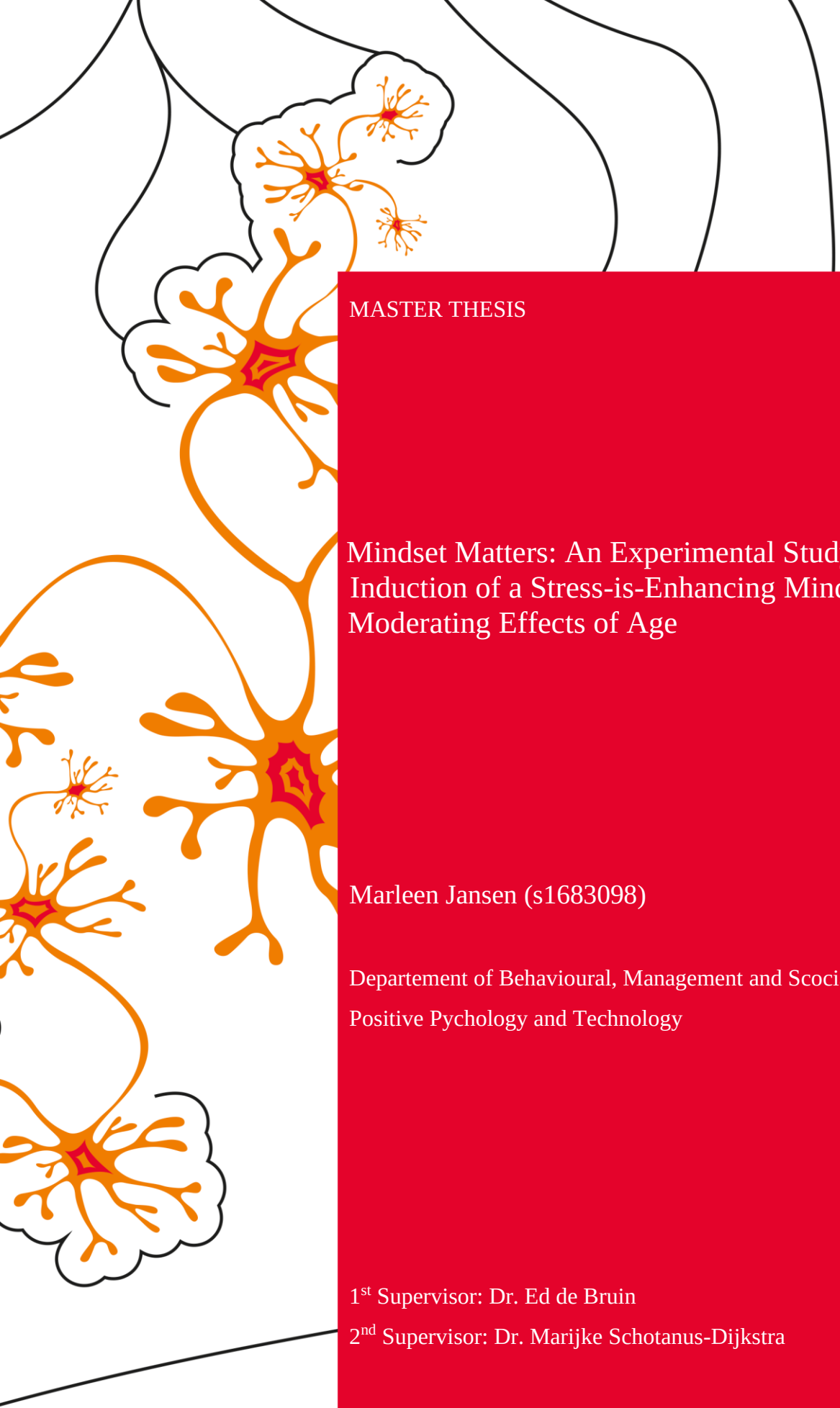

MASTER THESIS

Mindset Matters: An Experimental Study about the Induction of a Stress-is-Enhancing Mindset and the Moderating Effects of Age

Marleen Jansen (s1683098)

Departement of Behavioural, Management and Scocial Sciences

Positive Pychology and Technology

1st Supervisor: Dr. Ed de Bruin

2nd Supervisor: Dr. Marijke Schotanus-Dijkstra

29.05.2020

UNIVERSITY OF TWENTE.

Abstract

Context and Objectives: Stress can influence the human's health negatively. Holding a stress-is-enhancing mindset (belief that stress has enhancing consequences) can be effective in dealing with its consequences. A stress-is-enhancing mindset is indicated by literature to be positively related to the individuals' positive affect and perceived stress. However, it is yet unclear whether stress mindset changes lasted after the manipulative intervention was delivered. The present study investigated whether stress mindset can be altered by a video intervention promoting a stress-is-enhancing mindset and its temporal maintenance. Furthermore, if this change is accompanied by changes in the experience of positive emotions and perceived stress, and whether the stress mindset effects are moderated by age.

Design and Participants: A randomized controlled trial was conducted within a convenience sample of 98 German-speaking participants (*age M* = 36 years, *SD* = 15.85, 61.6% female) who were randomly assigned to either a stress-is-enhancing (n = 51) or control condition (n = 47). The stress-is-enhancing condition received a three-minute long video intervention presenting information about the enhancing nature of stress and the control condition a non-manipulative equivalent. All participants completed online self-reporting questionnaires about stress mindset, positive affect and perceived stress at baseline, post-test (one week after baseline) and follow-up (two weeks after baseline).

Results: Moderate effect size improvements in stress mindset into a more stress-is-enhancing mindset appeared for the stress-is-enhancing condition at post-test and follow-up (with decreased intensity) relative to the control condition. Changes were most visible directly after the stress mindset intervention (controlled for age and gender) was delivered. However, the main effect of perceived stress over time was marginally significant, for positive affect no significance was found. Furthermore, age was found to moderate changes in stress mindset at post-test with an increased effectiveness of the stress mindset intervention for participants who were older than 20 years up to the age of 66 years. Also, age moderated changes in perceived stress at post-test, indicating increased effectiveness of the stress mindset intervention for at least 40 years old participants up to the age of 66 years. For gender no significant main effect was found.

Conclusion: These results indicate that a stress mindset intervention may induce a more stress-is-enhancing mindset, especially for older individuals. The current study contributes to the stress mindset theory and displays a valuable starting point for future research in the domain of stress mindset.

Keywords: Stress Mindset; Enhancing; Positive Affect; Perceived Stress

Mindset Matters: An Experimental Study about the Induction of a Stress-is-Enhancing Mindset and the Moderating Effects of Age

In today's society, stress is perceived as having mainly negative consequences (Jamieson, Crum, Goyer, Marotta, & Akinola, 2018). Its experience in life seems to be increasing and becoming more persistent (Huang et al., 2011). Stressors such as an exam, death of a loved one or the workplace are ubiquitous in our daily lives (Jamieson et al., 2018; Lazarus & Folkman, 1986). Because stressors are unavoidable in life, a stress response is always triggered (Jamieson et al., 2018; Lazarus & Folkman, 1986). Several studies have shown that individuals can hold different mindsets about stress which influences their stress response and thereby their behaviour, thoughts, and emotions (Dweck, 2008). One possible mindset is the stress-is-enhancing mindset, which is a collection of beliefs about the positive and enhancing nature of the stress experience (Crum, Salovey, & Achor, 2013). Holding a stress-is-enhancing mindset leads to a lower perception of one's own stress level, greater report of positive emotions, and increased satisfaction with life (Crum et al., 2013; Crum, Akinola, Martin, & Fath, 2017; Goyer, Akinola, Grunberg, & Crum, 2018). There is growing evidence that one's stress mindset has an effect on the regulation of how the stress experience is shaped (Crum et al., 2013; Crum et al., 2017; Goyer et al., 2018). Therefore, it is of great importance to further examine determining variables that can optimize the individual's stress response (Jamieson et al., 2018).

The Nature of Stress

For a long time, defining a concept like stress has posed a challenge to researchers. Common usage seems to arrive at the definition where stress is defined as "a relationship with the environment that the person appraises as significant for his or her well-being and in which the demands tax or exceed available coping resources." (Lazarus & Folkman, 1986, p. 63). The thus triggered stress response is, according to Sapolsky (1996), a result of an evolutionary perspective, since overcoming challenges and fulfilling needs, which caused stress, were vital for surviving in earlier centuries. A stress response can contain various coping styles and subjective experiences in body and mind (Cohen, Kessler, & Gordon, 1995; Karasek, 1979).

Often, stress is perceived in a negative manner because it is characterized by high arousal, negative affect, and impaired mood (van Eck, Nicolson, & Berkhof, 1998). Several studies found that stress poses a threat to the human's physical and mental health, performance and overall life satisfaction (American Psychological Association [APA], 2019; APA, 2018; Crum et al., 2017; Jamieson et al., 2018; McEwen & Seeman, 1999). Over time, high levels of stress can affect the cardiovascular system (increased risk of hypertension,

stroke and heart attacks), the endocrine system (causing e.g. immune disorders and chronic fatigue), the nervous system (causing e.g. long-term drain and abrasion on the body), the musculoskeletal system (causing e.g. headache and migraine), the respiratory system (e.g. reduced lung functions) and reproductive system (e.g. reduced sexual desire). Constant stress fosters the development and persistence of those symptoms (Cohen, Tyrrell, & Smith, 1991; Huang et al., 2011). Furthermore, stress has been linked to the six leading causes of death (cancer, liver and heart diseases, lung ailments, accidents and suicide) (Sapolsky, 1996; Schneiderman, Ironson, & Siegel, 2005) and psychological consequences such as burnout, depression, eating disorders as well as cognitive impairments (APA, 2013; McEwen & Seeman, 1999).

Although the mentioned negative consequences of stress can be triggered, the effects of stress are malleable and vary based on multiple factors such as one's stress mindset or the context (Crum & Lyddy, 2014; Jamieson et al., 2018). Jamieson and colleagues (2018) noted that the experience of stress can also be advantageous. They refer to *stress-related growth*, which describes the enhancement of personal growth, improvement of one's work performance, greater appreciation of life, and increase of awareness (APA, 2019; APA, 2018; Crum et al., 2013; Crum & Lyddy, 2014; Jamieson et al., 2018; McEwen & Seeman, 1999; Park & Helgeson, 2006). The avoidance or minimization of stress can result in missing these developmental opportunities (Jamieson et al., 2018). Moreover, physiological reactions, such as an increased level of hormones like adrenaline or dopamine, can lead to an individual's narrowed focus, increased alertness and a higher energy level (Cahill, Gorski, & Le, 2003; Epel, McEwen, & Ickovics, 1998; Park & Helgeson, 2006). Interestingly, even while people are under stress, they are able to experience feelings of happiness and interest (MacIntyre & Gregersen, 2012).

These findings indicate that stress is a multifaceted concept which can have both debilitating and enhancing effects on the human's stress response (Crum & Lyddy, 2014).

Mindset matters

To simplify different kinds of information, humans use specific frameworks, called mindsets. Mindset can be operationalized as "a mental frame" or "lens" that selectively organizes information, thereby orienting individuals to specific sets of expectations and associations and guiding towards responses making the expected outcomes more likely (Crum et al., 2013; Dweck, 2008; Jamieson et al., 2018). Mindsets can be changed through different manipulations. Research demonstrated that the individual's mindset can be successfully influenced in different domains such as intelligence (e.g. Aronson, Fried, & Good, 2002;

Dweck, 2008), exercise (Crum & Langer, 2007), and aging (e.g. Levy, Slade, Kunkel, & Kasl, 2002).

More recently, in the domain of stress, the manipulation of the individual's mindset was examined. A stress mindset is "a collection of beliefs about the positive and negative nature of the stress experience which are thought to collectively influence the way an individual experiences and responds to stressful situations" (Crum et al., 2013, p. 716). Thus, a stress-is-enhancing mindset can be distinguished from a stress-is-debilitating mindset. In the stress-is-debilitating mindset, stress is seen as a debilitating resource in achieving well-being, performance, and health. In contrast, the stress-is-enhancing mindset refers to the belief that stress has a positive and enhancing effect on well-being, performance, and health (Crum et al., 2013; Crum et al., 2017; Heikkilä, Mattila, & Ainasoja, 2018). Here, stress functions as a "positive force" not only to perform well but also to experience more positive emotions (APA, 2019; Crum et al., 2017; Goyer et al., 2018). A stress-is-enhancing mindset increases an individual's resilience level, cognitive flexibility, and attentional bias towards positive information (Crum et al., 2013; Crum et al., 2017; Park & Helgeson, 2006). Individuals who hold a more stress-is-enhancing mindset perceive stressful situations as a chance to learn and grow personally. Consequently, their stress level seems to be low (Crum et al., 2013; Crum & Lyddy, 2014; Jamieson et al., 2018). The concept of stress mindset thus proposes that the way an individual experiences stress is related to the belief that stress is more enhancing or not (Crum et al., 2013). The consideration arises whether a change of one's stress mindset into a more stress-is-enhancing direction could positively influence the stress response.

The Malleability of Stress Mindsets

Generally, stress mindsets can be altered through different manipulative interventions. These interventions engender different stress mindsets using selected information, presenting the effects of stress in forms of articles, scientific information, and more recently videos on various outcomes (e.g. Crum et al., 2017; Sapolsky, 1996). The content was adjusted depending on the goal of the study. Two studies examined video interventions presenting selective information about stress mindsets. Crum and her colleagues (2013) induced a shift of stress mindset in participants by watching three videos (three minutes in length) over the course of one week presenting information biased towards either the enhancing or debilitating effects of stress in three different domains: psychological health, work performance, and life satisfaction. Next to the two experimental conditions (stress-is-enhancing vs. stress-is-debilitating), a no-intervention control condition was included, who did not receive any intervention. This study design was administered to American employees of a financial

institution. The participants' stress mindset was measured at two points of measurement, at baseline and post-test (three days after the third video was delivered). At post-test, participants in the stress-is-enhancing condition showed higher scores on the used Stress Mindset Measure over time, suggesting a shift of their stress mindsets into a more enhancing direction. Furthermore, they tend to experience greater well-being and life satisfaction, regardless of their actual amount of perceived stress, compared to those in the stress-is-debilitating condition. However, participants in the stress-is-debilitating condition demonstrated the opposed development, a shift into a more stress-is-debilitating mindset. The control condition did not change their stress mindset. Interestingly, holding a more stress-is-enhancing mindset positively influenced the participants' stress response on a psychological level. More precisely, participants in the stress-is-enhancing condition reported fewer anxiety and depression symptoms, as well as a greater experience of optimism, mindfulness, and resilience (Crum et al., 2013).

Another experimental study of Crum and her colleagues (2017) revealed that stress mindset can be altered by only one three-minute video promoting either a stress-is-enhancing or a stress-is-debilitating mindset in an American multicultural student sample. The used videos about work performance were adopted from the previous study of Crum et al. (2013). Participants were allocated to either the stress-is-enhancing or the stress-is-debilitating condition. Where the stress-is-enhancing condition showed a significant stronger change into a more stress-is-enhancing mindset, there were also a significant stronger change into a more stress-is-debilitating mindset in the stress-is-debilitating condition. Hence, it has been proven that even a short stress mindset video can induce a shift in stress mindset. Furthermore, the participants' positive and negative emotional affect was measured by the Positive and Negative Affect Schedule at five measurement points. Here, the induction of a more stress-is-enhancing mindset, resulted in higher positive affect over time, which means a greater experience of positive emotions, compared to those in the stress-is-debilitating condition (Crum et al., 2017). These findings are in line with those of MacIntyre and Gregersen (2012) that people are able to experience feelings of happiness and interest even while under stress. These promising results suggest that one way to preferably alter the people's stress response is to change an individual's mindset about the general nature of stress (Crum et al., 2013; Crum et al., 2017).

Previous research did not include a control condition at all or just without the exposure to any intervention. Moreover, they did not assess how long the experimentally induced changes in an individual's stress mindset lasted after the manipulative intervention was

delivered. The maintenance of a stress-is-enhancing mindset would suggest that individuals gain long-term profits of the positive effects associated with the stress-is-enhancing mindset, such as an increase in well-being, performance, and health (Crum et al., 2013; Crum et al., 2017; Heikkilä et al., 2018).

Moreover, it is unknown whether differences in individual demographic characteristics influence the responsiveness to manipulative stress mindset interventions. The cultural context might influence the change of the individual's stress mindset (Tweed, White, & Lehman, 2004). Further influential demographic factors might be age and gender. Tulviste, Kall, and Rämmer (2017) found that younger individuals, up to the age of 30, were more open to change compared to older individuals above the age of 30. It appears to be that younger individuals tend to seek out new experiences and change their attitudes more often than older individuals, who appear to prefer retention of their values, attitudes and traditions (Tulviste et al., 2017; Khoshtaria, 2018; Krosnick & Alwin, 1989). Researchers found that from late adolescence and early adulthood the changeability of attitudes decreases and remains with greater stability throughout the rest of an individual's life (Krosnick & Alwin, 1989). With regard to age differences in the experience of positive affect and perceived stress, the overall picture is vague. Several studies found a decrease in positive affect's intensity and frequency with increasing age (Ferring & Filipp, 1995; Rossi & Rossi, 1990; Smith & Baltes, 1993). In contrast, other research showed no age differences or an increase in positive affect as individuals aged (Mroczek & Kolarz, 1998; Vaux & Meddi, 1987). In the study of Bergdahl and Bergdahl (2002) the amount of perceived stress increased from the age of 20 years up to the highest level at 40 - 44 years and thereafter it decreased to the lowest level at the age of 60 - 69 years. Another study revealed a decrease in perceived stress with increasing age (Stawski, Sliwinski, Almeida, & Smyth, 2008).

Additionally, research has shown significant gender differences in stress mindset. For example, women and men are stressed by different types of situations. Wagner and Compas (1990) found that girls are especially sensitive to interpersonal stress, whereas boys are more sensitive to stress related to achievements. Furthermore, the mindset theory of Macnamara and Rupani (2017) displays that girls tend to hold on to rather a fixed mindset which is already developed as toddlers than boys, which means that girls change their mindset less often than boys. With regard to gender differences in the experience of positive affect and perceived stress, Sitz and Poche (2006) found that women show more optimism than men and therefore experience lower levels of perceived stress.

To tackle these deficiencies, a successful approach might be to include a follow-up measurement in the study design and to explore the influences the demographic factors age and gender might have on the efficacy of a stress mindset intervention for the individual's stress mindset, positive emotions, and perceived stress among Germans.

However, it is yet unclear whether stress mindset changes lasted after the manipulative intervention was delivered. The present study investigated whether stress mindset can be altered by a video intervention promoting a stress-is-enhancing mindset and its temporal maintenance. Furthermore, if this change is accompanied by changes in the experience of positive emotions and perceived stress, and whether the stress mindset effects are moderated by age.

The Present Study

The aim of the current study is to contribute to the stress mindset theory by examining to which extent a stress mindset intervention can shift a stress mindset into a more stress-is-enhancing mindset and how long this shift maintains. Furthermore, whether it is accompanied by changes in the participant's experience of positive emotions and perceived stress. Second, it is examined whether age moderate the efficacy of the stress mindset intervention. Two specific hypotheses are tested:

H1: *Watching the stress mindset intervention will be more effective in improving stress mindset, positive emotions, and perceived stress compared to the control intervention.*

H2: *Watching the stress mindset intervention will be more effective in improving stress mindset, positive emotions, and perceived stress for younger participants compared to older participants.*

Method

This study was approved by the Ethics Committee of the University of Twente and registered in The Netherlands Trial Register (register number 191189). All participants gave their online informed consent before participating in the current study.

Design

This experimental study was conducted as a parallel double-blind randomized controlled trial. Eligible participants were randomly assigned using the table of random numbers of randomization.org (allocation ratio 1:1) to either the stress-is-enhancing (SIE) condition (n = 68) or the control condition (n = 68). Online questionnaires were embedded in Qualtrics and obtained at baseline, post-test (one-week after baseline) and follow-up (two weeks after baseline).

Participants and Procedure

Participants were recruited using convenience sampling via social media posts or personal invitations describing the study (risks, benefits, voluntary participation, procedure, anonymity) by one of the researchers. To avoid subject biases, participants were told that we were interested in collecting information on their processing of new information. Participants were included when they (a) were older than 18 years and (b) had sufficient German language skills, because the intervention as well as the online questionnaires were conducted in German. Exclusion criteria were (a) no sufficient Internet connection or (b) no valid email address.

Of the 136 eligible participants, 38 individuals were excluded mainly due to the discontinuation of the survey. Data from the remaining 98 participants were used in all analyses (*age M* = 35.78 years, *SD* = 15.85). Figure 1 illustrates the flow chart of participants. The participants' characteristics at baseline can be seen in table 1.

After randomization, participants received a personal email with a link to the informed consent and the baseline assessment, consisted of three questionnaires respectively one about stress mindset, positive affect, and perceived stress. After either the stress mindset intervention or the control intervention was delivered, participants received the three questionnaires for a second time. To ensure that all participants watched the video, they were allocated to, these were embedded in Qualtrics. At follow-up, participants again filled in the three questionnaires. In case of discontinuation of the study, participants received an email reminder within three days. At the end of the study, participants were thanked and debriefed about the true purpose of this study, namely the investigation of a stress mindset intervention.

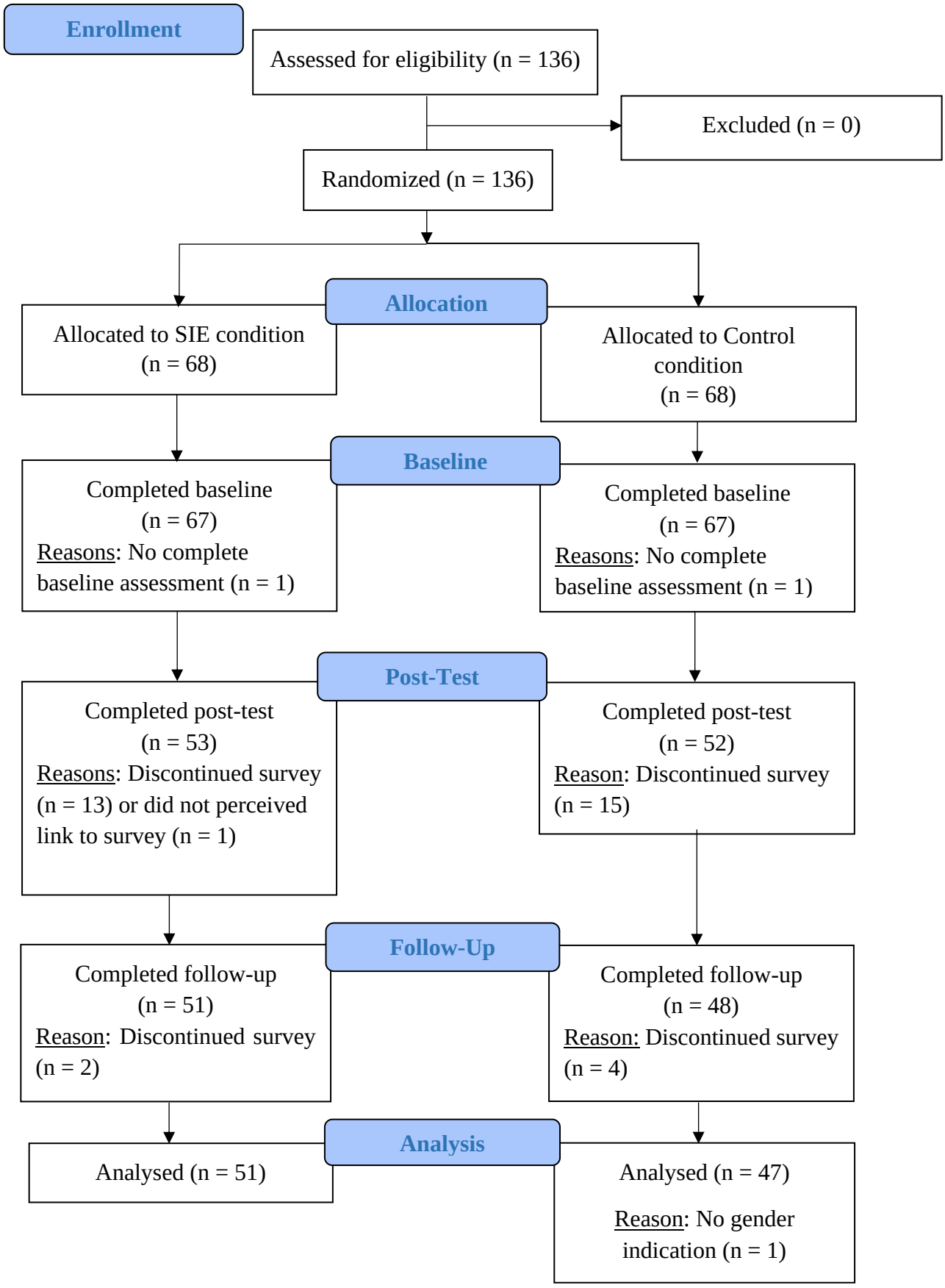

Figure 1. Flow-chart of participants in this study.

Intervention

Stress-is-Enhancing Condition. Participants in the SIE condition were shown a stress mindset video intervention (Appendix A). Scientific studies with examples examining the benefits of stress on performance, personal growth, energy levels, and health, were presented to demonstrate the enhancing nature of stress. The content was derived from the study of Crum and her colleagues (2017). The video was approximately three minutes in length and was composed of words, corresponding images, and sounds. The aim was to create a positive perception of stress and change the participants' stress mindset into a more SIE one.

Control Condition. Participants in the control condition received an informative video intervention explaining the categorical imperative by Kant in which the definition, images, and everyday life examples were presented (Appendix B). The video was approximately three minutes long and composed of words, sounds and corresponding images or videos. The aim was to pose a neutral, non-manipulative equivalent to the SIE condition's intervention.

Measures

Stress Mindset Measure. To assess participants' belief about the nature of stress, the Stress Mindset Measure (SMM) was used (Crum et al., 2013). Participants rated how strongly they agreed with eight statements related to the enhancing and debilitating effects of stress. Included were statements such as: "Experiencing stress facilitates my learning and growth." and "The effects of stress are positive and should be utilized." (scale: from 1 =*strongly disagree* to 5 = *strongly agree*). After reverse coding the four negative items (items 1,3,5,7), the mean scores were calculated. The SMM is a continuous scale with higher scores indicating a stronger SIE mindset. According to Crum et al. (2013), the SMM has excellent internal consistency, with a Cronbach alpha coefficient reported of .86. In the current study, the Cronbach alpha coefficient was also high ($\alpha_{\text{baseline}} = .88$, $\alpha_{\text{post-test}} = .91$, $\alpha_{\text{follow-up}} = .90$). The researchers of the current study translated the SMM into German, as there has not been a German version so far (Appendix C).

Positive and Negative Affect Schedule. In order to determine participants' emotional affect, the German version of the Positive Affect and Negative Affect Schedule (PANAS) was utilized (Krohne, Egloff, Kohlmann, & Tausch, 1996). It was adapted from the original scale of Watson, Clark and Tellegen (1988). The time instruction, which asked for the emotional affect during the last 24 hours, could be varied due to the purpose of the investigation (Bluemke & Breyer, 2016). Participants rated their emotions on 20 emotional states. Ten of these states described the dimension of positive affect (PA) and 10 the dimension of negative

affect (NA), on a five-point Likert scale, ranging from 1 = *not at all* to 5 = *extremely*. PA and NA were seen as highly distinctive dimensions. The scores of PA were calculated, because we were primarily interested in examining differences in the experience of positive emotions. Thereby, higher scores indicated an active, enthusiastic, and alert state (Watson et al., 1988). The PANAS has been proven to have a good internal consistency, with a Cronbach alpha coefficient reported of .84 (Bluemke & Breyer, 2016). In the current study, the Cronbach alpha was at baseline .72, at post-test .75 and at follow-up .73.

Perceived Stress Scale. To measure participants' appraisal of the experienced stress, the German version of the Perceived Stress Scale (PSS-10) was utilized (Klein et al., 2016). Original items were derived from Cohen, Kamarck, and Mermelstein (1983). In total, 10 items asked participants to reflect on the extent to which life has been stressful, uncontrollable, unpredictable, and overwhelming during the last week. The used time instruction differed slightly from its original scale which asked for the last month without losing its reliability. Included were questions such as: "How often have you found that you could not cope with all the things that you had to do?" and "Have you been upset by something that happened unexpectedly?". Participants rated their perception on a five-point Likert scale, ranging from 1 = never to 5 = very often. After reverse coding, the four positive items (items 4,5,7,8) the total scores were calculated by summing up all items. Thereby, higher scores indicated greater perceived stress. According to Klein et al. (2016), the German version of the PSS-10 has very good internal consistency, with a Cronbach alpha coefficient reported of .84. In the current study, the Cronbach alpha coefficient was .83 at baseline, .81 at post-test and .87 at follow-up.

Control Questions. Immediately following either the stress mindset intervention or informative video intervention, all participants were instructed to write a brief summary of the watched video. Furthermore, participants indicated how concentrated, attentive, and focused they were while watching the video on three questions with a five-point Likert scale (ranging from 1 = not at all to 5 = extremely). Questions such as: "Have you watched the video attentively?" and "Have you been able to concentrate on the video?" were included (Appendix D).

Moderator of the Intervention Effect

Prior research has indicated that age might influence the changeability of a stress mindset and is associated with differences in positive emotions and perceived stress (e.g. Bergdahl & Bergdahl, 2002; Macnamara & Rupani, 2017; Tulviste, Kall, and Rämmer,

2017). In the current study, we included age as a possible moderator. The participant's age were assessed at baseline.

Power Calculation

A power analysis conducted in G*Power led to a required sample of 74 participants per condition to provide a statistical power of 80% and a two-sided 5% significance to detect a standardized effect size of .30 (Cohen's *d*) for a 2 × 3 repeated measures analysis of covariance (ANCOVA). Due to the longitudinal study design, a dropout rate of 20% was anticipated (Bell, Kenward, Fairclough, & Horton, 2013). Hence, to compensate for possible dropouts, the required sample size was 148 plus 30 = 178.

Statistical Analyses

For our statistical analyses, we followed the Consolidated Standards of Reporting Trials (CONSORT) statement (Moher et al., 2010) and used SPSS version 26 (IBM, Chicago Ill., USA) and two-tailed tests with a significant level < .05. Missing data on the three measured outcomes were excluded from analysis for all points of measurement. All gathered data was handled confidentially, and only used for statistical purposes of the current study.

Baseline characteristics of all analysed participants were reported using frequency distributions and descriptive statistics. Differences between conditions at baseline and between drop-outs and completers were analysed using χ^2-tests. Drop-out was defined as incomplete data on the baseline assessment and/or post-test and/or follow-up.

To evaluate the superiority of the intervention on the three measured outcomes: stress mindset, positive emotions, and perceived stress, we used 2 (Condition: Stress-is-Enhancing, Control) × 3 (Time: Baseline, Post-Test, Follow-Up) repeated measures ANCOVA and a *post-hoc* Bonferroni test. Age and gender were included as covariates. Cohen's *d* effect sizes for between group differences at post-test and follow-up were determined by calculating the mean post-test or follow-up score of the SIE condition from the mean post-test or follow-up score of the control condition divided by the pooled standard deviation: Cohen's $d = (M_2 – M_1) / SD_{pooled}$. Effect sizes up to .49 were considered as small, effect sizes from .50 o .79 as moderate and effect sizes between .80 and 1.29 or larger were interpreted as large (Lachenbruch & Cohen, 1988).

An independent samples *t*-test was used to explore group differences at baseline for the three measured outcomes: stress mindset, positive emotions, and perceived stress.

Finally, moderation analysis was performed according to the procedure as outlined by Preacher and Hayes (2008) using the PROCESS tool (Hayes, 2018). First, stress mindset at post-test (controlled for stress mindset at baseline) or follow-up (controlled for stress mindset

at baseline and post-test) were entered in the regression analyses as dependent variables. Second, positive emotions at post-test (controlled for positive emotions at baseline) or follow-up (controlled for positive emotions at baseline and post-test) were entered in the regression analyses as dependent variables. Third, perceived stress at post-test (controlled for perceived stress at baseline) or follow-up (controlled for perceived stress at baseline and post-test) were entered in the regression analyses as dependent variables. The grand centered mean of the potential moderator age and the Condition × Age interaction term were entered as independent variables. If this interaction term contributed significantly to the intervention effect, then the moderator was further explored with plots and the Johnson-Neyman test.

Results

Table 1 summarizes the baseline characteristics of the participants. The mean age was 35.78 years (*SD* = 15.85). Participants were predominantly female (61.6 %) and higher educated (55.08 %).

Table 1

Sociodemographic Characteristics of Participants at Baseline in the Stress-is-Enhancing Condition and Control Condition

	Stress-is-enhancing condition		Control condition		
	n	*%*	*n*	*%*	*p*
Gender					.56
Male	20	39.2	17	35.42	
Female	31	60.8	30	62.5	
Not indicated			1	2.08	
Education					.37
Low	3	5.88	1	2.08	
Intermediate	24	47.06	18	37.5	
High	24	47.06	29	60.42	
Employment status					.11
Employed	30	58.82	26	54.17	
Unemployed (and students)	21	41.18	22	45.83	

Note. There were no significant group differences.

Drop-out

A total of 134 (98.5%) participants completed the baseline assessment, 105 (77.2%) the post-test and 99 (72.8 %) the follow-up. Overall, there was more drop-out in the control condition as compared to the stress-is-enhancing condition [29.4% vs. 25%, $\chi^2(1) = .33$,

p = .56]. For the 38 participants who were excluded from the analysis, no dropout bias was evident in terms of gender, age, stress mindset, positive emotions, and perceived stress, as indicated by the non-significant test of MCAR, $\chi 2(30,\ N = 136) = 37.28$, p = .17.

Interaction Effects

There were no statistically significant baseline differences between the stress-is-enhancing condition and control condition for positive emotions $t(97) = .79$, p = .45 and perceived stress t(97) = 3.08, p = .10. However, baseline differences between the two conditions reached almost significance for stress mindset $t(97) = 5.58$, p = .06. Furthermore, table 2 shows that there was an overall significant Time × Condition interaction effect, Wilk's Lambda = .75, $F(6,\ 90) = 5.13$, $p < .001$, suggesting differences in the effectiveness of the two used videos. An overall significant main effect of age, Wilk's Lambda = .89, $F(3, 93) = 3.85$, $p < .05$, was found, indicating an overall different score for younger and older participants. However, gender was not significant [Wilk's Lambda = .98, $F(3, 93) = .64$ p = .59]. Furthermore, a significant main effect of stress mindset over time, $F(1.73,\ 3.03) = 18.56$, $p < .001$, was found, indicating that participants in the stress-is-enhancing condition reported a stronger increase in stress mindset immediately following the stress mindset intervention (d = .57) than participants in the control condition (see Figure 2). Also, a marginally significant main effect of perceived stress over time, $F(2, 34.17) = 3.17$, $p < .05$, was observed, mainly due to the changes in the control condition's scores. These results indicate that stress mindset and perceived stress changed across time within each condition. However, the main effect of positive emotions was not significant [$F(2, 23.34) = .97$, p = .38]. A post hoc Bonferroni test of the stress mindset score revealed that the increase in stress mindset was significant from baseline to post-test, from baseline to follow-up, and from post-test to follow-up, indicating that the stress mindset increase was maintained up to one week. However, the initial increase maintained with decreased intensity (see Figure 2). The largest effect size was found for the stress mindset score at post-test, which was d = .57, indicating moderate effect size between conditions.

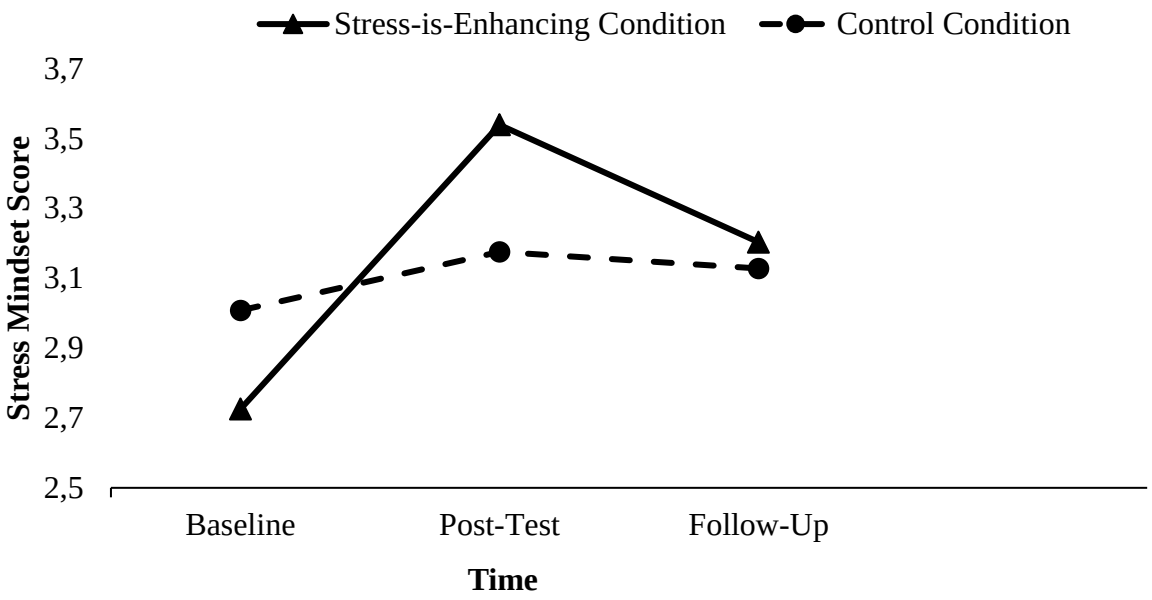

Figure 2. Mean stress mindset scores over time as a function of condition.

Table 2

Means and Standard Deviations for Stress Mindset, Positive Affect, and Perceived Stress and Results of the Repeated Measures Analysis of Covariance and Cohen's d for Between Group Effect Sizes

	Stress-is-enhancing condition (n = 51) *M (SD)*	Control condition (n = 47) *M (SD)*	F^a	*p*	Effect size *d*
Stress mindset					
Baseline	2.73 (0.81)	2.99 (0.56)			
Post-test	3.54 (0.76)	3.15 (0.59)	18.56	< .001	.57
Follow-up	3.20 (0.79)	3.10 (0.60)			.14
Positive affect					
Baseline	34.75 (6.81)	33.75 (6.21)			
Post-test	34.98 (6.39)	32.15 (6.05)	2.45	.087	.45
Follow-up	35.04 (7.74)	33.08 (5.54)			.29
Perceived stress					
Baseline	23.08 (6.35)	21.19 (4.78)			
Post-test	22.80 (6.51)	23.19 (5.08)	3.17	< .05	.07
Follow-up	22.69 (7.13)	22.58 (5.68)			.02

[a] Interaction effect (Time × Condition). When the assumption of sphericity is violated, Greenhouse-Geisser results are reported.

Moderation

Table 3 shows the Condition × Age interaction effects on stress mindset, positive emotions, and perceived stress for the moderator age. For stress mindset, tests revealed no significant interaction effect at follow-up. However, at post-test, a significant interaction was found for age (p = .041). Further inspection of the data revealed, different than expected, that older participants benefited more from the stress mindset intervention at post-test than younger participants. The effectiveness of the stress mindset intervention increased for participants who were older than 20 years old, b = .30, t(93) = 1.99, p = .05, up to the oldest age group, which was 66 years, b = .96, t(93) = 4.05, p < .001 (see Figure 3). For positive emotions, no significant interaction effects were found. Furthermore, tests for perceived stress revealed no significant interaction effect for age at follow-up. However, a significant interaction was found for age at post-test (p = .016), indicating that older participants showed more decrease in perceived stress over time relative to younger participants. Further inspection of the data revealed that the stress mindset intervention was not effective for participants who were younger than 40 years old, b = -1.88, t(93) = -1.99, p = .05. However, the effectiveness of the stress mindset intervention increased for participants who were at least 40 years old, up to the oldest age group, which was aged 66 years, b = -5.53, t(93) = -2.84, p < .05 (see Figure 4).

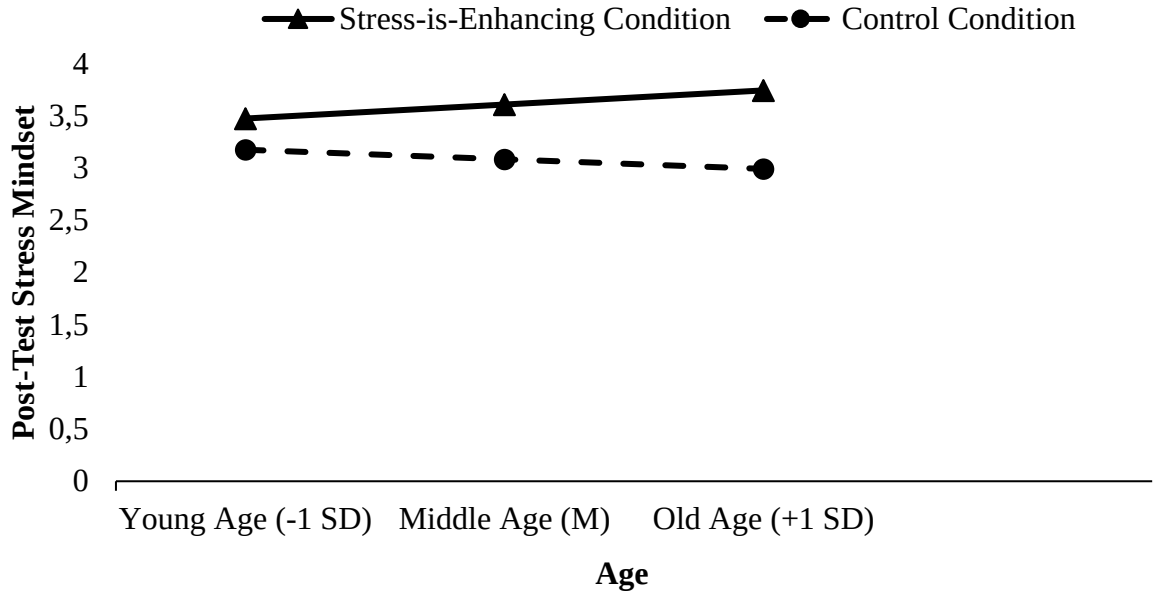

Figure 3. The moderating effect of age on the relationship between condition and stress mindset at post-test. The label 'young age' represents the age of 19.93 years which is equivalent to 1 SD below the mean age. The label ‘middle age' represents the age of 35.78 years which is equivalent to the mean age. The label ‘old age' represents the age

of 51.62 years which is equivalent to 1 SD above the mean age.

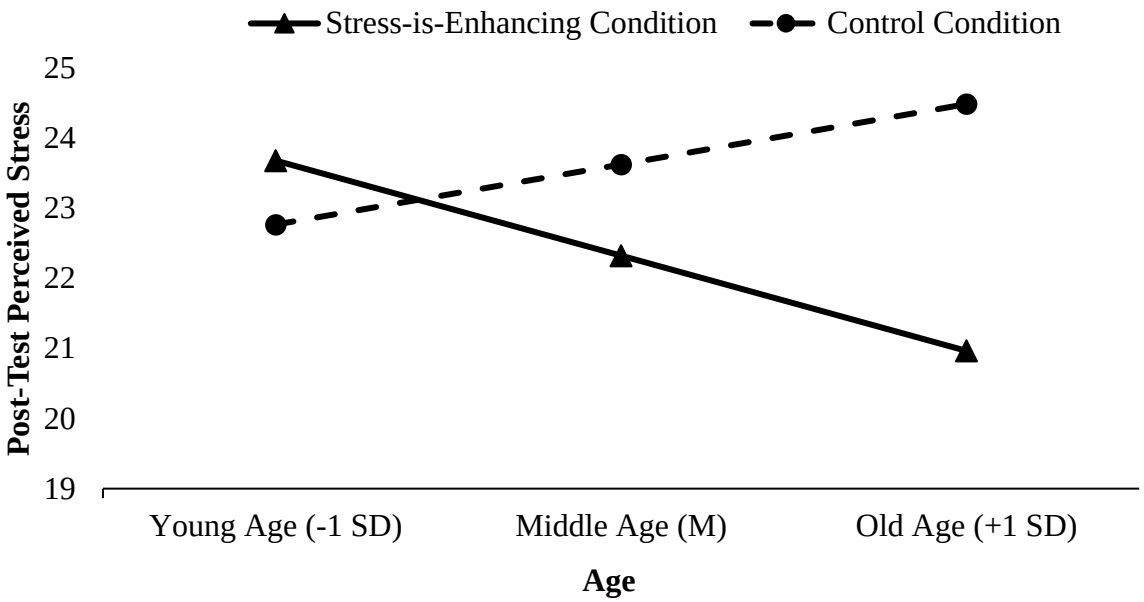

Figure 4. The moderating effect of age on the relationship between condition and perceived stress at post-test.

Table 3

Moderator Analyses of Stress mindset, Positive Affect, and Perceived Stress at Post-Test and Follow-Up (Age × Condition Interaction Effects)

	At post-test [a]			At follow-up [b]		
	b	95 % CI	*p*	*b*	95 % CI	*p*
Stress mindset [c]	0.01	0.00 - 0.03	.041	0.00	−0.01 - 0.01	.545
Positive affect	0.13	−0.03 - 0.28	.101	0.01	−0.13 - 0.15	.885
Perceived stress [c]	−0.14	−0.25 - −0.03	.016	-0.00	−0.1 - 0.1	.986

Note. PROCESS output with 5000 bootstrapped samples. *b* refers to the unique contribution of the interaction term (Age × Condition) in the prediction of stress mindset, positive affect, and perceived stress after controlling for the separate effects of condition and age, and stress mindset, positive affect, perceived stress at baseline (or baseline and post-test).

[a] Controlled for stress mindset/positive affect/perceived stress at baseline.

[b] Controlled for stress mindset/positive affect/perceived stress at baseline and post-test.

[c] The overall model was significant.

Discussion

The induction of a stress-is-enhancing mindset has shown to have significant impact on the improvement of the individual's stress mindset, positive emotions, and perceived stress

and so on their psychological as well as physiological health (e.g. Crum et al., 2017; Crum & Lyddy, 2014; Jamieson et al., 2018). Studies, however, have yet to determine how it might be possible to induce such a preferable stress mindset about the positive nature of stress, to optimize the individual's stress response. In this study, we worked towards this aim by investigating the effectiveness of a short manipulative intervention in form of a video containing information about the enhancing nature of stress, conducted among Germans.

Results of this two-weeks stress mindset study demonstrated that the participants' stress mindset and perceived stress changed significantly across time within each condition. The stress mindset intervention was more effective in the induction of a stress-is-enhancing mindset in the stress-is-enhancing condition compared to the control condition. Although this induction of a more stress-is-enhancing mindset was maintained for up to one week, its intensity immediately decreased after the stress mindset intervention was delivered. These results are promising and correspond to findings of earlier research suggesting that a stress mindset is not predetermined and can be altered through a short manipulative intervention containing biased information towards the enhancing nature of stress (Crum et al., 2013; Crum et al., 2017). Compared to previous stress mindset studies (Crum et al., 2013; Crum et al., 2017), we demonstrated that a shift into a stress-is-enhancing mindset can maintain up to one week after the manipulative intervention was delivered. Furthermore, the change in perceived stress was found to be marginally significant, which can primarily be explained by the wide range of the participants' scores in the control condition. Here, unknown confounding variables may have influenced the perceived stress scores. However, these results lent some support for previous findings, that holding a more stress-is-enhancing mindset results in lower perceived stress (Crum et al., 2017; Goyer et al., 2018). Changes in stress mindset and perceived stress were not accompanied by significant changes in the participants' positive emotions which disagree with findings of earlier research suggesting that holding a stress-is-enhancing mindset can activate the experience of positive emotions (Crum et al., 2017; MacIntyre & Gregersen 2012; Park & Helgeson, 2006). Therefore, hypothesis H1, which predicted a greater effectiveness of the stress-is-enhancing intervention on stress mindset, positive emotions, and perceived stress, was accepted for stress mindset and perceived stress, but rejected for positive emotions. A possible explanation could be that the information contained in the stress mindset intervention emphasized the enhancing nature of stress too little and the single exposure was insufficient to induce significant changes in positive emotions.

It is interesting to note that participants in the control condition did show an overall movement in their stress mindsets as well as in their positive emotions and perceived stress. These results indicate that the control intervention seemed to have an effect on the three measured outcomes. It is questionable if the control intervention demonstrated an appropriate non-manipulative equivalent to the stress mindset intervention.

A surprising finding of the current study was that older participants benefited more from the stress mindset intervention at post-test compared to younger participants. With regard to the stress mindset this means, that older participants changed their stress mindset more often into a stress-is-enhancing direction compared to younger participants. This finding seems to disagree with prior studies where younger individuals were found to be more open to change (Tulviste et al., 2017; Khoshtaria, 2018; Krosnick & Alwin, 1989). For perceived stress it was found, that older participants showed more decrease over time relative to younger participants. This result supports an earlier study of Stawski and colleagues (2008), but partly disagrees with findings of earlier research of Bergdahl and Bergdahl (2002). They found an increase of perceived stress from the age of 20 up to 40 - 44 years, and only afterwards a decrease with increasing age (Bergdahl & Bergdahl, 2002). It seems that the moderating function of age between different age groups and the changeability of stress mindset or perceived stress is not straightforward. Younger individuals might need more techniques or tools to shift their stress mindset into a more stress-is-enhancing direction and to benefit from their new developed stress mindset.

Strengths and Limitations

The present study makes some contributions to the stress mindset literature. Firstly, we demonstrated that it is possible to induct a stress-is-enhancing mindset using a short manipulative video intervention which maintained up to one week. But thereby, it is questionable if this shift in stress mindset into a more stress-is-enhancing direction can be fully attributed to the designed stress mindset intervention or to the found almost significant baseline difference between the two conditions for stress mindset. This found baseline difference increases the probability to find a significant increase in the stress-is-enhancing condition compared to the control condition. Based on random allocation we expected similar scores in both conditions for stress mindset at baseline. A possible explanation could be the used convenience sampling, which is highly vulnerable to selection bias and unknown confounding variables. Researchers advise to not take the used sample to be representative of the population at large, which results in limited generalizability (Mackey & Gass, 2015). Future researchers are challenged to use another reliable sampling method, such as the

stratified sampling method. This is important because one's stress mindset highly influences the individual's stress response and thereby their behaviour, thoughts, and emotions (Crum et al., 2017; Dweck, 2008). Furthermore, no significant changes were found in the stress-is-enhancing condition's positive emotions, which might indicate, that it seems more effective to invest in a multicomponent stress mindset intervention. Adding other techniques or tools, such as an imagination task might cause meaningful changes in the individuals' positive emotions.

Second, this study has methodological strengths such as that the used questionnaires: Stress Mindset Measure, Positive Affect Subscale and Perceived Stress Scale-10, are validated questionnaires demonstrating good to excellent reliability in the current study. However, even though self-report questionnaires are typically used in stress mindset studies, these display a limitation to the current study (Jamieson et al., 2018). Measurements obtained via self-report are vulnerable to the actual participants' state of mind and response bias. Participants may have reported self-enhancing answers (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Moreover, the Perceived Stress Scale-10 appears to be mainly constructed of negatively formulated items which present stress as a negative construct and may bias the participants' answers (Cohen et al., 1983). A future study should use another valid and reliable questionnaire to measure perceived stress, such as the General Perceived Stress Questionnaire of Levensteinet and colleagues (1993).

Third, between-group comparisons were examined to one-week after post-test (follow-up), compared to previous studies, which only assessed changes until directly after the manipulative intervention was delivered. Future studies need to examine whether the used stress mindset intervention is effective beyond one week. Also, a second follow-up measurement would be recommended, to better predict long-term effectiveness of the stress mindset intervention.

Fourth, we found significant moderating effects of age for stress mindset and perceived stress at post-test, suggesting that the stress mindset intervention seems suitable for rather older than for younger individuals within the boundaries of the convenience-selected sample with mainly younger-aged participants (57.1%). Researchers advise to not take the used sample to be representative, because of the underrepresentation of middle- (15.3%) and older-aged people (27.6%), which results in limited generalizability of the study findings (Mackey & Gass, 2015). Future researchers are challenged to reach more people of higher ages and replicate these findings which is important for the implementation of the intervention.

Final limitations include that our study was not statistically powered for the ANCOVA. For future studies, it is recommended to increase the sample size. This method is the most practical way to reach a certain precision, provide more information about the population and therefore maximizing the statistically power.

Practical Implications and Future Research

Our findings are relevant for the psychological as well as physiological health of the large population. In future studies we intend to implement the intervention in people with a more stress-is-debilitating mindset.

Also, researchers could test the applicability and efficacy of the used stress mindset intervention in combination with other techniques, such as an imagination task. Imagination is seen as a powerful tool, especially when emotions are activated (MacIntyre & Gregersen, 2012). Participants could imagine a future state wherein the consequences of stress are experienced as enhancing and therefore less stressful. Thus, the internalization of the presented information increases (Lazarus & Folkman, 1986) and so more stable changes in the people's stress mindset might be introduced.

Future research should take the necessary time to explore long-term changes in the perception of stress, since the intensity of the stress mindset intervention decreased after it was delivered. In general, long-term effects of different stress mindset interventions need to be investigated to identify the most effective one to adopt a stress-is-enhancing mindset.

To conclude, many individuals may benefit from the positive consequences of holding a stress-is-enhancing mindset on their stress response. We demonstrated that the stress mindset intervention was adequately designed for the induction of a stress-is-enhancing mindset and that participants appear to change their stress mindset quite rapidly. Also, this change needs to be interpreted with caution it could be maintained with decreased intensity for up to one-week after the intervention was delivered. Future research can build upon these findings and should explore the possibility of sustainable long-term effects of stress mindset and how to efficiently implement this to improve an individual's stress response and so their physiological and psychological health. Overall, it seems fruitful for individuals to follow stress mindset interventions like the current stress mindset intervention.

References

American Psychological Association. (2019). *How stress affects your health.* Retrieved from: http://www.apa.org/helpcenter/stress-facts

American Psychological Association (2018). *Stress Effects on the Body*. Retrieved from: https://www.apa.org/helpcenter/stress/index

American Psychological Association (2013). *How stress affects your health.* Retrieved from: https://www.apa.org/helpcenter/stress

Aronson, J., Fried, C. B., & Good, C. (2002). Reducing the Effects of Stereotype Threat on African American College Students by Shaping Theories of Intelligence. Journal of Experimental Social Psychology, 38(2), 113-125. doi:10.1006/jesp.2001.1491

Bell, M. L., Kenward, M. G., Fairclough, D. L., & Horton, N. J. (2013). Differential dropout and bias in randomised controlled trials: when it matters and when it may not. *Bmj*, *346*, e8668. doi: 10.1136/bmj.e8668

Bergdahl, J., & Bergdahl, M. (2002). Perceived stress in adults: prevalence and association of depression, anxiety and medication in a Swedish population. *Stress and Health: Journal of the International Society for the Investigation of Stress*, *18*(5), 235-241. doi: 10.1002/smi.946

Bluemke, M., & Breyer, B. (2016). Deutsche Version der Positive and Negative Affect Schedule PANAS (GESIS Panel). *In Zusammenstellung sozialwissenschaftlicher Items und Skalen*. doi:10.6102/zis242

Cahill, L., Gorski, L., & Le, K. (2003). Enhanced human memory consolidation with post-learning stress: Interaction with the degree of arousal at encoding. *Learning & Memory*, *10*(4), 270. doi:10.1101/lm.62403

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of health and social behavior*, 385-396. doi:10.2307/2136404

Cohen, S., Kessler, R. C., & Gordon, L. U. (1995). Strategies for measuring stress in studies of psychiatric and physical disorders. *Measuring stress: A guide for health and social scientists*, pp. 3-26.

Cohen, S. Tyrrell, D.A., Smith, A.P. (1991). Psychological stress and susceptibility to the common cold. *N Engl J Med, 325(9),* 606-612. doi:10.1056/nejm199108293250903

Crum, A. J., Akinola, M., Martin, A., & Fath, S. (2017). The role of stress mindset in shaping cognitive, emotional, and physiological responses to challenging and threatening stress. *Anxiety, Stress, & Coping*, *30*(4), 379-395. doi:10.1080/10615806.2016.1275585

Crum, A. J., & Langer, E. J. (2007). Mind-Set matters: Exercise and the placebo effect. *Psychological Science, 18,* 165–171. doi:10.1111/j.1467- 9280.2007.01867

Crum, A., & Lyddy, C. (2014). De-stressing stress: The power of mindsets and the art of stressing mindfully. *The Wiley Blackwell handbook of mindfulness*, pp. 948-963. doi: 10.1002/9781118294895.ch49

Crum, A. J., Salovey, P., & Achor, S. (2013). Rethinking stress: The role of mindsets in determining the stress response. *Journal of Personality and Social Psychology, 104(4), 716–733.* doi:10.1037/a0031201

Dweck, C.S. (2008). Can personality be changed? The roles of beliefs in personality and change. Current Directions in Psychological Science, 17, 391-394. doi:10.1111/j.1467-8721.2008.00612

Epel, E. S., McEwen, B. S., & Ickovics, J. R. (1998). Embodying psychological thriving: Physical thriving in response to stress. *Journal of Social issues, 54*(2), 301-322. doi:10.1111/j.1540-4560.1998.tb01220

Ferring, D., & Filipp, S. H. (1995). The structure of subjective well-being in the elderly: A test of different models by structural equation modeling. *European Journal of Psychological Assessment, 11*, 32.

Goyer, J. P., Akinola, M., Grunberg, R., & Crum, A. J. (2018). Evaluation of a stress mindset intervention to improve performance and wellbeing in underrepresented minority college students at a selective institution. Manuscript in preparation.

Hayes, A. F. (2018). Introduction to Mediation, Moderation, and Conditional Process Analysis (2nd ed.). New York, NY: Guilford Press. doi: 10.1111/jedm.12050

Heikkilä, P., Mattila, E., & Ainasoja, M. (2018). Designing a eustress toolbox: from entrepreneur experiences to an online service. *Human Technology*, *14* (2), 233-257. doi:10.17011/ht/urn.201808103818

Huang, C.J., Stewart, J.K., Franco, R.L., Evans, R.K., Lee, Z.P., Cruz, T.D., Webb, H.E., Acevedo, E.O. (2011). LPS-stimulated tumor necrosis factor-alpha and interleukin-6 mRNA and cytokine responses following acute psychological stress. *Psychoneuroendocrinology 36(10),* 1553-1561. doi:10.1016/j.psyneuen.2011.04.009

Jamieson, J. P., Crum, A. J., Goyer, J. P., Marotta, M. E., & Akinola, M. (2018). Optimizing stress responses with reappraisal and mindset interventions: An integrated model. *Anxiety, Stress, & Coping*, *31*(3), 245-261. doi:10.1080/10615806.2018.1442615

Jiang, Y, Zhang, J., Ming, H., Huang, S., & Lin, D. (2019). Stressful life events and well-being among rural-to-urban migrant adolescents: The moderating role of the stress mindset and differences between genders. Journal of Adolescence, 74, 24-32.

Karasek Jr, R. A. (1979). Job demands, job decision latitude, and mental strain: Implications for job redesign. *Administrative science quarterly*, 285-308. doi: 10.2307/2392498

Khoshtaria, T. (2018). What are the values of young people and how are these different from the values of older generations in Georgia? *Journal of Beliefs & Values*. doi:10.1080/13617672.2017.1359480

Klein, E. M., Brähler, E., Dreier, M., Reinecke, L., Müller, K. W., Schmutzer, G., ... & Beutel, M. E. (2016). The German version of the Perceived Stress Scale–psychometric characteristics in a representative German community sample. *BMC psychiatry*, *16*(1), 159. doi:10.1186/s12888-016-0875-9

Krohne, H. W., Egloff, B., Kohlmann, C. & Tausch, A. (1996). Untersuchungen mit einer deutschen Version der 'Positive and Negative Affect Schedule' (PANAS). *Diagnostica, 42*(2), 139-156. doi:10.1037/t49650-000

Krosnick, J., & Alwin, D. (1989). Aging and Susceptibility to Attitude Change. Journal of Personality and Social Psychology, 57, 416-425. doi:10.1037//0022-3514.57.3.416

Lachenbruch, P.A., & Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Journal of the American Statistical Association, 84(408), 1096. doi:10.2307/2290095

Lazarus, R. S., & Folkman, S. (1986). Cognitive theories of stress and the issue of circularity. In *Dynamics of stress* (pp. 63-80). Springer, Boston, MA. doi:10.1007/978-1-4684-5122-1_4

Levenstein, S., Prantera, C., Varvo, V., Scribano, M. L., Berto, E., Luzi, C., & Andreoli, A. (1993). Development of the Perceived Stress Questionnaire: a new tool for psychosomatic research. *Journal of psychosomatic research, 37*(1), 19-32. doi:10.1016/0022-3999(93)90120-5

Levy, B. R., Slade, M. D., Kunkel, S. R., & Kasl, S. V. (2002). Longevity increased by positive self-perceptions of aging. Journal of Personality and Social Psychology, 83(2), 261-270. doi:10.1037/0022-3514.83.2.261

MacIntyre, P., & Gregersen, T. (2012). Emotions that facilitate language learning: The positive-broadening power of the imagination. doi:10.14746/ssllt.2012.2.2.4

Mackey, A., & Gass, S. M. (2015). *Second language research: Methodology and design*. Routledge. doi:10.4324/9781410612564

Macnamara, B. N., & Rupani, N. S. (2017). The relationship between intelligence and mindset. *Intelligence*, *64*, 52-59.

McEwen, B. S., & Seeman, T. (1999). Protective and damaging effects of mediators of stress: elaborating and testing the concepts of allostasis and allostatic load. *Annals of the New York Academy of Sciences*, *896*(1), 30-47. doi:10.1111/j.1749-6632.1999.tb08103

Moher, D., Hopewell, S., Schulz, K. F., Montori, V., Gøtzsche, P. C., Devereaux, P. J., ... & Altman, D. G. (2012). CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomised trials. *International journal of surgery*, *10*(1), 28-55. doi:10.1016/j.ijsu.2011.10.001

Mroczek, D. K., & Kolarz, C. M. (1998). The effect of age on positive and negative affect: a developmental perspective on happiness. *Journal of personality and social psychology*, *75*(5), 1333. doi:10.1037/0022-3514.75.5.1333

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, *40*(3), 879-891. doi:10.3758/brm.40.3.879

Park, C. L., & Helgeson, V. S. (2006). Introduction to the special section: Growth following highly stressful life events—Current status and future directions. *Journal of Consulting and Clinical Psychology*, *74*, 791–796. doi:10.1037/0022-006X.74.5.791

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology, 88*(5), 879. doi:10.1037/0021-9010.88.5.879

Rossi, A. S., & Rossi, P. H. (1990). *Of human bonding: Parent-child relations across the life course.* New "Vbrk: Aldine de Gruyter. doi:10.4324/9781351328920

Sapolsky, R.M. (1996). Stress, glucocorticoids, and damage to the nervous system: The current state of confusion. Stress, 1, 1-19. doi:10.3109/10253899609001092

Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and health: Psychological, behavioral, and biological determinants. *Annual Review of Clinical Psychology, 1,* 607–628. doi:10.1146/annurev.clinpsy.1 .102803.144141

Sitz, E. H., & Poche, N. (2006). Gender differences in the relationship between optimism and perceived stress. *National Undergraduate Research Clearinghouse, 5*.

Smith, J., & Baltes, P. B. (1993). Differential psychological aging: Profiles of the old and very old. *Ageing and Society, 13,* 551-587. doi:10.1017/s0144686x00001367

Stawski, R. S., Sliwinski, M. J., Almeida, D. M., & Smyth, J. M. (2008). Reported exposure and emotional reactivity to daily stressors: The roles of adult age and global perceived stress. *Psychology and aging, 23*(1), 52. doi:10.1037/0882-7974.23.1.52

Tulviste, T., Kall, K., & Rämmer, A. (2017). Value Priorities of Younger and Older Adults in Seven European Countries. Social Indicators Research, 133(3), 931-942. doi:10.1007/s11205-016-1392-4

Tweed, R. G., White, K., & Lehman, D. R. (2004). Culture, stress, and coping: Internally-and externally-targeted control strategies of European Canadians, East Asian Canadians, and Japanese. *Journal of Cross-Cultural Psychology, 35*(6), 652-668. doi:10.1177/0022022104270109

van Eck, M., Nicolson, N. A., & Berkhof, J. (1998). Effects of stressful daily events on mood states: relationship to global perceived stress. *Journal of personality and social psychology*, *75*(6), 1572.). doi: 10.1037/0022-3514.75.6.1572.

Vaux, A., & Meddin, J. (1987). Positive and negative life change and positive and negative affect among the rural elderly. *Journal of Community Psychology*, *15*, 447-458. doi:10.1002/1520-6629(198710)15:4<447::aid-jcop2290150403>3.0.co;2-9

Wagner, B. M., & Compas, B. E. (1990). Gender, instrumentality, and expressivity: Moderators of the relation between stress and psychological symptoms during adolescence. *American Journal of Community Psychology*, *18*(3), 383-406.

Watson, D., Clark, L. A., & Tellegen, A. (1988). *Development and validation of brief measures of positive and negative affect: the PANAS scales*. Journal of personality and social psychology, 54(6), 1063. doi:022-35l4/88/00.75

Yeager, D.S., & Dweck, C.S. (2012). Mindsets That Promote Resilience: When Students Believe That Personal Characteristics Can Be Developed. *Educational Psychologist, 47* (4), 302-314. doi:10.1080/00461520.2012.722805

Appendices

Appendix A

Link of the Stress Mindset Intervention of the Stress-is-Enhancing Condition

https://www.youtube.com/watch?v=R-x0AMOS4g0

Appendix B

Link of the Informative Video of the Control Condition

https://www.youtube.com/watch?v=w91P_m1203Q

Appendix C

Items and Instructions for the Stress Mindset Measure (SMM)

Please, rate the extent to which you agree or disagree with the following statements: Please use this scale for all 8 statements.

Bitte geben Sie an, inwieweit Sie den folgenden Aussagen zustimmen oder nicht zustimmen: Bitte benutzen Sie die angegebene Skala für alle 8 Aussagen.

1 = Strongly Disagree / *Stimme absolut nicht zu*

2 = Disagree / *Stimme nicht zu*

3 = Neither Agree nor Disagree / *Stimme weder zu noch Dagegen*

4 = Agree / *Stimme zu*

5 = Strongly Agree / *Stimme absolut zu*

1. The effects of stress are negative and should be avoided.
   Die Effekte von Stress sind negativ und sollten vermieden werden.
2. Experiencing stress facilitates my learning and growth.
   Stress zu erleben, fördert mein Lernen und meine Entwicklung.
3. Experiencing stress depletes my health and vitality.
   Stress zu erleben, verschlechtert meine Gesundheit und meine Vitalität.
4. Experiencing stress enhances my performance and productivity.
   Stress zu erleben, verbessert meine Leistungsfähigkeit und meine Produktivität.
5. Experiencing stress inhibits my learning and growth.
   Stress zu erleben, verhindert mein Lernen und meine Entwicklung.

6. Experiencing stress improves my health and vitality.
   Stress zu erleben, verbessert meine Gesundheit und meine Vitalität.
7. Experiencing stress debilitates my performance and productivity.
   Stress zu erleben, verringert meine Leistungsfähigkeit und meine Produktivität.
8. The effects of stress are positive and should be utilized.
   Die Effekte von Stress sind positiv und sollten genutzt werden.

Appendix D

Items and Instructions for the Control Questions

1 = Strongly Disagree / *Stimme absolut nicht zu*

2 = Disagree / *Stimme nicht zu*

3 = Neither Agree nor Disagree / *Stimme weder zu noch Dagegen*

4 = Agree / *Stimme zu*

5 = Strongly Agree / *Stimme absolut zu*

1. Please write a brief summary (2-3 sentences) about the video.
   Bitte schreibe eine kurze Zusammenfassung (2-3 Sätze) des Videos.
2. Have you watched the video attentively?
   Hast du das Video gerade aufmerksam geschaut?
3. Have you been able to concentrate on the video?
   Konntest du dich auf das Video konzentrieren?
4. Have you been distracted while watching the video?
   Wurdest du abgelenkt während du das Video geschaut hast?