotional arousal during public speaking as indexed by physiological parameters such as increased mean heart rate. However, the differences between groups with high vs low IA were not significant. Analysis of planned contrast further showed that mean HR increased in both groups after 14 minutes of anticipation (the last phase of anticipation as the complete anticipation phase was divided into three slots of 6, 8 and 6 minutes respectively) and subsequently further amplified during the actual speech task. A significant drop immediately followed it in mean HR during the recovery phase. The results support that participants might have felt increased workload and stress during the public speaking task and recovered once it was over. These findings support

earlier findings, for example by Knepp and colleagues (2015) who reported high HR and low HRV during a stress task compared to baseline and recovery.

The effect of a social stressor on heart rate variability measures was also in line with previous research showing dominance of sympathetic activity among individuals with high IA as indicated by low HRV in the high-frequency spectrum reflecting weak parasympathetic activation (Dunn et al., 2010). The simultaneous increase in the HRV-LF and decrease in HRV-HF were continuous throughout all the experimental phases (except recovery phase) evincing strong sympathetic dominance (as endorsed by Appelhans & Luecken, 2006; and Thayer & Lane, 2009). The reduced HRV-HF suggested an association with psychopathologies (Friedman, 2007) and predicts the presence of anxiety (Barrett et al., 2004; Domschke et al., 2010; Herbert et al., 2011; Stevens et al., 2011) which was rated high during anticipation and actual performance of the speech in the current study. We also found trends pointing in the expected direction, supporting descriptively that individuals with high IA had a physiological effect (sympathovagal activity) that might turn into a problem when noticed and evaluated as something bad. This suggests that this might comprise a vulnerability for high IA individuals because they are at higher risk to consciously recognize these physiological changes. Of course, the current sample comprised of healthy participants, so high IA might not yet have exerted this effect. Still, there might be a possibility that high IA individuals diverted their attention inward, consciously recognized the physiological changes, evaluated them negatively and got anxious, as is reflected in the non-significant trends. These trends are further in line with findings from Wild & colleagues (2008) reflecting a positive association between high IA and social evaluative fear, particularly during a speech anticipation task. Similar results were also reported by Durlik and colleagues (2013). However, the current finding differs from individuals with social anxiety (Schulz et

al., 2009), suggesting that the current sample had the vulnerability but did not manifest social anxiety (yet).

Although the current results reflect the association between IA and psychopathology as evident from the aroused state during anticipation and actual speech performance tasks, they are contrary to the findings of Fustos and colleagues (2013). The authors showed that IA is the positive predictor of down-regulating emotional arousal. It raises the importance of finding an optimal IA range, which is helpful in maintaining a balanced psychological and physiological state in future researches.

During the experiment, t-VNS remained active during the anticipation phase. No effects were observed due to the stimulation of t-VNS. This is at odds with findings by Clancy and colleagues (2014) and Napadow and colleagues (2012). Both showed positive effects of t-VNS during stimulation as compared to baseline, albeit, in their experiments, no TSST public speaking task was used. One possible explanation for our discrepant findings might be a failure of t-VNS to counteract the effects of acute stress induction with the TSST public speaking procedure as compared to no stressor in the earlier studies (Clancy et al., 2014; Napadow et al., 2012).

Furthermore, it can be useful to compare these effects to the situation of chronic stress, where individuals might attend a chronic distressing event to manage to alleviate its effects. In this situation, individuals adapt their thoughts and adjust their lifestyle according to the stressor and may test if something new or different is suitable or not (e.g. by considering whether the situation is still perceived as uncontrollable and dangerous). However, acute stress does not need any long-term adjustment (Folkman & Moskowitz, 2000). Perhaps that was why t-VNS showed protective effects in the treatment of depression and epilepsy (Fang et al., 2016; He et al., 2013). In addition, the variability of parameters during the application of t-VNS could also be a convincing argument for illustrating such

divergent results. For example, trials with epileptic patients claimed applying t-VNS for 3-4 hours on a daily basis. Likewise, those studies demonstrating successful t-VNS application also applied it for fifteen minutes. Therefore, the application of successful t-VNS ranged from 3-4 hours to 15 minutes. On the contrary, those studies that failed to display such results have applied t-VNS in the range of 15 minutes to 25 minutes (e.g., Burger et al., 2016; Genheimer et al., 2017). However, the only difference was the presence of chronic vs acute vs no stressor that could be the possible reason to support this argument.

Likewise, CR was also used as ER strategy after anticipation and before the actual speech performance task. The main purpose was to help the participants regulate their aroused emotions during the anticipation phase so that their reduced effect could be reflected in their speech. Analysis of planned contrast highlighted a trend towards decreasing subjective anxiety during the ER phase reflecting the positive effect of CR at the cognitive level (self-report measure) on negative emotion (Ray et al., 2010; Szasz et al 2011). However, CR did not immediately lower the physiological responses as indexed by mean HR, HRV-LF, and HRV-HF explicating sympathetic dominance particularly in the high IA group. Descriptively this again indicated trends supporting the possibility of a physiology based vulnerability among high IA individuals.

The idea of differences in coping with a chronic vs an acute stressor is also applicable to the current findings of CR. Both high vs low IA groups showed that CR was helpful only during the time frame in which it was applied as indicated by reduced mean HR and subjective ancxiety. On the other hand, lower sympathetic activity was significant in the low as compared to the high IA group during the intervention phase in which CR was applied. this indicates a relationship between CR and vagally mediated HRV particularly in low IA individuals. However, the positive effect of CR (either for both groups in terms of mean HR and subjective anxiety or for individuals with low IA in terms of HRV) had no effects on the

subsequent public speaking task. It is also in accordance with the possibility that CR is effective only in long-term stressful situations rather than acute (Cray et al., 2010; Szasz et al., 2011). On the other hand, there are several studies that support the immediate positive effects of CR in acute psychosocial laboratory tasks (e.g., Aldao & Nolen-Hoeksema, 2012; Gruber et al., 2012). Moreover, Sheepes and colleagues (2007, 2009) reported less effectivity of CR during high-intensity emotions. Perhaps, the TSST public speaking task in the current experiment resulted in highly intense emotions during acute psychosocial stress that could not be reduced by CR effectively.

High IA, particularly in panic patients, has detrimental effects in terms of difficulty in decision making (Wölk et al., 2014) while on the other side healthy individuals with high IA are better ignoring task-irrelevant emotional cues (Sütterlin et al., 2013). These findings could give an explanation for the current results. Maybe, during the experiment, individuals faced difficulty in making decisions (i.e., use of CR) and might have perceived CR as a task-irrelevant cue therefore successfully ignored it by preparing for the upcoming speech task. The current sample, however, was comprised of healthy participants and the low IA group did also not show any effect of the CR. Therefore, it could be assumed that both high vs low IA individuals were vulnerable to heightened anxiety when in an intensified emotional situation (anticipation of and performing actual speech task).

Apart from the experimental findings, results from the self-report measures (only administered before the experiment) revealed interesting outcomes such as those who were high on IA had more self-control, less difficulty in identifying feelings, had high metacognitive awareness and showed better physical and mental component summaries of HRQoL. These findings are in line with previous findings highlighting that internal sensational awareness facilitated the down-regulation of emotions (Fustos et al., 2013; Garfinkel, et al., 2014) by timely identifying the changes and taking appropriate

counteractions. For instance, improved self-control during distressing situations leads to better HRQoL as evident from the better mental and physical component summaries of high IA individuals. It validates Dunn and colleagues' (2007) findings that showed an inverse relationship between psychopathology and high IA. However, it may also implicate the role of IA in the downregulation of emotions only in the absence of any acute stressor and suggesting that the beneficial effects of high IA as evident from the pre-experimental subjective assessment should be validated via post-experimental subjective assessment.

Moreover, the current study also identified individual differences in terms of high vs low trait EI. The analysis prompted that those low in trait EI were high on expressive suppression, alexithymia, and anxiety. The findings relate to earlier evidence (Grieve & Mahar, 2010; Parker et al., 2001; see also Schutte, Manes, & Malouff, 2009; Ochsner & Gross, 2008) suggesting that lack of emotional information might create problems in identifying and describing feelings appropriately. Besides, trait EI was found to be significantly positively associated with metacognitive awareness and mental component summary of HRQoL, which is in accordance with Schneider and colleagues' (2013) findings revealing the role of trait EI in the prevention of emotional maladjustment. It is in accordance with earlier findings suggesting that higher EI lead to better mental and physical health as well as well-being (Slaski & Cartwright, 2002; 2003; Mayer, Salovey, & Caruso, 2000). It further explains the role of trait EI in ER (supporting Kotsou et al., 2011; Laborde et al., 2011) by elucidating the fact that emotional awareness and management will increase confidence regarding accurately estimating the internal physiological states suggesting the utilization of emotional information intelligently (Ciarrochi et al., 2006).

The correlation analysis indicated no relationship between IA and trait EI suggesting that the two constructs (IA and trait EI) might work independently of each other. Previous

evidence showed that IA influences emotion perception and regulation (Garfinkel et al., 2015; Okon-Singer et al., 2014) which are two basic elements of trait EI. Moreover, Fustos and colleagues (2013) indicated that IA down-regulated aroused emotions particularly using CR. The current findings, however, explain that there could be a possibility that an individual may be proficient in IA but low in trait EI that is opposite to the supposition that combination of high IA and high trait EI would be beneficial in dealing with stress. Both IA and EI represents two different dimensions (physiological vs psychological respectively) therefore, it might be the case that there exists an optimal range of these construct for proficiency and efficiency in stressful situations. Hence, future studies should further explore these connections.

Stepwise regression analysis to check the predictive value of psychological variables in predicting physiological changes indicated that the emotionality subscale of trait EI strongly predicted the increase in mean HR from baseline during the last phase of anticipation. Emotionality refers to emotional perception and expression and suggests that individuals high on emotionality might have perceived their internal physiological states (particularly in the last phase of anticipation when the stress might have heightened). This might have increased their involvement and preparatory activation as indexed by increased HR. Of note, the current study did not show any association of mean HR and subjective anxiety ratings. This discrepancy may be an interesting target for future studies to investigate what exactly may be responsible for the development of anxiety in this situation. The cognitive model of social anxiety would suggest, it is a cognitive interpretation of emotional arousal and/or increased HR as a sign of threat. An interesting approach for examining this prediction is provided by predictive coding theory (Barrett & Simmons, 2015; Friston, 2005; Summerfield & de Lange, 2014) suggesting that initial information (e.g. inducing a negative evaluative focus on heart rate in a subsequent experimental session similar to the current

study 2 protocol) might change the priors for processing emotional and physiological information, and therefore might trigger the emanation of anxiety in the given situation.

Moreover, other than trait EI subscales, metacognitive awareness was the main predictor of change occurring in mean HR, HRV-LF, HRV-HF, subjective anxiety and confidence ratings during the actual speech task. It can be inferred that the more the person is confident about knowing the physiological changes, the higher would be the stress reactivity as indicated by high mean HR, HRV-LF, subjective anxiety and lower HRV-HF, and confidence during the speech task again supporting a positive relationship between high IA and stress (Dunn et al., 2007; Domschke et al., 2010; Herbert et al., 2011). Interestingly our results showed that metacognitive awareness was particularly high in individuals with low IA. Considering the above-mentioned literature, this may suggest that metacognitive awareness is a cognitive construct that is linked to unfavorable metacognitive information processing of distress signals.

All the participants in the experimental study were healthy volunteers. Previous research on social anxiety has observed significant subjective anxiety among speech anxious, socially phobic and healthy individuals. For example, Levin, and colleagues (1993) demonstrated that speech anxious individuals were high on anticipatory anxiety and showed increased heart rate when compared with healthy controls and generalized social phobia. Similarly, in Hofmann, Gerlach, Wender, and Roth (1997), generalized social phobia reported higher subjective anxiety in the public speaking task as compared to healthy controls. Following that Blöte, Kint, Miers and Westenberg (2009) have explained in a meta-analysis that speech anxiety has its separate place among different subtypes of social anxiety. As our study showed no differences of subjective as well as social anxiety between high vs low IA groups. Perhaps, the high subjective anxiety and physiological arousal were due to

the presence of speech performance anxiety among the participants. Future studies should assess the fear of social anxiety on a continuum of generalized, non generalized and speech anxious groups.

The present study highlighted the difference of coping responses towards highly stressful situations such as anticipation and speech task. The results highlight an interesting trend that high IA could predispose a person towards high anxious arousal and subsequent anxiety disorder as evident from the higher subjective anxiety and low HRV-HF. However, it has some limitations. The application of t-VNS did not appear to be effective in reducing sympathetic dominance. To confirm the difference between chronic and acute stressors, future studies should compare the implementation of t-VNS in acute vs chronic contexts of the stressor but with similar parameters. In addition, as mentioned by Badran and colleagues (2018) that cymba conchae may have 100% of ABVN but the innervations of ABVN fibers have also been noticed in the tragus (location on the anterior wall of the external ear). It is suggested that the t-VNS, if applied on tragus (rather cymba conchae), may come out to be successful.

Moreover, the CR applied did not prove to be efficacious in alleviating the aroused physiological symptoms during anticipation and performance of speech task. Blechert and colleagues (2012) gave one possible explanation regarding CR by highlighting that reappraisal may only work for stimuli encountered multiple times. This emphasizes the impact of the habitual use of CR for successful results. It might, therefore, be useful to recruit two groups based on habitual and non-habitual use of CR as an ER strategy. This may help to extract significant group differences. Krohne (2001) also pointed out that the imminence of the stressful event determined the pattern of appraisal; for example, controllable situations elicited appraisal of stressful situations as “challenging”. Moreover, Kever and colleagues (2015) reported that IA facilitated the selection and implementation of

the habitual use of CR. Following that proposition, future studies should focus on these elements to explore the possible effectiveness of CR in laboratory settings.

General Discussion

The present research examined the effects of trait EI and different procedures for coping with psychosocial stress in a multivariate approach. In addition, a cross-cultural perspective was applied, particularly focusing on differences between Germany and Pakistan, representing an industrialized, secular individualistic culture rooted in Christian traditions versus an only newly industrialized, more collectivistic country where everyday culture is permeated by Muslim and related religious beliefs.

Along these lines, study 1 was a cross-cultural and cross-sectional survey to understand the relationship between low trait EI and poor physical and mental component summaries of HRQoL, and potential mediators such as metacognitive beliefs about uncontrollability and danger as well as negative coping mechanisms. The relationship between metacognition about uncontrollability and danger with negative coping mechanisms has been previously established, as evident from the metacognitive model of GAD (Cartwright-Hatton & Wells, 1997; Coles & Heimberg, 2005). However, the present study applied the metacognitive model on individuals suffering from CHF with the addition of trait EI and HRQoL. In addition, the study is unique in examining differences of these associations including possible moderating effects between cultures (Germany and Pakistan). Moreover, the study also explored the roles of cultural factors namely religion and social support in relation to trait EI and HRQoL.

Study 2 was designed to examine psychosocial stress reactivity in a laboratory experiment. The well-known TSST public speaking task was used as a psychosocial stressor. To cope with the effects of this stress-induction, a novel technique named t-VNS was applied to control sympathetic dominance during anticipation of the stress. Notably, it was hoped that t-VNS could serve as a culture-independent mechanism for dealing with stress.

Additionally, CR was used to reappraise negative thoughts created during anticipation of the speech. Furthermore, the overall effects of the psychosocial stressor along with the coping mechanisms (both physiological and psychological) were studied in individuals with high vs low IA. It was hypothesized that high IA individuals would have more physiological arousal and subjective anxiety as compared to low IA individuals. Thus, the TSST public speaking task was applied in combination with t-VNS and CR on high vs low IA individuals to assess stress reactivity.

In summary, study 1 focused predominantly on correlates of a chronic stressor whereas study 2 intended to examine coping strategies to counteract an acute stressor. As an overarching topic, the role of trait EI was examined as a potentially protective resource that might support both, dealing with acute and chronic stress.

Overall, this research has shown that the *appraisal of the context* (chronic vs acute) made a great difference. The context was both influenced by culture and a situation's frame of reference such as chronicity/acuity of the illness/situation. Study 1 revealed that individuals suffering from CHF might have continuous deteriorating effects if they considered their illness as uncontrollable and dangerous. This is in line with Segerstrom and Miller's (2004) findings that chronic stress usually has detrimental effects on health. Perception of stress as uncontrollable and dangerous contributed substantially to the selection of negative coping strategies in both Germany and Pakistan, thus validating the metacognitive model universally. On the other hand, the selection and implementation of specific coping mechanisms were culture-specific. This is in line with Haas (1999) who suggested that cultural values and norms might affect one's perception of well-being, which has been further explained by Krause (2002) in terms of locus of control. Pakistani CHF patients had a greater tendency to use rumination and self-blame when they considered their

illness as uncontrollable and dangerous. In contrast, German CHF patients preferred only rumination when they considered their illness as beyond their control. Moreover, qualitative information showed that the use of religious coping was more common in Pakistani CHF patients as opposed to doing exercise in German CHF patients to prevent CHF-related worry. This reflects a general locus of control, which is internal in German CHF patients as they avoid stressful thoughts related to CHF to remain in a relaxed state (Buetow et al., 2001). However, in Pakistani CHF individuals, the locus of control is mostly external as they seek help from religion instead of selecting self-efforts to cope with the stress. Moreover, in terms of negative coping strategies Pakistani CHF patients blame oneselve which is again counter-productive as they search for reasons instead of solutions to cope with the situation. In summary, it can be concluded that contextual appraisal of a situation is highly influenced by cultural beliefs and practices.

In study 2, several findings were not significant but on a trend level they pointed into an interesting direction that is highly consistent with influential theoretical models such as the cognitive model of social anxiety by Clark and Wells (1995). Therfore, we tentatively interpret them for hypothesis generation. These results suggest that high IA individuals responded with higher physiological arousl and subjective anxiety to anticipation and performance of public speaking. This may indicate a physiological vulnerability for developing social anxiety disorder. Their increased interoceptive accuracy may lead to earlier or stronger detection of physiological symptoms during anticipation of public speaking. When these symptoms are interpreted as potentially threatening and this leads to avoidance, operant conditioning could well explain the development of (generalized) avoidance of situations that are expected to lead to social stress (Wild et al., 2008). However it should be noted that earlier literature also showed protective effects of IA. Therefore, IA could also facilitate protective compensatory coping in individuals who have adequate

strategies available. Hence, high IA could be used as a tool to identify idnviduals who might benefit from preventive treatment to deal with potential issues of emerging social anxiety.

The participants in study 2 showed a tendency for high subjective anxiety during the initial phase of anticipation and an increase of mean HR and decreased HRV-HF particularly in high IA individuals during the last phase of anticipation. These differences of psychological and physiological changes may signal the conscious effort to distract attention from the stressful situation despite continuous unconscious and uncontrollable physiological processing as evident from increased mean HR. This unconscious processing may have become more consciously accessible with an increase in the stressor intensity. This might be supported by the perseverative cognition hypothesis according to which stress-related physiological activity is not due to a stressor alone but because of continuous and spontaneous thinking about it (Brosschot, Verkuil, & Thayer, 2010). Williams and colleagues (2017) in a cross-sectional study have explained that vagally mediated HRV and anxiety were mediated by maladaptive rumination reflecting that stress vulnerable individuals (indexed by low resting vagally mediated HRV) are more prone to perseverative cognitions resulting in distressing outcomes.

Moreover, the role of metacognition was found important in the current research. Findings from study 1 suggested that CHF patients (both in Pakistan and Germany) frequently used metacognitions about uncontrollability and danger and had equally high levels of generalized anxiety and worry as assessed by GAD-7 and PSWQ respectively. Maladaptive metacognitions led to the selection of negative coping strategies that contributed to maintenance of their anxieties associated with CHF. In study 2, however, higher metacognitive awareness (i.e. one's confidence in 'knowing' one's internal physiological changes) about IA was associated with higher subjective anxiety, lower

confidence and pronounced physiological indicators of sympathetic dominance as noticeable from high mean HR, and low HRV-HF, during speech anticipation and speech performance. Recently Delahaij and van Dam (2016) showed the effectiveness of metacognitive awareness in a controllable situation (Gilbar, et al., 2010). The results from the present study indicate that uncontrollable situations or having negative information (only) about situations might have aversive effects as evident from increased subjective anxiety during anticipation and speech performance due to increased metacognitive awareness thus validating the relationship between IA and anxiety (as evident from Barrett et al, 2004; Domschke et al., 2010; & Herbert et al, 2011; Stevens et al., 2011).

Regarding trait EI, both studies support its protective role in combating anxiety and maintaining high HRQoL. In the cross-cultural survey (study 1), trait EI was negatively associated with anxiety, worry, and depression in both countries. It also predicted HRQoL in Pakistani CHF patients whereas only physical component summary of HRQoL in German CHF patients thus validating the earlier findings (Mikolajczak, et al., 2015; Schutte et al., 2007). The results from study 1 also demonstrated the selection of positive coping strategies in the presence of high trait EI in Pakistani CHF individuals. Whereas an inverse relationship of neutral coping mechanism (need for social support) was found significant in German CHF individuals. It represents them being less dependent on family as a source of support and validates the hypothesis of internal locus of control, which is also evident from the findings of religious and social support as coping resources. In a similar fashion, study 2 also underscored the beneficial effects of trait EI by suggesting its negative association with alexithymia, expressive suppression, GAD and social anxiety. Overall, the efficacious and pragmatic role of trait EI indicates that it supports individuals in adapting to maladaptive emotional states (Schneider et al., 2013) by increasing awareness and reducing irrational thoughts (Petrides et al., 2017). In the presence of high trait EI an individual can utilize the

emotional information constructively (Ciarrochi et al., 2006) and increase the perceived control, hence consider an unpredictable and novel situation as challenging instead of threatening (Mikolajczak., et al 2007). Trait EI also reflects an individual's personal flexibility which is reflected in high HRV in high trait EI individuals (Laborde et al., 2011), which is in line with the assumed effect of trait EI on ER (Kotsou et al., 2011).

In terms of all the coping strategies applied the results from study 2 failed to show their pronounced protective effects. For instance, the application of t-VNS along with CR did not manage to minimize the sympathetic activity during anticipation and actual speech performance. Among various other possible reasons such as context and parameters to consider, the general characteristics of an individual such as personality, personal goals, motivation, control and imminence of a stressor might have contributed to these reduced effects. Krohne (2001) suggested that these individual factors might determine the specific pattern of appraisal and hence coping. Chang (2001) has suggested that personal flexibility helps an individual to handle stress according to the situation and demands. It also validated the current findings considering IA, metacognitions, chronic vs acute stressor and cultural resources and demands.

The present study has also underlined the importance of comorbid factors associated with CHF particularly anxiety and depression. It has been evident from the experiment (study 2) that anxiety is associated with low HRV particularly in the high-frequency spectrum. Similarly, the patterns of high HR and low HRV in depression may have prognostic significance for heart patients. Carney, Freedland, Stein, Skala, Hoffman, and Jaffe (2000) in a sample of patients with angiographically coronary artery diseases observed that after applying extensive cognitive behavior therapy (CBT), severely depressed individuals showed low HR and an increase in short term HRV, especially during daytime.

The mean HR of the severely depressed patients reduced by nearly 5 beats per minute post-CBT (as opposed to 10.7 beats/minutes following beta-blocker therapy) and that was entirely because of the psychological intervention. This highlights the importance of providing psychological support alongside pharmacotherapy and stresses the significance of treating comorbid disorders such as depression in patients with cardiac disease. Perhaps applying a similar methodology in patients with CHF would be beneficial for the improvement of their health.

5.1 Limitations and future suggestions

The current research is not without limitations. With increasing globalization, societies are changing abruptly. The number of immigrants particularly towards European countries and American states are increasing mainly for achieving a better quality of life. However, this increased number of migrants have escalated the issues related to acculturation. Consequently, the societies are being influenced and changing rapidly resulting in multi-cultural societies with an amalgamation of cultural characteristics from both the country of origin and host country. For a smooth and flexible adjustment of immigrants in the host country, more cultural studies are needed to improve understanding of major cultural beliefs and characteristics. Currently, most of the measures to assess important psychological issues are based on western societies as evident from the results of the current study, which has revealed that Pakistani and German CHF patients differ in the perception of HRQoL as assessed by the SF-36 questionnaire. These issues highlight the necessity to develop trans-cultural self-report questionnaires to accommodate all basic characteristics of the societies studied for cross-cultural comparison.

Associated with this issue are the difficulties carrying out cross-cultural research. Cultural comparison studies especially comparing developing and developed countries are

hard to do. There exist remarkable infrastructural differences, which could simultaneously facilitate or hinder any ongoing research process in developed vs developing countries respectively. Future studies need to acknowledge these associated issues (such as availability of detailed information on patient's diagnosis, current state, and prognosis) more.

Moreover, future studies should also encourage dimensional approaches in laboratory studies. The use of dimensional methods in laboratory experiments helps to examine participant's responses beyond categorical and factorial levels. For example, study 2 should be replicated acknowledging the dimensional nature of interoception. This will increase not only an understanding of the optimum level of interoception but may also indicate the relevant extent of the effectivity of interoception. Moreover, future studies should focus on using both qualitative and quantitative methods that could help explore various unknown and unreported cultural factors related to coping with stress. Similarly, studies using questionnaires and experimental approaches for the same samples could further help to elucidate stress reactivity related to psychosocial stressors at dimensional and categorical levels.

Furthermore, experimental studies in relation to trait EI should be planned utilizing the information from both qualitative and prospective studies to draw inferences approaching causality. For example, experimental studies showed context-dependent stress-buffering effects of trait EI (Laborde et al., 2011; Mikolajczak, et al., 2007). Moreover, in comparison with self-report measures, weak positive relationships between trait EI and objective measures of physiological stress have been found (Lea, Davis, Mahoney, & Qualter, 2019). This highlights the need to examine context-dependency of the effectiveness of trait EI for regulating stress on different dimensions of emotion (Lang, 1995).

It should also be the focus of future studies to examine complex multivariate models in cross-cultural studies. This will help to resolve the problems of missing data (variables),

which is obvious in large cross-sectional and multi-centered studies. Furthermore, it will help identify additional factors that are possibly not covered with simple classical models.

Finally, the clinical CHF sample consisted of a heterogeneous group with patients from all etiologies and all NYHA classes. Future studies should differentiate separate categories of CHF based on various etiologies as well as NYHA class to see if there are any differences due to functional class levels of CHF individuals in reference to trait EI, metacognition, and coping mechanisms. For example, Fotos and colleagues (2012) indicated low HRQoL in patients at stage IV of NYHA class. However, their data were homogeneous as they recruited NYHA stage III and IV patients. In line with this, community samples should also be included in the studies along with reducing the differences created by private and government hospitals in countries like Pakistan.

5.2 Conclusion

The current findings support the overall protective role of high trait EI in maintaining high mental and physical component summaries of HRQoL both in case of chronic or acute stressors. In addition, an important role of metacognitive knowledge emerged for the selection of coping mechanisms and in responding towards heightened anxiety. These results also support the validity of the metacognitive model across cultures. Additionally, the current research suggests that increased IA may comprise a physiological vulnerability for developing social anxiety disorder and may be used as a tool to identify and prevent emerging social anxiety. Finally, the current results also revealed major cultural differences, in particular concerning the selection of specific strategies for coping with distress. This underlines the importance of considering culture specific differences when planning treatments to improve coping with a chronic disease such as CHF.

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Declaration of Academic Integrity

I hereby confirm that the present thesis "Coping with Psychosocial Stress: Examining the Roles of Emotional Intelligence and Coping Strategies in Germany and Pakistan" is the result of my own independent scholarly work, and that in all cases material from the work of others (in books, articles, essays, dissertations, and on the internet) is acknowledged, and quotations and paraphrases are clearly indicated. No material other than that listed has been used.

I have read and understood the Institute's regulations and procedures concerning plagiarism.

_____

Signature

Eigenständigkeitserklärung

Hiermit versichere ich, dass ich die vorliegende Bachelorarbeit "Coping with Psychosocial Stress: Examining the Roles of Emotional Intelligence and Coping Strategies in Germany and Pakistan" selbstständig verfasst habe.

Ich versichere, dass ich keine anderen als die angegebenen Quellen benutzt und alle wörtlich oder sinngemäß aus anderen Werken übernommenen Aussagen als solche gekennzeichnet habe, und dass die eingereichte Arbeit weder vollständig noch in wesentlichen Teilen Gegenstand eines anderen Prüfungsverfahren gewesen ist.

_____

Unterschrift

Appendix

A. Ethics Permission for Study 1

B. Patient Information and Consent Form-Study 1

C. Ethics Permission for Study 2

D. Participant's Information and Consent Form 1 (Study 2)

E. Participant's Information and Consent Form 2 (Study 2)

-) Abl -) Kopie Ltr

Julius-Maximilians-
UNIVERSITÄT WÜRZBURG

Ethik-Kommission
bei der Medizinischen Fakultät

KOPIE

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Lehrstuhl für Psychologie I der Universität
Marcusstr. 9-11
97070 Würzburg

EINGEGANGEN

Erl.

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Geschäftsführer: Dr. R. Wöffel
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Würzburg, 22.03.2016

unser Zeichen: **44/16** (bitte bei Schriftwechsel angeben)

Beratung nach § 15 Berufsordnung für Ärzte in Bayern

Studientitel: Emotional Intelligence as a Predictor of Quality of Life in Chronic Heart Failure: A Cross Cultural Study
Antragsteller: Prof. Dr. Dipl.-Psych. Paul Pauli, Lehrstuhl für Psychologie I der Universität, Marcusstr. 9-11, 97070 Würzburg

Sehr geehrter Herr Prof. Pauli,

die Ethik-Kommission hat Ihren Antrag vom 05.02.2016 auf der Basis der Unterlagen in Anhang 1 geprüft und in der Sitzung am 23.02.2016 beraten.

Die Ethik-Kommission erhebt keine Einwände gegen die Durchführung der Studie.

Allerdings empfiehlt sie, folgende Hinweise zu beachten:

Patienteninformation

Fachbegriffe sollten laienverständlich erklärt werden: prädiktive/determinierende Faktoren.

Statt das Bundesdatenschutzgesetz anzuführen, sollte auf "geltende Datenschutzbestimmungen" verwiesen werden.

Generell sollten in den Ausführungen zum Umgang mit den Daten, sofern nicht bereits gelistet, folgende Punkte angeführt sein: Angaben zur Datenspeicherung (was, wo, in welcher Form [pseudonymisiert/anonymisiert erklären]), wer hat Zugang, wer ist verantwortlich, erfolgt eine Weitergabe (Brandenburg nach Würzburg?), wenn ja an wen und in welcher Form, Veröffentlichung der Daten in welcher Form, Dauer der Datenspeicherung, was passiert mit den Daten bei einem Widerruf bzw. nach regulärer Lagerungsdauer etc. Die Ethik-Kommission empfiehlt am Ende der Speicherdauer oder bei einem Widerruf die Daten zu anonymisieren statt diese zu löschen.

Einwilligungserklärung

Diese sollte ebenfalls den Studientitel gemäß Antrag anführen.

Am Ende fehlt die Bestätigung des aufklärenden Arztes/Mitarbeiters über die Aufklärung.

Fragebogen Baseline T0: Die Notwendigkeit zur Erfassung des Geburtsmonats ist nicht erkennbar. Ebenso die Erfassung des exakten Tages für Labor und EKG. Hier wäre ebenfalls eine Erfassung eines Monatszeitraumes, innerhalb dessen diese Untersuchungen stattgefunden haben, ausreichend. Zudem ist

nicht klar erkennbar, ob nun im Rahmen der Studie diese Untersuchungen ggf. nachgeholt werden müssen, sofern vorhandene Daten in den Krankenunterlagen älter als drei Monate sind. In diesem Fall wären entsprechende ergänzende Angaben in der Patienteninformation notwendig.

Der Ethik-Kommission ist die Stellungnahme bzw. sind die geänderten Unterlagen in elektronischer Form vorzulegen. Hierbei ist darauf zu achten, dass mit den geänderten Unterlagen eine Version vorgelegt wird, aus der alle Änderungen (Streichungen/ Änderungen/Ergänzungen) klar hervorgehen. Nutzen Sie hierzu nach Möglichkeit die in gängigen Textverarbeitungsprogrammen verfügbare Funktion "*Änderungen nachverfolgen*".

Allgemeine Hinweise:
Sie werden um Beachtung folgender Punkte gebeten:
- Ihrem Antrag entsprechend vorzugehen. Änderungen hierzu sind der Ethik-Kommission zur erneuten Prüfung vorzulegen.
- Die Deklaration des Weltärztebundes in der aktuellen Version hinsichtlich der ethischen und rechtlichen Aspekte biomedizinischer Forschung am Menschen zu beachten.
- Der Ethik-Kommission das Studienende anzuzeigen und einen Kurzbericht über das Ergebnis der Studie vorzulegen.

Entsprechend der ausschließlich beratenden Funktion der Ethik-Kommission betrifft unser Votum nur die ethische Beurteilung des Projektes. Die ethische und rechtliche Verantwortung für die Durchführung dieser Studie verbleibt bei den Untersucherinnen/Untersuchern.

Die Ethik-Kommission wünscht Ihnen für Ihr Vorhaben viel Erfolg.

Mit freundlichen Grüßen

Prof. Dr. med. Eva-Bettina Bröcker
Seniorprofessorin
Vorsitzende der Ethik-Kommission

Ausgefertigt im Auftrag

Dr. med. Reinhard Wölfel
Geschäftsführer der Ethik-Kommission

Anhang 1
Antrag vom 05.02.2016
ASI- DEUTSCH VERSION.pdf
Baseline.pdf
BDI DEUTSCH VERSION pdf
Consent form.pdf
GAD-7 DEUTSCH VERSION.pdf
meta Kognition Fragebogen.pdf
PSWQ- DEUTSCH VERSION.pdf
SF-36 FINAL QUESTIONNAIRE. revised - Copy.pdf
SVF 120.pdf
TEIQue German version.pdf
WSI.pdf
ASI Urdu Version
Baseline
BDI-Urdu Version
GAD Urdu Version
MCQ Urdu Version
Patient information
PSWQ Urdu version
SF-36 Urdu Version
SVF Urdu Version
TEIQue Urdu Version
WSI Urdu Version
Signatures of Supervisors and applicant.PDF
Study 1 Application form for Ethical Committee.pdf
Study 1 Protocol.pdf
CPE Institute of Cardiology Multan, Pakistan.PDF
signed form.PDF
Permission (Pof Dr Oliver Ritter).pdf
Signatures of Supervisors and applicant.PDF
Signed form from Pof Dr Oliver Ritter.pdf

Julius-Maximilians-
UNIVERSITÄT
WÜRZBURG

Lehrstuhl für Psychologie I
Biologische Psychologie, Klinische Psychologie und Psychotherapie
Vorstand: Prof. Dr. Paul Pauli

Patienteninformation

Name der Studie: Emotionale Intelligenz als Prädiktor für die Lebensqualität bei chronischem Herzversagen: Eine interkulturelle Studie
Projektleiter: Dr. Stefan M. Schulz
Versuchsleiterin und Co-Projektleiterin: Hina Ghafoor
Supervision der Studie: Prof. Dr. Paul Pauli
Ansprechpartnerin für alle Fragen zur Studie, Datenschutz, etc.:
Hina Ghafoor, Marcusstr. 9-11, 97070 Würzburg,
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Email: hina.ghafoor@stud-mail.uni-wuerzburg.de

Sehr geehrte(r) Patient(in),

Sie haben hiermit die Gelegenheit an einer interkulturellen Vergleichsstudie zur Rolle der emotionalen Intelligenz im Umgang mit chronischem Herzversagen teilzunehmen.

Zweck und Ablauf der Untersuchung

Unter emotionaler Intelligenz versteht man die Fähigkeit, eigene und fremde Gefühle (korrekt) wahrzunehmen, zu verstehen und zu beeinflussen. Das Hauptziel dieses Forschungsprojekts ist es, kulturelle Unterschiede zwischen Pakistan und Deutschland in Bezug auf Emotionale Intelligenz als prädiktiven/determinierenden Faktor der Lebensqualität von Personen mit chronischer Herzkrankheit zu untersuchen. In der aktuellen Studie werden Sie daher gebeten eine Reihe psychologischer Fragebögen auszufüllen, um einen Überblick über Persönlichkeitseigenschaften, die Emotionale Intelligenz, Umgang mit beunruhigenden Situationen, damit evtl. zusammenhängende Besorgnis (z.B. das Ausmaß depressiver Verstimmung), persönliche Angaben (z,B, Alter, Familienstand), sowie Ressourcen und Bewältigungsstrategien zu erhalten, die den Umgang mit einer chronischen Herzerkrankung beeinflussen könnten. Das Ausfüllen der Fragebögen dauert ungefähr 2 Stunden.

Die gewonnenen Informationen werden das Verständnis der Rolle emotionaler Intelligenz im Umgang mit chronischer Herzerkrankung verbessern und für die weitere Optimierung der Behandlung von Herzpatienten hilfreich sein.

Während des Ausfüllens der Fragebögen könnte eine Frage oder Antwortmöglichkeit auftauchen, die Sie als unangenehm, erschütternd oder anderweitig fragwürdig empfinden. Manche Fragen könnten dazu anregen, über negative emotionale Begebenheiten nachzudenken. Sie haben das Recht, solche Fragen auszulassen und ggf. die Untersuchung abzubrechen, ohne dass Ihnen daraus Nachteile entstehen. Wir bitten Sie aber dennoch, auch diese

Würzburg,

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Hochschulambulanz für Psychotherapie
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Fragen soweit möglich zu beantworten und die Fragebogen vollständig auszufüllen.

Datenschutz

Bei dieser Studie werden persönliche Daten erhoben. Diese Daten unterliegen der Schweigepflicht. Erhebung, Weitergabe, Speicherung und Auswertung dieser Daten erfolgen nach den gesetzlichen Bestimmungen des Bundesdatenschutzgesetzes.

Die Erhebung und Verarbeitung Ihrer Daten erfolgt pseudonymisiert, d.h. in namentlich nicht kenntlicher Form. Das bedeutet, Ihnen wird zufällig eine Codenummer zugewiesen mit der Ihre Daten gekennzeichnet werden. Nur anhand einer Codeliste ist es möglich diese Codenummer und damit Ihre Daten auch Ihrer Person zuzuordnen. Die Codeliste wird unter Verschluss gehalten und ist nur Studienmitarbeitern zugänglich, die eine entsprechende Schweigepflichtserklärung unterzeichnet haben. Die Codeliste wird nach Abschluss der Datenauswertung, spätestens aber nach 10 Jahren gelöscht.

Die Verarbeitung und Nutzung Ihrer pseudonymisierten Daten erfolgt auf Fragebögen und elektronischen Datenträgern für die Dauer von maximal 10 Jahren.

Im Hinblick auf die Datenauswertung ist hervorzuheben, dass wir daran interessiert sind, Menschen im Allgemeinen als Angehörige zweier Kulturen zu untersuchen. Die Auswertung Ihrer Angaben zielt daher nicht auf individuelle Antworten ab, sondern fokussiert auf Unterschiede zwischen Gruppen von Menschen. Eine Veröffentlichung von Studienergebnissen erfolgt entsprechend anonymisiert.

Gemäß den datenschutzrechtlichen Bestimmungen benötigen wir Ihr Einverständnis zur Speicherung und Verwendung der Daten.

Freiwilligkeit/Studienabbruch

Ihre Teilnahme an dieser Studie ist freiwillig. Es steht Ihnen jederzeit und ohne Angabe von Gründen frei, Ihre Teilnahme an der Studie zu beenden, ohne dass Ihnen daraus Nachteile entstehen. Auf Wunsch werden Ihre Daten vollständig oder in Teilen gelöscht. Falls Sie Fragen haben, klären Sie diese bitte jetzt mit dem anwesenden Ansprechpartner.

Name, Vorname .....

Geburtsdatum .....

Derzeit wohnhaft .....

Telefon .....

Datum der Einwilligung .....

Herr/Frau ..... hat mich in einem Aufklärungsgespräch ausführlich über die vorgesehene Untersuchung informiert und meine Fragen zufriedenstellend beantwortet. Dafür stand ausreichend Zeit zur Verfügung und ich konnte mich frei bzgl. meiner Studienteilnahme entscheiden.

Ich weiß, dass mir die geplante Untersuchung persönlich keinen unmittelbaren, medizinischen Nutzen bringt und bei einer Ablehnung und mir bei einem evtl. Abbruch der Untersuchung keine Nachteile entstehen.

Mit der beschriebenen Handhabung der erhobenen Daten bin ich einverstanden. Insbesondere ist mir ist bekannt, dass ich mein Einverständnis zur Aufbewahrung bzw. Speicherung dieser Daten widerrufen kann, ohne dass mir daraus Nachteile entstehen.

Ein entsprechendes Informationsblatt über die Studie wurde mir ausgehändigt. Ich habe keine weiteren Fragen, fühle mich ausreichend informiert und willige nach ausreichender Bedenkzeit in die vorgesehene Untersuchung ein. Ich weiß, dass auch nach erfolgter Einwilligung die Teilnahme freiwillig bleibt und ich jederzeit ohne Angabe von Gründen die Untersuchung abbrechen kann.

Ich bestätige hiermit durch meine Unterschrift, dass ich die Aufklärung verstanden habe und mich mit der Durchführung der vorgenannten Studie einverstanden erkläre.

Ort, Datum und Name des/der Teilnehmers/in: Unterschrift:

_____ _____

Julius-Maximilians-
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Ethik-Kommission
bei der Medizinischen Fakultät

Ethik-Kommission • Versbacher Str. 9 • 97078 Würzburg

Prof. Dr. Dipl.-Psych. Paul Pauli
Lehrstuhl für Psychologie I der Universität
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EINGEGANGEN
09. Mai 2017

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Seniorprofessorin
Geschäftsführer: Dr. R. Wölfel
Sekretariat: S. Schmidt / A. Geiger / M. Keidel
Telefon 0049 (0)931 31 48315
Telefax 0049 (0)931 31 87520
ethikkommission@uni-wuerzburg.de

Würzburg, 04.05.2017/sc

unser Zeichen: **82/17**-sc (bitte bei Schriftwechsel angeben) Tel. Durchwahl: 0931 31 80193

Beratung nach § 15 Berufsordnung für Ärzte in Bayern

Studientitel: "Effect of transcutaneous vagus nerve stimulation on emotion regulation"
Studienleiter: Dr. Stefan Schulz, Lehrstuhl für Psychologie I der Universität, Marcusstr. 9-11, 97070 Würzburg
Antragsteller: Prof. Dr. Dipl.-Psych. Paul Pauli, Lehrstuhl für Psychologie I der Universität, Marcusstr. 9-11, 97070 Würzburg

Sehr geehrter Herr Prof. Pauli,

die Ethik-Kommission hat Ihren Antrag vom 10.04.2017 auf der Basis der Unterlagen in Anhang 1 geprüft und in der Sitzung am 25.04.2017 beraten.

Die Ethik-Kommission erhebt keine Einwände gegen die Durchführung der Studie.

Allerdings empfiehlt sie, folgende Hinweise zu beachten:

Probandeninformation Teil 1:
Neben dem Namen sollten zusätzlich die Initialen, Namensteile sowie das Geburtsdatum im Zusammenhang mit der *Identitätsinformation* angeführt werden.
Zu prüfen (Option ja/nein in der Einwilligungserklärung) wäre, ob die Verwendung der Probandendaten in der Lehre nicht von einer gesonderten Zustimmung abhängig zu machen wäre. Andernfalls müsste klar formuliert werden, dass ohne eine Einwilligung in die Verwendung der Daten auch für die Lehre eine Teilnahme an der Studie nicht möglich ist.
In allen Studiendokumenten sollte von der Einwilligung bzw. der Einwilligungserklärung gesprochen werden.
Im Zusammenhang mit einem Widerruf sollte klargestellt werden, dass automatisch eine Anonymisierung (ggf. auch Löschung) der vorhandenen Daten (inkl. Videoaufzeichnungen) erfolgt.

Einwilligungserklärung
Schreibfehler "... ist mir ist bekannt ..."
Zum Begriff Einwilligung s.o.
Der Hinweis zum Widerruf der Einwilligung ist doppelt angeführt.

Probandeninformation Teil 2
Sieh auch Anmerkungen zu Teil 1.
Zudem sollte in der Informationsschrift klar dargelegt werden, dass Videoaufzeichnungen gemacht werden und der Teilnehmer darauf zu erkennen sein wird.

Kann davon ausgegangen werden, dass den Teilnehmern die photoplethysmographische Blutdruckerfassung geläufig ist?

Der Satz "Dies ist aber nur sehr selten wirklich der Fall[t] sollte um einen Satz vorgezogen werden.
Beim Abschnitt Datenschutz könnte man ggf. auch auf den ersten Teil der Probandeninformation verweisen (inkl. der nun gemachten Videoaufzeichnungen).

Einwilligungserklärung
Siehe Anmerkungen Einwilligungserklärung Teil 1; ggf. könnte eine Ergänzung hinsichtlich der Videoaufzeichnungen erfolgen.

Werden der Ethik-Kommission Stellungnahmen bzw. revidierte Unterlagen vorgelegt, so genügt eine elektronische Version dieser Unterlagen. Hierbei ist darauf zu achten, dass mit den geänderten Unterlagen eine Version vorgelegt wird, aus der alle Änderungen (Streichungen/ Änderungen/Ergänzungen) klar hervorgehen. Nutzen Sie hierzu nach Möglichkeit die in gängigen Textverarbeitungsprogrammen verfügbare Funktion "Änderungen nachverfo/gen".

Es obliegt dem verantwortlichen Untersucher dafür Sorge zu tragen, dass die Freiwilligkeit der Teilnahme -9 nicht durch ein Abhängigkeitsverhältnis beeinträchtigt wird.

Allgemeine Hinweise:
Sie werden um Beachtung folgender Punkte gebeten:

- [redacted] Ihrem Antrag entsprechend vorzugehen. Anderungen hierzu sind der Ethik-Kommission zur erneuten Prüfung vorzulegen.
- Die Deklaration des Weltärztebundes in der aktuellen Version hinsichtlich der ethischen und rechtlichen Aspekte biomedizinischer Forschung am Menschen zu beachten.
- [redacted] Der Ethik-Kommission das Studienende anzuzeigen und einen Kurzbericht über das Ergebnis der Studie vorzulegen.

Entsprechend der ausschließlich beratenden Funktion der Ethik-Kommission betrifft unser Votum nur die ethische Beurteilung des Projektes. Die ethische und rechtliche Verantwortung für die Durchführung dieser Studie verbleibt bei den Untersucherinnen/Untersuchern.

Die Ethik-Kommission wünscht Ihnen für Ihr Vorhaben viel Erfolg.

efertigt im Auftrag

Mit freundlichen Grüßen
Prof. Dr. med. Eva-Bettina Bröcker

Seniorprofessorin
Vorsitzende der Ethik-Kommission

Ausgef lgt
Dr. med. Reinhard Wölfel

Geschäftsführer der Ethik-Kommission

Studieninformation

Name der Studie: "***Die Effekte von transkutaner Vagusnervstimulation auf Emotionsregultion"***

Projektleiter: Dr. Stefan M. Schulz
Versuchsleiterin und Co-Projektleiterin: Hina Ghafoor
Supervision der Studie: Prof. Dr. Paul Pauli
Ansprechpartnerin für alle Fragen zur Studie, Datenschutz, etc.:
Hina Ghafoor, Marcusstr. 9-11, 97070 Würzburg,
Tel: +49(0)931/31-88766
Email: eihsp02@gmail.com

Zweck und Ablauf der Untersuchung

Das Ziel dieser Studie ist es, physische und psychologische Mechanismen im Umgang mit psychosozialem Stress zu untersuchen.

Um Ihre Fähigkeiten im Umgang mit Stress und in der Anwendung bestimmter Strategien zu messen, werden Sie gebeten eine Reihe von Fragebögen auszufüllen. Zusätzlich wollen wir die Herztätigkeit durch ein Elektrokardiogramm (EKG) erfassen. Für das EKG wird eine Klebeelektrode ca. 2 cm unterhalb des rechten Schlüsselbeines, eine andere auf der linken Körperseite, etwa am Beginn des Rippenbogens, sowie eine auf dem linken Schlüsselbein angebracht. Diese Messfühler sind mit einem Gel gefüllt, das den Kontakt optimiert. Das Gel ist Hypoallergen und wird nahezu immer problemlos vertragen. Die Haut wird vor dem Anbringen der Elektroden an den Klebestellen mit Alkohol gereinigt.

Sie werden dann gebeten Ihren Herzschlag zu zählen sowie unterschiedlich lange Zeitintervalle zu schätzen.

Die Untersuchung nimmt insgesamt ungefähr dreißig Minuten in Anspruch.

Datenschutz

Bei dieser Studie werden persönliche Daten und EKG-Messungen erhoben. Diese Daten unterliegen der Schweigepflicht. Erhebung, Weitergabe, Speicherung und Auswertung dieser Daten erfolgen entsprechend den geltenden Datenschutzbestimmungen.

Die Erhebung der Daten erfolgt pseudonymisiert. Das bedeutet Ihrer Identitätsinformation (d.h., Ihrem Namen, Namensteile und zusätzlichen Initialen sowie Ihrem Geburtsdatum) wird zufällig eine Codenummer zugewiesen, die unter Verschluss und getrennt von den erhobenen Daten aufbewahrt wird. Nur anhand dieser Codenummer können Ihre Daten auch Ihrer Person zugeordnet werden. Eine Liste mit den Codes der VersuchsteilnehmerInnen und der jeweils passende Identitätsinformation welche diese Zuordnung ermöglicht wird am Lehrstuhl für Psychologie I unter Verschluss aufbewahrt und ist ausschließlich dem Projektleiter Dr. Stefan M. Schulz und der Co-Projektleiterin Hina Ghafoor zugänglich. Die Daten werden keinem Dritten übermittelt und lediglich für diese Studie und nicht für einen anderen Zweck als Lehre und Forschung verwendet. Die Codeliste wird nach Abschluss der Datenerhebung gelöscht. Bis dahin können Sie die Löschung Ihrer

Daten vollständig oder in Teilen verlangen ohne dass Ihnen daraus Nachteile entstehen. Durch Löschung der Codeliste werden die Daten vollständig anonymisiert. Die Daten werden in dieser anonymisierten Form sowohl papierbasiert als auch elektronisch, (verschlüsselt nach AES-256 Standard) zehn Jahre am Lehrstuhl für Psychologie I, Biologische Psychologie, Klinische Psychologie und Psychotherapie, Universität Würzburg, Deutschland aufbewahrt, bevor sie endgültig vernichtet werden.

Im Hinblick auf die Datenauswertung ist hervorzuheben, dass wir daran interessiert sind, Menschen im Allgemeinen zu untersuchen. Die Auswertung Ihrer Angaben zielt daher nicht auf individuelle Antworten ab, sondern fokussiert auf Unterschiede und Korrelationen zwischen Gruppen von Menschen. Eine Veröffentlichung und/oder Verwendung von Studienergebnissen in der Lehre erfolgt ausschließlich anonymisiert.

Gemäß den datenschutzrechtlichen Bestimmungen benötigen wir Ihr Einverständnis zur Speicherung und Verwendung der Daten für die Lehre, wie auch für die Veröffentlichung der Studienergebnisse.

Freiwilligkeit/Studienabbruch

Ihre Teilnahme an dieser Studie ist freiwillig. Es steht Ihnen jederzeit und ohne Angabe von Gründen frei, Ihre Teilnahme an der Studie zu beenden, ohne dass Ihnen daraus Nachteile entstehen. Bei Studienabbruch werden Ihre Daten, automatisch in Teilen oder vollständig gelöscht, solange die oben genannte Codeliste zur Verfügung steht. Nach erfolgter Anonymisierung ist eine individuelle Löschung nicht mehr möglich. Falls Sie noch Fragen haben, klären Sie diese bitte jetzt mit dem anwesenden Ansprechpartner.

Einwilligungserklärung Vp-ID----------

Name der Studie: "***Die Effekte von transkutaner Vagusnervstimulation auf Emotionsregultion"***

Name, Vorname .....

Geburtsdatum .....

Derzeit wohnhaft .....

Telefon .....

Email .....

Datum der Einwilligungserklärung .....

Herr/Frau ..... hat mich in einem Aufklärungsgespräch ausführlich über die vorgesehene Untersuchung informiert und meine Fragen zufriedenstellend beantwortet. Dafür stand ausreichend Zeit zur Verfügung und ich konnte mich frei bzgl. meiner Studienteilnahme entscheiden.

Ich weiß, dass mir die geplante Untersuchung persönlich keinen unmittelbaren, medizinischen Nutzen bringt und bei einer Ablehnung oder bei einem evtl. Abbruch der Untersuchung keine Nachteile entstehen.

Mit der beschriebenen Handhabung der erhobenen Daten bin ich einverstanden.

Ein entsprechendes Informationsblatt über die Studie wurde mir ausgehändigt. Ich habe keine weiteren Fragen, fühle mich ausreichend informiert und willige nach ausreichender Bedenkzeit in die vorgesehene Untersuchung ein. Ich weiß, dass auch nach erfolgter Einwilligungserklärung die Teilnahme freiwillig bleibt und ich jederzeit ohne Angabe von Gründen die Untersuchung abbrechen kann.

Ich bestätige hiermit durch meine Unterschrift, dass ich die Aufklärung verstanden habe und mich mit der Durchführung der vorgenannten Studie einverstanden erkläre.

Ort, Datum und Name des/der Teilnehmers/in: Unterschrift:

_____ _____

Ort, Datum und Name des/der Mitarbeiters/in: Unterschrift:

_____ _____

Studieninformation

Name der Studie: "***Die Effekte von transkutaner Vagusnervstimulation auf Emotionsregultion"***
Projektleiter: Dr. Stefan M. Schulz
Versuchsleiterin und Co-Projektleiterin: Hina Ghafoor
Supervision der Studie: Prof. Dr. Paul Pauli
Ansprechpartnerin für alle Fragen zur Studie, Datenschutz, etc.:
Hina Ghafoor, Marcusstr. 9-11, 97070 Würzburg,
Tel: +49(0)931/31-88766
Email: eihsp02@gmail.com

Versuchsablauf:

Ergänzend zum bereits bekannten Versuchsablauf soll nun eine weitere Aufgabe bearbeitet werden. Es ist wichtig für die Untersuchung, dass der erste Teil ohne Kenntnis über diesen Versuchsabschnitt bearbeitet wurde, damit Sie in dieser Phase völlig entspannt waren. Es folgt nun eine Ruhephase, dann haben Sie Zeit um eine Rede vorzubereiten, im Anschluss halten Sie die Rede vor dem/der VersuchsleiterIn während Sie mit einer Videokamera gefilmt werden. Es ist hervorzuheben, dass Sie auf den Videoaufzeichnungen zu erkennen sind. Anschließend folgt eine erneute Ruhephase.

In diesem Experiment werden zusätzlich zu den EKG-Messungen noch weitere Biosignal-Messungen eingesetzt. Zwei Messfühler werden an der linken Hand zur Messung der Hautleitfähigkeit sowie eine Blutdruckmanschette am linken Mittelfinger angebracht, die kontinuierlich den Blutdruck erfasst. Weiterhin werden zwei elastische Bänder - eines um den Bauch und eines um die Brust – gelegt um Ihre Atemtätigkeit zu erfassen. Evtl. Fragen zur Sicherheit und Technik der Verfahren beantwortet Ihnen der/die VersuchsleiterIn gerne.

Abschließend werden Sie gebeten, nochmals einige Fragebögen auszufüllen. Während des Ausfüllens der Fragebögen, könnten manche Fragen dazu anregen, über negative emotionale Begebenheiten nachzudenken. Dies ist aber nur sehr selten wirklich der Fall. Sie haben das Recht, solche Fragen auszulassen und ggf. die Untersuchung abzubrechen, ohne dass Ihnen daraus Nachteile entstehen. Wir bitten Sie daher, soweit möglich alle Fragen zu beantworten und die Fragebögen vollständig auszufüllen.

Sie erhalten zu jeder Aufgabe nochmals detaillierte Informationen, was Sie genau machen müssen, wenn es soweit ist. Außerdem können Sie jederzeit noch auftretende Fragen mit dem Versuchsleiter klären.

Der Rest der Untersuchung wird ungefähr eineinhalb Stunden dauern.

Datenschutz

Auch bei dem eben erläuterten zweiten Teil der Studie werden persönliche und physiologische Daten erhoben. Diese Daten unterliegen der Schweigepflicht. Erhebung, Weitergabe, Speicherung und Auswertung dieser Daten inkl. der Videoaufzeichnungen

erfolgen entsprechend den geltenden und bereits in Teil 1 der Studie dargelegten Datenschutzbestimmungen.

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