

**Preliminary Effectiveness of a Well-Being Intervention  
and an Exploration of a possible Mediation**

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# WELL-BEING INTERVENTION IN STUDENTS

<b>Table of Contents</b>	<b>Page</b>
Title Page	1
Table of Contents	2
List of Tables	3
Abstract	4
Introduction	5
Methods	12
Results	17
Discussion	20
References	27

## WELL-BEING INTERVENTION IN STUDENTS

<b>List of Tables/Figures</b>	<b>Page</b>
Table 1	13
Table 2	15
Table 3	17
Table 4	18
Figure 1	20
Table 5	20

### **Abstract**

Feelings of loneliness and sense of belonging are both important constructs that can have an impact on students' well-being. Previous research has indicated that both factors can be crucial for students' well-being especially when students are at the start of their university career. To maintain students' well-being or even increase it, researchers have developed various well-being interventions for students. The research has shown that such interventions are effective and can enhance one's well-being. A similar intervention has been developed and tested at the University of Twente. Besides testing the intervention various other aspects of well-being were measured. This study built upon that specific intervention and aimed to examine an explorative mediation effect of a change in feelings of loneliness and sense of belonging on the intervention-effect on students' well-being. For that the Mental Health Continuum Short-Form (MHC-SF), the short scale for measuring loneliness, and the sense of belonging of perceived cohesion scale were measured in a longitudinal study with students in the bachelor program at the University of Twente. The results indicated that the intervention improved students' well-being over time. However, the results showed that no explorative mediation effect occurred. Due to collecting the data in a pandemic, future research could repeat the data collection process in times of "normality" and re-examine whether the present study's results are replicated.

Keywords: well-being, students, sense of belonging, loneliness, well-being intervention, explorative analysis

### **Introduction**

#### *Mental Health*

In the past, research in psychology has mainly been focused on diminishing psychological difficulties and reducing complaints. However, mental health involves more than just that one approach of reducing mental health problems (Marais, Shankland, Haag, Fiault, & Juniper, 2018). A different approach that has been researched more in depth in recent years focusses on what makes people flourish and their life worth living (Seligman & Csikszentmihalyi, 2000; Marais et al., 2018). This approach has given rise to the field of positive psychology (Seligman & Csikszentmihalyi, 2000). Positive psychology focusses on the positive aspects in life and aims to promote well-being (Seligman & Csikszentmihalyi, 2000). Further, positive psychology intends to build and strengthen one's resources. Research has shown that positive psychology does have an impact on one's mental health. For instance, a previous study has given evidence that positive psychology has an impact on reducing mood disorders (Kotera & Ting, 2021).

#### *Well-Being*

An essential component of positive psychology is the construct of well-being (Seligman & Csikszentmihalyi, 2000). According to Keyes (2002) well-being can be further divided into hedonic and eudaimonic well-being. Hedonic well-being can also be referred to as subjective well-being and is usually indicated and measured through life satisfaction, interest in life, and happiness. Eudaimonic well-being on the other hand, can further be divided into social and psychological well-being. Social well-being consists of five dimensions and refers to optimal functioning in society and public (Keyes, 2002). Psychological well-being has gained a lot attention in recent years and consists of the following six dimensions: autonomy, purpose in life, personal growth, positive relationships, self-acceptance, and environmental mastery (Weiss, Westerhof, & Bohlmeijer, 2016).

## WELL-BEING INTERVENTION IN STUDENTS

Besides this, psychological well-being has been defined as a development of self-actualization (Weiss et al., 2016). A review of the literature that has been conducted on psychological well-being has found that a high level of psychological well-being can serve as a protective factor against the development of formal mental health disorders (Weiss et al., 2016).

The construct of well-being has become quite important for researchers and practitioners as it has become an important indicator of a good and meaningful life (Koydemir & Sun-Selisik, 2016). Therefore, Seligman (2011) constructed the PERMA model of well-being that is combining hedonic and eudaimonic well-being. The PERMA model stands for positive emotions, engagement, positive relationships, meaning in life, and accomplishment. It has been suggested that these five factors should be considered when creating a positive psychological intervention (PPI) (Waters, 2011). Finally, the PERMA model can be used to determine well-being (Marais et al., 2018).

### *Well-Being in Students*

Many research studies have given evidence that the risk of developing mental health distress and psychological difficulties in students has significantly increased (Baik, Larcombe, & Brooker, 2019; Papadatou-Pastou et al., 2019). The well-being of students has become more of a concern in the past years not only because students undergo personal, social, and academic changes, but also because students are typically at the age where most mental disorders start to be manifested (Davies, Morriss, & Glazebrook, 2014; Koydemir & Sun-Selisik, 2016; Papadatou-Pastou et al., 2019). Psychologists are worried about students' well-being because their mental health can have a significant impact on their academic performance (Kelders, Oberschmidt, & Bohlmeijer, 2019; Papadatou-Pastou et al., 2019). Research has found out that high levels of distress in students are associated with a reduced ability to meet academic obligations and an increased risk to develop a serious mental health

## WELL-BEING INTERVENTION IN STUDENTS

disorder (Stallman & Kavanagh, 2018). In addition, psychological distress can have an impact on students' cognitive, emotional, physical, and interpersonal functioning (Baik et al., 2019). Further, research has shown that stress, depression, and anxiety are the most common psychological issues among students (Baik et al., 2019; Papadatou-Pastou et al., 2019).

Research states that various academic-related factors that contribute to students' mental health difficulties (Davies, et al., 2014; Koydemir & Sun-Selisik, 2016; Schoeps, de la Barrera, & Montoya-Castilla, 2020). Kotera and Ting (2021) has indicated that factors such as financial stress due to high tuition fees, increased workload that leads to academic pressure, and general life stress are primarily responsible for low well-being in students. In addition, de Vibe et al. (2018) mention that high academic performance expectations and time pressure raise the level of stress for students, which is associated with low levels of life satisfaction and thus lead to poorer well-being. In line with de Vibe et al. (2018), Schoeps et al. (2020) also mention that students are concerned about their academic performance and the pressure to succeed and post-graduation plans.

However, there might also be the influence of non-academic-related factors that affect students' well-being. Many universities first-year students have a difficult time adjusting to the change from high school to a higher-level institution such as a university. Often such students experience homesickness (Koydemir & Sun-Selisik, 2016; Schoeps et al., 2020). Aside from that, they also feel lonely and socially dissatisfied as new friendship have yet to be developed (Koydemir & Sun-Selisik, 2016; Schoeps et al., 2020). Furthermore, student might feel like they do not belong to the university or the general academic environment. Research defines students' sense of belonging as them having a sense of membership while feeling accepted and connected to their institution (Ahn & Davis, 2020). Students' sense of belonging is strongly related to their academic success, which in turn is associated with students' well-being. According to Ahn and Davis (2020), sense of belonging is a

## WELL-BEING INTERVENTION IN STUDENTS

multidimensional concept that is affected by students' social and psychological functioning. Often students make the transition from adolescence to adulthood in college. During that time students are not only required to navigate academic workloads but also to build relationships with peers (Moeller & Seehuus, 2019). This process of building a social network can not only affect one's sense of belonging but also their feelings of loneliness (Ahn & Davis, 2020; Moeller & Seehuus, 2019). Some students might not succeed in making friends and form meaningful relationships right away due to poor social skills, which can then lead to experiencing loneliness (Moeller & Seehuus, 2019). Loneliness can be explained by one's cognitive discrepancy between the desired quality of relationships and the actual experiences. Research has given evidence that students who feel lonely are more likely to experience mental health difficulties such as anxiety and depression (Moeller & Seehuus, 2019). Considering these findings, it is important to understand the degree to which academic demands and the competitive environment can have a serious impact on students' mental health (Schoeps et al., 2020).

Keeping the above-mentioned information in mind, it should be highlighted that there are not only a few countries where students' well-being is affected, but that it is rather an issue that is represented worldwide (Baik et al., 2019; Schoeps et al., 2020). Around a 20 percent rate of university students in various countries are suffering from mental health distress, depression, or anxiety related symptoms (Howell & Passmore, 2018; Baik et al., 2019; Kotera & Ting, 2021). Besides this, international students potentially have an even higher prevalence of experiencing academic pressure whilst studying in a non-native language leading to mental health distress (Papadatou-Pastou et al., 2019). Furthermore, some studies have suggested that female students are more likely to experience lower well-being (Al-Ghalib & Salim, 2018; Baik et al., 2019; Marais et al., 2018). In addition, Baik et al. (2019) report that students who identify with sexual minorities and those coming from



## WELL-BEING INTERVENTION IN STUDENTS

lower socioeconomic backgrounds have a higher prevalence of mental health problems.

Research also suggests that students' academic expectations and with that related the amount of stress that they might experience, might vary depending on their year of study (Poots & Cassidy, 2020). Although, there is evidence that students' stress levels tend to peak in the final year (Poots & Cassidy, 2020). Koydemir and Sun-Selisik (2016) on the other hand, report that students in their first year experience the most mental health distress. Besides this, students in higher education institutions are more likely to experience mental health issues than same age individuals who do not take part in higher education (Papadatou-Pastou et al., 2019).

### *Positive Psychological Interventions (PPIs)*

To take positive psychology also into account in treatment and psychotherapy, positive psychological interventions (PPIs) have been developed and gained a lot more attention ever since the rise of positive psychology. PPIs aim to increase well-being and enhance positive cognitions, behaviours, and emotions (Davies et al., 2014; Howell & Passmore, 2018; Sin & Lyubomirsky, 2009; Weiss et al., 2016). The spectrum of PPIs is quite large with many research studies targeting mindfulness or strength interventions (Bamber & Morpeth, 2019; de Vibe et al., 2018; Ghielen, van Woerkom, & Meyers, 2018; Koydemir & Sun-Selisik, 2016). In addition, acceptance and commitment therapy, well-being therapy, and life-review therapy are also interventions that have been integrated in the field of positive psychology. PPIs have shown to enhance positive psychological functioning and shown to be effective in various mental disorders (Sin & Lyubomirsky, 2009; Weiss et al., 2016).

### *PPIs in Students*

In order to allow students to better cope with academic stress and pressure and develop resilience, PPIs have been applied to students (Galante et al., 2016). The

## WELL-BEING INTERVENTION IN STUDENTS

effectiveness of PPIs has also been researched in students and shown to be quite successful and efficient (Galante et al., 2016). As mentioned above lots of research has been done using mindfulness and strengths intervention, which is also the case for the research that has been conducted in students. Mindfulness refers to the regulation of attention and mindfulness interventions aim to increase one's awareness and take on an attitude of acceptance and non-judgement (Bamber & Morpeth, 2019; de Vibe et al., 2018). This is often practiced through meditation and relaxation techniques (Bamber & Morpeth, 2019; Regehr, Glancy, & Pitts, 2013). In their meta-analysis, Bamber and Morpeth (2019) have given evidence that mindfulness meditation is very effective in treating students' anxiety. In line with this, Galante et al. (2018) found that mindfulness interventions in students are more effective than other preventive interventions. Although, strength interventions, which focus on an individual's strengths and their identification of strengths to promote well-being, have also shown to be quite effective in students (Dolev-Amit, Rubin, & Zilcha-Mano, 2021; Ghielen et al., 2018). Ghielen et al. (2018) have given evidence that besides the positive effects of strengths interventions, focusing on one's strengths has a motivating factor, enhances one's confidence, and builds resilience. Considering these findings, students benefit from these PPIs in terms of improving their well-being but also in further developing individuals' personal growth and development (Ghielen et al., 2018).

### *Digital technological interventions*

Students have busy schedules and different aspects influence students' decision-making on whether they seek psychological help. Often students do not take the opportunity and get help due to the stigma that exists around mental illness and psychological help in our society (Kotera & Ting, 2021; Papadatou-Pastou et al., 2019; Stallman & Kavanagh, 2018). However, a possible solution to offer students help without them experiencing any kind of judgement or stigma can be the use of digital and technological interventions. Online mental

## WELL-BEING INTERVENTION IN STUDENTS

health interventions allow individuals to get help while avoiding potential barriers such as time and stigma (Lattie et al., 2019). Reviews have shown that technological interventions are effective in students. To emphasize the effectiveness, research suggests that no matter if the interventions are computer-, web-, mobile-, or virtual reality based, they show to be effective in improving students' well-being (Davies et al., 2014; Lattie et al., 2019). Further, students have indicated that they accept such technological online interventions and are prone to utilise them (Stallman & Kavanagh, 2018).

### *Research Question & Hypothesis*

The present study aims to examine a well-being intervention that has been applied to students at the University of Twente. As stated above, research has found that there is a positive association between online interventions and students' well-being. This might also be the case for the present well-being intervention in students at the University of Twente. However, the present study aims to take closer look at the well-being intervention and students' data to examine whether there might be a possible mediation effect of other aspects that may influence the relationship between the intervention and students' well-being. It has already been emphasized that mental health distress plays a significant role in students' well-being (Baik et al., 2019). Nevertheless, as indicated above already students might also feel lonely and lack a sense of belonging, which according to research are additional factors that can lead to mental health difficulties (Ahn & Davis, 2020; Moeller & Seehuus, 2019). Keeping this in mind, this study intends to take students' feeling of loneliness and their sense of belonging more into focus. Hence, this study is designed to answer the following research question: Is there a possible explorative mediation effect of loneliness and sense of belonging on well-being after a well-being intervention in students? Consequently, the subsequent hypotheses have been proposed:

## WELL-BEING INTERVENTION IN STUDENTS

H1: The intervention decreases students' loneliness and increases their sense of belonging.

H2: Students' loneliness negatively and sense of belonging positively relate to students' well-being.

H3: The intervention did not have a direct effect on students' well-being after controlling for loneliness and sense of belonging.

If H1 and H2 turn out to be supported, then an indirect mediation effect of the intervention on students' well-being can be suggested.

### **Methods**

#### **Participants**

A total of 97 psychology students were recruited for this study. However, due to not meeting the requirements of filling in a minimum of four out of six surveys and missing demographic information, 48 students were excluded from the study. Therefore, the study included 49 participants. Before being able to take part in the study, participants had to provide their informed consent, which is in line with the ethical guidelines of the University of Twente. Sociodemographic data was collected such as gender, age, nationality, year of study, and whether they were full-time or part-time students. The sample consisted of only full-time students of which 38 identified as females (77.6%) and 10 as males (20.4%); including one participant, who identifies as other. Most participants were German (N=33, 67.3%). Nine individuals were Dutch, and seven participants have a different nationality. Further, 79.6% of participants were first-year students, the rest (20.4%) were between second and fourth-year students. The age range was from 18 to 31 years and the mean age was 21.27 ( $SD=2.44$ ). Participants were divided into two different groups. One group included the participants that attended at least half or more of the live lectures and were therefore labelled

## WELL-BEING INTERVENTION IN STUDENTS

as high-attendance group (N=21). The other one included the participants that did only attend one lecture on none at all, falling into the category of the low-attendance group (N=28).

### Material

*Personal reflection, positive psychology and meditation; a No-Books course on well-being.* A short 4-week online well-being intervention has been developed at the University of Twente. The intervention was offered to students, who are enrolled in the psychology department to examine how their well-being level, stress and anxiety levels might change over the course of this intervention. The well-being intervention is based on various concepts of the positive psychology field such as mindfulness and gratitude exercises, for example. Table 1 demonstrates an overview of the topics and main exercises each week. Further, the content of this intervention was based on recent research that has been conducted at the University of Twente and examined students' current well-being (Kelders et al., 2019). Therefore, this intervention was constructed to support and maintain students' well-being. Each week was focussing on a different topic and students were offered a minilecture. In addition, four days after the minilecture, students had a live session that lasted one hour and was given by an expert in positive psychology and mindfulness. The well-being intervention was delivered online via the 'Canvas' platform that the university commonly uses to publish and access different course materials.

**Table 1**

*Outline of the different topics and exercises each week*

Week	Topic	Main exercises
		Passion tracking
Week 1	What's my story?	3-minute breathing space
		Gratitude

## WELL-BEING INTERVENTION IN STUDENTS

Week 2	Silence and compassions as a method	Body scan
Week 3	Where do I belong?	Metta-meditation
Week 4	What is my wellbeing?	Energy taking/giving

***Mental Health Continuum Short-Form (MHC-SF) (Keyes et al., 2008).*** To measure students' levels of well-being the MHC-SF was used. This questionnaire consists of 14 items and is scored on a six-point Likert scale that ranges from zero (never) to five (every day). Higher scores on the MHC-SF indicate higher levels of well-being. The MHC-SF has shown to have good validity and reliability (Keyes et al., 2008). In addition, this questionnaire has been widely used among students in various countries (Chan, Furlong, Nylund-Gibson, & Dowdy, 2021). For this sample, internal consistency was estimated using Cronbach's alpha (Field, 2018), which was .94 for the MHC-SF at baseline and .93 at the six-week measurement point.

***Short scale for measuring Loneliness (Hughes, Waite, Hawkey, & Cacioppo, 2004).*** To assess students' loneliness the three-item loneliness scale was used. This loneliness scale is an abbreviated version of the 20-item Revised UCLA Loneliness Scale (R-UCLA) (Russell, Peplau, & Cutrona, 1980). The three-item scale asks how often one lacks companionship, how often one feels left out, and how often one feels isolated from others. Responses are separated between hardly ever, some of the time, and often. Further, responses are ranked on a three-point Likert scale from one (hardly ever) to three (often). Thus, there is a score range between three and nine with higher scores implying loneliness. Research has shown that this scale has internal consistency, which indicates that the scale is reliable (Hughes et al., 2004). Further, the scale was developed with students and displayed to have

## WELL-BEING INTERVENTION IN STUDENTS

concurrent and discriminant validity (Hughes et al., 2004). The Cronbach's alpha for this sample at the week three measurement point was .92.

*Sense of Belonging of perceived cohesion scale (Bollen & Hoyle, 1990).* To measure participants' sense of belonging the Perceived Cohesion Scale (PCS) was used. This scale is composed of six items with three of them targeting sense of belonging. The items used in this study and measuring one's sense of belonging are as followed: "I feel a sense of belonging to \_\_\_; I feel that I am a member of the \_\_\_ community; and I see myself as part of the \_\_\_ community." Responses are scored on a 11-point Likert scale ranging from 0 (strongly disagree) to 10 (strongly agree), with higher scores indicating a stronger sense of belonging. The PCS was developed and tested in students and has shown to have strong psychometric properties suggesting it to be valid and reliable (Bollen & Hoyle, 1990). The Cronbach's alpha for this sample at the week three measurement point was .67.

### Design

The study is composed as an experimental design and is based on single-group pilot study. There were six measurement points in time to assess students' progress. Thus, at each measuring point, students' scores on these various concepts were measured with the help of questionnaires. Table 2 shows the different time measurement points. The intervention was used as the independent variable and the dependent variable were the participants scores of well-being according to the MHC-SF after the four-week intervention (Week 6).

**Table 2**

*Overview of the time measurement for each questionnaire*

Time Measurement Point	Measure
	Well-Being
Baseline	Sense of Belonging
	Loneliness

## WELL-BEING INTERVENTION IN STUDENTS

Week 3	Sense of Belonging
	Loneliness
Week 6	Well-Being

### **Procedure**

Participants were recruited by sending students the pre-survey via their email addresses. To be included in this study participants had to be psychology bachelor students at the University of Twente. Once students filled in the pre-survey, they were invited to the online platform to take part in the well-being intervention. Students' email addresses were used to reinvoke students to follow-up surveys. However, after completing the post-survey, students' email addresses were removed from the email list and the dataset. Each week students received various materials regarding a different positive psychology topic. Besides this, each week students were asked to fill in a survey that measured various aspects related to their well-being. On some occasions, certain measurements were repeated before, during, and after completing the intervention (cf. Table 2). Furthermore, students had the opportunity to give feedback.

### **Analysis**

The present study builds upon that previously explained research study in terms of exploring the effects of the intervention on students' well-being considering the predictor variables of sense of belonging and loneliness. The statistical analyses were carried out using the 27<sup>th</sup> version of IBM SPSS Statistics. Even though the data from the questionnaires is labelled as ordinal data as it is based on Likert scales, research has indicated that parametric tests can be used with ordinal data (Sullivan & Artino, 2013). Means and standard deviations were calculated for both participants groups regarding their well-being scores at baseline and six weeks past the begin of the intervention. At baseline and after week three of the



## WELL-BEING INTERVENTION IN STUDENTS

intervention, participants' sense of belonging and loneliness scores were measured. Then, the difference between baseline and week three scores were calculated for these two variables by subtracting the baselines scores from the scores in week three. Thus, the means and standard deviations that are presented in Table 3 were calculated by using the newly created variables for sense of belonging and feelings of loneliness that factor in the difference over time.

Lower scores in the difference scores of loneliness indicated that students' loneliness decreased. Similarly, for the sense of belonging difference, higher scores indicate an increase in students' sense of belonging. To test the three hypotheses, a repeated-measures ANOVA with the inclusion of covariates was conducted.

### Results

The present study aimed to examine the effects of a four-week well-being intervention on students' well-being under the consideration of students' sense of belonging and their feelings of loneliness. For that, standardised and self-reported questionnaires were being used. Table 3 below shows the means and standard deviations of the outcomes at the different measurement occasions. Together all three hypotheses aim to explore a possible mediation effect of the intervention on students' well-being. To test such mediation effect, a repeated-measure ANOVA with the inclusion of loneliness and sense of belonging as covariates was conducted.

**Table 3**

*Number (N), Means (M) and Standard Deviations (SD) for each measure for the Attendance condition.*

	Attendance	N	Mean (M)	Std. Deviation (SD)
Well-Being Baseline	High	21	33.57	14.72
	Low	28	37.11	14.70
Well-Being Week 6	High	21	36.76	12.55

## WELL-BEING INTERVENTION IN STUDENTS

	Low	28	40.04	14.34
Loneliness	High	21	-.381	1.60
	Low	28	-.321	1.42
Sense of Belonging	High	21	-.524	5.17
	Low	28	-.071	6.45

\*Loneliness and Sense of Belonging scores are the difference between scores measured in Week 3 and at baseline, with lower scores indicating a decrease in loneliness and sense of belonging.

Beforehand, several assumptions had to be met. The data was obtained through independent random observations and therefore met the assumption of independence of observation. The data also met the assumption of independence of the independent variable and the covariates, for loneliness  $F(1, 48)=.019, p=.891$ ; for sense of belonging  $F(1, 48)=.070, p=.793$ . It was also tested if homogeneity of regression slopes is given. The data met this assumption for both covariates, for loneliness  $F(1, 48)=.103, p=.749$ ; for sense of belonging  $F(1, 48)=.072, p=.790$ . The assumption of normality was met for the well-being and sense of belonging variables. For the loneliness variable, the Shapiro-Wilk test turned out to be significant. However, this case of normality violation can be ignored as ANOVAs are robust for normality violations and the groups sizes are fairly equal (Field, 2018). In Table 4 the normality statistics are presented.

**Table 4**

*Shapiro Wilk test results for the assumption of normality for each variable and the attendance condition.*

	Attendance	<i>W</i>	df	<i>p</i> -value
Well-Being Baseline	high	.966	21	.650
	low	.977	28	.774
Well-Being Week 6	high	.966	21	.651

## WELL-BEING INTERVENTION IN STUDENTS

	low	.991	28	.997
Loneliness	high	.883	21	.016*
	low	.919	28	.032*
Sense of Belonging	high	.973	21	.795
	low	.965	28	.466

Notes.  $p^* < .05$ .

All hypotheses have been rejected by the analysis. The results of the analysis are presented in Table 5. Hypothesis 1 is not supported because the intervention did not decrease students' feelings of loneliness and not increase students' sense of belonging over time. In the mediation model of Figure 1 this hypothesis is presented as path a. For hypothesis 2, there is also no statistical support as students' loneliness did not negatively and students' sense of belonging not positively relate to their well-being. Corresponding to Figure 1, path b demonstrates this hypothesis. Both of these results are demonstrated in Table 5, showing the absence of a significant intervention effect on the covariates over time and the covariates non-significant effect on student's well-being over time. (cf. Table 5). Therefore, an indirect mediation effect did not occur. Furthermore, hypothesis 3 can also be rejected as the opposite was found to be supported. By that it is meant that there was indeed a positive significant direct effect (path c in Figure 1) of the intervention on students' well-being. In detail, this result suggests that the intervention is effective because students' well-being improved over time. This effect is described in Table 5 as 'Time' because from baseline to week 6 students' well-being improved significantly. In addition, it did not matter whether students were in the high or low attendance group because both groups improved their well-being significantly over the course of the intervention, and there was no significant interaction of time and group (i.e., attendance), as is also visible in their means (cf. Table 3).

## WELL-BEING INTERVENTION IN STUDENTS

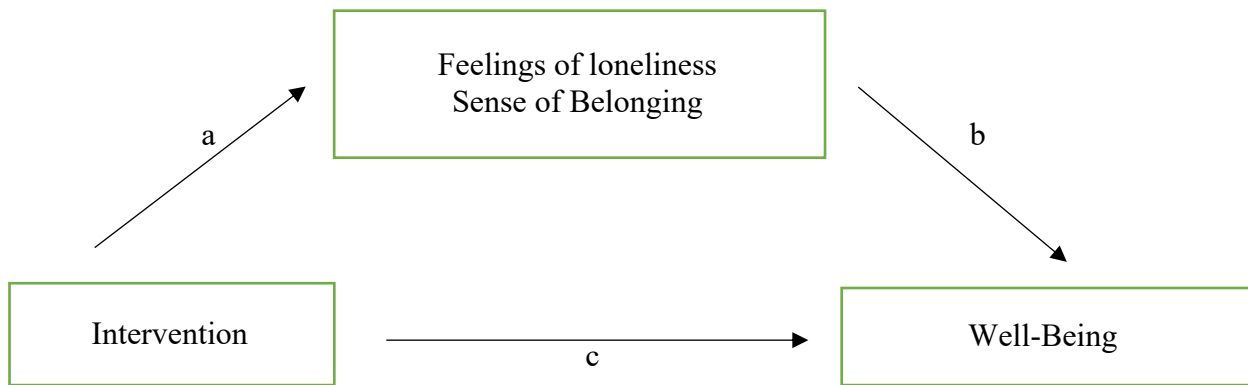


Figure 1: Mediation Model

**Table 5**

*Pillai's Trace tests results for each variable to test all hypotheses.*

	<i>F</i>	<i>p</i> -value	Effect size ( $\eta_p^2$ )
Time	5.927	.019*	.116
Time*Loneliness	.262	.611	.006
Time*Sense of Belonging	1.539	.221	.033
Time*Attendance	.022	.884	.000

Notes.  $p^* < .05$ . Time = Well-being at baseline and Week 6

### Discussion

This study aimed to investigate the effects of a well-being intervention on students' well-being. Exploratively it was investigated whether feelings of loneliness and sense of belonging had any effects on the above-mentioned effectiveness of the intervention. Regarding hypothesis 1, there was no support that the intervention had a significant effect on students' sense of belonging and their feelings of loneliness. There was also no support found for hypothesis 2 that students' sense of belonging and feelings of loneliness relate to their well-being in light of the intervention. Taking the results of the first two hypotheses together, it was found that neither feelings of loneliness or sense of belonging had any effects on the relationship between students' well-being over the course of the intervention. However, for hypothesis 3 the opposite result was found. The well-being intervention did have a direct

## WELL-BEING INTERVENTION IN STUDENTS

effect on students' well-being after controlling for the change between baseline and week 3 in sense of belonging and feelings of loneliness.

Considering the results of hypotheses 1 and 2, the results are quite surprising. Corresponding to hypothesis 1, the intervention did not have a significant preliminary effect on students' sense of belonging and feelings of loneliness. This result is not in line with previous research, which found that psychological interventions do improve students' sense of belonging (Marksteiner, Janke, & Dickhäuser, 2019). Specifically, PPIs have found to be effective in the growth of students' sense of belonging (Dunleavy & Burke, 2019). However, the effects of those PPIs were inconsistent across cultures (Dunleavy & Burke, 2019). Thus, the different ethnicities and cultures that students come from should be factored into the interpretation of the present study's results as well and might explain the absence of the significant effect of the intervention on sense of belonging and feelings of loneliness. Dunleavy and Burke (2019) searched for an alternative intervention and found that a peer intervention, which focussed on shared feelings, values, and experiences led to an increase in students' sense of belonging. Hence, PPIs are an option to increase sense of belonging and reduce loneliness in students. Further, alternative options such as a peer intervention or the inclusion of a cultural component in a PPI should be considered as well.

The result for hypothesis 2 suggests that sense of belonging and feelings of loneliness do not preliminary affect students' well-being during the course of the PPI. Similarly, to hypothesis 1, this result is very much unexpected. In his hierarchy of human's basic needs Maslow already indicated that humans need and thrive for connectedness and belonging (McLeod, 2007). Therefore, one would argue that sense of belonging, and the absence of loneliness are important for individuals' well-being (Dunleavy & Burke, 2019). Furthermore, previous research has indicated that a relationship between students' sense of belonging and feelings of loneliness and their well-being does exist (Ahn & Davis, 2020). Past research has

## WELL-BEING INTERVENTION IN STUDENTS

indicated that feelings of loneliness are associated with lower well-being (Hombrados-Mendieta, García-Martín, & Gómez-Jacinto, 2013). In addition, it was found that loneliness operates as a mediator between social support and well-being (Hombrados-Mendieta et al., 2013). Therefore, a new model that could be designed with the students at the University of Twente might be that students' social support gets measured followed by the examination of the relationship between students' social support and well-being with feelings of loneliness as a mediator. Furthermore, it has been suggested that students' feelings of loneliness lead to psychological distress and mental health difficulties, which often indicate lower levels of well-being (Moeller & Seehuus, 2019). These findings would suggest that different environmental factors such as social support can influence feelings of loneliness and sense of belonging which ultimately affect students' well-being. However, the present result might be explained by keeping in mind that this relationship was explored while students were actively engaging in the well-being intervention and other influential factors should be considered as well, which are discussed below.

Besides this, the data collection occurred during the COVID-19 pandemic. Keeping this in mind, the pandemic should be considered as a possible factor that influenced this study's result (Prasath, Mather, Bhat, & James, 2021). During the pandemic many universities delivered their class material online. Considering that almost 80 percent of the participants were first year students, it is possible that their sense of belonging, and feelings of loneliness were not really affected if they started off their university experience online. Thus, these students were not even able to feel like they belong to the university nor experience feelings of loneliness if they have not experienced the effects of in-person teaching at the university-level, which is quite different from high-school teaching. If this is the case that those students did not have the chance to experience what the actual university life is about, then that possibly explains the absence of the mediation effect of sense of

## WELL-BEING INTERVENTION IN STUDENTS

belonging and feeling of loneliness in relation to students' well-being and the intervention. Another explanation would be that these students have a good social system around themselves and feel like they already belong to something, that is more of importance and has a much greater impact on their well-being than the belonging to the university might have. Although, future research could examine the proposed explorative analysis of a possible mediation of this study again with the inclusion of a COVID-19 questionnaire to see whether that accounts for some of the results. In addition, research had indicated that many first-year students are making a transition and not only have to manage their academic work but also their new relationships with peers, which can affect their sense of belonging and feelings of loneliness (Ahn & Davis, 2020; Moeller & Seehuus, 2019). In case students lack the need of building new relationships, which might be less stressful in the beginning, their feelings of loneliness might increase over time. Besides this in COVID-19 times, online classes kind of take the building of relationships with peers away. Thus, these factors might explain why sense of belonging and feelings of loneliness do not mediate the relationship between well-being and the effect of the intervention.

Regarding hypothesis 3, students' well-being increased over the course of the intervention. Therefore, the present study's results for the effect of the intervention are in line with the findings of previous research (de Vibe et al., 2018; Stallman & Kavanagh, 2018; Weiss et al., 2016). Just like Davies, et al. (2014) and Ghielen et al. (2018) gave evidence for the usage of well-being interventions in students, the above-mentioned results suggest this as well. Seppälä et al. (2020) found that a well-being intervention can improve, in addition to well-being, other outcomes such as depression and stress reduction and mindfulness as well. Similarly, Davies et al. (2014) gave evidence in their review for a decrease in anxiety levels and depression after applying interventions via technology. Therefore, a follow-up study could include other outcome measures to the present study.

## WELL-BEING INTERVENTION IN STUDENTS

Although the results did not show the expected outcomes regarding the exploration of a possible mediation effect, the improvement in students' well-being over time gives room to explore other models by examining whether other factors play a significant role. Other research findings have shown that different factors such as self-compassion and social support mediate the relationship between students' well-being and academic stress and suggest that interventions can be applied to improve well-being (Poots & Cassidy, 2020). Therefore, future studies using the entire data that was collected from the intervention trial could examine other variables like self-compassion and social support that might turn out as possible mediators in the relationship. For instance, a model could be constructed using hope and school connectedness as potential mediators for students' well-being. Liu, Carney, Kim, Hazler, and Guo (2020) researched whether hope and school connectedness mediate the relationship between the bullying of students and their psychological well-being. As it turned out, hope and school connectedness mediate this relationship and operate as protective factors for bullying victimization. However, it should be considered that for the current study bullying might not be much of an issue due to the pandemic circumstance and online teaching. Also, it should be mentioned that school-connectedness is a more specific concept than sense of belonging. Lastly, parts of the well-being intervention could be included in universities' curriculum to give students the chance to acquire and develop skills about concepts of positive psychology and learn how to apply them (Koydemir & Sun-Selisik, 2016; Schoeps et al., 2020). The inclusion of well-being interventions in school can facilitate students' way to a flourishing life including healthy relationships, positive behaviours, and emotions (Koydemir & Sun-Selisik, 2016).

### *Limitations and future directions*

Despite the strengths of the current study, such as having several measurement points in time and the inclusion of measures of good psychometric properties, and it being a



## WELL-BEING INTERVENTION IN STUDENTS

longitudinal study, there were also several limitations. First, the sample was quite small, which might have reduced the power and margin of error in this study to detect effects. In addition, keeping in mind that most of the participants were first-year students, it would be beneficial to collect data from more students in different years as well to examine whether they also improve in well-being and similar results of this study are found. Furthermore, it might also be helpful to recruit so many participants that both genders are adequately represented to improve generalizability. Although research has indicated that female students are more likely to experience lower well-being (Baik et al., 2019), this cannot be applied to the present study due to not having a high enough percentage of male participants (roughly 20 percent) to do an adequate comparison. Another limitation of the present study is that there was no experimental set up of the group division into two groups as described in the method section. Thus, this limitation also limits the experimental design of the study, which is why the present study should only be seen as an explorative study of a mediation analysis. In addition, the main study which measured the data for the present study, included various other concepts that might influence students' well-being. Thus, in future studies it might be beneficial not to focus only on sense of belonging and feelings of loneliness, but also examine factors such as perceived stress and resilience levels among students. Other ideas that could be measured and examined in relation to students' well-being are alcohol, drug, and internet use as these three items show to be high among students at the University of Twente (Kelders et al., 2019). Lastly, this study can be seen as a preliminary step for a mediation analysis, which should be conducted in the future to examine the indication of a possible mediation of sense of belonging and feelings of loneliness.

In conclusion, the present study gives a clear indication that the well-being intervention is effective in students. This result is in line with previous research that has indicated that well-being interventions are effective in improving well-being in students.

## WELL-BEING INTERVENTION IN STUDENTS

However, the results of the explorative mediation analysis are not fully as expected. Neither sense of belonging or feelings of loneliness show to preliminary mediate the relationship between the well-being intervention and students' well-being. Future research could explore whether other factors such as cultural background, self-compassion, social support, and stress level possibly mediate this relationship. Lastly, the original data collection and thus also the present study could be examined again in times when students are not as limited as they were during the COVID-19 pandemic.

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