**The relationship between extraversion and resilience during the Covid-19 pandemic among university students: does cognitive restructuring partially mediate its association?**

Bachelor Thesis

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Mental health and Resilience during the Covid-19 pandemic

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**Abstract**

***Objective***. Resilience is a psychological concept with important mental health implications. Especially in times of crisis such as the Covid-19 pandemic, the need to identify factors that promote resilience becomes apparent. In the present study, the relationship between resilience and extraversion was examined, including the mediating role of cognitive restructuring within this association. In doing so, this study has focused on students. ***Method***. Participants were recruited using snowball and convenience sampling. Thereupon, 99 participants ($M_{age}$=22.42, $SD = 4.36$; 48 female and 51 male) completed an online survey in which they provided their socio-demographic data and answered the Big Five Inventory, the Coping Strategy Inventory, and the Brief Resilience Scale. ***Results***. The mediation analysis revealed that (1) extraversion correlated positively with resilience, (2) extraversion correlated positively with cognitive restructuring, (3) cognitive restructuring correlated positively with resilience, and (4) when cognitive restructuring was taken into account, the relationship between extraversion and resilience became less significant. ***Conclusion***. This study provides evidence that extraversion is positively associated with resilience. It further highlights that coping strategies play a significant role in the investigated relationship as cognitive restructuring has reduced the link between extraversion and resilience. In this way, the study implies that it might be valuable to shift the focus from personality to coping styles as an explanatory approach to resilience. These insights can be used to guide future research and interventions.

**Table of Content**

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**Relevance of study**

Due to the increasing number of mental health issues in today's modern society, the ability to overcome personal life challenges is of particular interest to people all over the world. Considering the fact that some individuals better cope with distressing situations than others (World Health Organization, 2004), interest arises in what factors underlie this phenomenon. Identifying factors that either promote or inhibit a positive adaptation to adversity, also known as resilience, is therefore essential to improving mental health in at-risk populations. In this context, research has shown that one potential source of information could be an individual's personality and their usage of coping strategies.

Particularly in times of a global pandemic, as was the case with Covid-19, people need to withstand critical life periods. Due to policy regulations, individuals are challenged by a lack of social resources, financial insecurity, risk of transmitting infection, and a fear of getting severe acute respiratory syndrome coronavirus 2 (Barzilay et al., 2020; Cheng et al., 2021). This change of life had negative effects on an individual's mental health due to the prolonged and constant exposure to stressors (Dawson & Golijani-Moghaddam, 2020; Hoyt et al., 2021). Noteworthy, research shows the prevalence of mental health problems is particularly high among university students (Paula et al., 2020). As extraverted individuals are most likely to suffer from the contact regulations accompanied by the pandemic (Zacher & Rudolph, 2021), attention should be paid on how they deal with the ongoing crisis. Information is needed on how, for example, reinterpreting the problem in a more positive direction, also called cognitive restructuring, is linked to resilience. Given the numerous obstacles associated with the ongoing pandemic, the need to collect data on how vulnerable populations cope with these challenges becomes apparent. Following this, the present study aims to investigate the relationship between extraversion and resilience in more depth and further analyse the mediating role of cognitive restructuring within this association.

**Resilience**

To cope with difficult life circumstances, people must have high levels of resilience. *Resilience* is defined as the ability to "achieve good outcomes despite serious threats to adaptation or development" (Masten, 2001, p. 228). Hence, it describes a person's ability to cope with various stressors in life (Connor & Davidson, 2003), including the challenges that

are accompanied by the current global pandemic. Although studies such as the one of Tagini et al. (2021) have highlighted other factors that influence this association, coping with stressful life events is largely determined by resilience. This is consistent with the study of Ziaian et al. (2012) which showed that individuals with high levels of resilience have fewer mental health problems. In addition, there is growing evidence of the usefulness of interventions aimed at building resilience in university students to achieve positive mental health outcomes (Rogers, 2016). Thus, resilience helps explain why some people are better protected from mental health problems than others, demonstrating the importance for public health to conduct more research on this concept.

Although resilience has major supposed benefits for mental health, its complex nature makes it difficult to evaluate research findings. According to Herrman et al. (2011), the concept of resilience is a dynamic rather than a static construct. In other words, resilience is a concept that underlies several mechanisms including individual, environmental, and genetic processes (Herrman et al., 2011). Due to the interaction of these factors, resilience is an extremely complex and multi-layered construct to study (Davydov et al., 2010; Hermann et al., 2011; Southwick et al., 2014). Researchers claim that these interacting mechanisms are indistinguishable from one another (Davydov et al., 2010; Hermann et al., 2011), implying difficulties in analysing research outcomes. Therefore, contemporary studies have focused on the most crucial factors in resilience for the sake of establishing a standardised basis for future investigations. Still, research is characterised by inconsistent methods (Davydov et al., 2010; Chmitorz et al., 2018), which in turn makes the validity of multiple studies less clear (Luther et al., 2011, as cited in Windle et al., 2011). In addition, Davydov et al. (2010) further argue that the lack of a universal definition of resilience hinders the progress within mental health research. This underlines difficulties in evaluating current research evidence, albeit Herrmann et al. (2011) deny the significance of the measure differences. Consequently, consistent methods and concept definitions are needed in order to obtain a more accurate picture of resilience.

In addition to the need for a universal operationalisation and conceptualisation of resilience, it is of interest to know what factors are associated with a successful adaptation to adversity. When experiencing adverse life events, people tend to exhibit diverse reactions, ranging from positive adaptations to severe problem manifestations. McAllister and McKinnon (2009) explain that resilient individuals better adapt to adversity due to higher protective capacities. Similarly, Maasten (2001) and Southwick et al. (2014) elaborate that individuals exhibit varying levels of resilience depending on the associated distressing life

event among other variables. It is therefore of interest to know what specific factors underlie resilience. In this regard, the literature points to multiple factors that serve as promoting resources against adversity including optimism, psychological flexibility, trust, self-esteem, and coping strategies (Dawson & Golijani-Moghaddam, 2020; Franke & Elliott, 2021; Kidd & Shahar, 2008). These factors enhance resilience, which helps individuals to recover from financial stress (Taylor et al., 2017), personal problems, and health issues (Ziaian et al., 2012). Besides the preceding variables, numerous studies indicated a strong relationship between personality traits and resilience (Asendorpf & van Aken, 1999; Campbell-Sills et al., 2006; Olsson et al., 2003; Oshio et al., 2018). For example, Campbell-Sills et al. (2006) assert that Goldberg's (1990) Big-5 personality traits are one of the greatest predictors of resilience. In this sense, personality traits might help to clarify why some individuals are more resilient than others.

**Extraversion and its Relationship to Resilience**

One personality trait that provides insights into individual differences in resilience is extraversion. *Extraversion* is defined as "a trait characterized by a keen interest in other people and external events, and venturing forth with confidence into the unknown" (Ewen, 1998, p. 289). Extraversion is further conceptualised as a trait continuum, ranging from introversion to extraversion (Eysenck, 1956). It includes psychological factors such as optimism, talkativeness, enthusiasm, and self-esteem (Goldberg, 1990). With regards to resilience, a meta-analysis conducted by Oshio et al. (2018) revealed a positive moderate correlation between resilience and four of the Big-5 personality traits, namely openness, conscientiousness, extraversion, and agreeableness, while neuroticism signified a negative correlation. Yet, the studies that were included cover the period up to 2016, thus not incorporating the significance of Covid-19.

With this in mind, current research has doubted the positive relationship between extraversion and resilience to be valid. For instance, Zager Kocjan et al. (2021) find that extraversion is the only personality trait that yields insignificant results for resilience. Zacher and Rudolph (2021) even assert that high levels of extraversion constitute greater mental health issues in Covid-19 times based on evidence of the perceived severity of limited social interactions. Conversely, some studies have found support for the opposite trend, thus suggesting that the positive relationship between extraversion and resilience remains. This is exemplified by the study of Morales-Vives et al. (2020) which argues that extraverts adapt better to Covid-19 circumstances due to higher levels of resilience and flexible adaptation

capabilities. Hence, the evidence on extraversion and resilience is slightly conflicting, suggesting that more research in this area is needed. Because there is a long history of extraversion's positive influence on resilience, more reliance is placed on these long-standing research findings. Moreover, adaptation to a prolonged pandemic is likely to change (Wright et al., 2021). Extraverts in particular may thus have developed greater resilience over the course of the pandemic, based on their broad range of protective mechanisms against adversity (Magnus et al., 1993). Consequently, it is hypothesised that extraversion positively correlates with resilience.

**Cognitive Restructuring and its Relationship to Resilience and Extraversion**

Besides extraversion, problem-focused coping strategies such as cognitive restructuring have been shown to be positively associated with resilience. According to Kalisch et al. (2014), resilience depends to a large extent on how positively a person evaluates adversity. In this regard, researchers highlight that some coping strategies are more effective than others when it comes to resisting the accompanied stressors. For instance, Southwick et al. (2014) assert that employing cognitive-behavioural methods is particularly useful in enhancing resilience. One strategy that belongs to this approach is *cognitive restructuring*. It is a coping strategy derived from Ellis's (1962) cognitive model of emotions, which implies that the interpretation of a specific stimulus is responsible for its affective outcome (Sweeney & Horan, 1982). It involves a schematic modification aimed at changing maladaptive thoughts accompanied by adversity into more positive ones (Clark, 2013). This mental process helps an individual to reframe the significance of the problem itself rather than the emotion that is associated with it. Cognitive restructuring belongs to the problem-focused coping system (Tobin et al., 1989) and is argued to constitute higher resilience and better mental health (Compas et al., 2001). Consistent with this finding, Lupe et al. (2020) and Morales-Rodríguez (2021) further indicate that this strategy is critical for successfully dealing with stress and anxiety during Covid-19. As university students are vulnerable to negative mental health outcomes during the current pandemic (Paula et al., 2020), the usefulness to replicate these findings becomes apparent. While several researchers have predominantly focused on social support and problem-solving as promoting coping styles in resilience, cognitive restructuring received less attention in similar studies despite its large positive relation.

Similarly, cognitive restructuring has been shown to positively correlate with personality traits. Connor-Smith and Flachsbart (2007) conducted a meta-analysis that

focused on the relations between personality traits and several coping strategies. This investigation found that besides social support and problem-solving, extraversion predicts cognitive restructuring (Connor-Smith & Flachsbart, 2007). This finding is consistent with the study of Carver and Connor-Smith (2010) which found evidence that cognitive restructuring has one of the strongest associations with personality traits. Following this, Penley and Tomaka (2002) explain that extraverts tend to appraise ambiguous life events as challenging rather than threatening. Hence, it is argued that the predispositions of extraverts might facilitate the usage of cognitive restructuring.

Extraversion is linked to both resilience and the employment of cognitive restructuring, yet the interaction between those constructs is far from clear. First, the conceptualisation as well as the operationalisation of resilience is problematic in research (Southwick et al., 2014). Second, in light of a global pandemic, inconsistent findings on extraversion's role in resilience stress the importance of further investigations (Zager Kocjan et al., 2021). Third, extraversion predicts cognitive restructuring (Connor-Smith & Flachsbart, 2007); likewise, cognitive restructuring is positively linked to resilience (Compas et al., 2001). Hence, it is debatable whether extraversion itself promotes resilience. Higher levels of extraversion are associated with higher cognitive restructuring as these individuals tend to reframe the problem itself rather than the emotion associated with adversity (Connor-Smith & Flachsbart, 2007). Similarly, people high in cognitive restructuring are also more likely to be resilient based on their positive way of thinking (Morales-Rodríguez, 2021; Connor-Smith & Flachsbart, 2007). Therefore, it might be the case that the relationship between extraversion and resilience is mediated by cognitive restructuring. This assumption is supported by the findings of Campbell-Sills et al. (2006) who found evidence that problem-oriented coping mediates the relationship between personality and resilience. Yet, few studies addressed the mediating influence of coping mechanisms. For these reasons, cognitive restructuring is examined, which is expected to partially mediate the relationship between extraversion and resilience.

**Present study**

Research suggests that higher levels of extraversion are associated with higher levels of cognitive restructuring and people high in cognitive restructuring are also more likely to be resilient (Connor-Smith & Flachsbart, 2007). Therefore, this cross-sectional study investigates the relationship between extraversion and resilience in more depth and further analyses whether this link is mediated by cognitive restructuring. Given the high prevalence

of mental health issues in university students (Paula et al., 2020), this study focuses on students. Due to the inconsistencies in the literature regarding the relationship between extraversion and resilience, one objective of the present study is to clarify this discrepancy by identifying direct effects on resilience. Particularly in light of contemporary life circumstances, the need to identify and clarify those deviations becomes apparent. Based on the lack of research into the mediating role of coping strategies, cognitive restructuring is used due to its strong correlation with extraversion and resilience.

**Hypotheses**

$H_1$: Extraversion correlates positively with resilience.

$H_2$: Extraversion correlates positively with cognitive restructuring.

$H_3$:  Cognitive restructuring correlates positively with resilience.

$H_4$: When accounting for cognitive restructuring, the previous significant relationship between extraversion and resilience becomes less significant due to mediation.

**Methods**

**Design**

This cross-sectional study was conducted by the Department of Psychology, Health, and Technology of the University of Twente. It was part of a broader study, in which several variables were tested including extraversion, cognitive restructuring, resilience, agreeableness, social skills, problem-solving, and life satisfaction. With regards to the current investigation, the independent variable *extraversion,* the dependent variable *resilience,* and the mediation variable *cognitive restructuring* were of interest. These variables were treated as continuous variables. For this, a mediation model was used (see Figure 1). To test the hypotheses, a correlational design was employed.

**Figure 1**

*Study design with extraversion as the independent variable, cognitive restructuring as the mediation variable, and resilience as the dependent variable.*
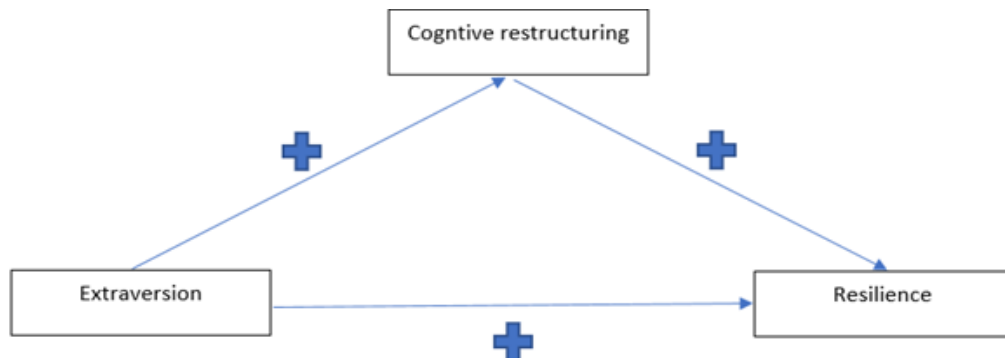


**Participants**

        Participants were selected by means of convenience and snowball sampling. Recruitment was conducted via Instagram, Facebook, WhatsApp, and an internal university network called Sona. Thereby, a significant part of the sample population was recruited from a larger hospital in Germany. The participants either received 0.25 study points within the previous network or partook voluntarily.

        The inclusion criteria were access to a device with an internet connection and a sufficient level of English proficiency. Conversely, participants were excluded when they were younger than 18 years, had not given informed consent, and were not students.

        In total, 235 subjects participated in the study while 208 completed the survey. Subjects who did not meet the inclusion criteria and those who exhibited straight-lining behaviour were omitted from the final sample. Therefore, the final sample consisted of 99 participants which were used for the subsequent analysis. With regards to socio-demographic characteristics, 51 males and 48 females participated. Overall, the distribution of the participants' nationality was as follows: 82 were from Germany (82.8%), followed by 16 were from the Netherlands (16.2%), and one participant from Spain (1.0%). The age ranged from 18 to 58, with a mean age of 22.42 ($SD = 4.36$). Concerning educational background (see Table 1), the majority had either an A-level or a Bachelor's degree, in total accounting for 91 participants (89.9%).

**Table 1**

*Socio-demographic characteristics of the sample population (N =99).*

| Item | Category | Frequency | Percentage |
|---|---|---|---|
| Gender | Female | 48 | 48.5 |
| | Male | 51 | 51.5 |
| Age | 18-20 | 30 | 30.4 |
| | 21-23 | 29 | 29.3 |
| | 24-26 | 18 | 18.2 |
| | 27-29 | 6 | 6.0 |
| | 58 | 1 | 1.0 |
| Nationality | German | 82 | 82.8 |
| | Dutch | 16 | 16.2 |
| | Spanish | 1 | 1.0 |
| Education | Lower secondary school | 1 | 1.0 |
| | General secondary school | 5 | 5.1 |
| | A-Level | 64 | 64.6 |
| | Bachelor's degree | 25 | 25.3 |
| | Master's degree | 2 | 2.0 |
| | Other | 2 | 2.0 |

**Measures**

Three criteria were chosen to determine the scales used in this study: good psychometric qualities, a small number of items, and free availability.

*Resilience*

Resilience was measured via the Brief Resilience Scale. Windle et al. (2011) examined 19 measures, three of which had adequate validity and reliability: (a) Connor-Davidson Resilience Scale (CD-RISC), (b) Resilience Scale for Adults (RSA), and the (c) Brief Resilience Scale (BRS). Concerns apply to the Resilience Scale for Adults (RSA) which contains 37 items. Though the Connor-Davidson Resilience Scale (CD-RISC) has good psychometric qualities, it was not freely accessible. Therefore, resilience was measured with the BRS due to its good psychometric qualities, the small number of items, and its free-to-use option (Smith et al., 2008); albeit it has a questionable factor structure (McKay et al., 2019). Smith et al. (2008) have shown that the BRS has both sufficient internal consistency ($\alpha = 0.80\text{-}0.91$) and test-retest reliability ($r = 0.69$ for a one-month interval). It is a self-report questionnaire with five response options. Each respondent indicates on a 5-point Likert scale to what extent to which they agree with six statements. In this study, the BRS had excellent psychometric properties ($\alpha = 0.872$). An overview of all items can be found in Appendix B. For instance, one item refers to "*I tend to take a long time to get over set-backs in my life.*". The answering options were then as follows: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree. The score ranges from 6 to 30, with high scores indicating high levels of resilience.

*Extraversion*

Extraversion is one of Goldberg's (1990) Big-5 personality traits and can be measured with the Big Five Inventory (BFI) developed by John and Srivastava (1999). It consists of 44 short phrase items that are used to measure core features of the Big-5 personality traits. The Big-5 personality traits are openness, conscientiousness, extraversion, agreeableness, and neuroticism. In the scope of this study, items of extraversion were of special interest, which is the reason why solely the extraversion subscale was included. The score was assessed using eight items which can be seen in Appendix B. Following this, a sample item was "*I see myself as someone who.. Is talkative*", where participants could choose one of five answering options: (1) disagree strongly, (2) disagree a little, (3) neither agree nor disagree, (4) agree a little, and (5) agree strongly. Thereby, scores range from 8 to 40 with high scores indicating high levels of extraversion. With regards to psychometric properties, John and Srivastava (1999, pp. 102–138) have shown that the scale of extraversion has good reliability ($r = 0.88$).

Further, it has generally good internal consistency ($\alpha = 0.84$) in a Dutch sample (Denissen et al., 2008). In the present study, the extraversion subscale had excellent internal consistency ($\alpha = 0.910$).

### Cognitive restructuring

Cognitive restructuring was measured with the Coping Strategy Inventory (CSI), a 72-item self-administered questionnaire that assesses thoughts and behaviours for coping with specific stressors in life. It encompasses items from multiple questionnaires that are both valid and reliable (Amirkhan, 1990; Tobin et al., 1989). The CSI consists of eight primary subscales, each representing a specific coping strategy: (a) problem solving, (b) cognitive restructuring, (c) problem avoidance, (d) wishful thinking, (e) express emotions, (f) social support, (g) self-criticism and (h) social withdrawal (Tobin et al., 1989). Like all subscales, cognitive restructuring is assessed with nine items (Appendix B). Typically, subjects are required to describe a stressful episode at the beginning of the questionnaire and later indicate the extent to which they employed a specific coping strategy. For comparative purposes, the onerous episode was pre-specified. Given the ongoing pandemic, the instruction provided to each respondent was related to typical barriers associated with a lockdown based on the findings of Barzilay et al. (2020) and Cheng et al. (2021). The instruction was as follows:

> Imagine that yesterday the policy decided that you cannot meet with more than two friends at the same time. You go out alone for some fresh air, thinking about your grandparents who have been alone for three weeks and might need some support at home. You want to visit them and decide to go to their house. On your way there, you get a call from your friends you met with three days ago - they tell you that they tested positive for Covid-19. When you arrive at your grandparents' house, you think about their age and health problems. You want to take care of them, but the risk of negative health consequences is great. You are afraid of unknowingly infecting them - you wrestle with yourself because you really want to support them, but ultimately decide not to visit. You go home and worry about the consequences of infection, which could have serious consequences for your own health, for your close friends as well as for your family. You feel stressed and sad. To what extent have you taken the following actions:

Thereupon, a sample item is *"I told myself things that helped me feel better"*. Here, each item was answered on a 5-point Likert scale with the following options: (1) not at all, (2) a little, (3) somewhat, (4) much, and (5) very much. Consequently, the total score ranges from 9 to 45 with high scores signifying high levels of cognitive restructuring. The CSI's psychometric

properties were excellent compared to other measurement instruments, including its internal consistency, test-retest reliability, and construct validity (Amirkhan, 1990; Tobin et al., 1989). Concerning cognitive restructuring, Tobin et al. (1989) showed that it has good internal consistency ($\alpha = 0.83$) as well as sufficient test-retest reliability ($r = 0.67$). In regard to the present investigation, the cognitive restructuring subscale had adequate statistical power ($\alpha = 0.838$).

**Procedure**

After ethical approval was granted by the BMS Ethics Committee (request number 220277), data was collected by means of an online survey between the 5th of April and the 3rd of May 2022. Subjects were given a link that took them to the website qualtrics.com, where they could answer the survey questions. Before participation, all subjects had to complete an online consent form to accept the terms of the study (Appendix A). The terms related to (a) the agreement to participate in the study, (b) the awareness of all study guidelines, (c) the voluntariness of participation, (d) the opportunity to withdraw at any time, and (e) the minimum age of 18 years. Thereby, participants gave consent for data to be used for analysis. If subjects refused informed consent, they were referred to the end of the study. Moreover, participants were given the researcher's contact details in case they had further questions. After signing the consent form, subjects provided their socio-demographic data, including gender, age, education, occupation, and nationality. Thereupon, the variables resilience, extraversion, and cognitive restructuring were assessed using three questionnaires: resilience via the BRS, (2) extraversion via the BFI, and (3) cognitive restructuring via the CSI. The order of these questionnaires was randomised within the survey. In the end, respondents were thanked for their participation.

**Data analysis**
*Inspection of data*

After collecting data, the data set was analysed using the IBM SPSS 25 software. In the beginning, subjects who did not complete the survey and those who showed straight-lining behaviour were omitted from the final sample. A reliability analysis is performed for the BRS, BFI, and CSI to verify that the questionnaires are valid for the sample population. For this, Cronbach's alpha is used to inspect the internal consistency of the measures. After this step, descriptive statistics of demographic variables were analysed to identify priori differences in gender, age groups, and nationalities. Here, the reversed items of the subscales were recoded, and the sum score was calculated. The demographics are displayed in Table 1.

Since linear regression analysis is required to answer the hypotheses, four assumptions of regression analysis must be tested beforehand (Marill, 2004). First, the variables themselves must be normally distributed. Since larger sample sizes generally result in normal distributions (Kwak & Kim, 2017), the Shapiro-Wilks test was used to check for normality. For control purposes, the skewness and kurtosis for each variable were computed. Here, it can be concluded that the assumption of normality is met if the value ranges between the interval of -1 and +1. Second, the relationships between all three variables need to be linear (Marill, 2004), analysed by computing scatterplots for each relationship. Third, the data should be homoscedastic (Marill, 2004) which was inspected by examining the scatterplots for the residuals against the predicted value for each variable. Fourth, the residuals for each variable should be independent of each other which was inspected by conducting the Durbin-Watson test and by analysing the scatterplots of the standardised predicted value against the standardised residual.

*Main analysis*

To answer all four hypotheses, a simple mediation analysis needs to be conducted. This type of analysis is performed by using Hayes' (2018) bootstrapping method. Here, the used number of bootstrap samples was 5000 to investigate direct and indirect effects. This non-parametric test was performed as it provides larger statistical power for smaller sample sizes (Preacher & Hayes, 2004). It further encompasses a PROCESS Macro: Model 4 in SPSS. Thereupon, the hypotheses can be tested, using a confidence interval of 95%, which corresponds to an alpha value of 0.05. In this context, Baron and Kenny (1986) established three conditions that must be met for mediation to occur: (1) there is a significant main effect of the independent variable on the dependent variable, (2) there is a significant effect of the independent variable on the mediation variable, and (3) there is an effect of the mediation variable on the dependent variable. These criteria represent the first three hypotheses in this study. The analysis is done by linearly regressing the predictor variables on the outcome variables. To examine the fourth hypothesis, the aforementioned three criteria need to be met. In the case of mediation analysis, the mediator needs to partially or fully mediate the relationship between the independent and dependent variable (Baron & Kenny, 1986). The hypothesis is accepted when the bootstrapped confidence intervals do not include zero. If the direct effect remains significant, partial mediation occurs.

## Results

### Inspection of data

Table 1 shows the descriptive statistics for socio-demographic characteristics. All three measures for the variables under investigation indicated excellent psychometric qualities for the sample population. By checking the four assumptions of linear regression, no violations were found (see Appendix C). For this reason, the results allow for a simple mediation, the results of which are shown in Figure 2. Before examining the hypotheses, descriptive statistics were calculated for the main variables extraversion, cognitive restructuring, and resilience. The results are presented in Table 2. Overall, no prior differences were found in the mean scores for different nationalities and education.

**Table 2**

*Descriptive statistics for the main variables.*

| Variables | N | Min | Max | Mean | S.E. | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|---|
| Extraversion | 99 | 8 | 40 | 27.49 | 0.80 | 8.01 | -0.65 | -0.79 |
| Cognitive restructuring | 99 | 13 | 39 | 28.75 | 0.69 | 6.89 | -0.59 | -0.56 |
| Resilience | 99 | 9 | 29 | 19.64 | 0.49 | 4.88 | -0.31 | -0.78 |

### Main analysis

The results of Hayes' (2018) PROCESS Macro analysis: Model 4 indicated that all four hypotheses can be accepted. The relationships between the variables are shown in Figure 2. A detailed overview of the results of the analysis can be found in Appendix D.

**Figure 2**

*Mediation model with the results of Hayes' (2018) PROCESS Macro analysis: Model 4.*
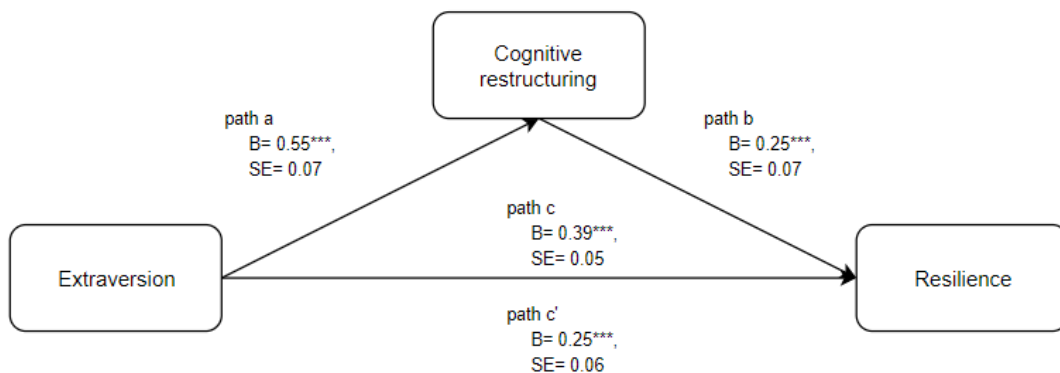


*Note.* The c coefficient represents the total relationship between extraversion and resilience. The c' coefficient represents the association between extraversion and resilience after accounting for the mediation of cognitive restructuring. The a and b paths represent the effects of the independent variable on the mediator and the mediator on the dependent variable, respectively. *$p < .05$; **$p < .01$; ***$p < .001$.

For the first hypothesis, the relationship between extraversion and resilience was analysed (path c). Extraversion was found to be a significant positive predictor of resilience in absence of the mediator cognitive restructuring, $b = 0.39$, $t(98) = 8.16$, $p < .001$. In other words, individuals high in extraversion score higher in resilience than individuals low in extraversion. In the second step, path a of the mediation model was examined (Figure 2). By linearly regressing the independent variable extraversion on the mediator cognitive restructuring, the effect has shown to be likewise significant and positive, $b = 0.54$, $t(98) = 8.10$, $p < .001$. Individuals high in extraversion have therefore higher levels of cognitive restructuring. For the relationship between cognitive restructuring and resilience (path b), the regression of cognitive restructuring on resilience was similarly significant and positive, $b = 0.25$, $t(98) = 3.76$, $p < .001$. Hence, individuals scoring high in cognitive restructuring have higher levels of resilience. Since the first three criteria are met, further testing for mediation was possible. In the last step, the mediation analysis revealed that cognitive restructuring had a positive indirect effect of extraversion on resilience $b=0.14$, 95% *Cl* [0.05, 0.22]. The interval does not contain zero, signifying that the effect is significant. As the direct effect of extraversion on resilience was still significant, $b = 0.25$, $t(98) = 4.33$, $p < .001$., it can be concluded that partial mediation occurred.

**Auxiliary analysis**

In addition to the main analysis, an auxiliary analysis was performed. Importantly, the results are explanatory in nature and can therefore not be used to infer any causal interpretations. As researchers have in general neglected the role of coping strategies within the relationship between personality traits and resilience, a correlational matrix was performed to identify any conspicuous correlations (Table 3). For instance, the agreeableness and problem-solving subscale were measured in the scope of the broader study. Interestingly, extraversion positively correlated with problem-solving, and problem-solving positively correlated with resilience. For that reason, a PROCESS Macro analysis was performed to determine if problem-solving, like cognitive restructuring, reduces the original significant relationship between extraversion and resilience (Figure 3). For the relationship between extraversion and problem-solving, the effect was positive and significant, $b = 0.16$, $t(98) = 2.58$, $p = .016$. However, the effect of problem-solving on resilience was not significant $b = 0.12$, $t(98) = 1.48$, $p = .143$. Since the criteria for mediation were not met, the indirect effect of problem-solving was also not significant $b = 0.02$, 95% $Cl$ [-0.02, 0.06]. Next, resilience displayed a negative significant correlation with gender (Table 3). Therefore, gender was dummy coded and linearly regressed on resilience. The relationship was significant and negative, $b = -1.78$, $t(98) = -2.15$, $p = .028$. Hence, males had a slightly higher score on resilience than females (Figure 4).

**Table 3**

*Correlation matrix for the auxiliary analysis. \*p < .05; \*\*p < .01; \*\*\*p < .001.*

| Variables | Extraversion | Cognitive restructuring | Resilience | Age | Gender | Nationality | Education | Agreeableness | Problem-solving |
|---|---|---|---|---|---|---|---|---|---|
| Extraversion | | | | | | | | | |
| Cognitive restructuring | 0.635** | | | | | | | | |
| Resilience | .638** | .618** | | | | | | | |
| Age | -.118 | -196 | -.074 | | | | | | |
| Gender | -.240* | -.070 | -.221* | -.234* | | | | | |
| Nationality | .040 | .097 | -.196 | -.066 | -.091 | | | | |
| Education | .019 | -.074 | .002 | .319** | -.163 | -.144 | | | |
| Agreeableness | .066 | .062 | .075 | .033 | -.023 | .213* | .032 | | |
| Problem-solving | .253** | .271** | .272** | -.165 | .017 | .104 | -.211* | -.089 | |

**Figure 3**

*Mediation model with the results of Hayes' (2018) PROCESS Macro analysis: Model 4, with problem-solving as the mediation variable.*
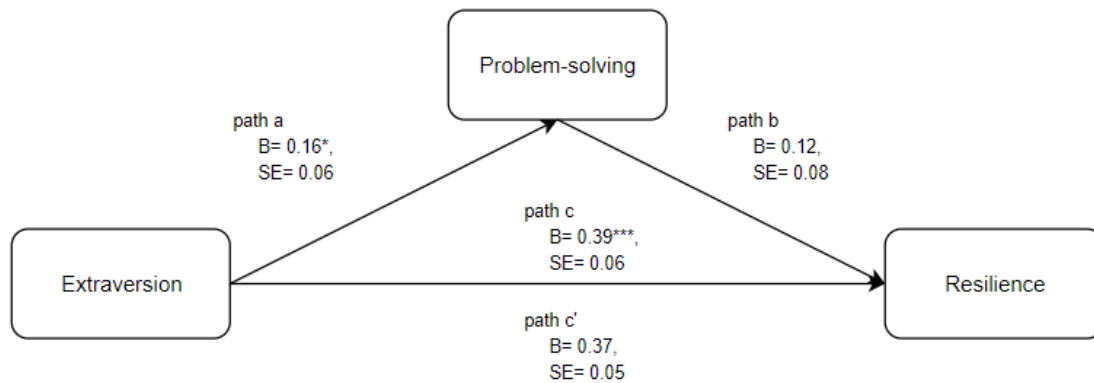


*Note.* The c coefficient represents the total relationship between extraversion and resilience. The c' coefficient represents the association between extraversion and resilience after accounting for the mediation of problem-solving. The a and b paths represent the effects of the independent variable on the mediator and the mediator on the dependent variable, respectively. *$p < .05$; **$p < .01$; ***$p < .001$.

**Figure 4**

*Comparison between males and females in terms of their resilience scores.*
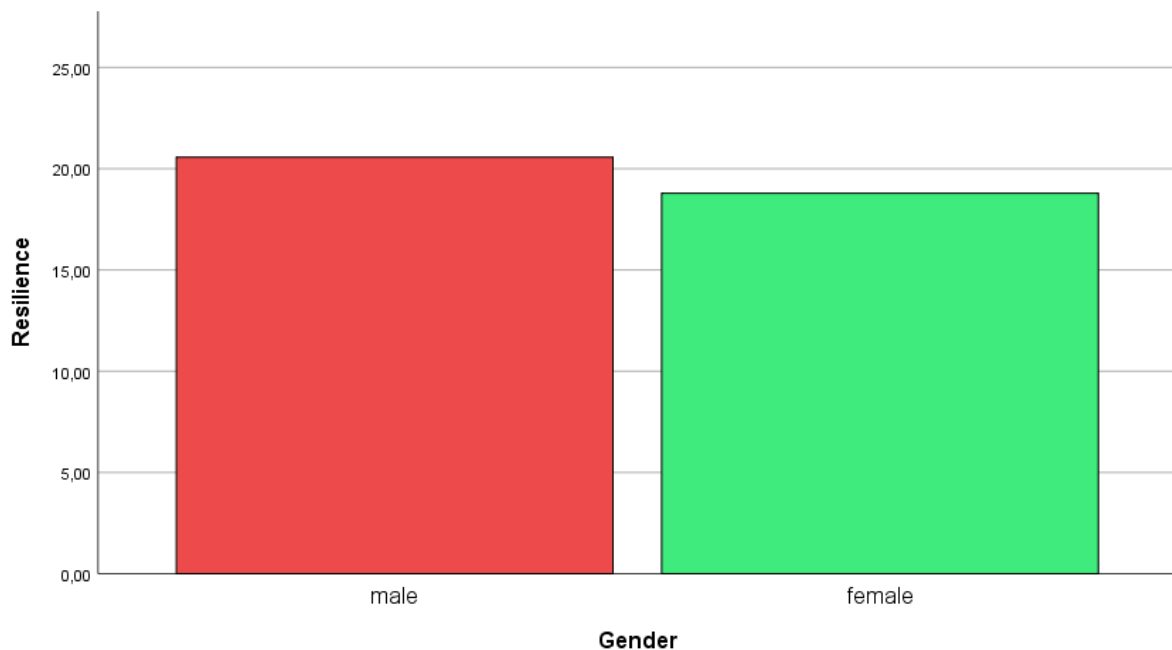
**Discussion**

This study investigated the relationship between extraversion and resilience and further examined the role of cognitive restructuring within this association. Research has pointed out that coping strategies and personality traits can explain a great proportion of individual differences in resilience. By examining the relationship between extraversion and resilience in more depth, inconsistencies on extraversion's role in resilience in literature can be clarified. In this study, it was predicted that there would be a positive link between those two concepts. Furthermore, little attention has been paid to coping strategies in the literature. Cognitive restructuring was expected to partially mediate its association due to the fact that extraversion was positively linked to cognitive restructuring and cognitive restructuring was also linked to resilience The results of the present study confirmed these expectations. In other words, (1) extraversion positively correlates with resilience, (2) extraversion positively correlates with cognitive restructuring, (3) cognitive restructuring likewise positively correlates with resilience, and lastly (4) when accounting for cognitive restructuring, the relationship between extraversion and resilience becomes less significant. The implications will be discussed in the following paragraphs.

**Outcome of hypothesis 1: Extraversion correlates positively. with resilience**

This study found support for the first hypothesis that extraversion positively correlates with resilience. Hence, individuals high in extraversion are more resilient than individuals low in extraversion. Current research suggests that resilience is influenced by several pathways including personality traits. As expected, extraversion explains some of the variance of individual differences in resilience. This finding is in line with the meta-analysis of Oshio et al. (2018) that showed similar correlational patterns for extraversion. Although some researchers have questioned the validity (Zager Kocjan et al., 2021), the present study found accumulating support for the positive trend.

Individuals high in extraversion love to spend time with others and cope with stress by mobilising social support systems. Therefore, based on the findings of Zacher and Rudolph (2021), one could assume that extraverts are less resilient during periods of personal Covid-19 limitations. However, extraversion is a broad trait continuum (Eysenck, 1956) that encompasses a whole range of predispositions for managing adverse life circumstances. These capabilities may explain why extraverts are more resilient than their counterparts. In this regard, Magnus et al. (1993) elaborate that extraverts are equipped with protective capacities when dealing with stress. Some of these are the sub facets of extraversion, namely

activity level, expressiveness, dominance, and positive emotionality (John & Srivastava, 1999), all of which may influence general coping ability with crises differently. This is exemplified by the fact that individuals high in extraversion are more likely to recall pleasant events than their introverted counterparts (Magnus et al., 1993) as positive life events are reinforced via an active reward system. Ercan (2017) further claims that these individuals are more likely to experience positive affect due to interpersonal skills. Thus, one possible explanation could be that extraverted students adapt better to adversity because they use alternative ways to deal with Covid-19 regulations, such as by mobilising their social networks through online communication tools. These interactions, in turn, could help them get through difficult times by partially satisfying their need for high levels of activity and expression. Taking into account the current pandemic, extraverts and especially extraverted students might have perceived the restrictions as more stressful (Zacher & Rudolph, 2021), but also have experienced more positive emotions due to their internal capabilities (Magnus et al., 1993). Thus, our results do not contradict the findings of Zacher and Rudolph (2021), but rather complement research findings on the notion that extraverts can deal flexibly with different stressors in life.

Consequently, it is more than simply the sociability that makes extraverted individuals resilient. Each of the aforementioned dispositions can protect them from adversity, albeit to varying degrees. Based on current research and the results of the present study, it appears that extraverts are indeed endowed with certain capacities that allow them to be resilient irrespective of the stress they are exposed to. Because resilience can be strengthened through interventions (Rogers, 2016), personality traits could be used as a criterion to identify groups that have difficulties coping with adversity. For example, while extraverted individuals seem to be properly equipped, neurotic individuals struggle to cope with adversity (Morales-Vives et al., 2020), thus being vulnerable to mental health issues. In addition, our study found that women are slightly less resilient than men. This finding is in line with the study of Kimhi et al. (2020), in which women report higher levels of psychological distress during the Covid-19 pandemic. Thus, these types of clustering can be used to find vulnerable target groups and ultimately tailor the prevention programs effectively. In this way, negative mental health outcomes can be prevented. Thereupon, the sub facets of each trait can then be used to identify specific activities that might help address adversity. For example, extraverts benefit from activities that involve parts of expressiveness, whereas neurotic individuals might prefer simple activities based on their high irritability (John & Srivastava, 1999).

**Outcome of hypothesis 2: Extraversion correlates positively with cognitive restructuring.**

The results of the present study support the second hypothesis, as extraversion positively correlated with cognitive restructuring. In other words, individuals with high levels of extraversion have higher levels of cognitive restructuring than those with low levels of extraversion. Consistent with the above line of reasoning, extraverted individuals employ multiple strategies in coping with stress. One main strategy that they use to cope with adversity is cognitive restructuring. Consequently, we found support for Connor-Smith and Flachsbart's (2007) meta-analysis that extraversion strongly predicts cognitive restructuring. Regardless of the type of adversity extraverts are experiencing, they show a strong tendency to positively reappraise the situation (Karimzade & Besharat, 2011). By actively attempting to reorganise the way they view the problem, they try to change the meaning of the stressful event itself (Tobin et al., 1989). As claimed by Rim (1987), this active problem-focused coping mechanism explains why extraverted students are better able to adapt to adversity than introverts. Specifically, when confronted with feelings of anxiety and stress (Morales-Rodríguez, 2021), such as the fear of infecting themselves or others, they try to look at the situation from a new perspective and steer it in a more positive direction. Through their optimistic and enthusiastic nature, they may possess a general protective coping approach against hard times. Studies such as the one from Kardum and Krapić (2001) have supported this notion. Conversely, O'Brien and DeLongis (1996) disagree with this point by emphasising that extraverts adapt their coping responses to the situation they are exposed to and do not have a strong predilection for problem-oriented coping. Hence, O'Brien and DeLongis (1996) defend on the one hand the emphasis on context specificity; on the other hand, they contrast the widespread assumption of a problem-focused coping preference. However, along with the present findings and the meta-analysis of Connor-Smith and Flachsbart (2007), extraverts in fact engage in cognitive restructuring irrespective of the type of adversity.

The auxiliary analysis further shows that the second subdomain of problem-focused coping, namely problem solving, is likewise predicted by extraversion. Thus, it can be inferred that individuals high in extraversion tend to employ problem-focused coping strategies when challenged with difficult life circumstances. Of particular note, extraverted individuals are also more likely to exhibit high levels of resilience. Although the findings cannot confirm a positive relationship between problem-solving and resilience, problem-focused coping strategies generally provide a valuable resource for positive mental health

outcomes (Compas et al., 2001). With further research, problem solving may prove its usefulness in intervention programs.

**Outcome of hypothesis 3: Cognitive restructuring correlates positively with resilience.**

The third hypothesis was also supported by the current study as cognitive restructuring positively correlated with resilience. Since cognitive restructuring encompasses rethinking problems in a more positive way (Connor-Smith & Flachsbart, 2007), individuals high in this coping strategy may be more resistant to adversity than others. Although Connor-Smith and Flachsbart (2007) emphasise that the use of specific strategies has neither positive nor inhibitory effects on health outcomes per se, the current study has shown that at least cognitive restructuring positively correlates with resilience. Therefore, as expected, our results support the findings of Compas et al. (2001) whose study indicates that this strategy promotes adaptation to adversity and positive mental health outcomes. Since the predefined scenario in the CSI involved typical stressors during Covid-19, the study complements Lupe et al. 's (2020) findings that cognitive restructuring promotes resilience in times of Covid-19.

Based on data from previous research and the present study, it can be concluded that positive self-affirmation and a change of perspective can be valuable tools when faced with feelings of anxiety and stress. This idea is undermined by the fact that cognitive restructuring is widely used as a form of treatment to change maladaptive thoughts into more positive ones (Clark et al., 1999). Its value might be further supported by the results of this study. It can be therefore concluded that cognitive restructuring helps individuals to cope with adversity by changing their perspective on the problem itself. This insight can be used to guide future interventions. Although individuals possess different coping preferences, teaching cognitive restructuring in intervention and prevention programs could be one way to equip individuals with resources to cope with adversity (Clarke et al., 2001).

**Outcome of hypothesis 4: When accounting for cognitive restructuring, the previous significant relationship between extraversion and resilience becomes less significant due to mediation.**

Extraversion might be one personality trait that is linked to resilience either directly or indirectly via several pathways. The findings of this study revealed that cognitive restructuring significantly reduced the relationship between extraversion and resilience. Hence, extraverts display their high level of resilience by employing cognitive restructuring in face of adversity. For example, by telling themselves things that make them feel better

(Tobin et al., 1989), trying to adopt a positive perspective on the situation (Karimzade & Besharat, 2011), and doing the best they can with what is available (Tobin et al., 1989), extraverted students try to counteract negative thinking patterns to cope with problems, including the challenges associated with the current pandemic.

From this perspective, it might be argued that personality traits are fully explained by coping strategies or vice versa, however, this does not justify the complex link to resilience. As for the auxiliary analysis, the correlation patterns show that, for example, agreeableness has not been linked to resilience, nor cognitive restructuring and problem solving (Table 3). Similarly, problem-solving, the second factor of the problem-oriented coping system, is predicted by extraversion, which, however, is neither responsible for higher levels of resilience nor has a mediating effect on these two constructs (Figure 3). Thus, it appears that each personality trait and coping strategy correlate differently. Moreover, the relationship between extraversion and resilience is still significant irrespective of the mediator cognitive restructuring, showing that the attempt to reduce personality traits to coping strategies is not as simple as it seems. Rather these findings support the assumption that personality and coping are in fact tightly connected but different constructs (Villasana et al., 2016). These findings have important implications for resilience research because they highlight its complexity. Specifically, not every personality trait and coping style has a clear relationship to resilience. Instead, this study supports the argument that resilience is influenced by numerous external factors, all of which have different relationships with resilience. The fact that resilience further depends on time and context (Southwick et al., 2014; Southwick et al., 2011) underlines the difficulty to obtain valid results for resilience. As previous research suggested, more research is needed to disentangle this construct.

**Strengths**

This study contributes to the literature on resilience by examining the link between extraversion and resilience in more depth. Due to discrepancies between past and present findings for extraversion's role in resilience, the results of the present study help to clarify this association by replicating the findings of Oshio et al. 's (2018) meta-analysis. In other words, the data was able to prove that the positive correlation between extraversion and resilience remains. The second strength relates to the highly complex multi-layered nature of resilience; this study untangles its link to some extent by identifying two underlying factors of resilience, namely extraversion and cognitive restructuring. In this regard, another strength refers to the fact that this is one of the first studies to fill the gap in the literature on the

mediating role of coping strategies within the relationship between personality traits and resilience. At the same time, the results of the auxiliary analysis add to the literature by showing that neither personality characteristics can be reduced to coping strategies, nor do each characteristic and coping strategy have the same relationship to resilience. By identifying promoting factors for resilience in a vulnerable population, the results can be further used to develop interventions to help students cope with crises. Last, the use of previously valid and reliable questionnaires had excellent psychometric properties in the population studied, thus increasing the validity of the questionnaire itself as well as the informational value of the present investigation.

**Limitations**

This study is not without limitations. First, because a cross-sectional design was used in this study, the results do not allow causal interpretations. In this regard, although two associated factors were identified, this research design cannot account for the whole variance in resilience. With this in mind, the present study had only assessed two of the Big-5 personality traits. Second, the generalisability of these findings should be evaluated with caution. In the sample population, German (82.8%) and Dutch participants (16.2%) are overrepresented. Here, a large number of participants were recruited from a clinic in Germany. It is also important to note that the data collection took place in April 2022, a time when several countries, including Germany and the Netherlands, reduced their Covid 19 restrictions. This may have influenced the results of the CSI, which included an imagined scenario that involved a typical situation people experience during the Covid 19 pandemic. Despite great statistical power of the utilised measures, resilience is said to be time (Southwick et al., 2014) and context-specific (Southwick et al., 2011), thus slightly limiting the informational value of the CSI and BRS scores. In other words, the study cannot fully explain the whole variance of resilience due to a great number of external factors. Consequently, it might be questionable to what extent these Covid-19-influenced results represent the general ability to cope with adversity. The last point of caution relates to survey biases. The measures of all three variables were based on self-administered questionnaires, thus implying the normal risk of social desirability and acquiescence biases. Because the items related to how subjects cope with adversity, the questions could be sensitive in nature and thus provide a basis for the occurrence of these biases. Nevertheless, the results are explanatory and can therefore be used to find implications for future research.

**Future research**

Given the increasing number of mental health problems, the need for further research on factors that promote resilience becomes apparent. Taking into account the complexity of the construct of resilience, research should first aim to find a measure that corresponds to a universally valid definition of resilience and then identify further underlying factors. More complex study designs should be used in this search. By implementing longitudinal study designs, researchers would gain a more accurate picture of resilience as resilience is likely to change over time (Southwick et al., 2014). In this way, and by considering related variables, information can be gathered about what factors are linked to a positive adaptation to adversity at a certain moment in life. Thereby, vulnerable age groups can be identified, which in turn provides a basis for effective interventions. The present study cannot confirm that there is a significant difference between age groups in terms of resilience scores, as suggested by some researchers (Southwick et al., 2014). Accordingly, it might be useful to compare broader age groups with each other. Likewise, this study found a correlation between gender and resilience. Here, using age or gender as an interacting variable would also allow researchers to identify specific resilience-promoting attitudes in different target groups. In applying these recommendations, the generalisation issue can be properly addressed. Regarding the inclusion of related variables, one suggestion for future research is to focus on the subdomains underlying the relationship between extraversion and resilience. For instance, the subdomains of each of the Big-5 personality traits may help to find specific factors that promote a positive adaptation. Similarly, subdomains that promote the use of cognitive restructuring could also be valuable for public mental health. In this way, it will be possible to develop effective interventions for at-risk groups, as cognitive restructuring helps to successfully manage crises. Finally, this study has focused on students since this population is increasingly vulnerable to mental health issues (Paula et al., 2020); similar at-risk groups such as children (Phelps & Sperry, 2020), employees in the health care sector (Kar et al., 2020), and older people should be considered in similar study designs to identify protecting factors to prevent long-term negative health consequences.

**Conclusion**

With regards to the aim of the present study, the findings show that the relationship between extraversion and resilience is positive and significant. In addition, cognitive restructuring has partially mediated its association. Due to this mediation, the preceding link might be less substantial than it first appeared. It consequently shifts the focus from

personality traits as the explanatory approach to resilience to specific coping strategies. Nevertheless, the link is still significant when cognitive restructuring is taken into account. Information on personality traits therefore might be useful to identify which groups of people may be vulnerable to adversity. In future, these at-risk individuals should be targeted in prevention and intervention programs to successfully help them get through difficult life situations. In this regard, the results of the present investigation found support for the notion that cognitive restructuring may be a potential source of resilience enhancement. This is exemplified by the fact that extraverts have high levels of resilience and one of their main strategies to deal with adversity is cognitive restructuring. This insight can serve as a basis to direct future research and interventions for at-risk populations. For instance, teaching specific strategies such as cognitive restructuring could be the first step toward educating people on how to successfully manage crises. In this way, negative mental health consequences, such as the mental health problems associated with the current Covid 19 pandemic, could be prevented, and better treated.

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**Appendix A Informed Consent**

Thank you for your willingness to participate in this study. This research investigates the broader topic of mental health and resiliency during the COVID-19 pandemic.

In order to help people through these tough times, the purpose of this study is to identify promoting factors for resilience. Therefore we examine psychological variables that are related to the concept of resilience, including personality traits, psychological flexibility and coping strategies.

This survey takes approximately 15 minutes to complete, but you can take as much time as you want. There are no risks of participating in this study. Your data will be anonymized, treated confidential and deleted at the end of this study. You have the right to withdraw from participating at any given time without giving explanation or justification.

If there are any further questions regarding this study, please contact one of the researchers.

Researchers: Kjell Gralla (k.f.gralla@student.utwente.nl), David Hähnchen (d.hahnchen@student.utwente.nl), David Konsorr (d.konsorr@student.utwente.nl)

I hereby declare that (1) I agree to participate in this study, (b) I have been informed about the nature of the study, (c) I am aware that participation is voluntary, (d) I can stop and withdraw at any time without explanation or justification, (e) I am at least 18 years old.

**Appendix B Measures**

**Resilience**

*Brief Resilience Scale (BRS)*

1. I tend to bounce back quickly after hard times.

2. I have a hard time making it through stressful events. (-)

3. It does not take me long to recover from a stressful event.

4. It is hard for me to snap back when something bad happens. (-)

5. I usually come through difficult times with little trouble.

6. I tend to take a long time to get over set-backs in my life. (-)


**Extraversion**

*Big Five Inventory (BFI)*

1. Is talkative.

2. Is reserved. (-)

3. Is full of energy.

4. Generates a lot of enthusiasm.

5. Tends to be quiet. (-)

6. Has an assertive personality.

7. Is sometimes shy, inhibited. (-)

8. Is outgoing, sociable.

**Cognitive restructuring**

*Coping Strategy Inventory (CSI)*

1. I tried to get a new angle on the situation.

2. I looked for the silver lining, so to speak; tried to look on the bright side of things.

3. I told myself things that helped me feel better.

4. I looked at things in a different light and tried to make the best of what was available.

5. I asked myself what was really important, and discovered that things weren't so bad after all.

6. I convinced myself that things aren't quite as bad as they seem.

7. I stepped back from the situation and put things into perspective.

8. I reorganized the way I looked at the situation, so things didn't look so bad.

9. I went over the problem again and again in my mind and finally saw things in a different

light.

**Appendix C Assumptions**

**Normality**

Normality is tested by calculating the kurtosis, skewness, and the Shapiro-Wilks test for each variable. The normality assumption is satisfied if the values of kurtosis and skewness are between -1 and +1. These results are presented in Table 4. The Shapiro-Wilks test measures whether the values for extraversion, cognitive Restructuring, and resilience are statistically different from the normal distribution. If the p-value is less than 0.05, the values are normally distributed. As shown in Table 4, this criterion is met for each variable.

**Table 4**

*Statistics for the main analysis of normality.*

| Variables | Skewness | Kurtosis | Shapiro-Wilks Test |
| --- | --- | --- | --- |
| Extraversion | -0.650 | -0.788 | .000 |
| Cognitive restructuring | -0.587 | -0.561 | .000 |
| Resilience | -0.307 | -0.777 | .014 |

**Linearity**

**Figure 5**
*Linearity check via the scatterplot of extraversion as independent variable (IV) and resilience as the dependent variable (DV).*
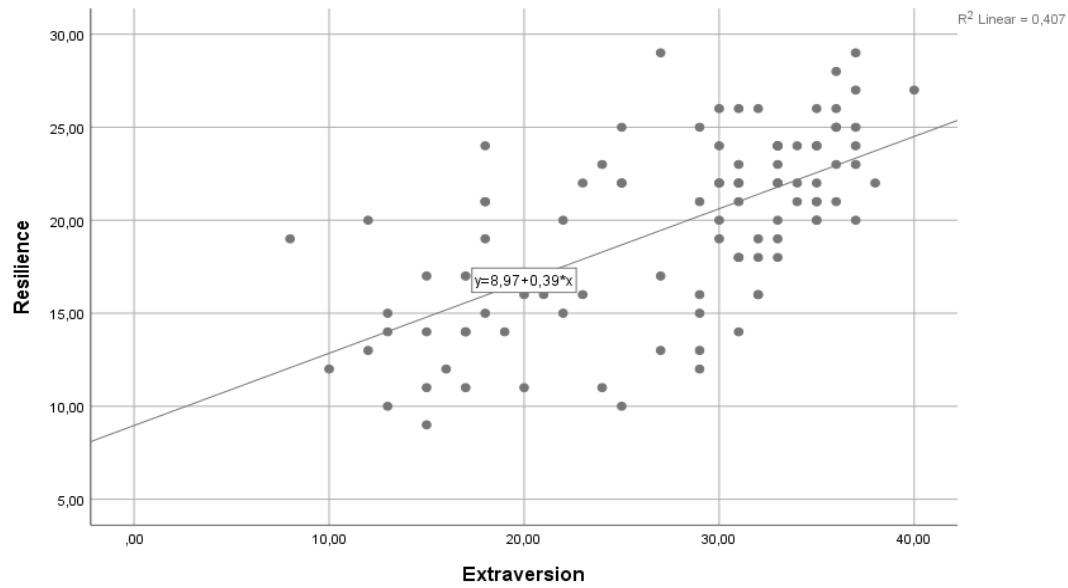


**Figure 6**
*Linearity check via the scatterplot of cognitive restructuring as IV and resilience as DV.*
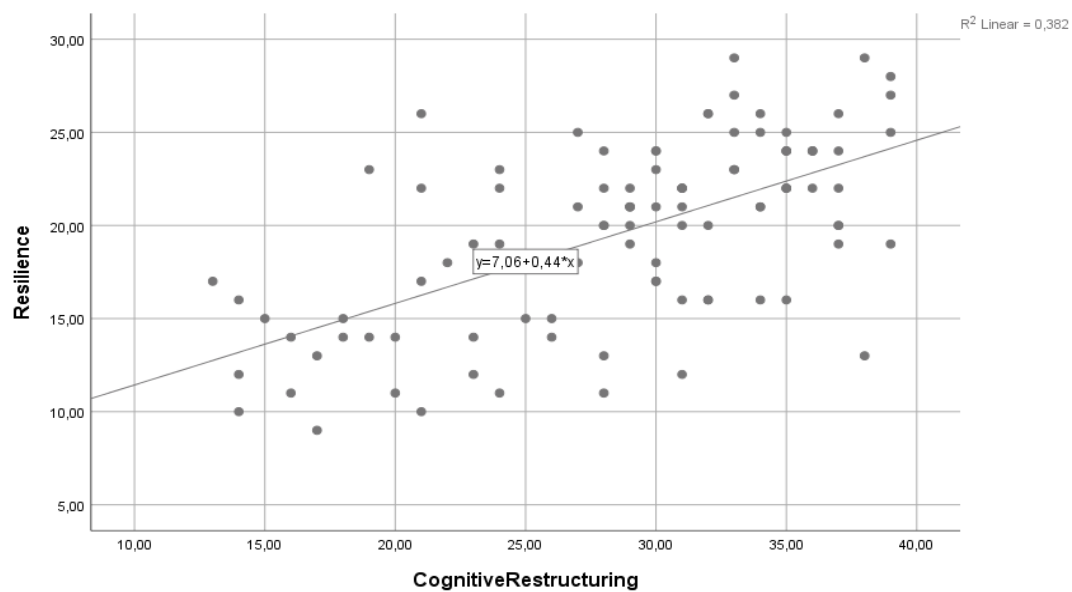
**Figure 7**

*Linearity check via the scatterplot of extraversion as IV and cognitive restructuring as DV.*



**Homoscedasticity**

**Figure 8**

*Homoscedasticity check via the scatterplot of extraversion as IV and Resilience as DV.*
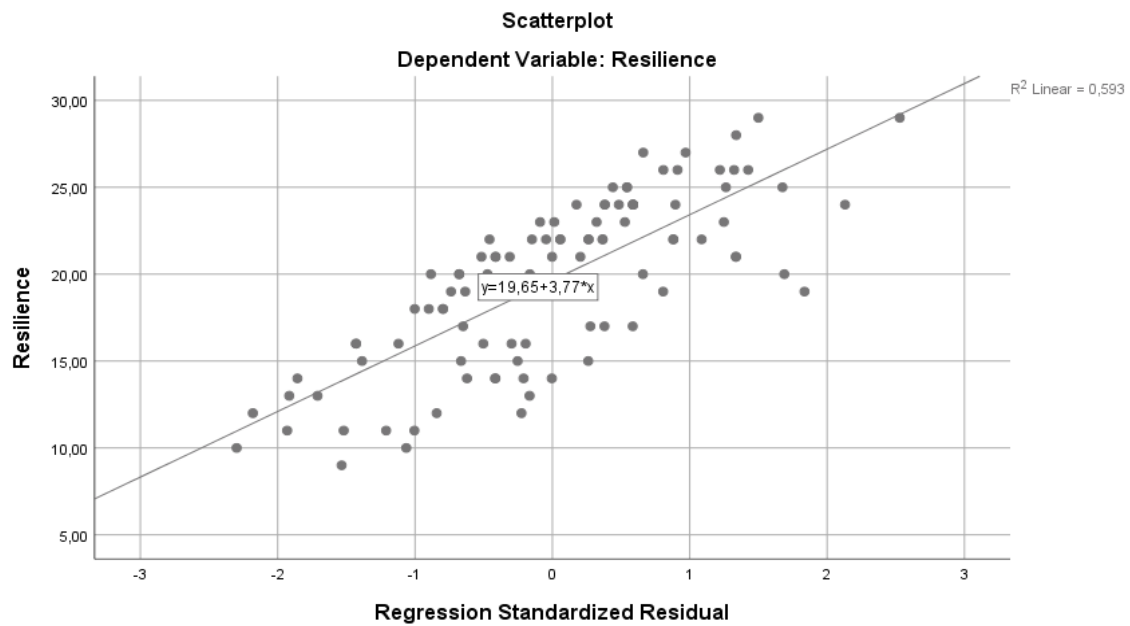
**Figure 9**

*Homoscedasticity check via the scatterplot of cognitive restructuring as IV and resilience as DV.*



Scatterplot
Dependent Variable: Resilience
$R^2$ Linear = 0,618
y=19,65+3,85*x

**Figure 10**

*Homoscedasticity check via the scatterplot of extraversion as IV and Cognitive Restructuring as DV.*



Scatterplot
Dependent Variable: CognitiveRestructuring
$R^2$ Linear = 0,596
y=28,75+5,34*x
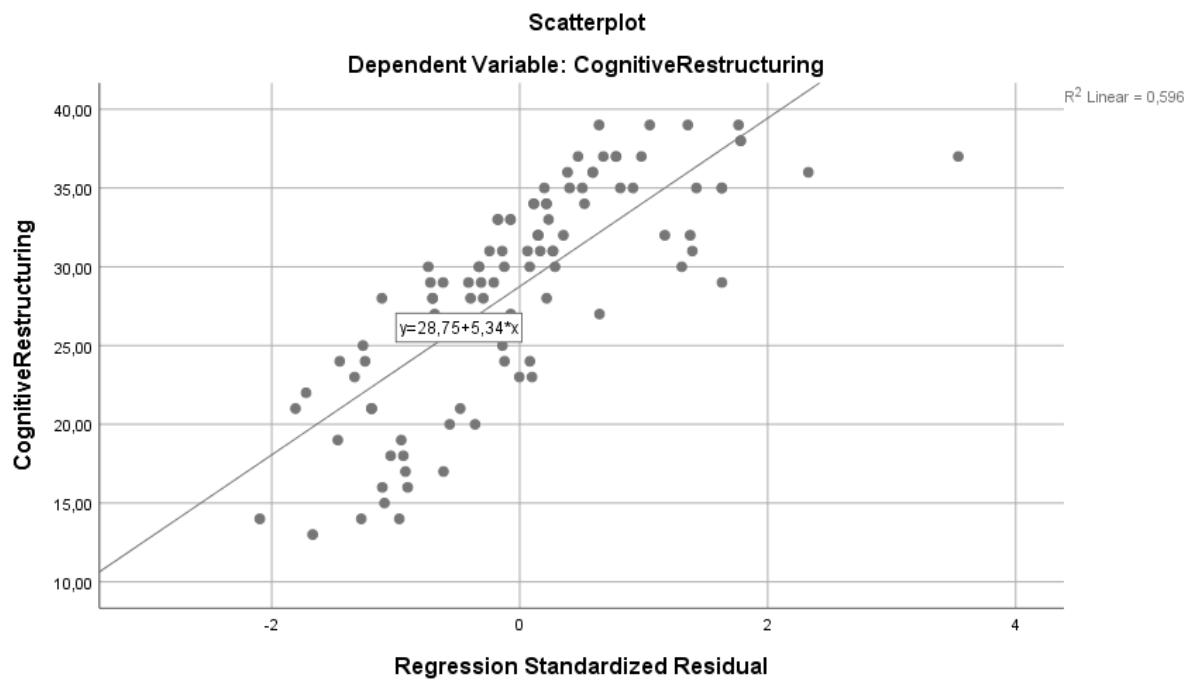
**Independence**

Given the scatterplots in Figure 10, 11, and 12, the independence assumption is not violated. In addition, the Durbin-Watson-Test is around 2 for each variable, which is considered to be the criterion for the independence assumption. For the relationship between extraversion and resilience it is 1.916, for extraversion and cognitive restructuring 2.091, and for cognitive restructuring and resilience 2.056.

**Figure 11**

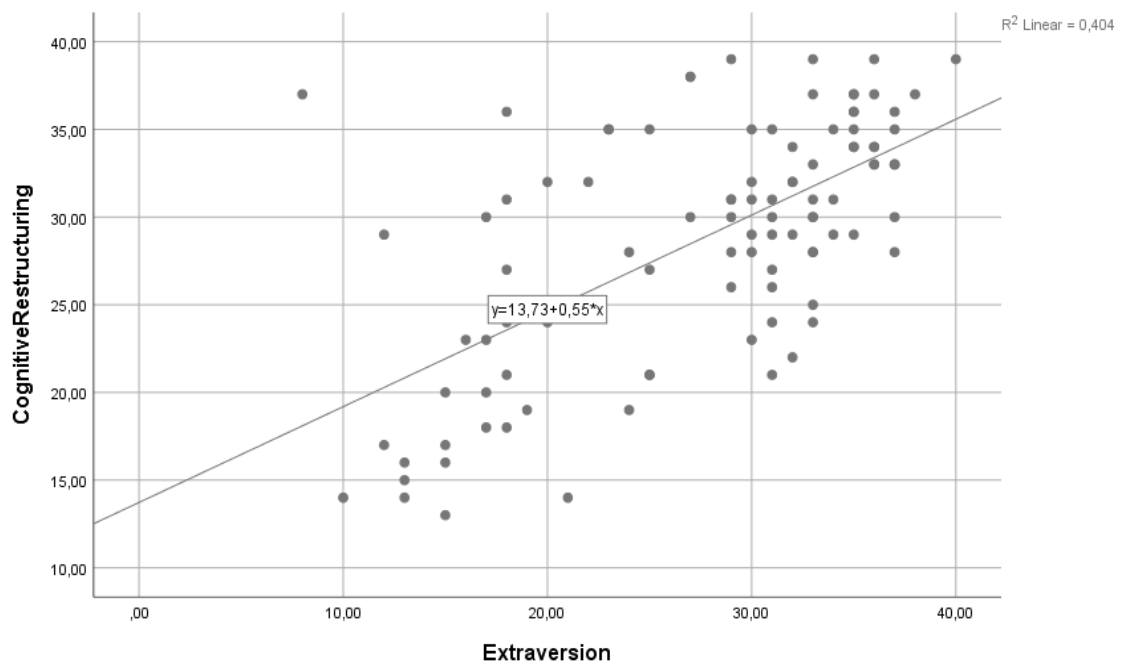*Independence check via the scatterplot of extraversion as IV and resilience as DV.*

**Figure 12**

*Independence check via the scatterplot of cognitive restructuring as IV and resilience as DV.*
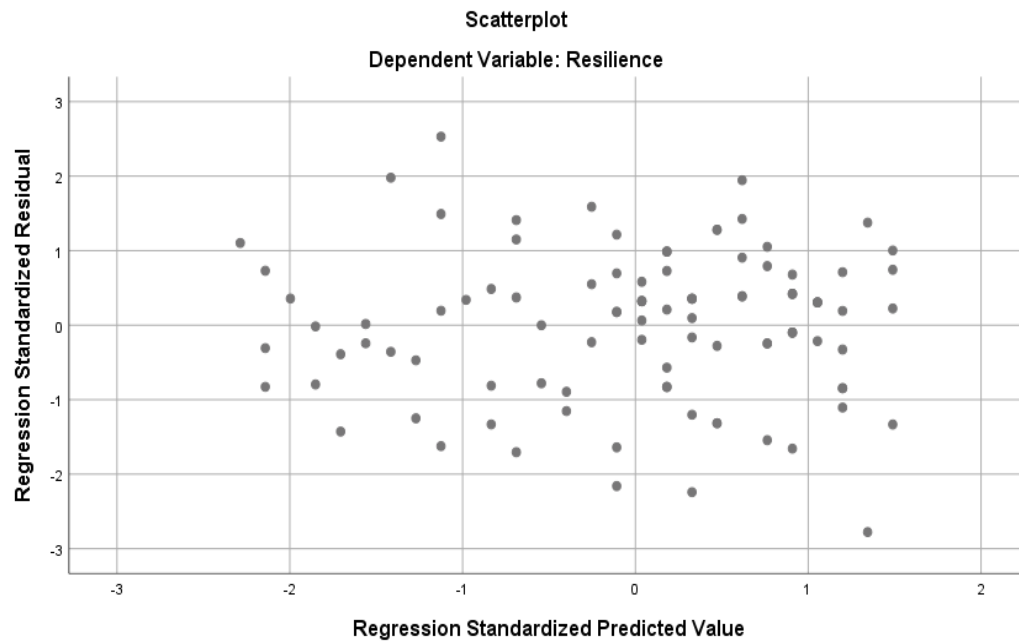


**Figure 13**

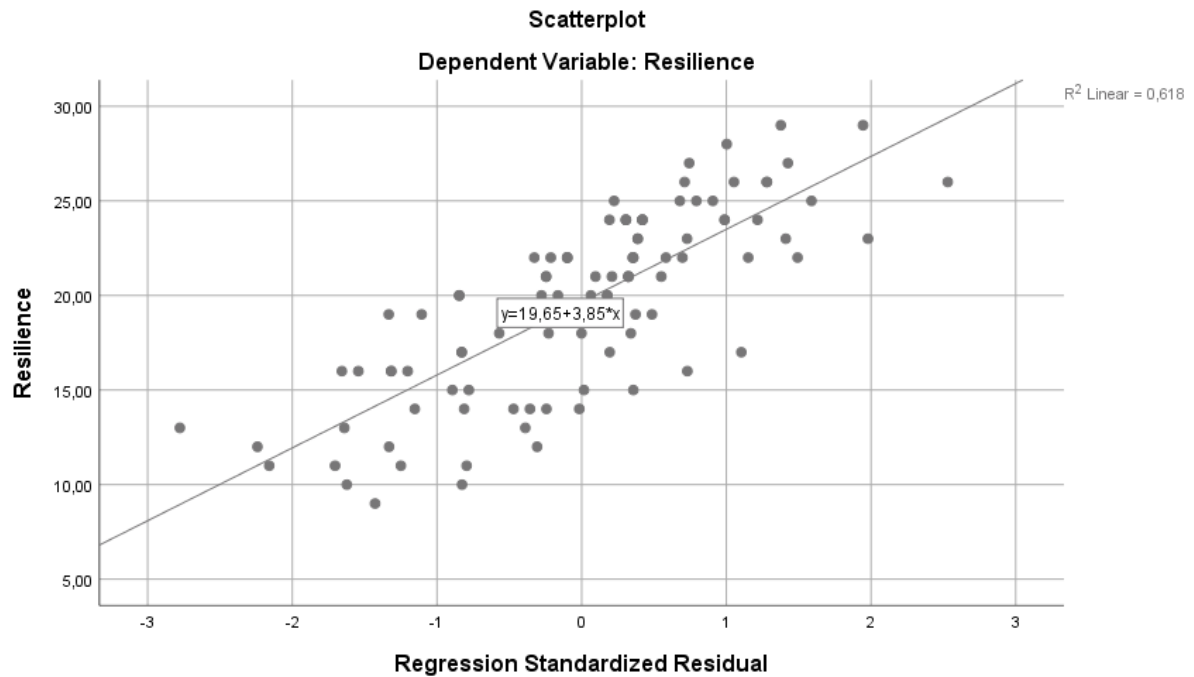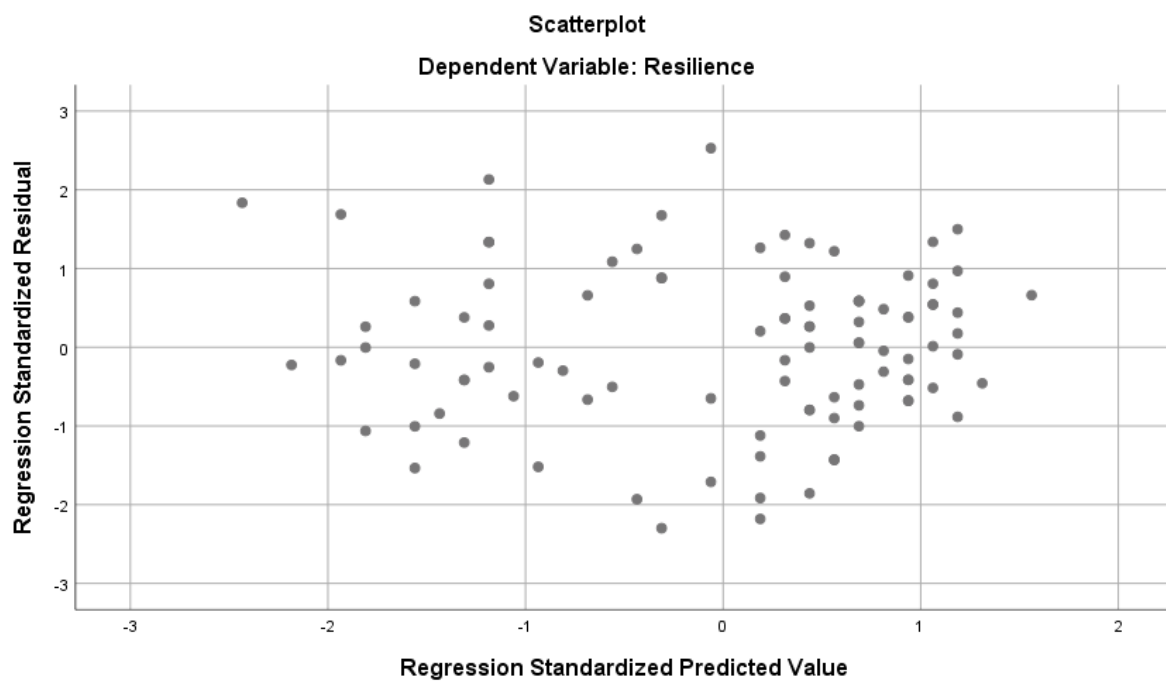*Independence check via the scatterplot of extraversion as IV and cognitive restructuring as DV .*
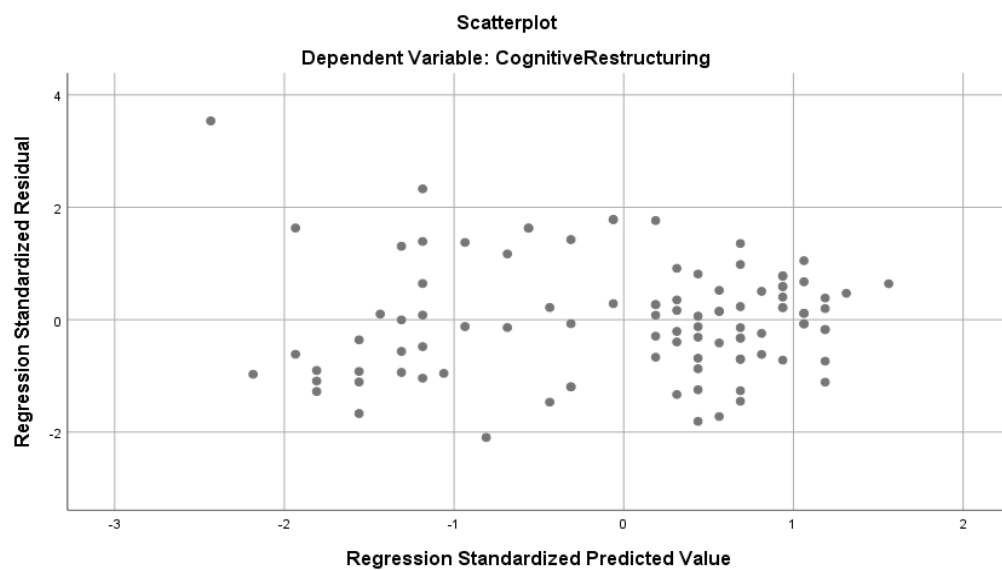
**Appendix D Output main analysis**

*Note*. In Hayes' (2018) PROCESS macro analysis: Model 4, the variable names should not have more than eight characters. Therefore, the abbreviations used in this SPSS output are as follows: the independent variable extraversion is named SumEx, the dependent variable resilience is called SumRes, and the mediation variable cognitive restructuring is called SumCR.

 Run MATRIX procedure:

**************** PROCESS Procedure for SPSS Version 4.1 ****************

       Written by Andrew F. Hayes, Ph.D.       www.afhayes.com

       Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**************************************************************************

Model  : 4

     Y  : SumRes

     X  : SumEx

     M  : SumCR

Sample

Size:  99

**************************************************************************

OUTCOME VARIABLE:

 SumCR

Model Summary

| R | R-sq | MSE | F | df1 | df2 | p |
|---|------|-----|---|-----|-----|---|
| ,6354 | ,4038 | 28,5622 | 65,6868 | 1,0000 | 97,0000 | ,0000 |

Model

| | coeff | se | t | p | LLCI | ULCI |
|---|-------|-----|---|---|------|------|
| constant | 13,7273 | 1,9295 | 7,1144 | ,0000 | 9,8977 | 17,5569 |
| SumEx | ,5463 | ,0674 | 8,1047 | ,0000 | ,4125 | ,6801 |

**************************************************************************

OUTCOME VARIABLE:

 SumRes

Model Summary

| R | R-sq | MSE | F | df1 | df2 | p |
|---|------|-----|---|-----|-----|---|
| ,6951 | ,4832 | 12,5466 | 44,8789 | 2,0000 | 96,0000 | ,0000 |

Model

| | coeff | se | t | p | LLCI | ULCI |
|---|-------|-----|---|---|------|------|
| constant | 5,4920 | 1,5776 | 3,4812 | ,0008 | 2,3605 | 8,6235 |
| SumEx | ,2503 | ,0579 | 4,3259 | ,0000 | ,1354 | ,3651 |
| SumCR | ,2530 | ,0673 | 3,7596 | ,0003 | ,1194 | ,3866 |

*********************** TOTAL EFFECT MODEL ***************************

OUTCOME VARIABLE:

 SumRes

Model Summary

| R | R-sq | MSE | F | df1 | df2 | p |
|---|---|---|---|---|---|---|
| ,6380 | ,4071 | 14,2455 | 66,6043 | 1,0000 | 97,0000 | ,0000 |

Model

| | coeff | se | t | p | LLCI | ULCI |
|---|---|---|---|---|---|---|
| constant | 8,9650 | 1,3627 | 6,5790 | ,0000 | 6,2605 | 11,6696 |
| SumEx | ,3885 | ,0476 | 8,1611 | ,0000 | ,2940 | ,4830 |

************* TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y *************

Total effect of X on Y

| Effect | se | t | p | LLCI | ULCI |
|---|---|---|---|---|---|
| ,3885 | ,0476 | 8,1611 | ,0000 | ,2940 | ,4830 |

Direct effect of X on Y

| Effect | se | t | p | LLCI | ULCI |
|---|---|---|---|---|---|
| ,2503 | ,0579 | 4,3259 | ,0000 | ,1354 | ,3651 |

Indirect effect(s) of X on Y:

| | Effect | BootSE | BootLLCI | BootULCI |
|---|---|---|---|---|

SumCR           ,1382   ,0437   ,0520   ,2228


********************** ANALYSIS NOTES AND ERRORS
***********************


Level of confidence for all confidence intervals in output:

  95,0000


Number of bootstrap samples for percentile bootstrap confidence intervals:

  5000


------ END MATRIX -----

**Appendix E Output auxiliary analysis**

*Note*. In Hayes' (2018) PROCESS macro analysis: Model 4, the variable names should not have more than eight characters. Therefore, the abbreviations used in this SPSS output are as follows: the independent variable extraversion is named SumEx, the dependent variable resilience is called SumRes, and the mediation variable problem-solving is called SumPs.

Run MATRIX procedure:

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* PROCESS Procedure for SPSS Version 4.1 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Written by Andrew F. Hayes, Ph.D.      www.afhayes.com

Documentation available in Hayes (2022). www.guilford.com/p/hayes3

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

Model  : 4

  Y  : SumRes

  X  : SumExtra

  M  : SumPs

Sample

Size:  99

**\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***

OUTCOME VARIABLE:

 SumPs

Model Summary

| R | R-sq | MSE | F | df1 | df2 | p |
|---|---|---|---|---|---|---|
| ,2527 | ,0639 | 23,6187 | 6,6194 | 1,0000 | 97,0000 | ,0116 |

Model

| | coeff | se | t | p | LLCI | ULCI |
|---|---|---|---|---|---|---|
| constant | 23,4722 | 1,7546 | 13,3774 | ,0000 | 19,9898 | 26,9546 |
| SumExtra | ,1577 | ,0613 | 2,5728 | ,0116 | ,0360 | ,2793 |

Standardized coefficients

| | coeff |
|---|---|
| SumExtra | ,2527 |

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

OUTCOME VARIABLE:

 SumRes

Model Summary

| R | R-sq | MSE | F | df1 | df2 | p |
|---|---|---|---|---|---|---|
| ,6483 | ,4203 | 14,0743 | 34,7974 | 2,0000 | 96,0000 | ,0000 |

Model

| | coeff | se | t | p | LLCI | ULCI |
|---|---|---|---|---|---|---|
| constant | 6,2486 | 2,2845 | 2,7352 | ,0074 | 1,7138 | 10,7834 |
| SumExtra | ,3702 | ,0489 | 7,5709 | ,0000 | ,2732 | ,4673 |
| SumPs | ,1157 | ,0784 | 1,4765 | ,1431 | -,0399 | ,2713 |

Standardized coefficients

coeff

SumExtra      ,6081

SumPs        ,1186

************************ TOTAL EFFECT MODEL
**************************

OUTCOME VARIABLE:

 SumRes

Model Summary

|   R   |  R-sq  |  MSE   |   F    |  df1   |  df2   |   p   |
|-------|--------|--------|--------|--------|--------|-------|
| ,6380 | ,4071  |14,2455 |66,6043 | 1,0000 |97,0000 | ,0000 |

Model

|          | coeff  |  se   |   t   |   p   | LLCI  | ULCI   |
|----------|--------|-------|-------|-------|-------|--------|
| constant | 8,9650 |1,3627 |6,5790 | ,0000 |6,2605 |11,6696 |
| SumExtra | ,3885  | ,0476 |8,1611 | ,0000 | ,2940 | ,4830  |

Standardized coefficients

coeff

SumExtra      ,6380

************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y
**************

Total effect of X on Y

| Effect | se | t | p | LLCI | ULCI | c_cs |
|--------|------|--------|-------|-------|-------|-------|
| ,3885 | ,0476 | 8,1611 | ,0000 | ,2940 | ,4830 | ,6380 |

Direct effect of X on Y

| Effect | se | t | p | LLCI | ULCI | c'_cs |
|--------|------|--------|-------|-------|-------|-------|
| ,3702 | ,0489 | 7,5709 | ,0000 | ,2732 | ,4673 | ,6081 |

Indirect effect(s) of X on Y:

| | Effect | BootSE | BootLLCI | BootULCI |
|-------|--------|--------|----------|----------|
| SumPs | ,0183 | ,0188 | -,0222 | ,0550 |

Completely standardized indirect effect(s) of X on Y:

| | Effect | BootSE | BootLLCI | BootULCI |
|-------|--------|--------|----------|----------|
| SumPs | ,0300 | ,0310 | -,0356 | ,0923 |

********************* ANALYSIS NOTES AND ERRORS
*********************

Level of confidence for all confidence intervals in output:

  95,0000

Number of bootstrap samples for percentile bootstrap confidence intervals:

  5000

------ END MATRIX -----

**Appendix F Survey**

**Mental health and resiliency during the COVID-19 pandemic.**

Start of Block: Informed consent block

Thank you for your willingness to participate in this study. This research investigates the broader topic of mental health and resiliency during the COVID-19 pandemic.

In order to help people through these tough times, the purpose of this study is to identify promoting factors for resilience. Therefore we examine psychological variables that are related to the concept of resilience, including personality traits, psychological flexibility and coping strategies.

This survey takes approximately 15 minutes to complete, but you can take as much time as you want. There are no risks of participating in this study. Your data will be anonymized, treated confidential and deleted at the end of this study. You have the right to withdraw from participating at any given time without giving explanation or justification.

If there are any further questions regarding this study, please contact one of the researchers.

Researchers: Kjell Gralla (k.f.gralla@student.utwente.nl), David Hähnchen (d.hahnchen@student.utwente.nl), David Konsorr (d.konsorr@student.utwente.nl)

I hereby declare that (1) I agree to participate in this study, (b) I have been informed about the nature of the study, (c) I am aware that participation is voluntary, (d) I can stop and withdraw at any time without explanation or justification, (e) I am at least 18 years old.

○ Yes, I want to participate in this study. (1)

○ No, I do not want to be part of the study. (2)

Page Break

End of Block: Informed consent block

Start of Block: Demographics

How old are you? (in years)

_____

What gender do you identify with?

o Male  (1)

o Female  (2)

o Non-binary / third gender  (3)

o Prefer to self-describe:  (4) _____

What is your nationality?

o Dutch  (1)

o German  (2)

o Other  (9) _____

What is your highest education?

o Lower secondary school  (1)

o General secondary school  (2)

o A-Level  (3)

o Bachelor's degree  (4)

o Master's degree  (5)

o Ph.D.  (6)

o Other  (7) _____

What is your current occupation?

o Student (including part-time students)  (1)

o Care service  (2)

o IT  (3)

o Finance  (4)

o Agriculture  (5)

o Law  (6)

o Economy  (7)

o Food retailing  (8)

o Other  (9) _____

End of Block: Demographics

Start of Block: Personality block

Here are a number of characteristics that may or may not apply to you. Please indicate the extent to which you agree  or disagree with the following statements.

I see myself as someone who...:

|  | Disagree strongly (1) | Disagree a little (2) | Neither agree or disagree (3) | Agree a little (4) | Agree strongly (5) |
|---|---|---|---|---|---|
| Is talkative (1) | o | o | o | o | o |
| Is reserved (2) | o | o | o | o | o |
| Is full of energy (3) | o | o | o | o | o |
| Generates a lot of enthusiasm (4) | o | o | o | o | o |
| Tends to be quiet (5) | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| Has an assertive personality (6) | o | o | o | o | o |
| Is sometimes shy, inhibited (7) | o | o | o | o | o |
| Is outgoing, sociable (8) | o | o | o | o | o |
| Tends to find fault with others (9) | o | o | o | o | o |
| Is helpful and unselfish with others (10) | o | o | o | o | o |
| Starts quarrels with others (11) | o | o | o | o | o |
| Has a forgiving nature (12) | o | o | o | o | o |
| Is generally trusting (13) | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| Can be cold and aloof (14) | o | o | o | o | o |
| Is considerate and kind to almost everyone (15) | o | o | o | o | o |
| Is sometimes rude to others (16) | o | o | o | o | o |
| Likes to cooperate with others (17) | o | o | o | o | o |

End of Block: Personality block

Start of Block: Resilience 2

Please indicate the extent to which these statements apply for you:

| | Strongly Disagree (1) | Disagree (2) | Neutral (3) | Agree (4) | Strongly Agree (5) |
|---|---|---|---|---|---|
| I tend to bounce back quickly after hard times. (1) | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| I have a hard time making it through stressful events. (2) | o | o | o | o | o |
| It does not take me long to recover from a stressful event. (3) | o | o | o | o | o |
| It is hard for me to snap back when something bad happens. (4) | o | o | o | o | o |
| I usually come through difficult times with little trouble. (5) | o | o | o | o | o |
| I tend to take a long time to get over set-backs in my life. (6) | o | o | o | o | o |

End of Block: Resilience 2

Start of Block: Social Skills block

Please indicate the extent to which the statements reflect your general behaviour/ feelings:

|  | Not at all like me (1) | A little like me (2) | Like me (3) | Very much like me (4) | Exactly like me (5) |
|---|---|---|---|---|---|
| I usually feel uncomfortable touching other people. (1) | o | o | o | o | o |
| Sometimes I have trouble making my friends and family realize how angry or upset I am with them. (2) | o | o | o | o | o |
| I often touch my friends when talking to them. (3) | o | o | o | o | o |
| I rarely show my feelings or emotions. (4) | o | o | o | o | o |
| I can easily tell what a person's character is by watching his or | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| her interactions with others. (5) | | | | | |
| I always seem to know what peoples' true feelings are no matter how hard they try to conceal them. (6) | o | o | o | o | o |
| I can accurately tell what a persons character is upon first meeting him or her. (7) | o | o | o | o | o |
| I can instantly spot a "phony" the minute I meet him or her. (8) | o | o | o | o | o |
| I am not very skilled in controlling my emotions. (9) | o | o | o | o | o |
| It is very hard for me to | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| control my emotions. (10) | | | | | |
| I am very good at maintaining a calm exterior even if I am upset. (11) | o | o | o | o | o |
| I am rarely able to hide a strong emotion. (12) | o | o | o | o | o |
| I love to socialize. (13) | o | o | o | o | o |
| I always mingle at parties. (14) | o | o | o | o | o |
| At parties I enjoy talking to a lot of different people. (15) | o | o | o | o | o |
| I enjoy going to large parties and meeting new people. (16) | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| I am very sensitive of criticism. (17) | o | o | o | o | o |
| It is very important that other people like me. (18) | o | o | o | o | o |
| I am generally concerned about the impression I am making on others. (19) | o | o | o | o | o |
| I am often concerned what others are thinking of me. (20) | o | o | o | o | o |
| When I am with a group of friends I am often the spokesperson for the group. (21) | o | o | o | o | o |
| I find it very difficult to speak in front of a large group of people (22) | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| I am usually very good at leading group discussions. (23) | o | o | o | o | o |
| I am often chosen to be the leader of a group. (24) | o | o | o | o | o |

End of Block: Social Skills block

Start of Block: Satisfaction block

Below are five statements that you may agree or disagree with. Indicate your agreement with each item by tapping the appropriate box, from strongly agree, to strongly disagree. Please be open and honest in your responding.

| | Strongly disagree (1) | Disagree (2) | Slightly disagree (3) | Neither agree nor disagree (4) | Slightly agree (5) | Agree (6) | Strongly agree (7) |
|---|---|---|---|---|---|---|---|
| In most ways my life is close to my ideal. (1) | o | o | o | o | o | o | o |
| The conditions of my life are | o | o | o | o | o | o | o |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| excellent. (2) | | | | | | | |
| I am satisfied with my life. (3) | o | o | o | o | o | o | o |
| So far, I have gotten the important things I want in life. (4) | o | o | o | o | o | o | o |
| If I could live my life over, I would change almost nothing. (5) | o | o | o | o | o | o | o |

End of Block: Satisfaction block

Start of Block: Acceptance block

Below you will find a list of statements. Please rate how true each statement is for you.

| | Never true (1) | Very seldom true (2) | Seldom true (3) | Sometime s true (4) | Frequentl y true (5) | Almost always true (6) | Always true (7) |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| My painful experiences and memories make it difficult for me to live a life that I would value. (1) | o | o | o | o | o | o | o |
| I'm afraid of my feelings. (2) | o | o | o | o | o | o | o |
| I worry about not being able to control my worries and feelings. (3) | o | o | o | o | o | o | o |
| My painful memories prevent me from having a fulfilling life. (4) | o | o | o | o | o | o | o |
| Emotions cause problems in my life. (5) | o | o | o | o | o | o | o |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| It seems like most people are handling their lives better than I am. (6) | o | o | o | o | o | o | o |
| Worries get in the way of my success. (7) | o | o | o | o | o | o | o |

End of Block: Acceptance block

Start of Block: Coping block

**Description**

In the following section, you will read a scenario that reflects a typical day in the Covid 19 crisis. You will then need to answer some questions about how you would have reacted. If some information does not apply to you, simply imagine how you would have acted.

Page Break

**Coping strategies**

Imagine that yesterday the policy decided that you cannot meet with more than two friends at the same time. You go out alone for some fresh air, thinking about your grandparents who have been alone for three weeks and might need some support at home. You want to visit them and decide to go to their house. On your way there, you get a call from your friends you met with three days ago - they tell you that they tested positive for Covid-19. When you arrive at your grandparents' house, you think about their age and health problems. You want to take care of them, but the risk of negative health consequences is great. You are afraid of unknowingly infecting them - you wrestle with yourself because you really want to support them, but ultimately decide not to visit. You go home and worry about the consequences of infection, which could have serious consequences for your own health, for your close friends as well as for your family. You feel stressed and sad. To what extent have you taken the following actions:

|  | Not at all (1) | A little (2) | Somewhat (3) | Much (4) | Very much (5) |
|---|---|---|---|---|---|
| I tried to get a new angle on the situation. (1) | o | o | o | o | o |
| I looked for the silver lining, so to speak; tried to look on the bright side of things. (2) | o | o | o | o | o |
| I told myself things that helped me feel better. (3) | o | o | o | o | o |
| I looked at things in a different light and tried to make the best of what was available. (4) | o | o | o | o | o |
| I asked myself what was really important, and discovered that things | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| weren't so bad after all. (5) | | | | | |
| I convinced myself that things aren't quite as bad as they seem. (6) | o | o | o | o | o |
| I stepped back from the situation and put things into perspective. (7) | o | o | o | o | o |
| I reorganized the way I looked at the situation, so things didn't look so bad. (8) | o | o | o | o | o |
| I went over the problem again and again in my mind and finally saw things in a different light. (9) | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| I just concentrated on what I had to do next; the next step. (10) | o | o | o | o | o |
| I changed something so that things would turn out all right. (11) | o | o | o | o | o |
| I stood my ground and fought for what I wanted. (12) | o | o | o | o | o |
| I made a plan of action and followed it. (13) | o | o | o | o | o |
| I avoided being with people. (14) | o | o | o | o | o |
| I knew what had to be done, so I doubled my efforts and tried harder to make things work. (15) | o | o | o | o | o |

| | | | | | |
|---|---|---|---|---|---|
| It was a tricky problem, so 1 had to work around the edges to make things come out OK. (16) | o | o | o | o | o |
| I worked on solving the problems in the situation. (17) | o | o | o | o | o |
| I struggled to resolve the problem. (18) | o | o | o | o | o |

End of Block: Coping block