The Effectiveness of a Well-Being Intervention in Improving Students' Well-Being, Loneliness and Perceived Stress and the Role of Sense of Belonging

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Abstract

Background: Research of the last years focussing on university student's state of mental health points to a high prevalence of mental illness and a lack of mental well-being among this population. Following this string of evidence, a survey was conducted at the University of Twente, Enschede in 2019 and produced similar results. Moreover, it identified factors influencing mental well-being and assessed their prevalence as well. To improve the students' mental health, a short online well-being course was offered to psychology students in the spring of 2021.

Aim: This paper focusses on assessing the intervention's effect on students' mental well-being and the related factors loneliness, perceived stress, and sense of belonging. It aims to 1) assess the intervention's effectiveness on improving mental well-being and reducing loneliness and perceived stress and 2) identify whether the intervention increased sense of belonging and if that had an impact on the intervention's effectiveness on all three outcomes.

Methods: A longitudinal study was conducted measuring the sample's (N=49) levels of mental well-being, loneliness, perceived stress, and sense of belonging at three timepoints during the short well-being course. Students' levels of the four factors over the course of the intervention were calculated. The intervention's effect on sense of belonging was determined by a paired t-test. A repeated measures analysis of covariance (ANCOVA) was used to determine the intervention's effect on the three outcomes and to measure the impact of sense of belonging on the intervention-effect.

Results: Student's mental well-being levels increased over the course of the intervention, while levels of loneliness and perceived stress decreased. Sense of belonging slightly decreased as well. The paired t-test showed no significant effect of the intervention on sense of belonging. Results of the repeated measures ANCOVA showed significant effects of the intervention on mental well-being, loneliness, and perceived stress. The impact of sense of belonging was significant only for the intervention-effect on perceived stress.

Conclusion: The well-being course showed to have effectively increased students' mental well-being and reduced their loneliness and perceived stress, and sense of belonging impacted the intervention's effect on perceived stress. The intervention did not have an increasing effect on sense of belonging, probably due to the online-nature of the intervention and the pandemic-related lockdown. Future research should consider replicating the course with physical contact on campus to enable the feeling of a group membership.

Introduction

Positive psychology is an emerging research field focussing on people's resources and strengths to improve their mental well-being and quality of life. Researchers have gained a lot of insights into the advantages of emboldening people's mental health, however, there is a gap in research when it comes to the population of university students. Despite the pleasant aspects of studying in higher education, such as connecting with people from all over the world, university students can also be negatively affected by factors like academic pressure or being away from home.

Over the past years, several studies conducted among university students from different countries found evidence for elevated levels of mental illness, loneliness, and perceived stress, as well as low levels of mental well-being (Dahlin, Nilsson, Stotzer & Runeson, 2011; Kelders, Oberschmidt, & Bohlmeijer, 2019; Lipson, Lattie & Eisenberg, 2019; Kohls, Baldofski, Moeller, Klemm, & Rummel-Kluge, 2021, Worsley, Harrison & Corcoran, 2021). Considering these statistics, it is crucial to understand why mental well-being is important, which factors have an influence on it and to find ways to help students deal with their distress and improve their mental well-being.

Mental well-being

Mental health, also called mental well-being, has three components: psychological well-being, social well-being, and emotional well-being (Keyes, 2002). Psychological well-being consists of six elements: self-acceptance, purpose in life, autonomy, positive relationships, environmental mastery and personal growth (Ryff, 1989). If an individual manages to achieve satisfaction of these elements, this person is said to have positive functioning in life (Keyes, 2002). Social well-being encompasses the "public and social criteria whereby people evaluate their functioning in life. These […] consist of social coherence, social actualization, social integration, social acceptance and social contribution" (Keyes, 2002; p. 209). Lastly, emotional well-being is "a cluster of symptoms reflecting the presence or absence of positive feelings about life", i.e., the presence of positive emotions, absence of negative emotions as well as an individual's overall life satisfaction (Keyes, 2002; p. 208). In addition to the above-mentioned components there are other constructs that play a role in improving mental well-being, for instance self-compassion, connectedness, and mindfulness (Bohlmeijer & Hulsbergen, 2018).

Keyes, Dhingra and Simoes (2010) found that the risk of developing a mental illness is lower in individuals with high levels of mental well-being. In a similar fashion, monitoring

mental health was found to help recovery from mental disorders, especially anxiety (Lukat, Becker, Lavallee, van der Veld & Margraf, 2017; Schotanus-Dijkstra, Keyes, de Graaf & ten Have, 2019; Teismann, Brailovskaia, Totzeck, Wannemüller & Margraf, 2018).

Factors influencing mental well-being

A study conducted by Kelders, Oberschmidt and Bohlmeijer at the University of Twente in Enschede in 2019 assessed the student population's state of mental health and distress. They summarized their findings in a student well-being report, which showed that students' well-being levels appeared to be slightly lower compared to other student populations. Moreover, they identified important factors influencing students' mental well-being: as such, they found that higher levels of loneliness and perceived stress predict lower well-being, and that a lower sense of belonging leads to lower well-being levels as well.

Loneliness, which is "the subjective feeling of the absence of a social network or a companion" (Leigh-Hunt et. al, 2017; p. 158), can be understood as a form of perceived social isolation and presents a contrast to high social well-being. Loneliness can lead to a lack of emotional fulfilment, discouragement, and problems with behavioural adjustment (Hughes, Waite, Hawkley and Cacioppo, 2004; Jeste, Lee, & Cacioppo, 2020). Especially during the COVID-19 pandemic, a time when the need for social interactions could not be met sufficiently, people reported lower satisfaction with their work and less connection with their communities (Clair, Gordon, Kroon & Reilly, 2021). Moreover, lonely individuals often experience a reduction in life satisfaction, less contentment with their living conditions, and during the pandemic, worries about their health and the coronavirus, which in turn gave rise to anhedonia (Clair, Gordon, Kroon & Reilly, 2021; Hoffart, Johnson & Ebrahimi, 2021). Lastly, loneliness was found to have similar components as depression, and can be a potential risk factor for developing a depression later on (Hoffart, Johnson & Ebrahimi, 2020).

Perceived stress is said to occur when an individual is facing challenges that he or she cannot overcome with his or her resources at hand (Lazarus, 1990). Besides perceived stress predicting low mental well-being, higher levels of perceived stress are associated with cognitive deficits, nervousness, physical symptoms (e.g., back pain), increased emotional exhaustion, depersonalization, and a decrease in personal fulfilment (Vargas Rubilar & Oros, 2021). Furthermore, stressed individuals are more likely to adapt dysfunction coping behaviours, such as substance use, a lack of food or overeating (Vargas Rubilar & Oros, 2021). Perceived stress was also found to be a predictor of depression and anxiety symptoms, as well as to be related

strongly to burnout (Pereira-Morales, Adan & Forero, 2017; Litam, Ausloos & Harrichand, 2021).

As Keyes (2002) stated in his paper, the sense of belonging to society is a crucial factor for high well-being levels. Sense of belonging is defined as "the experience of personal involvement in a system or environment so that persons feel themselves to be an integral part of that system or environment" (Hagerty, Lynch-Sauer, Patusky, Bouwsema & Collier, 1992; p. 173). This statement is bolstered by findings showing that the sense of belonging to a community, such as military or religious groups, were positively associated with participant's well-being; an experience that was concluded to be universally shared among different adult population groups (Stewart & Townley, 2020). Furthermore, it was shown that a lower sense of belonging predicted higher levels of perceived stress in students at the University of Twente (Kelders, Oberschmidt, & Bohlmeijer, 2019). Further, the strength of sense of belonging with the school community or a group of flatmates and the satisfaction with peer relationships was found to have an influence on students' distress and loneliness (Wuthrich, Jagiello & Azzi, 2020; Worsley, Harrison & Corcoran, 2021).

Positive psychological interventions

There are different kinds of positive psychological interventions (PPIs) concentrating on cultivating different aspects of mental well-being. In their self-help book for positive psychology, Bohlmeijer and Hulsbergen (2018) describe several types of interventions, for instance the '3 good things-exercise': this intervention helps people to foster their positive emotions by focussing on positive experiences in their everyday-life and to dwell on them by describing them in a detailed manner. The sheer task of paying attention to positive things on a daily basis increases the receptiveness for more positive experiences and thereby helps establishing healthy relationships, strengthening resources and building resilience to stress, thereby creating more positivity in life, as (is) stated in the broaden-and-build-theory (Fredrickson, 2013). Doing this exercise can help people in their loneliness, as they start to step away from their often negatively biased perspective on themselves and others and build relationships.

Another exercise called the 'Granny-exercise', aims to improve one's self-compassion by thinking of a loving and caring person (e.g., a grandmother), imagining that they are present in that moment and picturing this person's compassionate and nurturing behaviour towards oneself. By doing this, the soothing system in the brain is activated and helps calming down (Bohlmeijer & Hulsbergen, 2018). The underlying theory of this task is based on the assumption

that all humans have three internal systems: the threat system reacting to stress, the drive system to fulfil basic human needs and the soothing system to relax (Gilbert, 2009). In most humans, the threat system is overly active, as it is already triggered by stressful thoughts and imagination, while the soothing system tends to be underdeveloped (Gilbert, 2009). Therefore, strengthening one's soothing system by engaging in this exercise can help reduce perceived stress when facing difficulties.

Research has shown that participating in PPIs, also called well-being interventions, brought benefits to people's mental health, like participants in mindfulness interventions and meditation programmes showed to have reduced levels of perceived stress (Desai, Gupta, Parikh & Desai, 2021; Modrego-Alarcón et al., 2021). With regards to students' mental health problems, several interventions were already implemented at different universities and showed to be fruitful. Different types of interventions showed to be effective in decreasing students' levels of perceived stress and improving their well-being, as well as preventing a decline in mental well-being levels over time and also positively affecting students' well-being levels on a six-year follow-up (De Vibe et. al, 2018; Lattie et al., 2019; Young, Macinnes, Jarden & Colla, 2020; Modrego-Alarcón et al., 2021). Furthermore, students participating in a mindfulness intervention subsequently showed improvements in their self-care, self-awareness and emotion and thought regulation, which led to an increased quality of life (Altinyelken, Hoek & Jiang, 2020).

Existing research also suggests that a social factor like sense of belonging might influence the effectiveness of well-being interventions. For instance, findings show that group interventions reached the highest effect sizes in improving participants' mental well-being levels, as opposed to individual interventions (van Agteren et. al, 2021). Moreover, participants of a family well-being programme, which was adapted to university students and conducted in groups, indicated that taking part in the intervention helped them improve their relationships and social skills (Whiteside et. al, 2017). Taking into account that positive relationships are an important part of mental well-being, these findings suggest that sense of belonging possibly enhances the effectiveness of well-being interventions. Additionally, they shed light on a possible positive effect of PPIs on sense of belonging as well, since students participating in Whiteside et al.'s (2017) well-being programme also reported being able to safely share experiences with their fellow group members and to engage in open communication.

Current study

Based on the findings from the student well-being report by Kelders, Oberschmidt and Bohlmeijer (2019) showing that students at the University of Twente suffer from loneliness, perceived stress, and low mental well-being, a four-week well-being course was implemented at the university in the spring of 2021. This paper's first aim will be to assess the intervention's effect on students' mental well-being, loneliness, and perceived stress.

Considering the possible benefits of group interventions on the improvement of social relationships and that sense of belonging also showed to mitigate perceived stress and constitutes an essential part of well-being (Keyes, 2002; Kelders, Oberschmidt, & Bohlmeijer, 2019), it can be assumed that well-being interventions improve sense of belonging and that this in turn influences the effectiveness of well-being interventions. Thus, the second aim of this research paper will be to control for the impact of sense of belonging on the intervention's effect on participants' mental well-being, loneliness, and perceived stress.

Based on this, the following research question will be sought to be answered in this research paper: what are the effects of the well-being intervention on students and how does it relate to sense of belonging? In the light of information on the topic provided by previous research, it can be hypothesized that participation in the well-being intervention will be associated with increased mental health and decreased loneliness and perceived stress (hypothesis 1). Furthermore, completing the well-being intervention will improve participants' sense of belonging, which will be associated with higher mental health and lower loneliness and perceived stress levels (hypothesis 2). This will be investigated in the data collected in 2021 among students at the University of Twente participating in a short well-being intervention.

Methods

Design

A longitudinal study was conducted in the spring of 2021 using a four-weeklong online well-being course with repeated measurements before, during and after the intervention.

Participants and Procedure

For this study, bachelor and master Psychology students from all study years at the University of Twente were targeted. The first online survey of the well-being course was distributed to prospective participants via their student email addresses and was filled in by a total of 97 students. Before taking part in the surveys, participants had to fill in the informed consent form. During the intervention itself, which is described in further detail down below, students had to fill in several questionnaires concerning their mental health and illness levels, as well as measures of social connections at three points of time during the intervention. After the intervention, they were also asked to fill in a questionnaire collecting their demographic and academic data, for instance their gender, study year, etc.

Participants were included in the study if they filled in at least four out of the six surveys and completed the demographic post-survey. One participant was excluded for being under the minimum age of 18, thirteen participants dropped out after filling in the first survey and another four filled in the first survey twice and were therefore removed. Moreover, 30 students did not fill in the minimum amount of four surveys and left out the post-survey about the demographic information, which reduced the number of participants for this study to 49.

Materials

The online well-being course was delivered via 'Canvas', an online platform that students are familiar with as it is used for accessing materials of the psychology courses and receiving grades and updates on academic matters. During a four-week period in the spring of 2021, psychology students at the University of Twente had the opportunity to take part in the well-being intervention that encompassed the central concepts of positive psychology. It included four small lectures per week, all of which were displayed on separate pages and covered different themes. Four days after each week's upload of the lectures, students participated in one-hour-long live sessions hosted by mindfulness or positive psychology experts, which comprised these four topics: 1) What's my story, 2) Silence and compassion as

a method, 3) Where do I belong, 4) What is my well-being. The sessions covered the following themes: 1) personal values and motivations/passions, 2) well-being and potential challenges, 3) resilience, stress mindset and fear of uncertainty, 4) fear of missing out and gratitude, 5) self-compassion, and 6) connectedness/sense of belonging/loneliness. The techniques that students engaged in were derived from narrative psychology, mindfulness exercises, gratitude exercises and motivational interviewing. Moreover, they were provided with materials containing additional information about the different themes, which they could use to further educate themselves if they wished to.

The survey contained questions about sociodemographic and study-related data at the end of the intervention. Furthermore, participants were asked to fill in different questionnaires and scales before, during and after the course, measuring the variables of interest for this study, which were students' mental well-being, loneliness, perceived stress, and sense of belonging.

Demographic and academic variables. Students participating in the well-being course were asked to indicate their age, gender, nationality, and study year at the university.

Well-being, loneliness, and perceived stress. Students' mental well-being levels were measured with the Mental Health Continuum – Short Form (MHC-SF; Keyes, 2002), which consists of 14 items to be rated on a six-point Likert scale ranging from "0=Never" to "5=Every day". A high total sum score indicates high mental well-being. The questionnaire was used in a sample of university students and has shown excellent reliability (α=0.91; Bendtsen, Müssener, Linderoth, & Thomas, 2020), which was found in this study's sample as well (α=0.94).

Students' degree of loneliness was measured with the short scale for measuring loneliness created by Hughes, Waite, Hawkley and Cacioppo (2004). The scale contains three items such as "How often do you feel left out?". The questions are answered on a three-point Likert scale with "1=Hardly ever" and "3=Often", and scores are summed with high scores indicating more loneliness. The scale showed satisfactory reliability (α=0.72; Hughes, Waite, Hawkley & Cacioppo, 2004), in this study's sample Cronbach's alpha was good (α=0.83).

Perceived stress was measured with the Perceived Stress Scale 14 (PSS-14; Cohen, Kamarck, & Memelstein, 1983). The scale consists of 14 items asking questions like "In the last month, how often have you felt nervous and 'stressed'?". Participants rate the frequency of occurrence of the statements on a five-point Likert scale ranging from "0=Never" and "4=Very Often". Seven of the items are positively worded, meaning that they indicate a good coping with stress, as opposed to what the instrument measures. Therefore, their ratings were reversed for scoring, meaning that "0=Very Often" and "4=Never". Afterwards, total scores were

calculated by summing up all the responses, with a high score indicating a higher perceived stress level. Using the PSS in a sample of college students in the United States showed good reliability (α=0.82; Bodenlos, Hawes, Burstein, & Arroyo, 2020), while in this study's sample it was excellent (α=0.91).

Sense of belonging. Sense of belonging was measured with the sense of belonging subscale of Bollen and Hoyle's (1990) perceived cohesion scale (PCS). The subscale consists of three items (e.g., "I feel a sense of belonging to the University of Twente.") to be answered on an eleven-point Likert scale ranging with "0=Strongly disagree" and "10=Strongly agree". A higher sum of the three items' scores hint at a stronger sense of belonging. The PCS was used in samples of university students (Rohe et al., 2006; Thornton, Miller, & Perry, 2020) and the sense of belonging subscale showed excellent reliability (α=0.95; Chin, Salisbury, Pearson, & Stollak, 1999). In this study's sample internal consistency was similarly high (α=0.92).

Intervention involvement. To conduct analyses with the intervention as independent variable in this study, it was conceptualized as the intensity of students' involvement in the well-being course. For that, students' frequency of participation in the weekly live sessions was used, which was assessed weekly by asking whether the students had taken part in the live session to which they could respond with scores ranging from "1=yes" over "2=partly" to "3=no". To create the involvement variable, the levels "1=yes" and "2=partly" were summarized as "1=yes", whereas the response "3=no" was recoded to "2=no". Then, all participants who had attended less than two live sessions (i.e., with a score <2) were allotted to the "low-involvement" group, while all students who had attended two or more live sessions were assigned to the "high-involvement" group.

Data Analysis

All data was analysed using IBM SPSS Statistics 24. Frequency statistics for demographic and academic data such as the age and study year were calculated. Moreover, students were divided into two groups: one group of "low-involvement" (i.e., participation in zero or one live session of the course; N=29) and another of "high-involvement" (i.e., participation in two or more live sessions; N=20).

The respondents' levels of well-being, loneliness, perceived stress, and sense of belonging before, during and after the intervention were examined by computing descriptive statistics of total scores on the MHC-SF, three-item-loneliness scale, the PSS questionnaire, and the sense of belonging subscale, i.e., the mean and standard deviation of measurements at each of the three timepoints.

A repeated measures analysis of covariance (repeated measures ANCOVA) was used to test both research hypotheses after checking whether the collected data met the necessary assumptions. This analysis served the purpose of both, computing the within-subject differences between the three measurements to determine whether the intervention had an effect on the outcome variables, as well as to control for sense of belonging in the intervention-effect. The "involvement" variable was used as the between-groups factor.

To evaluate whether the intervention had a significant effect on sense of belonging, a paired t-test was run using the first (baseline) and second measurement. Then, the score of the baseline measurement of sense of belonging was subtracted from the score of the second measurement (in week three of the intervention) to obtain a difference score, testing whether the intervention had an increasing effect on sense of belonging. The difference score was then used as covariate in the repeated measures ANCOVA to control for the impact of sense of belonging on the intervention-effect.

Results

Demographic and academic variables

Table 1 illustrates the demographic characteristics of the two groups of involvement. There were more participants in the low-involvement group than in the high-involvement one. Overall, the sample characteristics were rather similarly distributed among the two groups. In both groups, the vast majority of participants belonged to the age group of 18-24 and identified as female. Moreover, participants were predominantly German and in their first study year at the University of Twente.

Table 1.

Demographic and academic data (N=49).

Involvement	Variable	Categories	N	Percentage
Low involvement (N=29)	Age	18-24	26	89.7
		25-31	3	10.3
	Gender	male	6	20.7
		female	23	79.3
	Nationality	German	20	69.0
		Dutch	4	13.8
		Other	5	17.2
	Study year	First year	23	79.3
		Second year	3	10.3
		Third year	3	10.3
High involvement (N=20)	Age	18-24	19	95.0
		25-31	1	5.0
	Gender	male	4	20.0
		female	15	75.0
		non-binary/third gender/other	1	5.0
	Nationality	German	13	65.0
		Dutch	5	25.0
		Other	2	10.0
	Study year	First year	16	80.0
		Second year	2	10.0
		Third year	1	5.0
		Pre-master	1	5.0

Table 2.

Participants' levels of mental well-being, loneliness, perceived stress, and sense of belonging (N=49).

Level of involvement	Questionnaire	1	2	3	Difference
		M(*SD*)	**M(*SD*)**	**M(*SD*)**	
Low involvement (N=29)	MHC-SF [mental well-being]	36.9(*14.5*)	39.9(*14.0*)	39.3(*14.6*)	+2.4
	Three-item-loneliness scale	6.4(*1.9*)	6.1(*1.6*)	5.8(*1.6*)	-0.6
	PSS-14 [perceived stress]	30.7(*9.4*)	27.7(*7.6*)	27.1(*8.9*)	-3.6
	Sense of belonging subscale	16.0(*6.7*)	16.1(*7.1*)	16.0(*8.0*)	+0.0
High involvement (N=20)	MHC-SF [mental well-being]	33.7(*15.1*)	35.6(*12.6*)	37.7(*12.2*)	+4.0
	Three-item-loneliness scale	6.4(*1.9*)	5.9(*1.4*)	5.2(*1.7*)	-1.2
	PSS-14 [perceived stress]	30.3(*9.9*)	27.4(*8.3*)	24.8(*7.5*)	-5.5
	Sense of belonging subscale	18.0(*6.0*)	17.3(*5.7*)	17.6(*5.4*)	-0.4

Note. 1=before the intervention, 2=during the intervention, 3=after the intervention.

Participant's mental well-being, loneliness, perceived stress, and sense of belonging

Overall, students' mental well-being scores seemed to have improved over time for both groups, as is displayed in *table 2*. Interestingly, the low-involvement group's baseline level was higher and increased more from the first to the second timepoint of measurement than the high-involvement group's levels did. However, the data shows that the high-involvement group continued to improve from timepoint two to three, whereas the low-involvement scores remained more or less at the level of the second timepoint. For students of the low-involvement group, loneliness and perceived stress seem to have decreased less than for the other group. On

another note, the level of sense of belonging for the high-involvement group appears to have decreased over time, while for the low-involvement group it mostly stayed the same.

Table 3.

Repeated measures ANCOVA for effectiveness of the intervention whilst controlling for sense of belonging (N=49).

Source	***df***	***F***	***p***
Between-subjects effects			
Involvement * time for well-being	1	0.49	0.487
Involvement * time for loneliness	1	1.29	0.262
Involvement * time for perceived stress	1	1.22	0.276
Within-subjects effects			
Well-being	1	7.56*	0.009
Well-being x sense of belonging	1	1.72	0.196
Loneliness	1	14.89*	0.000
Loneliness x sense of belonging	1	0.12	0.732
Perceived stress	1	19.63*	0.000
Perceived stress x sense of belonging	1	7.09*	0.011

Note. df: degrees of freedom. *significant at $p < .05$.

Effectiveness of intervention

Mauchly's test of sphericity was not significant for any of the outcome variables, which means that the assumption of sphericity was met. There was a significant effect of the intervention for both groups over time for well-being ($F(1, 46) = 7.56$, $p < .05$), loneliness ($F(1, 46) = 14.89$, $p < .05$) and perceived stress ($F(1, 46) = 19.63$, $p < .05$). However, there were no significant differences between the low- and high-involvement groups in this effect on well-being ($F(1, 46) = 0.49$, $p = 0.487$), loneliness ($F(1, 46) = 1.29$, $p = 0.262$) or perceived stress ($F(1, 46) = 1.22$, $p = 0.276$). For an overview of all values, see *table 3*.

Controlling for the impact of sense of belonging

The paired t-test showed that there was no statistically significant change in students' sense of belonging between the baseline measurement and the measurement taken mid-intervention ($t(48) = -0.316$, $p = 0.753$). Calculating the difference score for sense of belonging from baseline to week three resulted in a slightly negative value.

Afterwards, the impact of sense of belonging on the intervention's effectiveness was tested. The assumption of homogeneity of regression slopes was met ($p > .05$), while linearity could not be found for any of the variables. Running a repeated measures analysis of covariance did not produce significant results for the impact of sense of belonging on the change over time in well-being ($F(1, 46) = 1.72$, $p = 0.196$) and loneliness ($F(1, 46) = 0.12$, $p = 0.732$), but for perceived stress there appeared to be a significant effect ($F(1, 46) = 7.09$, $p < .05$). Refer to *table 3* for an overview of the results produced by the repeated measures ANCOVA.

Discussion

This study aimed to evaluate the effects of a four-week well-being course offered at the University of Twente on the participating students' mental well-being, loneliness, and perceived stress, as well as the influence of sense of belonging on said effects. The results showed that after the intervention, mental well-being, loneliness, and perceived stress were improved and that there was no difference for the low- and high-involvement groups in these effects of the intervention. Furthermore, when controlling for sense of belonging in the intervention-effect, the results indicated that sense of belonging had an impact on the intervention's effectiveness for perceived stress, but not for well-being and loneliness. These results suggest full support of the first hypothesis, that is the effect of the intervention in increasing well-being and decreasing loneliness and perceived stress, and partial support of the second hypothesis, which presumed that sense of belonging was increased by the intervention and had an impact on the intervention-effect on all three of the outcomes.

Levels of mental well-being, loneliness and perceived stress and the intervention's effectiveness. The findings of this paper showing that the intervention was effective in improving students' well-being, loneliness and perceived stress are in line with published research (see Lattie et al., 2019; Schotanus-Dijkstra, Pieterse, Drossaert, Walburg & Bohlmeijer 2019; Young, Macinnes, Jarden & Colla, 2020; Altinyelken, Hoek & Jiang, 2020; Modrego-Alarcón et al., 2021).

As for the absence of differences between the low- and high-involvement groups, a few aspects should be considered, since graphs show that the intervention's effectiveness for the low-involvement group was not as strong as for the high-involvement group (see Appendix). Considering this, the question arises why the intervention showed to be effective for this group at all. Interestingly, other research examining the effects of a positive psychological course on students' well-being showed that the frequency with which participants practiced the course exercises at home was not associated with well-being gains (Young, Macinnes, Jarden & Colla, 2020). A possible explanation could be that students in this group may have used the time differently, for example, by spending more time with their roommates or engaging in extracurricular activities, thereby experiencing social support, which was found to reduce loneliness and increase wellness in students (Worsley, Harrison & Corcoran, 2021; Boone, Schuler, Basu & Smith, 2021).

The baseline measurements in this sample showed that students' mental well-being was

lower, and perceived stress and loneliness were higher than in the sample that Kelders, Oberschmidt and Bohlmeijer (2019) used in their student well-being report. Similarly, comparing students' baseline well-being to that of another well-being intervention's adult sample by Schotanus-Dijkstra, Pieterse, Drossaert, Walburg and Bohlmeijer (2019), showed that students in this study reported a slightly lower well-being. These results might be best explained by the circumstances under which this study's data was collected: during the COVID-19 pandemic German and Dutch citizens were in lockdown, which could have affected students' mental health and distress as well. However, there is no clear consensus, since some research found elevated levels of loneliness and perceived stress among university students during the COVID-19 pandemic (Elmer, Mepham, Stadtfeld, 2020; Kohls, Baldofski, Moeller, Klemm, & Rummel-Kluge, 2021; Ochnik et al., 2021), while other research did not find any significant increase of those two mental stressors during the pandemic (Voltmer et al., 2021). Unfortunately, there is little to no papers discussing the impact of the pandemic on mental well-being in students, so further research is needed.

Controlling for sense of belonging. The second hypothesis assuming an impact of sense of belonging on the intervention's effectiveness included the assumption that the intervention would have a significant effect on students' sense of belonging and based on the well-being course's content and research findings, presumably increase its strength. However, no such effect was found for changes from baseline to week 3 measurements, which most likely explains the lack of power of sense of belonging: had the intervention increased students' sense of belonging, its impact on the intervention-effect for well-being and loneliness might have been larger.

A possible explanation for this lack of increase in sense of belonging might be that the intervention being online did not give students a chance to connect with other participants and to put newly acquired skills to practice, like participants of another well-being intervention reportedly could (Whiteside et. al, 2017). Moreover, no information was gathered about students' living situation, for instance whether they lived with other students, alone in an apartment or still at home. The COVID-19 pandemic might have made it impossible to move somewhere else for students who were unsatisfied with their living situation, and consequently would not have a group they could feel a sense of belonging to. This assumption is in line with findings by Worsley, Harrison and Corcoran (2021), who emphasized that a low sense of belonging in students to their roommates is associated with higher levels of loneliness. Additionally, other literature found that group interventions showed to be more effectively increasing well-being than individual or technology-based interventions did (van Agteren et.

al, 2021).

Significant findings indicate that the intervention's effect on perceived stress was impacted by sense of belonging, meaning that a large part of the intervention's effect for perceived stress is attributable to sense of belonging. The fact that sense of belonging slightly decreased over time, even if this decrease was not significant, but still significantly impacted the intervention-effect contradicts findings in other literature (Wuthrich, Jagiello & Azzi, 2020; Worsley, Harrison & Corcoran, 2021), which stated that a higher sense of belonging had a mitigating effect on perceived stress. However, despite this contradiction, the result implies that the intervention's effect on perceived stress might have been stronger, had sense of belonging improved for the sample. Taking into account that the decrease in sense of belonging was not significant and that measurements at both of timepoints showed only moderate levels of sense of belonging, a plausible explanation might be that students did not associate a lower sense of belonging with negative feelings and a more stressful experience, but rather spent more time concentrating on themselves like they were taught during the intervention through body scan exercises, for example. Students participating in a well-being intervention reported that besides developing feelings of connectedness to their group, they also learned skills pertaining to their self-awareness, management of emotions, dealing with everyday life stressors and the importance of self-care, making them feel empowered, confident, and successful (Whiteside et. al, 2017).

Strengths and limitations

Strengths of this study are that it was a real-life study, that it had a decent sample size and that students participated voluntarily. Moreover, the variety of measured variables and the frequency with which they were measured, asking participants to fill in all of the questionnaires before, during and after the intervention, allows for the data set to be used for different research foci in the field of positive psychology and PPIs. The usage of well-known and established questionnaires facilitates comparison of the results with other studies. Furthermore, the inclusion of live sessions and exercises in the well-being course allowed for participants to experience some sort of direct involvement in the intervention, which encouraged active attendance. Even though the differences between the involvement groups were not significant, distinguishing between the two during the analyses still showed a clear trend and how important active participation was to increase the intervention's effectiveness.

When determining students' levels of involvement and assigning them to one of the groups, the smaller sample size of this study made it important to focus on keeping the groups'

sample sizes as equally high as possible to guarantee some of the analysis' statistical power. Therefore, looking at the frequency of students' participation in the live sessions seemed like a good indication of how committed and motivated they might have been during the intervention. Furthermore, analysing how many percent of participants in the two groups stated to have watched the first lecture of each week elicited similar results: in the low-involvement group, less people watched each week's first lecture compared to their more involved counterparts. Using another method to split the sample into two groups of involvement might elicit different results than were found here. Additionally, the smaller sample size limited statistical power of the repeated measures ANCOVA, which might be the reason for a lack of impact by sense of belonging on the intervention-effect for mental well-being and loneliness.

Lastly, there was no control group of students, who did not participate in the intervention, but still filled in the same questionnaires. This could have provided some context for the interpretation of results, adjacent to comparing the levels of involvement. It would have made the impact of the intervention on the outcome variables and the controlling effect of sense of belonging clearer and could have given some additional data about possible outside factors.

Future recommendations

There are some suggestions for future research in that field that might help gather information to improve reliability and generalizability of results, help fill the gaps of this study and collect more, potentially interesting data.

First, research that focusses on implementing a well-being intervention and assessing its effectiveness should add a control group of students not participating in the intervention, but instead engaging in tasks with more neutral content, like additional classwork. This would allow comparison between participants and non-participants and potentially strengthen the significance of the intervention's effectiveness on the outcome variables. Moreover, it could provide some clarity as to why mental health improved in those students who did not participate as actively in the intervention, since there would be a similar group to compare their scores on the questionnaires to.

Secondly, if future research will focus on sense of belonging, additional data should be collected. For one, information about students' living situations should be gathered, including potential stressors like feelings of discomfort with the living space, roommates, or problematic family circumstances if living at home, as well as the unfulfilled wish to change something about these circumstances. Furthermore, to reduce uncertainty about student's social surroundings and contacts, especially during the pandemic, additional data on the frequency

and nature of social contacts of participants should be gathered to identify possible groups that students could feel a sense of belonging to.

Similarly, the study and intervention should be repeated during a time that makes it possible to hold it on campus, as opposed to online, and thereby allow face-to-face contact. This will give participants a chance to work in a group with its own dynamic and to put their newly acquired social skills to practice, like it was done in other interventions as well. This would allow the study's results to be more reliable and generalizable, as well as comparable to other interventions implemented prior to the pandemic.

Lastly, it should be mentioned that some research findings point at loneliness being associated with lower mental well-being levels and higher levels of stress (Moksnes, Bjørnsen, Eilertsen & Espnes, 2021; Mäkiniemi, Oksanen, Mäkikangas, 2021). Considering that loneliness was also defined as perceived social isolation, it presents a contrast to sense of belonging and could be examined as another factor possibly impacting the effectiveness of a well-being intervention. In a similar fashion as was hypothesised for sense of belonging, being part of an intervention group with frequent contacts or learning new skills on how to form and strengthen positive relationships might decrease feelings of loneliness. However, this relationship should be researched more thoroughly before considering it as a controlling variable in any future studies.

Conclusion

Overall, students' mental well-being in this study was found to be rather low, while loneliness and perceived stress were rather high. Compared to other data, students' state of mental health has worsened, probably attributable to the current situation caused by the pandemic and social isolation. Still, the well-being intervention showed to be effective for the entire student sample in increasing mental well-being and decreasing loneliness and perceived stress. Future implementation of a control group will help identify why the level of involvement did not have a significant impact but why students of the low-involvement group still experienced significant improvements over time, despite participating in the activities to a lesser degree.

An impact of sense of belonging was found only for the intervention-effect on perceived stress. There was no significant increase in sense of belonging caused by the intervention, which might be the reason for the lack of sense of belonging's impact on the intervention-effect for well-being and loneliness.

Future research should focus on considering the circumstances imposed on students by

the COVID-19 pandemic by collecting more information about students' social and living situations, adding a non-participation control group and consider controlling for the impact of other social factors, for instance loneliness, on the effectiveness of well-being interventions. Moreover, the intervention should be replicated once physical contact on campus is allowed again.

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Appendix

Figure 1.

Mean scores of mental well-being by involvement group before and after the intervention (N=49).

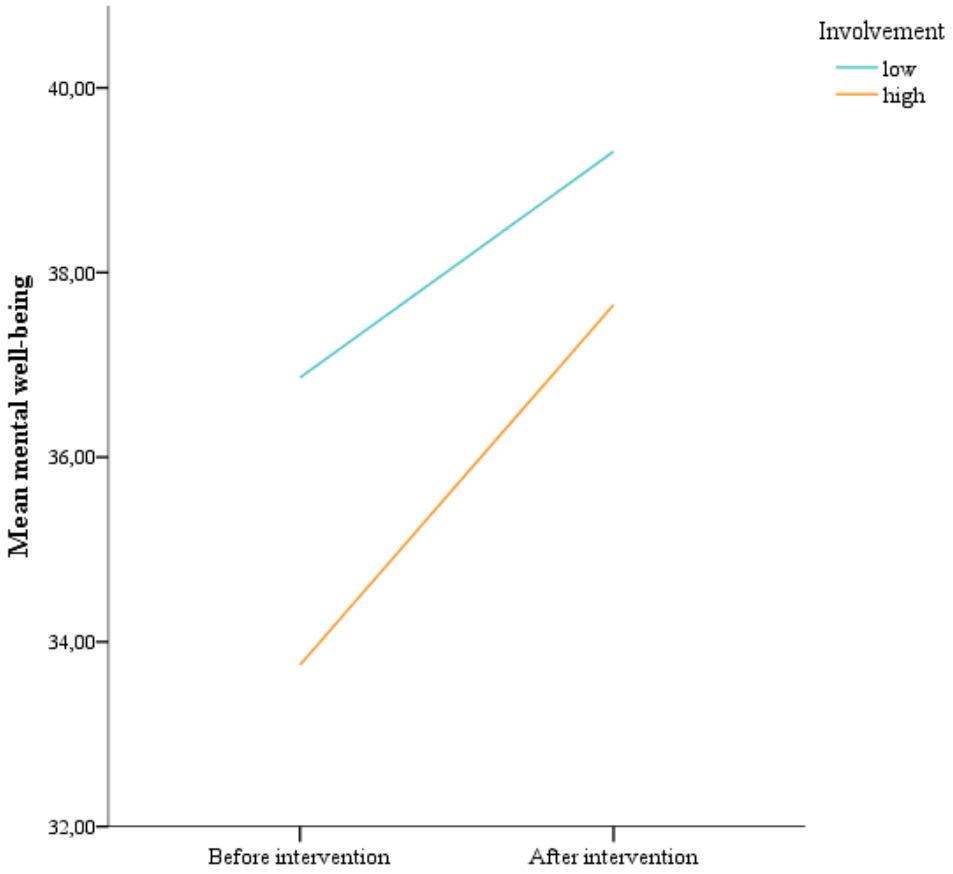

Figure 2.

Mean scores of loneliness by involvement group before and after the intervention (N=49).

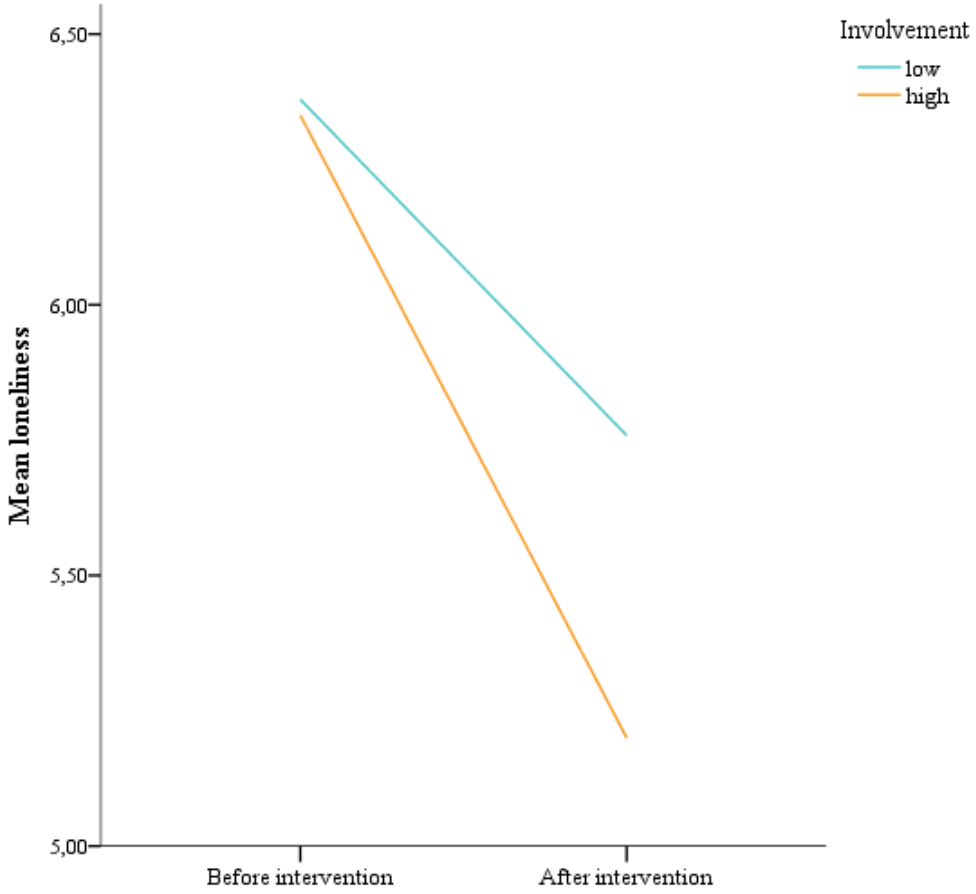

Figure 3.

Mean scores of perceived stress by involvement group before and after the intervention (N=49).