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Abstract

Coping strategies are important to deal with stressors effectively. The following master's thesis examines the relationship between different coping strategies and the level of acute stress, which is induced by a social stress test. Both adaptive coping (approach coping, religion, humor) and maladaptive coping (avoidance coping) are considered. Adaptive coping strategies are hypothesized to lead to a smaller stress increase and to a better recovery three hours after the stress test. For avoidance coping, a higher stress increase and a worse recovery is hypothesized. Participants ($N=22$) completed the Brief-COPE before the experiment and stress measure were assessed several times throughout the experiment. Self-reported stress was assessed via an analogue scale and physiological stress was assessed via monitoring heart rate and analyzing specific intervals. Since only one out of 16 regression analyses was significant, which could be due to the low sample size, extreme case analyses were additionally carried out. The analyses considering approach coping and avoidance coping suggest that they cannot be strictly divided into adaptive or maladaptive because of mixed results. Religion seems to be an adaptive strategy during stress recovery when participants find meaning in the experience. Humor seems to be most effective in the stressful situation itself because it could help not taking the situation too seriously. Although the results should be interpreted with great caution due to the small sample size, they suggest that coping strategies have an effect both on stress increase and stress recovery. Implications are discussed.

Keywords: approach coping, avoidance coping, religious coping, humorous coping, self-reported stress, physiological stress, acute stress

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Every person sooner or later experiences stress. Stress is one of the main reasons for both physical and psychological disorder (Brinkmann, 2021). It is very important that people are able to deal effectively with stress in order to lead fulfilling lives (Brinkmann, 2021). One way to achieve this is by using efficient coping strategies. This master's thesis explores the role of adaptive and maladaptive coping strategies and their relationships with acute stress, which is induced by a stress test. It is part of a larger research project by Dr. Jasminka Majdandzic and Univ.-Prof. Dr. Urs Nater and is conceptualized as a randomized controlled trial with three experimental conditions.

The COVID-19 pandemic coincided with this master's thesis. Short term consequences of the pandemic are already visible since actions to prevent the virus from spreading like lockdowns or having to keep distance lead to an increased prevalence of stress and mental illness like depression and anxiety disorders (Rogowska et al., 2020). Since the beginning of the pandemic, a general increase of psychopathological symptoms of 10% and COVID-19 related traumatic symptoms of 15% have been observed (Schäfer et al., 2019). However, the long term consequences are not yet visible and therefore hard to estimate. But because of this challenging situation, it is all the more important to identify protective factors like coping strategies with the goal of getting a better understanding on how to help other people as effectively as possible dealing with the COVID-19 pandemic. However, the COVID-19 pandemic and its consequences have to be taken into account when discussing the findings.

Stress

Definitions and forms of stress

Stress means two different things in everyday language: The source (=stressor) and the consequence on the organism and on the psychological wellbeing (=stress reaction). Not only objective parameters like stress duration, the intensity of the stressor and the frequency of the stressor are important if a person experiences stress, but also the subjective evaluation of the stressor (Nater et al., 2011)

If a stressor triggers a stress reaction, it depends on objective parameters like stress duration, intensity and frequency if a person experiences stress. Moreover, the subjective evaluation of the stressor is important (Nater et al., 2011). So stress can be summed up as “the physiological or psychological response to internal or external stressors” (American Psychological Association [APA], 2020)

Stress can also be defined as a “bodily or mental tension resulting from factors that tend to alter an existent equilibrium”(Lovullo, 2015, S. 32). The severity of the stress therefore

depends both on the severity of the challenge and the ability to compensate. That means that stress is an active process that has to include an action on the stressor. Stress normally ends when the compensation is completed and the stressor is removed. Moreover, this definition includes both bodily and mental tension. Physical stressors pose a direct threat to our health, some examples for that are heat, cold or toxic substances. They are considered a bottom-up process. Psychological stressors on the other hand are stressful not because of objective parameters of the stressor itself, but because of our perception, thoughts and interpretations of it. Some examples for this are the loss of a loved person, failure to achieve a goal or the break-up of a relationship. This process is considered to be top-down because the stress starts in the brain and only then the body is activated. Nevertheless, psychological stressors lead to the same physical responses as physiological stressors. Both physiological and psychological stressors are part of life and sooner or later happen to everyone (Lovallo, 2015).

Another important aspect of stress is the distinction between eustress and distress. Eustress is stress that is appraised as positive and motivates people to give their best. Distress on the other hand is appraised as negative and can have a severe impact on physical and mental health (Lovallo, 2015). In this master's thesis, only distress is considered.

The duration and severity of stress also plays an important role in the consequences of stress. *Acute stress* is an acute, experience-based and temporary stress reaction to a new and challenging event. It is defined as the response to either a recently experienced or anticipated challenge. The bodily consequence of this reaction is an increased capability to deal with the stressor, which is a protective reaction of the body. The psychological consequence is a short, intense feeling of stress. This reaction potentially increases the capability to deal with stress in the future (Lovallo, 2015). Chronic stress, however, is a prolonged feeling of stress and is primarily caused by everyday struggles. It can have a huge negative impact on one's health. Bodily consequences include a weakened immune system, stress-related disorders, chronic pain, cardiovascular diseases and headaches (Brinkmann, 2021). Psychological consequences are a higher risk for anxiety disorder, addiction, depression and burnout (Epel et al., 2018). This master's thesis focuses on acute stress. Moreover, throughout the centuries, the nature of stress has changed enormously. In the early times, people experienced life-threatening stress more regularly than people do nowadays. This was very important for their survival, for example in fighting situations with enemies, in the face of dangerous animals or in search for food (Lovallo, 2015). Naturally, people are still confronted with life-threatening stressors from time to time, like when having a severe accident or when living in countries in which there are ongoing wars or extreme poverty. But for the majority of first world countries,

people are rarely exposed to life-threatening situations. Instead, new stressors have emerged that are not life-threatening but still either acutely or chronically stressful. These stressors can be found in a lot of different areas in life, like for example family, friends, career, appearance or self-actualization (Epel et al., 2018).

General aspects

One important milestone in the study of stress was the conclusion that living things had an internal environment that could alter their behavior. To be alive, it is important to keep the internal environment constant to an ever-changing external environment. This process was later termed homeostasis. As long as homeostasis is maintained, people are considered to be healthy (Lovullo, 2015).

Hans Seyle later examined the reaction of animals when their homeostasis was threatened. He observed a fixed pattern of response, which he called general adaptation syndrome. Moreover, the animals also showed specific responses. So he concluded that the full pattern of response when exposed to a stressor is both a nonspecific adaptation syndrome and the specific reaction. The general adaptation syndrome includes three stages. With the help of these stages, the two stress responses work towards homeostasis. The first stage is called alarm reaction and at that time the organism begins to execute a stress response. The next stage is called the stage of resistance in which the organism fights to get back to homeostasis. This stage lasts until either the stressor is defeated or the organism is no longer able to fight. The final stage, the stage of exhaustion, only occurs when homeostasis cannot be re-achieved, and can be dangerous or even life-threatening. It lead to the ultimate death of the animals in the study (Lovullo, 2015).

When people are consistently exposed to moderate stress, homeostasis can only be maintained while continuously damaging the system. Allostasis is a self-regulatory biological process and means that when a demand cannot be removed, maintaining homeostasis is a process of ongoing harm. This takes a lot of physiological effort and can have severe long-term effects. Allostatic load therefore embodies the idea of having to maintain homeostasis while having to face constant challenges (Brinkmann, 2021, Lovullo, 2015).

The biological side of stress

Homeostatic regulation can be divided into five layers that are hierarchical. At the bottom there are organs and local reflexes. They regulate themselves independently without higher control. The brainstem and the endocrine system are two systems that allow descending information from the central nervous system to the organs. The brainstem controls the

autonomic nervous system (sympathetic, parasympathetic and enteric) in a direct-fashioned way. The next level is the hypothalamus which regulates the endocrine system and coordinates the brainstem. Furthermore, it involves motor areas that are specific for behaviors that are directed towards survival. On the highest level there are inputs from higher brain regions that can alter the workings of the hypothalamus. These regions have information from the external environment and at the same time have access to emotions and memories (Lovallo, 2015).

When homeostasis is threatened, a system of negative feedback loops take place. These loops spot a controlled activity and in a next step they compare it to a set point. If the activity departs from this set point, an opposite influence is started. To do this, the hypothalamus and the brainstem are in constant contact with the organs in order to receive information and then command back to the organs (Lovallo, 2015).

Two pathways of stress

There are two pathways for stress. The fast pathway works through the sympathetic nervous system and the slow pathways works through the hypothalamic pituitary adrenal axis (HPA-axis). These two systems are activated in parallel (Lovallo, 2015).

The fast pathway is part of the autonomic nervous system. It consists of two separate pathways that influence most vital organs: The sympathetic and the parasympathetic nervous system. An activation of the sympathetic nervous system mobilizes the energy resources of the body in order to prepare for a fight-or-flight response. The fight-or-flight response is the most prototypical stress response and prepares the body to react. It incorporates a complex set of both physiological and behavioral changes that are executed to stay alive in acutely threatening situations. During fight-or-flight mode we mostly experience negative emotions like anxiety, fear, or anger. Endocrine changes increase power and strength of the overtly shown behavior and strengthen physiological responses. The fight-or-flight mode can be activated both through physiological and psychological stress. The autonomic nervous system suppresses the parasympathetic nervous system and increases activity of the sympathetic nervous system. The parasympathetic nervous system, which is suppressed during the stress, usually leads to a lower heart rate and lower blood pressure. At the same time, digestive functions and growth are at a height. While the sympathetic activation only mobilizes energy for a short period of time, the parasympathetic activation is designed to be activated for a longer time in order to keep the body healthy and energy storage at a good level (Bear et al., 2020).

So in the fast pathway, also called sympatho-medullary pathway (SAM), the body sends a neural message through the spinal cord to activate the sympathetic system which in turn activates the adrenal gland. The adrenal medulla then releases epinephrine which activates the endocrine glands, the brain and the body's cells. Adrenaline accounts for increased heart rate, transformation from glycogen to glucose and increased metabolism, preparing the body for an optimal short-termed stress reaction. The hormones that are involved in this activation are epinephrine and norepinephrine (Lovallo, 2015).

The slow pathway, also called hypothalamic pituitary adrenal (HPA) axis, starts in the hypothalamus. The hypothalamus releases CRH (corticotropin-releasing hormone) into the anterior pituitary gland which then releases ACTH (adrenocorticotropin hormone). ACTH acts on the adrenal gland and then the adrenal cortex releases the hormone cortisol into the circulatory system. Finally, cortisol activates the brain, the body's cells and the endocrine glands. Cortisol is used for energy generation throughout the body. It transforms proteins and fat in glucose which in turn increases blood sugar, and also it inhibits the immune system (de Kloet et al., 2005). Moreover, both the amygdala and the hippocampus are able to influence the stress reaction because they both regulate the secretion of CRH. The amygdala is best known to be involved in fear and also coordinates the fear response. When receiving sensory information from the neocortex or the thalamus, the amygdala starts a respective stress response involving the hypothalamus. This works through an activation of both the HPA axis and the sympathetic nervous system. So while the amygdala stimulates CRH release, the hippocampus inhibits this release. This is an essential feedback regulation to avoid too high cortisol levels (Bear et al., 2020).

The psychological side of stress

Not every potential stressor is actually perceived as stressful and not every individual reacts the same way to a stressor. The transactional stress model by Lazarus and Folkman (1984) accounts for this idea. There are three different conditions that are relevant for stress: Damage / loss that comes from an already existing pressure, threat that comes from a negatively anticipated pressure and challenge that comes from a positively anticipated pressure (Nater et al., 2011).

According to this model, stress situations are complex interdependencies between the demand of the situation and the acting person. Another key component is the subjective evaluation of the stress reaction which can explain individual differences in stress responses. When people experience a stressor, they appraise it in two steps. Firstly, people evaluate

whether the stressor is positive, dangerous or irrelevant. This process is called primary appraisal. Only if the stressor is appraised as dangerous, secondary appraisal takes place. In this step, an evaluation of the resources to cope with the stressor takes place. Only if resources are insufficient, a person experiences stress (Lazarus & Folkman, 1984).

Stress recovery

People do not experience stress forever. *Stress recovery* is defined as the return to the initial homeostasis. To achieve homeostasis, an activation of the parasympathetic system and / or the deactivation of the sympathetic system is initiated (de la Torre-Luque et al., 2017). Usually, this process is initiated after an successfully executed action. After achieving recovery, people feel a relaxation on physiological, cognitive and affective levels, which can lead to an improved mood or a reduction of physiological and psychological strain (Toker & Melamed, 2017). When this process is inefficient though, for example due to overexposure of a stressor, it leads to an ongoing sympathetic activity which in turn can lead to weakened energetic resources (Toker & Melamed, 2017). The consequences are severe health consequences, like an increased vulnerability to ulcers, greater intensity of pain (de la Torre-Luque et al., 2017), a continuions fatigue, burnout or poor sleep (Toker & Melamed, 2017). Moreover, chronically heightened cortisol levels can have severe consequences like weight gain, fatigue, difficulty in concentrating, sleeping disorders or difficulties in concentrating (Brinkmann, 2021). Thus, it is very important to deal with stress sufficiently enough to achieve recovery.

Another important aspect one should consider when talking about stress recovery, is the concept of *resilience*. Sooner or later, the majority of people will experience something stressful or potentially traumatizing which can have a huge impact on mental health. Nonetheless, people usually recover quickly after such events with an equal or even improved mental health. When a person is resilient, he / she is able to cope with a difficult situation and go back to a pre-crisis status fast. Resilience means that people are able to cope well even when being confronted with trauma, threats, tragedy or a vast amount of stress (de Terte & Stephens, 2014). Resilience is a multidimensional construct that involves biological, psychological, social and cultural factors which are all intertwined. This is why some people show greatly impaired functioning while other people show a high level of resilience when being confronted with the same stressor. Furthermore, resilience can be seen as a trait, a process or an outcome. Misleadingly, resilience is often talked about in a binary way, meaning that either a person is resilient or not. In reality, resilience exists on a constantly changing continuum that can change from situation to situation (Southwick et al., 2014).

Coping

To successfully manage stress, coping strategies are necessary. *Coping* is defined as the „cognitive or behavioral efforts to manage external and / or internal demands that are appraised as taxing or exceeding the resources of the person.” (Lazarus & Folkman, 1984).

Coping is classically considered a state variable which can change from situation to situation (Folkman et al., 1987). In this thesis though, coping is conceptualized as a trait variable. Thus, habitual coping is considered. Short, periodic exposure to stressors can potentially increase the ability of the body to cope with those stressors because the body physically adapts to it. Moreover, effective coping means that the available coping strategies are quickly activated when needed and efficiently terminated when the stressor is gone (de Kloet et al., 2005). Severe, long-term exposure of a stressor, on the other hand, can have a detrimental effect on one's coping (Lovallo, 2015).

Originally, Lazarus and Folkman (1984) distinguished between two coping strategies: If people use problem-focused coping, they actively try to do something about the stressor and if people use emotion-focused strategies, they try to regulate the tension that they experience while being exposed to the stressor. Problem-focused strategies are considered adaptive while emotion-focused strategies are mostly considered maladaptive (Lazarus & Folkman, 1984).

The effectiveness of coping depends not only on one's coping strategies, but is partly controlled by habitual personality traits or the environment, like the nature of the specific stress which is also called situational specificity. This includes factors such as controllability (Bengel & Lyssenko, 2012). In controllable situations, problem-focused strategies seem to be more useful and in uncontrollable situations, emotion-focused strategies seem to be more useful (Gan et al., 2004). Other factors that can influence the coping process include newness of the situation or the likelihood of the situation occurring again (Bengel & Lyssenko, 2012).

Approach and avoidance coping

Recent literature has shown that emotion-focused strategies are not always dysfunctional and problem-focused strategies are not always functional. A very important factor that has been ignored before is the direction in which the coping is oriented (Bengel & Lyssenko, 2012). Because of this insight, a newer approach distinguishes between approach and avoidance coping. *Approach coping* is an orientation towards the stressor and includes active thinking about the stressor. *Avoidance coping* on the other hand is an orientation away from the stressor and is often accompanied by emotional or behavioral distraction (Benatov et al., 2020; Herman-Stahl et al., 1995).

There is a distinction between adaptive and maladaptive, sometimes referred to as functional and dysfunctional coping strategies. Adaptive strategies contribute to a long-lasting and sustainable solution, while maladaptive strategies emphasis distraction and contribute to a worse mental state (Benatov et al., 2020). Generally, approach coping strategies are considered adaptive and avoidance coping is considered maladaptive. For example, avoidance coping is a significant predictor for eating disorders (McGarrity et al., 2019). Depressed and suicidal people rely more on avoidance strategies and less on approach strategies (Benatov et al., 2020). Also, seeking social support, an approach strategy, was related with less suicidal attempts, while avoidance strategies were related with more suicidal attempts (Benatov et al., 2020). People who use more avoidance strategies had on average a worse mental state while people who use active problem solving and reframing the meaning as approach coping strategies, reported less health symptoms (Arthur, 1998). A study that was conducted with nurses showed that even the occasional use of avoidance strategies increases the risk of burn out (Gibbons, 2010). Also, very stressed teacher tend to rely more on maladaptive coping strategies which is also a risk factor for burn out (Austin et al., 2005). Furthermore, there is a significant positive correlation between positive mood and approach coping strategies (Totan, 2014). Approach coping also seems to influence to some extent the way people experience the COVID-19 pandemic, since it correlates both with less psychopathology and a better life quality (Shamblaw et al., 2021).

Religion and humor as coping strategies

Furthermore, there are two coping strategies, religion and humor, that are also frequently used but cannot be definitely classified as approach or avoidance coping (Carver et al., 1989).

The significance of religion

Religion is a very important aspect in the lives of many people. “To be *religious*” is defined as the belief that either a superhuman or superhuman powers exists with the ability to help or harm mankind (Banton, 2013; Horton, 1960). Some aspects of religion, like attending religious services, are positively associated with life satisfaction. This is true because religious people feel a strong sense of community and social networking while attending services (Lim & Putnam, 2010). Other aspects like “believing in god” have not always shown that positive association and are even associated with psychopathology like OCD, social anxiety or paranoia when believing in a punitive and not in a benevolent god (Silton et al., 2014). Moreover, religion shows the most positive correlations with positive concepts like happiness or life satisfaction when the religion is the dominant religion of the country one lives in (Gebauer et al., 2012).

Religion can have a very positive impact on the lives of religious people. Religion is able to show religious people a way to deal with their lives (Carone & Barone, 2001). On average, religious people have superior mental health (Wolf et al., 2016) and also lead happier and more satisfied lives (Stavrova et al., 2013), compared with non-religious people. Also, there is a positive correlation between religion and life satisfaction (Habib et al., 2018). Generally speaking, in a meta-analysis of 43 reviewed studies, 72,1% reported that religious people suffered from less mental health disorders, 18,6% reported mixed results and 4,7% reported more mental health issues (Bonelli & Koenig, 2013).

On the other hand, even though those studies are in the minorities, a few researchers have also reported that religious people tend to have more mental health issues and a poorer well-being (Weber & Pargament, 2014). Also, religion does not necessarily improve life satisfaction (Markides et al., 1987). So to sum up, religion seems to be a complex construct with major implication on mental health and seems to mostly fulfill an adaptive function.

Religion as a coping strategy

Religious coping can be divided into positive and negative religious coping which differently associated with positive and negative outcomes like stress and psychopathology (Carpenter et al., 2012). Positive religious coping means being confident and having a trusting connection with a benevolent god. Some examples for positively religious coping strategies are seeking religious support or making benevolent religious reappraisals. Negative religious coping on the other hand involves an insecure relationship with a punitive god. Some coping strategies include religious discontent and making punitive religious reappraisals (Park et al., 2018). Positive religious coping is associated with better outcomes and negative religious coping is associated with worse outcomes (Carpenter et al., 2012; Park et al., 2018). Moreover, in the Brief COPE questionnaire, religious coping is correlated to the same extent to approach ($r=.21$) and avoidance ($r=.25$) strategies (Carver et al., 1989). But since the religious subscale is described as “using one’s religion as a source of emotional support and active coping” (Rice et al., 2014, p. 4), in this master thesis, religious coping is considered an adaptive coping strategy.

In a study, negative religious coping was a significant moderator between stress and depressive symptoms. Depressive symptoms were highest when stress exposure and negative religious coping was highest. These effects were strongest when the participants had high personal religious commitment (Carpenter et al., 2012).

The significance of humor

Humor is the ability to express something that is considered funny. It is both a means for entertainment and a coping resource. It can also be seen as the ability to both perceive and express amusing aspects of different situations (Martin et al., 2003). Moreover, humor is often used to form social bonds and flirt with potential partners (Kruczek & Basińska, 2018).

Humor can be divided into four styles. Affiliative humor and aggressive humor are targeted towards external factors. Affiliative humor means making fun of things that the majority of people find jolly. Goal of this kind of humor is to bring people together by laughing about everyday things. Examples include everyday situations or jokes about animals. It is used to enhance relationships due to reducing conflicts. Aggressive humor on the other hand is used to bring people down by insulting them. The intent is to threaten or psychologically hurt them. It is often used by bullies. The other two forms of humors are targeted toward oneself. Self-enhancing humor is the ability to laugh at yourself, like telling a story about something funny that you have done. Like affiliative humor, self-enhancing humor also uses everyday situations, but makes the person telling the story the target of humor in a healthy way. When using self-defeating humor, on the other hand, people put themselves down in an aggressive or pitiful way. This type of humor is often used by people with low self-esteem and by the victims of bullies in order to try and avoid conflicts and keep in control (Martin et al., 2003). So to conclude two of the humor styles are adaptive (affiliative humor and self-enhancing humor) and two of them are maladaptive (aggressive humor and self-defeating humor). It is not clear which kind of humor the coping questionnaire of this master's thesis measures. The subscale is defined as "using humor in order to make fun of the stressor" (Rice et al., 2014, p. 4).

Humor as a coping strategy

In the transactional stress model, humor is treated as an individual resource to cope with situations that are appraised as taxing (Lazarus & Folkman, 1984). Humorous coping is defined as an individual using humor in order to be able to deal with stressful and demanding situations (Kruczek & Basińska, 2018).

Previous literature has shown that humor is used as an adaptive coping strategy. For example, humor is positively correlated with adaptive coping and negatively with stress (Kruczek & Basińska, 2018). In another study, participants were divided by the median into a humorous and a non-humorous group. The humorous group reported less subjective stress and anxiety, even though they had the same amount of everyday problems as the non-humorous

group (Abel, 2002). Moreover, humor and life satisfaction are positively correlated ($r = .25$; Zhao et al., 2014). Also, the effectiveness of a humor therapy was tested. Participants who underwent this therapy reported an increase in happiness and life satisfaction (Tse et al., 2010). Moreover, people who use humor as a coping strategy tend to appraise stressful situations more positively, for example as a challenge (Kuiper et al., 1995). Also, humorous people were more likely to distance themselves from problems in stressful situations and look at those problems from multiple perspectives (Kuiper et al., 1995). Because of this findings humorous coping is treated as an adaptive strategy in this master's thesis.

Gap in research

There has been a lot of research on stress and coping strategies. But since most research focuses on chronic stress, only few studies have investigated the relationship between acute stress and coping strategies. Those few studies that did focus on this relationship did it mostly with the focus on competitive sport (Anshel & Anderson, 2002; Anshel & Delany, 2001; Nicholls & Polman, 2008). Acute stress that is induced by a stress test has hardly been considered, although it is important to be able to cope with acute stress as well. The general research question for this master's thesis therefore is: Do different habitual coping strategies have an effect on the stress increase after an acute stressor and the stress recovery after an acute stressor?

To address this research question, an experiment, conceptualized as a randomized control trial with two experimental conditions and one control condition took place. Habitual coping is assessed with a questionnaire prior to the experiment. During the experiment, participants have to complete a social stress test (TSST; Kirschbaum et al., 1993) and then have the chance to recover for several hours in which they either listen to music / audiobook / lie in silence or read a magazine. Several measure timepoints capture this stress recovery.

Research questions and hypotheses

Research questions

Firstly, the research questions that will be explored in this theses are listed:

Q1: Do approach coping strategies affect the level of acute stress?

Q2: Do avoidance coping strategies affect the level of acute stress?

Q3: Does religious coping affect the level of acute stress?

Q4: Does humorous coping affect the level of acute stress?

Hypotheses

These hypotheses are inferred from the presented research questions:

H1: There is a negative relationship between approach coping and acute stress.

H1a: There is a negative relationship between approach coping and self-reported stress after an acute stressor.

H1b: There is a negative relationship between approach coping and physiological stress after an acute stressor.

H1c: There is a negative relationship between approach coping and self-reported stress recovery after an acute stressor.

H1d: There is a negative relationship between approach coping and physiological stress recovery after an acute stressor.

H2: There is a positive relationship between avoidance coping and acute stress.

H2a: There is a positive relationship between avoidance coping and self-reported stress after an acute stressor.

H2b: There is a positive relationship between avoidance coping and physiological stress after an acute stressor.

H2c: There is a positive relationship between avoidance coping and self-reported stress recovery after an acute stressor.

H2d: There is a positive relationship between avoidance coping and physiological stress recovery after an acute stressor.

H3: There is a negative regressive relationship between religious coping and acute stress.

H3a: There is a negative relationship between religious coping and self-reported stress after an acute stressor.

H3b: There is a negative relationship between religious coping and physiological stress after an acute stressor.

H3c: There is a negative relationship between religious coping and self-reported stress recovery after an acute stressor.

H3d: There is a negative relationship between religious coping and physiological stress recovery after an acute stressor.

H4: There is a negative relationship between humorous coping and acute stress.

H4a: There is a negative relationship between humorous coping and self-reported stress after an acute stressor.

H4b: There is a negative relationship between humorous coping and physiological stress after an acute stressor.

H4c: There is a negative relationship between humorous coping and self-reported stress recovery after an acute stressor.

H4d: There is a negative relationship between humorous coping and physiological stress recovery after an acute stressor.

Methods

This study is part of an overall research project which is called “effects of music listening after an acute stressor on psychological, cardiovascular and endocrine stress measures and skin barrier recovery”. It is conducted by Dr. Jasminka Majdandzic and Univ.-Prof. Dr. Urs Nater from the Music and Health Lab, which is part of the Department of Clinical and Health Psychology at the University of Vienna. This study focuses on the relaxing effect of music after an acute stressor and has a focus on skin barrier recovery. It is conceptualized as a randomized controlled trial with three experimental conditions.

Sample

Participants were mostly recruited online with the help of social media platforms like Facebook. Furthermore, some participants were recruited directly via the University of Vienna or via snowball system. Since the experiment was conducted during the COVID-19 pandemic, lockdowns have repeatedly complicated testing since participants were not allowed to leave their homes. Due to that, the testing had to be put on hold a few times for some weeks. This is also why, out of the intended 45 participants, which was computed via G*Power, only 22 participants completed the experiment at the time of writing. Since the experiment lasted for approximately four hours, participants received a monetary compensation of 45€.

Only healthy women between the age of eighteen and thirty-five meet the inclusion criteria. They must have a regular menstrual cycle and a BMI (Body Mass Index) between 18 and 35, which is considered normal weight (Bhaskaran et al., 2018). Moreover, they must be fluent in German in order to understand the instructions. Moreover, they have to be non-

smokers and must not use alcohol in an abusive way. What is more, professional musicians, people with an absolute hearing and people with a hearing impairment are not allowed to participate in order to control for a potential bias in the previous experience to music listening.

Participants must not have any allergies, skin diseases or skin sensitivities and they must not use hormonal contraception or hormonal medication. Moreover, women who are pregnant and women who breast-feed at the time of the testing were excluded. Women with impaired somatic health were also excluded. This was for example the case when they had a chronic or severe medical condition, a surgery in the last eight weeks, severe visual impairments that could not be corrected with glasses or vaccination in the last two weeks. In addition, psychological factors were asked. Women with a current mental disorder like depression or an eating disorders were excluded. This also includes that they must not have taken any drugs in the past two years or any psychopharmaceutic medication in the last 14 days.

Lastly, it is essential that the participants have never completed or heard of the TSST before. This is important to make sure that the TSST actually induces stress. This also includes that the participants must not know the active or the passive stressor in any way. So, if a potential participant knows a study team member, it was important not to assign this member for the testing in order to avoid effects of social support.

The actual experiment had to happen at a specific time window during the menstrual cyclus which is called the follicular phase. Optimally, the second half of the follicular phase is used which is 4-7 days after menstruation starts. (Berk, 2011). In order to find a suitable day for the experiment, participants were asked what their average cycle length was, how long their average menstruation lasts and when their last menstruation started.

All these inclusion and exclusion criteria were inquired during a telephone screening. After ensuring that all these criteria were met and finding a suitable day for the testing, participants were sent the link for the test battery and were randomly assigned to one of the three listening conditions (music, audiobook, silence).

Since this experiment happened during the COVID-19 pandemic, special actions took place in order to protect the study team members and the participants from an infection. Both participants and study team members had to provide test evidence that they were not infected with COVID-19. Furthermore, for each testing, the study team members and the participants had to fill out a short questionnaire in order to confirm that they did not show any symptoms

of COVID-19 and were not in a high-risk area during the last 2 weeks. Moreover, they had to sign a written informed consent with important information regarding the study.

The final sample size includes $N = 22$ women and had a mean age of 25.77 ($SD = 3.73$). One participant had to be excluded from the analyses involving self-reported stress because she did not mark the line on the analogue stress scale in order to state how stressed she was feeling at the time points peak stress and stress recovery time point. Moreover, two participants had to be excluded from the analyses involving heart rate. The reason for one participant was that the movisens sensor was not working accurately. The other participant showed an extreme value for the peak stress level which was considerably lower than her baseline value. So the final sample for self-reported stress includes $N = 21$ and for physiological stress $N = 20$.

Study design

The overall research project examines the relaxing effects of music after an acute stressor (TSST; Kirschbaum et al., 1993). The study is a randomized controlled trial with three listening conditions as an independent variable that participants are randomly assigned to: They either have to listen to music (=experimental condition) or they have to listen to an audiobook or lie in silence (=control conditions). The playlists in use were validated in a pilot study with $N=70$ participants.

There are several stress measures that serve as dependent variables in this study: Salivary alpha-amylase, salivary cortisol, heart rate / respiratory sinus arrhythmia, electrodermal activity and self-report. Heart rate and electrodermal activity are continuously measured throughout the study. The other stress measures are collected at eight different time points: a baseline measure, before the stress test, after the stress test, before the listening condition, after the listening condition and three final measures with 30 minutes intervals.

These are the main variables that are important throughout the experiment. But participants also have to fill out a test battery with a lot of questionnaires at home before the actual experiment starts. In this test battery, a lot of other variables are assessed.

Tasks

The Trier Social Stress Test (TSST; Kirschbaum et al., 1993).

In order to measure acute stress, participants have to be put into a stressful situation. The Trier Social Stress Test (TSST; Kirschbaum et al., 1993) robustly induces moderate physiological and psychological stress in a laboratory setting. When being compared to a rest

condition, the participants reported a significantly higher amount of psychological stress and state anxiety (Nater et al., 2006). Due to its standardization it allows high controllability of the situation (Allen et al., 2017). The TSST combines two key elements to induce stress: social-evaluative threat and uncontrollability (Allen et al., 2017). During the TSST, changes in the concentration of different hormones like the adrenocorticotrophic hormone (ACTH), cortisol in the serum and saliva, growth hormone (GH) (Kirschbaum et al., 1993) and prolactin (Nater et al., 2006) have been measured. Moreover, participants showed a significant increase in heart rate (Kirschbaum et al., 1993) while completing the TSST. Moreover, salivary cortisol responses during the TSST showed a significant increase when being compared to a baseline measure, this effect has a high reproducibility and consistency and has been shown across different studies (Kirschbaum et al., 1993).

The TSST consists of two parts, a job interview and mental arithmetic's. Before the test, there is a mandatory preparation period of three minutes in which participants are asked to take notes for the job interview. They are not allowed to use those notes though. Then the actual test period starts. First, participants are asked to do a free speech of five minutes for a job interview. They are told to imagine that they really want the job. In the interview, they must only talk about their personality because their curriculum is already known. Whenever the participants start talking about their previous job experiences, they are asked to talk more about their personality. After that, the mental arithmetic's starts for another five minutes. Participants are asked to count backwards from 2043 in steps of 17. Whenever a mistake is made, they have to start at 2043 again and whenever the calculating takes too long they are told to try and be faster (Kirschbaum et al., 1993).

In the TSST, stress is induced in several ways. Participants must stand the whole time in front of an active male stressor and a passive female stressor who sit in front of the participants. They are dressed in white, always have a neutral facial expression and occasionally take notes. The active male stressor does all the talking but is instructed to talk as little as possible to induce as much stress as possible. This is important to decrease any possible effects of social support. To increase the stress induction, the participants also believe that the two stressors are trained in behavioral observation which is not true. Also, participants think that the whole test is being videotaped and that there is a microphone in the room. In reality, both the microphone and the camera are not turned on during the test (Kirschbaum et al., 1993).

Procedure

Before the experiment, participants have to fill out a test battery that includes several questionnaires to assess additional variables. These questionnaires include the Trierer-Inventar zum chronischen Stress (TICS; Schulz & Schlotz, 1999) to assess life stress and stress reactivity, the Perceived Stress Scale (PSS; Cohen et al., 1983) to assess perceived stress, the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 2003) to detect neglect and abuse in childhood and the Perceived Stress Reactivity Scale (PSRS; Schlotz et al., 2011) to assess stress reactivity. Furthermore, protective factors like coping (Brief-COPE; Carver, 1997) and emotion regulation (Emotion Regulation Questionnaire; ERQ; Sala et al., 2012), resilience (Resilienz-Kurzskala; RS-11; Leppert et al., 2008) were assessed. Personality traits were also considered using the NEO-Fünf-Faktoren-Inventar (NEO-FFI; Borkenau & Ostendorf, 1993) to include the Big Five personality factors and the Rosenberg Self-Esteem (RSES; Rosenberg et al., 1989) to include self esteem. Health and wellbeing were other assessed variables. They were assessed using the Prime MD Patient Health Questionnaire (PHQ-D; Spitzer et al., 2000) to assess the most common mental disorders and the Beck Depression Inventory (BDI 2; Jackson-Koku, 2016) in order to assess depressivity. Not only psychological disorders, but also somatic symptoms and PMS were considered using the Multidimensional Fatigue Inventory (MFI-20; Smets et al., 1995). Since this experiment has a strong focus on the relaxing effects of music, some variables about music and musicality were also considered, like music preferences (Music Preference Questionnaire; MPQ; Nater et al., 2005), musical sophistication and musicality (Gold-MSI, G-MSI; Müllensiefen et al., 2014).

Since the testing periods coincided with the COVID-19 pandemic, additional safety procedures had to be followed while being in contact with the participants. Everyone had to wear face masks (FFP1 or FFP2) all the time with a few exceptions (like taking saliva samples). Plus, it was obligatory to disinfect both hands and all potentially contaminated surfaces and objects regularly. Moreover, measuring body temperature was important to make sure that neither the study team members nor the participants had a fever which is a symptom of COVID-19. Furthermore, everybody had to present a negative COVID-19 test before the experiment. It is important to consider though that due to varying regulations, not every participants had to follow the exact same precautions.

After checking the COVID-19 requirements, participants had to sign an informed consent and filled out an entry questionnaire. Afterwards, the Ecg Move 4 sensor, which was developed by the company movisense in Karlsruhe, Germany, was put in position. The best part for that is the lower sternum and it is fixated using a chest strap. This sensor is important

to monitor heart rate. Furthermore the Eda Move 4 sensor, which was also developed by movisense, was attached to the non-dominant hand with adhesive electrodes. It is used to record electrodermal activity. In this preparation phase, the saliva sample was also practiced. Afterwards, participants who were randomly assigned to the listening condition could select one out of five playlists with different music genres / audiobooks. The musical genres were ambient, lo-fi, lounge, jazz or guitar. The audiobooks were physics, cosmology, philosophy, biology or history.

When the participants were done with the preparations, the first measurements for stress took place. First a saliva sample was taken, at the same time the first electrocardiography (ECG) and electrodermal activity (EDA) measures happened. Although these two variables were measured continuously throughout the experiments, there were certain marker time points that coincided with the saliva sample. For those markers, participants had to tap their wrist band shortly. This set of stress measurements also included a few questionnaires that assessed the participants' stress response and affective state. The visual analogue scale (VAS; Lesage et al., 2012), however, assessed stress, tension, controllability, urge to leave and anxiety using an analogue scale ranging from 0 to 100. All these described measurements for stress were assessed at eight different time points throughout the study. The Primary Appraisal Secondary Appraisal Questionnaire (PASA; Gaab, 2009) was used once during the experiment directly before the TSST.

After this set of baseline measures, participants were walked into a different room in which they had to complete the TSST (Kirschbaum et al., 1993, see page 19-20). The instructor instructed the participants about the TSST. Then the mandatory preparation period took place and after that, the second set of measurements of the salivary sample, ECG / EDA, TTPAS / MBDF / VAS were done and filled out. Afterwards, the testing period of the TSST with the job interview and the counting took place. Directly after that, the third set of measurements took place. Additionally to the set of questionnaire, participants had to fill out PASA (Gaab, 2009) to appraise the TSST. Following that, participants were walked back to the testing room and the first TEWL measurement started. Firstly, a baseline measurement took place, then the tape stripping procedure happened, and after that, the TEWL impaired measurement took place. This was not done by the instructor, but by another person who was solely responsible for the TEWL measurements. After that, the fourth measurements of salivary sample, ECG/EDA and the set of questionnaires were done and filled out.

After that, the listening condition took place. Participants had to lie down on a deck chair with dimmed lights. If they wanted to, they could have a blanket on top of them so they did not get cold. For the next 30 minutes, they solely had to listen to their previously chosen music playlist or audiobook. If they were in the silence condition, they had to lie down in silence for 30 minutes. They were actively instructed not to touch their headphones or their TEWL forearm and not to fall asleep during that time. When the 30 minutes were over, the instructor and the TEWL person reentered the room and turned back on the lights. After that, the fifth measurements of salivary sample, ECG / EDA and the set of questionnaires took place. Additionally, participants had to fill out a questionnaire with some questions about the music or audiobook that they had just heard. This was called *Bewertung Musikstimulus* (BMS). Following that, the first follow-up TEWL measurement was done by the TEWL person. It was essential that this first follow-up measurement happened exactly 55 minutes after the TEWL impaired measurement.

85 minutes after the TEWL impaired measurement, the sixth measurements of salivary sample / ECG / EDA and the set of questionnaires took place. Directly after that, the second TEWL follow-up measurement were carried out. Between those measurements, participants were asked if they wanted to read some magazines. After yet another 30 minutes, the seventh measurements and the third TEWL measurements took place. This should happen precisely 115 minutes after the TEWL impaired measurement. Then there was a final interval of 30 minutes in which the participants were again allowed to read magazines and after that, the eighth measurements and the fourth TEWL measurements took place. This again should happen exactly 145 after the TEWL impaired measurement. Then the experiment was over and participants had a detailed debriefing and were allowed to ask questions. For a graphical overview of the study timeline, see figure 1 at page 24.

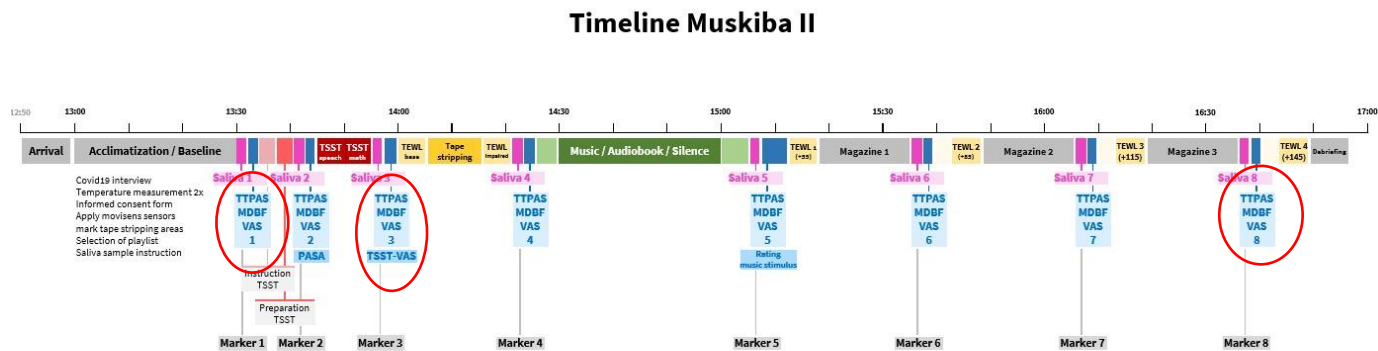


Figure 1

Study timeline

Operationalizations

The Brief-COPE

Coping strategies were conceptualized via the Brief-COPE (Carver, 1997), which was first translated into German by Knoll et al. (2005). It is the short version of the COPE questionnaire (Carver et al., 1989) and is a self-report measurement. Participants have to indicate on a four point likert scale how often they show a specific reaction as a coping mechanism for their problems. The Brief-COPE consists of 28 items and has 14 subscales, which means that each subscale has two items. Each subscale describes a coping strategy. In this questionnaire, stress and coping are conceptualized according to the transactional model of stress by Lazarus and Folkman (1984). All subscales but religion and humor can be classified as approach or avoidance coping. The subscales for approach coping strategies include positive reframing, active coping, planning, acceptance, seeking emotional support and seeking instrumental support. The subscales for avoidance coping strategies include denial, substance use, venting, behavioral disengagement, self-distraction, and self-blame (Carver, 1997; Knoll et al., 2005). Table 1 gives a more detailed look at the subscales. Internal reliability was .50 to .88 and therefore satisfactory. The factor structure of the Brief-COPE was consistent with the longer COPE questionnaire. Low correlations were found between the subscales of the Brief-COPE which suggests that they each measure independent coping strategies (Carver, 1997). This questionnaire can be used in three different ways: 1) retrospective (“I’ve been criticizing myself”), 2) situational with coping as a state variable (“I am criticizing myself”) or 3) dispositional with coping as a trait variable (“I criticize myself”)

(Carver, 1997). In this study, coping is conceptualized as a trait variable because habitual coping is considered.

Table 1

Descriptives of the subscales of the Brief-COPE (Rice et al., 2014, p. 4)

	Description
Acceptance	Accepting the reality that the stressor has happened and learning to live with it
Emotional support	Getting moral support from others
Positive reframing	Viewing a stressor in positive terms that should lead to active, problem-focused coping
Active coping	Taking steps to remove or ameliorate the stressor
Planning	Thinking out a systematic method to cope with a stressor
Instrumental support	Asking for help and advice from others, seeking advice
Denial	Refusal to believe the stressor exists
Self-distraction	Focusing on other things to take one's mind of the stressor
Behavioral disengagement	Giving up trying to manage the stress
Substance use	Using alcohol or drugs
Self-blame	Criticizing one's self, blaming one's self for what happened
Venting	Focusing on and verbalizing negative feelings
Humor	Using humor and making fun of the stressor
Religion	Using ones religion as a source of emotional support and active coping

The stress visual analogue scale (VAS)

Throughout the experiment, a set of questions on analogue scales involving constructs such as relaxation, controllability, anxiety, stress or the urge to leave the situation was filled out eight times. (Dawans et al., 2018). The item about stress is also on a visual analogue scale (VAS) and is called "Ich fühle mich gestresst" which translates to "I feel stressed" This allows a quick quantitative assessment of the current stress level. The analogue line ranges from zero to hundred with zero being the minimum and participants not being stressed at all and hundred being the maximum with participants being extremely stressed. To indicate their

stress level for the time being participants have to mark the analogue scale with a line (Lesage et al., 2012).

Psychometric properties are satisfactory. Because the VAS only contains few items it is very ecological. Pearson correlation between the stress VAS and another stress test called Perceived Stress Scale (PSS; Lee, 2012) is $r = .66$, supporting its construct validity (Lesage et al., 2012).

Like previously described, there are eight different time points throughout the experiment where the VAS is filled out by the participants. Only three time points are relevant for the following analysis: the baseline measure (Marker 1), the measure directly after the TSST (Marker 3) to capture peak stress and the last measure to capture stress recovery (Marker 8). For a graphic timeline of the self-reported stress measure, see figure 1 (page 24)

Heart rate (HR)

HR is the frequency of the cardiac cycle and is defined as the number of beats per minute. It consists of alternating phases of contraction and relaxation and is used as an indicator of the autonomic nervous system. There are many factors that can influence HR, some examples are physical activity, psychological state, drugs, diet or genetics. HR is one of the vital signs, besides body temperature, blood pressure and respiration. Even though there is a great amount of variation within humans, the average heart beat is between 60 and 100 beats per minute (Zhang & Zhang, 2009).

It is well known that heart rate responds to stress. Activation of the sympathetic nervous system leads among other things to an increase in heart rate, which is known as the fight-or-flight reaction. If the heart pumps too fast for a prolonged period of time, it may not be able to pump enough blood through the body. This could result in the organs not getting enough oxygen which in turn can lead to symptoms like a pounding heartbeat or a feeling of flopping in the chest area. A prolonged exposure to a stressor also is a significant predictor of cardiovascular disease and heart attack (Pandey et al., 2020). Heart rate was used as an operationalization in this paper due to its close connection to the physical stress response (Brinkmann, 2021).

In this study, heart rate is measured continuously by a belt worn around the chest (movisens) throughout the entire experiment. At specific time points, participants have to set a marker by tapping the movisens equipment. This continuous measurement is divided into

intervals of five minutes. Within these five intervals, the average heart rate is taken as a value for the analyses.

There are ten time windows (TW) throughout the experiment: TW1 is the baseline value, TW2 is the anticipation of the TSST, TW3 is the speech part of the TSST, TW4 is the arithmetic part of the TSST, TW5 is the value directly after the TSST, TW6 is the value before the listening condition and TW7 is the value directly after the listening condition. TW8, TW9 and TW10 are the values in between the magazine reading. For this thesis, only TW1 for the baseline, TW4 for peak stress and TW10 for stress recovery are relevant. For a graphical overview, see figure 1 (page 24).

Statistical analysis

Firstly, descriptive statistics were used to get a better understanding of the sociodemographic characteristics of the sample. More specially, the included parameters were the mean value (*M*), standard deviation (*SD*) and Cronbach's Alpha to test the reliability of the constructs. To test hypothesis 1-4, regression analyses were conducted. The scores on the different coping strategies (approach coping, avoidance coping, religious coping, humorous coping), which are measured with the different subscales of the Brief-COPE, served as the independent variable and stress increase / stress recovery served as the dependent variable.

There are two different time points in which the analyses are conducted. The first one is stress increase and is conceptualized as the measure during the TSST for heart rate / directly after the TSST for self-reported stress while controlling for the baseline (measure during or after TSST - measure at baseline). Since it can be assumed that participants are most stressed during the stress test, stress measured at this time point should reflect the effect of the different coping strategies on participants' stress level. The second time point is stress recovery. It is conceptualized as a percentage: (measure directly during or after TSST – last measure of the experiment) / (measure directly after TSST – measure at baseline) and indicates to what percentage stress levels have recovered with respect to baseline. A value of 1.00 means that participants are exactly as stressed as during the baseline measure, a value below that means that they have not fully recovered yet and a value above 1 means that participants show lower stress levels than during the baseline measure. These recovery analyses show if the participants had the chance to fully recover from the stress test three hours after.

Furthermore, the analyses happen with two different measures of stress: Self-reported stress, measured by a questionnaire, and physiological stress, measured by heart rate. Both of

these stress measures will be linked to the different coping strategies for stress increase and stress recovery. These two different measures are described in more detail in the operationalization (see page 24).

Since the main hypothesis of the overall research project is that listening to music can reduce the stress increase and lead to a better recovery, it was necessary to control for the different listening conditions (music, audiobook, silence) in all hypotheses considering stress recovery. For stress increase, the listening condition had not happened yet and therefore the listening condition did not have to be controlled for.

Because most regression analysis did not show a significant effect due to the very small sample size, extreme case analysis were carried out as well to detect possible trends in the data that support the hypotheses. To do this, two groups were formed: the participants with the highest score in the different coping strategies and the participants with the lowest score in the different coping strategies. After that, their stress levels were compared and illustrated in a graph. To support the hypotheses, the people with the highest score in approach coping, religious coping and humorous coping should have a lower stress increase and a better stress recovery than the people with the lowest score. The people with the highest score in avoidance coping, on the other hand, should have a higher stress increase and a worse recovery than the people with the lowest score. These extreme case analyses were also carried out at both stress increase and stress recovery, and all analyses were conducted with both self-reported stress and physiological stress.

Results

Descriptive statistics of the sample

The final sample size includes $N = 22$ women. The women were between the age of 18 and 32 with a mean of 25.77 ($SD = 3.73$). This very low sample size can be explained with the COVID-19 pandemic and the four lockdowns that happened during the testing period and each lasted a few weeks. The participants were a homogenic group regarding demographic variables like employment status, nationality and education level, as can be seen in table 2 and table 3. Out of the 22 participants, 21 participants reported attending university. One person reported doing an apprenticeship. So the sample size was highly educated. 15 women were from Austria, 4 women from Germany, one woman from Chile, one woman from the Ukraine and one woman from Switzerland. The two variables relationship status and housing situation were more evenly distributed. Participants averagely lived with 2.32 ($SD = 0.10$) other people

in a household with a minimum of 1 and a maximum of 5 people. For a more detailed description of the sample, see table 2 and table 3.

Table 2

Descriptives of the sample 1 (N=22)

	<i>M</i>	<i>SD</i>	Range
Age	25.77	3.73	18-32
BMI	21.38	0.39	19.15-24.49
Housing situation	2.32	0.10	1-5

Table 3

Descriptives of the sample 2 (N=22)

	Absolute values (<i>n</i>)	Relative values (%)
Sex		
Female	22	100%
Nationality		
Austria	15	68%
Germany	4	18%
Chile	1	4%
Ukraine	1	4%
Switzerland	1	4%
School education		
A-levels	21	96%
Secondary school	1	4%
Employment		
Full time	3	14%
At least part time	5	23%
Less than part time	4	18%
In training	7	32%
Unemployed	3	14%
Relationship situation		

In partnership	11	50%
Single	10	45%
Other	1	4%
Housing situation		
Alone	2	9%
Shared apartment	12	55%
With partner	4	18%
Other	4	18%

Descriptive statistics of the Brief-COPE and the stress measures

Table 4 shows the descriptives of the scales. The mean value for approach coping was remotely higher than the one for avoidance coping, even though they had the same range. Also, the mean value for humor was higher than the mean value for religion while having the same range. Hence, approach coping seems to be more frequently used than avoidance coping and humor seems to be more frequently used than religion. Cronbach's Alpha for approach coping was $r = .88$, for avoidance coping $r = .81$, for religious coping $r = .73$ and for humorous coping $r = .85$. Cronbach's Alpha for religious coping can therefore be considered acceptable ($>.70$) and for all other coping strategies good ($>.80$). Since the VAS / HR Marker 3 (peak stress) is considerably higher than VAS / HR Marker 1 (baseline) and VAS / HR Marker 8 (stress recovery), it can be carefully assumed that the TSST worked and induced a significant amount of stress. Moreover, VAS / HR Marker 8 is even lower than VAS / HR Marker. This shows that the majority of participants seem to have fully recovered before leaving and are even more relaxed than in the beginning.

To confirm the assumption that the stress test induced a significant amount of stress and the means of the different time points therefore differ, paired t-tests were conducted. There was a significant difference in the stress levels of time point 1 (baseline) and time point 3 (peak stress) for both self-reported stress, $t(20) = -7.05$, $p < .001$, and physiological stress, $t(20) = -8.39$, $p < .001$. Because of these significant differences, it can be assumed that the social stress test worked.

Table 4*Descriptives of the scales (N=22)*

	<i>M</i>	<i>SD</i>	Variance	Values possible	Range
Approach Coping	34.86	6.69	44.79	4-48	24
Avoidance Coping	23.05	5.95	35.38	4-48	23
Religion	3.36	1.67	2.82	2-8	6
Humor	4.50	1.63	2.64	2-8	6
VAS Marker 1	9.72	9.60	92.21	0-100	0-35
VAS Marker 3	53.62	25.90	670.65	0-100	5-99
VAS Marker 8	9.54	12.24	149.88	0-100	0-48
VAS peak stress	43.90	28.53	813.99	0-100	1-98
VAS stress at recovery	1.01	0.47	0.22	0-100	0-2.17
HR Marker 1	80.30	9.80	94.27		59.14-92.50
HR Marker 3	106.62	19.16	367.19		69.97-151.40
HR Marker 8	75.73	11.88	141.73		56.49-102.21
HR peak stress	26.31	14.03	196.73		10.83-67.01
HR Stress at recovery	1.33	0.40	0.16		0.39-1.92

Afterwards, intercorrelations between the coping strategies were computed. Table 5 illustrates these intercorrelations. Generally, correlations were very low and not significant. Approach coping and avoidance coping show a medium-sized positive correlation, which does not support the assumption that one is adaptive and the other is maladaptive. Humor and religion show a higher correlation with approach coping than with avoidance coping which further suggests that these two constructs are adaptive coping strategies.

Table 5*Intercorrelations between the coping strategies (N=22)*

	1	2	3	4	5
1. Approach Coping	1				
2. Avoidance Coping	.34	1			
3. Religion	.12	.01	1		
4. Humor	.31	.03	.05	1	

Remark. * = significant ($p < .05$)

In a next step, intercorrelations between stress increase and stress recovery for both stress measures were computed and listed in table 6. The two measures show a medium-sized positive correlation for stress increase and a weak correlation for stress recovery. This very weak correlation of the recovery time points needs to be taken into account when interpreting the results.

Table 6*Intercorrelations between the stress measures (N=22)*

	1	2	3	4
1. VAS stress increase	1			
2. VAS stress recovery	-.02	1		
3. HR stress increase	.39*	-.20	1	
4. HR stress recovery	-.34	.08	-.45*	1
6. HR Marker 8	.06	.48*	.05	.59*

Remark.. * = significant ($p < .05$)**Preconditions**

All of the hypotheses were tested with regression analyses. Before running the analyses, preconditions were checked. For a regression analysis, the data has to meet the criteria of linearity of the regression coefficients, random sample, homoscedasticity, normal distribution, interval scala and no autocorrelation (Field, 2013). A random sample can be assumed because of the study design. The items for coping are measured via likert scales between 1 and 4. The VAS is measured on an analogue scale from 0 to 100. Heart rate has a wide range as well. Because of this, it can be assumed that all variables are interval-scaled. Linearity and homoscedasticity were tested via scatter plots of standardized predicted values (*ZPRED) and residuals (*ZRESID) as well as partial regression plots. Because of the visual assessment of

the partial regression diagrams for each variable, it can be assumed that the precondition of linearity was met. Furthermore, the scatter plots showed no pattern, which is why homoscedasticity can be assumed as well. To test for autocorrelations, the Durbin-Watson statistic was used. The values were near 2 in all analyses, which means that no autocorrelations were found. The normal distribution was tested with the Saphiro-Wilk test. Approach Coping, Avoidance Coping und Humor all met the criteria of being normally distributed since the residual statistics all lie between -2.5 and 2.5. Moreover, the Probability-Probability (P – P) plot of the standardized residuals show that the residuals were normally distributed. Religion, however, was not normally distributed. To approach a normal distribution, a BCa-Bootstrapping with 1000 BCa samples was conducted (Field, 2013). This procedure showed no effect, so that even after the bootstrapping the data still was not approximately normally distributed. Since the preconditions were fulfilled, the regression analysis for approach coping, avoidance coping and humorous coping were carried out with an alpha-level of $p > .05$. For religious coping, a non-parametric procedure was used because of the non-existent normal distribution.

Hypothesis 1: Approach coping and acute stress

Table 7

regression analysis approach coping and self-reported stress at peak stress (N=21)

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	85.94	32.42		2.65	.02*
Approach Coping	-1.21	0.91	-.29	-1.32	.20

Remark. Dependent variable: self-reported stress, * = significant

In order to test hypothesis 1a, a regression analysis was conducted to see if the use of approach coping strategies predicted the increase in self-reported stress directly after the stress test. The results are illustrated in table 7. The effect of approach coping on stress increase was not significant, $B = -1.21$, $SE(B) = 0.91$, $p > .05$, 95 % KI for B [-3.12, 0.71]. Hypothesis 1a cannot be confirmed.

Table 8*regression analysis approach coping and physiological stress at peak stress (N=20)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	23.78	17.85		1.33	.20
Approach Coping	0.72	0.50	0.03	0.15	.89

Remark. Dependent variable: physiological stress, * = significant

The relationship between approach coping and physiological stress increase was investigated in hypothesis 1b. Table 8 illustrates the results. No significant effect of approach coping on stress could be found in the data, $B = 0.72$, $SE(B) = 0.50$, $p > .05$, 95 % KI for B [-0.97, 1.12]. Hypothesis 1b cannot be confirmed.

Table 9*regression analysis approach coping and self-reported stress at stress recovery (N=21)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	0.32	0.53		0.60	.57
Approach Coping	0.20	0.15	.29	1.32	.20

Remark. Dependent variable: self-reported stress, * = significant, control variable: listening condition

Another regression analysis was conducted to test hypothesis 1c and see if the use of approach coping strategies predicted the self-reported stress recovery with respect to baseline. The results are summed up in table 9. The analysis showed that approach coping did not significantly predict the recovery of participants, $B = 0.20$, $SE(B) = 0.15$, $p > .05$, 95 % KI for B [-0.12, 0.51]. Hypothesis 1c must be rejected.

Table 10*regression analysis approach coping and physiological stress at stress recovery (N=20)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	1.87	0.49		3.82	<.01*
Approach Coping	-0.02	0.14	-.26	-1.11	.28

Remark. Dependent variable: physiological stress, * = significant, control variable: listening condition

Hypothesis 1d aims to explore the relationship between approach coping strategies the physiological stress recovery with respect to baseline. The most important statistic parameters are presented in table 10. No effect for approach coping on stress recovery could be found, $B = -0.02$, $SE(B) = 0.14$, $p > .05$, 95 % KI for B [-0.04, 0.14]. Hypothesis 1d must be rejected.

Hypothesis 2: Avoidance coping and acute stress

Table 11

regression analysis avoidance coping and self-reported stress at peak stress (N=21)

	B	$SE\ B$	β	t	p
Constant	63.87	25.63		2.49	.22
Avoidance Coping	-0.88	1.09	-.18	-0.80	.43

Remark. Dependent variable: self-reported stress, * = significant

Hypothesis 2a (There is a positive relationship between avoidance coping and self-reported stress after an acute stressor) was tested with a regression analysis. Table 11 shows the results. Avoidance coping strategies did not have a significant effect on the stress increase, $B = -0.88$, $SE(B) = 1.09$, $p > .05$, 95 % KI for B [-3.17, 1.41]. Hypothesis 2a must therefore be rejected.

Table 12

regression analysis avoidance coping and physiological stress at peak stress (N=20)

	B	$SE\ B$	β	t	p
Constant	40.90	13.25		3.09	<.01*
Avoidance Coping	-0.62	0.55	-.26	-1.11	.27

Remark. Dependent variable: physiological stress, * = significant

To see whether avoidance coping strategies had an effect on the stress increase of physiological stress, hypothesis 2b was analyzed with a regression analysis. Results are presented in table 12. No significant effect could be found, $B = -0.62$, $SE(B) = 0.55$, $p > .05$, 95 % KI for B [-1.76, 0.53]. Hypothesis 2b must be rejected.

Table 13*regression analysis avoidance coping and self-reported stress at stress recovery (N=21)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	0.18	0.38		0.47	.65
Avoidance Coping	0.04	0.01	.46	2.25	.03*

Remark. Dependent variable: self-reported stress, * = significant, control variable: listening condition

In order to test hypothesis 2c, a regression analysis was conducted to see if the use of avoidance coping strategies predicted the self-reported stress recovery after an acute stress test with respect to baseline. The results are illustrated in table 13. The use of avoidance coping strategies had a significant effect on the recovery of the participants, $B = 0.04$, $SE(B) = 0.01$, $p < .05$, 95 % KI for B [0.01, 0.07]. The effect moreover shows the expected positive direction. Hypothesis 2c can therefore be confirmed.

Table 14*regression analysis avoidance coping and physiological stress at stress recovery (N=20)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	1.40	0.56		2.48	.02*
Avoidance Coping	0.00	0.18	-.08	-0.30	.77

Remark. Dependent variable: physiological stress, * = significant, control variable: listening condition

Moreover, the effect of avoidance coping on the physiological stress recovery with respect to baseline was of interest in hypothesis 2d. To get a more detailed look of the statistic parameters, see table 14. No significant effect could be found, $B = 0.00$, $SE(B) = 0.18$, $p < .05$, 95 % KI für B [-0.4, 0.03].

Hypothesis 3: Religion and acute stress

Since religious coping is not normally distributed, even after the bootstrapping procedure, no regression analyses were computed. Instead, the hypotheses were tested with a non-parametric test. In this study, the Spearman-Rho correlation was used, which is the non-parametric equivalent to the Pearson correlation (Field, 2013). Because the hypotheses have a direction, the one-tailed version was used.

Hypothesis 3a (There is a negative relationship between religious coping and self-reported stress after an acute stressor) was not supported by the data ($r = .26$, $p > .05$, 95% Bootstrap KI for r [-.17, .67]). This means that hypothesis 3a cannot be confirmed.

In Hypothesis 3b, the relationship between religious coping and the stress increase of physiological stress was investigated. The assumption that religious people had a lower stress increase could not be found in the data ($r = .02$, $p > .05$, 95% Bootstrap KI for r [-.45, .48]). Hypothesis 3b cannot be confirmed.

Hypothesis 3c explores the relationship between religious coping and self-reported stress recovery. No relationship could be found between those two constructs ($r = -.03$, $p > .05$, 95% Bootstrap KI for r [-.35, .27]). Hypothesis 3c must therefore be rejected.

The relationship between religious coping and physiological stress recovery was of interest in hypothesis 3d. The hypothesis was not supported by the data ($r = -.17$, $p > .05$, 95% Bootstrap KI for r [-.79, .44]). Hypothesis 4d cannot be confirmed.

Hypothesis 4: Humorous coping and acute stress

Table 15

regression analysis humorous coping and self-reported stress at peak stress (N=21)

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	75.19	17.17		4.39	.00*
Humor	-6.99	3.60	-.40	-1.94	.06

Remark. Dependent variable: self-reported stress, * = significant

To see whether humorous coping had an effect on the self-reported stress increase after an acute stressor, hypothesis 4a was analyzed with a regression analysis. Results are shown in table 15. No significant effect could be found, $B = -6.99$, $SE(B) = 3.60$, $p > .05$, 95 % KI for B [-14.52, 0.54]. Since the reported p -level almost reached significance, a trend that humorous coping has an effect on the self-reported stress increase can cautiously be assumed. Future studies with a larger sample sizes are needed to further investigate this relationship.

Table 16*regression analysis humorous coping and physiological stress at peak stress (N=20)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	29.57	10.11		2.92	.01*
Humor	-0.70	2.06	-.08	-0.34	.74

Remark. Dependent variable: physiological stress, * = significant

The relationship between humorous coping and physiological stress increase after an acute stressor was investigated in hypothesis 4b. Table 16 illustrates the results. No significant effect of humorous coping on stress increase could be found in the data, $B = -0.70$, $SE(B) = 2.06$, $p > .05$, 95 % KI for B [-5.03, 3.63]. Hypothesis 4b therefore cannot be confirmed.

Table 17*regression analysis humorous coping and self-reported stress at stress recovery (N=21)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	0.96	0.39		2.45	.02*
Humor	0.03	0.06	.09	0.70	.70

Remark. Dependent variable: self-reported stress, * = significant, control variable: listening condition

Another regression analysis was conducted to test hypothesis 4c and see if the use of humorous coping strategies predicted the self-reported stress recovery with respect to baseline. The results are summed up in table 17. The analysis showed that humorous coping did not significantly predict the self-reported stress recovery, $B = 0.03$, $SE(B) = 0.06$, $p > .05$, 95 % KI for B [-0.11, 0.16]. Hypothesis 4c must be rejected.

Table 18*regression analysis humorous coping and physiological stress at stress recovery (N=20)*

	<i>B</i>	<i>SE B</i>	β	<i>t</i>	<i>p</i>
Constant	1.08	0.38		2.87	.01*
Avoidance Coping	0.03	0.06	.14	0.56	.58

Remark. Dependent variable: physiological stress, * = significant, control variable: listening condition

Finally, the effect of humorous coping on the level of physiological stress recovery after an acute stress test with respect to baseline was of interest in hypothesis 4d. To get a more detailed look of the statistic parameters, see table 18. No significant effect could be found, $B = 0.03$, $SE(B) = 0.06$, $p < .05$, 95 % KI for B [-0.09, 0.16]. Hypothesis 4d must therefore be rejected.

Extreme Case Analyses

Since the sample size was very low, extreme case analyses were carried out to further investigate the hypotheses despite the non-significance of most regression analyses. It is important to remember though that this method is solely descriptive. This means that it only indicates trends and is not suitable for definite statements.

Moreover, the listening condition had to be taken into account when considering stress recovery. In all extreme case analyses considering stress recovery, participants of the music condition and of the control conditions were in each extreme group which accounts for a fairly balanced distribution. Approximately half of the participants in each extreme group were assigned to the music condition and approximately half were assigned to one of the control conditions.

It is also important to remember that the computed value for peak stress is an absolute value (peak stress – stress at baseline) and indicates the stress increase. Stress at recovery, however, is conceptualized as a proportion ((peak stress – stress at recovery) / (peak stress – baseline)). In order to get a percentage, all proportions were multiplied by 100 for the comparison. This means that a value of 1 means that the participant has recovered 100%. A value below one means that the participant has not fully recovered yet and a value above 1 means that the participant has recovered more than 100%.

To form extreme groups, the participants who scored lowest were compared to the participants who scored highest in the different coping strategies. The four or five participants with the most extreme values were put into one extreme group in order to account for balanced group sizes. Since no recommendation could be found from previous literature on how to form extreme groups based on these coping strategies, this loose criterium had to be applied. Of course, it would have been preferred to have applied a stricter criterium based on scientific evidence.

Hypothesis 1: Approach coping and acute stress

For the descriptive analyses regarding approach coping, extreme groups had to be formed. Five people reported a very high score of approach coping higher than 40 (41, 41, 43, 45, 47) and represented one extreme group. Six people reported a very low score of approach coping lower than 30 (23, 25, 25, 26, 27, 29).

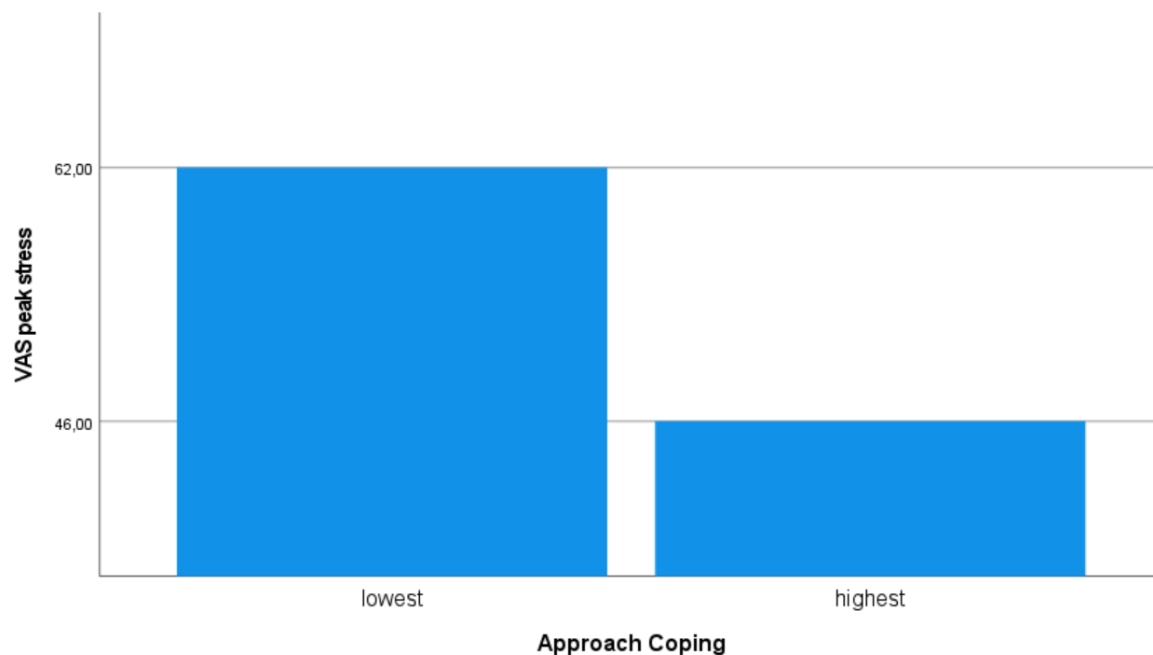


Figure 2

Extreme group analysis approach coping and increase in self-reported stress

The high approach copers showed a self-reported stress increase (VAS) which ranged from 1 to 98 and the low approach copers showed a self-reported stress increase which ranged from 30 to 98. The people who scored highest on approach coping reported an average self-reported stress increase of 46 ($SD=38.56$) points while people who scored lowest on approach coping reported an average self-reported stress increase of 62 ($SD=25.28$) points, meaning that the people who use less approach coping show a higher stress increase. This comparison is illustrated graphically in figure 1. The extreme case analyses supports hypothesis 1a.

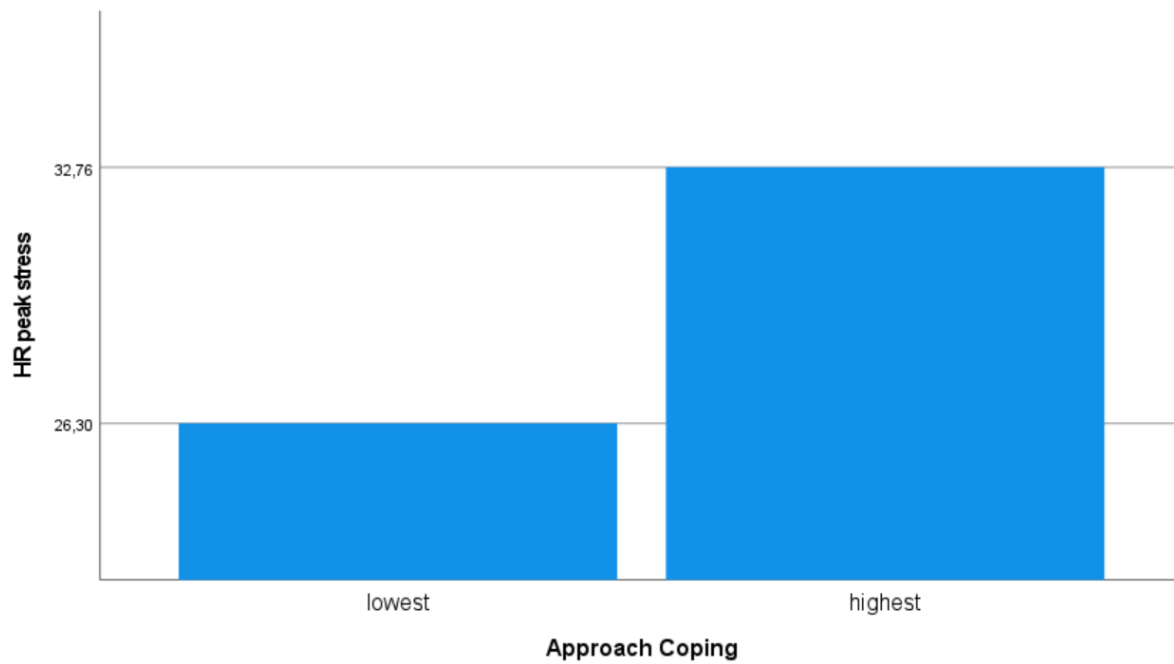


Figure 3

Extreme group analysis approach coping and increase in physiological stress

In order to get a better understanding of the relationship between approach coping and physiological stress during the stress increase, another extreme case analysis was executed. Heart rate increases ranged from 12.81 to 67.01 for the high approach copers and from 17.60 to 53.06 for the low approach copers. The people who scored highest on approach coping showed an average stress increase of 32.76 ($SD=20.58$) while the people who scored lowest in approach coping showed an average increase of 26.30 ($SD=17.89$), which is not in accordance with hypothesis 1b. Figure 2 also shows this relationship.

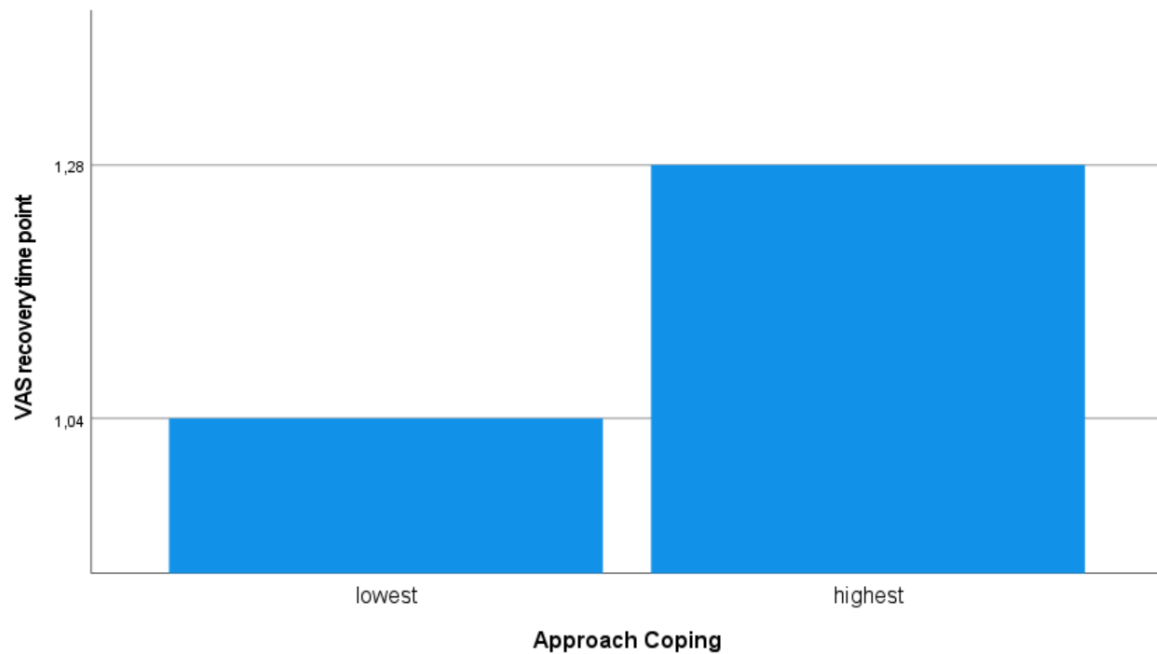


Figure 4

Extreme group analysis approach coping and self-reported stress recovery

Hypothesis 1c (There is a negative relationship between approach coping and self-reported stress recovery after an acute stressor) was also examined in an extreme case analysis. The percentage of recovery for self-reported stress varied from 98% to 217% for the high approach copers and from 83% to 123% for the low approach copers. Averagely, participants who scored highest in approach coping recovered 128% ($SD=0.77$) while participants who scored lowest in approach coping recovered 104% ($SD=0.16$), which can also be seen in figure 3. This means that both groups recovered beyond the baseline value, but the high approach copers seemed to have recovered more, which supports hypothesis 1c.

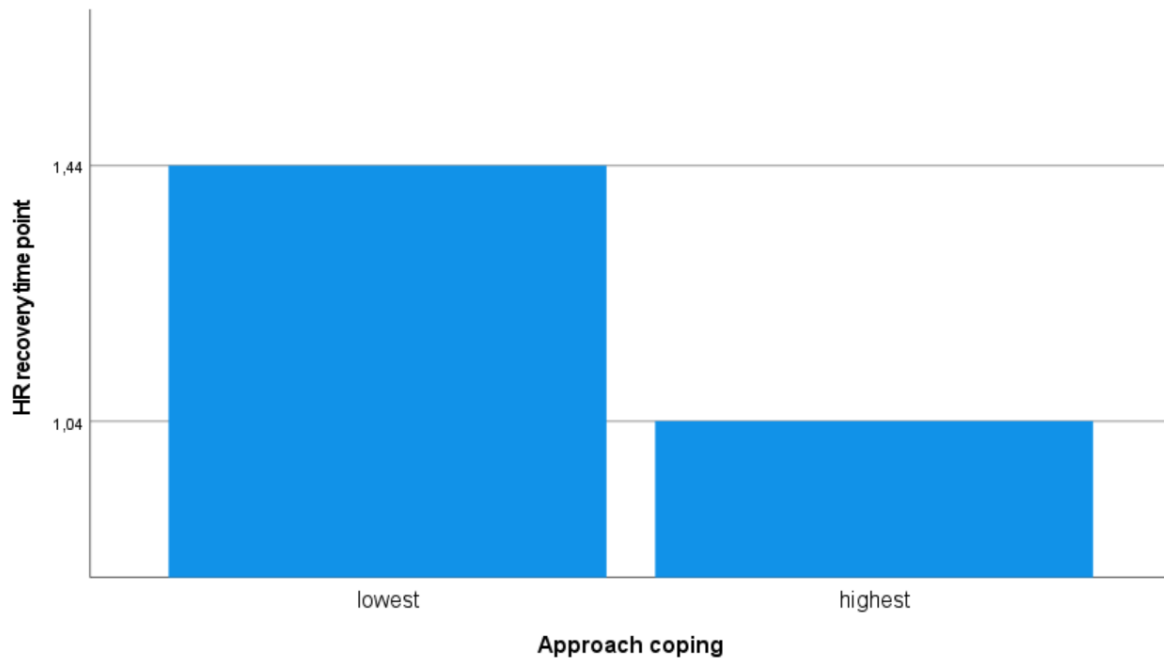


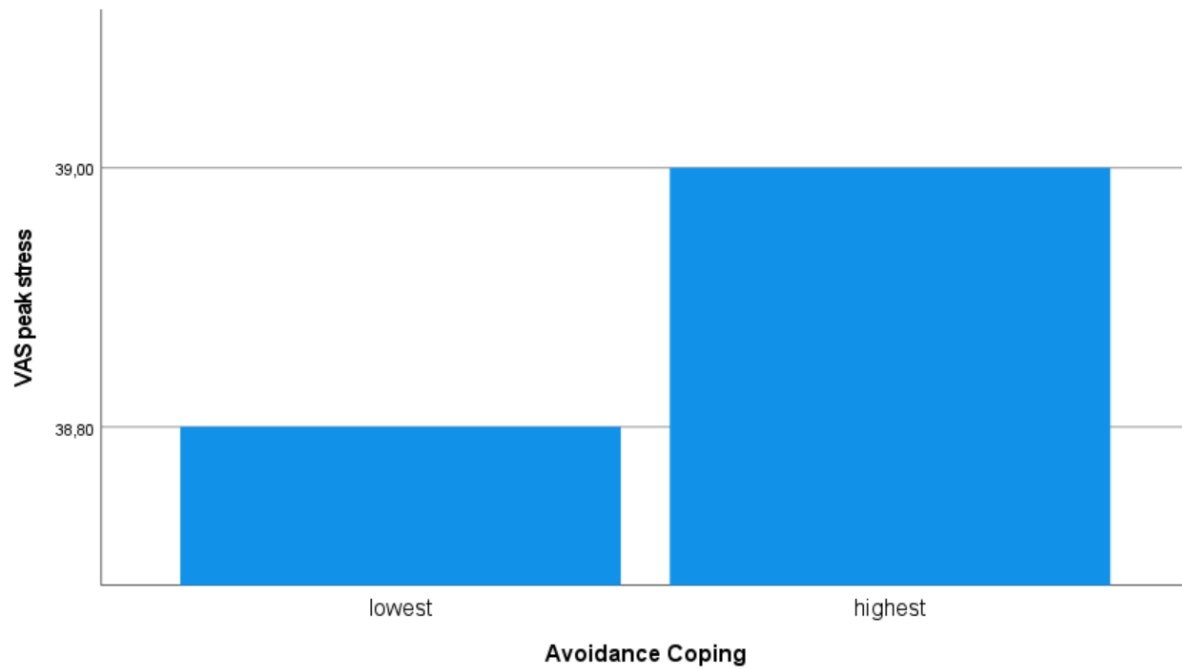
Figure 5

Extreme group analysis approach coping and physiological stress recovery

Another extreme case analysis was carried out to find out more about the relationship between approach coping and physiological stress recovery. The recovery percentages ranged from 39% to 182% for the high approach copers and from 104% to 173% for the low approach copers. The participants who scored highest in approach coping averagely recovered 104% ($SD=0.51$) while the participants who scored lowest in approach coping averagely recovered 144% ($SD=0.28$). This means that the low approach copers show a better heart rate recovery, which is not in accordance with hypothesis 1d. This comparison is illustrated graphically in figure 4.

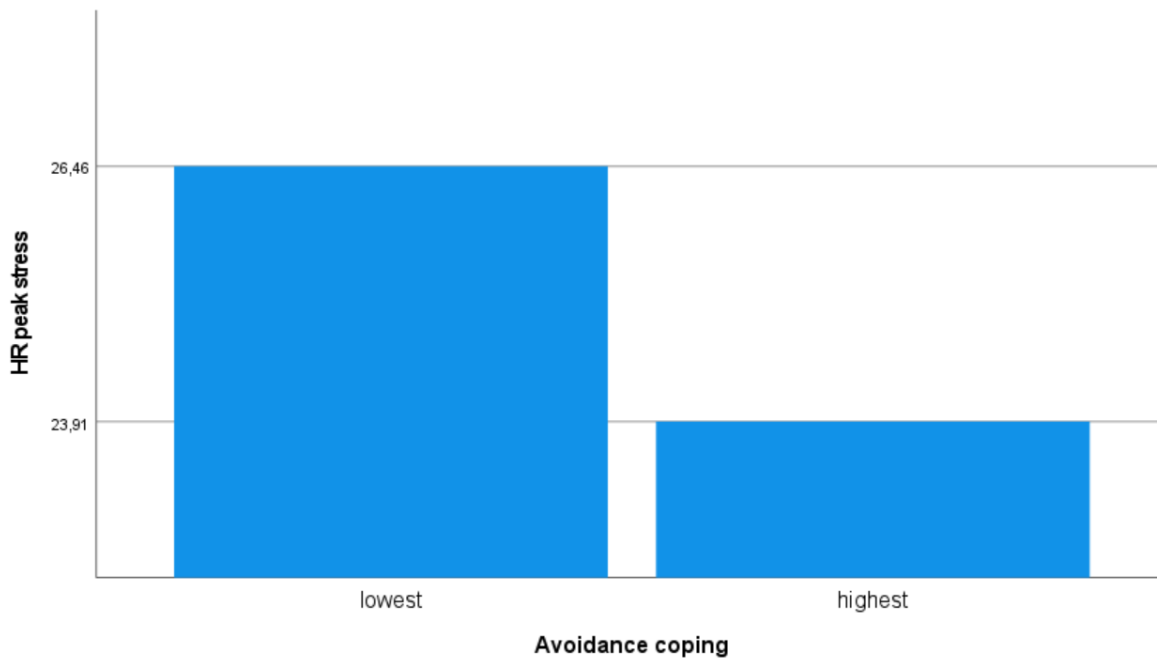
Hypothesis 2: Avoidance coping and acute stress

In a next step, the descriptive relationship between avoidance coping and acute stress was examined via extreme case analyses. One extreme group consisting of five people reported very high values of avoidance coping higher than 28 (28, 29, 30, 35, 37). The other extreme group consisted of six people who scored very low on avoidance coping with values below 18 (14, 14, 16, 18, 18, 18).

**Figure 6**

Extreme group analysis avoidance coping and increase in self-reported stress

To test hypothesis 2a (There is a positive relationship between avoidance coping and acute self-reported stress increase), an extreme case analysis was carried out. The values of the stress increase for the high avoidance copers ranged from 14 to 80 and those from the low avoidance copers ranged from 16 to 98. Averagely, the people who scored highest on avoidance coping showed a stress increase of 39 ($SD=39.48$) points while the people who scored lowest showed a stress increase of 38.8 ($SD=31.15$) points. Technically, this is in accordance with the hypothesis that high avoidance copers have a higher stress increase, but since the difference is only 0.2 points, it is not reasonable to say that the extreme case analysis supports hypothesis 2a. Figure 5 also shows this relationship.

**Figure 7**

Extreme group analysis avoidance coping and increase in physiological stress

Next, the relationship between avoidance coping and acute physiological stress during stress increase was further investigated via an extreme case analysis. High avoidance copers reported a stress increase ranging from 10.83 to 53.00 and low avoidance copers reported a stress increase ranging from 19.70 to 34.51. The people who scored highest on avoidance coping reported an average stress increase of 23.91 ($SD=17.00$) points while the people who scored lowest on avoidance coping showed an average stress increase of 26.40 ($SD=6.65$) points, which can also be seen in figure 6. This means that the low avoidance copers averagely had a higher stress increase, which is not in accordance with hypothesis 2b.

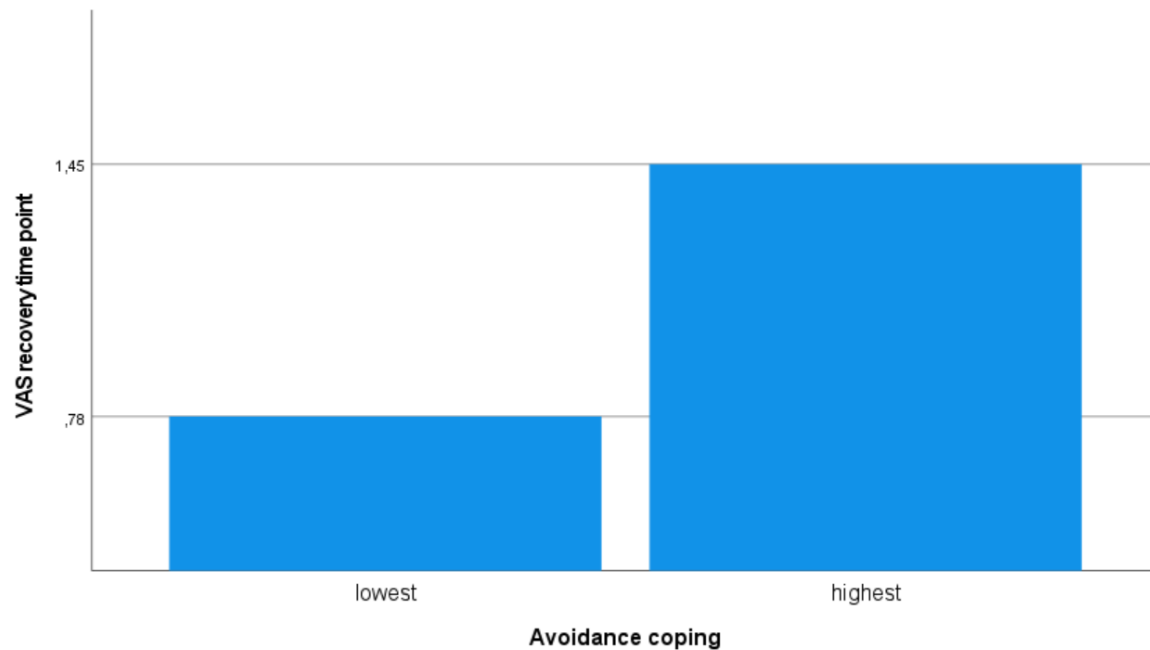


Figure 8

Extreme group analysis avoidance coping and self-reported stress recovery

For this master's thesis the relationship between avoidance coping strategies and self-reported stress recovery is also of interest. The high avoidance copers reported values ranging from 100% to 217% and the low avoidance copers reported values ranging from 4% to 123%. Averagely, people who scored lowest in avoidance coping recovered 78% ($SD=0.32$) while participants who scored highest recovered 145% ($SD=0.56$). This means that the high avoidance copers recovered beyond their baseline values while the low avoidance copers are still more stressed than at baseline. This comparison is illustrated graphically in figure 7. In those two groups are two extreme values though: One low avoidance copers has only recovered 4% while one high avoidance copers has recovered 217%. This complicates interpretation. However, hypothesis 2c is not supported by this extreme case analysis.

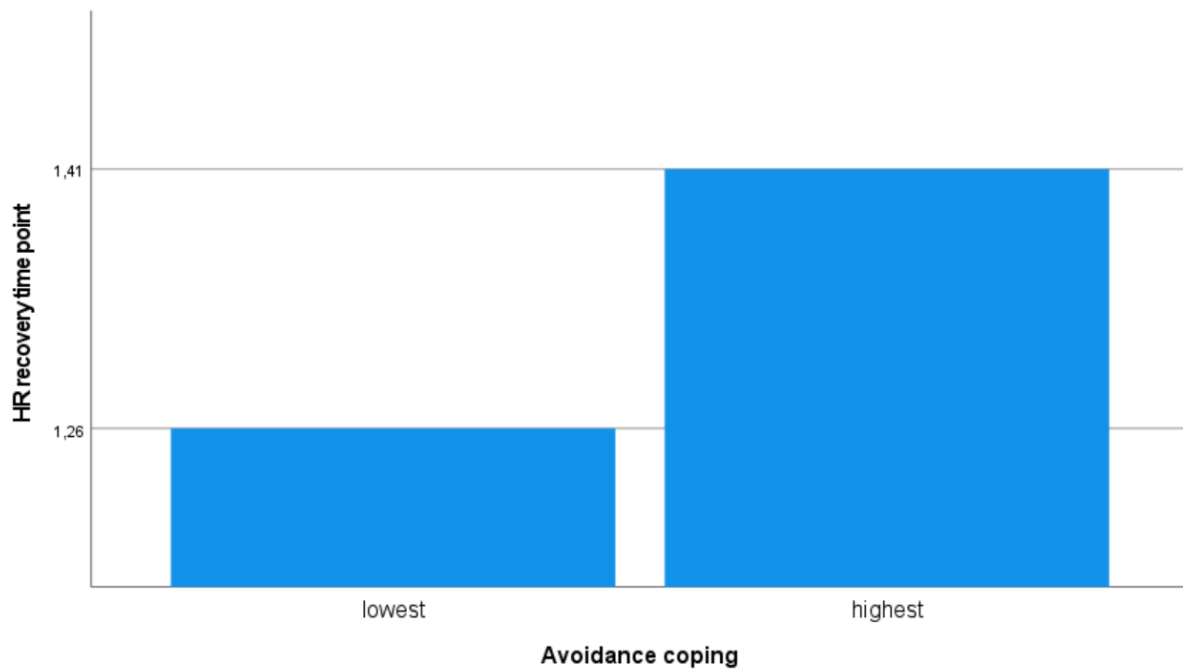


Figure 9

Extreme group analysis avoidance coping and physiological stress recovery

Another extreme case analysis was carried out to further examine the relationship between avoidance coping and acute physiological stress recovery. Participants who scored highest reported a stress recovery ranging from 90% to 182% while participants who scored lowest in avoidance coping reported a stress recovery ranging from 108% to 159%. High avoidance copers showed an average recovery of 141% ($SD=0.35$) while low avoidance copers showed an average recovery of 126% ($SD=0.26$), which can also be seen in figure 8. So both extreme groups have fully recovered, but the low avoidance copers showed a worse recovery, which is not in accordance with hypothesis 2d.

Hypothesis 3: Religious coping and acute stress

To get a deeper understanding of the relationship between religious coping and acute stress, four extreme case analyses were carried out. Nine participants reported the lowest possible value (2) for religious coping and represent one extreme group. Five participants reported higher values of religious coping (5, 5, 6, 6, 8) and represent the highly religious group. It is important to note for the interpretation though, that even in the highly religious group values for religious coping are mostly average and not extremely high since there is only one participant who reported the highest possible score.

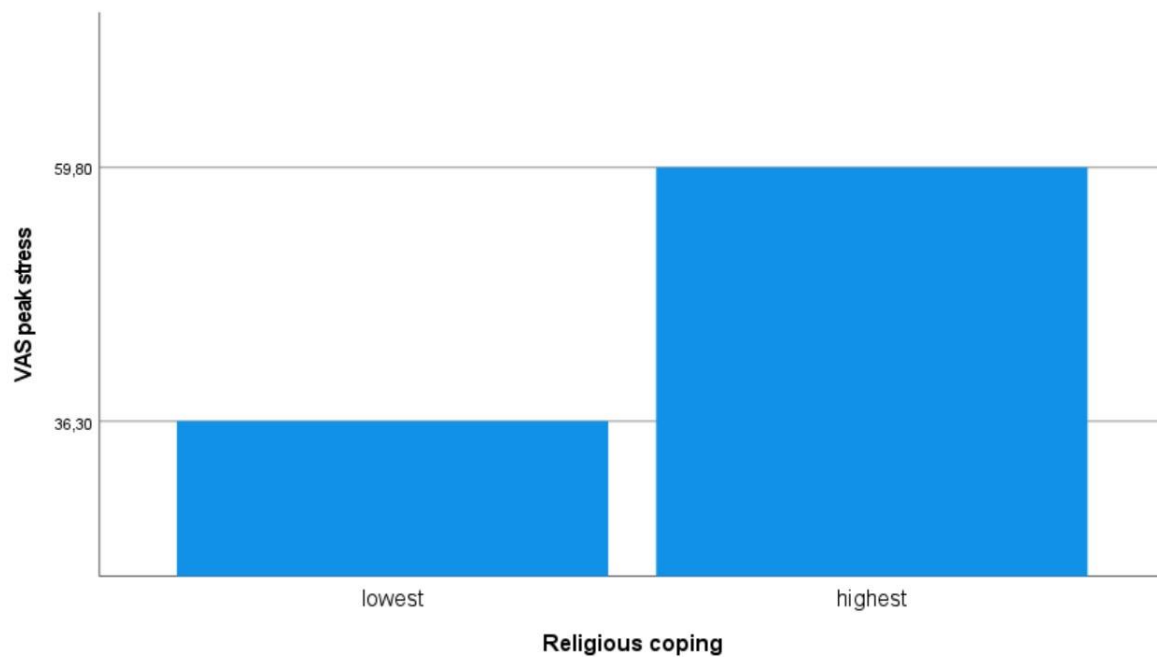


Figure 10

Extreme group analysis religious coping and increase in self-reported stress

To further analyze hypothesis 3a (There is a negative relationship between religious coping and self-reported stress increase), an extreme case analysis was carried out. Results are presented in figure 9. Religious participants reported stress increases ranging from 21 to 95 and non-religious participants reported stress increases ranging from 11 to 98 and. Averagely, the religious extreme group reported an average stress increase of 59.80 ($SD=27.55$) points while the non-religious extreme group reported a stress increase of 36.30 ($SD=26.40$) points, which does not support hypothesis 3a.

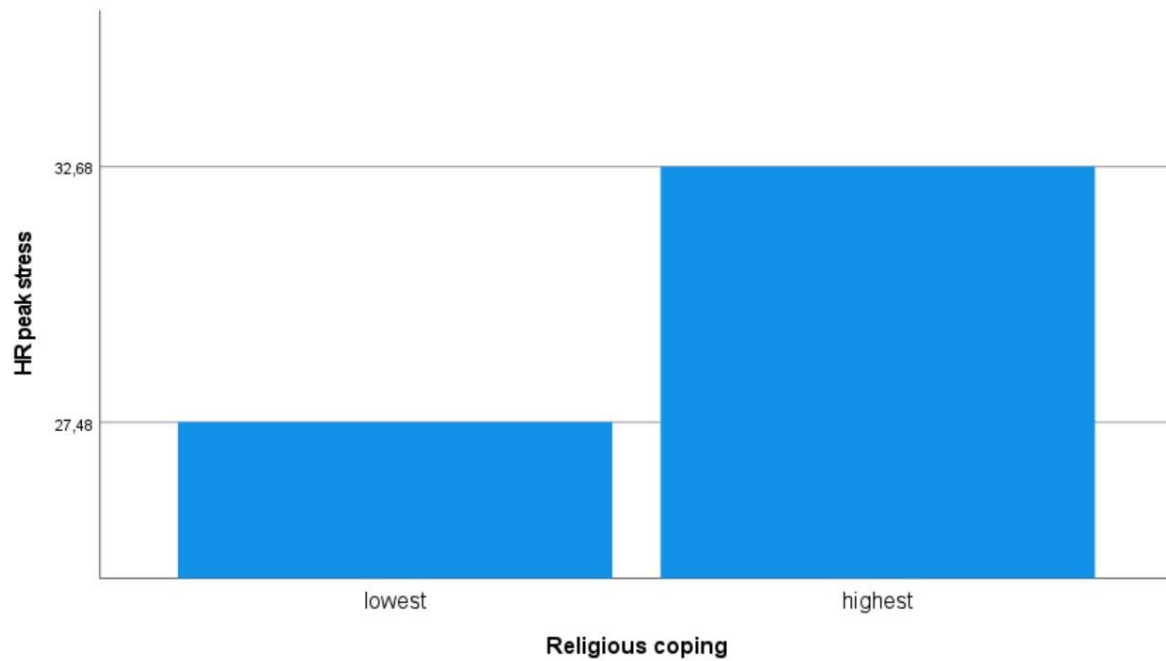


Figure 11

Extreme group analysis religious coping and increase in physiological stress

To get a better understanding of the relationship between religious coping and physiological acute stress increase, another extreme case analysis was carried out. This analysis is depicted in figure 10. Religious participants reported stress increases ranging from 13.50 to 67.01 and non-religious participants reported stress increases ranging from 12.72 to 53.06. Furthermore, the religious extreme group had a mean of 32.68 ($SD=10.40$) while the non-religious extreme group had a mean of 27.48 ($SD=11.35$). This means that the religious extreme group averagely had a higher increase in heart rate, which is not in accordance with hypothesis 3b.

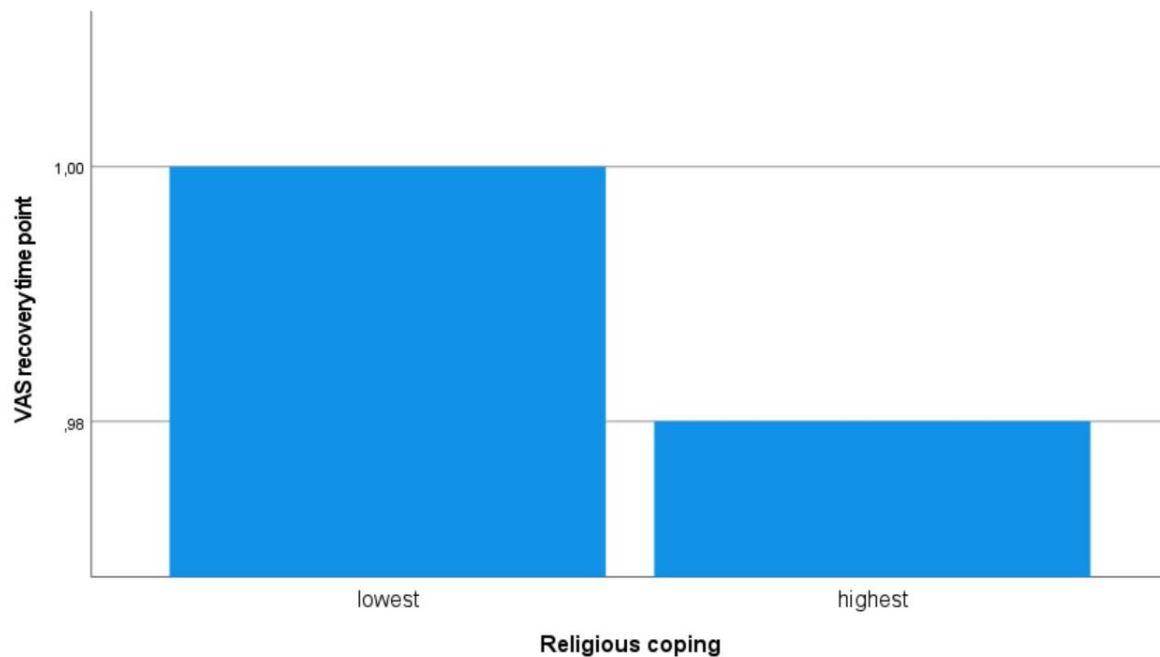


Figure 12

Extreme group analysis religious coping and self-reported stress recovery

The relationship between religious coping and self-reported stress recovery is of interest in hypothesis 3c. This comparison is illustrated in figure 11. The religious group reported a recovery ranging from 71% to 121% and the non-religious group reported a recovery ranging from 4% to 163%. On average, the religious group recovered 100% ($SD=0.19$) while the non-religious participants recovered 98% ($SD=0.85$). This means that only the religious group fully recovered, which is in accordance with hypothesis 3c. The difference in recovery is only 2% though, which makes interpretation hard. Moreover, the non-religious group had one extreme value, meaning that one participant only recovered 4% which could also distort the findings.

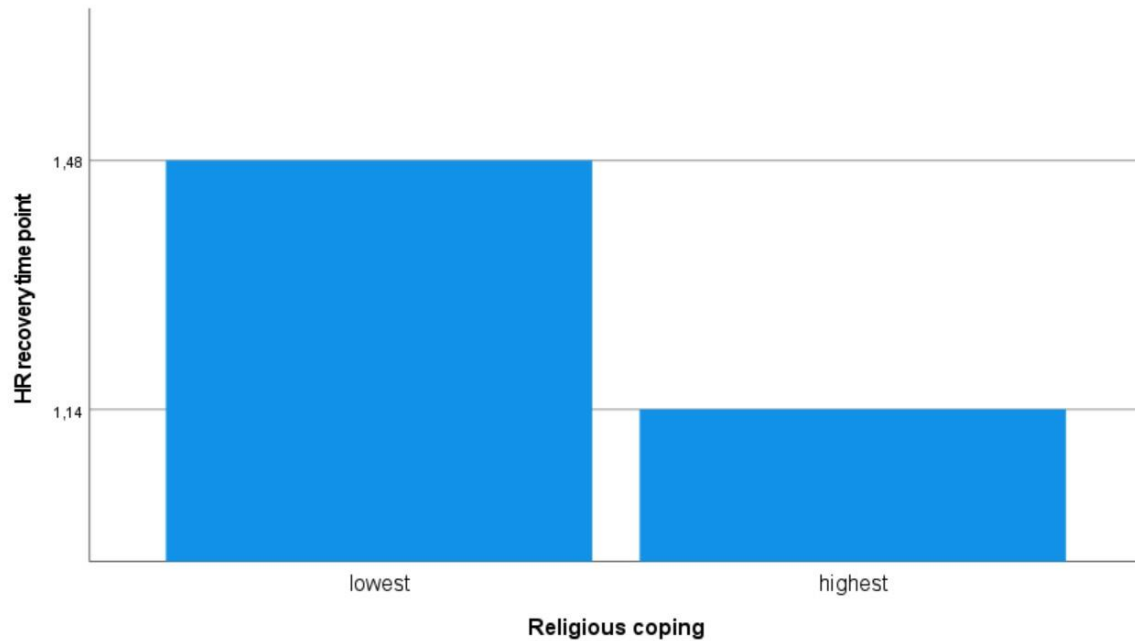


Figure 13

Extreme group analysis religious coping and physiological stress recovery

Another extreme case analysis was carried out to learn more about the relationship between religious coping and physiological stress recovery after an acute stressor. Results are illustrated in figure 12. Religious participants reported one between 39% and 192%, non-religious participants reported a physiological recovery between 104% and 182%. It is important to note that in the non-religious group every participant recovered beyond 100% while in the religious group there was one participant who recovered only 39%, which could distort the comparison. Religious people reported an average physiological recovery of 114% ($SD = 0.42$) while non-religious participants reported an average physiological recovery of 148% ($SD = 0.46$). This means that even though both groups fully recovered, non-religious participants recovered more, which is not in accordance with hypothesis 3d.

Hypothesis 4: Humorous coping and acute stress

Humorous coping was the focus of hypothesis 4 (There is a negative regressive relationship between humorous coping and acute stress). Again, four extreme case analyses were carried out to further investigate those relationships. Four people reported the lowest possible value (2) of humorous coping and were grouped into one extreme group. Five people reported high values of humorous coping (6, 6, 6, 7, 8) and were put together in the highly humorous group.

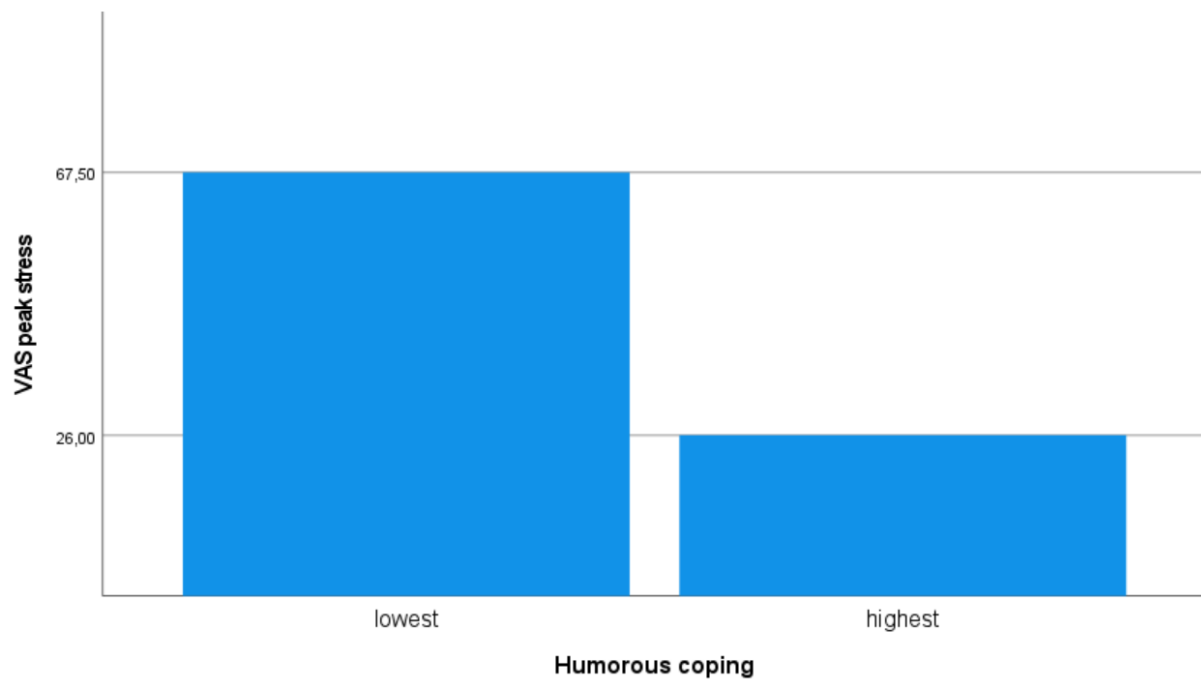
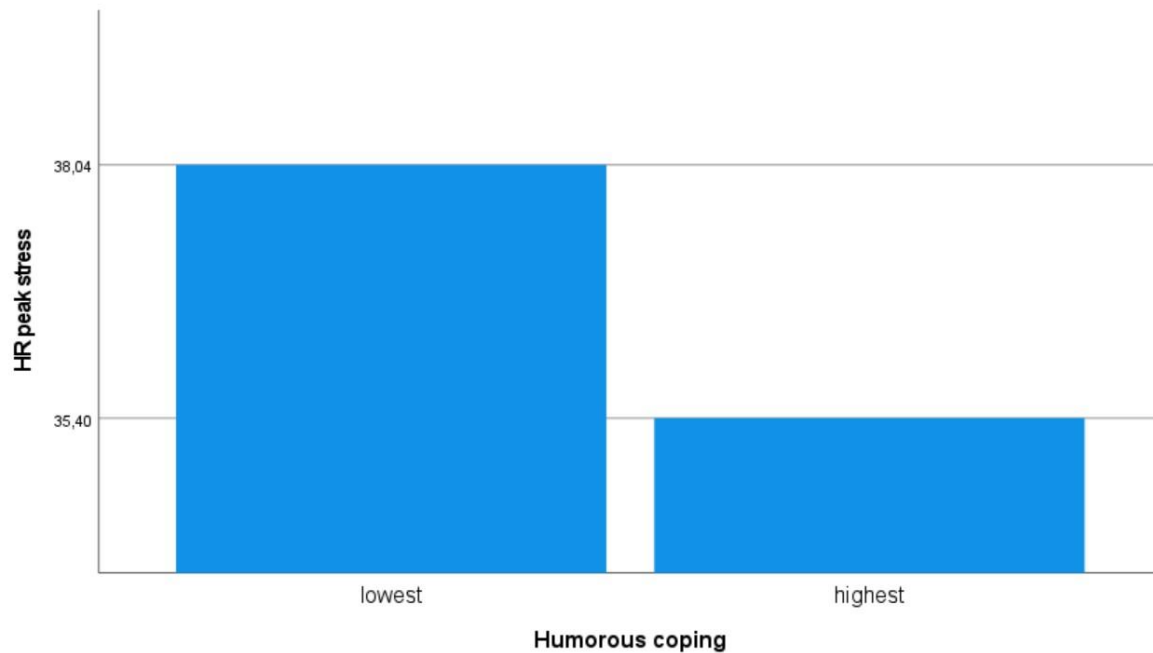


Figure 14

Extreme group analysis humorous coping and self-reported stress increase

To examine the relationship between humorous coping and self-reported stress increase, another extreme case analysis was carried out. The participants who scored highest showed stress increases ranging from 1 to 73 while participants who scored lowest in humorous coping showed stress increases ranging from 43 to 98. On average, highly humorous participants reported a stress increase of 26.00 ($SD=27.78$) and non-humorous participants reported a stress increase of 67.50 ($SD=26.01$) points. Since the highly humorous group reported a distinctly lower stress increase, hypothesis 4a is supported. Figure 13 illustrates this comparison graphically.

**Figure 15**

Extreme group analysis humorous coping and physiological stress increase

To get a deeper understanding of the relationship between humorous coping and physiological stress increase, another extreme case analysis was carried out. The stress increases of the humorous group ranged from 21.11 to 67.01 and those of the non-humorous group ranged from 22.42 to 53.06. Participants who scored highest reported an average stress increase of 38.04 ($SD=18.26$) and participants who scored lowest reported an average stress increase of 35.40 ($SD=15.33$), which not is in accordance with hypothesis 4b. This analysis is also illustrated in figure 14.

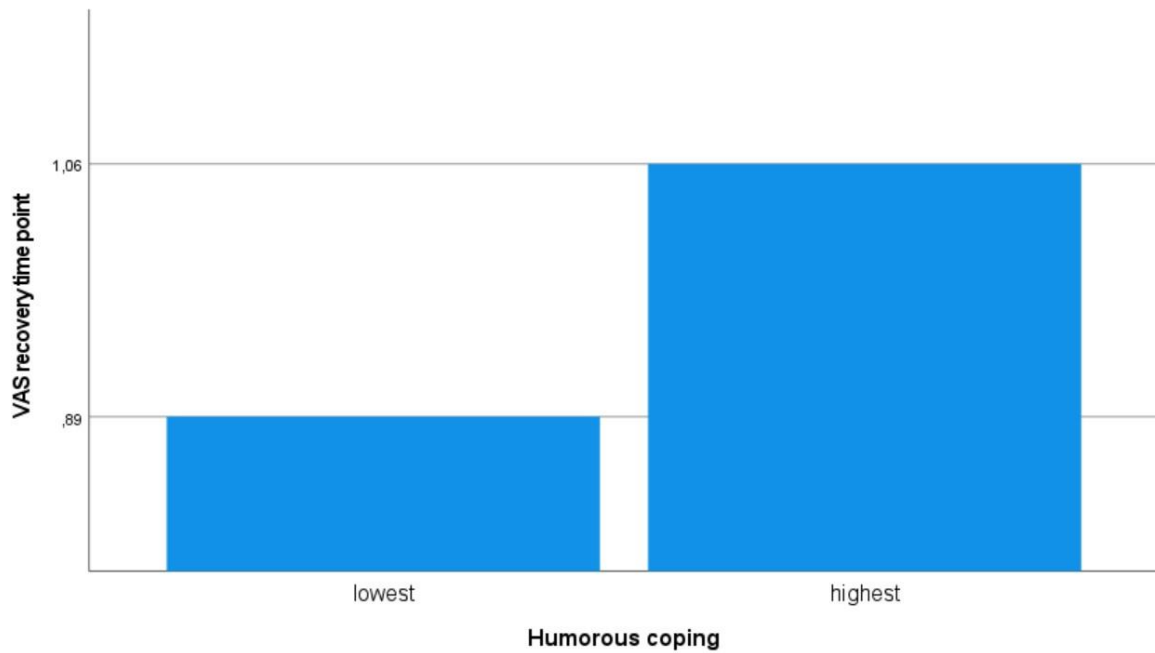


Figure 16

Extreme group analysis humorous coping and self-reported stress recovery

To further analyze hypothesis 4c (There is a negative relationship between humorous coping and acute self-reported stress recovery after an acute stressor), an extreme case analysis was carried out. Results are presented in figure 15. The recovery percentage of the humorous group from 0% to 163% and those of the non-humorous group ranged from 71% to 105%. It is important to note that the humorous group contained one extreme value since there is one participant who recovered 0% and is still as stressed as during baseline. This makes interpretation harder. Still, there is a clear trend visible because in the humorous group only one person does not recover beyond baseline while in the non-humorous group only one person recovered beyond baseline. Averagely, the non-humorous group recovered 89% ($SD=0.16$) while the humorous group recovered 106% ($SD=0.62$), which is in accordance with hypothesis 4c.

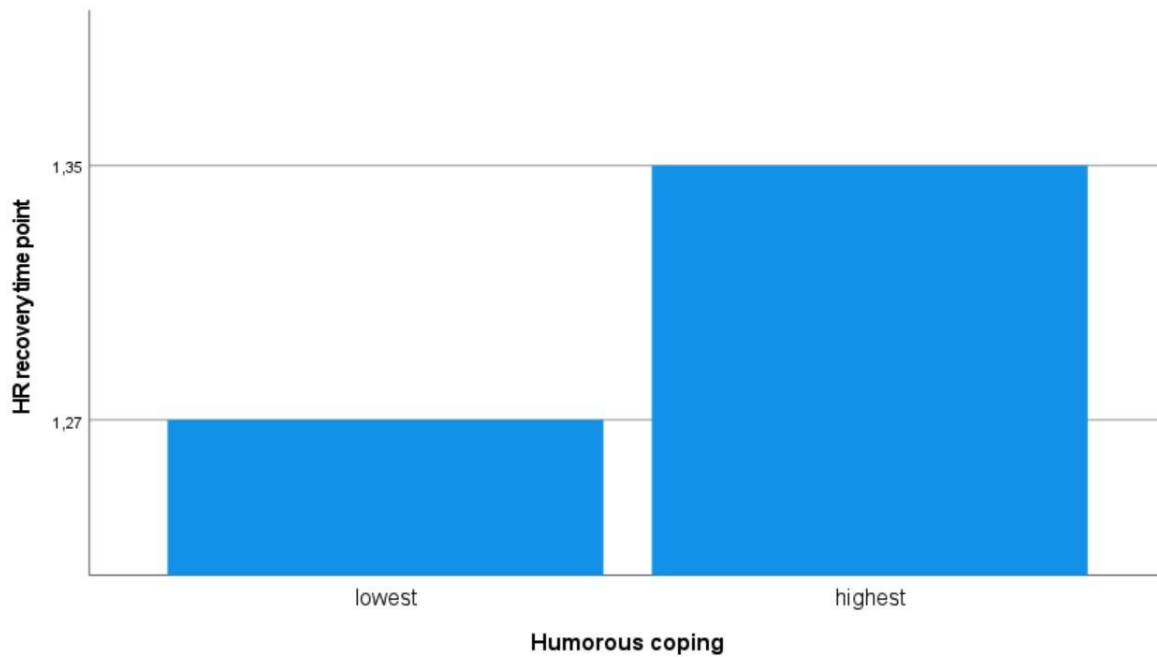


Figure 17

Extreme group analysis humorous coping and physiological stress recovery

One last extreme case analysis was carried out in order to detect possible trends in the relationship between humorous coping and physiological stress recovery. The result can be seen in figure 16. The percentage of recovery ranged from 98% to 182% in the humorous group and from 95% to 182% in the non-humorous group. Averagely, the humorous group recovered 135% ($SD=0.35$) and the non-humorous group recovered 127% ($SD=0.48$). Even though both groups fully recovered, the humorous group showed a higher recovery, which is in accordance with hypothesis 4d.

Discussion

Every person experiences stress at some point in their lives since stressors are omnipresent in all shapes and forms (Brinkmann, 2021). Because of this, it is important to have coping strategies at hand in order to get through these stressful times. While the relationship between coping and chronic stress is well researched, the effect of habitual coping on acute stress has been widely neglected so far. In this master's thesis, the relationship between different habitual coping strategies (approach coping, avoidance coping, religious coping, humorous coping) and acute stress, which was induced by a social stress test (TSST; Kirschbaum et al., 1993), was the focus. It was assumed that coping strategies that are considered adaptive in previous literature (approach coping, religion, humor) have a negative direct effect on the level of acute self-reported and physiological stress, meaning that people

who habitually use those coping strategies a lot, experience a smaller stress increase and a better stress recovery. Maladaptive habitual coping strategies (avoidance coping), on the other hand, were assumed to have a positive direct effect on the level of acute self-reported and physiological stress, meaning that people who habitually cope with stressors in an avoidant way, experience a higher stress increase and a worse recovery.

Summary of results

The aim of these regression analyses was to identify a potential effect of the various coping strategies on acute stress, which was induced by a social stress test. Due to the COVID-10 pandemic, only a very low sample size could be tested, which decreases the chances of detecting a possible effect in the general population dramatically. Only one out of the 16 analyses turned out to be significant. Avoidance coping had a significant effect on the level of self-reported stress recovery (hypothesis 2c). Even though the effect size was very small ($B=0.04$), this result still shows the right direction, namely a positive relationship between avoidance coping and stress recovery. Of course it is hard to generalize from this very low sample size. The effect of humorous coping on self-reported stress increase was almost significant with $p=.06$ and $B=-6.99$ (hypothesis 4a). This result shows a larger effect size that also shows the right direction, namely a negative relationship between humorous coping and acute stress increase. If more participants completed the experiment, it can be assumed that this hypothesis would have turned out to be significant.

For some other analyses, additionally to not being significant, the found effects did not show the expected directions. It is important to note, however, that most B -values were very low which also makes the results hard to interpret. Considering approach coping, a negative direction was found for acute self-reported stress increase and for physiological stress recovery, which is what was previously hypothesized. A positive effect was found between approach coping and self-reported stress recovery and for approach coping and physiological stress recovery, which is not in accordance with hypothesis 1. Looking at avoidance coping, this coping strategy showed a negative association with self-reported stress increase and self-reported stress recovery, which is not what was priorly hypothesized. For physiological stress, a positive effect was found for stress increase and no effect at all ($B=0.00$) was found for stress recovery. For religious coping, correlation analyses were conducted because the variable religion was not normally distributed. Out of the four effects, only the ones regarding stress recovery showed the expected negative direction. The effects focusing on stress increase showed a positive direction, which is not in accordance with hypothesis 3. It is worth noting though, that confidence intervals were wide. Regarding humorous coping, only the

effects in which stress increase was investigated, showed the expected negative direction, while the two analyses regarding stress recovery showed a positive direction, which is not what was priorly hypothesized.

Because of the very low sample size due to the COVID-19 pandemic, extreme case analyses were conducted. These analyses showed mixed results. For approach coping, only the analyses regarding self-reported stress showed the hypothesized trend (smaller stress increase, better stress recovery when approach coping high) while the analyses regarding physiological stress did not. The analyses regarding avoidance coping only showed the expected positive trend (higher stress increase, worse stress recovery when avoidance coping values high) for self-reported stress increase. The other hypotheses (physiological stress increase and both stress measures at stress recovery) showed the opposite trend, which is not what was priorly hypothesized. Looking at religious coping, only the hypothesis considering self-reported stress recovery showed the expected trend but since the recovery difference only was 2% this comparison is hard to interpret. The other three analyses (both stress measures for stress increase and physiological stress recovery) showed that non-religious people dealt better with stress which is not in accordance with hypothesis 3. All four hypotheses considering humorous coping showed the expected trend that participants who took the situation with humor had both a smaller stress increase and a better stress recovery, which is in accordance with the hypotheses.

Interpretation of results

Approach coping was the first concept that was examined. It is assumed an adaptive strategy that is associated with positive outcomes like less mental health problems (Arthur, 1998) and less depressive symptoms or suicidal attempts (Benatov et al., 2020). None of the effects turned out to be significant. People who tend to habitually cope in an approach way, had a smaller self-reported stress increase and a higher physiological recovery, which was what was hypothesized. In the extreme case analyses, the expected effect was only found for stress increase in both stress measures. So to sum up, only hypothesis 1a (There is a negative relationship between approach coping and self-reported stress increase) can be supported in a careful way because it shows the expected negative trend with an effect size $B > 1$ and this is also observable in the extreme case analysis. So it is at least partly indicated that participants who tend to approach stressful situations seem to have a smaller stress increase and a better stress recovery. But at least in this master's thesis, the assumption that approach coping is solely adaptive cannot be supported.

Avoidance coping was assumed to be maladaptive and is linked to negative outcomes like a higher risk for eating disorders (McGarrity et al., 2019), depression or suicidal thoughts (Benatov et al., 2020). Avoidance coping was also associated with a worse mental state (Arthur, 1998) and a higher risk for burn-out (Austin et al., 2005). Analyses regarding the effect of avoidance coping on acute stress increase showed results which do not support the assumption that they are solely maladaptive strategies. For the regression analyses, effect sizes were always below 1, meaning that no direction could be meaningfully confirmed. The direct effect of avoidance coping on acute self-reported stress recovery showed a significant positive effect. However, this should be interpreted with great caution because the effect size was close to 0. The extreme case analyses mostly showed the opposite trend of what was expected, meaning that the participants who scored highest on avoidance coping showed both a smaller stress increase and a better recovery. So to sum up, no clear statement can be derived for avoidance coping, except that it does not seem to be as maladaptive in acute stressful situations involving social stressors as it was hypothesized to be. Of course, this interpretation has to be taken with great cautions due to the low sample size. One reason for this surprising result could be that people who habitually tend to cope with avoidance could not avoid the stress test, they had to deal with it. Their coping strategy, to avoid, was taken away from them. It is unknown how those participants then dealt with the situation and what other coping strategies they used.

Religion can be divided into positive religious coping and negative religious coping (Habib et al., 2018). While it is unclear which type of religious coping the coping questionnaire measures, previous literature showed that religious coping seems to be mostly used as an adaptive strategy that shows a negative correlation with for example everyday stressors (Habib et al., 2018) and a positive correlation with life satisfaction (Ayten & Karagöz, 2021). This was the reason for the assumed negative direct effect on stress increase and stress recovery. Yet, in this master thesis, the use of religion as a coping strategy seems to have a positive effect on the stress increase, meaning that people who habitually tend to use religious coping, mostly showed a higher stress increase, which is not in accordance with hypothesis 3 and previous literature. For stress recovery, the opposite pattern was observed, namely that people who habitually use religion as a coping strategy had a better recovery. One reason for this mixed result could be that religion helps people find meaning in their lives (Weber & Pargament, 2014). So it is possible that using religion as a coping strategy is not useful in the stressful situation itself, but later on. Finding meaning after an experience can change the perception of that experience to have it appear in a more positive light. Meaning

can be described as expected relationships which helps people make sense of prior experiences. From meaning, people's expectations about experiences form. When those expectations are violated in any way, like when they are not in accordance with prior relations, the sympathetic nervous system is activated (Proulx & Inzlicht, 2012). So it could be the case that when religious people find meaning after the social stress test, the meaning making is somehow involved in the stress reduction, which then leads to recovery.

Humorous coping was also assumed to be an adaptive coping strategy because it shows a positive correlation with other adaptive coping strategies (Kruczek & Basińska, 2018) and a negative association with stress (Olah & Ford, 2021). The results of this master's thesis show mixed results regarding humor as an adaptive coping strategy. All extreme case analyses support the assumption that highly humorous participants have a smaller stress increase and a better stress recovery. The regression analyses investigating the role of humor on the acute stress increase show a negative trend, which means that highly humorous participants tend to have a smaller stress increase. The analyses regarding stress recovery, on the other hand, show that humorous people tend to have a worse recovery. At least for the effect of humor on stress increase, it can be assumed that humor is an adaptive strategy. One reason could be that when the humorous participants use humor in a stressful situation, they reappraise it in a more positive way (Abel, 2002). That could help them to take it not as seriously (Kruczek & Basińska, 2018), which in turn could have the effect that the stress increase is not as high.

To sum up, it seems that approach coping and avoidance coping are not as black-and-white adaptive and maladaptive when dealing with acutely stressful situations as it was previously believed. Plus, there are probably third variables that play an important role whether those coping strategies are used in an adaptive or a maladaptive way. Correlational analyses showing a medium-sized positive relationship between approach coping and avoidance coping furthermore indicate that those two constructs do not seem to be completely oppositional constructs. Religion seems to be most efficient not in the stressful situation itself, but later on when coming to terms with it and finding meaning in the experience. Humor, on the other hand, seems to be most effective in the stressful situation itself because it could help not taking the situation too seriously.

Limitations

All these interpretations should be considered with great caution because of some limitations that could potentially influence the analyses and distort the interpretation. Those limitations involve the study design and problems regarding generalizability and validity.

Limitations regarding the study design

First and foremost, it is important to note that this study design was not designed to answer the research questions of this master's thesis. The focus lies on the relaxing effects of music after an acute stress test. So originally, there was no focus on coping strategies. In the overall research project, coping is only one out of many variables that are assessed using a test battery. This also explains why in this master thesis, only a very brief questionnaire (Brief-COPE) assessed the different coping strategies.

The brief questionnaire for coping is another limitation worth noting. Instead of the COPE (Carver et al., 1989) which would have had 60 items and assesses each coping strategy with 4 items, the Brief-COPE (Carver, 1997) was used which has only 28 items and assesses each coping strategy with only 2 items. Even though it was explored that the brief COPE measures coping in the same way as the COPE with similar internal reliabilities and almost equal factor structure (Carver, 1997), it is possible that in this sample, a questionnaire with more items per strategy would have been able to more accurately measure the different coping strategies.

The coping strategies were classified as approach coping and avoidance coping. Another possible distinction would have been the one between problem-focused coping and emotion-focused coping. Latest research mostly uses the newer approach-avoidance distinction, but some older studies that are cited used the problem-focused vs emotion-focused distinction. These two distinctions incorporate similar strategies. This means that approach coping and problem-focused coping share many similarities and the same is true for avoidance coping and emotion-focused coping. Still, there could also be some differences between the distinctions, which could account for some of the findings in previous literature that are not in accordance with the findings of this master's thesis.

The most important limitation regarding the thesis is that habitual coping was considered. The questionnaire considering the different coping strategies was filled out by the participants prior to the experiment. This means that it is only known how the participants usually respond to stressful situations, but it is completely unclear how the participants actually responded during the stress test. It is possible that participants used completely different coping strategies than they usually do while facing this specific stressor (TSST). While there is a good chance that people turn to the coping strategies that they know well when experiencing stress, it is no guarantee.

Moreover, for this master's thesis long term recovery was the main focus, which means that the last time window of the experiment (Marker 8) three hours after the stress test was used as the recovery time point. It is plausible that after three hours, most participants have recovered beyond their baseline values and do not experience stress anymore. This ceiling effect could probably be avoided if a shorter recovery interval would have been used like the one directly after the music intervention (Marker 5).

Peak stress was the second important time point for this master's thesis. This time point was conceptualized as time window 4 (last five minutes of the TSST) for physiological stress while controlling for the baseline. During the last five minutes of the TSST, participants had to do the counting exercise (counting backwards from 2047 in steps of 17). It is possible that some participants do not feel stressed at all during this part of the TSST because they are for example very good at math's. People who are more afraid of having to give speeches in public probably had the highest stress increase during the first part of the TSST and were already beginning to recover during the last five minutes of the TSST. This means that there is a high possibility that not the peak stress timepoint for every participant was measured during the last five minutes of the TSST and another time window like the first five minutes of the TSST or 2.5 minutes of each part of the TSST would have probably yielded different results.

Even though most of the preconditions of the regression analyses were fulfilled, it is not reasonable to interpret these findings too much because most of the regression analyses were not significant and effect sizes were very small (mostly $B < 1$). For some analyses, effect sizes were below $B = 0.05$ / $B = -0.05$. Although some of the findings were both non-significant and had a small effect size, they were interpreted. But it should be noted that it needs future research before deriving any definite statements. Furthermore, the extreme case analyses should be interpreted with caution because they are not statistical analyses, but solely descriptive. This means that while being a good way of examining the data further, they only indicate trends, but no clear definite statement can be derived.

Limitations regarding generalizability and validity

The first thing that has to be noted that could be a big problem to validity is that the sample size was very small due to the COVID-19 pandemic. There are only 21 participants for self-reported stress and 20 participants for physiological stress in the analyses which leads to a reduced power which in turn makes finding a potentially existing effect less likely. Moreover, the probability of finding random effects or false-positive effects is highly

increased. So these findings cannot be generalized to the general population, further research with a bigger sample size is necessary to be able to do that.

A big problem for generalizability is that the sample was very homogenous. Of course that is useful because this way a lot of third variables that could potentially confound findings can be controlled for. All participants were highly educated females from the age of 18 to 35 and mostly from Austria or Germany who had no severe physical or mental illness and normal weight. They did not drink in an abuse way or take any other drugs. As a result, the findings can only be generalized to this specific population. All further generalization have to be done with great precaution and future studies are needed to derive more definite statements.

While the two stress measures (self-reported stress and physiological stress) show a medium-sized positive correlation for stress increase, only a very weak positive correlation was found between the two stress measures for stress recovery. This is an important limitation for both validity and generalizability. So self-reported stress and physiological stress do not seem to capture stress recovery in the exact same way and it is unclear which stress measure captures the concept of stress recovery better. Moreover, the pairs of hypotheses, where only the two stress measures are different, often show different results, which also supports the claim that self-reported stress and physiological stress are not completely the same constructs. One reason for this low correlation could be that the formula for stress recovery $((\text{peak} - \text{baseline}) / (\text{recovery} - \text{baseline}))$ takes all three timepoints into accounts and is therefore more noisy. However, comparing the effects of the two pairs of hypotheses with the different stress measures is only meaningful to some extent since the correlation is very low. This is especially the case for approach coping and avoidance coping because there were almost exclusively different outcomes between the two stress measures. For religious coping and humorous coping, the stress measures were more alike.

Another thing that is challenging for generalizability is that this study was mostly done throughout the COVID-19 pandemic. During this time, a lot of things changed. Because of the precautions that had to be considered in order to stop the virus from spreading (like cleaning hands regularly, social distancing, distance learning etc.) a new normality emerged. One aspect on which the COVID-19 pandemic had an impact, could be the coping strategies participants usually use. It could for example be harder to use social support as a coping strategy during social isolation. The use of instrumental support could also be harder when people are expected to stay at home. Another example would be that alcohol use as a coping strategy has dramatically increased during the COVID-19 pandemic (Tran et al., 2020).

Finally, planning as an adaptive coping strategy has become very hard since the COVID-19 pandemic is uncontrollable. When comparing the results of this study to studies that were conducted prior to COVID-19, COVID-19 specific factors should always be in mind.

Since there were four lockdowns during the course of the experiment, participants had to stay at home. This means that the possibility for social contact was limited to very few people that the participants knew well. This could have two possible effects: Either participants were so eager for social interactions that the stress levels did not increase as much as they would have before the COVID-19 crisis or participants were not used to social interaction with foreign people anymore, so their stress increases were a lot higher than they usually would have been. We do not know which of the two possibilities happened, but it is safe to assume that the COVID-19 pandemic might have some kind of impact on the stress responses.

Moreover, it is well documented that there has been a rise of mental problems since the beginning of the COVID-19 pandemic. A pandemic is a potentially traumatic situation for every person (Lee-Baggley et al., 2004) and goes along with an increased feeling of stress and a higher number of mental illnesses (Rogowska et al., 2020). Since the beginning of the first wave of infection, a general increase of psychopathological symptoms of 10% and an increase of COVID-19 specific traumatic stress of 15% have been observed (Schäfer et al., 2019). This means that there is a high probability that participants already had a higher amount of stress even before the experiment started, which could also complicate an interpretation of the stress increase.

Lastly, during the course of the experiment, COVID-19 regulations had to be adapted a few times because of governmental restrictions, which could make a generalization even within the sample hard. For example, the first participants did not have to wear a face mask at all because the experiment started prior to COVID-19. Other participants had to wear a face mask and the last participants had to wear a FFP2 mask. Especially the social aspect such as social support and being able to see the emotions of other people could have been influenced by whether the participants were able to see the full face of the experimenter and the TEWL person or not.

Implications

The analyses of this master theses showed mixed results about the relationship between (mal-)adaptive coping strategies and acute stress. Furthermore, interpretations are complicated because of the small sample size due to the COVID-19 pandemic. Nevertheless, previous literature has shown numerous times that the relationship between coping and stress seems to

be an interesting field worth exploring. Future studies that further explore this relationship should concentrate on a larger sample size in order to be able to make more definite statements. Moreover, other samples should be considered. It would be interesting for example to see if men showed different results than women or if elder people showed different results than younger people. Moreover, replicating this study after the COVID-19 pandemic would be interesting to see how the COVID-19 pandemic has influenced both the level of acute stress and the use of coping strategies. Most importantly, acute coping should be considered and not habitual coping. Coping should be assessed directly before and / or after the stress test in future studies in order to have clarity which coping strategies participants actually used in this stressful situation.

Nevertheless, the findings of this master thesis implicate that there seems to be a difference between the usage of adaptive and maladaptive coping strategies on both stress increase and stress recovery during stressful situations. Doing psychoeducation on how to use adaptive coping strategies when being in a stressful situation could have a very positive effect on both people with mental problems (Arthur, 1998; Benatov et al., 2020; Herman-Stahl et al., 1995; Yan et al., 2021) and on the general population (Habib et al., 2018; Kruczek & Basińska, 2018) because previous literature has shown that adaptive coping strategies can decrease the level of stress (Habib et al., 2018; Kruczek & Basińska, 2018; Olah & Ford, 2021). Yet, all these studies only considered chronic stress. Since almost every person experiences acute stress sooner or later in their lives, it is important to also do research on how people can cope with acute stress because it is possible that there are some differences compared to how people cope with chronic stress. This could especially also have implications on occupational groups that have a high risk of experiencing acute stress like police officers or firefighters. Offering specific trainings on how to deal with acute stress in an adaptive way could decrease the prevalence of trauma-related long term consequences like PTSD (post traumatic stress disorder). Moreover, if people are able to cope well with stress, they may also develop a better resilience which in turn has many positive effects like a better mental health (Southwick et al., 2014).

Conclusion

In this master's thesis, the effect of different coping strategies on stress increase and stress recovery were investigated. While approach coping and avoidance coping have not shown to be strictly adaptive or maladaptive, people who use religious coping seem to have a better stress recovery and people with who habitually use humorous coping seem to have a

lower stress increase. Especially during the COVID-19 pandemic, stress levels are elevated and people experience acute stress more often, like when being at risk of having been infected. So it is important to consider that different coping strategies seem to have different effects on the stress increase and stress recovery. Coping strategies could be an important resource that could both have a positive effect on stress itself and also on the health consequences of stress by developing resilience.

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Appendix

Brief-COPE (German; Knoll et al., 2005)

1. Ich habe mich mit Arbeit oder anderen Sachen beschäftigt, um auf andere Gedanken zu kommen.
2. Ich habe mich darauf konzentriert, etwas an meiner Situation zu verändern.
3. Ich habe mir eingeredet, dass das alles nicht wahr ist.
4. Ich habe Alkohol oder andere Mittel zu mir genommen, um mich besser zu fühlen.
5. Ich habe aufmunternde Unterstützung von anderen erhalten.
6. Ich habe es aufgegeben, mich damit zu beschäftigen.
7. Ich habe aktiv gehandelt, um die Situation zu verbessern.
8. Ich wollte einfach nicht glauben, dass mir das passiert.
9. Ich habe meinen Gefühlen freien Lauf gelassen.
10. Ich habe andere Menschen um Hilfe und Rat gebeten.
11. Um das durchzustehen, habe ich mich mit Alkohol oder anderen Mitteln besänftigt.
12. Ich habe versucht, die Dinge von einer positiveren Seite zu betrachten.
13. Ich habe mich selbst kritisiert und mir Vorwürfe gemacht.
14. Ich habe versucht, mir einen Plan zu überlegen, was ich tun kann.
15. Jemand hat mich getröstet und mir Verständnis entgegengebracht.
16. Ich habe gar nicht mehr versucht, die Situation in den Griff zu kriegen.
17. Ich habe versucht, etwas Gutes in dem zu finden, was mir passiert ist.
18. Ich habe Witze darüber gemacht.
19. Ich habe etwas unternommen, um mich abzulenken.
20. Ich habe mich damit abgefunden, dass es passiert ist.
21. Ich habe offen gezeigt, wie schlecht ich mich fühle.
22. Ich habe versucht, Halt in meinem Glauben zu finden.
23. Ich habe versucht, von anderen Menschen Rat oder Hilfe einzuholen.

24. Ich habe gelernt, damit zu leben.

25. Ich habe mir viele Gedanken darüber gemacht, was hier das Richtige wäre.

26. Ich habe mir für die Dinge, die mir widerfahren sind, selbst die Schuld gegeben.

27. Ich habe gebetet oder meditiert.

28. Ich habe alles mit Humor genommen.

Stress VAS (German; Lesage et al., 2012)

1. Ich fühle mich gestresst.

Abstract

Coping strategies are important to deal with stressors effectively. The following master's thesis examines the relationship between different coping strategies and the level of acute stress, which is induced by a social stress test. Both adaptive coping (approach coping, religion, humor) and maladaptive coping (avoidance coping) are considered. Adaptive coping strategies are hypothesized to lead to a smaller stress increase and to a better recovery three hours after the stress test. For avoidance coping, a higher stress increase and a worse recovery is hypothesized. Participants ($N=22$) completed the Brief-COPE before the experiment and stress measure were assessed several times throughout the experiment. Self-reported stress was assessed via an analogue scale and physiological stress was assessed via monitoring heart rate and analyzing specific intervals. Since only one out of 16 regression analyses was significant, which could be due to the low sample size, extreme case analyses were additionally carried out. The analyses considering approach coping and avoidance coping suggest that they cannot be strictly divided into adaptive or maladaptive because of mixed results. Religion seems to be an adaptive strategy during stress recovery when participants find meaning in the experience. Humor seems to be most effective in the stressful situation itself because it could help not taking the situation too seriously. Although the results should be interpreted with great caution due to the small sample size, they suggest that coping strategies have an effect both on stress increase and stress recovery. Implications are discussed.

Keywords: approach coping, avoidance coping, religious coping, humorous coping, self-reported stress, physiological stress, acute stress

Abstract German

Jeder Mensch erlebt im Laufe seines Lebens Stress. Deshalb sind Coping Strategien notwendig, um den Stress erfolgreich zu bewältigen. Diese Masterarbeit untersucht die Beziehung zwischen unterschiedlichen Coping Strategien und dem Ausmaß an akutem Stress, der durch einen sozialen Stresstest ausgelöst wird. Es wurden sowohl adaptive Strategien (Approach Coping, Religion, Humor) als auch maladaptive Strategien (Avoidance Coping) berücksichtigt. Adaptive Strategien sollen zu einem kleineren Stressanstieg, wenn die Proband*innen ihr höchstes Stresslevel erreichen, und zu einer besseren Erholung drei Stunden nach dem Stresstest, führen. Für maladaptives Coping wurde der umgekehrte Effekt angenommen. Die Proband*innen ($N=22$) füllten den Brief-COPE vor dem Experiment aus, die Stresswerte wurden einige male im Laufe des Experimentes erhoben. Selbstberichteter Stress wurde mit einem Fragebogen (VAS) erhoben und physiologischer Stress wurde durch das Analysieren spezifischer Intervalle der Herzrate erhoben. Da aufgrund der niedrigen Stichprobengröße nur eine von 16 Regressionsanalysen signifikant war, wurden zusätzlich Extremgruppenanalysen ausgeführt. Die Analysen bezüglich Approach Coping und Avoidance Coping zeigten gemischte Ergebnisse, was bedeutet, dass die beiden Konstrukte möglicherweise nicht so eindeutig (mal-)adaptiv sind wie bisher angenommen. Religion scheint eine adaptive Wirkung während der Erholungsphase zu haben, wenn die Proband*innen Sinn in ihrer Erfahrung finden. Humor zeigte sich am effektivsten während dem Stresstest, weil Proband*innen die Situation möglicherweise durch den Einsatz von Humor nicht so ernst nahmen. Auch wenn die Ergebnisse aufgrund der geringen Stichprobengröße mit großer Vorsicht interpretiert werden sollten, wurde gezeigt, dass Coping Strategien einen Einfluss auf das Ausmaß an akutem Stress zu haben scheinen. Implikationen wurden diskutiert.

Schlüsselwörter: Approach Coping, Avoidance Coping, religiöses Coping, humorvolles Coping, selbstberichteter Stress, physiologischer Stress, akuter Stress