The Relationship Between the Use of Character Strengths and Depression in University Students

Lukas Schröder

S1978330

University of Twente

BMS Faculty

Department of Psychology

1st Supervisor: Dr. T. Dekkers

2nd Supervisor: Dr. P. Gül

Abstract

Background: University students are suffering disproportionally from mental health issues, especially depression. The use of character strengths might be a way for them to cope with depression more effectively. The connection between character strengths and depression has already been shown on a between person level but on a within person level research on this subject is still lacking. Some research also exists which suggests that a persons gender might influence the relationship between strength use and depression.

Objective: The current research had two objectives. Firstly, it aimed to determine, whether the relationship between strength use and depression exists mainly on a between person level or on a within person level. Secondly, this research aimed to find out whether there is any difference in the relationship between strength use and depression for the two genders.

Method: The sample consisted of 10 university students aged 22 to 25, with mostly German nationality (70%). To measure the state constructs over time, an Experience Sampling Method (ESM) was used. In order to measure trait depression, the Patient Health Questionnaire-8 (PHQ-8) was used and in order to measure trait strength use the Strength Use Scale (SUS) was used. The single item scale of depressive mood was used to measure state depression and to measure state strength use, two items from the SUS were used. On day one of the study, participants had to fill in their demographic data and complete the trait level measurements. For the following seven days, participants needed to fill in the state questionnaires three times a day. To analyze the data, correlation analyses and linear mixed models were used.

Results: The results showed a significant negative weak correlation between strength use and depression on a within person level, but no significant correlation on a between person level. Furthermore, the results have shown that there is no significant difference between the genders when it comes to the correlation between strength use and depression.

Discussion: The study found that when participants used their strengths more than usual, they simultaneously experienced fewer depressive symptoms than usual. However, how much people were using their strengths on average gave no indication on how overall depressed they were. Furthermore, no differences between the genders could be found in the relationship between strength use and depression. Based on these results, future research should put more focus on the state level relationship between strength use and depression, rather than the trait level relationship.

Introduction

It has been shown time and time again that university students are disproportionally affected by mental health issues (Ibrahim, Kelly, Adams & Glazebrook, 2013). Many university students find themselves insufficiently prepared for the challenges that university life throws at them. Especially in the beginning of their academic career, although not exclusively, students seem to struggle with living on their own, academic pressure, social adaptation and management of their time and finances (Mostert, Theron & de Beer, 2017). This leads to high levels of stress among students. Furthermore, in most Western countries a significant percentage of young people are university students (Tertiary education statistics, 2019), and projections predict that this number will increase even more over time (Roser & Ortiz-Ospina, 2013). So, it is necessary to find solutions to the specific problems that students are facing.

One of the most common mental health issues that students face is depression (Ibrahim, Kelly, Adams & Glazebrook, 2013), which is what this paper will focus on. Depression affects about 264 million people globally (GBD 2017 Disease and Injury Incidence and Prevalence Collaborators, 2018), which makes it one of the most common forms of mental illness in the world. In severe cases, depression can even lead to suicide. Almost 800.000 people die from suicide each year and it is the second leading cause of death for people aged 15 to 29 (Depression, 2020). Similarly, a study by Pratt, Druss, Manderscheid and Walker (2016) found that people with symptoms of anxiety or depression die on average 7.9 years earlier than people without those symptoms. University students are also substantially more likely to experience depression than the regular population (Bayram & Bilgel, 2008), which is why gaining more knowledge on how to treat depression in university students is especially important.

One possible way for students to better cope with depression could be through the use of character strengths. Character strengths are conceptualized as a family of widely valued positive traits for feeling, thinking and behaving with the purpose of achieving fulfillment and happiness (Duan, Bu, Zhao & Guo, 2018). However, it was more recently shown that merely the possession of character strengths is not sufficient, instead people also need to be aware of that strength and use it in the world (Govindji & Linley, 2007; Proctor, Maltby & Linley, 2011).

Studies on the connection between character strength use and depression found the relationship to be generally significant but weak. A study by Duan and Bu (2017) that focused on Chinese undergraduate freshmen found that character strength use can reduce depression

over time. Similarly, a study by Senf and Liau (2012), with a sample of mostly female university students, found a character strength use intervention to decrease depressive symptoms over time. In contrast, a study by Mitchell, Stanimirovic, Klein and Vella-Brodrick (2009) found no significant decrease in depression over time, following a strength use intervention. A more general perspective can be gained from a meta-analysis by Schutte and Malouf (2018) that analyzed seven studies, including the previous three, and concluded that strength use interventions had a significant effect on decreasing depression, however the effect was rather small. This view is supported by an earlier meta-analysis by Sin and Lyubomirsky (2009) which compared 25 different studies and also found strength use and depression to generally have a significant, but small correlation.

However, it is important to take into account that these studies were not correlational studies, but rather intervention studies. That means these studies not only aimed to examine whether strength use and depression are correlated, but also whether depression can be influenced through strength use interventions. Failure to achieve this change in depressive state could have had other reasons, like poor intervention design, and does not necessarily imply that strength use and depression are not correlated. When examining correlational studies, the consensus seems to be that strength use is positively correlated with general wellbeing. One study by Proctor, Maltby and Linley (2011) found that the use of character strengths is a good predictor for subjective wellbeing in British university students. Later a study by Stander, Diedericks, Mostert and de Beer (2015) on South African first year university students found similar results. They found strength use to be a predictor for life satisfaction, hope and efficacy. Yet another study by Zhang and Chen (2018) that focused on Chinese university students found that the relationship between character strengths and wellbeing is moderated by strength use. It is notable that these studies did not focus specifically on depression, but rather on more general wellbeing. However, since it is well known that wellbeing and depression are negatively correlated (Zheng, 2016), the findings of this research can still be taken into account.

The varying results and the overall small effect that can be found for the relationship between strength use and depression indicate that this relationship may exist for some people but not for others. This leads to the idea that individual differences between participants may influence the association between strength use and depression. One characteristic that could be of particular interest in this regard is gender. A study by Quintana-Orts and Rey (2018) found that the character strength of forgiveness shows a negative association with depression and suicide for adolescent boys, but not for girls. This indicates that the two genders benefit

from different strengths and thus that gender is a factor that should be considered in strength use research. Another study also found that men and women benefit from different strengths when it comes to protection against depression and suicidality in the workplace (Kim, Kim, Hong, Han, Yoo, Min & Lee, 2018). Even though these studies do not indicate that the relationship between general strength use and depression would necessarily be different between genders, they support the idea that gender is a concept that should be considered in strength use research.

However, these were all studies that focused on strength use at one point in time and ignored the specific circumstances of the individual, thus focusing on the between person level. But whether someone can effectively use their strengths is not solely dependent on the individual, but also on their environment (Bakker & van Woerkom, 2018). These insights led to the idea that strength use is a behavior that may differ depending on the time and environment it is being applied in (Bakker, Hetland, Kjellevold-Olsen, & Espevik, 2019). So, this indicates that not only the trait of strength use may be connected to depression (between person level), but the act of using one's strengths could also be associated with fewer momentary depressive symptoms (within person level).

To effectively measure how a person's use of character strengths would affect their depressive symptoms over time, a longitudinal study design is needed. The cross-sectional study design is only appropriate to measure differences between persons, whereas a longitudinal study with multiple participants could offer information about both between-person and within-person differences. A paper by Curran and Bauer (2011) gives an example which illustrates this quite well. While exercising, an individual's risk of heart attack is heightened (i.e. within person effect), but also people that exercise more have a generally lower risk of heart attack (i.e. between person effect). Both findings are valid and relevant, however generalizing the between person effect to the individual would be wrong (i.e. the more you exercise the more likely you are to suffer a heart attack). In the same vein, it has been demonstrated that people who use their strengths more are also generally less depressed (i.e. between person effect) (Schutte & Malouf, 2018; Sin & Lyubomirsky, 2009). However, it is unknown whether using one's strengths at a certain point in time would also be associated with fewer depressive symptoms at that point in time (i.e. within person effect).

Finding this relationship between strength use and depression on a within person level could imply that university students should be encouraged to use their strengths on a daily basis, as this would be associated with fewer depressive symptoms at that time. Furthermore,

finding evidence for a link between these concepts at the within person level would indicate that the theories about those concepts hold true across different levels of analysis, which is an idea that is known as isomorphism. Oftentimes certain concepts that are used to describe individuals are also used to describe higher level units like groups, or the other way around. However, these comparisons might not be appropriate since generalizability and meaningfulness across levels may not have been made evident yet, which is why isomorphism is something to strive for (Tay, Woo & Vermunt, 2014). Research about the within person relationship between strength use and depression does not yet exist. There has been one study by Bakker, Hetland, Kjellevold-Olson and Espevik (2019) which confirmed a relationship between strength use and wellbeing on a within person level for naval cadets, however this research has not yet been replicated for other populations, nor for depression as a specific aspect of well-being.

This research aims to examine the association between use of character strengths and depressive symptoms in university students and how this relationship varies between genders. Based on previous research two hypotheses have been formulated. The first hypothesis is that strength use and depression have a significant negative weak correlation on a between person level and on a within person level. The second hypothesis is that the correlation between strength use and depression is different for the two genders.

Methods

Design

In this study, the experience sampling method (ESM) was used to assess momentary character strength use and momentary depression in university students over the course of a week. ESM is a structured self-report diary technique that can be used to assess concepts such as mood as they are taking place in regular life (Myin-Germeys et al., 2018). In ESM studies participants usually fill in a questionnaire several times a day over a multiple day period. This method was suitable for the current study, since it allowed for measurements on a between person level and on a within person level by collecting multiple measurements each day from multiple participants. This study was part of a larger study, which focused on character strength use and wellbeing. As part of this larger research, there were other measures of wellbeing included in the study design which are not relevant to this specific study and are not discussed further. The study received ethical approval by the Behavioral, Management and Social

Sciences (BMS) ethical committee of the University of Twente on the 22nd October 2020 (approval number 201229).

Participants

A convenience sampling method was used to recruit participants. Participants were recruited through personal contacts of the researchers. The participants received no compensation for their participation in the study. Inclusion criteria were that participants had to be enrolled in a college or university, had to have basic English skills to be able to complete the (English language) surveys and had to have a smartphone in order to download the Ethica application. Originally 27 participants were recruited for this study, which appeared to be a reasonable number, since experience sampling studies have a median sample size of 19 participants (van Berkel, Ferreira & Kostakos, 2017). However, 17 participants had to be excluded from the current study, leaving a final sample of 10 participants. In total, three participants had to be excluded for not filling in the baseline assessments, six had to be excluded for not meeting the inclusion criteria, and eight had to be excluded because their response rate was too low (<50%). The participants were 50% male and 50% female, with ages ranging from 22 to 25 years old (M_{age}=23.5 SD_{age}=.85). The participants were all university students and their nationalities were 70% German, 10% Dutch, and 20% other.

Materials

To collect data for this study, version 390 of the Ethica application (Ethica, 2019) was used. Ethica is an application that participants can download for free on their smartphone. Participants can fill in questionnaires through Ethica and the application can also send them push notifications as reminders. Ethica is convenient for experience sampling methods since it uses the phone of the participant to collect the data, which allows measurements on the go. The application is available for iOS and Android phones and offers full offline support, meaning that participants do not have to use their mobile data to participate. All data in Ethica is encrypted and stored securely. Ethica offers the participants security and privacy by giving them full control over their data, including the option to delete it. In order to use the Ethica application an e-mail address and phone were needed.

The study included a set of demographic questions, two trait level questionnaires and a daily questionnaire. The demographic questions assessed the participants' age, gender, nationality,

and university enrollment status. The trait level questionnaires consisted of a questionnaire measuring depression and a questionnaire measuring character strength use.

Trait depression

The questionnaire that was used to measure trait level depression was the Patient Health Questionnaire-8 (PHQ-8) (Appendix B), which was first introduced in a paper by Kroenke and Spitzer (2002). The PHQ-8 consists of 8 items that are measured on a 4-point Likert scale, ranging from 0 (not at all) to 3 (nearly every day). The items themselves are prefaced by the following sentence "Over the last 2 weeks, how often have you been bothered by any of the following problems?". An example of one of the items would be "Feeling down, depressed, or hopeless". The PHQ-8 has adequate reliability and validity (Kroenke & Spitzer, 2002). In this current study, the PHQ-8 had a Cronbach's Alpha of .86 and was thus also found to have adequate reliability.

Trait strength use

In order to measure the participants trait level of character strength use, the Strengths Use Scale (SUS) (Appendix C) was used, which was first introduced in a paper by Govindij and Linley (2007). The scale consisted of 14 items that were measured on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). An example of one of the items would be "I achieve what I want by using my strengths". The SUS has been shown to have adequate reliability and validity (Govindij & Lindley, 2007). In this current study, the SUS had a Cronbach's Alpha of .906 and was thus also found to have adequate reliability.

Daily questionnaire

The daily questionnaire (Appendix D) consisted of three items and measured the participants' state level character strength use and momentary depression. The first part of the daily questionnaire focused on depression and was based on the single item scale for depressive mood (McKenzie & Marks, 1999). The item was measured on a 9-point Likert scale, ranging from 0 (hardly at all) to 8 (very severely disturbing/disabling). The original item was "Choose a number from the scale below to show how much you are troubled by feeling miserable or depressed". The item had a correlation of 0.71 to 0.78 with scores from the Beck Depression

Inventory (BDI-21) and had acceptable reliability and validity (McKenzie & Marks, 1999). However, for the item to measure momentary depressive mood instead of general depressive mood, the item was slightly modified. The resulting new item read as "On a scale from 0 (Hardly at all) - 8 (Very severely disturbing/disabling), how much are you troubled by feeling miserable or depressed at the moment? Choose the number that you feel best reflects your current feelings."

The second part of the daily questionnaire focused on character strength use and consisted of two items from the Strengths Use Scale (Govindji & Linley, 2007). The items were measured on 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The two items were "I am regularly able to do what I do best" and "I am able to use my strengths in lots of different ways". These two items had a factor loading of .79 and .75 respectively and thus had the highest factor loadings out of all the 14 items that were part of the original scale. These items also had to be slightly transformed in order for them to measure momentary strength use instead of general strength use. The resulting new items were "I feel able to do what I do best at the moment" and "I feel able to use my strengths in lots of different ways at the moment". To get a single state strength use variable for the analysis, the average score from the two items was used.

Procedure

After the study was programmed into Ethica and pilot tested for correctness, participants could sign up for it. At the start of the data collection participants were provided with a URL link, which led them to the Ethica website. On the website participants were instructed to download the Ethica application from either the "Google Play Store" or the "App Store", depending on their type of phone. From there on all necessary information, including the informed consent form (Appendix A), was provided through the application, however participants still had the opportunity to contact the researchers by phone in case of additional questions.

Immediately after downloading the application, participants had the opportunity to fill in their demographic data and had time to do so until the end of the study. Participants were required to complete the trait level questionnaires on the day of sign up (day 1). This was done to ensure that the daily questionnaires would not influence the participants responses on the trait level questionnaires. On day 2 to 8 the daily questionnaire was administered. An

interval contingent protocol was used in administering the daily questionnaires to receive multiple measurements per day at standardized time windows and minimize the burden on the participants (Christensen, Barrett, Bliss-Moreau, Lebo & Kaschub, 2003). Each day had three time windows, during which the daily questionnaire was administered once. Three measurement points in a day are most common in ESM, usually during morning, late afternoon and night (Yearick, 2017). Measurements should also have some space in between each other and take place when the target group is awake (Connor & Lehman, 2012). Thus, the time windows for this study were in the morning from 9am to 12am, in the afternoon from 2pm to 5pm and in the evening from 7pm to 10pm. At the beginning of each of these three hour time windows the participant received a push notification to remind them that it was time to fill in the questionnaire. After 90 minutes the participant received a second push notification to again remind them that it was time to fill in the questionnaire, in case they had not done so already. This resulted in a total number of six notifications per day, with a minimum of 90 minutes in between, which was found to be a sufficient inter-notification time (van Berkel, Ferreira & Kostakos, 2017).

In total, the study had a duration of 8 days. ESM studies commonly take about 14 days, but for this study it was decided to shorten the length in order to reduce participant burden. The whole data collection process lasted from the 9th November 2020 until the 23rd November 2020.

Data analysis

To analyze the data, the statistics program IBM SPSS Statistics 25 was used. Participants with repetitive answering patterns were excluded from the dataset. A repetitive answering pattern was defined as the same answers having been selected every time the questionnaire was presented. Test cases from the researchers and cases that did not include baseline assessments were also excluded. Additionally, participants with a response rate lower than 50% were also excluded. Conner and Lehman (2012) mentioned that a cutoff point at 50% is commonplace in ESM studies. This cutoff point also allowed for a reasonable amount of data to be collected while simultaneously excluding participants whose response rate was considerably below the average response rate of 70%. Descriptive statistics were calculated for demographics of the participants. Afterwards, sum scores for the PHQ-8 and the trait level version of the SUS were calculated, as well as means for each participant. For a visual analysis graphs were created, which depicted the levels of state strength use and state depression for each participant across

the study period. Also, a bar graph was created which showed each participants' mean value for state depression and state strength use.

First a correlation analysis was conducted on the sum scores of the PHQ-8 and the trait level Strength Use Scale to check the correlation of the trait constructs. Additionally, the correlation between the state measures and their corresponding trait measure was analyzed, but to do so, a new variable had to be created first. Mean scores for each participant regarding state strength use and state depression were calculated across all time points, resulting in the Person Mean (PM) value for these variables. A correlation analysis between PM-strength use and the trait level Strength Use Scale was conducted, aswell as a correlation analysis between PM-depression and the PHQ-8. To check the overall correlation between state strength use and state depression, a linear mixed model was used with state strength use as the predictor variable and state depression as the outcome variable. Afterwards, to see whether this correlation between state depression and state strength use was the same for men and women, a moderation analysis was conducted with gender as the moderator variable.

The association between state strength use and state depression over time was also analyzed using a linear mixed model. This linear mixed model was used to examine whether the relationship between character strength use and depression most resembles a trait like (between person) or state like (within person) association (Curran & Bauer, 2011). To do so, another new variable had to be created first. The PM-strength use score was subtracted from each individual state strength use score, resulting in the Person Mean Centered (PMC) value for strength use. The PMC-strength use indicates for each measurement point whether the participant used their strengths more or less than their average and if so, to what extent. The linear mixed model used state depression as the outcome variable and the new variables, PM-strength use and PMC-strength use, as predictor variables. Additionally, Z-scores were calculated for state depression, PM-strength use and PMC-strength use and a standardized linear mixed model was created, using these standardized variables. In these models PM was used to determine the strength of the trait like association and PMC was used to determine the strength of the state like association.

Results

Descriptive Statistics

In total 27 people signed up for the study, of which 17 had to be excluded for different reasons, which were mentioned under the section 'Participants'. This left 10 participants for the analysis. Table 1 shows an overview of the mean and standard deviation, as well as minimum and maximum scores for the trait questionnaires and for the PM of the state constructs. Something that stands out about these values is that the participants had rather low state depression scores. For reference a score below two indicates no sign of depression and a score of 3-4 only indicates mild-moderate depressive symptoms (McKenzie & Marks, 1999). The trait depression scores were somewhat higher, however the mean score still stayed below ten. A score of ten or above is a generally accepted cutoff point for depression, meaning a score below ten gives no indication of current depression (Kroenke, Strine, Spitzer, Williams, Berry & Mokdad, 2009).

Table 1

Descriptive Statistics of Trait Strength Use (SUS) and Trait Depression (PHQ-8), as Well as Person Mean (PM) Scores of State Strength Use and State Depression

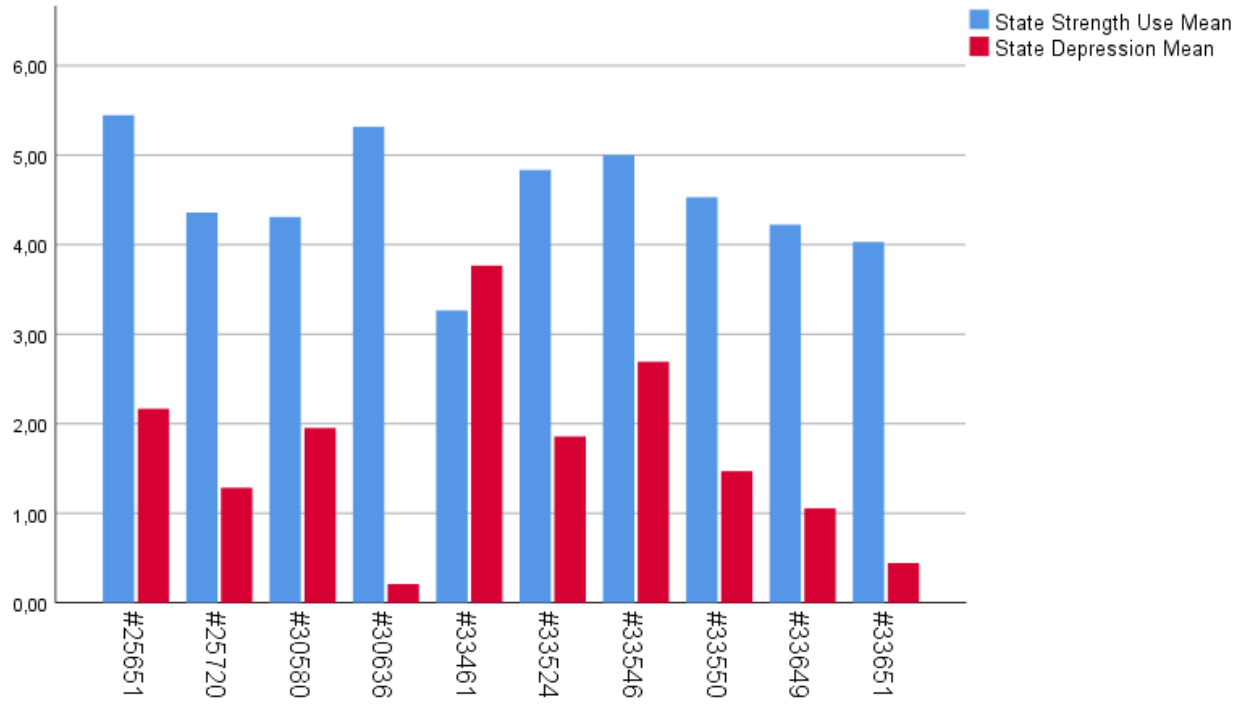
	Mean	Standard deviation	Minimum (Scale Minimum)	Maximum (Scale Maximum)
Trait Strength Use	65.66	11.265	43 (14)	78 (98)
Trait Depression	7.483	4.559	2 (0)	17 (24)
State Strength Use PM	4.534	0.616	3.26 (1)	5.44 (7)
State Depression PM	1.659	0.991	0.21 (0)	3.76 (8)

Visual Analysis

Figure 1 depicts the average state levels of strength use and depression for each participant, over the course of the study. When analyzing this graph, it appears that the variation between participants is greater for the depression values than for the strength use values (for ranges see Table 1). Another thing that stands out is that there seems to be a negative association between state strength use and state depression on a between person level. This is most apparent when looking at participant #30636, who had the lowest depression score (0.21) and one of the highest strength use scores (5.32).

Figure 1

Average State Depression and State Strength Use per Participant.

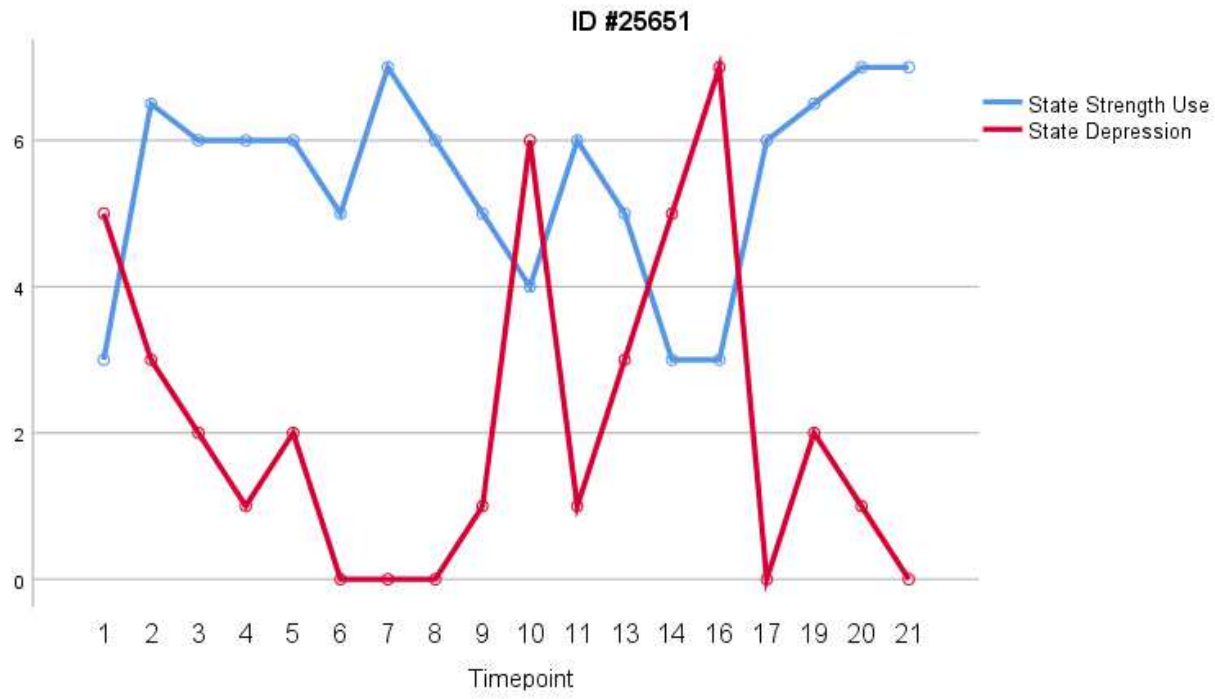


Note: State Depression is on a scale from 0-8 and State Strength Use is on a scale from 1-7, so the ranges are different.

Figure 2 provides additional information on the fluctuating values of the state constructs over time. When looking at Figure 2, one can see how the relationship between state strength use and state depression looks like over time for participant #25651. This participant is an interesting choice for closer visual inspection because they had the highest average state strength use score (5.44) out of all the participants. When looking at the graphs it seems like oftentimes when there is a spike in one of the constructs, there is a dip in the other one, which would indicate a negative association between the two constructs on a within person level. This is not always the case though, as one can see for example at timepoints 5 and 6, where state depression and state strength use were both lower at timepoint 6 than they were at timepoint 5.

Figure 2

State Strength Use and State Depression over Time for Participant #25651



Correlation Analyses

A correlation analysis between state level and trait level measures of depression showed a strong and significant correlation between the two constructs (r=.809, p<.001). A correlation analysis between state level and trait level measures of strength use showed a significant, but weak correlation between the two constructs (r=.158, p=.036). A correlation analysis between the trait level measure of depression and the trait level measure of strength use showed no significant correlation between the two constructs (r=.111, p=.142).

Linear Mixed Models

A linear mixed model was used to check the overall association between state level strength use and state level depression, as well as the strength of the between person and within person associations between these concepts, and a possible interaction by gender. First, the analysis showed that there was overall a significant moderate negative association between state strength use and state depression over time, B= -.554, p <.001, 95% CI [-.738, -.371]. This means that on average, participants with higher strength use experienced less depression. When exploring an influence of gender, the analysis showed that there was no significant

difference in the relation of state depression and state strength use between the genders, B=.340, p=.076, 95% CI [-.036, .717]. This means that the correlation between strength use and depression was the same for men and for women. Next, the analysis showed that there was no significant negative association between strength use (PM) and depression on a between person level, B=-.215, p=.061, 95% CI [-.442, .01]. Lastly, the analysis showed that there was a significant weak negative association between strength use (PMC) and depression on a within person level, B=-.333, p<.001, 95% CI [-.449, -.216]. These analyses indicate that the association between strength use and depression is more of a state like association. This means that the association between strength use and depression can mostly be attributed to the fact that when participants use their strengths more than they normally do, they also experience less depression than they normally do at that same timepoint.

Discussion

Result interpretation

The aim of this research was to examine the association between use of character strengths and depressive symptoms in university students, therefore an ESM study was conducted to examine this association on a within person level and on a between person level. Another aim was to assess whether this relationship varies between men and women.

The first hypothesis was that there is a significant relationship between strength use and depression on a between person level and on a within person level. Based on the findings this hypothesis was rejected, since there was only a significant relationship on a within person level but not on a between person level. The second hypothesis for this research was that there is a difference in the correlation of state strength use and state depression between the two genders. Based on the findings this hypothesis was rejected, since the relation between strength use and depression was the same for men and women.

The results showed overall a significant negative correlation between state strength use and state depression. This means that, generally speaking, university students who used their strengths more often also experienced less depression. Furthermore, the results showed that the negative correlation between state strength use and state depression was only significant on a within person level and not on a between person level. This indicates that the previously mentioned association between state strength use and state depression can mostly be explained by a within person association. In this case the within person association means

that when students used their strengths more than they normally did, they also experienced less depression than they normally did. The results of the trait strength use and trait depression correlation did not show a significant between person association either. This means that the students' average amount of strength use gave no indication on their general level of depression. Lastly, the results did not show a significant difference in the correlation of state strength use and state depression between the genders. This means that the degree to which people who were frequently using their strengths also experienced less depression was roughly the same for men and for women.

The overall significant negative correlation between the state constructs is in line with the findings from previous researchers. The meta-analysis by Schutte and Malouff (2018) analyzed seven studies on strength use and depression and found that strength use had a significant impact on decreases in depression. Even though their findings also imply a causal relationship that could not be replicated by this study, the fact that a significant correlation between the constructs has been found is in line with their research. Similarly, the meta-analysis by Sin and Lyubomirsky (2009) compared 25 different studies and overall found a significant relationship between strength use and depression, so the current finding is very much in line with previous research.

As mentioned in the introduction, there was no research done on the within person relationship between strength use and depression. However, Bakker and colleagues (2019) did research on the relationship between strength use and wellbeing on a daily level and in their study found this relationship to be significant. Since there is a significant negative correlation between wellbeing and depression (Zheng, 2016), it can be said that the current findings are in line with the research of Bakker and colleagues. However, the current study also added a level of detail in two notable ways. Firstly, it showed that strength use and wellbeing are not only associated on a daily level but also on a momentary level, since this study involved three measurements per day. Secondly, it also specifically differentiated between the within person level and the between person level. It must also be noted that, since the association between strength use and depression was only significant on a within person level and not on a between person level, it appears that the principle of isomorphism may not apply for this relationship.

When looking for possible explanations why using one's strengths more would directly be associated with less depression the broaden and build theory (Fredrickson, 2004) might offer some insights. It has been documented that depressive mood and the pessimistic

thinking that results from it affect each other reciprocally, resulting in a downward spiral that may result in a steady worsening mood or severe depression (Peterson & Seligman, 1984). However, broaden and build theory proposes that the inverse might also be true and thus positive emotions and the optimistic thinking that results from it affect each other, resulting in an upward spiral that may lead to an increase in emotional wellbeing over time (Fredrickson, 2004). So, it could be that when university students indicated an absence of depression, they also felt positive emotions which directly led to more optimistic thinking and a broadened mindset. This broadened mindset would then promote the discovery of novel and creative actions, which would include the use of certain character strengths. At the same time, it could be that more strength use indirectly leads to more positive emotions and thus also fewer depressive symptoms, which would explain the negative correlation between strength use and depression. Previous researchers have also considered strength use in the context of broaden and build theory and found that the theory provides an adequate basis to explain the effects of strength use. (Lavy & Littman-Ovadia, 2017)

The lack of a correlation between trait strength use and trait depression were not in line with the findings of previous researchers. All available previous research on strength use and depression focused on between person differences and the results varied somewhat, depending on the study. However, the general consensus was that a weak, but significant association exists between the two constructs (Schutte & Malouff, 2019; Sin & Lyubomirsky, 2009). This current study is not in line with this research, since no evidence for such an association was found.

These findings put the current understanding about the relationship between strength use and depression in question. The general understanding about the effect of strength use interventions on depression was that it functioned on a trait level, since all previous research was conducted on that level. The results of this current study may suggest that this understanding needs to be reevaluated, since the association between strength use and depression was only significant on a within person level. Thus, it is possible that an adjustment of character strength interventions towards momentary strength use could lead to better results by combating momentary depressive symptoms. In any case, more research is needed before any definitive conclusions on this topic can be drawn. An intervention study about the effects of momentary strength use on momentary depressive symptoms could offer valuable insights into more effective ways of combating depression, as compared to conventional strength use interventions.

The fact that there was no significant difference between men and women in the correlation of state strength use and state depression is not conflicting with previous research. Previous research has shown that differences exist between men and women in how they benefit from character strengths, when it comes to depression. However, these studies only indicated that men and women benefit from different strengths, not that the amount of strength use behavior would affect them differently (Quintana-Orts and Rey, 2018; Kim, Kim, Hong, Han, Yoo, Min & Lee, 2018), which is why those studies are not conflicting with the current findings. So since men and women can generally both benefit equally from strength use interventions future research should focus on finding out which strengths are most beneficial for each gender. If the most beneficial character strengths for each gender were known, then the effectiveness of strength use interventions could be maximized depending on the target group. If, for example, the use of certain strengths was beneficial for men but not for women, it would be unnecessary to have both genders partake in an intervention that emphasizes the use of those strengths. Instead men and women should each partake in the strength use interventions that emphasize the specific strengths that are most beneficial for them based on their gender.

Limitations and Future Research

The current study did have several limitations that should be taken into account. One big limitation is the fact that the state- and trait level measurements of strength use were only very weakly correlated. This has implications for the validity of the study, since it is possible that the variable that was supposed to measure state strength use might have actually measured a different construct. This puts the validity of the study into question, since there is no guarantee that the intended construct was measured. In order to avoid this, future researchers should not use these same state strength use measure again but should instead try other measures to see if they work better. As alternative measures researchers could try to incorporate a think aloud protocol or a qualitative study design. These measures could help validating a state strength use scale, by using the direct feedback of the participant to assess whether state strength use was measured as intended.

Another limitation that has to be considered is the fact that the study had only ten participants. This is number is large enough for the within person analysis, due to the fact that each participant took multiple measurements a day over an extended time period, but it might not be enough for between person analysis. It is notable that many different studies with large

sample sizes that were conducted on a trait level did find a significant correlation between the constructs. So, the fact that no between person correlation could be found between strength use and depression might be because the small sample size did not have enough power on a trait level to find an association.

Another possible limitation of the study is that the data was collected during the global Covid-19 pandemic and the therefrom resulting lockdown. This could have affected the participants' levels of strength use and depression unevenly. It has been well established that Covid-19 led to a tremendous increase in depression among the general population (Bueno-Notivol, Gracia-Garcia, Olaya, Lasheras, Lopez-Anton, Santabarbara, 2020) but it is unclear what effect it has had on people's strength use behavior and whether these effects are comparable. This could have led to biases in the survey responses since an unequal rise in depression as compared to strength use would have influenced the associations between these constructs. Future researchers could mitigate this problem by replicating this research outside a lockdown.

Another limitation of the current study is the fact that participants were recruited through a convenience sampling method. This method oftentimes leads to hidden biases in the participant selection, which negatively influences the representativeness of the sample (Etikan, Musa & Alkassim, 2016). All of the participants were recruited through the personal contacts of the researchers, which lead to the majority of the sample being of German nationality and having a rather narrow age range. It is possible that different nationalities interpret constructs such as strength use and depression differently (Kirmayer, 2001) and thus this study may only be representative for German university students. When it comes to age, the samples mean age of 23.5 was actually very close to the mean age of graduating German university students (Koptyug, 2020), so the study is still representative in this regard.

Based on the results of this study there are several things that future research should focus on. Currently, it seems that the most important focus should be to find a valid measure of state strength use. Since the state- and trait level measurements of strength use were only very weakly correlated in this study it is possible that the state level items did not measure the construct that they were supposed to measure. Thus, the main priority should be to find a valid state level measurement of strength use. Another focus point of future research could be the within person relationship between strength use and depression. This research has demonstrated that there might not be much of a between person association between strength use and depression and the association is instead mainly on a within person level. Thus, future

research should focus on this state level relationship, for example by developing possible strength use interventions to combat depressive symptoms on a within person level.

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Appendix

Appendix A – Informed consent

Informed consent form

We would like to assure you that your participation is completely voluntary and all your data will be stored anonymously. You may find some of the questions to be sensitive in nature and we would greatly appreciate if you can answer them as honestly as possible. For this reason, you can opt out of answering any questions and withdraw your participation at any time without reason during the course of the study.

All data procured from this study will be used for the results section of the bachelor's theses of the researchers involved and only them. Any personal information that could potentially identify you (e.g. name) will only be viewable by the research team.

Study contact details for further information: [Daniel Doherty, **d.p.doherty@student.utwente.nl**; Lukas Schroder, **l.n.schroder@student.utwente.nl**]

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente at ethicscommittee-bms@utwente.nl

Appendix B – Patient Health Questionnaire-8 (PHQ-8)

This is a questionnaire to measure how you feel. We want you to know that there are no right or wrong answers and we would greatly appreciate it if you would answer as honestly as possible. You can quit the survey at any point, if you feel unable to continue for whatever reason. Thank you for your participation!

Over the last 2 weeks, how often have you been bothered by any of the following problems?

1. Little interest or pleasure in doing things

- Not at all
- Several days
- More than half the days
- Nearly every day

2. Feeling down, depressed, or hopeless

- Not at all
- Several days
- More than half the days
- Nearly every day

3. Trouble falling or staying asleep, or sleeping too much

- Not at all
- Several days
- More than half the days
- Nearly every day

4. Feeling tired or having little energy

- Not at all
- Several days
- More than half the days
- Nearly every day

5. Poor appetite or overeating

- Not at all

- Several days
- More than half the days
- Nearly every day

6. Feeling bad about yourself - or that you are a failure or have let yourself or your family down

- Not at all
- Several days
- More than half the days
- Nearly every day

7. Trouble concentrating on things, such as reading the newspaper or watching television

- Not at all
- Several days
- More than half the days
- Nearly every day

8. Moving or speaking so slowly that other people could have noticed? Or the opposite - being so fidgety or restless that you have been moving around a lot more than usual

- Not at all
- Several days
- More than half the days
- Nearly every day

Appendix C – Strength Use Scale (SUS)

This questionnaire will be used to measure how you feel. There are no right or wrong answers and your honest participation is appreciated. You may quit the survey at any point if you do not wish to continue. Thank You!

I am regularly able to do what I do best

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I always play to my strengths

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I always try to use my strengths

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I achieve what I want by using my strengths

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I use my strengths everyday

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I use my strengths to get what I want out of life

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

My work gives me lots of opportunities to use my strengths

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

My life presents me with lots of different ways to use my strengths

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

Using my strengths comes naturally to me

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I find it easy to use my strengths in the things I do

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I am able to use my strengths in lots of different situations

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

Most of my time is spent doing the things that I am good at doing

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

Using my strengths is something I am familiar with

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I am able to use my strengths in lots of different ways

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

Thank you for your response!

Appendix D – Daily Questionnaire

The following questions will aim to measure your daily level of happiness, strength-use, and depression. Good luck :)

I am able to do what I do best at the moment

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

I am able to use my strengths in lots of different ways at the moment

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Neither Agree nor Disagree
- Somewhat Agree
- Agree
- Strongly Agree

On a scale from 0 (Hardly at all) - 8 (Very severely disturbing/disabling), how much are you troubled by feeling miserable or depressed at the moment? Choose the number that you feel best reflects your current feelings.

0 – 8

Thank you for filling out the survey! See you soon!