YOUNG ADULTS IN A GLOBAL PANDEMIC: USING A SELF-MADE INTERVENTION TO INCREASE SUBJECTIVE VITALITY AND TO IDENTIFY POSSIBLE MEDIATORS

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Abstract

Aim: The aim of this study was to investigate whether a 7-day intervention, that tackles both the physical and mental aspect of subjective vitality, would increase subjective vitality among young adults. Another aim of this study was to test for potential mediating effects of spiritual well-being and physical self-efficacy between exercise and subjective vitality. The contextual background for this study was the Covid-19 crisis, where people are thought to possess overall less subjective vitality.

Method: 51 participants (mean age: 21, range: 18-24; 80.3% women) completed the 7-day intervention. Subjective vitality, spiritual well-being, and physical self-efficacy were measured at the pre- and post-test stage. The employed scale for subjective vitality was the subjective vitality scale (SVS), while the scales used for spiritual well-being and physical efficacy were the FACIT-Sp and physical self-efficacy respectively. For the duration of the self-made intervention, participants had to complete a set of physical tasks in their mornings and a breathing task every evening that tackles the mental side of subjective vitality. Data was analysed with SPSS.

Results: The results showed significant differences in subjective vitality for the pre- and post-test. After the intervention, participants reported to feel generally more vital than before. The mediation analysis did not yield significant results. However, spiritual well-being and physical self-efficacy turned out to be predictors for changes in subjective vitality rather than mediators between frequency of exercise and subjective vitality.

Conclusion: The self-made intervention could serve as a well-fitting starting point for future research. However, adjustments to the whole structure must be made to be able to yield usable results.

Key words: subjective vitality, spiritual well-being, physical self-efficacy, exercise

1. Introduction

Throughout the last year, people all over the world suffered from Covid-19, either directly or indirectly. People who have been infected by this virus suffer from somatic symptoms but there are also additional psychological symptoms that need to be addressed. This ongoing situation especially emphasizes the need to address both the physical and the mental aspects to health equally. People, who either were infected with Covid-19 or have experienced a close person suffering from it, are at a greater risk of developing anxiety, depression, or PTSD than those who did not, which stresses the impact of pandemics on the mental health of people (González-Sanguino et al., 2020). Furthermore, González-Sanguino et al. (2020) stated that young individuals and those who suffered from illness before, also are at greater risks to experience the aforementioned symptoms on mental health. Another scientific paper from Barber, & Kim (2021) adds to this, stating that younger people also hold more worries towards this pandemic, compared to older people. Meanwhile, Balkhi et al. (2020) found that most people worry about their family member's health, with social media being the greatest source of panic, which might explain why younger people experience worry to a greater extent. Additionally, the lack of success in eliminating this virus is impacting the general well-being in the population negatively (Aslam et al., 2020). Furthermore, Aslam et al. (2020) state that the majority of news headlines evoke negative emotions among those reading them. Now, having all this information, it becomes apparent that mental health is at great risk of decreasing during global pandemics like the Covid-19 pandemic. This great mental health risk results in a need to improve mental health in the general population through interventions, especially among young people as research shows (Barber, & Kim, 2021). However, physical health is also an important part of an individual's overall health, especially in a global pandemic where people are urged to stay at home and where all fitness centers are closed (WHO, 2021). Hence, this study is designed based on the mental and physical aspects of health and in line with the current living situation around Covid-19.

1.1. Subjective Vitality

As mentioned before, there is a need to improve mental health in the population. The chosen way of increasing mental health in this case is with the use of 'subjective vitality'. But first, vitality needs to be clearly defined in order to continue. As stated by Ryan, & Deci (2001), an individual is regarded as vital when they are in a state in which they fully function and are psychologically well. Moreover, vital people can be characterized by feeling alive, and by being full of enthusiasm and energy, mentally and physically (Salma-Younes, & Hashim, 2017). As one can see, vitality has a strong connection with psychological well-being, which is defined as "*a state of well-being in which every individual realizes his or her own potential, can cope with the normal stress of life, and can work productively and effectively*" by the WHO (2003). These findings are in line with Ryan, & Frederick (1997), where they indicated that subjective vitality is a significant indicator for well-being. Subjective vitality, as defined by Ryan, & Frederick (1997), is a certain experience of feeling spirit and enthusiasm. Additionally, they state that exercising increases subjective vitality, which is also supported by Mavilidi et al. (2020). Furthermore, vitality is used to assess the amount of energy that is available to strive for goals (Tough et al., 2017). In addition, vitality is said to improve resilience and coping effectiveness against stress (Ryan, & Deci, 2001). Although mental concepts are stressed in this paragraph, physical health is just as important as mental health to become a vital person. This essentially means that both psychological and somatic factors have an influence on each other and should be kept in mind when trying to raise subjective vitality. On the one hand, people feel generally more vital if they are free of conflicts and feeling capable of acting, i.e., inheriting a sense of self-efficacy. On the other hand, people feel less vital in general if they lack self-efficacy, relatedness to others, or if they lack autonomy. Additionally, anxiety and pressure also relate to a lower sense of vitality, as stated by Ryan, & Frederick (1997). To conclude, because subjective vitality encompasses both psychological and somatic factors, the need for an intervention, that is aimed toward both factors, becomes apparent.

1.2. Spiritual Well-Being

As mentioned above, there is a need to include both psychological and somatic factors into an intervention that aims to increase subjective vitality, where both factors (psychological and somatic) are of equal importance. 'Spiritual Well-Being' was chosen because it is directly linked to psychological well-being, while also encompassing a general sense of striving toward goals, a characteristic by which vitality is also characterized (Paloutzian et al. 2021, Tough et

al., 2017). To be more precise, an individual that has high levels of spiritual well-being reflects positive behaviours, feelings, and cognitions towards oneself, others, the transcendent (religion), and nature. All of this eventually provides an individual with a sense of identity satisfaction, and purpose in life (Gomez, & Fisher, 2003). Before and after the intervention, spiritual well-being scores will be measured, in order to give insight whether spiritual well-being is a significant mediator between the exercise and subjective vitality, since spiritual well-being is expected to indirectly influence subjective vitality. Although normally only psychological well-being is associated with subjective vitality, spiritual well-being could possibly also be a good mediator for an increase in subjective vitality because spiritual well-being is also associated with psychological well-being (Gomez, & Fisher, 2003, Ryan, & Frederick, 1997). Moreover, spiritual well-being was chosen on purpose because research of vitality in connection with spiritual well-being is lacking, although again, spiritual well-being might have a stronger effect than is commonly believed.

1.3. Physical Self-Efficacy

Now that the psychological factor to this subjective vitality intervention is defined, a somatic factor to this intervention is still missing. Hence, the next factor that will be explained is 'physical self-efficacy'. While Sarıçam (2015) found that general self-efficacy and subjective vitality are related to each other, Ryan, & Frederick (1997) specifically found physical self-efficacy to be a predictor for higher subjective vitality. Essentially, this means that people who feel physically capable of doing something, they are generally more vital. In addition to this, Ju (2017) states that physical activity is positively related to subjective vitality and meaning in life. In addition, this information comes as a well-fitting argument for the decision of introducing spiritual well-being into the study, which is also about meaning in life. Furthermore, Joseph et al. (2014) added to this field of research by finding out that generally, physical activity (PA) improves quality of life (QOL). Like Ryan, & Frederick (1997) they also concluded that quality of life is composed of physical and psychological aspects, while PA can potentially influence QOL through mediating effects. Hence, physical self-efficacy will be tested for possible mediating (indirect) effects in this particular study. They argued that especially college students are at risk of experiencing lower QOL because of potentially increased emotional and psychological stress. Another finding from Praksh et al. (2015) suggests that PA is further associated with a reduction in cognitive decline and might also preserve and enhance cognitive vitality. To conclude, the aforementioned information makes physical self-efficacy arguably a concept worth looking into when investigating subjective vitality because in theory, it should

affect participants' subjective vitality. To conclude, a major global pandemic yields risks for both mental and physical health. Therefore, the use of subjective vitality as a concept in an intervention should address both of these risks at the same time.

1.4. Purpose of this study

The purpose of this study is to investigate whether a 7-day intervention might raise subjective vitality levels. Although interventions in this field are usually longer than 7 days, the researchers decided for 7 days nonetheless because of the given time frame in which the study took place (Kinnafick et al., 2014). Furthermore, the mediating variables of spiritual well-being and physical self-efficacy were chosen because they are uncommonly used in connection with subjective vitality, although they might have a great extent of influence on subjective vitality. Furthermore, they were seen as mediators rather than moderators because they are presumed to be influenced by the frequency of exercise and also to influence subjective vitality, rather than only having a effect on the relationship between frequency of exercise and subjective vitality. Although both mediators are depicted in one figure (see Figure 1), mediation analysis will be carried out for each variable separately. With this, we hope to add new insights into research in the domain of subjective vitality. Last but not least, we aim to gather insight on participation levels during the intervention, i.e. how many people participated for how long.

1.5.Hypotheses

Because of this global pandemic, the researchers argue that in general, subjective vitality in the population is lower than usual and especially young people are at risk for developing psychological symptoms. Therefore, the aim is to raise subjective vitality among participants, with physical self-efficacy and spiritual well-being being tested for a possible mediating effect.

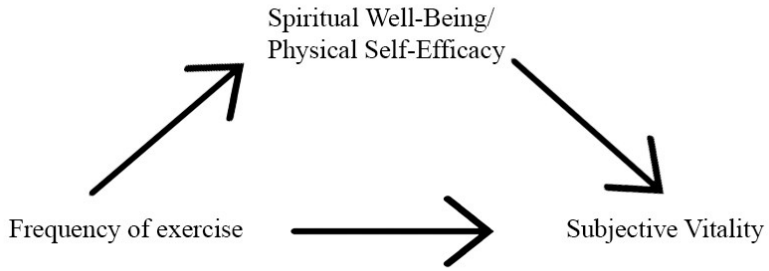

Figure 1. *Visualized relationship between variables.*

The hypotheses are as follows:

1. Subjective Vitality increases after adherence to the 7-day intervention, compared to before the intervention.
2. Spiritual Well-Being and Physical Self-Efficacy have a mediating effect on the relationship between the adherence to the intervention and Subjective Vitality.

2. Methods

2.1. Design

A quasi-experimental design was used to conduct the research. However, it is worth noting that a control-group was not established because this was a pilot study. The single independent variable (IV), called "Frequency of exercise" was placed on a continuum where "7" was the lowest achievable score and "14" was the highest possible score, meaning that participants did all the exercises. "Spiritual Wellbeing" and "Physical Self-Efficacy" were seen as mediating variables between the independent variable and the dependent variable "Subjective Vitality". Since this research is a co-production with Emily Hahn (Hahn, 2021), an additional dependent variable was introduced to the study, i.e. "loneliness", but was not taken into account for this particular research.

2.2. Participants

The initial sample included 66 adults aged between 18 and 25 during the pre-test phase. Participation dropped by 15 people for the post-test (*N=51*). An age of 18-25 was the only inclusion criterion in this study. More than half of the participants were women (*N=53, 80,3%*). All other participants were identified as male (*N=13, 19,7%*). The mean age of participants was 21 (*SD=1.3*), ranging from 18 to 24. Participant characteristics are listed in *Table 1* and show that on average, people completed 11.47 tasks out of 14 total tasks during the whole week. A more thorough day-by-day activity is depicted in *Table 2.*

Table 1. *Participant characteristics.*

Characteristic	Pre-Test (n=66)	Post-Test (n=51)
Sex (M/F), N	13/53	-
Age, mean ± SD	21 ± 1.3	-
Participation in intervention, mean ± SD		11.47 ± 1.88

Table 2. *Participation per day during the intervention.*

Day	Did all exercises (n)	Did only one exercise (n)
Day 1	38	13
Day 2	36	15
Day 3	29	22
Day 4	28	23
Day 5	32	19
Day 6	26	25
Day 7	40	11

Ethical approval (file number: 210392) was obtained from the dedicated committee at the Faculty BMS before recruitment began. During recruitment, participants were selected based on the opportunity-sampling method. This was enabled through the SONA-systems survey network of the University of Twente (UT). In addition, the researchers asked individuals from their social surroundings. However, the researchers were also aware that this sampling method might have introduced bias into the study. Nevertheless, this method was chosen

because participants were easily found because they would get 0.5 credits after completion of the study. These credits are necessary for students at the UT to complete their degree. The recruitment text of the study was as follows:

> *Have you been feeling down lately and do you want to feel more energized? Then this study might be for you! We would like to invite you to participate in our 7-day intervention, which is meant to enhance your subjective vitality. There will be two questionnaires that you will have to fill out, one before and one after the intervention. The intervention itself comprises morning and evening exercises at 5 minutes each.*

2.3. Measures

At first, a pre-measurement questionnaire was distributed among participants through the internet. Participants either needed a mobile phone or a computer (or any other device that can access Qualtrics) to fill out this questionnaire. In order to test the relationship between variables in this study, four scales were introduced into the survey.

The first scale in the questionnaire was the subjective vitality scale (SVS) by Ryan, & Frederick (1997) (see Appendix A). This scale originally measures subjective vitality with 7 items on a 6-point Likert scale, ranging from "Not at all true" (1) to "Very true" (6). However, one item was excluded because it proved to be unreliable due to negative wording. Hence, only 6 items in were included in the final version of the questionnaire. To give an example, one statement in an item was "*I have energy and spirit*." All scores from every item were summed up. The higher the score in the end was, the better was subjective vitality in a participant. The internal consistency of items in this scale was very high ($\alpha = .88$) for this particular study.

The next scale that was presented to the participants was the loneliness scale, which was used for parallel research (Hahn, 2021).

Afterward, participants needed to fill out the spiritual well-being scale (FACIT-Sp) by Peterman et al. (2002) (see Appendix B). Here, participants had to answer 12 items on a 5-point Likert scale, ranging from "Not at all" (0) to "Very much" (4). An item that serves as example is "*I have a reason for living*". In the end, all item-scores were summed up to acquire a total score. A higher total score indicated higher spiritual well-being. Furthermore, items 4 & 8 were reversely scored. The overall internal consistency for items in this scale was good ($\alpha = .86$) in this study.

Lastly, participants had to fill out the physical self-efficacy scale (PSE) by Ryckman et al. (1982) (see Appendix C). This particular scale measures physical self-efficacy with 22 items

on a 6-point Likert scale. The answering option range from “Strongly Agree” (1) to “Strongly Disagree” (6). An exemplary item is “*I don’t feel in control when I take tests involving physical dexterity.*”. The item-score were added up to receive a score that resembles the total physical self-efficacy among participants. Moreover, items 1, 3, 4, 9, 11, 14, 17, 19, 20, 21, and 22 were reversely scored. Internal consistency was proven to be sufficient ($\alpha = .83$) for this study.
The whole questionnaire was structured in a way that the scales with only a few items come first, followed by the scales with more items. Here, the intention was to make the questionnaire subjectively easier for the participant to answer and to not feel overwhelmed.

2.4. Procedure

The whole intervention started with an introductory email from the researchers after completion of the first questionnaire. With this email, participants were provided with all the materials necessary to complete the intervention. Moreover, they were reminded to do the exercises and fill out the post-test approximately every 5 days. Materials were exclusively made for this intervention and were provided in the form of a video (physical exercise) and audio clip (mental exercise) on YouTube (see Appendix F), ensuring fast and easy access to the material for the participants. In the email, it was stated that participants are free to choose between doing the physical exercises they were provided with or to do other physical exercises that were more to their liking and/ or more appropriate for their individual fitness level. It should be noted that the participants were asked in the pre-test to remember to write down if they left out any exercises during the intervention. After seven days when they did the post-test, they were asked to indicate whether they did the exercises they were provided with or not. Their self-reports were later categorized for the independent variable of “frequency of exercise”. They also needed to state whether they used the provided material with the tick of a box (see Appendix E).

2.5. Intervention

In general, participants were expected to do their physical exercises for at least 5 minutes with a subjectively increased heart rate, meaning that they did not need to measure their heart rate during the exercise but rather having a feeling of being physically active. If they chose to follow the material, they had to do a 5-minute workout that varies in intensity depending on the individual fitness level of the participant. This was ensured by showing them different

variations for the same exercise in the video. At first, participants needed to stretch themselves in different ways for one minute. Subsequently, they were asked to do as many pushups as possible in a minute. Afterward, they had to plank for one minute, followed by one minute of squats. Lastly, they had to stretch themselves again for one minute in the end. During the video, a voiceover explained to them how to complete each activity in different variations successfully. Participants were told to complete these exercises shortly after waking up to feel awake and alert as early as possible in their day.

For the mental exercise, participants were expected to listen to the audio clip at least once to get an understanding about what is expected from them. The whole premise of this exercise was to ensure that participants experience 5 consecutive minutes of deep relaxation with an inward focus. First, they could breathe in through their nose for 4 seconds, hold their breath for another 7 seconds and then breath out for 8 seconds through their mouths. Another option for the participants was to focus on their bodily sensations (focus on parts of their body) for 5 minutes if they wanted to do so. If they felt comfortable doing that activity, they were also allowed to do the exercise themselves without the audio. Participants were also explicitly told to do these exercises right before going to bed to feel more rested and to have a potentially enhanced sleep.

To conclude, these specific physical and mental tasks were chosen because they tackle the physical and mental aspect of subjective vitality and they are fairly easy to adjust to the individual levels of fitness and/ or personal preferences. In general, 5 minutes were seen as a sufficient duration for both exercises because on the one hand, the tasks are fairly easy and limited time-wise which counteracts a high drop-out rate (De Feo, 2013) and on the other hand, they are also effective if they are done regularly (Stamford, 1998).

2.6. Data Analysis

At first, scale reliability of all scales was measured, using Cronbach's alpha. Subsequently, descriptive statistics were gathered and initial analyses were executed. The descriptives included information about demographics, the intervention, and about possible contact with Covid-19. Next, means of the pre- and post-test scales were compared by using a paired sample t-test. Then, a multiple linear regression was carried out to see whether participation in the intervention and the mediators were significant predictors for changes in subjective vitality. Here, the mediator variables were seen as independent variables. Lastly, Hayes' macro process was used to test the mediation effects of spiritual well-being and physical

self-efficacy on the relationship between the frequency of participation and subjective vitality. For this, two separate mediation models were computed, for each mediator variable respectively. In general, a 95% confidence interval was set to assume statistical significance.

3. Results

3.1. Main analysis

To answer whether the differences between the pre- and post-test are significant, a paired sample t-test needed to be employed. The results of the paired sample t-test portray significant differences between pre-test and post-test for subjective vitality [$t(50) = -3.362$, $p=.001$]. This means that we can accept the first hypothesis, based on the gathered results for the paired sample t-test. Furthermore, differences between pre-test and post-test for spiritual well-being [$t(50) = -1.776$, $p=.082$] and physical self-efficacy [$t(50) = -1.104$, $p=.275$] respectively were non-significant ($p>.05$). Down below, the mean scores and their standard deviations are summed up in *Table 3*.

Table 3. *Subjective vitality, spiritual well-being, and physical self-efficacy scores pre- and post-test.*

Variable	Pre-Test M (SD)	n	Post-Test M (SD)	n
Subjective Vitality	22.05 (5.17)	66	25.19 (4.01)	51
Spiritual Well-Being	25.17 (8.41)	66	28.07 (7.59)	51
Physical Self-Efficacy	79.07 (13.56)	66	82.25 (13.57)	51

Subsequently, a multiple linear regression analysis was carried out to estimate the relationship between the dependent variable of subjective vitality and the independent variables. Here, the mediators were treated as ordinary independent variables. Therefore, participation in the intervention, the total scales scores for spiritual well-being and physical self-efficacy respectively, were incorporated as independent variables into the analysis. A significant regression equation was found ($F(3, 47) = 11.886$, $p < .000$), with an R^2 of .431. Furthermore, spiritual well-being was a significant predictor for changes in subjective vitality (see Table 4).

Table 4. *Results of multiple linear regression for predicting subjective vitality scores.*

Predictor	B	95% CI	β	t	p
(Intercept)	6.528	[-.433, 13.489]		1.887	.065
Frequency of exercise	.458	[-.030, .946]	.214	1.887	.065
Physical Self-Efficacy	.131	[-.006, .269]	.248	1.920	.061
Spiritual Well-Being	.118	[.041, .196]	.400	3.080	.003

Last but not least, Hayes' macro process was carried out to test the mediating effect of spiritual well-being and physical self-efficacy on the relationship between the intervention and subjective vitality separately (see Figures 2 and 3). Although the direct effects from both spiritual well-being (b = .561, *s.e.* = .261, p = .036) and physical self-efficacy (b = .510, *s.e.* = .248, p = .045) respectively were positive and significant, indicating that both mediators had a significant influence on subjective vitality, mediation cannot be assumed. There are two reasons why mediation cannot be assumed. Firstly, the direct effect (a) of frequency on both mediators, spiritual well-being (b = .844, *s.e.* = .564, p = .141) and physical self-efficacy (b = 1.618, *s.e.* = 1.006, p = .114) respectively, is non-significant. Secondly, the set confidence intervals for the indirect effects (ab) for both spiritual well-being (95% CI [-.119, .509]) and physical self-efficacy (95% CI [-.135, .691]) include a "0", meaning that p >.05. Hence the null hypothesis cannot be rejected and mediation cannot be assumed.

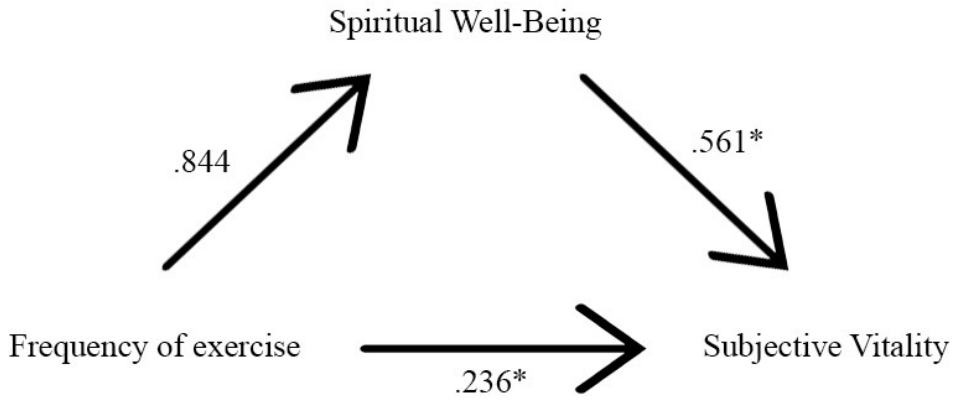

Figure 2. *Results of mediation analysis for Spiritual Well-Being.* *****= $p < .05$.

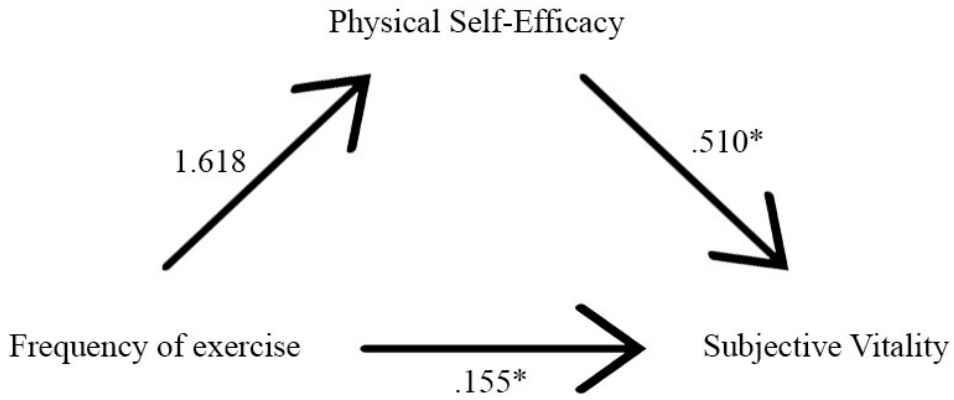

Figure 3. *Results of mediation analysis for Physical Self-Efficacy. *= p < .05.*

4. Discussion

4.1. Key findings and interpretation

The aim of this particular study was to investigate whether a 7-day intervention leads to significant increase in subjective vitality among participants, while accounting for possible mediating effects of spiritual well-being and physical self-efficacy.

Looking at the results, participants mostly adhered to the intervention. Furthermore, subjective vitality increased significantly between pre-test and post-test. As for the mediation analysis, only the direct effects of spiritual well-being and physical self-efficacy on subjective were significant, while the direct effect of exercise on the mediators was non-significant. Therefore, out of both hypotheses, only the first can be accepted certainly, which was namely "Subjective Vitality increases after the 7-day intervention, compared to before the intervention.". The second hypothesis, namely "Spiritual Well-Being and Physical Self-Efficacy have a positive mediating effect on the relationship between the intervention and Subjective Vitality", must be rejected because significant direct effects between the independent variable and the mediators were missing, as well as the lack of significance for the overall indirect effects of both mediators on subjective vitality. As for the interpretation of the results, it can be stated that changes in the dependent variable of subjective vitality can be safely associated with the proposed intervention, since the direct effect of the frequency of exercises on subjective vitality was significant (see Figures 2 and 3). These findings are in line with the previously gathered information, where it was stated that exercising generally increases

subjective vitality (Ryan, & Frederick, 1997, Mavilidi et al. 2020). Therefore, one can assume that changes in subjective vitality did occur because of the intervention itself. Next to this, both spiritual well-being and physical self-efficacy did not serve as mediators for this study but rather as standalone predictors for changes in subjective vitality, as portrayed by significant direct effects on the presumed mediators on subjective vitality. This is also supported by the results of the multiple linear regression, where spiritual well-being was a significant predictor for changes in subjective vitality. These findings are mostly in line with previously gathered information. Firstly, spiritual well-being is commonly associated with psychological well-being (Gomez, & Fisher, 2003, Paloutzian et al. 2021, Ryan, & Frederick, 1997, Tough et al., 2017), which is mainly used as a mental concept in connection with subjective vitality throughout literature. Ju (2017) proposed that frequent exercising increases meaning in life, which is a key aspect of spiritual well-being and might account for the significant direct effect of spiritual well-being on subjective vitality. However, the overall lack of inclusion of spiritual well-being in connection with subjective vitality makes it hard to compare these findings with others, but they yield promising directions for future research nonetheless. Lastly, physical self-efficacy was found to be directly correlated with subjective vitality throughout scientific literature (Ryan, & Frederick, 1997, Sarıçam, 2015). Although physical self-efficacy is mostly used as a mediator in literature (Joseph et al., 2015), it is not true in this particular study because of a missing mediation effect. This study however, is still in line with previous research, because Ryan, & Frederick (1997) also found that physical self-efficacy is a promising predictor of changes in subjective vitality.

4.2. Strengths and Limitations

Now, there are also several strengths and limitations to this study. An arguable strength of this study was the inclusion of uncommon mediators into the relationship between an intervention and subjective vitality because these mediators are not seen in scientific literature. Although there was no complete mediation, they still had a direct effect on subjective vitality, which shows there are concepts that can be connected with subjective vitality, which are normally not analyzed. Another strength of this study was the self-made intervention, which was carefully planned beforehand. These two design choices are arguably the biggest strengths of this particular study.

Next to the strengths, there are also several limitations to this study. Precisely, looking

at participation day-by-day showed that participation declined steadily over time (see Table 2). This is also in line with a previous finding of De Feo (2013), where they found that drop-out rates decrease based on time effort. However, participation on day 7 was higher than on day 1, which seems rather odd. An explanation for this could be that participants knew that this was the last day of the intervention and gained motivation because of that. Though, this is pure speculation but still very interesting. General participation in the study was also not as expected.

In the beginning, 100 participants were set as a goal. During the pre-test, 66 people took part in the study, while only 51 people finished the whole study. That is a drop-out rate of 22,72%, which is not high but too high for this already small sample size. Hence, the sample size for a study of this scope is too low and it would definitely need to be bigger if one wanted to redo this study (Hill, 1998). Now, a reason for this high drop-out rate might be that 7 days are a rather big time-frame and participants also had little incentive to stay on track and to do the tasks. The only incentive were SONA-points, which were pretty low for a 7-day intervention and solidarity to the researchers, which also varies per individual. It has to be noted that the researchers did everything they could to gain more participants for this study but again, the incentives on SONA were bad compared to simpler studies that offered the same or a similar amount of credits (questionnaires for example) and the "opportunity sampling" technique was also not fruitful because partly the researchers did not know many people to begin with. Another limitation to this study is the context in which it took place. This study was carried out as the situation revolving around Covid-19 already got better, which might account for generally higher scale scores during the post-test.

A further limitation was the time frame (7 days) in which the intervention took place because normally, interventions in this domain last for several weeks to yield promising results (Kinnafick et al., 2014). This contradicts the previous statement that the dropout rate was already high for 7 days. Hence, one would need to increase the time of the intervention while simultaneously raising the incentive for participants to complete it successfully. However, given the circumstances under which this study took place, a longer study and better incentives were impossible. Next to this, the researchers had to trust the participants and their self-reports, while the participants all had the possibility to miss out on the exercises and then lie during the post-test. Another limitation to this study is a lack of diversity in the sample. In this study, most participants were young adults from Germany, which lowers the overall generalizability of the gathered results. Furthermore, during the post-test, participants were unable to report whether they did no task for a particular day, meaning that the lowest amount of exercise was "7" instead of "0". Hence, if someone did not do any task, the dataset still showed 7 completed exercises.

Lastly, the biggest limitation of this study is the lack of a control group. Because a control group is missing, one cannot make inferential statements about the results with certainty.

To sum up, there are several limitations to the design of this study, especially time and the lack of a control group was an issue. The biggest strength was arguably the intervention that is self-made.

4.3. Practical Implications

Based on the strengths and limitations of this study, there are also some practical implications of this study to research in this field. Moreover, a practical implication of this study is the direct effect of the presumed mediators on subjective vitality. Since their direct effect on subjective vitality was significant, they could practically work as fitting direct predictors for changes in subjective vitality, rather than having an indirect effect on the outcome. Another practical implication is that this study shows how important it is to keep the drop-out rate low in interventions that are even longer, since this was an intervention that took place over a very limited period of time. Usually, an intervention in this area is even longer (Kinnafick et al., 2014). Furthermore, this study serves as a practical implication for individuals to keep in mind that both physical and psychological aspects are of equal importance when one wants to be healthy. Most participants in this study already experienced the practical implications first hand but it would be even better if more people would be aware about the matter at hand.

4.4. Further Research

Based on the gathered results and limitations, future researchers might look into our intervention and test it for its long-term successfulness in a longer intervention. Moreover, the inclusion of control groups in future research is crucial to be able to make inferential statements at all (Moser, 2019). Additionally, a future intervention should last for several weeks rather than one week to acquire reliable results, while keeping the dropout rate low (Kinnafick et al., 2014). For example, participants could be offered something of value if they finish the intervention (money, vouchers, or materialistic objects). Next to this, future researchers should collect data from a more diverse sample to increase generalizability of the results, since the sample in this study was gathered using non-probability sampling methods that resulted in sample that was mainly composed of young German adults. Additionally, future researchers should employ different forms of proof than self-reports to ensure that participants actually did

the exercises. For example, they could hand out heart-rate monitors or ask the participants to film themselves during the exercises as proof of completion. Another option would be to have the participants execute the tasks in a controlled environment (lab). However, these options could come with a financial cost. Furthermore, this study should be replicated at a later point in time to avoid contextual factors influencing the results, which they might have in this case, i.e. Covid-19 situation got better. Generally, research in this field should be continued because pandemics of this scope can potentially affect even healthy people. Therefore, it would be wise to continue with thorough research in this field, even after the Covid-19 pandemic will end.

4.5. Conclusion

The self-made intervention, which was created to target subjective vitality directly and indirectly by employing the mediators spiritual well-being and physical self-efficacy, partly generated promising results. The first of the two hypotheses was accepted, namely that subjective vitality increases after the 7-day intervention. However, since there was no control group, one cannot safely assume that subjective vitality increased solely because of the intervention. Next to this, the presumed mediators spiritual well-being and physical self-efficacy were rather predictors for changes in subjective vitality than mediators because of their direct effect on subjective vitality, while missing a direct effect between them and frequency of exercise (see Figures 2 and 3). In addition to this, it was expected but still surprising that especially spiritual well-being is a significant predictor for changes in subjective vitality. These results in general emphasize the need to look for further mental and physical concepts that might be associated with subjective vitality but might have been overlooked. Although subjective vitality increased significantly at the end of the intervention, the design of the study would need to be adjusted further in order to yield usable results in the future, however, as there was no control group for example. Finally, the importance of both the mental and physical aspects to health are stressed, in order to be overall healthy and to feel a high sense of subjective vitality as an individual.

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Appendices

Appendix A – Subjective Vitality Scale

Please read the following statements carefully and try to answer them as honestly as possible. Please indicate how true each statement has been for you **during the past 7 days**.

	Not at all true	Not true	Almost not true	Almost true	True	Very true
I feel alive and vital.	○	○	○	○	○	○
Sometimes I am so alive I just want to burst.	○	○	○	○	○	○
I have energy and spirit.	○	○	○	○	○	○
I look forward to each new day.	○	○	○	○	○	○
I nearly always feel awake and alert.	○	○	○	○	○	○
I feel energized.	○	○	○	○	○	○

Appendix B – Spiritual Well-Being Scale

Please read the following statements carefully and try to answer them as honestly as possible. Please indicate how true each statement has been for you **during the past 7 days**.

	Not at all	A little bit	Somewhat	Quite a bit	Very much
I feel peaceful.	○	○	○	○	○
I have a reason for living.	○	○	○	○	○
My life has been productive	○	○	○	○	○
I have trouble feeling peace of mind.	○	○	○	○	○
I feel a sense of purpose in my life.	○	○	○	○	○
I am able to reach down deep into myself for comfort.	○	○	○	○	○
I feel a sense of harmony within myself.	○	○	○	○	○
My life lacks meaning and purpose.	○	○	○	○	○
I find comfort in my faith or spiritual beliefs.	○	○	○	○	○
I find strength in my faith or spiritual beliefs.	○	○	○	○	○
My illness has strengthened my faith or spiritual beliefs	○	○	○	○	○
I know that whatever happens with my illness, things will be okay.	○	○	○	○	○

Appendix C – Physical Self-Efficacy Scale

Please read the following statements carefully and try to answer them as honestly as possible. Please indicate how true each statement has been for you **during the past 7 days**.

	Strongly agree	Agree	Somewhat agree	Somewhat disagree	Disagree	Strongly disagree
I have excellent reflexes.	○	○	○	○	○	○
I am not agile and graceful.	○	○	○	○	○	○
I am rarely embarrassed by my voice.	○	○	○	○	○	○
My physique is rather strong.	○	○	○	○	○	○
Sometimes I don't hold up well under stress.	○	○	○	○	○	○
I can't run fast.	○	○	○	○	○	○
I have physical defects that sometimes bother me.	○	○	○	○	○	○
I don't feel in control when I take tests involving physical dexterity.	○	○	○	○	○	○
I am never intimidated by the thought of a sexual encounter.	○	○	○	○	○	○
People think negative things about me because of my posture.	○	○	○	○	○	○
I am not hesitant about disagreeing with people bigger than me.	○	○	○	○	○	○
I have poor muscle tone.	○	○	○	○	○	○
I take little pride in my ability in sports.	○	○	○	○	○	○
Athletic people usually do not receive more attention than me.	○	○	○	○	○	○
I am sometimes envious of those better looking than myself.	○	○	○	○	○	○
Sometimes my laugh embarrasses me.	○	○	○	○	○	○
I am not concerned with the impression my physique makes on others.	○	○	○	○	○	○
Sometimes I feel uncomfortable shaking hands because my hands are clammy.	○	○	○	○	○	○
My speed has helped me out of some tight spots.	○	○	○	○	○	○
I find that I am not accident prone.	○	○	○	○	○	○
I have a strong grip.	○	○	○	○	○	○
Because of my agility, I have been able to do things which many others could not do.	○	○	○	○	○	○

Appendix D – Study Introduction

Dear participant,

Thank you for taking part in this study. In this study, you will first fill out a questionnaire regarding your subjective vitality and it's surrounding concepts. Subsequently, we politely ask you to take part in a one-week intervention that is aimed towards improving subjective vitality. After the intervention, we ask you one more time to fill out another questionnaire to know whether you saw improvements.
We kindly ask you to read these descriptions and look at the questions carefully before you proceed to answer them as honest as possible. The questionnaire will begin with some general questions, followed by questions tailored around subjective vitality. All of your data will be handled as anonymously as possible and will not be given to third parties. This survey will take approximately **20 minutes** to complete. At the end of the questionnaire, You are required to provide us with your preferred email-address, so we are able to send you the materials for the intervention and to identify you as an individual in our data. We will also send you the last questionnaire to your chosen email-address after completion of the intervention. Your email-address will be anonymized for the data analysis of this study.
Additionally, we kindly ask you to write down when you did not do the tasks and if so, which tasks specifically. This enables us a deeper insight on your behaviour during the intervention. It is advised to write down missed exercises, either on paper or your phone, so you can see can keep an overview.
Again, your data will be processed anonymously; participation is voluntary and you can withdraw from the research at any given time. However, SONA-credits will only be applied after you answered the questionnaire following the intervention. If you have any questions, please feel free to contact us via email: l.dannenberg@student.utwente.nl, or e.hahn@student.utwente.nl.

Kind regards,
Leon and Emily.

I agree to participate in this study.

- ○ Yes
- ○ No

Appendix E – Intervention Questionnaire (Post-Test)

Please indicate which tasks you did **during the past 7 days.**

	I have done all of the exercises.	I have not done the morning exercises.	I have not done the evening exercises.
Day 1	○	○	○
Day 2	○	○	○
Day 3	○	○	○
Day 4	○	○	○
Day 5	○	○	○
Day 6	○	○	○
Day 7	○	○	○

Have you done the tasks we provided you with?

- ○ Yes, I have done the tasks you provided me with.
- ○ No, I have done other tasks.

Appendix F – Link to Intervention Material

https://www.youtube.com/playlist?list=PL8HiMAGXUpyErBXpUeMs_mNeGA5H-v1ou