Can eustress protect against distress?

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2016, Enschede

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Abstract

Stress consists of two types, a negative type which causes distress and a positive type which causes eustress. In this research personality types and physiological and self-reported effects are measured in reaction to a short term stressor. This short term stressor is the Sing a Song Stress Test (SSST) which requires participants to first relax, conduct some neutral tasks, then prepare for singing, sing for 30 seconds and relax again. The reactions to these tasks are measured through Heart Rate (HR) and Skin Conductance Response (SCR). The aim of this research is to determine whether some personality traits (neuroticism vs. extraversion) provide lower distress reactions. Participants were between 18-55 years of age and were divided in the distress group or eustress group, based on their personalities. This was measured with the NEO-FFI. Physiological measures (HR and SCR) were measured during the test and self-reported scores were assigned to the participants' subjective stress during five phases of the experiment. The results were that HR does not measure the physiological reaction to short term stress adequately. SCR however finds that people in the distress group need more time to recover their SCR after singing, indicating a longer stressful period after singing. No significant differences were obtained about the preparation and singing phases. Self-reported scores confirm more stress in the distress group at the start of the experiment and after singing.

1. Introduction

In our daily lives we're exposed to stress. Some events are important and stressful, like a divorce, and some are small, producing less stress, for example driving to work. As there is 'bad' stress, called distress, there is also 'good' stress, called eustress. Distress occurs when an event has a negative effect on the body and mind. These effects can be a decrease in job performance (Blase, 1986), and can lead to anxiety, hostility and depression (Motowidlo, Packard, & Manning, 1986). Eustress on the other hand occurs when the level of stress is not high enough for a given individual to have negative consequences, but produces positive effects. Eustress can reduce stress that has already occurred (Edwards & Cooper, 1988), it has a positive relationship with performance (Babakus, Cravens, Johnston, & Moncrief, 1999) and can generate a positive appraisal for stress (Lazarus & Folkman, 1984).

In this research personality traits are compared to reactions to stress. Different traits cause individuals to react differently to stress. Neuroticism is linked to distress and extraversion to eustress for example. In this research a short term stressor is used, the Sing a Song Stress Test (SSST). This paradigm instructs participants to perform a few neutral tasks and then instructs them to think of a song and sing it in the presence of two other persons. Understandably, this causes stress for most participants, which is measured through their heart rate (HR) and skin conductance response (SCR). The results are analysed to answer the question: can the personality traits which lead to eustress provide a protective function against the effects of distress?

1.1 Personality traits

Which personality traits can provide better coping strategies to handle stressful events and which cannot? To answer this, we need to look at which personality traits exist. The Big Five is the most common theory when it comes to personality traits. It encompasses the traits neuroticism, extraversion, openness, agreeableness and conscientiousness. Cattell was one of the first scientists to construct a personality taxonomy in 1943 (Goldberg, 1990). He used a list of almost 18,000 terms, created by Allport and Odbert (1936), to determine 4,500 stable traits. Five factors (the Big Five)

proved to be replicable, which were confirmed by other researchers (e.g. (Digman & Inouye, 1986; Goldberg, 1990; R. R. McCrae & Costa, 1985). However, these five stable traits are mostly categories made up of other stable traits. The Big Five are therefore called higher order traits and are made up of multiple lower order traits. An example is the higher order trait 'extraversion', which consists of the lower order traits social dominance, positive emotional feelings, sociability, achievement, impulsivity and motor activity (MacDonald, 1999). Extravert people have a tendency toward positive affectivity, being energetic and social. They have a higher threshold for emotional challenges than people high in neuroticism (Brouwer, van Schaik, Korteling, van Erp, & Toet, 2014).

High neuroticism means to have a low tolerance for stress (Eysenck, 1990), a tendency to experience negative affect and to view oneself and the surrounding world in a negative way (Rantanen, Pulkkinen, & Kinnunen, 2005). Naturally, it would seem that this personality trait is sensitive to distress, which is supported by several studies (Hinnen, Hagedoorn, Sanderman, & Ranchor, 2007; Ormel & Wohlfarth, 1991). Neuroticism is also linked to worse performances under social pressure. And people with high neuroticism are more easily triggered by distress, fear, anxiety and anger (Rusting & Larsen, 1997).

Openness, or openness to experience, consists of intellectual curiosity, aesthetic sensitivity, liberal values, and emotional differentiation (McCrae, 1987). Creative people score high on openness. Scoring high on openness, however, does not mean that that person is open to every experience. They could be open to one type of experience and very closed to the next form of experience (Coan, 1972). These areas of experience are for example, fantasy, aesthetics, feelings, actions, ideas, and values (McCrae, 1993).

Agreeableness concerns the quality of interaction with other people. People high in agreeableness for example are better in combining work and family roles (Rantanen et al., 2005). Costa, McCrea & Dye (1991) have identified trust, straightforwardness, altruism, compliance, modesty and tender-mindedness as facets of agreeableness. Agreeableness differs from extraversion, because extraversion is more focused on the quantity of social interaction and agreeableness on the quality.

Conscientiousness exists of the facets competence, order, dutifulness, achievement striving, self-discipline and deliberation (Paul T. Costa et al., 1991). Being conscientious means having a proactive as well as an inhibitive side. People are proactive in the sense of commitment to their work and the need for achievement, but they are inhibitive when it comes to cautiousness and their morals. Even though these facets of Costa, McCrea and Dye are confirmed, many researchers have different interpretations for the concept of conscientiousness. Roberts, Chernyshenko, Stark, and Goldberg (2005) performed a factor analysis to determine which lower order factors have a high correlation with the higher-order factor of conscientiousness. They showed that order, virtue, traditionalism, self-control, responsibility and industriousness correlated highly with conscientiousness and correlated low with the other Big Five traits. This means that people who score high on traits related to order, virtue, traditionalism, self-control, responsibility, industriousness, competence, dutifulness, achievement striving, and deliberation are very conscientious. Contentiousness is an especially good trait to have when it comes to employment.

Traits of the Big Five are always expressed on a scale of opposites. For example, a person is somewhere between trusting and distrusting or on a scale of responsible to irresponsible, easily irritated to patient etc. Moreover, traits are also combined with each other, which results in the vast differences between people's personalities. There are also facets which fall between two traits but, give preference to one of these traits. For example, 'responsibility' represents agreeable conscientiousness whereas 'cooperation' represents conscientious agreeableness (John & Srivastava, 1999). All of these variations make a person more suitable for some work, situations, relationships etc. and less suitable for others (de Fruyt & Mervielde, 1999; Locke & Kirkpatrick, 1991). There is evidence that high extraversion, conscientiousness and low neuroticism are important personality characteristics for people to work and perform well under stressful conditions (Brouwer et al., 2014).

The Big Five personality traits can be measured through self-report, mainly questionnaires. There are long and short versions of these questionnaires (Rammstedt & John, 2007). The more extensive NEO Personality Inventory (NEO-PI) measures the five personalities through a 240 item scale (Costa &

McCrae, 1995). The NEO-Five Factor Inventory (NEO-FFI) measures the Big Five through a 60 item scale, shortened from the NEO-PI (Gosling, Rentfrow, & Swann, 2003). More information about the version used in this research (NEO-FFI/IRS) is found in chapter two. There is also a brief version of the Big Five Inventory with only ten items. This version can be used when researchers have very little time, no money or need their subjects to fill out the questionnaire multiple times, for example in a longitudinal study. This short measure is called the BFI-10 (Rammstedt & John, 2007). The outcome of these tests indicate how high or low someone scores on the Big Five personality traits, which are linked to the way people handle stress.

1.2 Stress

There is not one definition of stress used in general, stress can be stated like the non-specific response of the body to any demand for change (Selye, 1973) or perception of threat, with resulting anxiety discomfort, emotional tension and difficulty in adjustment (Fink, 2010). A stressor (the stress producing factor) can be an external or internal force which acts upon a person and produces stress as the consequence (Anderson, 1977; Jacobs et al., 1994). These stress reactions can be physical or psychological (Le Fevre et al., 2003).

Distress is the result of a person exceeding their capacity to expend energy in maintaining homeostasis (Le Fevre et al., 2003). In other words; the stressor asks too much for the body to handle, which results in stress. Even before the stressor actually begins “stressing”, the person appraises the stressor to determine if it is a threat or a challenge. When a stressor is perceived as a threat, it causes the individual to stress before they actually have to deal with it. So even the prospect of having to deal with a negative stressor can cause stress (Schneider, 2004). A stressor is also evaluated by its timing, whether it’s perceived as desirable or not, whether it is beneficial or not, whether the individual has control over the stressor, whether the demand comes from the individual themselves or is imposed externally and, if imposed externally, what that source it has (a friend, a manager, a policy etc.) (Le Fevre et al., 2003). Distress can have many negative consequences, for example a decrease in job performance (Blase, 1986; Motowidlo et al., 1986; Pugliesi, 1999), negative psychological and

emotional impact (Mayhew & Chappell, 2007), it can lead to egoistic motivations (Batson, Fultz, & Schoenrade, 1987), it can lead to miscarriages (Knackstedt, Hamelmann, & Arck, 2005) and during pregnancy and early in life it can make the child susceptible for diseases later in life and alter their brains in a negative way (Bremner & Vermetten, 2001; Knackstedt et al., 2005).

Eustress is a lesser known concept because researchers tend to focus on the negative side of stress. Simmons and Nelson (2001) stated that eustress is not just the opposite of distress but has to be seen as a separate concept. Positive and negative responses to a stressor can happen simultaneously, which make distress and eustress separate but related concepts. Eustress is therefore not just the absence of distress (Nelson & Cooper, 2007). Edwards and Cooper (1988) define eustress as a positive discrepancy between an individual's perceived state and desired state, provided that the presence of this discrepancy is considered important by the individual. The perceived and desired states are considered to be the cognitive representation of the individual. Therefore how one interprets stress determines their reaction (Le Fevre et al., 2003) and the way one reacts to stress is called coping.

1.3 Coping

Eustress elicits physiological responses which can directly or indirectly influence health. This is achieved through coping, which consists of mechanisms an individual uses to respond to stress (Gunthert, Cohen, & Armeli, 1999). Eustress can enhance an individual's ability related with coping or increase effort aimed at coping. It can also provide a break from ongoing stress, sustain coping or restore resources which are necessary for coping (Edwards & Cooper, 1988).

Coping is accomplished by trying to minimize the effects of a stressor or by restoring the balance (homeostasis) of a person's emotions (Ben-sira, 1985). To do this an individual needs resources, which can be traits or properties. Some examples are actively addressing, palliative reaction (to engage in other activities to try to relax), avoiding, seeking social support, passive response pattern (isolating oneself from others or escape into fantasies), expression of emotions and comforting

thoughts (Norberg, Lindblad, & Boman, 2005). There are many properties which can have an effect on coping and therefore stress. These properties often arise from an individual's personality traits.

1.4 The Big Five and stress

Gallagher (1990) studied the effect of stress on neuroticism and extraversion and found that neurotic people are highly predictive of making threat appraisals and extravert people are highly predictive of making challenge appraisals. Neurotic people rather see a threat in stressful events because they are more sensitive to the potential negative outcomes of a situation. They experience more negative emotions like worry, fear and anxiety. Extravert people experience the opposite because they are more sensitive to the potential positive outcome of a stressful situation and rather see a challenge in them. Neuroticism is a trait which correlates highly with distress because neurotic people are also more likely to use less-adaptive coping strategies like avoidance coping or a hostile reaction (Boyes & French, 2010; Gunthert et al., 1999). Extraversion is related to stress and coping in a positive way, it elicits the use of problem-focused coping and level of well-being (Hart, Wearing, & Headey, 1995). They cope better with stress than neurotic people when they have high social support and do worse when their social support is low (Parkes, 1986).

There has been less research about the role of agreeableness, conscientiousness and openness in stress, but some researchers have had significant results. Haisch and Meyers (2004) found that veterans with Post Traumatic Stress Syndrome (PTSD) have lower levels of openness, agreeableness and E. They also found that: "individuals with a higher risk of PTSD were less agreeable, less extroverted, less conscientious and were more neurotic than individuals with a lower risk for PTSD". Carver and Connor-Smith (2010) specified the role of agreeableness on stress by saying that this trait is linked to low social stress. And that E, openness and conscientiousness all relate to perceiving events as challenges rather than threats. The traits of extraversion, conscientiousness, and openness relate to more engagement coping; neuroticism to more disengagement coping; and conscientiousness and agreeableness to less disengagement coping.

This research compares two groups; people with eustress and people with distress traits. To do this, the participants had to be divided amongst these groups according to their results. The “distress group” consisted of people who scored high on neuroticism but no too high on extraversion. People who scored high on extraversion but not too high on neuroticism were placed in the “eustress group”. Personality traits were measured through questionnaires and compared to physiological data to see if they matched and what happened when a person had to sing unexpectedly. Which physiological data was used will be explained next.

1.5 Physiological data

There are many forms of physiological data available, like heart rate, skin conductance, neurophysiological measures, blood pressure, respiration etc. Physiological data used in this research are heart rate (HR) and skin conductance response (SCR). Heart rate can be influenced by many factors, including exercise, physical and mental stress, respiration, blood pressure regulation, thermoregulation, circadian rhythms, and other unknown factors (Stein, Bosner, Kleiger, & Conger, 1994). Therefore it is important to eliminate these factors, as much as possible, when measuring heart rate. The participants sit still during this experiment to relax their respirations and reduce movement. To cause extra mental stress for the participants, there are two persons present when they have to sing. This extra mental stress occurs in the presence of an audience, which makes people pay more attention to themselves and to the importance of performing well (Baumeister, 1984; LeBlanc , Albert; Jin, Young Chang; Overt, Mary; Siivola, 1997). However, this consciousness of performance does not contribute to the actual skill and only increases anxiety, which reduces the performance instead of enhancing it.

HR is chosen as a measurement because it is easy to use and it is an objective measure (Mulder, 1992; Vrijkotte, van Doornen, & de Geus, 2000). The sympathetic nervous system increases HR when a person is exposed to stress. The parasympathetic nervous system acts when the stressor is no longer present and returns the HR to a baseline level in a short amount of time. This rapid return to baseline is especially convenient in this research because of the short term stressor that is being used. The

participants are only exposed to stress for 30 seconds, with another 30 seconds of preparation for them to anticipate the stressful task. The participants have only 120 seconds, in which they are still being measured, after the stressor to return their stress levels to baseline, which is why a fast stress response is necessary.

Skin conductance is a way of measuring the electrodermal activity of the skin. When people sweat, the moisture becomes a conductor and the amount of conductance can be measured (Harrison et al., 2006). The glands which produce sweat can be influenced by emotional arousal, like stress (Gladman & Chiswick, 1990). The skin conductance response measures the autonomic nervous system, which is primarily in control of our fight-or-flight response which is predominant in stress (Jacobs et al., 1994). When people are under mental stress, their sweat glands are activated. This means that skin conductance response rises during mental stress (Berguer, Smith, & Chung, 2001; Jacobs et al., 1994; Sun et al., 2012) and why it is a satisfying measure for the SSST. Skin conductance is made up of two parts, amplitude and skin conductance response (SCR). The amplitude presents the level of skin conductance during a certain amount of time and SCR the amount of peaks during a certain period of time.

Some research has shown that adding physiological data to questionnaires can help determine extraversion, conscientiousness and neuroticism (Brouwer et al., 2014). Kuo and Linehan (2009) researched whether people with borderline personality disorder reacted differently to two emotion inducing conditions than people with social anxiety disorder and normal people. They found that their skin conductance and self-reports (through questionnaires) indicated higher stress levels than the other two groups. This implies a correlation between personality and stress, both objectively and subjectively measured. Other research also found that an individual's susceptibility to disorders can be predicted by their reactivity to stress. This reaction is influenced by personality traits when, for example, people with high negative emotionality display greater emotional distress (Childs, White, & de Wit, 2014). Measuring stress can be done with physiological measures, but it is rather difficult,

because movements influence physiological data. That is why the sing a song stress test (SSST) was developed.

1.6 Sing-a-song stress test

There is a history of tests to measure physiological data that have led to the development of the SSST, where people have to perform a stress-inducing task. The most used test is the Trier Social Stress Test (TSST), where participants have to act like someone interviewing for a job and deliver a speech in front of people about why they're the best candidate (Brouwer & Hogervorst, 2014). The SSST is a way of measuring physiological data in reaction to a sudden, short, and medium to strong social stressor in which the results are not confounded by movement. The effects of a short-term stressor on a higher HR were found by Delaney and Brodie (2000). Movement causes a rise in heartbeat and higher skin conductance which could influence the results (Brouwer & Hogervorst, 2014). In the SSST the participants sit still throughout the test which allows for a good measurement of the baseline and the stressor. People will still move a little (e.g. their mouths) because they have to sing, but they also have a few neutral tasks and a relaxation exercise before that to determine a baseline. Furthermore they have 30 seconds before the singing starts when they are aware that they will have to sing. This causes stress in itself but does not confound the results due to movement.

During the SSST a participant sits in front of a computer screen, which displays tasks they must accomplish. The first tasks are a relaxation and neutral task to establish a baseline for HR and SCR. They have to sit as still as possible for the duration of the test. After a relaxation task and a few neutral tasks the participant has to sing a song, which is the stressor. After that they have to keep sitting still and try to relax, which gives a measurement of how fast they get back to their baseline again. The singing lasts only 30 seconds, which make it a short term stressor. This gives a new insight in how fast a person "recovers" from such a short term stressor.

This study expands on studies done by Brouwer and Hogervorst (2014) and Derikx (2015). Derikx modified the original study on the SSST by Brouwer and Hogervorst. Derikx used only one confederate during the experiment instead of two and added a pre- and post-baseline to determine the recovery

of the participant after the stressor. Derikx focused on the coping strategies used in stress recovery and only used the SCR as a measurement, this research focuses on the effect of personality traits on eustress and distress and uses SCR and HR as measurements.

1.7 Research questions

Eustress seems to be better realized by people with certain traits. People who score high on neuroticism (N) seem to be more susceptible to distress. People high in extraversion (E) seem to perceive stress as a challenge and are therefore more resilient to distress. We are exposed daily to short term stressors, which can have an immediate effect on well-being (Almeida, 2013). Eustress is important because it can possibly provide some protection against distress, which becomes more and more important in our increasingly busy lives. Therefor this research aims to answer; do the traits which lead to eustress, provide a protective function against the effects of distress?

To get a clear answer on the research question there are a number of hypotheses. They address both the objective and subjective measures used in this experiment to determine whether extravert people differ from introvert people and to look at the differences between eustress and distress from both sides. Finding corresponding results between one of the objective and subjective measures will indicate that these measures correlate. Because a higher HR and SCR are connected to higher levels of stress, and neuroticism is also connected to more susceptibility to stress, the first hypothesis is; neurotic people have higher skin conductance response and heart rate than extravert people during the preparation and singing phases of the SSST. Neurotic people also are less adept at coping with stress than extravert people. The second hypothesis is; neurotic people have a longer recovery time to get their skin conductance response and heart rate down in 120 seconds after singing than extravert people. The third hypothesis focusses on the self-reported stress during the preparation and singing phases. Extravert people are expected to perceive less stress during these phases. The third hypothesis is; Extravert people report lower levels of stress in themselves (on a scale of 1-9) during the preparation and singing phases of the SSST than neurotic people. Neurotic people are also expected to be stressed by the singing phase for a longer amount of time after the stop singing. The fourth

hypothesis is; neurotic people report higher levels of stress in themselves (on a scale of 1-9) two minutes after the SSST than extravert people. The scores on neuroticism are expected to correlate with the self-reported stress scores. The higher a person scores on neuroticism, the higher their score will be on self-reported stress. The fifth hypothesis is; the scores of the self-report correlate positively with the score on neuroticism as measured by the NEO-FFI. Lastly, another point of interest is whether neurotic people experience more stress than extravert people in general. Which is why this is tested with the third pre baseline measurements of HR and SCR and with the self-reported stress scores at the start of the experiment. The third pre baseline measurement is chosen so people will be accustomed to the equipment and to the relaxing exercise. The sixth hypothesis is; neurotic people have higher SCR, HR and self-reported stress scores at the start of the experiment than extravert people.

2. Methods

This research has been conducted at the University of Twente and the collected data was shared amongst students for their theses. The data gathering was done by L. Derikx and L. Nijboer, and is gratefully used in this research.

2.1 Participants

A total of 154 participants were recruited by Derikx and Nijboer through the university's sona system and by asking their personal contacts. The sona system is a mandatory part of the studies psychology and communication science, where students have to participate 15 hours in studies conducted on the university. Students will earn points by partaking in researches, which they can select themselves, and receive a 'complete' after they participated in enough researches.

Of the 154 participants, 91 were Dutch, 62 were German and 1 was Belgian and 97 were female and 57 male. The ages ranged from 18 to 55 with a mean of 22.23 and a SD of 4.18. 14 participants were excluded from the analysis because they missed data of the skin conductance response (SCR), which was due to technical reasons. The participants received a point for the sona system when needed; they did not receive a monetary reward. The research done by Derikx and Nijboer was approved by the ethics committee of the faculty of Behavioural, Management and Social sciences.

All participants read and signed an informed consent form before taking part in this study. They were first briefed about the study and given the contact information of the researchers. The participants were intentionally not informed about the purpose of the study to maintain the surprise effect of the SSST. They were told that they were taking part in a study about personality and fitness. Fitness was chosen as the misleading topic because it provides an alibi for using physiological measures. Physiological measurements are used as measurements in research to both fitness and stress, so fitness is a plausible alternative. The deception was needed to prevent self-selecting bias by the participants. If people would know beforehand that they would have to sing a song, they might opt out of this study or prepare themselves in advance.

2.2 Materials

Derikx and Nijboer used a slightly adapted version of the original study by Brouwer and Hogervorst (2014). Some assignments were changed to a more neutral version, a post baseline was added and one confederate instead of two confederates was used.

2.2.1 Computers and room setup.

The instructions the participants had to follow during the SSST were given on a computer screen. The computer was running in Windows lean mode, a mode in which the computer does not download updates and does not start unnecessary background services. The display was a 1280x720 60Hz flat screen that was placed approximately 60 centimetres from the participant. The script that displayed the instructions was written in PsychoPy by Dr. M. Noordzij. PsychoPy is an open source application which uses Python to allow the presentation of stimuli and collection of data for psychology experiments, among other things. The order of the instructions was fixed, the instructions were shown for 5 seconds and then the script would show a timer displaying the duration of the corresponding task. The first and last task lasted for 120 seconds and the other tasks lasted 30 seconds.

The place where the experiments were conducted, was a room at the University of Twente designed to minimize distractions. There was a window of which the louvers were drawn. The light in the room was provided by a fluorescent lamp on the ceiling. The questionnaires the participants had to fill out about their personalities, were presented on a laptop running Windows. This laptop was placed at an angle of 90 degrees from the computer that was used for the physiological measuring part of the experiment. The researcher would sit in another chair in the room when the second part of the experiment was conducted.

The questionnaires were written in Dutch and displayed with the internet browsers Google Chrome on separate tabs. Non-Dutch speaking students have to achieve a NT2 level in Dutch before they can start a study in the Netherlands. This means that they have to speak, write and read Dutch well enough to work or study on a higher education level. So the German participants had a sufficient

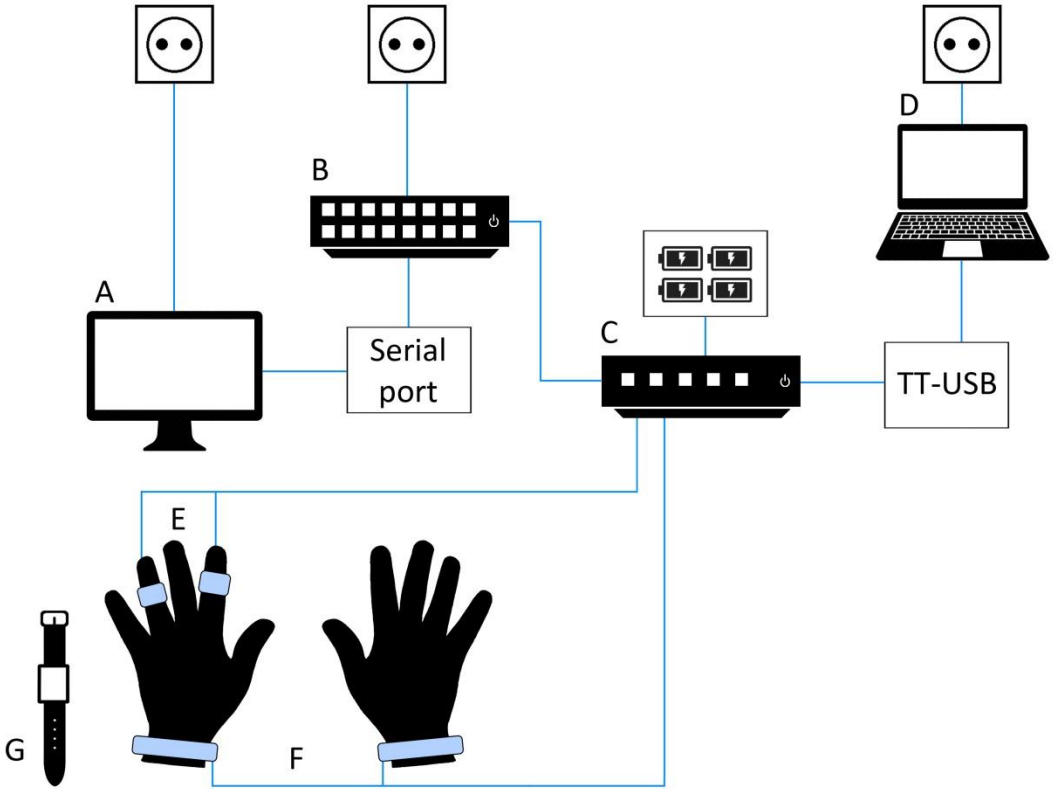
level of Dutch to participate in this experiment. The group differences between Dutch and German participants were all within in 1 SD of each other.

2.2.2 Physiological measurements.

The physiological measurements were carried out by means of the Biograph Infiniti package. This is a software and hardware package which can measure the physiological processes needed for this research. The setup of the experiment is displayed in figure 1. The software used to write the script was also used to let the serial port function as a timer when it was connected to the voltage isolator. In this way the pulses from the voltage isolator matched with the instructions given on the screen of the desktop computer. The pulses were used as the starting times for the different time slots used in the analysis.

Figure 1

The setup of the hardware with (A) the computer running the instructions through python, (B) voltage isolator, (C) amplifier, (D) laptop running the questionnaires and the Biograph Infiniti software, (E) finger sensors and (F) wrist sensors and the (G) Q sensor.



The SCR and HR sensors were attached to the amplifier with cables. The ports of the amplifier were set to measure with a frequency of 256 Hz. The laptop was installed with the software of Biograph Infiniti and plotted the SCR, HR and peaks from the voltage isolator in real time.

2.2.3 Sensors.

The SCR was measured through two sensors. They were placed on the ventral side of the medial phalanges of the ring and index finger of the left hand. A wearable electrodermal activity wrist sensor (Q sensor) was placed on the left forearm on the anterior side. The output from the Q sensor was synchronized with the computer to match the starting times of the different tasks. All the sensors were kept in place with Velcro straps. The heart rate of participants was measured with the ECG (electrocardiogram) package from Biograph Infiniti. It includes three silver/silver-chloride electrodes that are attached to reusable non-latex rubber tourniquets. The sensors were placed on the skin on the anterior side of the wrists and held in place with tourniquets.

2.2.4 Self-report stress measurements.

In the first part of the experiment, the participants had to answer demographical questions and fill out two personality questionnaires. The demographical questions were about age, gender and lifestyle including smoking, alcohol consumption, medicine intake, drugs, sporting and singing experience.

After the demographics questionnaires the NEO-FFI/IRS was filled out and after that the Utrechtse Coping Lijst (UCL). The UCL was added after participant no. 103 so only participants 103-154 filled out the UCL. The UCL was filled out last so it would not corrupt the rest of the experiment. The results indicated the use of seven coping strategies. However some of these strategies can't be carried out during this experiment (e.g. seek help from others, have a drink etc.) so the decision was made not to use the results in this research.

The NEO-FFI/IRS is a version of the NEO-FFI which consists of 60 questions that measure the Big Five personality traits; openness, conscientiousness, extraversion, agreeableness and neuroticism. The IRS measures the general life stress people experience and the coping abilities they possess

(Jenderny, 2015). The NEO-FFI/IRS questionnaire was made available via web browser by the independent Dutch research organisation TNO. The questions were answered on a 5 point Likert scale that ranges from 'I totally agree' to 'agree', 'neutral', 'disagree' and 'totally disagree'.

In addition to the objective measures the sensors provide, subjective measures were also gathered through self-report during the experiment. The participants were asked two times to indicate how stressed they were. The first measurement was before the instructions started and the second time was after the instructions had ended. At the last measurement the participants had to indicate how stressed they were when they heard they had to sing in 30 seconds, during the singing, after the singing and at that moment. They indicated this on a scale from 1 to 9 in a box presented on the computer.

2.3 Procedure

When the participants entered the space of the experiment they were first briefed by the researcher about the experiment. The participants were asked if they knew what the experiment was about and explained that it was to research personality and fitness. Next, the consent form was signed which included contact information of the researchers (appendix A). They were told that if they had any questions they could contact the researcher and that they could stop the experiment at any time without further consequences or having to give a reason. They also received a brochure with an explanation about the procedure of measuring physiological data because the researcher had to touch their skin in order to apply the sensors (appendix B). The experiment consisted of two parts, one where they had to fill out questionnaires and one where the SSST was conducted.

For the first part of the experiment the participant was led to the room with the computers and told to take a seat behind the laptop. The participant was given instructions that they had to fill out three questionnaires and that if they had any questions they could ask the researcher. The researcher would leave the room to let the participant answer the questions. There were several tabs open in internet browser Google Chrome that showed the questionnaires. The first questionnaire was to assess their demographical information (appendix C), the second was the NEO-FFI/IRS and the third

the UCL. Filling out these questionnaires would take about 45 minutes to complete. German participants were provided with a list of translations of words that were potentially unknown to them. The participants had to knock on the door when they finished the questionnaires.

After they finished the questionnaires the participants conducted part two of the experiment for which they moved to the desktop computer and were given instructions on the screen. The researcher would come into the room for this part of the research to attach the sensors, observe if they would sit still and encourage them to sing. To attach the sensors, the participants had to remove all jewellery. The purpose of the sensors was explained as the researchers attached them to the participants. Then the researcher would do a check if the sensors were working properly and asked if the sensors were not placed too tight. An explanation was given about movement reducing the quality of the results and that the participant had to sit in the same position for eight minutes. Then they were allowed to move once more to fill in their current level of stress and the software was started to record the physiological data. The first and last instructions were to sit calmly and to try and relax and focus on their breathing. These exercises lasted 120 seconds. The other instructions all lasted 30 seconds. The other instructions were to think about different animals which names start with the letter P, think of things they could find in a kitchen, think of things that are important when planning a wedding and imagine as many team sports that are played without a ball. Then the participant had to think of a song in the next 30 seconds that they could sing out loud, the preparation phase. Immediately after the preparation phase they had to sing the song out loud for 30 seconds, with as little movement as possible. These instructions can also be found in appendix D (in Dutch and English).

During this second part another researcher was invited into the room who acted as another participant. The actual participant was told that this person was too early and would start with filling out the questionnaires on the laptop. The confederate was given the same instructions as the participants but that if they had questions, they would have to wait until the experiment of the participant was completed.

After the final phase of relaxation the participant was told by the researcher that they could move again, the software was stopped and the sensors were removed. The participant had to enter their perceived stress level at three times during the experiment, as mentioned earlier. The participant was then told about the deception, the confederate, they were given an explanation about the true purpose of the research and were shown their data recorded by the Biograph Infiniti software. Participants were asked if they saw the confederate as a real participant, which was written down, along with if the participant really sung, if they sang too soon and possible complications during the experiment. Complications in this setting would mean when the sensors, software and hardware were working improperly or when there was movement of the participant during the experiment.

Finally the participant was asked not to share information about the experiment with others to keep the content of the experiment a secret. They could also leave their contact information if they wanted to receive information about the results of the research. And they were reminded about the brochure if they had any further questions.

2.4 Design

2.4.1. Data analyses

The data was analysed with IBM SPSS statistics 23, Microsoft Excel 2007 and MATLAB. The HR, SCR and amplitude of the skin conductance were measured for every participant. In this research only the SCR and HR were used. Because the baselines before and after the SSST were both two minutes, they were cut into four equal pieces to be compared more easily to the other phases of the SSST which lasted 30 seconds each. The third part of the first baseline was chosen to include in the analysis because the first ones might have confounding factors, like movement, because the participants might not have been comfortable with the equipment yet. The last part of the baseline after the SSST was included in the analyses because it gave the participants the most time to recover their HR and SCR after singing. The calculation of the HR and SCR were performed with MATLAB and the scripts are available on request at dr. M. Noordzij. The SCR data was measured by counting the numbers of

spontaneous changes in 30 seconds of the recorded skin conductance. This was done by a tool programmed in Python which is available on request at L. Nijboer MSc.

To compare the groups, neurotic- and extravert people, the participants had to be divided amongst these groups according to their results. The raw data of the NEO-FFI was converted to stanine scores for each trait with the norm table B 1 NEO-FFI, a table for research context and scores divided to gender (Hoekstra, de Fruyt & Ormel 2003). Table 1 shows the distribution of these scores over the personality traits.

Table 1
Stanine scores per personality trait.

Stanine Score	Group	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
1		2	3	0	10	22
2	Low	9	3	1	9	15
3		18	8	6	16	26
4		23	18	9	23	24
5	Medium	32	25	28	32	25
6		35	33	33	26	23
7		14	37	38	27	5
8	High	15	15	24	10	11
9		6	12	15	1	3

These stanine scores were used to divide the participants in three groups. In the distress group (N=26) were the neurotic people with a score of seven or higher on N but no higher score than six on E. In the eustress group (N=48) are the extravert people who scored seven or higher on E but no higher than six on N. The third group consisted of everyone else who did not fit in the first two groups (n=65). This last group was not further analysed for this research.

Participants were selected for the eustress or distress group on the basis of their high scores on either N or E but not when both of these scores were high. This was done to prevent participants from falling into both groups. In an earlier exploration of the data the participants were divided differently amongst the eustress and distress groups. They had to have a high N score and score low on all other traits to fall into the distress group or a high E, openness, agreeableness, conscientiousness and a low N score to fall into the eustress group. The effect size for the total amount of participants is sufficient however due to the strict criteria there were no usable results. This is why the criteria for both groups were broadened to include enough participants to be able to draw some conclusions about the research question.

2.4.2. Assumptions

To determine the normality of the data a Shapiro-Wilk test was executed on the data of SCR and HR. The results would have to be a p value larger than 0.05 to determine if the data is normally distributed. This was not the case for HR and SCR in all phases.

To test whether the phases of interest differed significantly from each other, a Wilcoxon signed rank test was performed. The third pre baseline and the third neutral task were compared with the preparation phase and the singing phase for HR and SCR. All these phases differed significantly ($p>0.00$) from each other. The preparation phase and the singing phase were also compared with the last post baseline to determine if they differed. All results also showed significant differences ($p>0.00$).

2.4.3. Tests

The first four hypotheses involve a comparison between two groups, the neuroticism group and the extraversion group. The dependent variables in the first hypothesis were HR and SCR in two phases; the preparation and singing phases. The independent variables are distress and eustress personalities. The second hypothesis also compared these two groups but now on recovery time, which is the difference between the singing phase and the last 30 seconds of the post baseline. To calculate the results for the recovery time, the recovery time had to be determined first. This was done by subtracting the score on HR and SCR on the last post baseline from the scores on singing. For

the third and fourth hypothesis the self-report scores on the perceived stress during the preparation, singing and after the SSST are compared. For the third hypothesis the scores between the preparation and singing phases are compared between distress and eustress personalities. The fourth hypothesis analyses the reported stress level after the SSST was conducted and whether people with distress traits are still more stressed than people with eustress traits. The sixth hypothesis will be comparing the self-reported scores and HR and SCR at the start of the experiment for the distress group with the extravert group to check whether the distress group starts at a higher stress level. For all these hypotheses the Mann Whitney U test will be used to calculate the results.

The fifth hypothesis calls for a correlation between the scores of the self-reported stress and the Big Five N score. Because these scores are normally distributed ($p=0.121$ and $p=0.110$ respectively) the Pearson correlation is applied to this data. The self-reported scores were compared to the stanine scores on N to simplify the correlation. The N score was compared to every phase on which a self-reported score was given and on the mean score of the self-reported scores. This provides a detailed view of the results. If the correlation confirms neurotic people to perceive themselves more stressed during the experiment, the expectation is that extravert people would perceive less stress. This is why a correlation was also performed between the self-reported scores and the scores on E.

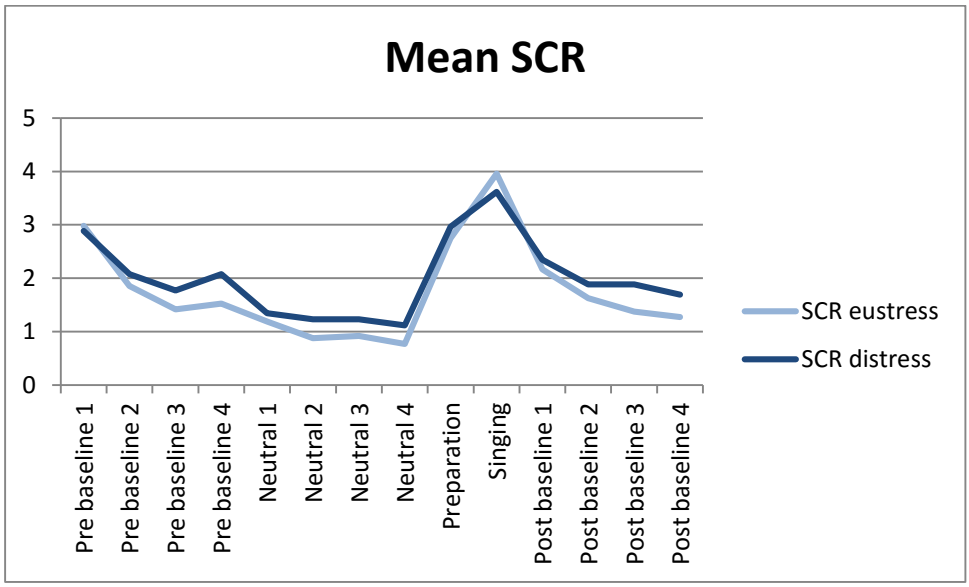
3. Results

To confirm whether the singing phase had the highest scores on HR and SCR, the mean of every phase was calculated and compared. This was done to make sure the right phase was used to compare the recovery time of HR and SCR in the different groups. Figure 2 shows that HR and SCR in the singing phase had indeed the highest scores. The mean of the HR over the whole experiment was 74.25 (N=155) with a standard deviation of 15.54. The mean of the SCR over the whole experiment was 1.96 (N=155) with a standard deviation of 1.73. The mean of the self-reported score was 4.51 (N=155) with a standard deviation of 1.64. The mean of the HR and SCR in every phase can be seen in figure 2a and 2b and the mean of the self-reported scores in figure 2c. These figures show an overview of how the scores on HR, SCR and self-reported stress changed during the experiment. It is apparent that all three start a peak when the participants discover they will have to sing and peaks during singing. SCR appears more unstable at the start of the experiment whereas HR is stable until the preparation phase. There is no data of self-reported scores between the start of the experiment and the preparation phase. Figure 2c does show a difference between the eustress and distress groups in all phases; on average, people in the distress group always report a higher level of stress.

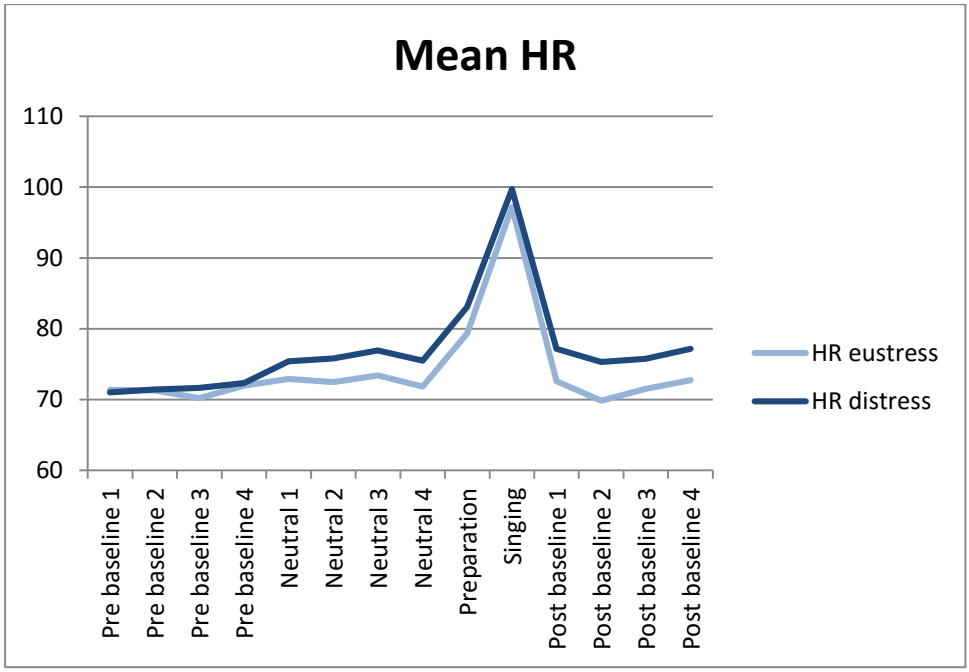
Figure 2

Mean SCR (a) and HR (b) of the distress and eustress group during every phase of the experiment. The mean scores of the self-reported stress and the mean scores of the eustress and distress groups before the start of the experiment, during the preparation- and singing phases, immediately after singing and immediately after the experiment (c).

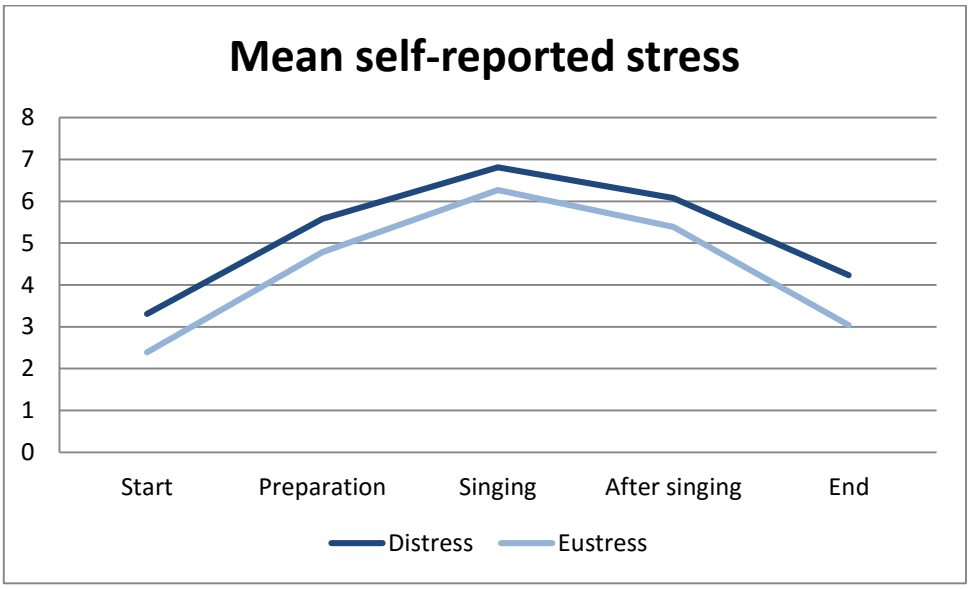
(a)



(b)



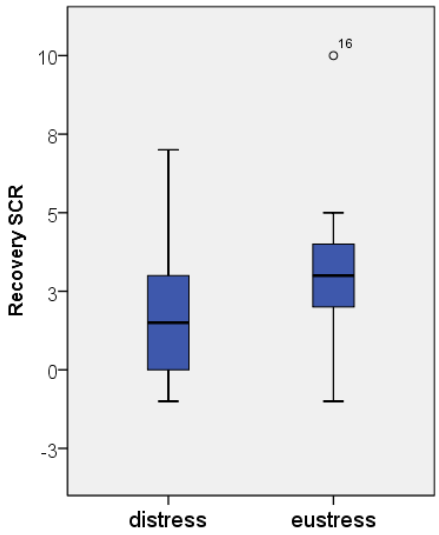
(c)



The Mann Whitney U test for the difference between the two groups on HR and SCR in the preparation (U=532, p=0.296 and U=608, p=0.427) and singing phases (U=559, p=0.422 and U=562, p=0.24) showed no significant results. The groups did not differ significantly from each other on recovery on HR after the singing phase (U=559, p=0.42) but they did differ on SCR (U=468, p=0.037). The difference between the eustress and distress groups was small (r=-0.208). Figure 3 displays a boxplot of the results of the recovery of the SCR. The amount of SCR scores is more widely spread in the distress group but the most scores of the eustress group are higher than those of the distress group. The higher the score, the more people have recovered from the singing phase.

Figure 3

Boxplot showing the results from hypothesis 2 about the recovery measured in the 120 seconds after singing. The eustress group has a stronger recovery during this period than the distress group.



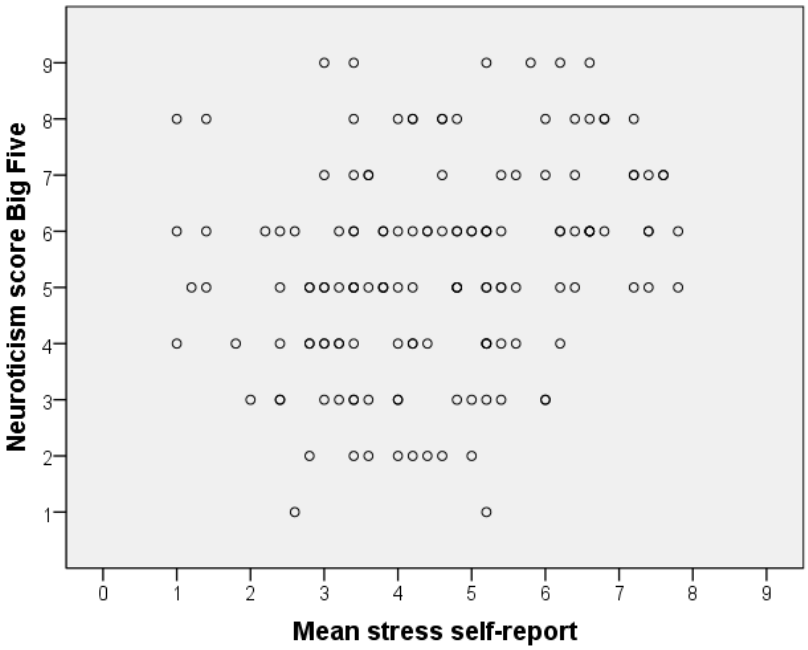
The third hypothesis states that people with eustress traits reported lower levels of stress in themselves than people with distress traits during the singing and preparation phases. The fourth hypothesis states that people with distress traits report higher levels of stress at the end of the experiment. The Mann Whitney U test has significant results over the mean scores of all phases (U=442, p=0.015), there is a small difference between the two groups (r=-0.251). Splitting the mean score into the five phases yields a more specific view. The reported stress at the start and the end of the experiment are significant (U=403, p=0.004 and U=387, p=0.003 respectively) with a medium difference for the start (r=-0.310) and the end (r=-0.323) of the experiment. But the preparation, singing and after singing phases did not yield significant results (U=533, p=0.122, U=553, p=0.172 and U=510, p=0.075 respectively). Which means that the distress group reports more stress at the start and finish of the experiment but during the experiment there is not a significant difference between the two groups. The third hypothesis is therefore rejected but the fourth is confirmed.

A scatterplot, figure 4 (a), for the correlation of the N scores on the Big Five and the mean scores of the self-report provides no clear picture. There appears to be a small upwards tendency but not much coherence between the scores. The same applies to the scatterplot in figure 4 (b) which displays

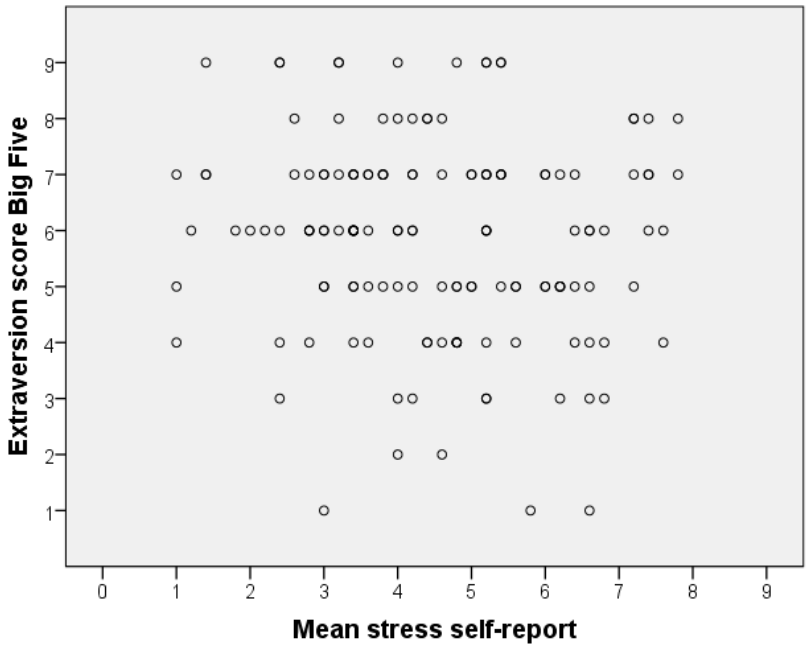
the self-reported stress scores against the E score of the Big Five, only this plot has a small downwards tendency.

Figure 4
Scatterplots of the mean scores of the self-report and the scores on neuroticism (a) and extraversion (b) of the Big Five.

(a)



(b)



The results of the fifth hypothesis provides significant results (r=0.263, p=0.001), with 6,9% of variance explained. This means that there is a weak, positive correlation between the scores on

neuroticism of the Big Five and the mean of the self-reported levels of stress, even though figure 4 (a) does not indicate this very clearly. The scores per phase also indicate a small positive correlation. These scores are (r=0.277, p=0.001) with 7,7% of variance explained for the start of the experiment, (r=0.181, p=0.029) with 3,3% of variance explained for the preparation phase, (r=0.186, p=0.025) with 3,5% of variance explained for the singing phase and for right after singing and (r=0.252, p=0.002) with 6,4% of variance explained for the end of the experiment. To confirm the hypothesis a positive correlation is expected between N and the self-reported score but also a negative correlation between E and the self-reported scores. This is why the correlations on all the self-reported scores were calculated for N and E. The scores for E were all slightly negative but also not significant (for example r=-0.105, p=0.208 for the mean self-reported scores). The scatter plot of E displays is more spread out in general than the plot of N but this difference seems minimal.

The last hypothesis calls for a comparison of the distress and eustress groups on HR and SCR in the third pre baseline phase. Results indicate that there is no difference between the eustress and distress groups on HR (U=502, p=0,187) and SCR (U=548, p=0.177). The difference between the two groups on their self-reported stress has already been mentioned in this section. All of these results are explained more fully in the discussion.

4. Discussion

This research aimed to answer if the traits which lead to eustress, provide a protective function against the effects of distress. The preparation and singing phases itself do not indicate a difference between the eustress and distress groups. Self-report and recovery time during the start and end phases of the SSST, do indicate a difference. In the various graphs shown in the results section (e.g. figure 2), a peak can be observed during the preparation and singing phases in HR and SCR. These results do not indicate a significant difference between the two groups which means that both the eustress and the distress group had about the same scores on the HR and SCR during the preparation and singing phases.

This study also aimed to answer if people with distress traits have a longer recovery time to get their skin conductance response and heart rate down after singing than people with eustress traits. SCR scores were 0.77 points lower for the eustress group at the end of the experiment than for the distress group. This means that people in the eustress group had 28,62% less peaks in their skin conductance than the distress group, which indicates that they were less stressed than the people in the distress group. A remarkable result is that HR does not indicate a difference between the two groups. Can SCR be a better measurement than HR for measuring stress, or can it be that it's a better measurement for short term stressors? An explanation could be that HR was already back to its baseline by the time the participants were measured again. As mentioned in the introduction, HR can return to baseline rather fast so it is possible that the 120 seconds of relaxation was more than enough time for both groups to reduce their HR enough so there would be no significant results anymore. This is reflected in figure 2, where SCR is not yet at the level it had from pre baseline 3 until neutral task 4. HR however drops back to its baseline fairly quickly, in figure 2 it appears to be back already at post baseline 1. Taylor and Epstein (1966) confirm that SCR and HR do differ between various sorts of experiments and that, for example, SCR rises more monotonically with increasing stress. Ulrich et al. (1991) also confirms that HR is a more complex measurement of stress than SCR. It could be that because of this complexity HR might be a less ideal way to measure stress in this type of experiment.

SCR does seem to be a better way to measure stress response during a short term stressor in this research because it measures a significantly longer recovery time in the distress group after singing.

People in the distress group reported higher levels of stress in themselves after the experiment than people in the eustress group. They also reported higher stress at the start of the experiment but not during the experiment, rejecting the third hypothesis. This could be due to a ceiling effect which happens when a variable no longer has an effect on another variable. In this experiment that would mean that the singing and preparation phases both elicit the same amount of subjective stress in both groups. Both extravert and neurotic people could get the same amount of stress from singing in this experiment. To test if the groups start with a difference, the sixth hypothesis compares the HR, SCR and self-report at the start to determine if the distress group starts with an elevated stress level. Only self-reported stress yielded significant results that confirmed people in the distress group rated their own stress higher than people in the eustress group. From these results, it can be concluded that the distress group always has higher perceived stress that the eustress group. It could also mean that the idea of an experiment in itself is already a cause for the distress group to be more stressed than the eustress group. This research indicated that this is due to the nature of their personalities; a person with high N traits always seems to be experiencing more stress than people with high E traits. Another contributing factor could be the short term stressor used in this experiment; a short term stressor could quickly cause equal stress for both personality groups (the ceiling effect). A long-term stressor could cause more or longer enduring stress for the distress group. People with a high N trait see threat in stress which causes anxiety, distress and fear (Rusting & Larsen, 1997). This makes them more vulnerable to stress and its negative consequences as mentioned in the introduction (Hinnen et al., 2007; Ormel & Wohlfarth, 1991). The effect of the SSST has been found (Brouwer & Hogervorst, 2014; Derikx, 2015; Jenderny, 2015) but the effect of neuroticism on the scores of the SSST has hardly been researched. So neuroticism and stress correlate and the SSST has been found to elicit stress. But it is not (yet) possible to distinguish experienced stress between the eustress and distress group during preparation and singing, which might be due to the short period of stress or a ceiling effect.

In the introduction it is mentioned that Parkes (1986) stated that people high in E do worse when they don't have access to social support. People high in N are also linked to performing worse under social pressure (Rusting & Larsen, 1997). This could be one of the reasons why there are so few differences found between the eustress and distress groups. The way coping influences extravert people and social pressure influences neurotic people perceiving a stressful event, might be the reason why both groups can't be differentiated during the preparation, singing and after singing phases but can at the start of the research and after a relaxation period of two minutes.

The fifth hypothesis states a correlation between the scores of the Big Five on N and self-reported stress. Weinberger, Schwartz, and Davidson (1979) found that people low in anxiety were less stressed than people high in anxiety. As anxiety is a lower order trait of neuroticism (Rusting & Larsen, 1997), the same result would be expected here. And though a correlation has been found, it is only a weak one (figure 4). This is why another correlation was done between the scores of the Big Five on E and the self-reported stress, to determine if these would provide the opposite results, a downward correlation instead of an upwards correlation. It did display this but the effect was even weaker. Therefore a weak conclusion can be made that the higher a score on N, the higher the self-reported stress is.

Another interesting effect is shown in figure 2, where the mean scores of HR and SCR are shown. The HR scores are stable throughout the experiment except for the preparation and singing phases but the SCR score starts high, keeps descending until the preparation phase and decreases again after the singing phase. Why would SCR be unstable at the start of the experiment in comparison to HR? HR might be a much faster physiological response in general. So because of the movement of the participant when they change chairs between the questionnaires and the actual experiment, the SCR and HR spike. But because HR is a much faster system it has already stabilized when the participants sat down, the sensors were applied and the rest of the experiment is explained by the researcher. The SCR might still be high because it a slower system but it does somewhat stabilize after pre baseline 2.

Two forms of measurement were used to measure stress, an objective measurement with physiological measures and a subjective one with self-reported scores. Both can be appealing in their own way. Choosing either depends on whether one thinks the personal experience of stress is more important (Edwards & Cooper, 1988; Le Fevre et al., 2003) or if an objective measurement is needed to determine an objective amount of stress. The way people experience stress is different for each individual and influences the way they perceive stressful events. However this way of measuring stress is subject to influences like social desirable answers, mood, people not being in touch with their true feelings etc. However physiological measures could be interpreted wrong or used for the wrong reasons and both need to be validated by other research as well. More clarity on when HR or SCR is a better measurement might help in determining the effects of personality traits on stress.

3.1 Limitations and future research

This research has not included all traits because early tests performed where the criteria for the distress group was a high neuroticism score and for the eustress group was a high score on extraversion, agreeableness, conscientiousness and openness did not yield significant results. From the literature extraversion seems the most important contributing factor to eustress, which is why this trait was selected for the eustress group. However more tests can be done on the other three traits which were excluded here. For example an effect of conscientiousness on the effects of the SSST has not yet been proven (Duddeck, 2015; Jenderny, 2015).

A recommendation for future research is to research the effect of eustress on a long-term stressor. Because the effects that a short term stressor like the SSST differs between eustress and distress people is hardly proven in this research might mean that another type of stressor can yield stronger results. The fact that people high in extraversion do worse when they don't have access to social support can be an important factor in future research. It is an interesting subject by itself or it is a fact that has to be taken into account when repeating an experiment similar to this one. Agreeableness is mentioned in the introduction as concerning interaction with other people. It looks like extraversion, except that agreeableness is more about the quality of the social interaction and not

the quantity, which is what extraversion is about. This could mean that when agreeableness is a topic of interest in a future research that the same recommendation applies; keep in mind that they can do worse when they don't have access to social support, which could influence their results.

5. Conclusion

This research contributed to the knowledge about the effects distress and eustress have on stress. People with distress traits take longer to return their stress levels to their baseline when measured with SCR. For HR there is no difference between these two groups. The distress group also reports being more stressed at the start of the experiment which might indicate that people high in N are more stressed in general. HR and SCR did not confirm higher stress in this group. A weak effect was found between high N scores and the self-reported stress during the experiment. Which means that a weak claim can be made that neurotic people experience more stress during the experiment than extravert people. Can eustress protect against distress? This research indicates that SCR is a better method to measure stress when using a short term stressor. SCR also indicates that neurotic people need more time to recover from the stressful singing phase in the SSST than extravert people, which the self-reported scores confirm. Difference in stress has not been found during the stressful event itself but during recovery neurotic people seem to be more stressed than extravert people.

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Appendix

Appendix A: consent form (in Dutch)

GEÏNFORMEERDE TOESTEMMING

Ik, …….. (*naam proefpersoon)*

Stem hiermee toe mee te doen aan een onderzoek dat uitgevoerd wordt door

Lars Nijboer en Luc Derikx

Ik ben me ervan bewust dat deelname aan dit onderzoek geheel vrijwillig is. Ik kan mijn medewerking op elk tijdstip stopzetten en de gegevens verkregen uit dit onderzoek terugkrijgen, laten verwijderen uit de database, of laten vernietigen tot 24 uur na het onderzoek.

De volgende punten zijn aan mij uitgelegd of anders zijnde duidelijk gemaakt:

1. Het doel van dit onderzoek is het onderzoeken van de samenhanging tussen persoonlijkheidskenmerken en niveau van fitness.
2. Er zal mij gevraagd worden vragenlijsten in te vullen en diverse taken gepresenteerd via een computer uit te voeren.
3. Ik ben mij ervan bewust dat tijdens een deel van het onderzoek mijn (HR) hartslag en SCR (Skin Conductance Response) worden gemeten. Ook ga ik ermee akkoord dat de apparatuur om dit te meten aan mij zal worden aangesloten door een van de onderzoekers.
4. Tijdens het onderzoek zal ik de instructies, die mij door de onderzoekers worden gegeven uitvoeren.
5. Het hele onderzoek zal ongeveer 60 minuten duren. Ongeveer 15 minuten hiervan bent u verbonden aan de meet-apparatuur. De resterende tijd bestaat uit het invullen van vragenlijsten. Aan het einde van het onderzoek zal de onderzoeker u een briefing geven over dit onderzoek.
6. De gegevens verkregen uit dit onderzoek zullen anoniem verwerkt worden en kunnen daarom niet bekend gemaakt worden op een individueel identificeerbare manier.
7. De onderzoeker zal alle verdere vragen over dit onderzoek beantwoorden, nu of gedurende het verdere verloop van het onderzoek.
8. Ik heb de mogelijkheid om de eindresultaten van het onderzoek in te zien, zodra ik dit wil en de onderzoekers mijn contactgegeven (E-Mail Adres) geef.

9. Deelnemers aangesloten via Sona-Systems krijgen 1 punt toegewezen na complete afloop van dit experiment, ongeacht de beslissing de persoonlijke data te laten vervallen.

Handtekening onderzoeker: …… Datum: ……..

Handtekening proefpersoon: …… Datum: ……..

Appendix B: information brochure

Procedure wegens persoonlijk contact.

Gedurende dit experiment wordt u aangesloten op apparatuur om hartslag en huidgeleiding te meten. Deze apparatuur bestaat uit twee polsbanden met sensoren en twee sensoren voor de wijs en ringvinger van uw linkerhand. Daarnaast wordt er een EDA meter aangesloten. Deze worden door de onderzoeker bij u aangebracht. Hier hoort geen risico of ongemak uit voort te vloeien. De apparatuur draagt u ongeveer 15 minuten terwijl u instructies op een scherm opvolgt. Het gehele experiment duurt maximaal 1 uur.

Wegens persoonlijk contact is het gebruikelijk de gegevens van de onderzoekers mee te geven aan de deelnemers van het experiment. Tevens staan hieronder de gegevens vermeldt waar eventuele klachten kunnen worden ingediend waarover u van mening bent dat dit niet bij de onderzoekers achtergelaten dient te worden.

Het experiment wordt uitgevoerd door;

Onderzoeker	E-mail	Telefoonnummer	Adres
Lars Nijboer	Larsnijboer@gmail.com	(mob) 0622321286	Maanstraat 29, 7521 te Enschede
Luc Derikx	L.W.J.Derikx@student.utwente.nl	(mob) 0622852357	Richtersweg 18, 7521 BW Enschede

Bij klachten over de onderzoekers of over de procedure kunt u deze indienen bij de secretaris van de ethische commissie te bereiken op het mailadres; j.rademaker@utwente.nl toe behorend aan Drs. Janke Rademaker werkzaam bij de vakgroep BFD.

Appendix C: demographic questionnaire

In de volgende vragenlijst wordt u gevraagd om vragen over middelengebruik, gezondheid, zing-ervaring en algemene demografische gegeven te beantwoorden. In totaal bestaat de vragenlijst uit 28 vragen. Wij vragen u om deze vragenlijst zo volledig en zo waarheidsgetrouw mogelijk in te vullen. Tijdens het invullen is de onderzoeker voor eventuele vragen beschikbaar. De resultaten worden helemaal anoniem verwerkt.

Demografische Gegevens

Voer hier uw (Sona)-Proefpersoonnummer in : _____

1. geslacht:

2. nationaliteit:

• Nederlands

• Duits

• anders, namelijk: _____

3. Hoe oud bent u?

___ jaar

4. U bent op dit moment

• Student

• Scholier

• werkend

• gepensioneerd

• werkloos

• anders, namelijk: _____

5. Hoe heeft u van dit onderzoek gehoord?

• -De Onderzoekers zelf

• -Sona-Systems

• -Vrienden

• -anders, namelijk: _____

Drugs- en middelengebruik

6. Rookt u?

• Ja

• Nee → verder na vraag 8.

• Nee, ik ben _____ maanden/jaren geleden gestopt → verder na vraag 8

7. Hoeveel sigaretten rookt u gemiddeld ongeveer per dag?

___ sigaretten per dag

Heeft u in de twee uur voorafgaand aan het onderzoek gerookt?

- Ja

- nee

8. Drinkt u wel eens alcoholhoudende dranken?

• Ja

• Nee → verder na vraag 11.

9. Heeft u in de twee uur voorafgaand aan het onderzoek alcohol gedronken?

• Ja

• Nee

10. Hoeveel glazen alcohol drinkt u gemiddeld ’per week?

___ glazen

11. Gebruikt u regelmatig medicijnen?

• Ja

• Nee → verder na vraag 14.

12. Welke medicijnen gebruikt u? (Indien u dit niet wil delen, wilt u dat dan aangeven)

_____

13. Hoe vaak gebruikt u deze medicijnen per week?

___ dagen per week.

14. Drinkt u wel eens cafeïne houdende dranken?

• Ja

• Nee → verder na vraag 17

15. Heeft u in de twee uur voorafgaand aan het onderzoek een cafeïne houdende drank gedronken?

- Ja

- nee

16. Hoeveel drinkt u gemiddeld?

___ kopjes per dag

17. Rookt u wel eens Cannabis?

• Ja

• Nee → verder na vraag 20.

19. Hoe vaak rookt u gemiddeld Cannabis?

___ dagen per week

20. Gebruikt u nog andere middelen of Drugs (zoals cocaine, MDMA, Ecstasy, Speed, Amphetamine, etc.)?

• Ja

• Nee → verder na vraag 22

21. Indien ja, noem a.u.b. welke middelen u verder nog consumeert en hoe vaak u dit doet.

Middel Gemiddelde Dagen per week

Gezondheid

22. Leidt u onder ernstige klachten of chronische ziekte?

• Ja

• Nee → verder na vraag 24.

23. Indien ja, welke:

_____

24. Hoeveel dagen per week bent u gemiddeld aan het sporten?

___ dagen per week. (Indien u 0 dagen aan het sporten bent, sla de volgende vraag over)

25. Hoe veel minuten bent u op zo'n dag gemiddeld aan het sporten?
___ minuten per dag.

26. Hoe intensief sport u gemiddeld?
0 niet intensief
0 gemiddeld intensief
0 zeer intensief

Zingen

28. Zingt u wel eens?
- vaak
- soms
- (bijna) nooit

29. Zingt u wel eens in de aanwezigheid van anderen (bijvoorbeeld huisgenoten)?
- ja
- nee

27. Heeft u ervaring met zingen in het openbaar (koor, band, musical, professionele zanglessen, etc)?
• Ja
• Nee

28. Heeft u ervaring met solo (alleen) zingen in het openbaar?
• Ja
• Nee

29. Heeft u ervaringen met solo(alleen) a capella (zonder instrumenten) zingen in het openbaar?
• Ja
• Nee

Bedankt voor het invullen. U kunt de vragenlijst nu aan de onderzoeker terug geven.

Appendix D: Script instructions SSST

Instructie	Tijd (sec.)
Zit rustig, probeer te ontspannen en je aandacht te richten op je ademhaling terwijl je de seconden ziet aftellen.	120
Bedenk verschillende dieren die met de letter P beginnen.	30
Bedenk dingen die je in een keuken kunt vinden.	30
Bedenk verschillende dingen, die belangrijk zijn als je een bruiloft wilt organiseren.	30
Bedenk zoveel mogelijk teamsporten die zonder bal beoefend worden.	30
De volgende opdracht is om een lied hardop te zingen - bedenk in de komende 30 seconden welke liedjes je kunt zingen.	30
Zing nu een lied hardop gedurende de komende 30 seconden en probeer je armen stil te houden. Blijf zingen!	30
Zit rustig, probeer te ontspannen en je aandacht te richten op je ademhaling terwijl je de seconden af ziet tellen.	120

Instruction	Time (sec.)
Sit calmly, try to relax and focus on your breathing.	120
Think of different animals that start with the letter P.	30
Think of things you can find in a kitchen.	30
Think of things that are important when you are planning a wedding.	30
Think of team sports which are played without a ball.	30
The next task is to sing a song out loud. Think in the next 30 seconds about song which you can sing.	30
Sing the song out loud for the next 30 seconds while trying to keep as still as possible. Keep singing!	30
Sit calmly, try to relax and focus on your breathing.	120