The Relationship of Daily Strength Use and Depressive Symptoms in LGBTQ+ Individuals

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Abstract

Background. Mental health problems among Lesbian, Gay, Bisexual, Transgender, Queer, and other (LGBTQ+) individuals are a common worldwide problem. Positive psychology has proven to be useful in improving wellbeing, it focuses on personal strengths. Research found out that strength use is correlated to wellbeing, however, solely possessing strengths is not sufficient to improve wellbeing.

Objective. This study aims to examine the relationship between daily strength use and daily depressive symptoms in LGBTQ+ individuals since there is lack of insight into daily associations. It is expected to find an association between strength use and depressive symptoms on a state-level.

Method. This study used an online experience sampling method, which consisted of 16 participants. The participants (ages between 18 and 27) were mainly university students (93,75%) who had a German nationality (75%). Depressive symptoms were measured using the Patient Health Questionnaire-9 (PHQ-9, trait) and PHQ-2, (state). Strength use was measured using the Strength Use Scale (SUS, trait), and a selection of two items of the SUS (state). On the first day of the study, participants were asked to fill in the trait questionnaires. From the second day onwards, participants filled in the state questionnaires, three times a day, for one week. Correlation analyses and a linear mixed model have been conducted to analyse the data.

Results. A significant negative association on a between-, within-, and trait-level was observed. Unexpectedly, the between analyses showed a stronger association than the within analyses. Also, this study found a non-significant correlation between trait-level and mean between-level of strength use and depressive symptoms.

Discussion. This study provides evidence of the significant negative association between state-level strength use and state-level depressive symptoms. Yet, findings suggest that the association is more trait-like than state-like.

Keywords: positive psychology, between-person, within-person, trait-level, experience sampling method (ESM), LGBTQ+, linear mixed model (LMM), wellbeing

Introduction

Mental health problems among Lesbian, Gay, Bisexual, Transgender, Queer, and other (LGBTQ+) individuals is an international problem. Bockting, Miner, Swinburne Romine, Hamilton, and Coleman (2003) found high levels of psychological stress in LGBTQ+ individuals. According to this study, 44.1%, of the people that label themselves as 'transgender', was diagnosed as clinically depressed, while 33.2% suffered from an anxiety disorder. Figueiredo & Abreu (2015) found evidence that all LGBTQ+ individuals are at a greater risk of having suicidal thoughts and behaviours than non-LGBTQ+ individuals are. Globally, suicidal rates are higher in LGBTQ+ individuals, in comparison to non-LGBTQ+ individuals (Figueiredo & Abreu, 2015). Hence, LGBTQ+ individuals are more likely to be diagnosed with serious mental health disorders, than non-LGBTQ+ individuals.

Reasons for these mental health problems could be that LGBTQ+ individuals are regularly stigmatized and marginalized by their social environment, which results in mental health problems (Hatzenbuehler, 2014). Although through time LGBTQ+ individuals received more rights and recognition, LGBTQ+ individuals still experience systematic oppression and devaluation (Anderson, 2018). Examples of marginalization at the macro level are the lack of civil rights, for instance, adoption, medical care, and workplace safety (Meyer, 2003). Likewise, LGBTQ+ individuals at a micro-level experience prejudice, bias, violence from peers, and stigmatization (Kosciw, Greytak, Diaz, & Bartkiewicz, 2014). In fact, LGBTQ+ adults (18 to 24 years) experience distress during their internal identity development, such as anti-LGBTQ+ legislation and hate crimes. Therefore, the struggle between interpersonal and intrapersonal pressures could elicit negative emotions, including, anxiety, loneliness, isolation, fear, anger, resentment, shame, and guilt (Vaughan & Waehler, 2010). This research is focused on the exploration of ways to improve the wellbeing of LGBTQ+ individuals.

Positive psychology and LGBTQ+ mental health

One way to improve the mental health of LGBTQ+ individuals is through the use of positive psychology. Positive psychology is the science of positive subjective experience, positive individual traits, and positive institutions. Positive psychology is an overarching

concept for theories and studies about what makes life worth living (Seligman & Csikszentmihalyi, 2000). Additionally, Sheldon & King (2001) define positive psychology as 'nothing more than the scientific study of ordinary human strengths'. Strengths are explained as 'a natural capacity for behaving, thinking, or feeling in a way that allows optimal functioning and performance in the pursuit of valued outcomes' (Linley & Harrington, 2006). Strengths could be, for instance, social, intelligence, gratitude, bravery, and creativity. In other words, Park, Peterson & Seligman (2004) suggest that strengths are all positive individual traits, characteristics, and abilities that are presented in thoughts, feelings, and behaviours. These strengths exist in scales and can be assessed as individuals characteristics.

Most research in mental health psychology focused on minimalizing negative outcomes, such as mental illnesses or psychological disorders (Seligman & Czikszentmihalyi, 2000). According to Vaughan & Rodriguez (2014), a content analysis found that only 17.5% contained strengths-based research in LGBTQ+ research. These outcomes show the lack of positive aspects in LGBTQ+ studies and the lack of LGBTQ+ problems in strength-based research (Flanders, Robinson, Legge & Tarasoff, 2016). In short, the percentage of 17.5% illustrates that positive psychology plays a rather small role in psychological research, compared to traditional research which focuses on minimalizing mental illnesses or psychological disorders.

The daily use of strengths and wellbeing

As mentioned earlier, Linley & Harrington (2006) describe strengths as a natural capacity that individuals possess to function and perform optimally. Furthermore, Clifton and Anderson (2002) explain strengths as a naturally recurring pattern of behaviour, thought, and feelings that can be adequately used to improve wellbeing. They mentioned that a major number of strengths remain within people. These strengths are the most authentic of an individual's character (Clifton and Anderson, 2002). Strengths are the mechanisms that define the virtues. Strengths are distinguishable routes to illustrate virtues. For instance, the virtue of wisdom can be achieved through such strengths as curiosity, love of learning, judgment, or creativity (Csikszentmihalyi & Csikszentmihalyi, 2006). Furthermore, individuals using their strengths are more likely to be successful and are

strongly aligned with their tasks during their work. In this way, the risk of stress will be reduced and it increases the opportunities for optimal functioning. To achieve this, individuals should be conscious of their strength use (Bakker, Hetland, Olsen & Espevik, 2019), in this case, LGBTQ+ individuals.

Moreover, strengths theory posits that strengths have positive consequences on wellbeing because individuals are doing what they instinctively do best (Harzer & Ruch, 2013). This view was supported by Botha and Mostert (2014). Their research found out that strength use creates feelings of autonomy, competence, confidence, due to individuals are doing what they do instinctively best. Yet, solely possessing strengths is not sufficient to enhance wellbeing. According to research, strength use is correlated to wellbeing (Govindji & Linley, 2007). People that use their strengths are authentic and are expected to be more successful, in comparison to people that do not use their strengths (Bakker, Hetland, Olsen & Espevik, 2019). Govindji & Linley (2007) define being authentic as the natural capacities that people yearn to use, which enables authentic expression, and functions as energizing. According to Dubreuil, Forrest & Courcy (2014), strengths are experienced as energizing and it furthers individuals to flourish. According to Fredrickson and Losada (2005), flourishing can be explained as living within an optimal range of human functioning. In addition, Huppert and So (2012) describe flourishing as a synonym for a high level of mental wellbeing.

In general, Peterman and Seligman (2004) assume that people will likely face positive consequences when they identify, appreciate, and use their strengths. Wood, Linely, Maltby, Kashdan & Hurling (2011) studied the connection between strengths use and wellbeing in an English community sample. The outcomes illustrated that strength use was correlated to an increase in self-esteem, positive affect, and vitality. In fact, participants showed a decline in perceived stress three months, and six months after the initial measurement. Similar outcomes were found by Hone, Jarden, Duncan, and Schofield (2015). Their study showed that individuals who used their strengths were 18 times more likely to be flourishing than individuals who used their strength least.

All previously discussed research examined strength use on a trait-level, studying well-being in individuals who used their strengths more often on average. Alternatively, in comparison to the trait strength use, the state-level of strength use may also play a

significant role in relation to wellbeing. Bakker and colleagues (2019) found that daily strength use is positively correlated to positive affect and work engagement. In a study of naval cadets, naval cadets were more excited, enthusiastic, and energized on the days they used their strengths. Similarly, in a study of 65 civil engineers, the impact of organizational support for strength use on weekly work engagement and proactive behaviour was assessed. This study showed that organizational strength use was positively related to weekly work engagement and proactive behaviour, through weekly self-efficacy (Van Woerkom, Oerlemans & Bakker, 2015). Consequently, these studies suggest that the daily (or weekly) fluctuations in strength use could be associated with the daily level of wellbeing in LGBTQ+ individuals.

The daily use of strengths and depression

A particular aspect of the wellbeing of LGBTQ+ individuals that this paper will focus on is depression. In a one-year time period, generally, 5.4% of US citizens will meet the requirements for Major Depressive Disorder (Narrow, Rae, Robins & Regier, 2002). Depression can be described as an overabundance of negative moods and cognitions (Abramson, Seligman, & Teasdale, 1978). Most depression treatments are generally fixated on mitigating and eliminating such negative feelings and cognitions and are less focused on creating positive resources. However, the lack of negative moods and cognitions does not imply that positive moods and cognitions are present in depressed individuals. According to Sin & Lyubomirsky (2009), psychologists using positive psychology should not focus on raising a person's mental health from -5 to neutral 0, rather they should focus on raising a person's mental health to, for instance, +5 or higher. Following this line of thinking, it could be beneficial for LGBTQ+ individuals to focus on creating positive feelings and cognitions, instead of only emphasizing eliminating the negative cognitions and feelings.

This research focuses on the association of daily strength use and daily depressive symptoms and it is assumed that the direction could be positive as well as negative. On the one hand, it could be argued that the association between daily strength use and daily depressive symptoms could be negative. An increasing number of positive psychology interventions have been conducted on persons with depressive symptoms and people who

are diagnosed with depression. Seligman, Steen, Park & Peterson (2005) showed in an online study with 411 randomly assigned volunteers, that a positive psychology intervention could boost happiness and create a decline in depressive symptoms. On the other hand, no research in the literature provides evidence for a positive association between strength use and depressive symptoms. Nonetheless, it could be the case when LGBTQ+ experience depressive symptoms, they use their strength at the same particular moment as they are experiencing depressive symptoms. A strength is a natural resource LGBTQ+ individuals could appeal to when they experience depressive symptoms. In this way, it could be argued that there could be a positive association between daily strength use and daily depressive symptoms.

As mentioned before, there is a lack of research in the study of LGBTQ+ individuals' strengths. According to Vaughan & Rodriguez (2014), the lack of literature on the strengths of LGBTQ+ individuals contributes to non-LGBTQ+ individuals being the default in how strengths are developed and how they are used. Without a systematic body or organizing structure, the research of LGBTQ+ strengths will continue to be disorganized, with little attention, and less integration into the literature of positive psychology. Consequently, psychologists concerned with practice, training, and research experience difficulties in providing scientifically informed perspectives in the context of LGBTQ+ individuals (Vaughan & Rodriguez, 2014). This study could contribute to the understanding of LGBTQ+ in relation to the daily use of strengths by exploring the association of daily depressive symptoms and daily strength use.

As aforementioned, the problem is that LGBTQ+ individuals suffer greatly from several mental health problems, including depression. Research suggests that the use of strengths could play a huge role in the level of depression of LGBTQ+ individuals. The use of strengths is not an aspect that is consistent over time, it can vary from day to day (Bakker, et al., 2019). Until now research did not take the daily (or weekly or monthly) variability of the use strengths into account in LGBTQ+ individuals. Due to the lack of literature on this topic and with this target group, this research could be suitable to fill the gap.

In short, this study aims to explore the association between state-level strength use and state-level depressive symptoms in LGBTQ+ individuals. This study is relevant

for the sake of LGBTQ+ individuals' mental health. This study contributes to the understanding, whether daily strength use is associated with having depressive symptoms in LGBTQ+ individuals. It is important to research this topic because it could positively influence the lives of LGBTQ+ individuals. If daily strength use is found to be associated with reduced depressive symptoms, this knowledge could be used to develop suitable psychological interventions to reduce the risk of having depressive symptoms. Hence, the question that will be researched is: "*what is the strength of the relationship between state-level strength use and state-level depressive symptoms in LGBTQ+ individuals?"* This research question is attached to the following hypothesis: "*the daily use of strength is correlated to the daily level of depressive symptoms in LGBTQ+ individuals."*

Methods

Design

This research tested whether there is a significant relationship between state-level strength use and state-level depressive symptoms in LGBTQ+ individuals. Through an Experience Sampling Methodology (ESM) study it is examined how daily strength use is related to depressive symptoms. ESM is a structured self-report diary method that is used to assess mood, symptoms, context, and appraisals as they occur in daily life. In ESM studies participants are asked to complete a momentary questionnaire several times a day over several days (Myin-Germeys et al., 2018).

The greatest advantage of ESM is that it offers a way of collecting detailed data about essential aspects of individuals' lives. ESM provides momentary data that cannot be collected with other types of methodologies (Kubey, Larson & Csikszentmihalyi, 1996). For instance, ESM is used to measure several psychological constructs, such as quality of life, psychopathology, or psychological mechanisms (stress-sensitivity, coping). In comparison to cross-sectional questionnaires, these constructs are easier to assess with ESM, because ESM provides the possibility of momentary assessment. Accordingly, ESM is considered to be suitable to assess daily strength use and daily depressive symptoms (Verhagen, Hasmi, Drukker, Van Os & Delespaul, 2016).

This study contains a between-person approach as well as a within-person approach, in which observations are repeatedly assessed three times per day. According

to Van Berkel, Ferreira, & Kostakos (2017), it is advisable to use a minimum duration of seven days to ensure a variety of days in the participants' life are captured. Therefore, in this research, it is chosen to measure depressive symptoms and daily strengths for a period of seven days. Furthermore, A non-experimental design has been employed, as there was no deliberate manipulation conducted in this research (e.g. strength use training). Before conducting this research, ethical approval has been received from the Ethics Committee of the University of Twente (approval code: 201190).

Participants

Participants were recruited via the Sona system (a system of the University of Twente, used for questionnaires for studies) and the social network of the researcher. Participants that enrolled via the Sona system were rewarded with Sona credits for their participation. Other participants were recruited via social media, such as a WhatsApp group chat with psychology students of the University of Twente. Thus, a non-probability, convenience sample has been recruited.

The study used the following inclusion and exclusion: 1) a minimum age of at least 16 years old, 2) sufficient English language proficiency, 3) self-identification with the LGBTQ+ community, 4) only mentally healthy participants. The minimum age has been chosen because it was not considered ethically acceptable to ask young individuals about their sexual orientation. Other than that, only participants with sufficient proficiency in the English language were included, because the questionnaire was conducted completely in English. Also, participants were supposed to identify themselves with the LGBTQ+ community, because that is the target group of this study. Lastly, only mentally healthy participants were included, because of ethical considerations.

The sample of this study consisted of 16 participants. Participants were between the ages of 18 and 27, with a mean age of 21 (SD = 2.3). The sample consisted (current gender identification) of three men (18.75%), 11 women (68.75%), and two persons (12.5%) who indicated to identify themselves with another gender. Further, none of the participants indicated their sexual orientation as heterosexual, three individuals (18.75%) identified as gay or lesbian, ten individuals (62.5%) as bisexual, and three persons (18.75) as other sexual orientation. 12 individuals (75%) have German nationality, three

participants (18.75%) have Dutch nationality, one has Chinese nationality (6.25%). 15 participants (93.75%) were students and one participant (6.25%) was employed for wages.

Materials

To measure daily depressive symptoms and daily strength use, Ethica (version 391), was used. Ethica is a research platform that facilitates researchers to quantitatively measure human behaviour, using smartphones, wearables, and big data (Ethica, 2020). Researchers can create several activities (e.g. questionnaires) per study and arrange the time intervals in which the activities will appear on the participants' smartphone. Participants will receive a notification every time there is a questionnaire available.

This study consisted of several questionnaires: the demographics, the Strength Use Scale (SUS), Patient Health Questionnaire-9 (PHQ-9), and the daily questionnaires. First of all, the demographics of the participants were assessed. The researcher provided six questions about gender (the original gender at birth and the current gender (Williams Institute, 2020)), sexual orientation, nationality, educational level, and employment status. Additionally, several multi-item scales were used to measure strength use, depressive symptoms (on a trait-level), and daily strength use, daily depressive symptoms (on a state-level).

Trait questionnaires

The PHQ-9 and the SUS questionnaires functioned as baseline questionnaires (appendix B).

Trait depressive symptoms

The PHQ-9 is the depression subscale (of the PHQ in general), which assesses each of the nine DSM-IV criteria for major depression (Kroenke, Spitzer & Williams, 2001). It has nine items with statements and all items start with the question: *"How often have you been bothered by the following over the past 2 weeks?"* Respondents used a four-point Likert scale with ordinal answer possibilities (0 = not at all to 3 = nearly every day), to indicate how much they agree or disagree with statements such as, *"little interest or*

doing in things?", *"feeling down, depressed, or hopeless?"* and *"trouble falling or staying asleep, or sleeping too much?".* Higher scores indicate a higher level of depressive symptoms. According to Kroenke, Spitzer & Williams (2001), the PHQ-9 showed sufficient reliability (Cronbach's α of 0.89) and test-retest reliability (0.84). In addition, it has good criterion, construct, and external validity: participants who scored high (>10) on the PHQ-9 were between 7 to 13.6 times more likely to be diagnosed with depression. Also, respondents who scored low (<4) had less than a 1 in 25 chance to be diagnosed with depression (Kroenke, Spitzer & Williams, 2001). The Cronbach's α has been calculated in this research for the PHQ-9. It resulted in an α of 0.70, which can be considered acceptable (Gliem & Gliem, 2003).

Trait strength use

The SUS is a 14-item self-report scale, created to assess individual strength use (Govindji & Linley, 2007). Respondents used a seven-point Likert scale with ordinal answer possibilities to indicate how much they agree or disagree with the given statements (strongly disagree to strongly agree). Examples of the statements are *"I am able to use my strengths in lots of different ways"* and *"Using my strengths is something I am familiar with"* (Proctor, Maltby, & Linley, 2010). The SUS has good psychometric properties. The internal consistency was very high, with an α of 0.97. The test-retest statistic showed significance and a high coefficient, an α of 0.85. Criterion validity was also high (Wood et al., 2011). The SUS in this research showed a Cronbach's α of 0.92, which is considered to be excellent (Gliem & Gliem, 2003).

Daily questionnaires

From the second day onwards, a repeating daily questionnaire was conducted, which contained two very brief questionnaires: the PHQ-2 and two items of the SUS (appendix C).

State depressive symptoms

The Patient Health Questionnaire-2 (PHQ-2) has been chosen to measure depressive moods. It consists of two items and it is used to inquire about the frequency of depressive

moods. The PHQ-2 shows good reliability, with an intraclass correlation coefficient of 0.92 (Gelaye, et al., 2016). Usually, respondents use a four-point Likert answering scale structure for the PHQ-2 (0 = not at all, to 3 = nearly every day) (Kroenke, Spitzer, Williams, 2003). For this study, the answer possibilities had to be adjusted to measure daily depressive symptoms, since the goal of ESM studies is to measure current states. The adjusted questions read: "*little interest or doing in things, at this moment?"*, *"currently, feeling down, depressed, or hopeless?*", and were answered on a five-point Likert scale (0 = disagree, to 5 = agree).

State strength use

For the daily strength use questionnaire, two items are chosen from the SUS, with the highest factor loading. The factor loading quantifies the strength of the relationship between the items and the factors (DeCoster, 1998). In this case, it indicates that the two chosen items measure the factor "strength use" the best out of 14 all items. For the items from the SUS, the items had to be adjusted to measure the daily strength use. These are the adjusted items with the highest factor loading: "*At this moment, I am able to do what I do best"* (0.79), "*Currently, I play to my strengths"* (0.67).

Procedure

As mentioned before, in this study ESM has been used to measure daily strength use and daily depressive symptoms in LGBTQ+ individuals. After receiving ethical approval from the ethical committee of the University of Twente, the study was set up in Ethica. After the setup, the study was tested by two pilot participants. After correcting errors, such as grammar and notification setup, participants signed up for the study.

On the first day of participation, respondents received a link that directed them to the website of Ethica. At the Ethica website, subjects were asked to download the mobile application of Ethica. Through a registration code, participants could register for the study in the application of Ethica. After registration, participants received general information about the study and information about how to set phone notifications to receive all daily notifications. Thereafter, respondents provided informed consent (see Appendix A) and answered demographic questions, including gender at birth, current

gender, sexual orientation, nationality, educational level, and employment status. After that, participants filled in the two baseline questionnaires, the PHQ-9 and the SUS.

For the daily questionnaires, this study used an interval-contingent protocol. This protocol requires participants to reply at specific times each day and is considered useful for routine activities. Interval-contingent protocols do not require too much effort or time and mostly last about one or two weeks (Hektner, Schmidt & Csikszentmihalyi, 2007). From the second day on, respondents received notifications three times a day – morning (between 9:00 and 11:30), afternoon (between 14:00 and 16:00), and evening (between 20:00 and 22:00). According to Connor and Lehman (2012), measurements should be set at a time that the target group is awake and not too close to one another. Additionally, a fixed time interval is the least burden to the respondents since they can take the questionnaires into consideration when planning their daily schedule, this could increase the responses from the subjects (Connor and Lehman, 2012). Participants received reminders after 30 and 60 minutes and the questionnaire would expire after 90 minutes after receiving the initial notification. This expiration time is used regularly in ESM studies (Yearick, 2017), to ensure measurement of momentary state-levels. The daily questionnaires took approximately 10 minutes per day in total. This process continued for seven days, until the end of the study (from 22 October 2020 until 16 November 2020).

Analysis

The data from Ethica was exported to IBM SPSS Statistics 25. Some variables had to be recoded, and invalid and pilot test cases were removed. Moreover, cases that did not meet the eligibility criteria, and cases that did not include the baseline questionnaires were excluded (two cases were removed). The mean of the baseline questionnaires (PHQ-9 and SUS) was calculated, as well as the daily measurements and both were merged into one SPSS file.

Additionally, some cases had to be removed because the participation scores were below the cut-off score of 50%. According to Kang (2013), a common approach to deal with missing data is complete case exclusion. Connor and Lehman (2012) argue that a cut-off score of at least 50% is a common cut-off score. They mentioned that using a

rather low cut-off score takes the likelihood of participants missing measuring points into consideration due to the length and intensity of the study. In the end, of the 18 participants, the data of two participants had to be deleted, these cases did not reach the 50% cut-off score. So, in this study 16 cases were analysed.

To examine whether there are associations between different variables, several analyses have been conducted to examine the relationship between strength use and depressive symptoms on a trait- and state-level. First of all, descriptive statistics have been computed to visualize the range, mean, and standard deviation. Secondly, descriptive visual analysis has been employed to explore the data. For instance, an overall graph is created to visualize the difference in the level of strength use and depressive symptoms across all the participants. Additionally, some cases (e.g. cases with the highest depressive symptoms/strength use score) were highlighted in graphs to illustrate the daily variations and to visualize the association between strength use and depressive symptoms.

Thirdly, the sum scores of depressive symptoms and strength use have been calculated per measurement moment (state-level). Then, for each participant across all measurement moments the mean has been calculated, the state-levels of depressive symptoms and strength use was calculated (i.e. the person mean, PM) (between). Next, the within score (i.e. the person-centered mean, PMC) was calculated. According to Curran & Bauer (2011), centering is traditionally used to describe the rescaling of a variable by deviating the observed values around the variable mean. In this case, it means subtracting the sum score from the PM score (sum daily depressive symptoms – daily depressive symptoms PM and sum daily strength use – daily strength use PM). The PM scores display the average momentary levels, and the PMC illustrates the scores of each particular moment of depressive symptoms and strength use. These scores have subsequently been standardized. After that, the mean scores for depressive symptoms and strength use on a trait-level have been calculated. Next, correlation analysis has been employed to calculate the correlation between strength use and depressive symptoms on a trait- and state (PM)-level. Lastly, the overall association between strength use and depressive symptoms on a state-level was computed in a linear mixed model, including

the outcomes, predictors, and covariates. Strength use (PMC and PM) functioned as independent variables, while depressive symptoms functioned as the dependent variable.

Results

Descriptive statistics

Table 1 displays the descriptive statistics of strength use and depressive symptoms on a trait- and state-level. Furthermore, the PM scores had a similar range, as well as the SD. Taking the trait scores into consideration, it appears that strength use has a greater range and SD than the PM scores.

Table 1

Descriptive statistics for range, minimum, maximum, mean and SD, strength use, and depressive symptoms (PM, and Trait)

Variable	N	Range	Minimum	Maximum	Mean	SD
Strength use (PM)	335	3.99	6.21	10.20	8.65	1.07
Depressive symptoms (PM)	335	4.30	2.48	6.78	4.40	1.30
Strength use (Trait)	16	43	42	85	70.12	12.36
Depressive symptoms (Trait)	16	16	12	28	18.75	4.28

Note. N = total amount of measuring moments (participants x time points), PM = person mean.

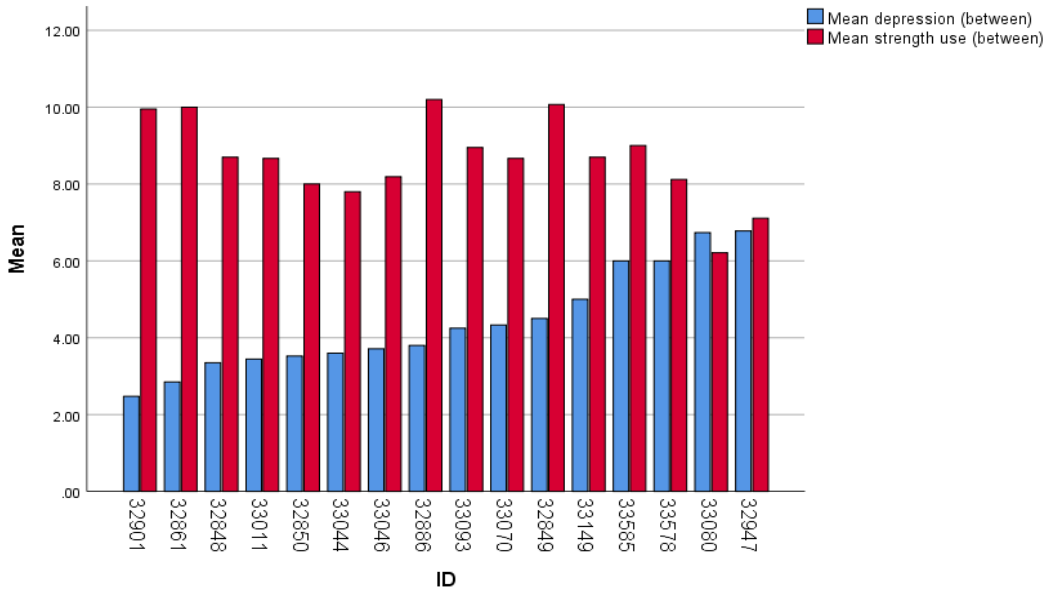
Visual analysis: association strength use and depressive symptoms

Figure 1 illustrates the clustered mean scores of depressive symptoms and strength use per participant. When analyzing this bar graph, several aspects stand out. First, the strength use scores are greater than the depressive symptoms in almost all participants,

except for participant 33080. Secondly, looking at the mean scores of depressive symptoms, the scores show more variation than the mean scores of strength use. Thus, depression seems to fluctuate more between participants than strength use and strength use seems to be more stable than depressive symptoms. Further, the figure does not indicate any kind of association between strength use and depressive symptoms. However, when the data is not aggregated but rather examined per time point, associations between strength use and depression at various time points are visible (Figure 2 and Figure 3). At timepoints 3, 6, and 20 this negative association is illustrated. Similarly, participant 33080 (Figure 4) also shows this association at most time points. On the one hand, figures 2, 3, and 4 indicate at various moments that when strength use scores are high, depressive symptoms are low and when strength use scores are low, depressive symptoms are high. On the other hand, figure 1 only illustrates high strength use and low depressive symptoms in most participants.

Figure 1

Clustered mean depressive symptoms and mean strength use score per participant.



Visual analysis: strength use score

In figure 2, participant 32886 is highlighted, this is the participant with the highest mean strength score (10.20). The participant showed great variation during the whole period, for strength use (range: -6.20 to 3.80) as well as for depressive symptoms (range: -1.80 to

5.20). This participant shows at most time points that when depressive symptoms score is high, strength use is low, and vice versa. For example, at time points 2, 3, 5, 12, 17, and 20 the association is visible.

Figure 2

Associations between depressive symptoms and strength use in the participant with the highest mean strength use score.

Figure 3

Individual depressive symptoms and strength use scores of participant 32947.

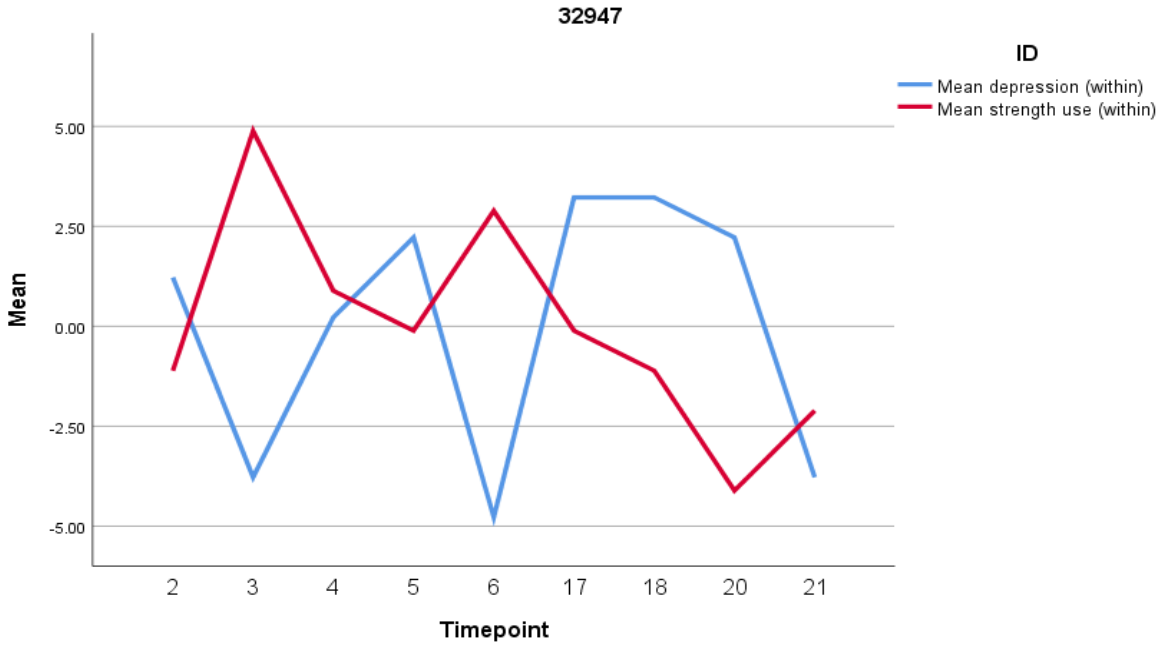
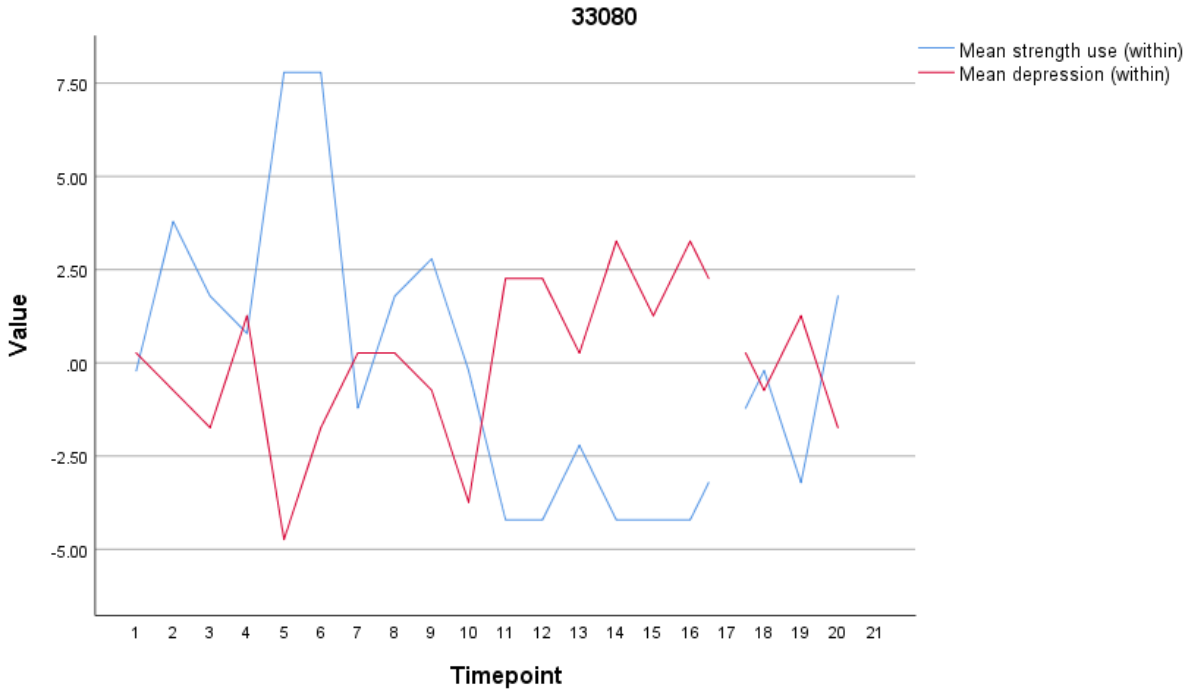


Figure 4

Individual depressive symptoms and strength use score of participant 33080.



Correlation analysis

A correlation analysis was conducted between strength use and depressive symptoms (between-level), and between trait-level strength use and trait-level depressive symptoms. The mean between-participant (PM) analysis showed a moderate negative correlation, $r(14) = -.61$, $p = .000$. On a trait-level, a strong correlation between strength use and depressive symptoms association was observed, $r(14) = -.70$, $p = .003$. Moreover, correlation analysis has been conducted between trait-level depressive symptoms and mean between (PM) depressive symptoms, a non-significance was observed, $r(14) = -.05$, $p = .851$. Finally, a correlation analysis was computed between trait-level strength use and mean between (PM) strength use, which also showed a non-significant association, $r(14) = -.04$, $p = .869$.

Linear mixed model

A linear mixed model was employed to research the association between strength use and depressive symptoms on a state-level. The hypothesis was formulated to test the association between daily strength use and daily depressive symptoms. Firstly, the within analysis (PMC) showed a low negative significant association, $\beta = -.27$, $t(14) = -5.63$, $p = 0.00$, 95% CI [-.37, -.17]. This finding indicates that individuals who used their strength more on average, have lower levels of depressive symptoms, at that moment. Secondly, the between analysis (PM) showed a low negative significant association, $\beta = -.34$, $t(14) = -4.93$, $p = 0.00$, 95% CI [-.48, -.20]. This outcome shows that people that use their strengths are having lower levels of depressive symptoms, on average.

Discussion

This study aimed to examine the relationship between state-level depressive symptoms and state-level strength use in LGBTQ+ individuals. This study was conducted to create understanding of the momentary wellbeing (i.e. depressive symptoms) of LGBTQ+ individuals in relation to momentary strength use. Firstly, the hypothesis (the daily use of strength is correlated to the daily level of depressive symptoms in LGBTQ+ individuals) can be accepted, a significant (negative) correlation was found. Secondly, the research question (what is the strength of the relationship between state-level strength use and

state-level depressive symptoms in LGBTQ+ individuals?) can be answered, the results show a low significant negative association.

State association

A significant negative association was found between daily strength use and daily depressive symptoms in LGBTQ+ individuals, between participants as well as within participants. This means that the higher the daily level of strength use is, the lower the daily level of depressive symptoms is and vice versa. The outcomes show that LGBTQ+ individuals do not appeal to strength use as a natural resource as argued earlier. Instead, at particular moments there are low levels of strength use while there are high levels of depressive symptoms and vice versa. Moreover, one of the relevant findings was that the negative association was not visible when comparing the means of strength use and depressive symptoms. Instead, the negative association was only visible at various timepoints. Also, there was much more variation in depressive symptoms rather than strength use, which suggests that the fluctuations of daily depressive symptoms are greater than fluctuations of daily strength use. For future research, this finding could be used as a basis to research the causal relationship between daily strength use and depressive symptoms.

Furthermore, this study can be compared to similar studies that have been conducted in the past. For instance, this study extends earlier findings of Harzer & Ruch (2013), who stated that strengths theory demonstrates that strength use negatively is associated with wellbeing. This research extends this finding because the results showed that there is a negative (low) association between momentary strength use and momentary depressive symptoms. In contrary to the research of Clifton and Anderson (2002), according to their study, strengths are a naturally recurring pattern of behaviour, thoughts, and feelings. This study showed that strength use is not stable over time, it can fluctuate over several time points per day. So, in this study, a naturally recurring pattern was not observed.

Nevertheless, several unexpected outcomes were found in this study. First, correlation analysis showed non-significant outcomes between trait-level strength use and daily strength use, and between trait-level depressive symptoms and daily depressive

symptoms. This finding is unexpected because it assumes that individuals who report using their strengths daily do not report having a higher strength use on a trait-level, same as for daily depressive symptoms and trait-level depressive symptoms. This could mean that trait-level and daily strength use and depressive symptoms are two different components. Therefore, based on these findings, the following questions arise: are daily and trait-level depressive symptoms/strength use the same component, and are they comparable with each other? Or are daily and trait-level depressive symptoms/strength two completely different components? Future research is needed to explore the components of state-level and trait-level in strength use and depressive symptoms more in-depth.

Second, it was not expected that the between association (PM) would be stronger than the within association (PMC). When comparing the magnitudes of both associations, it shows that the between association is stronger than the within association. It means that individuals are using their strengths more on average and are less likely to have depressive symptoms on average, rather than individuals using their strength at a particular moment. Participants who have lower depressive scores on average have higher strength use on average and vice versa. This finding suggests that the association is more trait-like than state-like. For future research, it would be recommended to examine these components to identify whether they are the same or two different components.

This particular outcome could be explained by the broaden-and-built theory of emotions (Fredrickson, 2001). The broaden-and-built theory could be described as positive emotions that have a positive influence on wellbeing. Positive emotions broaden people's though-action repertoires, it undoes constant negative emotions, it builds psychological resilience and triggers an upward spiral towards enhanced wellbeing. An example of people experiencing positive emotions is by finding positive meaning in daily events. Linking the broaden-and-built theory to this research, it could explain that when individuals use their strengths daily it builds psychological resilience and works as a positive cycle towards enhanced wellbeing. Thus, the momentary use of strengths results in a higher level of strength use on average. As mentioned earlier, Bakker and colleagues (2019) already found evidence that daily strength use is positively correlated to positive affect. In practice, this could mean that future strength use interventions have to be used

for a longer period because individuals have to build strengths to reach a higher average level of strength use. However, future research is required to test whether the greater between (than within) association could be explained by the broaden-and-built theory.

Another explanation could be that strength use is used as a coping strategy. Goetz & Boehm (2020) researched the role of strength use support and friendship opportunities for coping with technological insecurity, in a sample of 8019 German employees. In short, their study showed that high support for strength use and high friendship opportunities are negatively correlated with technological insecurity. As a consequence employees use strengths as a coping strategy. Similar outcomes were found by Van Woerkom, Bakker & Nishii (2016). They studied the idea of employees who are actively encouraged to utilize their strengths on the job, are better able to cope with job demands. In a sample of 832 employees, they found that strength use support is negatively correlated with experiencing high workload and high emotional demands. These studies suggest that strength use as a coping strategy explains the finding of a greater between association than within association. Future research could research whether strength use could be used as a coping strategy.

Trait association

This study also researched the association between trait-level depressive symptoms and trait-level strength use. A significant negative effect was found on the relationship of strength use and depressive symptoms on a trait-level. This result is supported by earlier studies. For instance, Wood et al. (2011) state that individuals who reported greater use of their strengths show greater levels of wellbeing over time. This view was supported by Proctor et al. (2010), their research found out that strength use was positively correlated with subjective wellbeing.

As aforementioned, there is a lack of research in the science of LGBTQ+ individuals' strengths. Vaughan & Rodriguez (2014) explained that the lack of study in LGBTQ+ strengths contributes to the fact that non-LGBTQ+ individuals are seen as the default in research. Yet, this research contributes to the understanding of the association of strengths use and depressive symptoms, or positive psychology and wellbeing, in LGBTQ+ individuals. Taking the significant negative association into consideration, it

could be argued that findings from similar studies in other target groups could be also suitable to fill the gap in the LGBTQ+ literature.

Strengths and limitations

A strong point of this study is the high response rate of the participants. Yearick (2017) conducted a review of experience sampling method studies and found out that the average within-participant response rate is approximately 80%. This research showed an above-average within-participant response rate of 89%. The high response rate could be explained by the structured functionality of the Ethica application. The application was tested by the researcher and pilot participants, and there were no technical issues detected. Besides, after data collection, the researcher has not received any complaints about Ethica, the researcher rather received positive notes from participants. Additionally, according to Hektner, Schmidt & Csikszentmihalyi (2007), the fixed time intervals that were set in Ethica, could have positively influenced the high response rate, because participants were able to plan the measuring moments in their timetable.

This research also has some limitations. First of all, the participants in this research were mostly students (93,75%). A systematic review of studies of depression prevalence in university students was conducted by Ibrahim, Kelly, Adams & Glazebrook (2013), which included 24 research papers that examined the prevalence of depression in University students. They found that the average depression prevalence is 30.6%, a higher rate than the 9% found in the general sample rates of the US. Importantly, this suggests that students are more likely to be depressed or experience depression symptoms than the non-student population. For this reason, the association could have been overestimated, other particular age ranges and occupations could have illustrated different levels of depressive symptoms and strength use. A recommendation for future research would be to research, the same variables used in this study, in different occupations and age ranges to measure differences in comparison to this study.

Secondly, it is important to take into consideration that the data of this study were collected during the global pandemic of the Corona Virus (Covid-19). This study was conducted during measures to combat the pandemic, taken by the Dutch as well as the German government. These measures contained restrictions in one's social life, keeping a

physical distance from each other, staying home as much as possible, and working from home. Additionally, some facilities of the University were closed, as well as restaurants, pubs, and other non-essential shops. Other measures were travel restrictions, which affected many German students of the University of Twente, as well as German students studying in the Netherlands in general. Taking this into consideration, students had to deal with these restrictions, as well as to adapt to them (Völker, 2020). The psychological effects of the measures of Covid-19 were researched by Solomou and Constantinidou (2020), in a study of 1642 adult participants. They found out that 48% reported mild, and 9.2% reported moderate-severe depression symptoms. Also, they state that as a consequence of the pandemic women, individuals aged between 18 and 29 years old, and students are at a higher risk for developing depressive symptoms. Future research could focus on the same variables after the current pandemic (Covid-19) to compare the results of this study to examine discrepancies. In this way, the impact of the pandemic on the association between daily strength use and depressive symptoms could be identified.

Thirdly, another limitation of this study is the recruitment process, which was through convenience sampling. The greatest disadvantage of this recruitment method is the great likelihood of biases, for instance, the selection bias (Etikan, 2016). Most of the participants were recruited via the internal subject pool of the University of Twente, consequently, most participants in this study were Psychology students of German nationality. Logically, this non-variety in participants could be a disadvantage since people from different cultures could interpret depressive symptoms or strength use in another manner. Taken all together, this recruitment process is not the best method considering the representation of a population. Therefore, future research should research this topic and use a random sampling method to attempt to avoid biases.

Finally, this study is not suitable to be generalized across the whole LGBTQ+ population. First of all, this research aimed to research all gender and sexual orientations of the LGBTQ+ population, however, the majority of the participants identified themselves as bisexual. And, the majority stated their current gender as the same gender they had on their original birth certificate. Therefore, this research is not representative of all sexual orientations, as well as all gender identifications. As mentioned before, random sampling method could be used to avoid this limitation in future research.

Conclusion

This report provides evidence for a negative association between momentary strength use and momentary depressive symptoms, while emphasizing the non-significant correlation between momentary and trait-level strength use and depressive symptoms. In addition, this research takes the difference between the within-analysis and between-analysis into consideration, outcomes suggest that the association is more trait-like than within-like.

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Appendix

Appendix A – Informed Consent

Welcome to our research study and thank you for your consideration to participate!

The goal of our research study is to investigate the relationship between strength use and depressive symptoms in LGBTQ+ individuals. The survey consists of several daily questionnaires, a period of seven days in total. On the first day, the survey will start with demographic questions concerning your age, gender, nationality, educational level, occupation, and sexual orientation. Afterward, questions about strength use and depressive symptoms will follow. On the remaining days, you are asked to fill in a short questionnaire, three times a day to measure fluctuations in strength use and depressive symptoms.

The whole survey will take approximately 15 minutes a day. Participation is completely voluntary. We ask you to give honest answers. If you are unsure which answer you should take, choose the one which is the most applicable. You can cancel the survey whenever you would like to. If you have any further questions feel free to ask. This research does not involve any kind of risks and it has been reviewed and approved by the BMS Ethics Committee.

Please be assured that your responses will be kept confidential, which means that it is not possible to trace them back to you. The data will only be used for the indicated research aim of investigating the relationship between strength use and depressive symptoms in LGBTQ+ individuals. The data will not be provided to third parties, only the research team has access to the data. Your participation includes no risks or consequences.

Due to the goal of this research, requirements for participation is that you should identify yourself as a member of the LGBTQ+ community and you should be at least 16 years old. By clicking the button "I agree to participate", you confirm that you have been informed about the content of this research study.

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 by ethicscommittee-bms@utwente.nl.

S. Unval
Student Bachelor Psychology

Appendix B – Questionnaires

Trait Questionnaires

Patient Health Questionnaire-9 (PHQ-9)

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 figety 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

9. Thoughts that you would be better off dead, or of hurting yourself
    - Not at all
    - Several days
    - More than half the days
    - Nearly every day

Strength Use Scale (SUS)

- I am regularly able to do what I do best
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

1. I always play to my strengths
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

2. I always try to use my strengths
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

3. I achieve what I want by using my strengths

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

4. I use my strengths everyday
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

5. I use my strengths to get what I want out of life
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

6. My work gives me lots of opportunities to use my strengths
    - Strongly disagree
    - Disagree
    - Somewhat disagree

- Neutral
- Somewhat agree
- Agree
- Strongly agree

7. My life presents me with lots of different ways to use my strengths
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

8. Using my strengths comes naturally to me
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

9. I find it easy to use my strengths in the things I do
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree

- Strongly agree

10. I am able to use my strengths in lots of different situations
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

11. Most of my time is spend doing the things that I am good at doing
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

12. Using my strengths is something I am familiar with
    - Strongly disagree
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree
    - Strongly agree

13. I am able to use my strengths in lots of different way

- Strongly disagree
- Disagree
- Somewhat disagree
- Neutral
- Somewhat agree
- Agree
- Strongly agree

Appendix C – Questionnaires

State Questionnaires

Patient Health Questionnaire-2 (PHQ-2)

1. Little interest or pleasure in doing things, at the moment
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree

2. Currently, feeling down, depressed, or hopeless
    - Disagree
    - Somewhat disagree
    - Neutral
    - Somewhat agree
    - Agree

Strength Use Scale (two items)

1. At this moment, I am able to do what I do best

Strongly disagree

Disagree

Somewhat disagree

Neutral

Somewhat agree

Agree

Strongly agree

2. Currently, I play to my strengths

Strongly disagree

Disagree

Somewhat disagree

Neutral

Somewhat agree

Agree

Strongly agree