Investigating the Relationship between Valued Living, the Ability to Adapt, and Anxiety

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Abstract

Background: Anxiety is a common problem for students, impacting personal health and impairing cognitive performance via chronic worry. The ability to adapt is the capability to adjust and react appropriately to challenging events and their psychosocial consequences. A concept that is hypothesised to impact anxiety and the ability to adapt is valued living, a positive psychology concept emphasising the importance of intent daily actions aligning with one´s personal values. This study investigated the following hypotheses: I. After the valued living intervention, valued living is significantly higher than at pre-assessment. II. After the valued living intervention, the ability to adapt is significantly higher than at pre-assessment. And III. After the valued living intervention, anxiety is significantly lower than at pre-assessment. **Methods:** Applying a randomised controlled trial (RTC), with a three-group pre-post-intervention design, 12 students at Dutch universities participated in the week-long online intervention. They answered the ELS-16, GSAAS, and GAD-7 measuring the respective concepts before and after the intervention. **Results:** Using an LMM, the findings indicated that valued living did increase after the intervention ($p = 0.049$), however, 39.2 % of the variance could not be explained by the model, which was able to predict higher scores better than lower ones. The LLM for the ability to adapt showed no significant effect ($p = 0.101$); the model accounted for 89.9 % of the majority of variance and predicted scores good overall, however, the lower scores were predicted slightly less good. Anxiety showed no significant effect ($p = 0.918$); the model accounted for 85.9 % of variance but did not predict higher scores well. Results must be regarded with caution due to the small sample size. **Conclusion:** This study was the first to show an increase in valued living after an intervention, that included no other intervention factors next to valued living (compared to e.g., ACTs). Further, it was the first to investigate the relationship of valued living with the ability to adapt, and the relationship between valued living and anxiety without other intervention aspects. It is recommended to include additional measuring factors in the in

future research, such as psychological flexibility and model the ability to adapt as a moderator between valued living and anxiety.

Keywords: Valued Living, Ability to Adapt, Anxiety, Dutch University Students, Randomized Controlled Trial, Increase of Valued Living, Non-Significance of Ability to Adapt and Anxiety

Table of Contents

Introduction

Mental health affectations are prevalent worldwide, making them one of the most common disease burdens, with anxiety and depression disorders having the highest prevalence (Health Data, 2021; Whiteford et al., 2015). The majority of these problems first occur between the ages of 18 and 25, the usual age of university students (Solmi et al., 2022). Common stressors that facilitate these problems in students are adjusting to a new routine, academic work, financial problems, and establishing new relationships (Lui et al., 2022). One way these stressors can impact students is in the form of anxiety.

Anxiety can be defined as a chronic, excessive, and uncontrollable worry, that causes the individual distress, impairs their social functioning, and diminishes their quality of life (Donker et al., 2011). These elevated levels of worry and fear can lead to compromised health, sleep disturbances, and impaired cognitive performance (Xun Ci Soh et al., 2023). Students with anxiety symptoms struggle to avoid distractions and academically perform more poorly than others (Kaya, 2022). Additionally, they report lower life satisfaction and psychological well-being (Kaya, 2022). Anxiety is the most frequent and urgent concern students report when contacting mental health professionals (Xun Ci Soh et al., 2023). With an overall prevalence of 39.0% in students worldwide, anxiety affects students greatly in their everyday life (Li et al., 2022). Next to the unique factors of student life that can increase anxiety symptoms, such as dealing with a new environment, other factors can explain the development of anxiety, as demonstrated by the following explanation models of anxiety.

Several models attempt to explain anxiety (Behar et al., 2009). In the focus of this study, the Contrast Avoidance Model and Emotion Dysregulation Model are the most relevant (Mennin et al., 2002; Newman and Llera, 2011). While these models were originally designed to explain Generalized Anxiety Disorder (GAD) and not solely anxiety symptoms, for the study at hand they can help to gain an understanding of the workings behind anxiety.

Firstly, according to the Contrast Avoidance Model, an individual worries so they do not have to deal with potentially distressing emotions and, as such, worry functions as an avoidance strategy (Erickson et al., 2023). The model claims that worry is something an individual experiences in a verbal-linguistic way, meaning their worries are something that can be articulated and talked about (Rashtbari and Saed, 2020). This is in contrast with bodily-related responses to emotions, which additionally can occur as mental images (Rashtbari and Saed, 2020). Thus, when an individual uses worry to avoid distressing emotions, they engage in a verbal, mental activity instead of having to deal with bodily reactions and mental images. Therefore, worrying may give the individual a sense of control over uncomfortable bodily sensations and potentially distressing mental images (Rashtbari and Saed, 2020). However, as the worry becomes an automatic response to stressful events, this sense of control might diminish, instead leading to the individual being controlled by the worry instead of controlling it (Hallion et al., 2017). This difficulty of experiencing emotions is shared across both models explaining anxiety.

On the other hand, the emotion dysregulation model focuses on the beliefs which individuals carry about emotions and emotional dysregulation (Deleurme et al., 2022). According to the model, people with GAD experience their emotions at a higher intensity than others and struggle to differentiate between their individual emotions. Therefore, they lack strategies to regulate and control their emotions (Hofmann et al., 2012). It is theorized that these problems cause individuals to sustain negative beliefs about their emotions, leading them to fear them (Deleurme et al., 2022). This fear then leads people to avoid their emotions via worry, similar to the explanation given by the Contrast Avoidance Model (Erickson et al., 2023). The result is a continuous cycle of intense emotional experiences powered by negative reinforcement. Experiencing emotions causes anxiety, which causes worry to control the anxiety, which maintains emotion dysregulation in a vicious cycle (Deleurme et al., 2022). Emotion dysregulation has been linked to various psychopathological conditions, among them

anxiety, and thus has the potential to impact the lives of affected individuals severely (Agako et al., 2022). Individuals become overwhelmed with their emotions and struggle to deal with them adequately.

A common theme of anxiety theories is the individual not dealing with experienced emotions adequately, they are feared, dismissed, or avoided by worrying instead (Behar et al., 2009). Avoiding unpleasant internal experiences is called experiential avoidance and can lead to behavioural restrictions, meaning that the individual does not engage in certain behaviours due to their worry and anxiety (Behar et al., 2009). This leads students to miss out on social and academic chances and personal development, as well as not living their lives in a personally meaningful way (Wilmer et al., 2021). One aspect of engaging in meaningful behaviour is by practising valued living.

Valued Living

Valued living is characterized by engaging in daily intent actions that agree with one´s personal values (Wilson et al., 2010). These values are individual, differing between each person (Ceary et al., 2019). Behaviour in various situations is guided by personal values, leading life paths in aspired directions (Ceary et al., 2019). It is important to note, that values are not something people strive to achieve but ethical standards that individuals apply (Ceary et al., 2019). Personal values provide individuals with a framework, facilitating quick-decision making that aligns with their beliefs and long-term behaviour. Values can support individuals with direction, meaning and purpose in life, providing the groundwork for authentic happiness and optimal functioning. People who live in line with their values have been shown to have greater psychological well-being (Firestone et al., 2019). Incorporating valued living in students' lives therefore has the potential to improve their mental prosperity.

One way to increase valued living is via psychological interventions, which can connect an individual to the values they find personally meaningful. The encouragement of

meaningful actions to implement these values has shown benefits for various populations, including university students (Firestone et al., 2019). For student populations, online interventions are especially promising, as receiving mental health care digitally fits within their increasingly digital lifestyle (Parlak Sert and Başkale, 2022). This has some advantages over traditional face-to-face counselling as internet-based interventions are often free of charge and can be accessed from anywhere with an internet connection (Nguyen-Feng et al., 2017). By being able to use online interventions in their own time and place, stigma and access barriers such as transportation can be reduced (Nguyen-Feng et al., 2017). Online interventions have the potential to bring valued living to students in a straightforward way by meeting the students in their daily lives.

There have been some online interventions using valued living to increase well-being aspects, however, this has been mostly done in combination with other intervening concepts such as within Acceptance and Commitment Therapy (ACT) (Howell and Passmore, 2018). For example, in their ACT review Hayes et al., (2012) mention the application of values but only in combination with similar approaches. Including valued living in interventions has shown promising results and researchers reported reduced levels of anxiety (Graham et al., 2014). However, there is a lack of research investigating whether valued living as the main component has the potential to reduce anxiety symptoms. As a result, the relationship between valued living and anxiety remains largely unclear.

As mentioned priorly, anxiety symptoms can lead to a compromised lifestyle, where students miss out on personally meaningful and rewarding experiences (Wilmer et al., 2021). Living in accordance with one´s values might be a way to counteract this, as valued living can reduce anxiety symptoms (Hamdullah Tunç et al., 2023). A possible explanation for this is that daily value-based actions improve overall mental health outcomes such as psychological distress and well-being (Grégoire et al., 2021). Additionally, researchers have found that

valued living promotes resilience in students, which is defined as the ability to adapt to stressors (Ceary et al., 2019). Adapting to new situations is key in valued living, as it often brings the individual practising it into new circumstances.

The Ability to Adapt

The ability to adapt refers to an individual's capability to readjust to challenging events and react appropriately to the psychosocial consequences (Franken et al., 2023). Personal resources can impact how long the adaptation process lasts and how severely the individual is impacted by it (Perrig-Chiello et al., 2014). These resources include, among others, values (Bohnmeijer and Westerhof, 2021). However, there are also barriers to successful adaption, mainly negative biases in thinking such as dysfunctional beliefs about oneself and the world, suppression of emotions and avoidance behaviour (Bohnmeijer and Westerhof, 2021). Consequently, the ability to adapt may be positively influenced by valued living.

The process of adjustment can be explained using Roy´s adaption model, where adaption is seen as an iterative process, in which the individual and environment constantly interact (DeSanto-Madeya and Fawcett, 2009). The individual has physiological and psychosocial needs, mainly they need to regain a concept of their self, find their role in the situation and establish interdependence (Franken, et al., 2023)**.** Successful adaption is based on the integration of internal stimuli like thoughts and feelings with the environment and can be seen as achieving dignity and integrity in the situation (Franken, et al., 2023)**.** Briefly, a person is seen as an adaptive system, which either adequately or ineffectively responds to stimuli (Perrett and Biley, 2013). Further, what makes a situation challenging for a person, is when the characteristics of that situation bring the person´s resources out of balance. This imbalance forces the individual to adapt to the challenge, by reassorting their needs (Franken, et al., 2023). The ability to adapt is therefore dependent on the individual's ability to regulate

their emotions (Franken, et al., 2023). Concluding, adapting to new circumstances is a crucial ability, which allows the individual to navigate through different situations in life successfully and their available resources impact their ability to adapt.

As mentioned above, values in the form of personal assets may impact the adaptation process of a person. The sustainable mental health model proposed by Bohlmeijer and Westerhof (2021) suggests a relationship between valued living and the ability to adapt. The model was created within the positive psychological realm, relating interventions like valued living to resources, which influence the ability to adapt (Bohlmeijer and Westerhof, 2021). The model shows how utilising resources can influence mental well-being and illness by enhancing adaption processes. This suggests that increased valued living levels could increase in the ability to adapt.

The purpose of this research is to examine the relationship between the ability to adapt, valued living and anxiety. This far, researchers have only reported a decrease in anxiety, after interventions that included valued living (Hayes et al., 2012). Whether valued living as a main component of an intervention can impact anxiety has not been established yet. Further, a relationship between valued living and the ability to adapt has only been theorized in the sustainable mental health model, with no empirical evidence yet (Bohlmeijer and Westerhof, 2021). Investigating these relationships has the potential to understand specifically how valued living interacts with anxiety and the ability to adapt. This knowledge can be useful to understand anxiety in students better, as for now, it remains largely unclear how valued living as an intervention's main component influences anxiety symptoms and the ability to adapt in students. Understanding this interaction may provide a reference point for potential solutions for anxiety problems as well as a way to foster the ability to adapt. Applying an online intervention to increase valued living in students can provide data about how the three concepts impact in a student´s daily life.

The research question of this thesis is therefore:

What is the relation between valued living, the ability to adapt, and anxiety in students attending a Dutch university between the ages 18- 25?

With the hypotheses:

I. After the valued living intervention, valued living is significantly higher than at pre-assessment.

II. After the valued living intervention, the ability to adapt is significantly higher than at pre-assessment.

III. After the valued living intervention, anxiety is significantly lower than at pre-assessment.

Methods

This study was part of a larger research project. Other concepts were measured within this project, which are included in the methodology to assure completeness. This mostly impacts the study design, materials and procedure, but as they are not needed for the study at hand, they will only be mentioned briefly and not further described.

Design

The study aimed to administer a randomized controlled trial (RCT) and used a three-group pre- post-intervention design (Aggarwal and Ranganathan, 2019). Participants answered pre-assessment survey questions, among them questionnaires that measured valued living, the ability to adapt and anxiety. Then they were randomly allocated to either the control group, intervention group 1, or intervention group 2. All three groups were interacting with the Twente Intervention and Interaction Machine (TIIM) app, which is later described in more detail. However, the control group only received assessment questionnaires and reminders, while the two intervention groups were receiving valued living audio exercises

additionally. Both experimental groups received the intervention in the same manner, except for the notes the participants took of their values. Intervention group 1 was instructed to write down and later re-read five of their personal values while intervention group 2 was asked to take and later look at the photographs that reminded them of their five personal values, so that each value was represented in one photograph. After the week-long online intervention was concluded, all three groups answered the same assessment survey questions again, which constituted the post-assessment. Ethical approval was given by the Ethics Committee of the University of Twente (Application Nr. 240732), the data collection lasted from the 21st of October until the 28th of November 2024.

Participants

The participants were reached by using snowball convenience sampling, applying various methods to promote the study. Firstly, participants were either asked to participate personally by one of the researchers or heard about the study by one of the researchers announcing the study (the researchers shared the link to the study online via WhatsApp and Instagram). Secondly, the study was also promoted on the campus of the University of Twente. This included posters and flyers around the campus, particularly focusing on places frequently visited by students. Third, the researchers also promoted the study themselves on campus, presenting the study to students and inviting them to join. Lastly, the participants could also discover the study on their own in the Test Subject Pool of the Behavioural, Management and Social Sciences (BMS), which granted them 2.5 study credits after completion of the study. The total time the study was available for participants to access was 38 days, from 21st October 2024 to 28th November 2024.

Inclusion and Exclusion Criteria

To be included in the study, participants needed to be at least 18 years old, enrolled as a student at a university in the Netherlands, be fluent in English, have access to a mobile device and the internet and be familiar with and could use the technology of daily life.

Participants who were diagnosed with major depressive disorder, bipolar disorder, schizophrenia or borderline personality disorder were excluded from the study. Additionally, students were excluded if they took psychiatric medication, exhibited suicidal thoughts, had attempted suicide in the past, or were undergoing psychological or psychiatric treatment at the time of participation.

Materials

To measure the relevant concepts the General Anxiety Disorder Scale-7 (GAD-7), the Generic Sense of Ability to Adapt Scale (GSAAS) and the Engaged Living Scale (ELS-16) were used. For the implementation of the intervention, valued living exercises were needed, as well as reminders and daily assessment questions (details can be seen in the procedure section). Further, there were questions about socio-demographic data, asking about gender, age, educational level and nationality (details can be found in Appendix A). The intervention was delivered using the online survey software Qualtrics and the Twente Intervention and Interaction Machine (TIIM) (Cushman et al., 2021; BMS lab, 2024).

Additional materials are included in Appendix A and B. They consist of the informed consent form and socio-demographic questions (A), the intervention protocol, which includes the daily assessment questions, the transcripts of the audio instructions for the intervention and the daily reminders (B).

As the materials were used in different phases of the schedule, the respective times are indicated as well. For this the term Ecological Momentary Intervention (EMI) is used, meaning that intervention content was sent to the participants at crucial times. This consists of

EMI A, which are all activities for day one, EMI B, which refers to the exercise and respective questions of day two to nine, and EMI C, which constitutes the daily reminders from day two to nine. Figure 1 shows a concrete schedule.

Valued Living Questionnaire (ELS-16)

To measure the valued living levels, the Engaged Living Scale (ELS-16) was used (Trompetter et al., 2013). It consists of 16 items with the subscales for valued living (items 1-10) and life fulfilment (11-16). For this study, only the valued living subscale is relevant. One example item is “I know what motivates me in life.”. Participants rated the items on a 5-point scale, ranging from 1 (never) to 5 (almost always). The total score of the subscale is calculated by the sum of the items, with scores ranging from 10 to 50, with higher scores relating to higher valued living. The ELS-16 subscale of valued living has good internal consistency (Cronbach´s $\alpha = 0.86$) (Trompetter et al., 2013).

Ability to Adapt Questionnaire (GSAAS)

To measure the ability to adapt, the Generic Sense of Ability to Adapt Scale (GSAAS) was used (Franken et al., 2023). Participants rate their agreement on 10 items with a 5-point scale, which ranges from 1 (not at all) to 5 (completely). “I can cope well with the stress in my life.” is an example of an item. The total score is calculated as a sum of the 10 items and ranges from 10 to 50. The higher the score, the better the participant´s ability to adapt. The reliability is good (Cronbach’s $\alpha = 0.87$) (Franken et al., 2023).

Anxiety Questionnaire (GAD-7)

To measure anxiety symptoms, the General Anxiety Disorder Scale-7 (GAD-7) was used (Spitzer et al., 2006). It consists of 7 items, which are rated by the participant on a 4-point scale ranging from 0 (not at all) to 3 (nearly every day). The items ask about the symptoms in the last seven days, for example, “Not being able to stop or control worrying”. The sum of the questions provides the total score, which ranges from 0 to 21, respectively.

The higher the score, the higher the levels of anxiety the participant experiences. The reliability has been reported as very good (Cronbach α =0 .92) (Spitzer et al., 2006).

Twente Intervention and Interaction Machine

The Twente Intervention and Interaction Machine (TIIM) is a software developed by the Behavioural, Management, and Social sciences (BMS) lab, the social science innovation lab of the University of Twente (BMS lab, 2024). Interventions and questionnaires, including experience sampling method (ESM) studies, can be created and distributed with TIIM. Researchers access TIIM via the webpage, where the desired content can be created in the form of items, modules and interventions. These can be scheduled for specific times and timeframes. Participants are able to access these via the mobile app, where they engage with the content. Notifications allow for reminders for the participant to access activities on TIIM in time. The gathered data can be downloaded from the TIIM website (BMS lab, 2024).

Audio Exercises and Daily Assessment Questions

The audio exercises and daily assessment questions constituted the content which the participants received via the TIIM app each day during the intervention. Therefore, only the participants of the two intervention groups received the audios while the control group did not.

There were two different audio exercises, one for the first day of the intervention, and one for the days two to nine. The first one had the goal of clarifying the participant´s central values that were most important in their lives. An audio narrator asked the participants to mentally visualise themselves during the exercise in which they imagined themselves in a future scenario. The second audio exercise served as a reminder during the following days of those identified central values, encouraging the participants to connect with them. For this, they were instructed to imagine a scenario in their daily life in which they would apply their

personal values. Further details are provided in the procedure section and a transcript of both exercises can be found in Appendix B.

All three groups (control, intervention one and intervention two) received the daily assessment questions. These consisted of items regarding symptomatology, wellbeing and valued living being. Further, there were questions from the Values Practice Quality Scale (VPQS), which asked about the extent to which participants were able to use mental visualisation. The intervention groups additionally answered two open questions about the audio exercise.

Daily Reminders

For the days two to nine, the participants of all groups received three notifications throughout the day, to remind them of their values. This constitutes the EMI C. Entailed is the question "*Since the last notification, to what extent have you been consciously aware of your values?*" where the answer could be indicated ranging from 0% "Not at all" to 100% "Very much". This was followed by the instruction "*Now, take a moment and think about your central values.*", which participants could complete by clicking "*Ok*". All three groups (control, intervention 1, and intervention 2) received the reminders. The timely availability of the reminders can be seen in Figure 1. See Appendix B for details.

Procedure

The study and its intervention lasted for nine days and started with the baseline measurements on day zero.

Day Zero. Participants reached the beginning of the study via a direct link or QR code, which directed them to the study´s welcome page on the Qualtrics website. Next, they were met with the informed consent page, where the agreement to the conditions of the study was checked via a Yes or No answer. After agreeing, the participants were asked to create a code from which researchers could recognize their data entries. This was a combination of

their initials and the last three digits of their phone number. As this study had prototype-like qualities, the participants were asked to provide an email address and phone number through which the researchers could contact them in case of technical problems. After participants completed the intervention, this personal information was deleted, to ensure anonymity.

The sociodemographic questions followed, asking about participants' age, gender identity, education level, nationality, and whether they studied at a Dutch university. If the participant was not 18 or not a student at a Dutch university, they were directed to the end of the survey and did not proceed with the study, as they did not fulfil the target group requirement. Then followed the exclusion criteria. As those were not mentioned in the informed consent form, meeting one criterion brought the participant to the end of the survey, and they did not proceed with the study. After this, the participants encountered the psychological assessment questionnaires. The following concepts were covered in this order: anxiety (GAD-7 as described above), valued living (ELS-16 as described above), and the ability to adapt (GSAAS as described above). Next, the participants received their final message on Qualtrics, which provided an overview of the following steps of the study. They were directed to their E-mail inbox where detailed instructions on the instalment of and account creation in the TIIM app and sign-up for the study awaited them. This concluded day zero of the study.

Using the Study Randomizer Software (2017), participants were assigned to either the control group or one of the experimental groups. The participants were blinded about this, meaning that they did not know that there were different conditions to this study. The following intervention description only applies to the intervention group 1, as they are the focus of this thesis.

Intervention

Day One. The day after the pre-assessment questions and sign-up process in the TIIM app counted as the first day of the intervention. For this day, the participants had to complete one module (EMI A), which was available from 06:00 to 23:59 hours. Firstly, the participants were required to answer a set of assessment questions before and after the day's audio exercise. The assessment questions were categorized into symptomatology, well-being and valued living sections. The symptomatology questions consisted of two anxiety and two depression measuring questions from the respective questionnaires. For anxiety those were *"At this moment, to what extent are you feeling nervous, anxious, or on edge?"* and *"At this moment, to what extent you are not being able to stop or control worrying?"*. The questions were answered with a number slider ranging from 0% "Not at all" to 100% "Very much", and were part of EMI A.

Then, the participants received their values clarification exercise, for which a mental visualisation was used, asking the participants to imagine themselves in the future celebrating their 50th birthday. They are encouraged to imagine and feel that they lived a life to be proud of. They are surrounded by loved ones and imagine what they would most like them to say to the participant. The audio narrator guides the participant through three interactions with three different people. Each experience prompts the questions *"What does this person say about how you have lived this life?"*, *"What does this person say about what you have dedicated your time and energy to in recent years?"* and *"What does this person say about what you have found important in your life?"*. The audio ends by describing personal values as something the participants find valuable, prioritizable and motivating in their lives, explaining that these often become more visible in sentimental moments. The audio exercise was about 8:00 minutes long.

After the audio exercise followed the symptomatology, well-being and valued living questions again, as well as the VPQS and two open questions. An example for the VPQS is *"During the practice, I had many difficulties constructing the mental scene that I was using to clarify my values."*, which was rated using a number slider ranging from 0% "Not at all" to 100% "Very much". The open-questions followed, with the first asking the participant to write down keywords that their loved ones used to describe them. The second one encouraged them to name the five values that they thought were most important to their 50-year-old self. Both questions could be answered in the TIIM app via a text box. The answers to the second question were displayed again later for the participants to remember their values throughout the day. A transcription of day one (EMI A) can be found in Appendix B.

Day Two to Seven. The activities and schedules for the intervention days two to seven were identical for each day. It started with the assessment questionnaire similar to the one on the first day, with symptomatology, wellbeing and valued living being asked. Valued living, however, was reduced to two questions instead of four, asking only for value clarity and intent. Before the exercise, the participants were encouraged to read their values again, which they had previously noted.

This was followed by the audio exercise, which asked the participant to connect with what they felt was most important in their life, connecting with their central values. They were encouraged to think about why those values mattered to them and how they shaped their life. Then they were guided to visualize moments in their day, in which they could act according to their values. Lastly, they were supported to appreciate this connection with their values and to carry it through their day. The audio exercise was about 2:30 minutes long.

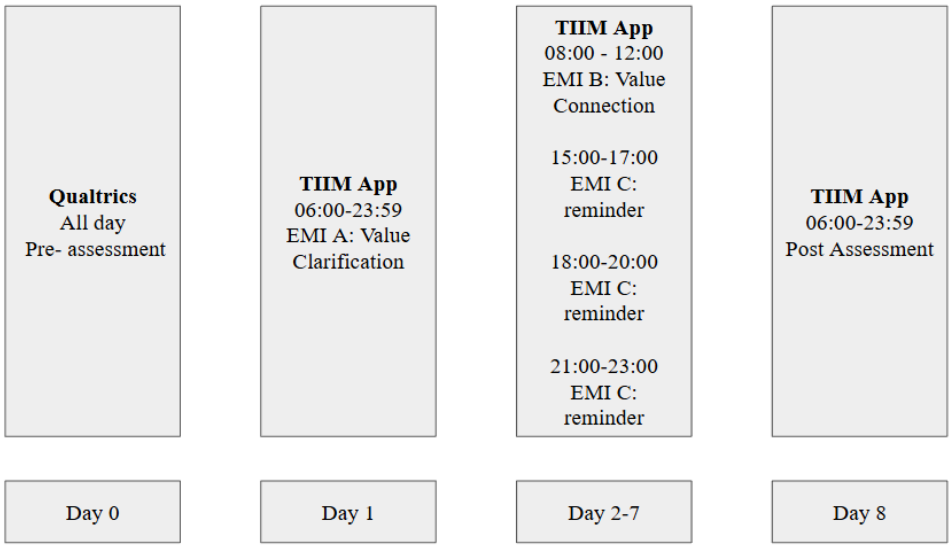
After the exercise, participants were asked where they completed the exercise via an open-question text box. Then followed the assessment questions (again only two valued living ones) and the VPQS, which were only the first four items instead of the previous ten. The

questions and corresponding audio exercise were available from 06:00 to 12:00 and were part of EMI B. Details can be found in Appendix B. Additionally, participants received three notifications throughout the day (EMI C), reminding them to keep in touch with their values. The intervention schedule can be seen in Figure 1.

Day Eight. The last day of participation included the same assessment questions the participants answered on day zero, to allow for a pre- and post-comparison. Details can be seen in Figure 1 and in Appendix A.

Figure 1

Timeline of the Intervention



Note: EMI A refers to the entirety of what is presented to the participant on day one, including the assessment questions and audio exercise. EMI B refers to the entirety of what is presented to the participant on day two, including the shortened assessment questions and the respective audio exercise. EMI C is the reminder, which content is always the same.

Data Analysis

In order to investigate and analyse the relationship between valued living, the ability to adapt and anxiety, the following data analysis used the R programme version 4.2.2 (Posit,

2023). The code can be found in Appendix C. Before starting the data analysis, adjustments were made to the data. This mainly concerned omitting some of the participants' answers, as participants who did not complete the questionnaires and intervention were still included in the datasets. Furthermore, the questionnaire´s textual answers were transformed into numerical data. Six new variables were created in R for the overall scores of the pre-assessment for the GAD-7, GSAAS, and ELS-16 and the overall scores of the post-assessment for these same questionnaires. Further, a data subset with these six variables and the participant´s demographics was created, which was used for the data analysis that corresponded to the hypotheses. The descriptive statistics mean, range, variance, and standard deviation were calculated. Then the parametric assumptions were considered, to ensure that the linear regression analysis of the two variables could be applied. The assumptions of normality and homoscedasticity were examined visually, as they were not met the Wilcoxon Signed Rank Test was used to calculate the p-value.

Hypothesis I: After the valued living intervention, the valued living is higher than at the pre-assessment.

To investigate this hypothesis, the pre- and post-scores of valued living (ELS-16 overall pre-score, ELS-16 overall post-score) were needed. The dataset was restructured into long format, and a linear mixed model was used to adequately work with this data. The linear mixed model accounts for the dependence between each participant´s pre- and post-score on valued living and ability to adapt. A dummy variable for valued living was created with t0 (pre intervention) as the reference category. An Intraclass Correlation Coefficient (ICC) was calculated, applying Bootstrapping Confidence Intervals to calculate variances. Fixed effects predictions were used to investigate the quality with which the model predicted the respective scores.

Hypothesis II: After the valued living intervention, the ability to adapt is significantly higher than at pre-assessment.

To investigate this hypothesis, the pre- and post-scores of the ability to adapt (GSAAS overall pre-score, GSAAS overall post-score) were needed. The dataset was restructured into long format and a linear mixed model was used to adequately work with this data. The linear mixed model accounts for the dependence between each participant´s pre- and post-score on valued living and ability to adapt. A dummy variable for valued living was created with t0 (pre intervention) as the reference category. An Intraclass Correlation Coefficient (ICC) was calculated, applying Bootstrapping Confidence Intervals to calculate variances. Fixed effects predictions were used to investigate the quality with which the model predicted the respective scores.

Hypothesis III: After the valued living intervention, the anxiety is significantly lower than at pre- assessment.

For the investigation of this hypothesis, the pre and post scores of the ability to adapt (GSAAS overall pre score, GSAAS overall post score) were needed. The dataset was restructured into long format and to adequately work with this data, a linear mixed model was used, which accounts for the dependence between each participant´s pre and post score on valued living and ability to adapt. For valued living, a dummy variable was created with t0 (pre intervention) as the reference category. An Intraclass Correlation Coefficient (ICC) was calculated, applying Bootstrapping Confidence Intervals to calculate variances. To investigate the quality with which the model predicted the respective scores, fixed effects predictions were used.

Results

Demographics

Overall, 93 students participated in the survey, of which 20 were part of the intervention group 1. Of those, 12 participants completed all pre-, post- and daily assessment questionnaires that were needed for this study so that their data could be used for the analysis.

This sample consisted mostly of German and Spanish participants (*n* = 6.50%, *n* = 3.25%), the rest varied in nationality (*n* = 3, 25%). The majority identified as women (*n* = 9, 75%), and the others as men (*n* = 3, 25%). Most of the students were pursuing a Bachelor´s degree (*n* = 8, 66.7%), the others followed a Master´s programme (*n* = 4, 33.333%). The age range was 18 - 25, with a mean of 21.8 (*SD* = 2.547).

Descriptive Statistics

Table 1 displays the results of the descriptive statistics.

Table 1

Pre and Post Intervention Variable Means, Standard Deviation, and Range

Condition/Variable	Pre-assessment		Post-assessment	
	M (*SD*)	Range	*M* (*SD*)	Range
Valued Living	34.1 (5.58)	27-44	37.6 (5.87)	31-48
Ability to Adapt	34.4 (7.18)	19-45	36.0 (5.83)	26-45
Anxiety	5.08 (4.46)	0-15	5.0 (5.34)	0-19

Note: M = mean, *SD* = Standard Deviation.

Inferential Statistics

In order to investigate the impact that the intervention had on valued living, the ability to adapt and anxiety, a linear mixed model was applied to each construct respectively. As the assumptions for normality and homoscedasticity were not satisfied, the Wilcoxon test was applied to find the p-value. An Intraclass Correlation Coefficient (ICC) was calculated, applying Bootstrapping Confidence Intervals to calculate variances. Fixed effects predictions were used to investigate the quality with which the model predicted the respective scores.

Hypothesis I: Valued living

The model calculations to determine whether the intervention had a significant effect on valued living produced the following results: The linear mixed model showed that the intervention had a significant positive effect on valued living scores (t = 2.39, p = 0.049), which improved by 3.5 (SD = 1.464, CI: 95%: 0.001, 6.999). This means that the intervention significantly improved the valued living of participants. Details can be seen in Table 2.

Table 2

Estimates of Valued Living

Variable/ Instrument	Pre *M* (*SD*)	Post *M* (*SD*)	*b* (CI: 95%)	*t(df)*	*p*
Valued Living	30.583 (2.650)	34.083 (1.464)	3.5 (0.001 to 6.999)	2.39 (11)	0.049

Note: *M* = mean, *SD* = Standard Deviation, *b* = Slope, CI = Confidence Interval, *t(df)* = t-value and corresponding Degrees of Freedom, *p* = p-value.

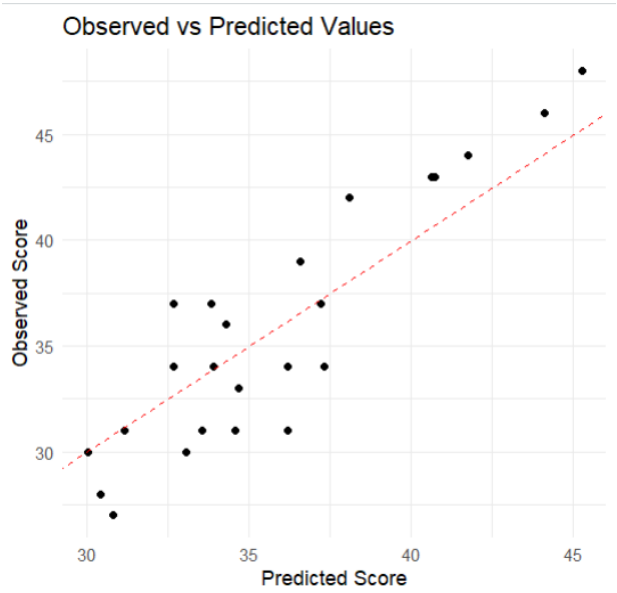
An ICC of 0.608 (CI: 95% 0.391, 0.944) was calculated, using Bootstrapping Confidence Intervals. This showed that 60.8% of the variance in valued living was due to the difference between individuals, while the remaining 39.2 may be due to residual differences. This suggests that a rather large part of the variance cannot be explained by the model used.

However, due to the relatively small sample size with only two measurements per individual, the ICC may be inflated and must be interpreted with caution. There may potentially be a different amount of explained and unexplained variance in valued living scores in the sample.

A fixed effects prediction was used to investigate the quality with which the model predicted valued living scores. As can be seen in Figure 2, the model predicts the observation to a decent extent, however, a difference can be seen between higher scores (higher than 40) and lower and mid-range scores. The latter were not as well predicted as the higher scores. This suggests that the model is more capable of predicting higher valued living scores, rather than lower ones. It therefore may not be fitted to predict scores within a lower to mid-range and should thus be interpreted with caution.

Figure 2

Fixed Effects Prediction for Valued Living



Note: The Figure plots the predicted scores on the X-axis against the observed scores on the Y-axis for the linear mixed model.

Hypothesis II: Ability to Adapt

The effect of the intervention on the ability to adapt is represented in the following results. An increasing effect of 1.583 (SD = 0.848, CI: 95%: 0.005, 3.171) units was found, however, it was not statistically significant (t = 1.867, p = 0.1014). This means that the intervention did not improve the ability to adapt for participants. Details are provided in Table 3.

Table 3

Estimates of the Ability to Adapt

Variable/ Instrument	Pre *M* (SD)	Post *M* (SD)	*b* (CI: 95%)	*t(df)*	*p*
Ability to adapt	32.833 (6.294)	34.416 (0.848)	1.583 (0.004 to 3.171)	1.867 (11)	0.1014

Note: *M* = mean, *SD* = Standard Deviation, *b* = Slope, CI = Confidence Interval, *t(df)* = t-value and corresponding Degrees of Freedom, *p* = p-value.

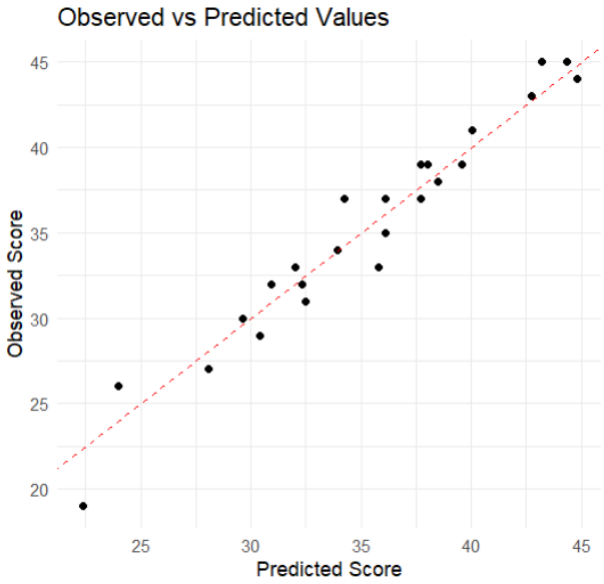
An ICC of 0.899 (CI: 95% 0.876, 0.992) was calculated, using Bootstrapping Confidence Intervals. This showed that 89.9% of the variance in the sample was due to the difference between individuals, which the model accounted for. The remaining 10.1% may be due to residual differences, a variation that the model is not able to explain. However, due to the relatively small sample size with only two measurements per individual, the ICC may be inflated and must be interpreted with caution. The actual variation may differ from this output.

A fixed effects prediction was used to investigate the quality with which the fixed and random effects predicted the scores of the ability to adapt. As can be seen in Figure 3, the model has a strong predictive power for the ability to adapt scores, however towards the lower end (20-25) this quality slightly diminishes. This means that the model can accurately predict

the scores, however, there may be some outliers or problematic areas towards the lower scores, which the model cannot predict as well.

Figure 3

Fixed Effects Prediction for the Ability to Adapt



Note: The Figure plots the predicted scores on the X-axis against the observed scores on the Y-axis for the linear mixed model.

Hypothesis III: Anxiety

After the intervention, the model reported a decreasing effect of -0.083 (SD = 0.753, CI: 95%: -0.166, -0.167) for anxiety, which was not statistically significant (t = -0.111, p = 0.918). Therefore, it can be concluded that the intervention did not reduce anxiety symptoms in participants. Table 4 shows the details.

Table 4

Estimates of Anxiety

Variable/ Instrument	Pre *M* (SD)	Post *M* (SD)	*b* (CI: 95%)	*t(df)*	*p*

Anxiety	5.167 (1.776)	5.167 (1.776)	-0.083 -(0.167 to -0.167	-0.111 (11)	0.918

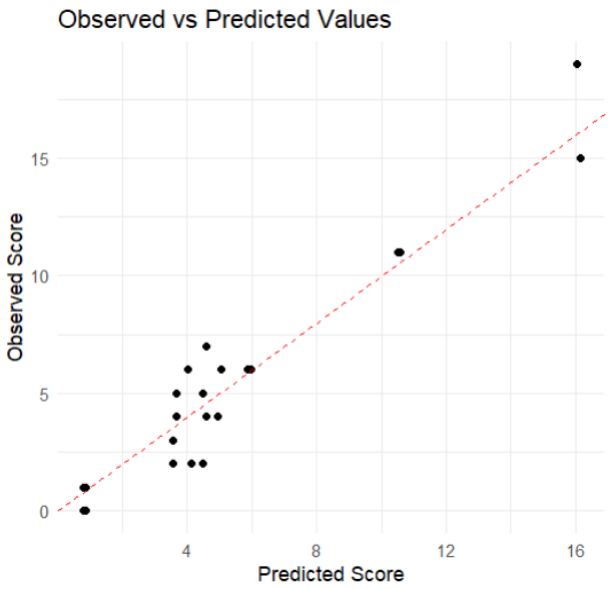
Note: M = mean, *SD* = Standard Deviation, *b* = Slope, CI = Confidence Interval, *t(df)* = t-value and corresponding Degrees of Freedom, *p* = p-value.

An ICC of 0.859 (CI: 95% 0.792, 0.995) was calculated, using Bootstrapping Confidence Intervals. This showed that 85.9% of the variance was due to the difference between individuals, while the remaining 14.1 may be due to residual differences, which are unaccounted for by the model. However, due to the relatively small sample size with only two measurements per individual, the ICC may be inflated and must be interpreted with caution.

A fixed effects prediction was used to investigate the quality with which the model predicted anxiety scores. As can be seen in Figure 4, the model predicted lower scores of anxiety (0-5) more accurately than higher scores (>10), suggesting that the model may not reliably present the relationship between the intervention and anxiety scores for higher values.

Figure 4

Fixed Effects Prediction for Anxiety



Note: The Figure plots the predicted scores on the X-axis against the observed scores on the Y-axis for the linear mixed model

Discussion

The objective of this study was to investigate the relationship between valued living, the ability to adapt and anxiety in university students. The results indicated a significant positive effect on valued living after the intervention as compared to before. This result is in line with the hypothesis; however, this increase cannot be attributed to the intervention with certainty, as the sample size is very small. For the ability to adapt, no statistically significant effect was found, therefore the intervention was not able to improve the ability to adapt in participants. The intervention also had no significant effect on anxiety; therefore, it did not seem to impact anxiety in participants.

Aligning with the hypothesis and previous literature, the findings reported a significant positive effect of the intervention on valued living, which can be explained by the following considerations. Firstly, Firestone et al., (2019) implemented a single-session web-based intervention to increase valued living in students and reported a similar effect of increased valued living at follow-up measurement. The results are further supported by ACT studies, which reported increased valued living when including valued living exercises, however only in combination with other positive psychology treatments (Hamdullah Tunç et al., 2023; Wersebe et al., 2017). Nonetheless, it can be stated that the positive significant effect of interventions with valued living aspects on valued living has been reported consistently in a variety of studies (Hamdullah Tunç et al., 2023; Hayes et al., 2006). This indicates as to why the study at hand reported the same findings; it is supported by a variety of empirical research.

Further, there is the theoretical aspect behind valued living to consider. Firestone et al. (2019) suggest that the personal connections participants foster with their values during the

intervention provide them with a framework for guiding in-the-moment decisions so that they are more likely to engage with meaningful actions, which in turn impacts long-term behaviour. More concretely, by thinking about their values in a quiet moment (such as during the audio exercises), participants are more able to quickly decide on action in line with their personal values when faced with decision-making in an everyday-like situation. Additionally, Firestone et al., (2019) found that better outcomes in valued living have been associated with participants choosing more personally relevant values rather than values overall. As the exercises in the intervention of the current study focused on personal values the participants chose and prioritized themselves, this might have been an important factor in producing a significant positive effect.

For the ability to adapt, the reported findings are not confirming the hypothesis, that a valued living intervention leads to increases in the ability to adapt. This is not in line with the previously reviewed literature. Bohlmeijer and Westerhof (2021) suggested in their sustainable mental health model, that there may be a relationship between valued living and the ability to adapt, with personal resources as a mediating variable. However, until now, the relationship has never been empirically tested. But psychological flexibility has been related to valued living (Finkelstein-Fox et al., (2019). While psychological flexibility is not the same as the ability to adapt, as a personal resource it may promote adaptability (Bohlmeijer and Westerhof, 2021). It was hypothesised that increased valued living would, therefore, also lead to an increase in the ability to adapt. Still, the findings suggest that this may not be the case, as no significant increase in the ability to adapt was found after the valued living intervention. A possible reason for this is suggested by Graham et al., (2014), who theorise that psychological flexibility may partly be promoted if the individual is fully present in their current environment, rather than being distracted by their thoughts. The effect of valued living on the ability to adapt may have been disrupted by psychological inflexibility due to a disconnected feeling within the individual (Bohlmeijer and Westerhof, 2021; Graham et al.,

2014). Similarly, negative thinking biases, avoidance behaviour and suppression of emotions are suggested to inhibit the ability to adapt (Bohlmeijer and Westerhof, 2021). If participants exhibited high levels of those barriers, it may be that the valued living intervention did not impact adaptability in a significant matter. Lastly, another feasible cause for the lack of an effect found, is that the connection between the psychological flexibility and the ability to adapt may be weaker than initially expected. It is also possible, that the suggested relationship between valued living and the ability to adapt, does not have the strength theory suggests.

Additional points are to be considered for the lack of an effect on the ability to adapt. Firstly, the sample size was very small, with only 12 participants it is improbable to gain enough statistical power to produce significant results (Kwak and Kim, 2017). Secondly, the fixed effects prediction showed, that the model was better able to predict higher scores in the ability to adapt, rather than smaller ones. One possible explanation for this is, that other factors are playing a role in the relationship between valued living and the ability to adapt, that the model did not account for. As mentioned, a possible factor might be psychological flexibility (Finkelstein-Fox et al., 2019). If it plays indeed a role in this relationship, not including it in the model might have led to the non-significant findings.

The findings reported for the effect of the valued living intervention on anxiety do not confirm the hypothesis. They also do not match the previously reviewed literature. For example, Graham et al., (2014) reported a substantial reduction in anxiety after their value-based intervention. Similarly, Hamdullah Tunç et al., (2023) found that valued living and anxiety had a negative correlation. The study at hand was not able to support the direction of those findings. It might be the case that the valued living exercises did not affect anxiety because the mechanisms behind anxiety nullified the attempt to increase valued living. As anxiety is defined as a chronic worry and with avoidance as a coping strategy, the individual may find it difficult to engage with the feelings they experience when thinking about their

personal values (Donker et al., 2011; Erickson et al., 2023). As Graham et al., (2014) suggest, the individual may consequently engage in anxiety-based stress-controlling ways to reduce distressing thoughts and feelings, and this coping behaviour of anxious individuals is often divergent from their personal values. The participation in a valued living exercise might trigger anxiety-based coping strategies for dealing with distressing emotions, thus counteracting the effects of the valued living exercises. Additionally, in their 2018 report, Burke et al., found that participants reported an increase in anxiety when partaking in an online intervention, due to them monitoring their anxiety so closely. It is possible, that the anxiety of participants negatively impacted the perception of the valued living intervention, which thus resulted in a non-significant negtative effect.

Further, there may be a discrepancy between participant´s needs and the aspects the intervention covered. The research of Burke et al., (2018) supports this, as participants named a mismatch between their personal anxiety experiences and the intervention material as hindering in an internet-delivered intervention. Especially personality characteristics can impact the effectiveness of interventions (Bendelin et al., 2011). Also, in their qualitative study, Walsh et al., (2018) report that participants may not have the ability to connect to the positive aspects of the intervention and that their more negative disposition or outlook on life may hinder the engagement with an intervention based on positive psychology. In addition, it is noted that the identification of positives (such as personal values in this study) is crucial for the match between the intervention and the participant (Walsh et al., 2018). If there is no such fit, the participant may feel misunderstood or dismissed, which could be reflected in the found non-significant decrease in anxiety.

Similar to the ability to adapt, the lack of a significant effect on anxiety may be due to the small sample size. The resulting lack of statistical power to detect a relationship between valued living and anxiety is likely to have caused the non-significant finding (Kwak and Kim,

2017). Moreover, the model did not predict scores consistently. The fixed effects prediction showed that the model was sufficient at predicting lower anxiety scores but was not good at predicting higher ones. One explanation for this is an unaccounted complexity in the relationship between valued living and anxiety. Applying the sustainable mental health model, a relationship between values living and anxiety can be established with the ability to adapt as a mediator. Shortly, it is possible that valued living influences the ability to adapt, which influences anxiety in turn. The model used in this study at hand did not include the ability to adapt when investigating the relationship between valued living and anxiety. Therefore, it might underestimate the relationship between them, which may have led to decreased statistical power.

Further, the sample characteristics must be considered. In a related study, Hamdullah Tunç et al., (2023) reviewed the effect of valued living on anxiety and reported that the population and mean age were significant moderators of the relationship between valued living and anxiety. They stated that younger age weakened the association between valued living and anxiety. As previously reported, the mean age of the study at hand was 21.8 (SD = 2.547), while Hamdullah Tunç (2023) reported a weighted average mean age of 34.26, making it significantly higher. The low mean age of the study at hand therefore might have led to a reduced and thus non-significant relationship between valued living and anxiety.

Limitations

There are at least three potential limitations regarding the results of this study. First, is the duration of the intervention. As it only lasted one week, it might not have had a significant lasting effect on the participants. As the post-assessment took place the very next day after the intervention ended, and no follow-up assessment was done, it is not clear whether the elevated levels of valued living will last and how exactly diminishment would impact the participant´s levels of other variables such as the ability to adapt and anxiety (Posternak and Zimmerman,

2007). If the intervention would have lasted longer, there would possibly be a greater observation of increased valued living and ability to adapt, and decreased anxiety. Furthermore, a follow-up measurement would have given additional information about the impact of the intervention after it ended (Posternak and Zimmerman, 2007). The current study might have not provided the participants with enough time to explore their values in a way that significantly affects their ability to adapt and anxiety symptoms.

Secondly, the intervention may not fit with the participant´s needs. In their 2018 study, Burke et al., describe intervention material that does not align with participant´s personal experience as a hindering aspect in internet-delivered interventions. More specifically, certain personalities and attitudes have been found to impact the participant´s responses to such interventions (Bendelin et al., 2011; Rochlen et al., 2004). The current study required the participants to engage with the intervention multiple times a day, which may have been perceived as disturbing. This may impact their attitude to perceive the intervention as having more inconveniences than helpful benefits. Similar issues with intervention structures have also been reported by Burke et al., (2018). On the other hand, the same authors found that psychoeducation was perceived as helpful, and the lack of it in the present study may have resulted in nonunderstanding and disregard of the amount of content and notifications.

Lastly, an overarching concern is the small sample size. One reason for this is the difficulty of recruiting students. As Khatamian Far (2018) showed, students evaluate the costs and benefits of participation when considering participation. It is possible that students evaluated the study design as having more costs than benefits and thus they decided against participation (Khatamian Far, 2018). Additionally, the study design divided already scarce participants further into conditions, leaving a reduced number of observations for intervention group 1, which was considered in this study. A small sample size increases the risk of statistical error and false results (Faber and Fonseca, 2014). Therefore, the results of this study

should be treated with caution. Further, the generalizability is severely impacted. With a larger sample size, more statistical power could have been obtained, which would have led to greater certainty of and confidence in the results. Additionally, the representativeness and generalizability would be improved as well.

Strengths

Regarding the strengths of this study, firstly, is has produced outcomes that are not in line with the current scientific theories about the relationships between valued living, the ability to adapt and anxiety, which may give rise to new questions regarding aspects of those theories. For instance, the factor of psychological flexibility might also be involved in the relationship. This study was the first to empirically investigate the relationship between valued living and the ability to adapt and brought forward several considerations between the two concepts. This is similar to the relationship between the ability to adapt and anxiety, which has not previously been empirically investigated; of the proposed model only valued living and psychological flexibility have been considered as an influence of anxiety (Hamdullah Tunç et al., 2023; Masuda and Tully 2011). The research at hand therefore has the potential to serve as a starting point for future research when considering the relationship between valued living, the ability to adapt and anxiety.

Secondly, the TIIM app constitutes a significant strength. Via the web application, the researchers were able to create all questionnaires, reminders and exercises themselves and could deliver the intervention directly to the participants (BMS lab, 2024). The use of the TIIM app enabled the researchers to build the study directly without a developer or programme designer, as is common for such studies (van Agteren et al., 2021). The result is a more direct approach to the implications of data gathering and participant overview. By creating the intervention themselves, the researchers could solve problems as they arose, check for important details and make decisions with a keen understanding of the

consequences within the intervention design and delivery. Further, the direct involvement of the researchers in the implementation of the intervention and its software details reduced the obstacles of communication problems, that may arise with a developer or programme designer (Maudet et al., 2017). All this contributed to a straightforward and time-efficient manner when realizing the intervention.

Third, this study is one of very few to implement a valued living intervention without additional ACT exercises. This gives weight to the intervention and corresponding increase of valued living, as it can be certain that the two interacted. Previous interventions only implemented valued living in combination with other factors, mostly within ACT (Onnink et al., 2022). While these studies were able to show an increase in valued living after an intervention, the study designs do not allow for a clear interpretation of whether these increases are due to the valued living or other factors used in the study (Hsu et al., 2023). The study at hand, however, allowed for an investigation of the impact of valued living without interfering factors, meaning that the increase in valued living after the intervention was due to the corresponding exercise and not another unaccounted determinant. This is a contribution, which many other studies that investigated valued living did not provide (Klimczak et al., 2023). Only including one positive psychological concept allowed for a certainty of cause and effect that similar studies have not produced this far.

Directions for Future Research

This research showed that valued living interventions outside of ACT can have an impact on valued living for participants and gave rise to new considerations regarding the objective, which was to investigate the relationship between valued living, the ability to adapt and anxiety. The investigation was limited by the small sample size, and therefore the first direction for future research is to ensure a sufficient sample size, in order to be able to meaningfully conclude on the measured variables.

Further, as previously mentioned, a possible implication for the model of valued living and the ability to adapt was that it did not include an additional factor. One candidate to include in future research is psychological flexibility. Bohlmeijer and Westerhof (2021) argue that psychological flexibility promotes the ability to adapt, and Finkelstein-Fox et al., (2019) showed that valued living is related to psychological flexibility. Including psychological flexibility as a variable in future research and including it in the model with valued living and the ability to adapt can provide more insight into whether this theory holds, and how exactly this relationship might work.

As seen earlier, the model of valued living and anxiety might also benefit from an additional factor, that is the ability to adapt. Applying the sustainable mental health model by Bohnmeijer and Westerhof (2021) a mediation relationship can be theorised. As valued living increases cognitive and emotional resources, it promotes the ability to adapt (Bohlmeijer and Westerhof, 2021). The latter then influences anxiety (Bohlmeijer and Westerhof, 2021). In their meta-review, Hamdullah Tunç et al., (2023) found a relationship between valued living and anxiety, however, it was only a negative small to medium correlation. Including the ability to adapt as a mediator, as suggested by Bohlmeijer and Westerhof (2021), may give more information about this relationship.

As it was hypothesized for the relationship between valued living and the ability to adapt that psychological flexibility also factors into this relationship, it would be wise to include it in a model that also measures anxiety. Taking the two points together, it is suggested to create a model consisting of valued living, psychological flexibility, the ability to adapt and anxiety. A consideration of this model might provide additional insight into the interplay between the variables.

A point to consider about the study design is how participants engage with the intervention. As Viskovich et al., (2021) point out, gathering and evaluating data about how

the participants complete the exercises of interventions can be helpful. Especially for online environments, it is a considerable factor, as participants rely on self-identification, enrolment and motivation to complete the exercises (Viskovich et al., 2021). Including measurements for this would allow for insights into the feasibility of the intervention, which is an important consideration regarding the small sample size. Adding aspects of psychoeducation about the measured concepts has been shown to support the participants further (Burke et al., 2018). Additionally, using a qualitative research method to gather data about how participants interpret the measured concepts and their intrinsic reasons for choosing specific answers can be helpful in interpretation. The latter point is especially important in light of Firestone et al., (2019) findings, that values that are more personally relevant show a greater impact in interventions, and the suggested hindrances by Burke et al., (2018) such as a mismatch between participant´s needs and online interventions, which impacts the effect of the intervention.

Conclusion

The objective of this research was to investigate the relationship between valued living, the ability to adapt and anxiety. Data was gathered by a randomized controlled trial, with 12 participants being considered in the analysis. Linear mixed models together with a Wilcoxon test were applied to test the hypotheses. Additionally, an ICC and fixed effects predictions were used. This brought forward a significant positive effect of the intervention on valued living. No significant effects on the ability to adapt and anxiety were reported. Conclusively, it can be said that while much remains unknown about the relationship between valued living, the ability to adapt and anxiety, this study was able to make some progress in investigating the interplay between them. More research is needed to further narrow the research gap.

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Appendices

Appendix A: The Materials

Informed Consent Form

Being of legal age, I agree to the following:

1) I have been informed of the characteristics of this study titled: "Capturing What Matters: Fostering Quality of Practice in a Values-Based Positive Intervention." Click the following link to read more about the study: InformedConsent143

2) I have read and understood the study information and my questions have been satisfactorily answered.

3) I voluntarily consent to participate in this study and understand that I can refuse to answer questions or withdraw at any time without providing a reason.

Furthermore, the following points are clear to me:

- I understand that participation requires using the Qualtrics platform and TIIM app for a week, receiving notifications, and completing questionnaires.
- All collected data will be anonymous and untraceable to my identity.
- The information I provide will be used only for teaching, research, or publication.
- I acknowledge the potential risk of mental discomfort when discussing sensitive topics, such as past personal experiences.
- I agree not to share details of the study to avoid affecting its results.
- I give permission for my answers to be archived for future research and learning.
- I consent to being contacted for future studies.

By virtue of these conditions, I agree to participate in this study by clicking YES:

Socio-Demographic Questionnaire

Age

[*number input*]

Gender

- Women
- Man
- Non-Binary
- Other, *Please, specify*:

  [*Text Field*]
- I prefer not to specify

Marital Status

- Single
- Informal Relationship
- Married or in a civil partnership
- Separated or divorced
- Widowed
- Other, *please, specify*:

  [*Text Field*]

Educational Level

- Undergraduate student (Bachelor´s degree)
- Postgraduate student (Master´s degree)
- Doctorate student (PhD or equivalent)
- None of these

University

Are you currently enrolled in a Dutch university (e.g., University of Twente or another…)?

- Yes
- No

Nationality

- Dutch
- Other. *Please, specify*:

  [*Text Field*]

Engaged Living Scale (ELS-16)

Over the last week…

1/10 … I have valued that give my life more meaning.

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

2/10 …I knew what motivated me in life

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

3/10 …I knew which values were important to me

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

4/10 …I knew exactly what I wanted to do with my life

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

5/10 … I made choices based on my values, even if it was difficult.

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

6/10 … I knew exactly how I wanted to live my life.

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

7/10 … I was very clear about what I wanted to do with my life

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

8/10 … my values were truly reflected in my behaviour

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

9/10 … the way I behaved matched my personal needs and desires.

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

10/10 … unpleasant emotions did not stop me from doing what I found important.

1 = never

2 = seldom

3 = sometimes

4 = regularly

5 = often

6 = (almost) always

The Generic Sense of Ability to Adapt (GSAAS)

Read the following items and rate the extent to which they generally describe you.

1/10 I can cope well with adverse circumstances

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

2/10 I feel energetic.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

3/10 I see plenty of interesting challenges.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

4/10 I can cope well with the stress in my life.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

5/10 I have an influence over my personal circumstances.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

6/10 I can easily handle setbacks.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

7/10 If something unexpected happens, I can easily adapt.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

8/10 I can cope well with the stress in my life.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

9/10 If I encounter difficulties, I can find a way out.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

10/10 If I want something, I go for it.

1 = not at all

2 = somewhat

3 = reasonably

4 = mostly

5 = totally

General Anxiety Disorder Scale-7 (GAD-7)

Over the last week, how often have you been bothered by the following problems?

1/7 Feeling nervous, anxious or on edge.

0 = not at all

1 = several days

2 = more than half the days

3 = nearly every day

2/7 Not being able to stop or control worrying.

0 = not at all

1 = several days

2 = more than half the days

3 = nearly every day

3/7 Worrying to much about different things.

0 = not at all

1 = several days

2 = more than half the days

3 = nearly every day

4/7 Trouble relaxing.

0 = not at all

1 = several days

2 = more than half the days

3 = nearly every day

5/7 Being so restless that its hard to sit still.

0 = not at all

1 = several days

2 = more than half the days

3 = nearly every day

6/7 Becoming easily annoyed or irritable.

0 = not at all

1 = several days

2 = more than half the days

3 = nearly every day

7/7 Feeling afraid as if something awful might happen

0 = not at all

1 = several days

2 = more than half the days

3 = nearly every day

Appendix B: The Intervention Transcriptions

EMI A: Availability from 06:00 – 23:59

1/13. At this moment, to what extent are you feeling nervous, anxious, or on edge?

2/13. At this moment, to what extent you are not being able to stop or control worrying?

3/13. At this moment, to what extent are you feeling little interest or pleasure in doing things?

4/13. At this moment, to what extent are your feeling down, depressed or hopeless?

5/13. At this moment, what is your level of well-being?

6/13. How happy do you feel right now?

7/13. At this moment, to what extent are you satisfied with your life?

8/13. At this moment, to what extent are you feeling that your life has a sense of direction or meaning to it?

9/13. At this moment, how easy is it for you to identify the values that drive your life?

10/13. In the last 24 hours, to what extent have you been consciously aware of your values?

11/13. In the last 24 hours, how many of your actions have been aligned with your values?

12/13. And how aware were you, while doing them, that you were acting according to your values?

13/13. To what extent do you INTEND to take actions aligned with your values in the following hours?

Intervention

Let's start with a first exercise. Press play and close your eyes (if you have them, we recommend using headphones).

[Audio starts] *I would like you to do an exercise that could help you clarify your central values that drive your life. This is a visualization to discover what you consider important in this life. People have all sorts of different experiences with this exercise. This visualization has proven to be revealing for some people, while for others it has simply confirmed something they have always known, or it has had no effect at all. So there are no right or*

wrong experiences, nor better or worse experiences. I just ask you to observe whatever arises within you. Are you ready?

Great, let's begin by closing your eyes or, if you prefer, you can fix your gaze on a point on the floor. Take a moment to notice your breathing and how your body feels. (Pause). If you get distracted or notice your mind wandering, that's okay. Just notice and bring your attention back to this exercise. (Pause)

Let's start by visualizing your own figure in front of you, in that mental visual space (pause). When you have your figure, imagine that we are moving forward in time. Picture yourself aging and growing older as the years pass. You have reached the age of 50 and observe how your figure looks again—what do you look like? I will ask you to become, for a moment, that figure, and start to feel yourself in that body in the first person (pause). Now, imagine that you are celebrating this 50th birthday.

It has not been just any life, but a life that you would be proud to have lived. You have lived it your way, and you have decided and chosen how you wanted to live it, despite any difficulties that may have arisen. Take a moment to feel this. (pause)

The most special people to you, those you care about the most, have come to celebrate your 50th birthday with you. I invite you to imagine not who you think might be there, but who you would most like to be at your 50th birthday party. These people are here for you and because of you.

It is now time for several people to start dedicating words to you. Again, I am not asking you to imagine what they would probably say. I invite you to imagine what you would most like them to say. Imagine who is the first person you are visualizing to start.

Visualize how this person approaches you, stands in front of you, and takes a moment to speak. Observe the face. And try to really listen to what this person is going to say to you. And remember, imagine you have been living the life you chose and wanted. Listen, (1) What does this person say about how you have lived this life? (2) What does this person say about what

you have dedicated your time and energy to in recent years? (3) What does this person say about what you have found important in your life? And observe how you feel as you listen to their words.

Now imagine how a second person approaches. Who is this person? Observe the face and imagine what you would most like this person to say about the life you chose and wanted. Listen, (1) What does this person say about how you have lived this life? (2) What does this person say about what you have dedicated your time and energy to in recent years? (3) What does this person say about what you have found important in your life? And observe how you feel as you listen to their words.

Now imagine how a third person approaches. Who is this person? Observe the face and imagine what you would most like this person to say about the life you chose and wanted. Listen, (1) What does this person say about how you have lived this life? (2) What does this person say about what you have dedicated your time and energy to in recent years? (3) What does this person say about what you have found important in your life? And observe how you feel as you listen to their words.

Your values are what is important to you in life. This means that you determine what you believe is valuable and prioritized in your life, what makes everything worth it, and what motivates you. Values become more visible in our moments closest to our farewell. It is when we realize what truly deserves our time and energy. [Audio ends].

In relation to the audio: What are some of the words they have used to describe the person you have become and the life you have chosen to live? [OPEN QUESTION]

Thinking about what your 50-year-old self would say, what are the ways of acting or living during life that have been most important to you above all else, that is your values? Write down the 5 most important ones. For example 1) Spending quality time with my dog... When

you finish, take a screenshot of these values or write them down (on your notes app or on paper), as you will need them in the coming days. Then, continue to the next question. [OPEN QUESTION]

Post – 10' Audio Assessment

Where did you complete the practice?

1/10. At this moment, how easy is it for you to identify the values that drive your life?

2/10. To what extent do you INTEND to take actions based on your values in the following hours?

3/10. At this moment, what is your level of well-being?

4/10. How happy do you feel right now?

5/13. At this moment, to what extent are you satisfied with your life?

6/10. At this moment, to what extent are you feeling that your life has a sense of direction or meaning to it?

7/10. At this moment, to what extent are you feeling nervous, anxious, or on edge?

8/10. At this moment, to what extent you are not being able to stop or control worrying?

9/10. At this moment, to what extent are you feeling little interest or pleasure in doing things?

10/10. At this moment, to what extent are your feeling down, depressed or hopeless?

Standardized Questionnaire: VPQS (10 questions; Likert Scale 0-100%)

1/10. During the practice, I had great difficulty choosing the elements that shaped up the mental scene that I was using to clarify my values.

2/10. During the practice, I had many difficulties constructing the mental scene that I was using to clarify my values.

3/10. During the practice, I had great difficulty holding the mental scene that I was using to clarify my values.

4/10. During the practice, I had a hard time manipulating the mental scene that I was using to clarify my values.

5/10. During the practice, I managed to generate a sense of meaning and significance towards my life.

6/10. During the practice, I had great difficulty seeing clearly and in detail the mental scene that I was using to clarify my values.

7/10. During the practice, I felt that I was completely within the visualization, forgetting that I was in this room.

8/10. During the practice, I self-criticized myself for not being able to clarify with my values.

9/10. During the practice, I noticed a sense of vitality or expansion in my body.

10/10. During the practice, I perceived a great connection and sense of closeness with the mental scene that I was using to clarify my values.

You have completed your first session! Your participation is crucial to our study, and you are now closer to being rewarded for your effort. Starting tomorrow, every morning for 6 days, you will receive a notification with a 3-minute audio to listen to. It is very important that you complete them all. Additionally, you will receive three more notifications throughout the day with short messages. So, do not miss out! Now, click "Next".

EMI B: Availability from 06:00 – 12:00

PRE – 3' Audio Assessment

1/13. At this moment, to what extent are you feeling nervous, anxious, or on edge?

2/13. At this moment, to what extent you are not being able to stop or control worrying?

3/13. At this moment, to what extent are you feeling little interest or pleasure in doing things?

4/13. At this moment, to what extent are your feeling down, depressed or hopeless?

5/13. At this moment, what is your level of well-being?

6/13. How happy do you feel right now?

7/13. At this moment, to what extent are you satisfied with your life?

8/13. At this moment, to what extent are you feeling that your life has a sense of direction or meaning to it?

9/13. At this moment, how easy is it for you to identify the values that drive your life?

10/13. In the last 24 hours, to what extent have you been consciously aware of your values?

11/13. In the last 24 hours, how many of your actions have been aligned with your values?

12/13. And how aware were you, while doing them, that you were acting according to your values?

13/13. To what extent do you INTEND to take actions aligned with your values in the following hours?

Let's go to today's morning visualization (3 minutes). Before listening to the audio, please remember your central values (or read them in your notes).

Intervention

[Audio starts] *Take a few moments to connect with what matters to you (pause), with what is most important to you in your life (pause). Connect with each of your central values and feel the significance of each as it resonates in your heart. (30' pause)*

Now, think about why these values matter to you and how they shape your life. (30' pause)

Now, visualize moments in your day where you can do things that are aligned with these values. Picture yourself engaging in these activities. (30' pause)

Take a moment to appreciate this connection (pause) and when you're ready, gently bring your awareness back to the present, carrying this sense of alignment with you throughout your day. Thank you for taking this time to connect with your values. [Audio ends]

POST – 3' Audio Assessment

Where did you complete the practice?

1/10. At this moment, how easy is it for you to identify the values that drive your life?

2/10. To what extent do you INTEND to take actions based on your values in the following hours?

3/10. At this moment, what is your level of well-being?

4/10. How happy do you feel right now?

5/13. At this moment, to what extent are you satisfied with your life?

6/10. At this moment, to what extent are you feeling that your life has a sense of direction or meaning to it?

7/10. At this moment, to what extent are you feeling nervous, anxious, or on edge?

8/10. At this moment, to what extent you are not being able to stop or control worrying?

9/10. At this moment, to what extent are you feeling little interest or pleasure in doing things?

10/10. At this moment, to what extent are your feeling down, depressed or hopeless?

11/14. During the practice, I had many difficulties constructing the mental scene that I was using to connect with my values.

12/14. During the practice, I had a hard time manipulating the mental scene that I was using to connect with my values.

13/14. During the practice, I managed to generate a sense of meaning and significance towards my life.

14/14. During the practice, I noticed a sense of vitality or expansion in my body.

You have completed your morning visualization. Throughout the day, we will send you 3 brief notifications with messages, do not miss them! Thank you for continuing to collaborate; your reward is getting closer. Now, click "Next".

EMI C: Availability from 15:00 – 17:00 / 18:00 – 20:00 / 21:00 – 23:00

Since the last notification, to what extent have you been conciously aware of your values?

Now, take a moment and think about your central values.

Appendix C: AI Statement

During the preparation of this work the author(s) used Word, Grammarly, and ChatGPT in order to correct spelling, punctuation, and grammar mistakes, debug R-Code and summarise, clarify or provide additional information on topics discussed in the course. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the work.

Appendix D: The R-Code

```
#TIIM 1: cleaning data


library(tidyverse)
library(foreign)
library(broom)


#setting working directory
setwd("C:/Users/jzsal/OneDrive/Desktop/Data Analysis")
library(haven)


#alles neu
data <- read_csv("Capturing what matters (UT)_1 de diciembre de 2024_14.22.csv")
data <- read.csv("Capturing what matters (UT)_1 de diciembre de 2024_14.22.csv",
         stringsAsFactors = FALSE, check.names = TRUE)


#making a new dataset with only the variables I need
library(dplyr)
```

```
library(dplyr)

subdata <- data %>% select(CODE, Age, Gender, EducationalLevel, Nationality,
                           Nationality_0_TEXT,
                           GAD1, GAD2, GAD3, GAD4, GAD5, GAD6, GAD7,
                           ELS1, ELS2, ELS3, ELS4, ELS5 , ELS6, ELS7, ELS8,
                           ELS9, ELS10,
                           GSAAS1, GSAAS2, GSAAS3, GSAAS4, GSAAS5, GSAAS6,
                           GSAAS7, GSAAS8, GSAAS9, GSAAS10)

#ok that worked lets goooo

write.csv(subdata, "C:/Users/jzsal/OneDrive/Desktop/Data Analysis.csv", row.names =
          FALSE)

# Save the new dataset
write.csv(subdata, "subdata.csv", row.names = FALSE)

#ok lets get the post data
post_data <- read_sav("TIIM_Intervention_Condition 1.sav")
View(post_data)

#rename etc
library(dplyr)

# Syntax: rename(data, new_name = old_name)
```

```
colnames(post_data)[1] <- "ID"  # First column

colnames(post_data)[2] <- "Intervention"  # Second column

colnames(post_data)[3] <- "Language"

colnames(post_data)[4] <- "Code"

#5 code time stamp

colnames(post_data)[6] <- "1"

#7  ts

colnames(post_data)[8] <- "2"

#9  ts

colnames(post_data)[10] <- "3"

#11  ts

colnames(post_data)[12] <- "4"

#13  ts

colnames(post_data)[14] <- "5"

#16  ts

colnames(post_data)[16] <- "6"

#19  ts

colnames(post_data)[4] <- "Code"


#rename stuff for GSAAS scale

colnames(post_data)[410] <- "GSAAS10"

colnames(post_data)[408] <- "GSAAS9"

colnames(post_data)[406] <- "GSAAS8"

colnames(post_data)[404] <- "GSAAS7"

colnames(post_data)[402] <- "GSAAS6"

colnames(post_data)[400] <- "GSAAS5"
```

```
colnames(post_data)[398] <- "GSAAS4"

colnames(post_data)[396] <- "GSAAS3"

colnames(post_data)[394] <- "GSAAS2"

colnames(post_data)[392] <- "GSAAS1"


#rename stuff for ELS

colnames(post_data)[376] <- "ELS10"

colnames(post_data)[372] <- "ELS9"

colnames(post_data)[370] <- "ELS8"

colnames(post_data)[368] <- "ELS7"

colnames(post_data)[366] <- "ELS6"

colnames(post_data)[364] <- "ELS5"

colnames(post_data)[362] <- "ELS4"

colnames(post_data)[360] <- "ELS3"

colnames(post_data)[358] <- "ELS2"

colnames(post_data)[356] <- "ELS1"


#rename stuff for anxiety

colnames(post_data)[276] <- "GAD7"

colnames(post_data)[274] <- "GAD6"

colnames(post_data)[272] <- "GAD5"

colnames(post_data)[270] <- "GAD4"

colnames(post_data)[268] <- "GAD3"

colnames(post_data)[266] <- "GAD2"

colnames(post_data)[264] <- "GAD1"
```

```
#create subset of post_data with only stuff I need
post_sub_data <- post_data %>% select(Intervention, Code,
                    GAD1, GAD2, GAD3, GAD4, GAD5, GAD6, GAD7,
                    ELS1, ELS2, ELS3, ELS4, ELS5 , ELS6, ELS7, ELS8,
                    ELS9, ELS10,
                    GSAAS1, GSAAS2, GSAAS3, GSAAS4, GSAAS5, GSAAS6,
                    GSAAS7, GSAAS8, GSAAS9, GSAAS10)

# Save the new dataset
write.csv(post_sub_data, "post_sub_data.csv", row.names = FALSE)

#lets do the same to the other set
post_data2 <- read_sav("TIIM_Intervention_Condition 2.sav")
View(post_data2)

# Syntax: rename(data, new_name = old_name)
colnames(post_data2)[1] <- "ID"  # First column
colnames(post_data2)[2] <- "Intervention"  # Second column
colnames(post_data2)[3] <- "Language"
colnames(post_data2)[4] <- "Code"

#create stuff for GAD
colnames(post_data2)[568] <- "GAD1"
colnames(post_data2)[570] <- "GAD2"
colnames(post_data2)[572] <- "GAD3"
colnames(post_data2)[574] <- "GAD4"
```

```
colnames(post_data2)[576] <- "GAD5"

colnames(post_data2)[578] <- "GAD6"

colnames(post_data2)[580] <- "GAD7"


#create stuff for values

colnames(post_data2)[660] <- "ELS1"

colnames(post_data2)[662] <- "ELS2"

colnames(post_data2)[664] <- "ELS3"

colnames(post_data2)[666] <- "ELS4"

colnames(post_data2)[668] <- "ELS5"

colnames(post_data2)[670] <- "ELS6"

colnames(post_data2)[672] <- "ELS7"

colnames(post_data2)[674] <- "ELS8"

colnames(post_data2)[676] <- "ELS9"

colnames(post_data2)[680] <- "ELS10"


#create stuff for GSAAS

colnames(post_data2)[696] <- "GSAAS1"

colnames(post_data2)[698] <- "GSAAS2"

colnames(post_data2)[700] <- "GSAAS3"

colnames(post_data2)[702] <- "GSAAS4"

colnames(post_data2)[704] <- "GSAAS5"

colnames(post_data2)[706] <- "GSAAS6"

colnames(post_data2)[708] <- "GSAAS7"

colnames(post_data2)[710] <- "GSAAS8"

colnames(post_data2)[712] <- "GSAAS9"
```

```
colnames(post_data2)[714] <- "GSAAS10"


#create subset of post_data with only stuff I need
post_sub_data2 <- post_data2 %>% select(Intervention, Code,
                                        GAD1, GAD2, GAD3, GAD4, GAD5, GAD6, GAD7,
                                        ELS1, ELS2, ELS3, ELS4, ELS5 , ELS6, ELS7, ELS8,
                                        ELS9, ELS10,
                                        GSAAS1, GSAAS2, GSAAS3, GSAAS4, GSAAS5, GSAAS6,
                                        GSAAS7, GSAAS8, GSAAS9, GSAAS10)

# Save the new dataset
write.csv(post_sub_data2, "post_sub_data2.csv", row.names = FALSE)




#cleaning pre data

library(tidyverse)
library(foreign)
library(broom)
library(dplyr)

# Remove all rows with any NA values
pre_data <- na.omit(pre_data)

# Remove a specific column by name (Nationality bc no one is dutch)
```

```
pre_data$Nationality <- NULL


#make character variables into numerical ones for GAD
pre_data <- pre_data %>%
  mutate(GAD1 = recode(GAD1,
                       "0 = Not at all" = 0,
                       "1 = Several days" = 1,
                       "2 = More than half the days" = 2,
                       "3 = Nearly every day" = 3

  ))

pre_data <- pre_data %>%
  mutate(GAD2 = recode(GAD2,
                       "0 = Not at all" = 0,
                       "1 = Several days" = 1,
                       "2 = More than half the days" = 2,
                       "3 = Nearly every day" = 3

  ))

pre_data <- pre_data %>%
  mutate(GAD3 = recode(GAD3,
                       "0 = Not at all" = 0,
                       "1 = Several days" = 1,
                       "2 = More than half the days" = 2,
```

```
                "3 = Nearly every day" = 3

  ))

pre_data <- pre_data %>%
  mutate(GAD4 = recode(GAD4,
                "0 = Not at all" = 0,
                "1 = Several days" = 1,
                "2 = More than half the days" = 2,
                "3 = Nearly every day" = 3

  ))

pre_data <- pre_data %>%
  mutate(GAD5 = recode(GAD5,
                "0 = Not at all" = 0,
                "1 = Several days" = 1,
                "2 = More than half the days" = 2,
                "3 = Nearly every day" = 3

  ))

pre_data <- pre_data %>%
  mutate(GAD6 = recode(GAD6,
                "0 = Not at all" = 0,
                "1 = Several days" = 1,
```

```
                "2 = More than half the days" = 2,
                "3 = Nearly every day" = 3

  ))

pre_data <- pre_data %>%
  mutate(GAD7 = recode(GAD7,
                "0 = Not at all" = 0,
                "1 = Several days" = 1,
                "2 = More than half the days" = 2,
                "3 = Nearly every day" = 3

  ))


#now for the ELS
pre_data <- pre_data %>%
  mutate(ELS1 = recode(ELS1,
                "1 = Never" = 1,
                "2 = Seldom" = 2,
                "3 = Sometimes" = 3,
                "4 = Regularly" = 4,
                "5 = Often" = 5,
                "6 = (Almost) Always" = 6

  ))
```

```
pre_data <- pre_data %>%
  mutate(ELS2 = recode(ELS2,
                       "1 = Never" = 1,
                       "2 = Seldom" = 2,
                       "3 = Sometimes" = 3,
                       "4 = Regularly" = 4,
                       "5 = Often" = 5,
                       "6 = (Almost) Always" = 6

  ))

pre_data <- pre_data %>%
  mutate(ELS3 = recode(ELS3,
                       "1 = Never" = 1,
                       "2= Seldom" = 2,
                       "3 = Sometimes" = 3,
                       "4 = Regularly" = 4,
                       "5 = Often" = 5,
                       "6 = (Almost) Always" = 6

  ))

pre_data <- pre_data %>%
  mutate(ELS4 = recode(ELS4,
                       "1 = Never" = 1,
```

```
                "2= Seldom" = 2,
                "3 = Sometimes" = 3,
                "4 = Regularly" = 4,
                "5 = Often" = 5,
                "6 = (Almost) Always" = 6

  ))

pre_data <- pre_data %>%
  mutate(ELS5 = recode(ELS5,
                "1 = Never" = 1,
                "2= Seldom" = 2,
                "3 = Sometimes" = 3,
                "4 = Regularly" = 4,
                "5 = Often" = 5,
                "6 = (Almost) Always" = 6

  ))

pre_data <- pre_data %>%
  mutate(ELS6 = recode(ELS6,
                "1 = Never" = 1,
                "2= Seldom" = 2,
                "3 = Sometimes" = 3,
                "4 = Regularly" = 4,
                "5 = Often" = 5,
```

```
                "6 = (Almost) Always" = 6


  ))

pre_data <- pre_data %>%
  mutate(ELS7 = recode(ELS7,
                "1 = Never" = 1,
                "2= Seldom" = 2,
                "3 = Sometimes" = 3,
                "4 = Regularly" = 4,
                "5 = Often" = 5,
                "6 = (Almost) Always" = 6


  ))

pre_data <- pre_data %>%
  mutate(ELS8 = recode(ELS8,
                "1 = Never" = 1,
                "2= Seldom" = 2,
                "3 = Sometimes" = 3,
                "4 = Regularly" = 4,
                "5 = Often" = 5,
                "6 = (Almost) Always" = 6


  ))
```

```
pre_data <- pre_data %>%
  mutate(ELS9 = recode(ELS9,
                       "1 = Never" = 1,
                       "2= Seldom" = 2,
                       "3 = Sometimes" = 3,
                       "4 = Regularly" = 4,
                       "5 = Often" = 5,
                       "6 = (Almost) Always" = 6

  ))

pre_data <- pre_data %>%
  mutate(ELS10 = recode(ELS10,
                       "1 = Never" = 1,
                       "2= Seldom" = 2,
                       "3 = Sometimes" = 3,
                       "4 = Regularly" = 4,
                       "5 = Often" = 5,
                       "6 = (Almost) Always" = 6

  ))

#and now the same with GSAAS
pre_data <- pre_data %>%
  mutate(GSAAS1 = recode(GSAAS1,
                       "1 = Not at all" = 1,
```

```
                "2 = Somewhat" = 2,
                "3 = Reasonably" = 3,
                "4 = Mostly" = 4,
                "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
  mutate(GSAAS2 = recode(GSAAS2,
                "1 = Not at all" = 1,
                "2 = Somewhat" = 2,
                "3 = Reasonably" = 3,
                "4 = Mostly" = 4,
                "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
  mutate(GSAAS3 = recode(GSAAS3,
                "1 = Not at all" = 1,
                "2 = Somewhat" = 2,
                "3 = Reasonably" = 3,
                "4 = Mostly" = 4,
                "5 = Totally" = 5

  ))
```

```
pre_data <- pre_data %>%
  mutate(GSAAS4 = recode(GSAAS4,
                         "1 = Not at all" = 1,
                         "2 = Somewhat" = 2,
                         "3 = Reasonably" = 3,
                         "4 = Mostly" = 4,
                         "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
  mutate(GSAAS5 = recode(GSAAS5,
                         "1 = Not at all" = 1,
                         "2 = Somewhat" = 2,
                         "3 = Reasonably" = 3,
                         "4 = Mostly" = 4,
                         "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
  mutate(GSAAS6 = recode(GSAAS6,
                         "1 = Not at all" = 1,
                         "2 = Somewhat" = 2,
                         "3 = Reasonably" = 3,
```

```
                "4 = Mostly" = 4,
                "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
  mutate(GSAAS7 = recode(GSAAS7,
                "1 = Not at all" = 1,
                "2 = Somewhat" = 2,
                "3 = Reasonably" = 3,
                "4 = Mostly" = 4,
                "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
  mutate(GSAAS8 = recode(GSAAS8,
                "1 = Not at all" = 1,
                "2 = Somewhat" = 2,
                "3 = Reasonably" = 3,
                "4 = Mostly" = 4,
                "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
```

```
  mutate(GSAAS9 = recode(GSAAS9,
                         "1 = Not at all" = 1,
                         "2 = Somewhat" = 2,
                         "3 = Reasonably" = 3,
                         "4 = Mostly" = 4,
                         "5 = Totally" = 5

  ))

pre_data <- pre_data %>%
  mutate(GSAAS10 = recode(GSAAS10,
                         "1 = Not at all" = 1,
                         "2 = Somewhat" = 2,
                         "3 = Reasonably" = 3,
                         "4 = Mostly" = 4,
                         "5 = Totally" = 5

  ))

# Save the new dataset
write.csv(pre_data, "pre_sub_data_clean.csv", row.names = FALSE)

#fixinggggg
library(tidyverse)
library(foreign)
library(broom)
```

```
library(dplyr)


#make character variables into numerical ones for GAD
post_sub_data <- post_sub_data %>%
  mutate(GAD1 = recode(GAD1,
                       "[1, 0 = Not at all]" = 0,
                       "[2, 1 = Several days]" = 1,
                       "[3, 2 = More than half the days]" = 2


  ))


#with gad2
post_sub_data <- post_sub_data %>%
  mutate(GAD2 = recode(GAD2,
                       "[1, 0 = Not at all]" = 0,
                       "[2, 1 = Several days]" = 1,
                       "[3, 2 = More than half the days]" = 2
  ))


post_sub_data <- post_sub_data %>%
  mutate(GAD3 = recode(GAD3,
                       "[1, 0 = Not at all]" = 0,
                       "[2, 1 = Several days]" = 1,
                       "[3, 2 = More than half the days]" = 2
  ))
```

```
post_sub_data <- post_sub_data %>%
  mutate(GAD4 = recode(GAD4,
                       "[1, 0 = Not at all]" = 0,
                       "[2, 1 = Several days]" = 1,
                       "[3, 2 = More than half the days]" = 2
  ))

post_sub_data <- post_sub_data %>%
  mutate(GAD5 = recode(GAD5,
                       "[1, 0 = Not at all]" = 0,
                       "[2, 1 = Several days]" = 1,
                       "[3, 2 = More than half the days]" = 2
  ))

post_sub_data <- post_sub_data %>%
  mutate(GAD6 = recode(GAD6,
                       "[1, 0 = Not at all]" = 0,
                       "[2, 1 = Several days]" = 1,
                       "[3, 2 = More than half the days]" = 2
  ))

post_sub_data <- post_sub_data %>%
  mutate(GAD7 = recode(GAD7,
                       "[1, 0 = Not at all]" = 0,
                       "[2, 1 = Several days]" = 1,
                       "[3, 2 = More than half the days]" = 2
```

```
  ))

#make character variables into numerical ones for ELS
post_sub_data <- post_sub_data %>%
  mutate(ELS1 = recode(ELS1,
                       "[1, Never]" = 1,
                       "[2, Seldom]" = 2,
                       "[3, Sometimes]" = 3,
                       "[4, Regularly]" = 4,
                       "[5, Often]" = 5,
                       "[6, (Almost) Always]" = 6
  ))

#correct because i missed a ] lol
# Replace NA values in 'ELS1' with 6 using base R
post_sub_data$ELS1[is.na(post_sub_data$ELS1)] <- 6



post_sub_data <- post_sub_data %>%
  mutate(ELS2 = recode(ELS2,
                       "[1, Never]" = 1,
                       "[2, Seldom]" = 2,
                       "[3, Sometimes]" = 3,
                       "[4, Regularly]" = 4,
                       "[5, Often]" = 5,
                       "[6, (Almost) Always]" = 6
```

```
  ))

#correct because i missed a ] lol
# Replace NA values in 'ELS1' with 6 using base R
post_sub_data$ELS2[is.na(post_sub_data$ELS2)] <- 6

post_sub_data <- post_sub_data %>%
  mutate(ELS3 = recode(ELS3,
                       "[1, Never]" = 1,
                       "[2, Seldom]" = 2,
                       "[3, Sometimes]" = 3,
                       "[4, Regularly]" = 4,
                       "[5, Often]" = 5,
                       "[6, (Almost) Always]" = 6
  ))

#correct because i missed a ] lol
# Replace NA values in 'ELS1' with 6 using base R
post_sub_data$ELS3[is.na(post_sub_data$ELS3)] <- 6

post_sub_data <- post_sub_data %>%
  mutate(ELS4 = recode(ELS4,
                       "[1, Never]" = 1,
                       "[2, Seldom]" = 2,
                       "[3, Sometimes]" = 3,
                       "[4, Regularly]" = 4,
```

```
                    "[5, Often]" = 5,
                    "[6, (Almost) Always]" = 6
  ))

post_sub_data <- post_sub_data %>%
  mutate(ELS5 = recode(ELS5,
                    "[1, Never]" = 1,
                    "[2, Seldom]" = 2,
                    "[3, Sometimes]" = 3,
                    "[4, Regularly]" = 4,
                    "[5, Often]" = 5,
                    "[6, (Almost) Always]" = 6
  ))

post_sub_data <- post_sub_data %>%
  mutate(ELS6 = recode(ELS6,
                    "[1, Never]" = 1,
                    "[2, Seldom]" = 2,
                    "[3, Sometimes]" = 3,
                    "[4, Regularly]" = 4,
                    "[5, Often]" = 5,
                    "[6, (Almost) Always]" = 6
  ))

post_sub_data <- post_sub_data %>%
  mutate(ELS7 = recode(ELS7,
```

```
                "[1, Never]" = 1,
                "[2, Seldom]" = 2,
                "[3, Sometimes]" = 3,
                "[4, Regularly]" = 4,
                "[5, Often]" = 5,
                "[6, (Almost) Always]" = 6
  ))

post_sub_data <- post_sub_data %>%
  mutate(ELS8 = recode(ELS8,
                "[1, Never]" = 1,
                "[2, Seldom]" = 2,
                "[3, Sometimes]" = 3,
                "[4, Regularly]" = 4,
                "[5, Often]" = 5,
                "[6, (Almost) Always]" = 6
  ))

post_sub_data <- post_sub_data %>%
  mutate(ELS9 = recode(ELS9,
                "[1, Never]" = 1,
                "[2, Seldom]" = 2,
                "[3, Sometimes]" = 3,
                "[4, Regularly]" = 4,
                "[5, Often]" = 5,
                "[6, (Almost) Always]" = 6
```

```
  ))

post_sub_data <- post_sub_data %>%
  mutate(ELS10 = recode(ELS10,
                        "[1, Never]" = 1,
                        "[2, Seldom]" = 2,
                        "[3, Sometimes]" = 3,
                        "[4, Regularly]" = 4,
                        "[5, Often]" = 5,
                        "[6, (Almost) Always]" = 6
  ))

#correct because i missed a ] lol
# Replace NA values in 'ELS1' with 6 using base R
post_sub_data$ELS10[is.na(post_sub_data$ELS10)] <- 6

#and now we do the whole spiel for GSAAS
post_sub_data <- post_sub_data %>%
  mutate(GSAAS1 = recode(GSAAS1,
                         "[2, 2 = Somewhat]" = 2,
                         "[3, 3 = Reasonably]" = 3,
                         "[4, 4 = Mostly]" = 4,
                         "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
```

```
  mutate(GSAAS2 = recode(GSAAS2,
                         "[2, 2 = Somewhat]" = 2,
                         "[3, 3 = Reasonably]" = 3,
                         "[4, 4 = Mostly]" = 4,
                         "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS3 = recode(GSAAS3,
                         "[2, 2 = Somewhat]" = 2,
                         "[3, 3 = Reasonably]" = 3,
                         "[4, 4 = Mostly]" = 4,
                         "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS4 = recode(GSAAS4,
                         "[2, 2 = Somewhat]" = 2,
                         "[3, 3 = Reasonably]" = 3,
                         "[4, 4 = Mostly]" = 4,
                         "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS5 = recode(GSAAS5,
                         "[2, 2 = Somewhat]" = 2,
```

```
                "[3, 3 = Reasonably]" = 3,
                "[4, 4 = Mostly]" = 4,
                "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS6 = recode(GSAAS6,
                "[2, 2 = Somewhat]" = 2,
                "[3, 3 = Reasonably]" = 3,
                "[4, 4 = Mostly]" = 4,
                "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS7 = recode(GSAAS7,
                "[2, 2 = Somewhat]" = 2,
                "[3, 3 = Reasonably]" = 3,
                "[4, 4 = Mostly]" = 4,
                "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS8 = recode(GSAAS8,
                "[2, 2 = Somewhat]" = 2,
                "[3, 3 = Reasonably]" = 3,
                "[4, 4 = Mostly]" = 4,
```

```
                    "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS9 = recode(GSAAS9,
                    "[2, 2 = Somewhat]" = 2,
                    "[3, 3 = Reasonably]" = 3,
                    "[4, 4 = Mostly]" = 4,
                    "[5, 5 = Totally]" = 5
  ))

post_sub_data <- post_sub_data %>%
  mutate(GSAAS10 = recode(GSAAS10,
                    "[2, 2 = Somewhat]" = 2,
                    "[3, 3 = Reasonably]" = 3,
                    "[4, 4 = Mostly]" = 4,
                    "[5, 5 = Totally]" = 5
  ))


# Save the new dataset
write.csv(post_sub_data, "post_sub_data_clean.csv", row.names = FALSE)

#now I´ll look at demographics and calculate total scores for pre_data

library(tidyverse)
```

```
library(foreign)
library(broom)
library(dplyr)

pre_data <- read_csv("R-files/pre_sub_data_clean.csv")

#looking at gender
# Example: Summarizing a character variable
table(pre_data$Gender)



# Remove the first two rows
pre_data <- pre_data[-c(1, 2), ]

# convert age into numeric variable
pre_data$Age <- as.numeric(as.character(pre_data$Age))

# Calculate the mean of a numerical variable
mean_value <- mean(pre_data$Age)
print(mean_value)

# Minimum value
min_value <- min(pre_data$Age)

# Maximum value
max_value <- max(pre_data$Age)
```

```
# Print results
print(min_value)
print(max_value)

#Nationality
table(pre_data$Nationality_0_TEXT)

#degree
table(pre_data$EducationalLevel)

#creating an overall score variable for GAD
pre_data <- pre_data %>%
  mutate(GAD_total_score = rowSums(across(c(GAD1, GAD2, GAD3,
                                    GAD4, GAD5, GAD6,
                                    GAD7)), na.rm = TRUE))

#now total score for ELS
pre_data <- pre_data %>%
  mutate(ELS_total_score = rowSums(across(c(ELS1, ELS2, ELS3,
                                    ELS4, ELS5, ELS6,
                                    ELS7, ELS8, ELS9,
                                    ELS10)), na.rm = TRUE))

#and GSAAS
```

```
pre_data <- pre_data %>%
  mutate(GSAAS_total_score = rowSums(across(c(GSAAS1, GSAAS2, GSAAS3,
                                              GSAAS4, GSAAS5, GSAAS6,
                                              GSAAS7, GSAAS8, GSAAS9,
                                              GSAAS10)), na.rm = TRUE))



#post data total scores
library(tidyverse)
library(foreign)
library(broom)
library(dplyr)

post_data <- read_csv("R-files/post_sub_data_clean_correct.csv")

#creating an overall score variable for GAD
post_data <- post_data %>%
  mutate(GAD_total_score = rowSums(across(c(GAD1, GAD2, GAD3,
                                              GAD4, GAD5, GAD6,
                                              GAD7)), na.rm = TRUE))

#now total score for ELS
post_data <- post_data %>%
  mutate(ELS_total_score = rowSums(across(c(ELS1, ELS2, ELS3,
                                              ELS4, ELS5, ELS6,
                                              ELS7, ELS8, ELS9,
```

```
                                ELS10)), na.rm = TRUE))


#and GSAAS
post_data <- post_data %>%
  mutate(GSAAS_total_score = rowSums(across(c(GSAAS1, GSAAS2, GSAAS3,
                                              GSAAS4, GSAAS5, GSAAS6,
                                              GSAAS7, GSAAS8, GSAAS9,
                                              GSAAS10)), na.rm = TRUE))

#combining the two data sets

library(tidyverse)
library(foreign)
library(broom)
library(dplyr)

pre_data <- read_csv("R-files/pre_sub_data_clean.csv")

# Select variables from the first dataset
totals_pre_data <- pre_data[, c("CODE", "GAD_total_score", "ELS_total_score",
                    "GSAAS_total_score")]

# Select variables from the second dataset
totals_post_data <- post_data[, c("Code", "GAD_total_score", "ELS_total_score",
                          "GSAAS_total_score")]
```

```
#renaming the variables so they match
# Rename specific columns by index
colnames(totals_pre_data)[1] <- "Code"
colnames(totals_pre_data)[2] <- "GAD_pre"
colnames(totals_pre_data)[3] <- "ELS_pre"
colnames(totals_pre_data)[4] <- "GSAAS_pre"

# Rename specific columns by index
colnames(totals_post_data)[1] <- "Code"
colnames(totals_post_data)[2] <- "GAD_post"
colnames(totals_post_data)[3] <- "ELS_post"
colnames(totals_post_data)[4] <- "GSAAS_post"

#now merge the two data sets

library(dplyr)


# Merge by 'ID' column
combined_data <- left_join(totals_pre_data, totals_post_data, by = "Code")

# View the result
print(combined_data)

#delete missing values
```

```
combined_data_no_missing <- na.omit(combined_data)



#demographics code for the 12 participants


library(tidyverse)

library(foreign)

library(broom)


sub_pre_data_no_missings <- read_csv("R-files/sub_pre_data_no_missings.csv")


#make data subset with only the people who also have post data


library(dplyr)


demo_data <- sub_pre_data_no_missings %>%

  filter(CODE %in% c("JP493", "EA029", "PB017",

                     "ML864", "KI634", "FD764",

                     "VH308", "MU409", "AE712",

                     "TE935", "NY555", "JG544"))


# convert age into numeric variable

demo_data$Age <- as.numeric(as.character(demo_data$Age))


# Calculate the mean of a numerical variable

mean_value <- mean(demo_data$Age)
```

```
print(mean_value)

#with SD
sd_score <- sd(demo_data$Age)
print(sd_score)

# Minimum value
min_value <- min(demo_data$Age)

# Maximum value
max_value <- max(demo_data$Age)

# Print results
print(min_value)
print(max_value)

#Nationality
table(demo_data$Nationality_0_TEXT)

#degree
table(demo_data$EducationalLevel)

#alles neu macht die Jana

library(tidyverse)
library(foreign)
```

```
library(broom)
library(dplyr)

#checking the assumptions for GAD
library(modelr)

GAD_model3 <- GAD_long %>%
  lmer(Score ~ Time + (1 | Code), data = .)

summary(GAD_model3)

#normality
GAD_long %>%
  ggplot(aes(x = resid)) +
  geom_histogram()

#assumption that residuals have equal variance
GAD_long %>%
  ggplot(aes(x = pred, y = resid)) +
  geom_point()

#wilcoxon test
wilcox.test(data_GAD$GAD_pre, data_GAD$GAD_post,
            paired = TRUE)

#ELS
```

```
ELS_model3 <- ELS_long %>%
  lmer(Score ~ Time + (1 | Code), data = .)

summary(ELS_model3)

#assumptions

ELS_long <- ELS_long %>%
  add_predictions(ELS_model3) %>%
  add_residuals(ELS_model3)

#normality
ELS_long %>%
  ggplot(aes(x = resid)) +
  geom_histogram()

#assumption that residuals have equal variance
ELS_long %>%
  ggplot(aes(x = pred, y = resid)) +
  geom_point()

#wilcoxon test
wilcox.test(data_ELS$ELS_pre, data_ELS$ELS_post,
            paired = TRUE)

#GSAAS
```

```
GSAAS_model3 <- GSAAS_long %>%
  lmer(Score ~ Time + (1 | Code), data = .)

summary(GSAAS_model3)

#assumptions

GSAAS_long <- GSAAS_long %>%
  add_predictions(GSAAS_model3) %>%
  add_residuals(GSAAS_model3)

#normality
GSAAS_long %>%
  ggplot(aes(x = resid)) +
  geom_histogram()

#assumption that residuals have equal variance
GSAAS_long %>%
  ggplot(aes(x = pred, y = resid)) +
  geom_point()

#wilcoxon test
wilcox.test(data_GSAAS$GSAAS_pre, data_GSAAS$GSAAS_post,
            paired = TRUE)

#making some graphs for insight
```

```
#FIXED EFFECT PREDICTION
# Add predicted values to the dataset
GAD_long$Predicted <- predict(GAD_model3)

# Plot observed vs predicted
ggplot(GAD_long, aes(x = Predicted, y = Score)) +
  geom_point() +
  geom_abline(intercept = 0, slope = 1, color = "red", linetype = "dashed") +
  labs(title = "Observed vs Predicted Values", x = "Predicted Score", y = "Observed Score") +
  theme_minimal()


#MARGINAL EFFECTS (FIXED EFFECT)
install.packages("sjPlot")
library(sjPlot)

# Plot marginal effects
plot_model(GAD_model3, type = "pred", terms = "Time") +
  labs(title = "Marginal Effect of Time on Score", x = "Time", y = "Predicted Score")

#VARIANCE PARTITON (INTRACLASS CORRELATION COEFFICIENT)

# Extract variance components
variance_components <- as.data.frame(VarCorr(GAD_model3))
```

```
# Calculate ICC
icc <- variance_components$vcov[1] / sum(variance_components$vcov)

# Display ICC
print(paste("Intraclass Correlation Coefficient (ICC):", round(icc, 3)))

# Variance partitioning pie chart
variance_df <- data.frame(
  Source = c("Between Groups", "Within Groups"),
  Variance = c(icc, 1 - icc)
)

ggplot(variance_df, aes(x = "", y = Variance, fill = Source)) +
  geom_bar(stat = "identity", width = 1) +
  coord_polar(theta = "y") +
  labs(title = "Variance Partitioning (ICC)") +
  theme_void()

#confidence intervall bootstrap for ICC because low sample size
library(boot)

# Custom function to calculate ICC
icc_func <- function(data, indices) {
  d <- data[indices, ]
  model <- lmer(Score ~ (1 | Code), data = d)
  varcomp <- as.data.frame(VarCorr(model))
```

```
  between_var <- varcomp$vcov[1]
  residual_var <- varcomp$vcov[2]
  icc <- between_var / (between_var + residual_var)
  return(icc)
}

# Bootstrap ICC
results <- boot(data = GAD_long, statistic = icc_func, R = 1000)
boot.ci(results, type = "perc")



#fixed effect prediction for valued living


# Add predicted values to the dataset
ELS_long$Predicted <- predict(ELS_model3)


# Plot observed vs predicted
ggplot(ELS_long, aes(x = Predicted, y = Score)) +
  geom_point() +
  geom_abline(intercept = 0, slope = 1, color = "red", linetype = "dashed") +
  labs(title = "Observed vs Predicted Values", x = "Predicted Score", y = "Observed Score") +
  theme_minimal()


#VARIANCE PARTITON (INTRACLASS CORRELATION COEFFICIENT)


# Extract variance components
```

```
variance_components <- as.data.frame(VarCorr(ELS_model3))

# Calculate ICC
icc <- variance_components$vcov[1] / sum(variance_components$vcov)

# Display ICC
print(paste("Intraclass Correlation Coefficient (ICC):", round(icc, 3)))

# Variance partitioning pie chart
variance_df <- data.frame(
  Source = c("Between Groups", "Within Groups"),
  Variance = c(icc, 1 - icc)
)

ggplot(variance_df, aes(x = "", y = Variance, fill = Source)) +
  geom_bar(stat = "identity", width = 1) +
  coord_polar(theta = "y") +
  labs(title = "Variance Partitioning (ICC)") +
  theme_void()

#confidence intervall bootstrap for ICC because low sample size
library(boot)

# Custom function to calculate ICC
icc_func <- function(data, indices) {
  d <- data[indices, ]
```

```
  model <- lmer(Score ~ (1 | Code), data = d)
  varcomp <- as.data.frame(VarCorr(model))
  between_var <- varcomp$vcov[1]
  residual_var <- varcomp$vcov[2]
  icc <- between_var / (between_var + residual_var)
  return(icc)
}

# Bootstrap ICC
results <- boot(data = ELS_long, statistic = icc_func, R = 1000)
boot.ci(results, type = "perc")

#fixed effect prediction for the ability to adapt

# Add predicted values to the dataset
GSAAS_long$Predicted <- predict(GSAAS_model3)

# Plot observed vs predicted
ggplot(GSAAS_long, aes(x = Predicted, y = Score)) +
  geom_point() +
  geom_abline(intercept = 0, slope = 1, color = "red", linetype = "dashed") +
  labs(title = "Observed vs Predicted Values", x = "Predicted Score", y = "Observed Score") +
  theme_minimal()

#VARIANCE PARTITON (INTRACLASS CORRELATION COEFFICIENT)
```

```
# Extract variance components
variance_components <- as.data.frame(VarCorr(GSAAS_model3))

# Calculate ICC
icc <- variance_components$vcov[1] / sum(variance_components$vcov)

# Display ICC
print(paste("Intraclass Correlation Coefficient (ICC):", round(icc, 3)))

# Variance partitioning pie chart
variance_df <- data.frame(
  Source = c("Between Groups", "Within Groups"),
  Variance = c(icc, 1 - icc)
)

ggplot(variance_df, aes(x = "", y = Variance, fill = Source)) +
  geom_bar(stat = "identity", width = 1) +
  coord_polar(theta = "y") +
  labs(title = "Variance Partitioning (ICC)") +
  theme_void()

#confidence intervall bootstrap for ICC because low sample size
library(boot)

# Custom function to calculate ICC
icc_func <- function(data, indices) {
```

```
  d <- data[indices, ]
  model <- lmer(Score ~ (1 | Code), data = d)
  varcomp <- as.data.frame(VarCorr(model))
  between_var <- varcomp$vcov[1]
  residual_var <- varcomp$vcov[2]
  icc <- between_var / (between_var + residual_var)
  return(icc)
}

# Bootstrap ICC
results <- boot(data = GSAAS_long, statistic = icc_func, R = 1000)
boot.ci(results, type = "perc")

#adding range measure

# Calculate the range for GAD_pre
range_GAD_pre <- range(data_GAD$GAD_pre, na.rm = TRUE)
cat("Range for GAD_pre: ", range_GAD_pre, "\n")

# Calculate the range for GAD_post
range_GAD_post <- range(data_GAD$GAD_post, na.rm = TRUE)
cat("Range for GAD_post: ", range_GAD_post, "\n")

#valued livnig
# Calculate the range for GAD_pre
range_ELS_pre <- range(data_ELS$ELS_pre, na.rm = TRUE)
```

```
cat("Range for ELS_pre: ", range_ELS_pre, "\n")


# Calculate the range for GAD_post
range_ELS_post <- range(data_ELS$ELS_post, na.rm = TRUE)
cat("Range for ELS_post: ", range_ELS_post, "\n")


#ability to adapt
# Calculate the range for GAD_pre
range_GSAAS_pre <- range(data_GSAAS$GSAAS_pre, na.rm = TRUE)
cat("Range for GSAAS_pre: ", range_GSAAS_pre, "\n")


# Calculate the range for GAD_post
range_GSAAS_post <- range(data_GSAAS$GSAAS_post, na.rm = TRUE)
cat("Range for GSAAS_post: ", range_GSAAS_post, "\n")
```