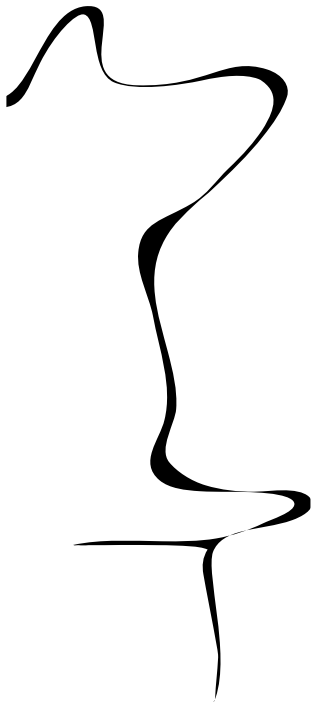


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**THE EFFECT OF A CHANGE IN
STRESS-MINDSET ON SELF-ESTEEM**

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Bachelor Thesis Psychology
June 24, 2019

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Abstract

Chronic stress is a topic of growing awareness in today's society since it has been shown to have considerable negative effects on physical and mental health. Therefore, it is of special duty for today's research to investigate ways of adaptive coping with stress. This study examines whether manipulating participants to have a more stress-enhancing mindset actually leads to having a more stress enhancing mindset and whether this has an effect on their level of self-esteem. A parallel RCT study design was conducted in the Netherlands. In total, 80 participants were included in the study. Participants were randomly assigned into an experimental and a control group with an allocation ratio of 1:1 and they took part in three online surveys allocated over a time span of 3 weeks. The experimental group was presented with a short text about the enhancing side of stress while the control group was presented with a short text about the Big Five personality traits. Independent sample t-tests and a paired sample t-test was used to analyze the obtained dataset. No change in mindset was found after the manipulation and no significant results were found regarding the relationship between stress mindset and level of self-esteem. For future research, it is recommended to use a manipulation in form of videos, so that the participants are prone to visual and audible material, which makes it easier to internalize the information. Furthermore, it is recommended for studying stress mindset to choose for a specific target group, which is regularly inclined to experience stress. Since stress is a topic of growing awareness in today's society, it is necessary to further elaborate on stress and on how to cope with stress in order to help people to live a long and healthy life.

1. Introduction

Chronic stress has become a topic of growing awareness in today's society. It is a critical factor that influences human physiological and psychological well-being. A study by Cohen and Miller (2007) has shown that experiencing stress in the long term is correlated to a higher risk of developing different diseases such as cardiovascular disease or hypertension. Next to the biological and physiological problems which can be one consequence of permanently experiencing stress, psychological and mental well-being can also be negatively affected by stress (Mazure, 2006).

People unconsciously hold different mindsets of stress in order to modify their mental well-being. These mindsets determine the way people think of stress and in that way mindsets moderate whether people feel good or bad in the way they experience stress (Crum, Salovey, & Achor, 2013). The way people are thinking about stress is not the only moderator to regulate how people experience stress and how they feel about it. People's way of experiencing stress and coping with it can also be modified by personal attributes. One of those personal attributes, which serves as a moderator between stress and mental well-being has been shown to be self-esteem, which is being confident and satisfied with one's personal worth and being able to trust one's own abilities (Hudd et al., 2000).

Therefore, it is important to further explore the role of stress with regard to mental well-being and in which way a change in one's mindset of stress can lead to an improvement of mental well-being. In order to investigate this topic, it is necessary to firstly define stress and the mindset of stress and to secondly elaborate the relationship between stress, the mindset of stress, mental well-being and self-esteem and the studies that have been focusing on this topic so far.

1.1 Stress

People experience stress in each domain of life and stress can be perceived in many different forms and situations. There are stress factors experienced at work or during studying, such as having to keep track on several deadlines while also studying for exams next to it or being allocated to having a responsible role in one's workplace. Next to it, stress can also be perceived in everyday life or in trying to hold one's work-life balance (Chiang, Birtch, & Kwong Kan, 2010). In addition to stress factors experienced in one's work or study field and in everyday life, stress factors can also be specific life events such as the death of a loved one, a divorce or losing one's job. It is important to outline that stress is experienced subjectively and therefore, people experience stress at different levels and in different situations, always depending not only on the people's subjective feelings but also on the context in which stress is experienced (Mazure, 2006). The subjectivity of experiencing stress makes it difficult to find a definition of stress which is suitable for every person and for every situation or context.

Despite the fact that people feel stressed in different situations or due to different factors, the bodily reactions to stress are experienced universally (Viner, 1999). Even though there is a range of bodily reactions, not all of them occur once a person is experiencing stress but always depending on the magnitude and the subjective importance of the situation in which stress is experienced. The main bodily reaction, which is felt when experiencing stress, is arousal (Chrousos, 2009).

It is important to outline that stress, even though it is portrayed negatively in most media, is not consequentially negative. If stress is alternated with phases of relaxation or relaxation techniques, such as listening to music, it has beneficial effects on the performance and productivity of people (Linnemann, Ditzen, Strahler, Doerr, & Nater, 2015). Stress triggers areas of the brain responsible for controlling attention and to distribute resources. In that way, people are able to focus on their tasks and to work efficiently on it (Fay & Sonnentag, 2003). In contrast, experiencing stress in the long run, namely chronic stress, can

lead to severe impacts on health, such as being at risk of developing cardiovascular disease or hypertension (Cohen, et al., 2007). The impact stress directly or indirectly has on people's health is one of the reasons why it is of high importance to investigate stress, the way people experience stress and how experiencing stress can be modified in order to help people cope with stress. Next to the impact on physiological health, stress also affects mental well-being in different ways and since mental well-being has been proven to have a considerable impact on one's well-being and health in general, it is necessary to also outline the relationship between stress and mental well-being.

1.2 Stress and mental well-being

Research has shown that stress has severe negative impacts on mental well-being.

Experiencing a large amount of stress for a long time period can lead to low levels of energy and developing a depression (Mazure, 2006). Furthermore, it was researched that the way people experience stress, in terms of thinking about not being able to cope with the stress or to handle the situation, also has a major influence on mental well-being and can result in depression (Hovey & King, 1996).

Next to developing a depression, experiencing stress in the long term can also result in eating disorders or suffering from a burnout. It was proven that experiencing stress on a longer term can result in unregular and unhealthy eating patterns and can result in both eating too much or too less than what the body usually needs (Fryer, Waller, & Kroese, 1998). In the long run, this can on the one hand result in binge eating disorders, where people are at risk of developing obesity, which in turn can result in severe health implications, such as cardiovascular disease (WHO, 2018). On the other hand, chronic stress can result in unregular eating behaviors associated with eating less than necessary, and therefore, can result in eating disorders such as anorexia nervosa, which in the long run can also lead to health problems, such as being undernourished (National Eating Disorder Association, 2012).

Stress can also lead to experiencing a burnout, which can lead to impairments of personal as well as social functioning and thus can impair the work-life balance and in the worst case can lead to losing one's job due to not functioning correctly at work. Therefore, experiencing a burnout can lead to experiencing even more stress (Cherniss, 1980). These examples of how stress can influence people's mental well-being highlight that it is of special importance to further investigate coping with stress in order to prevent severe mental and physical health impairments. The ability to trust in one's abilities, namely self-esteem is associated with adaptive coping styles with regard to stress (Bailey, 2003). Thus, it is interesting to examine the connection between self-esteem and stress and the research that has been done on this topic so far.

1.3 Stress and self-esteem

Self-esteem also has a major influence on mental well-being. It can be defined as how a person sees himself in terms of his abilities and goals in life. But self-esteem is not only about how the person sees his abilities and goals but also how he assesses them, whether he trusts or distrusts in himself and his abilities (Bailey, 2003). Self-esteem has been shown to be a part of one's personality but in contrast to rather stable personality traits, self-esteem can be modified by changing factors as a study by Anusic and Schimmack (2016) has shown. Since self-esteem is closely connected to the mental well-being of people, it was shown that low levels of self-esteem are connected with a broad range of mental disorders. Individuals who do not trust themselves are at risk to develop depressive disorders, eating disorders as well as personality disorders (Mann et al., 2004). However, low levels of self-esteem have not only been shown to be connected to a range of mental disorders but also seem to be related to maladaptive coping with stress as the following studies showed.

A study conducted by Mäkikangas and Kinnunen (2003) investigated the influence of self-esteem and optimism on psychosocial work stressors. They found that low levels of self-

esteem had a negative influence on mental distress with regard to male employees. The study concludes and supports that self-esteem can have an influence on mental well-being and the ability to cope adaptively with stress (Mäkikangas & Kinnunen, 2003).

Another study, which was conducted by Hudd and colleagues (2000) examined the effects of stress at college in a sample of University students on health behaviors. The study showed that self-esteem, accompanied by social support and perceived health status, which positively mediates the effect of stress on health behaviors. They found that high levels of self-esteem have a positive effect on effectively coping with stress and perceiving more positive health behaviors in contrast to students who experienced lower levels of self-esteem (Hudd et al., 2000).

Besides these studies, a study by Rector and Roger (1997) investigated whether people who are manipulated to expose a high level of self-esteem experience less stress and have a better outcome in performance on the Stroop task compared to people who are manipulated to have a low level of self-esteem. They conducted an experiment in order to compare the two conditions of high level of self-esteem and low level of self-esteem. The results support the assumption that people with a higher level of self-esteem experience less stress and performed better on the Stroop task than people with a lower level of self-esteem (Rector & Roger, 1997).

All in all, the studies highlight that having higher levels of self-esteem is positively related to successfully coping with stress. Therefore, self-esteem is an important topic to investigate with regard to stress in order to help people to cope with stress effectively. Furthermore, since self-esteem has an important influence on mental well-being, it would be interesting to investigate, whether the way of experiencing stress, also has an influence on self-esteem. Thus, it is necessary to examine the way people think about stress, their stress mindset, and how this has an impact on how people cope with and experience stress. Thus,

the relationship between different stress mindsets and experiencing stress will be outlined in the following.

1.4 Stress mindset

People not only experience stress in different ways, people also hold different mindsets of stress, which can influence their way of experiencing stress. In order to understand the effects and purpose of a stress mindset, it is necessary to first of all define the term mindset. A mindset can be seen as a mental framework which organized the information and perceptions in order to direct the individual to achieve his goals and does so by guiding his actions (Dweck, 2008).

Crum, Salovey and Achor (2013) studied two different sets of stress mindsets. A stress mindset can be defined as the assumption a person has whether stress has a positive or negative effect on their performance and productivity. The term stress-enhancing mindset refers to the belief that stress has a positive and enhancing effect on one's productivity and performance. Sapolsky (1996) stresses that experiencing stress has an enhancing effect on the physical behavior and mental abilities in order to fulfil the demands and tasks required. According to Sapolsky (1996) this stems from an evolutionary perspective since fulfilling the demands and tasks, which caused stress, were necessary for survival in former times. In this kind of experiencing stress, the attention is tightened, and the resources are directed to the demand or task that needs to be fulfilled, so that each part of the body and the mind is focused on concentrating on the demand or task. This type of stress is called eustress and implies that stress is good and necessary in order to earn benefits from the demands and tasks that cause stress (Alpert & Haber, 1960).

The second mindset is called the stress-debilitating mindset and highlights the believe that stress has a negative and debilitating effect on the outcome and performance. Thinking about stress in a negative way does not prepare the body and mind to exert reactions to fully

concentrate and limit one's resources on the demand or task that causes stress. Once being driven by focusing on stress as a negative rather than a positive factor, people get into a downward spiral and are more likely to engage in behaviors that hinder them from fully focusing on the demands and tasks required (Crum, Salovey, & Achor, 2013).

Crum, Salovey and Achor (2013) found that making people aware of the existence and impact of those mindsets can convince people to change their mindset from experiencing stress as debilitating to experiencing stress as enhancing. In their study, they started with testing the people's mindset with a measure called Stress Mindset Measure (SMM).

Afterwards, they presented one group of the participants with three short videos in two to three days intervals informing the participants about the existence of the enhancing view and the effect of stress in different domains of life (Crum, Salovey, & Achor, 2013). In contrast, another group was presented with three short videos, also presented in two to three days intervals, containing information about the debilitating view of stress and its effects on different life domains. A third group, the control group, did not view any of these videos. After watching the third video, the participants were again measured on the SMM. The results outline that participants who held a stress-debilitating mindset before changed their mindsets readily into a stress-enhancing mindset. Furthermore, it was shown that changing the mindset to a stress-is-enhancing mindset has a positive impact psychological factors and work performance (Crum, Salovey, & Achor, 2013).

This study highlights that people are capable of changing their mindset and it shows that having a stress-is-enhancing mindset can have considerable effects on mental well-being. A change in mindset might be accomplished by presenting people with videos or articles and making them aware of the mindset they hold about stress and also to show them how having a positive mindset about stress can enhance their performance (Crum, Salovey, & Achor, 2013). Since stress is a topic of growing awareness due to its negative impacts on physical and mental health, it is necessary to further investigate into stress-mindset and their impact on

mental well-being. In the following, the relationship between stress, stress-mindset, mental well-being and self-esteem will be outlined and the aims as well as the importance of the current study will be explained.

1.5 Current study

As there is no study yet that examines the relationship between one's stress mindset and self-esteem, this study examines whether a change in one's stress-mindset towards experiencing stress as enhancing also fosters self-esteem and the trust people have in their own abilities. To test whether a change in the mindset after a manipulation occurs and if the participants change from a more stress-debilitating mindset to a more stress-enhancing mindset, the first research question arises: *To what extent does a change from a more stress-debilitating mindset to a more stress-enhancing mindset occur when people are confronted with the various potential mindsets on stress?* Out of this research question, the following hypothesis arise:

H1: It is expected that people who were manipulated to change their mindset from a more stress-debilitating mindset to a more stress-enhancing mindset, score higher on the Stress-Mindset-Measure after the manipulation compared to participants who were not manipulated to change their mindset.

Next, it is interesting to see how a change in one's mindset influences one's self-esteem.

Therefore, the following research question arises: *To what extent does a change in the stress mindset from a more stress-debilitating mindset to a more stress-enhancing mindset has a positive influence on self-esteem?* Out of this research question, the following hypotheses arise:

H2: It is expected that people who were manipulated to change their mindset to a more stress-enhancing mindset, are more likely to have higher levels of self-esteem than people who respectively were not manipulated to change their mindset.

H3: It is expected that people who changed their mindset to a more stress-enhancing mindset have a higher level of self-esteem after changing the mindset compared to their level of self-esteem before they changed the mindset.

2. Method

This study was approved by the ethics committee of the University of Twente. All participants participated voluntarily and gave their informed consent online before they participated in this study.

2.1 Design

A parallel RCT study design was conducted in the Netherlands. Participants were randomly assigned into an experimental and a control group with an allocation ratio of 1:1. Online surveys were received at three different points in time: at baseline, post-test one week after baseline and follow-up two weeks after baseline. It was examined whether stress-mindset changes over time due to the manipulation and whether there is a relationship between the dependent variable self-esteem and the independent variable stress-mindset.

2.2 Participants and procedure

In April 2019, participants were recruited by the use of the convenience sampling. Each of the eight researchers asked at least 20 people to complete the survey with the aim to choose people with a wide range of age and an equal mix of gender. The participants were asked by

the researchers to participate in the online survey in Qualtrics about how humans process new information. Eligible participants were adults from Germany, aged 18 years or older, who have a valid e-mail address and a sufficient internet connection. All information and all surveys were given to the participants in German. Participants who agreed to participate received an email with the link to the informed consent, which they needed to agree in order to fill in the baseline survey. In the informed consent, it was stated that the purpose of the study is to investigate how humans process new information. Furthermore, the procedure and the time frame for each of the baseline survey, posttest and follow up survey were explained, and the participants were ensured that their data is kept anonymously and confidential. After agreeing to the informed consent (see Appendix A and B), the participants were directly led to the baseline survey, which consisted of demographical questions regarding age, gender, educational and occupational status and of six different scales and 82 questions in total. For this study, only the demographical questions and the Stress Mindset Measure (SMM) as well as the Rosenberg Self-Esteem Scale are relevant. The baseline survey took approximately 15 to 20 minutes to complete. Of the 158 eligible participants, 155 participants finished the baseline survey, as displayed in the flowchart of the participants in Figure 1. After baseline, the 155 participants were randomly allocated by the main researcher into two experimental and one control groups on a 1:1 ratio. 51 participants were allocated to the life group, 52 participants were allocated to the stress group and 52 participants were allocated to the control group. Since this study only focuses on the stress-mindset manipulation, the life-mindset manipulation will not be taken into account any further and respectively the participants allocated to the life-mindset ($n = 51$) were not included in this study sample. Furthermore, as the life group will not be taken into account, the stress group will be referred to as experimental group in the following. After randomization and one-week after the baseline survey, the participants received an email which asked them to further participate in the posttest. Before they filled out the posttest, they were asked to read an informative text. The

experimental group was presented with a manipulation in form of a short text about the positive and enhancing side of stress, while the control group was presented with a short, neutral text about the big five personality traits. Directly after reading the texts, the participants filled out the posttest which consisted of four scales and 23 items in total. 45 participants of the manipulation group and 45 participants of the control group filled out the posttest. With regard to the posttest, only the SMM was relevant for this study. One week after posttest and two weeks after the baseline survey, a link to the follow-up was sent to the participants via E-Mail. The follow-up consisted of six scales and 79 items in total. In total, 43 participants of the experimental group and 37 participants of the control group completely filled in the last survey. The full flow chart of participants can be found in Figure 1. To increase participation, participants received a reminding email when they have not filled out the questionnaires so far.

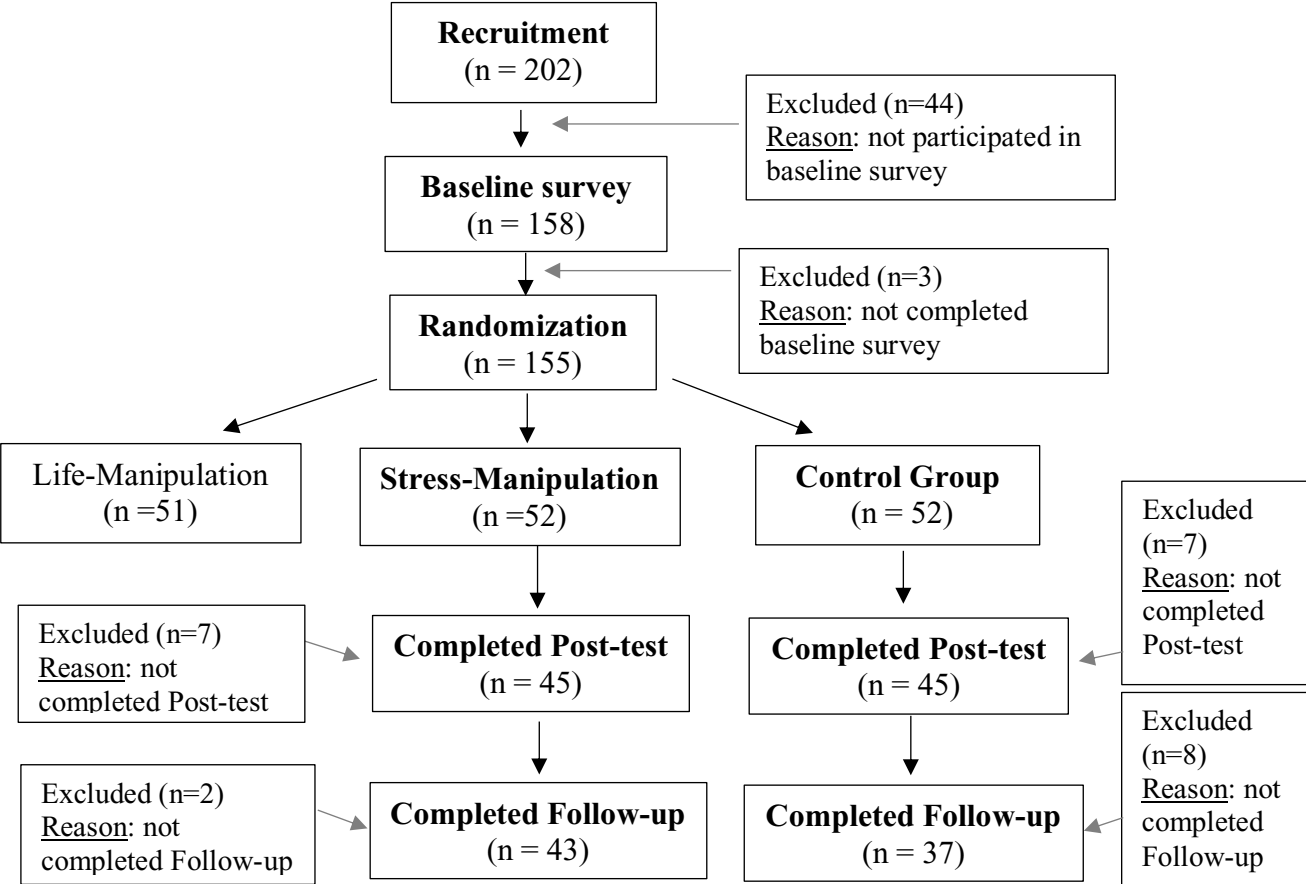


Figure 1. Flow chart of participants in this study

2.3 Interventions

2.3.1 Intervention in experimental group

The experimental group was presented with a short informative text (see Appendix C and D), approximately half a page of size, with information regarding the enhancing side of stress.

The text started by asking the participants whether they already know that stress can be beneficial for their health and personal growth. Afterwards, it was stated that stress is not only negative but also has positive, beneficial side and that this beneficial, enhancing side of stress puts the brain in an optimal condition to function. Additionally, the participants were informed that believing of stress as positive can contribute to having higher levels of energy, better workplace performance and being more satisfied in life in general. At the end, it is shortly concluded that believing that stress is positive can have a beneficial impact on health, performance and personal growth. It was chosen to inform the participants about this side of stress since this was outlined in the study by Crum, Salovey and Achor (2013).

2.3.2 Intervention in control group

The control group was presented with a short informative text (see Appendix E and F), approximately half a page of size, about the big five personality traits. At the beginning of the text, the participants were asked whether they have heard that the big five are not only animals but also indications of their personality. In the following, the participants were informed about the five personality traits – openness, conscientiousness, extraversion, agreeableness and neuroticism – and the attribute contributing to these personality traits. Moreover, it was described that these personality traits are stable over time and that each personality trait moves in between two extremes. In the end, it is shortly concluded that one's personality can be categorized into five main traits which are relatively stable. It was chosen to inform the participants about the big five personality traits since this has nothing to do with this study but still, it has an informative character.

2.4 Measures

2.4.1. Stress Mindset Measure (SMM)

In order to determine whether a person holds a stress-debilitating or a stress-enhancing mindset, the Stress Mindset Measure (SMM) developed by Crum, Salovey & Achor (2013) was used. The SMM is an eight-item questionnaire, in which people can rate on a five-point Likert scale how they perceive stress in general (Crum, Salovey, & Achor, 2013). The Likert-Scale ranges from 0 (strongly disagree) to 4 (strongly agree). Furthermore, the SMM assesses whether a person perceives stress as enhancing or debilitating. Example items are “*Experiencing stress facilitates my learning and growth.*” and the opposite item “*Experiencing stress inhibits my learning and growth.*”. The SMM contains each four negative, stress-debilitating items and four positive, stress-enhancing items. The scores are obtained by reverse scoring the negative items, and then calculating the mean of all eight items. The higher the score on the SMM implicating a more stress-enhancing mindset. The SMM has been proven to have sufficient reliability and validity shown in a study by Crum, Salovey & Achor (2013) with a Cronbach’s alpha of .86 in a sample of 335 participants. In the current study, the SMM has a Cronbach’s alpha of .83. As there has not been a German translation of the SMM so far, the SMM was translated in German by the researcher (see Appendix G).

2.4.2 Rosenberg’s Self-Esteem Scale

To determine a person’s level of self-esteem, the Rosenberg’s Self-Esteem Scale developed by Rosenberg (1965) was used. It is a ten-item scale with a four-point Likert rating scale (Rosenberg, 1965). The Likert-Scale ranges from 0 (strongly disagree) to 4 (strongly agree). The participants had to indicate items, such as “*On the whole, I am satisfied with myself.*” and “*I certainly feel useless at times.*” in order to determine how they think of themselves, their abilities and capacities. This scale is also divided in half positive items and half negative

items. Therefore, to obtain the Rosenberg's Self-Esteem Scales' scores, the negative items are scored reversely and then the mean of the ten items is taken. The higher the score on the Rosenberg's self-esteem scale, the higher the level of self-esteem. The Rosenberg's Self-Esteem Scale has shown to have a good reliability with Cronbach's alpha of .83 in the current study.

2.4 Statistical Analysis

All analyses were performed using SPSS, Statistical Package for the Social Sciences, version 24. During all analysis, an alpha of .05 was applied and all the tests that were used were two-tailed. The final data set was determined. Cases that did not fill out the whole questionnaire were removed from the sample.

Descriptive statistics were used to describe the characteristics of the participants. In order to allocate the participants in more stress-enhancing or more stress-debilitating categories, the sum scores on the SMM were used. Since there is no cut off score for this measure, it can only be said that the lower the score on the SMM, the more stress-debilitating mindset and the higher the score on the SMM, the more stress-enhancing mindset.

In order to see whether the data is normally distributed, a skewness and kurtosis check was implemented. The effect of the independent variable stress-mindset on the dependent variable self-esteem was assessed by using Pearson correlation. In order to test H1, whether there was a change in the stress-mindset after the manipulation in the experimental group compared to the control group, an independent sample t-test was used. To check H2, whether participants who changed their mindset to a more stress-enhancing mindset have a higher self-esteem compared to the participants in the control condition, an independent sample t-test was used. Next, to test H3, whether participants who were manipulated have a higher level of self-esteem after the manipulation compared to their level of self-esteem before the manipulation, a paired sample t-test was used.

3. Results

3.1 Participants

The final sample consisted of 80 participants ($n = 80$). In Table 1 the baseline characteristics of the participants in the experimental, control group, total sample and the baseline differences between experimental and control group can be found. 30 participants (37.5%) were male and 50 participants (62.5%) were female ($M = 1.6$, $SD = .49$). The mean age of the sample was 36.33 years ($M = 36.33$, $SD = 17.6$) and the participants were predominantly higher educated (68.9%). No baseline differences were found between the experimental and the control group.

Table 1.

Baseline characteristics and differences of participants in the experimental, control group, total sample.

	<i>Experimental</i> ($n = 43$)	<i>Control</i> ($n = 37$)	<i>Total</i> ($n = 80$)	<i>Baseline differences</i> (t ; p -value)
Age, M (SD)	37.02 (18.1)	35.51 (17.2)	36.33 (17.6)	.381; .704
Gender, n (%)				.515; .608
Female	28 (65.1)	22(59.9)	50 (62.5)	
Male	15 (34.9)	15 (40.5)	30 (37.5)	
Education, n (%)				1.068; .289
Low (Hauptschulabschluss)	0 (0)	1 (2.7)	1 (1.3)	
Middle (Mittlere Reife)	5 (11.6)	4 (9.3)	9 (11.3)	
High (Hochschulreife, Fachhochschulreife)	22 (51.2)	13 (35.1)	35 (43.8)	
Bachelor	3 (7)	6 (16.2)	9 (11.3)	
Master	2 (4.7)	2 (5.4)	4 (5)	
Professor	0 (0)	1 (2.7)	1 (1.3)	
Apprenticeship	2 (4.7)	4 (10.8)	6 (7.5)	
Apprenticeship + further education	4 (9.3)	2 (5.4)	6 (7.5)	
Other	4 (9.3)	5 (13.5)	9 (11.3)	
Employment Status, n (%)				.386; .248
Pupil	1 (2.3)	0 (0)	1 (2.3)	
Student	15 (34,9)	10 (27)	25 (31.3)	
Apprentice	3 (7)	3 (8.1)	6 (7.5)	

Full-time (38 + hours per week)	17 (39.5)	14 (37.8)	31 (38.8)
Half-time (less than 38 hours per week)	6 (14)	8 (21.6)	14 (17.5)
Unemployed	0 (0)	0 (0)	0 (0)
Retired	1 (2.3)	2 (5.4)	3 (3.8)

3.2 Drop-outs

As it is illustrated in the flowchart of the participants in Figure 1, out of the 202 participants that were recruited in total, 158 participated in the baseline survey and 155 participants completed the baseline survey. After being allocated to either life, stress or control group, 51 participants were allocated to the experimental group and 52 participants were allocated to the control group. The participants allocated to the life group will not be taken into account any further. Out of these participants, 45 participants of the experimental group completed the post-test and 6 participants did not participated in the post-test. In the control group, 45 participants completed the posttest whereas 7 participants did not participate in the post-test. In the follow-up 43 participants of the experimental group completed the survey and 2 participants did not participate while 37 participants of the control group completed the survey, 7 participants did not participate, 1 participant did not fill out the survey completely and was thus removed from the sample. Drop-outs and participants completing the survey did not differ with regard to demographical aspects.

3.3 Distribution of stress mindsets in participants

In the sample, 24 participants (30%) scored lower on the SMM, that showed that these participants held a more stress-debilitating mindset while 56 participants (70%) scored higher on the SMM, which showed that these participants held a more stress-enhancing mindset in the baseline assessment. In the mindset assessment in the posttest, 15 participants (18,8%) participants scored lower on the SMM showing that they held a more stress-debilitating whereas 65 participants (81,3%) scored higher on the SMM showing that they held a more

stress-enhancing mindset. In the follow-up assessment, 18 participants (22,5%) scored lower on the SMM, showing that these participants held a more stress-debilitating and 62 participants (77,5%) scored higher on the SMM, showing that these participants held a more stress-enhancing mindset.

3.4 Change from a more stress-debilitating to a more stress-enhancing mindset

The first research question was to what extent does a change from a more stress-debilitating mindset to a more stress-enhancing mindset occur. Therefore, the first hypothesis claimed that it was expected that people who were manipulated to change their mindset from a more stress-debilitating mindset to a more stress-enhancing mindset, score higher on the SMM after the manipulation compared to participants who were not manipulated to change their mindset. The data was normally distributed and there was a positive correlation found between the independent variable stress-mindset and the dependent variable self-esteem ($r = .34, p \leq 0.01$). The results of the independent sample t-test showed that there is no significant difference between the stress mindset after the posttest for the experimental group ($M= 25.77, SD= 6.11$) compared to the control group ($M= 24,27, SD= 5.32$); $t= 1.160 p= .250$. This demonstrates that the participants in the experimental group did not hold a different stress mindset after the posttest compared to the participants of the control group. Similar results were obtained in the comparison of the stress mindset after the follow-up for the experimental group ($M= 25.07, SD= 6.91$) compared to the control group ($M= 24.03, SD= 6.44$); $t= .694; p= .489$. This shows that the participants of the experimental group did not hold a different stress mindset after the follow-up compared to the participants of the control group. The results suggest that the first hypothesis, that participants score higher on the SMM after being manipulated compared to the participants who were not manipulated, is not supported.

3.5 Comparison of self-esteem between experimental and control group

The second research question was to what extent does a change in the stress mindset from a more stress-debilitating mindset to a more stress-enhancing mindset has a positive influence on self-esteem. Thus, the second hypothesis claimed that it was expected that people who were manipulated to change their mindset to a more stress-enhancing mindset, are more likely to have higher levels of self-esteem than people who respectively were not manipulated to change their mindset. The independent sample t-test to test H2 showed that there was no significant difference between the follow-up scores on the Rosenberg self-esteem scale of the experimental group (M= 31.02, SD= 4.42) compared to the scores of the control group (M= 32.46, SD= 4.40); $t = .150$; $p = .501$. This indicates that the participants of the experimental group did not have a higher level of self-esteem after the manipulation compared to the participants of the control group. Thus, the second hypothesis, that participants who were manipulated to change their mindset to a stress-enhancing mindset score higher on the self-esteem scale than those in the control group, was not supported.

3.6 Comparison of self-esteem in experimental group between baseline and follow-up

The third hypothesis was set to also answer the second research question. It was expected that people who changed their mindset to a more stress-enhancing mindset have a higher level of self-esteem after changing the mindset compared to their level of self-esteem before they changed the mindset. The results of the paired t-test showed that there is no significant difference between the scores on the Rosenberg's self-esteem scale in the baseline survey (M= 30.95, SD= 4.52) compared to the scores on the Rosenberg's self-esteem in the follow-up (M= 31.02, SD= 4.42) for the experimental group ($t = -.190$; $p = .851$). This demonstrates that the participants of the experimental group did not have a higher level of self-esteem after the manipulation compared to their level of self-esteem in the baseline survey. Therefore, the third hypothesis, that participants who were manipulated to score higher on the SMM have a

higher score on the self-esteem scale after the manipulation compared to their score on the self-esteem scale before the manipulation, is not supported.

4. Discussion

In order to study the impact of knowledge about an enhancing stress-mindset on self-esteem, an experiment was set up in which participants were allocated to two groups: 1) experimental group and 2) control group. The aim of this study was to investigate whether participants hold a more stress-enhancing mindset after being exposed to a manipulation in form of a short informative text containing information about the enhancing and beneficial side of stress and its impact on health, performance and personal growth. Furthermore, it was examined whether the manipulation has an influence on the participants' level of self-esteem.

Main findings

The first hypothesis stated that it was expected that participants who were manipulated to change their mindset from a more stress-debilitating mindset to a more stress-enhancing mindset, have a more stress-enhancing mindset after the manipulation. The results of this study showed that participants did not have a more stress-enhancing mindset after being exposed to the manipulation. These findings are contradictory to the results found by Crum, Salovey & Achor (2013). In their study, participants had a more stress-enhancing mindset after being exposed to three different videos containing information regarding the enhancing side of stress over a course of one week (Crum, Salovey, & Achor, 2013). Therefore, a possible explanation for the rejection of the first hypothesis could be that the manipulation in form of a short text informing the participants about the enhancing side of stress used in this study was not manipulative enough for the participants to change their mindset to a more stress-enhancing mindset after the manipulation. Using videos as a manipulation makes it

easier for the participants to visualize the content instead of only reading the information since both the visual and the auditory working memory are getting activated when watching a video (Coker Morey, Cowan, Morey, & Rouder, 2011), Furthermore, in this study the manipulation was only given at one point in time instead of three points in time as conducted in the study by Crum, Salovey, & Achor (2013).

The second hypothesis stated that it was expected that people who were manipulated to change to a more stress-enhancing mindset, are more likely to have higher levels of self-esteem than people who respectively were not manipulated to change their mindset. The results showed that participants did not have higher levels of self-esteem after being manipulated compared to the participants who were not manipulated. These findings are in contrast to the findings of Mäkikangas and Kinnunen (2003) since they found that low levels of self-esteem have a negative influence on the ability to cope with stress. A possible explanation for the contradictory findings could be that receiving negative feedback on coping abilities with regard to stress can have a threatening effect on self-esteem (Crum, Salovey, & Achor, 2013). It is possible that the participants already received positive feedback from their environment with regard to their coping abilities, which in turn lead to an enhancement in self-esteem and also to holding a more stress-enhancing mindset.

The third hypothesis stated that it was expected that people who changed their mindset to a more stress-enhancing mindset have a higher level of self-esteem after changing the mindset compared to their level of self-esteem before they changed their mindset. The results showed no difference in the manipulation group comparing the level of self-esteem before the manipulation and afterwards. The results of the second and third hypothesis are contradictory to the results found by Hudd and colleagues (2000) who showed that high levels of self-esteem were positively correlated with effectively coping with stress. One explanation for this finding could be that Hudd and colleagues (2000) examined self-esteem as a form of mediator between the effect of stress and health behaviors. The current study directly focused

on the relationship between stress mindset and self-esteem and did not take into account whether self-esteem works as a mediator between stress mindset and health behaviors. Another possible explanation for these results regarding the second and third hypothesis could be that the first hypothesis was not supported since both the second and third hypotheses were based on the assumption that participants changed their mindset after being manipulated. Therefore, as it was proven that participants did not change their mindset to a more stress-enhancing mindset after being manipulated, no difference regarding the mindset was found between the manipulation and the control group. Moreover, another possible explanation could be that 70% of the participants already held a more stress-enhancing mindset at the baseline survey, so that their level of self-esteem was already high at the baseline survey and no observable difference was found after the manipulation.

Since stress is a topic of growing awareness in today's society, it is of special importance to further investigate this topic. Having a more stress-enhancing mindset and a high level of self-esteem both have been shown to be successful ways of coping with stress (Crum, Salovey, & Achor, 2013; Mäkikangas & Kinnunen, 2003; Hudd et al., 2000; Rector & Roger, 1997). Therefore, it is necessary to investigate the relationship of these two coping mechanisms to be able to give advice to people on how to cope with stress in general and also with regard to specific situations or events which are experienced as stressful. Furthermore, since it was proven that stress has a negative effect not only on physical but also on mental health, being able to cope with stress reduces the risk of developing certain diseases, such as cardiovascular disease or burnout symptoms (Cohen & Miller, 2007; Mazure, 2006).

Strengths and Limitation

This study adds to the existing research due to several reasons. It is the first study to examine the influence of a stress-mindset on people's level of self-esteem and therefore, is the first study which gives insights into these two processes in combination. One strength of this study

are the questionnaires, namely the Stress Mindset Measure and the Rosenberg's self-esteem scale, which were used. Both questionnaires have been shown to have a high reliability and validity. In addition, the chosen study design of a parallel randomized control trial is another strength of this study. Gathering data from three points of time regarding stress mindset and from two points of time regarding self-esteem as well as having an experimental and control group makes it easier to detect small changes between the groups. Furthermore, another strength of this study is the age range represented in the sample, which shows that the sample is representable and thus, the results are generalizable.

The results are limited due to several reasons. Since this study was focusing on a change from a more stress-debilitating mindset to a more stress-enhancing mindset, it was one limitation that 70% of the participants already held a more stress-enhancing mindset at the baseline survey. It would be advisable for future research, to use a more stress-debilitating mindset as an inclusion criterion and a more stress-enhancing mindset as an exclusion criterion in order to get a sample which is respectively representative for a more stress-debilitating mindset. Moreover, limitations and improvements were found with regard to the sample of this study. Due to the small sample size it was difficult to detect small changes between the groups. Therefore, it would be advisable for future research to set up a bigger sample in order to be able to detect changes between the groups more easily. Another limitation of this sample was the overrepresentation of higher educated people (68.9%) and of women (62.5%), which limits the generalizability of the sample. Thus, another suggestion for future research could be to also set up inclusion and exclusion criteria with regard to the educational background and gender of the participants in order to have a generalizable sample. Furthermore, another suggestion for improvement with regard to the sample would be to choose for a specific target group to study stress mindset and self-esteem. An example for a suitable sample would be employers in specific working environments where they have to deal with stressful situations and events on a regular basis.

Future Research

To conclude, this study did not confirm the expectation that people change their mindset from a more stress-debilitating mindset to a more stress-enhancing mindset. Moreover, it was not confirmed that people who were manipulated to change their mindset have a higher level of self-esteem compared to people who were not manipulated to change their mindset.

Additionally, it was not supported that people who were manipulated to change their mindset have a higher level of self-esteem after the manipulation compared to their level of self-esteem before the manipulation.

As this study did not yield any significant relations, there are some suggestions for improvement for future research. As the manipulation of this study did not work out, it would be advisable to use another form of manipulation. An example for a manipulation can be taken from the study conducted by Crum, Salovey, & Achor (2013) who showed three short videos to their participants in a time span of one week. Videos might be a better manipulation than small informative texts because videos do not only integrate the reading abilities of the participants but also their vision and listening comprehension (Coker Morey, Cowan, Morey, & Rouder, 2011). In that way, people take the information on more than one level and are able to process this information better than by just reading about it. Another suggestion would be to use a specific target group, which is prone to experience stress on a regular basis. This could be interesting to investigate because people might already have an elaborated mindset with regard to stress and they might also have developed coping mechanisms. In addition, it would be advisable to take a different sampling procedure. A suggestion would be to use a purposive sampling method to also prevent having a high number of participants which already hold a stress-enhancing mindset at the beginning of the study. Furthermore, it would be appropriate to set up inclusion and exclusion criteria with regard to gender and educational background in order to have a fair distribution of men and women in the sample and to avoid having an overrepresentation of higher educated participants.

People are prone to experience more and more stress in their lives and stress has shown to have severe negative consequences on people's physical and mental health. Therefore, the topic of stress is of growing awareness in today's research and it is necessary to further investigate this topic, so that people are able to cope with stress in order to work more efficiently and to live a long and healthy life.

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Appendix A

Informed Consent in English

Welcome to the study!

The purpose of this study is to investigate how people perceive new information. This study consists of three parts. The first part starts after you have read and agreed to this informed consent. If you agree with the conditions to participate in this study, you will be automatically redirected to the first survey. This first survey will take approximately 20 to 30 minutes.

Please complete this survey before the 07.04. to be able to participate in this study.

On Friday - 12.04. - you will receive an email with a link to the second survey. You will also receive some information to read. This survey (including the reading) will take approximately 15 minutes. Finally, on Friday - 19.04. - you will receive an email with a link to the final survey which will take approximately 5 minutes. Please complete each survey within 3 days. Each survey contains some questions about your personality and wellbeing.

Your data will be collected entirely online and treated confidentially. Therefore, we use your name and email address only for sending you the three personalized surveys. All materials will be identified by an assigned participant number, not by your name. During the research period, your data will be treated with great confidentiality and only be accessible by the main researcher dr. Marijke Schotanus-Dijkstra. Your individual privacy will be maintained in all published and written data resulting from this study.

Participation in this study is voluntary. If you decide to participate, you will be asked to agree to the informed consent. After that, you are still free to withdraw at any time and without giving a reason for your withdrawal.

If you have any comments or questions regarding this study, please contact dr. Marijke Schotanus-Dijkstra (m.schotanus@utwente.nl).

I have read and I understand the provided information. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason. I voluntarily agree to take part in this study.

Principal Investigators

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Under supervision of dr. Marijke Schotanus-Dijkstra

University of Twente

Appendix B

Informed Consent in German

Herzlich Willkommen!

Das Ziel unserer Studie ist zu untersuchen, wie Menschen neue Informationen wahrnehmen. Diese Studie besteht aus drei Teilen. Der erste Teil beginnt, nachdem Sie diese Einverständniserklärung gelesen und ihr zugestimmt haben. Wenn Sie zustimmen, teilzunehmen, werden Sie automatisch zu der Studie weitergeleitet. Der erste Fragebogen wird etwa 20 bis 30 Minuten dauern. Bitte füllen Sie diese Studie vor dem 07.04. aus, um an der Studie teilnehmen zu können.

Am Freitag, dem 12.04., werden Sie eine E-Mail mit dem Link für den zweiten Fragebogen erhalten. Sie werden ebenfalls Informationen zum lesen bekommen. Dieser Fragebogen (inklusive des Lesens) wird ungefähr 15 Minuten dauern. Bitte füllen Sie diese Studie vor dem 14.04. aus. Am Ende, am Freitag dem 19.04. werden Sie eine E-Mail mit dem Link für den letzten Fragebogen erhalten, welcher ungefähr 5 Minuten dauern wird. Bitte füllen Sie jeden Fragebogen innerhalb von 3 Tagen aus. Jeder Fragebogen erhält einige Fragen über Ihre Persönlichkeit und Ihr Wohlergehen.

Ihre Daten werden ausschließlich online erfasst und vertraulich behandelt. Daher nutzen wir Ihren Namen und E-Mail Adresse nur, um Ihnen die drei personalisierten Fragebögen zu schicken. Alle Daten werden durch eine Teilnehmernummer identifiziert, nicht durch Ihren Namen. Während der Forschungsperiode werden Ihre Daten mit größter Vertraulichkeit behandelt und sind nur der Hauptforscherin Dr. Marijke Schotanus-Dijkstra zugänglich. Ihre Daten unterliegen in allen veröffentlichten und schriftlichen Formen dem Datenschutz.

Die Teilnahme in dieser Studie ist freiwillig. Wenn Sie sich dazu entscheiden teilzunehmen, werden Sie gefragt, dieser Einverständniserklärung zuzustimmen. Danach haben Sie immer noch die Möglichkeit, jederzeit die Studie zu beenden, ohne einen Grund für die Beendigung zu nennen.

Wenn Sie Fragen oder Anmerkungen zu der Studie haben, kontaktieren Sie bitte Dr. Marijke Schotanus-Dijkstra (m.schotanus@utwente.nl).

Ich habe die oben genannte Information gelesen und zur Kenntnis genommen. Ich weiß, dass meine Teilnahme freiwillig ist und dass ich die Studie jederzeit ohne die Angabe von Gründen beenden kann. Ich stimme freiwillig zu, an dieser Studie teilzunehmen.

Forscher

Natascha Berden, Morticia Borocho, Helen Brand, Pia Hülsmann, Miriam Kebernik, Carina Schreiber, Lara Watermann, Felizia Wellinger

Unter der Leitung von Marijke Schotanus-Dijkstra

University of Twente

Appendix C

Text for manipulation group in English

The beneficial nature of stress

Did you know that stress is beneficial for your health and personal growth? Although stress is being portrayed in a negative way in the media and by the people around us, there is also a positive side of experiencing stress. For example, people who believe that stress is positive have higher energy levels, show better workplace performance, are more satisfied with their life in general and have fewer symptoms of depression and anxiety. How do you interpret a stressful situation? Do you find stress negative or positive?

Recent scientific studies have shown that experiencing stress puts the body and the brain in an optimal condition to function in order to fulfil the demands and tasks asked for. Therefore, the attention is focused on the demands and this will boost memory and performance. Stress is an essential ingredient of being able to fulfil everyday tasks as well as more difficult challenges. Thus, individuals who perceive stress as a necessary and positive aspect of life are more likely to succeed and feel happy.

Taken together, if you believe that stress is positive, this can have a great beneficial impact on your personal growth, performance and your health.

Appendix D

Text for manipulation group in German

Die positive Seite von Stress

Wussten Sie, dass Stress sehr vorteilhaft für Ihre Gesundheit und Ihr persönliches Wachstum sein kann? Auch wenn Stress in den Medien und von vielen unserer Mitmenschen als negativ dargestellt wird, hat er auch eine positive Seite. Zum Beispiel haben Menschen, die glauben, dass Stress positiv ist, ein höheres Energielevel sowie bessere Arbeitsleistungen, sie sind generell mehr mit ihrem Leben zufrieden und zeigen zudem weniger Depressions- oder Angstsymptome. Wie interpretieren Sie eine stressige Situation? Empfinden Sie die Situation als negativ oder positiv?

Studien haben kürzlich herausgefunden, dass Stress den Körper und das Gehirn in einen optimalen Zustand setzt, um Leistung zu erbringen. Dabei wird die Aufmerksamkeit auf die zu erfüllende Aufgabe fokussiert und dadurch wird das Gedächtnis und die Leistungsfähigkeit gesteigert. Stress ist also ein wichtiger Bestandteil, um sowohl alltägliche Aufgaben als auch schwierige Herausforderungen zu meistern. Aus diesem Grund sind Menschen, die Stress als einen notwendigen und positiven Aspekt des Lebens betrachten eher dazu veranlagt erfolgreicher und glücklicher zu sein.

Insgesamt lässt sich sagen, dass wenn Sie daran glauben, dass Stress positiv ist, dass eine sehr vorteilhafte Wirkung auf Ihr persönliches Wachstum, Ihre Leistungsfähigkeit und Ihre Gesundheit haben kann.

Appendix E

Text for control group in English

The Big Five

Did you know that ‘The Big Five’ are not only animals but also indicate your personality?

While the big five animals in Africa refer to the five animals most difficult to hunt on foot - the lion, leopard, rhinoceros, elephant and cape buffalo - psychologists use the term to describe the five core traits of your personality:

1. Openness to experience: curious, broad range of interests, try new things.
2. Conscientiousness: thoughtfulness and planning, organized, attention to detail.
3. Extraversion: sociable, talkative, assertive, outgoing and energized.
4. Agreeableness: trust, kindness, cooperative, care about other people.
5. Neuroticism: emotional unstable, mood swings, gets upset easily.

Recent scientific studies have shown that both biological and environmental influences play a role in shaping our personalities. Studies also suggest that these big five personality traits tend to be relatively stable over the course of adulthood. It is important to note that each of the five personality factors represents a range between two extremes. For example, extreme extraversion versus extreme introversion, and neuroticism (emotional instability) versus emotional stability. In the real world, most people lie somewhere in between the two polar ends of each dimension. Taken together, your personality can be categorized into five main personality traits which are relatively stable.

Appendix F

Text for control group in German

The Big Five

Wussten Sie, dass “the Big Five” nicht nur Tiere sind, sondern auch Ihre Persönlichkeit erklären? Während sich “the Big Five” in Afrika auf die fünf am schwierigsten zu jagenden Wildtiere bezieht - den Löwen, den Leoparden, das Nashorn, den Elefanten und den Büffel - benutzen Psychologen den Ausdruck “the Big Five”, um die fünf Kerneigenschaften Ihrer Persönlichkeit zu beschreiben:

1. Offenheit für Erfahrungen: Neugierde, weites Interessenspektrum und offen neue Dinge zu probieren
2. Gewissenhaftigkeit: Bedächtigkeit, Planung, Organisation und Aufmerksamkeit fürs Detail
3. Extraversion: kontaktfreudig, gesprächig, durchsetzungsfähig, selbstbewusst, aufgeschlossen und energiegeladen.
4. Verträglichkeit: treu, gütig, kooperativ, und sorgend um andere Leute
5. Neurotizismus: emotional instabil, Stimmungsschwankungen und Neigung zu negativen Verstimmungen

Neueste wissenschaftliche Studien zeigen, dass sowohl biologische als auch umweltliche Einflüsse eine Rolle in der Persönlichkeitsentwicklung spielen. Außerdem sollen diese fünf großen Persönlichkeitszüge im Erwachsenenalter relativ stabil sein. Wichtig zu wissen ist, dass jeder dieser fünf Persönlichkeitsfaktoren einen Bereich zwischen zwei Extremen darstellt. Zum Beispiel starke Extraversion im Gegensatz zu starker Introversion, und Neurotizismus (emotionale Instabilität) im Gegensatz zu emotionaler Stabilität. In der Realität liegen die meisten Leute irgendwo zwischen den beiden Extremen jeder Persönlichkeitsdimension. Ihre Persönlichkeit kann also in fünf Hauptpersönlichkeitszüge kategorisiert werden, die relativ stabil sind.

Appendix G

The Stress Mindset Measure (SMM) translated in German

Stress Mindset Measure (SMM)

Bitte geben Sie an, inwieweit Sie den folgenden Aussagen zustimmen oder nicht zustimmen.

Bitte benutzen Sie die angegebene Skala für alle 8 Aussagen.

0 = stimme absolut nicht zu

1 = stimme nicht zu

2 = neutral (stimme weder zu noch dagegen)

3 = stimme zu

4 = stimme absolut zu

1. Die Effekte von Stress sind negativ und sollten vermieden werden.

2. Stress zu erleben, fördert mein Lernen und meine Entwicklung.

3. Stress zu erleben, verschlechtert meine Gesundheit und meine Vitalität.

4. Stress zu erleben, verbessert meine Leistungsfähigkeit und meine Produktivität.

5. Stress zu erleben, verhindert mein Lernen und meine Entwicklung.

6. Stress zu erleben, verbessert meine Gesundheit und meine Vitalität.

7. Stress zu erleben, verringert meine Leistungsfähigkeit und meine Produktivität.

8. Die Effekte von Stress sind positiv und sollten genutzt werden.