

**Multicomponent Positive Psychology Intervention (mPPI)
App for healthcare professionals: a quantitative
monocenter pilotstudy to evaluate the use, satisfaction and
change on well-being, self-compassion, job satisfaction and
intention to leave job**

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Abstract

Background/Aim: Healthcare professionals are likely to be exposed to additional burdens in the future due to various factors, such as demographic change and the growing risk of pandemics. This underscores the importance of digital solutions for safeguarding mental health in healthcare professionals, as they offer the possibility of flexible and resource-saving deployment. The aim of this pilot study is to investigate the extent to which a mPPI-App (TiP-app) was used and appreciated by healthcare professionals and whether there is a change in well-being, self-compassion, job satisfaction and intention to leave job after use of the app.

Methods: A one group pretest posttest design was used, in which 29 (15 drop-outs) healthcare professionals used the TiP-app for 3 weeks. Participants completed questionnaires on use, satisfaction (CSQ-8 adapted for TiP), appreciation, well-being (MHC-SF), self-compassion (SCS-SF), job satisfaction and intention to leave job.

Results: The results imply a moderate satisfaction with the TiP-app (CSQ-8: $M = 18.6$, $SD = 3.9$). There was a significant increase in *self-compassion* after use of the app (T1) ($M = 4.59$, $SD = .4$) compared to before use of the app (T0) ($M = 3.48$, $SD = .83$), $t(14) = 4.74$, $p < .001$. There were no significant differences for the variables *well-being*: T1($M = 49.4$, $SD = 7.58$); T0($M = 46.4$, $SD = 7.58$) *job satisfaction*: T1($M = 4.8$, $SD = 1.01$); T0($M = 4.2$, $SD = 1.52$) *intention to leave job*: T1($M = 2$, $SD = 1.36$); T0($M = 2$, $SD = 1.13$).

Conclusion: The significant increase of self-compassion in this pilot study gives hope that a mPPI-App can contribute to the mental health of healthcare professionals. Further research on the effectiveness should be conducted in the form of RCT in the future. Since the sample in this study had little room for improvement for the variables well-being, job satisfaction, and intention to leave job. In subsequent studies, attention should be paid to a lower (well-being, job satisfaction) or high (intention to leave job) entry score in the sample.

Introduction

Compared to many other employees, HCPs are exposed to higher levels of psychological stress (Braithwaite, 2008). High levels of work-related psychological stress do not only have negative consequences for the HCPs, such as lower mental well-being, illness and low job satisfaction (Cimiotti et al., 2012; Salvagioni et al., 2017; Woodhead, Northrop & Edelstein, 2016), it may also have a direct negative impact on the health of patients due to resulting medical errors and reduced quality of care, and consequently on the healthcare organization due to reduced work quantity and quality (Favrod et al., 2018; Kahsawneh et al., 2021). Due to the rising age expectancy and the associated increase in chronic disease, we are experiencing an increasing burden on the healthcare system, which further drives the nursing shortage (WHO, 2013). Job satisfaction among HCPs is important because low job satisfaction can have a negative impact on the quality and safety of patient care and contribute to HCPs leaving the profession (Roelen et al., 2013; Masum et al., 2016; Lu et al., 2019)

The Corona pandemic has added an additional stressor to the well-being and mental health of HCPs. While the negative impact that the COVID-19 pandemic has on the mental health of the general population is already common sense, a variety of reviews provide urgent evidence that HCPs are particularly negatively affected (Chutiyami et al., 2022; Saragih et al., 2021; Ślusarska et al., 2022). The overall pooled prevalence of mental health problems during the pandemic has been reported to be higher in HCPs than in the general population (Chutiyami et al., 2022). Reported factors for the increased risk of mental health problems were the fear of getting infected, the concern about infecting family members, change in regular work tasks and job demands, with the increase in high-pressure work, and overtime (Ślusarska et al., 2022). Previous pandemics, including SARS and MERS, were also characterized by higher mental illness burden among HCPs (Luo et al., 2018; Wu et al., 2009). According to the World Health Organisation, there is a growing risk of pandemic

outbreaks (WHO, 2019), thus the mental health of HCPs could also be at increased risk in the future. This risk underlines the importance of mental well-being among HCPs and the urge to develop interventions to secure, strengthen and improve well-being.

Mental well-being is defined by the WHO as a state, in which the individual recognizes his or her own abilities, copes with the normal stresses of life, works productively, and contributes to his or her community (WHO, 2005, p.2). This definition encompasses aspects of well-being and good functioning; after long defining mental health only by the absence of psychopathological disorders such as depression and anxiety. The more differentiated two continua model of mental illness and mental health (Keyes, 2002, 2007) assumes that the two are related but different dimensions: One continuum indicates the mental health, the other mental illness. The dimension of mental illness ranges from no mental disorder to a diagnosed mental disorder, and the mental well-being dimension ranges from languishing mental health to flourishing mental health. The model implies, that low mental well-being does not automatically means having (symptoms of) a mental disorder. It has been shown that higher levels of well-being can protect against the development of mental disorders such as anxiety and depression, reduce suicide risk (Grant et al., 2013; Keyes et al., 2010; Lamers et al., 2015; Schotanus-Dijkstra et al., 2016a; Wood and Joseph, 2010 as cited in Schotanus-Dijkstra et al., 2017), and is associated with lower healthcare costs and sickness benefit transfers (Santini et al. 2021).

Self-compassion which is a very similar definition to the self-acceptance component of mental well-being, seems to be one of the most important aspects of mental well-being. Neff describes (2003) self-compassion as an awakened awareness of suffering in oneself and others that includes three elements: (1) self-compassion (being kind and understanding toward oneself), (2) compassion (knowing that suffering is part of human life), and (3) mindfulness (being present in the here and now). Self-compassion differs from compassion, which refers

more to being sensitive to the suffering of others while having a strong desire to alleviate that suffering (Goetz et al., 2010). A recent meta-analysis showed that self-compassion has a small to moderate effect on mental well-being across different cultures (Chio et al., 2021). To this end, the findings of a systematic review of work-related well-being, which included predominantly studies with HCPs, indicate, that self-compassion training can improve self-compassion and other work-related well-being outcomes in working populations (Kotera & van Gordon, 2021).

In the context of positive psychology, a variety of interventions have been developed since the beginning of the century to improve mental well-being in the population in general. Those kind of interventions have the potential to help people cope with stress. In the book *Dit is Jouw Leven*, or the more recent English version *Using Positive Psychology every day*, a variety of evidence-based positive interventions are described (Bohlmeijer & Hulsbergen, 2013, 2018). For example, the *Three Good Things* exercise in which you savor positive emotions by thinking of three things that went well today (Seligman et al., 2005). Several meta-analyses have shown that such positive psychology interventions can lead to small to moderate improvements in well-being and reduce depressive symptoms in general and depressive population (Bolier et al., 2014; Sin & Lyubomirsky, 2009; Weiss et al., 2016). Another systematic review shows that efficacy is further improved when multiple evidence-based positive psychology activities are combined into a multicomponent intervention (Hendriks et al., 2019).

When looking at mental health of HCPs, previous studies have mainly focused on reducing mental health problems. Some more recent studies have also evaluated the effects of PPIs in this group (Guo et al., 2020; Kloos et al., 2019; Luo et al., 2019; Romppanen & Häggman-Laitila, 2016). The results of a recent systematic review study suggest that mindfulness-related trainings, programmes, and overall PPIs may positively impact nurses'

psychological well-being (Sulosaari et al., 2022). However, in all but one of the reviewed studies, the mindfulness programs were conducted face-to-face, which is a good approach but means higher costs for the clinics and increased time requirements for the employees.

In conclusion there is promising evidence on the effectiveness of positive psychology for the mental health of HCPs, there is still a need for development and evidence in the field of mPPI-Apps. In the current study, we wanted to examine the usability and acceptance of a multicomponent positive psychology intervention smartphone app among HCPs. We chose a multicomponent intervention because they seem to be more promising than single-component interventions (Hendricks et al., 2019). Due to the fact that smartphone usage is on the rise worldwide - averaging 4.2 hours in 2020, according to the *State of Mobile Report 2021* from analytics platform *App Annie*, it is to be assumed that mPPI-Apps offer the opportunity to reach people better. The University of Twente has developed such a mPPI-App – *the Training in Positivity App (TiP-App)*, that people can use to practice positivity. This app is based in part on an multicomponent intervention (including all aspects of mental well-being) that has been shown to be effective (Schotanus-Dijkstra et al., 2017).

The primary aim of this study is to evaluate the use and satisfaction with the TiP-App in HCPs. A secondary aim is to evaluate the well-being, self-compassion, job satisfaction and intention to leave job, from pre- to post- usage of the App.

The following research questions were answered:

1. To what extent did the HCPs use the TiP-App?
2. How did the HCPs appreciate the TiP-App and it's components?
3. To what extent is usage of the TiP-App related to changes in well-being, self-compassion, job satisfaction and intention to leave job in T1 compared to T0

Methods

Researchdesign

This study, conducted in the Medical Spectrum Twente, is a quantitative monocenter study (one group pretest-posttest) using questionnaires and an intervention in which participants were invited to follow a smartphone training in positive psychology. The intervention lasted three weeks, questionnaires were completed before (T0) and after the intervention(T1). This study was approved by the Ethics Committee of the University of Twente. All participants gave their online informed consent before participating in the study.

Participants and Procedure

Participation was voluntary and open to all HCPs working in the Department of Rheumatology and Maxillofacial Surgery of the MST in Enschede. Potential participants were recruited by the contact person of the respective outpatient clinics. An e-mail was sent to MST healthcare professionals from the two mentioned departments around 15 of March 2022. All contacted MST healthcare professionals who could understand and read Dutch were eligible to participate. Participants also had to agree to follow the training via the TiP-App for three weeks and complete the questionnaires before and after the training. To use the app, participants had to have a valid email address to receive practical information, a smartphone, and an internet connection. MST healthcare professionals who wanted to participate registered through a website. After registering and completing a questionnaire, participants received a link and access code for the app. Assessment took place between March 2022 and May 2022. To improve adherence participants were offered the opportunity to receive regular notifications(daily, weekly or none depending on the participants preferences).

Intervention

The intervention used was the TiP-App that consists of an evidence-based multicomponent positive psychology intervention to promote well-being adapted from the book *Using Positive Psychology every day* (Bohlmeijer & Hulsbergen, 2018; Schotanus-Dijkstra et al., 2017). Containing six modules, the app is designed to be completed within three weeks with a daily time commitment of 10-15 minutes. Each module covers the key components of well-being (1) *positive emotions*; (2) *discovering and using strengths*; (3) *optimism*; (4) *self-compassion*; (5) *resilience*, and (6) *positive relations*. All modules start with a short psychoeducation, and consist of a combination of an animation and a positive psychology exercise. When starting the first module, there is first a general introduction to the objective of the app.

The start screen of the app shows the user a kind of labyrinth, where the colors indicate which modules have already been passed through (Figure 1). A new module is opened only when participants have fully completed the previous module and have practiced with it for three days.



Figure 1. *TiP-App* vizualition

Questionnaires

Demographics

The questionnaire collected the age, gender and professional group of the participants. For the professional group of the participants, participants had to choose between the categories *medical specialist; nurse; nursing specialist* or *physician assistant; support management* and *other*.

Use

App usage was measured with 5 items. Two of the items had a follow-up questions. Participants were asked to indicate on which digital device they used the app (“Smartphone with Android”, “Smartphone with IOS”, “Tablet PC”, “PC or Laptop”). Furthermore, participants were asked how much time they spend on an exercise per day on average (“5 minutes a day”, “10 minutes a day”, “15 minutes a day”, “20 minutes a day”, “more than 20 minutes a day”). Participants were asked whether they had technical problems. If they had, a follow-up question was given, in which they could elaborate the technical problem. After that the participant were asked whether the occurring problems affected their motivation. Respondents could answer “No, definitely not (my motivation remained the same)”, “No, I don’t think so”, “Yes, I think so”, “Yes, definitely (it made me less motivated)”. In addition participants had to indicate which modules they completed by ticking the modules. This was accompanied by an open follow-up question, where the respondents could indicate what prevented them from continuing, if they did not complete all parts.

Satisfaction

The participants satisfaction with the app was measured with the Client Satisfaction Questionnaire-8 (CSQ-8; Attkisson & Zwick, 1982). The CSQ-8 has no subscales and reports a single score measuring a single dimension of overall satisfaction. For this study the CSQ-8 has been adapted to the Tip-App (e.g. “To what extent did Tip meet your needs?”). Only 7 of

the total 8 items of the CSQ-8 were used. The inverse coding as in the original csq-8 was not done. Total score ranges from 7 to 28, with the higher number indicating higher satisfaction. The internal consistency of the questionnaire was satisfying. Cronbach's alpha was .86. in the current study (T0).

The participants were asked which parts they found to be most helpful. In addition, participants were asked open-ended questions to specify which aspects of the app they found appealing and which they disliked (e.g. "What aspects of TiP appealed to you? (What did you find good, important, enjoyable or useful about TiP?"). Furthermore, there was an additional open space for explanations in case the participant would not recommend the TiP app("Space for explanation (if any)"). The respondents were also asked to rate the structure of the app and the various components with 5 items each on a scale ranging from 1 "badly" to 5 "very good"(see table 4).

Mental well-being

To measure mental well-being the Mental Health Continuum Short Form (MHC-SF) was used (Keyes, 2002). The MHC-SF consists of 14 items that were selected to represent each fact of well-being. It contains 3 emotional well-being items, (e.g. „in the past month, how often did you feel happy?“), 6 psychological well-being items (e.g. „ in the past month, how often did you feel confident to think or express your own ideas and opinions?“), and 5 social well-being items (e.g. „in the past month, how often did you feel that our society is becoming a better place for people?“). These response options assess the frequency with which respondents experience each symptom of positive mental health. The questionnaire uses a scale ranging from 0 "never" to 5 "daily." Items are summed, yielding a total score ranging from 0 to 70. Subscale scores range from 0 to 15 for the emotional (hedonic) well-being, from 0 to 25 for social well-being, and from 0 to 30 for psychological well-being

(combined eudaimonic well-being). Flourishing mental health is defined by reporting ≥ 1 of 3 hedonic signs and ≥ 6 of 11 eudaimonic signs experienced “every day” or “5-6 times a week.” Higher scores indicate greater levels of positive well-being. At both measurements, the total scale and subscales showed acceptable or good reliability. Cronbach’s alpha of the total scale in the current study (T0) was good ($\alpha = .88$) and the Cronbach’s alpha (T0) of the subscales ranged from (marginally) satisfactory (Emotional well-being $\alpha = .64$ Social well-being $\alpha = .62$) to good (Psychological well-being $\alpha = .84$).

Self-compassion

Self-compassion was measured with the Self-compassion Scale Short-Form (SCS-SF; Raes et al., 2011). This questionnaire consists of 12 items and measures six components of self-compassion: self-kindness, self-judgment, normal humanity, isolation, mindfulness, and overidentification (2 items for each component). Respondents rate on a 7-point scale from 1 „almost never“ to 7 „almost always“ (e.g. “I try to be understanding and patient towards those aspects of my personality I don’t like.”). Subscale scores are computed by calculating the mean of subscale item responses. To compute a total self-compassion score, the score of the negative subscale items - self-judgment, isolation, and over-identification are reversed. Higher scores are indicating higher levels of self-compassion. Cronbach’s alpha of the scale (T0) showed a good reliability in the current study ($\alpha = .93$).

Job Satisfaction and Intention to leave

Job satisfaction was measured with a single item („Considering everything, how satisfied or dissatisfied are you with your work, lately?“). Respondents rated on a 5-point scale from 1 „very dissatisfied“ to 5 „very satisfied“. Intention to leave was also measured with one item

(“How likely or unlikely is it that you will leave MST within a year?”). Participants rated on a 5-point scale from 1 “very unlikely” to 5 “very likely”.

Statistical analysis

SPSS was used for data processing and statistical analysis. Descriptive statistics of frequencies, means, range and standard deviations were calculated to describe participants demographics. Due to the low variety of the sample an independent t-test was only used to analyze if there were any differences in age between participants that completed T0 but not T1 (drop-outs) and participants that completed T0 and T1 (compliers). The participants responses were compared on baseline T0 and T1. To analyze if there were any changes in mental well-being, self-compassion, job satisfaction and intention to leave, after using the app, a paired t-test was used. Dropout and adherence, as well as the use and level of satisfaction with the intervention, will be analyzed through frequency distribution. Participants were excluded from the study in the case of incomplete questionnaires (questions related to the research questions) or not finishing T0 or T1.

Results

Sample characteristics

At baseline, 32 participants started the T0 questionnaire. Three participants did not complete the questionnaire or had missing data and were excluded. The T1 questionnaire was started by 16 participants from which 1 participants was excluded because of missing data. Due to the low variety of the sample, a t-test was used only for age to test differences between the completers of T0 who did not complete T1 and completers of T1 for significance. There was no statistically significant difference between mean ages of the group that completed T0 but not T1 and the group that completed T1, $t(27) = .37, p = .717$.

Table 1

Characteristics of participants (N=29), T0 Completers, Drop-outs , Compliers

	Completed T0 (n=29)	Drop-outs (n= 14)	Compliers (n=15)
Age (Mean, SD)	47.9 (9.3)	48.3 (9.3)	47.5 (9.1)
Gender (N, %)			
Female	26 (87%)	12 (85.7%)	14 (93%)
Male	3 (13%)	2 (14.3%)	1 (7%)
Function (N, %)			
Medical specialist	4 (14%)	1 (7%)	3 (20%)
Nurse	4 (14%)	4 (29%)	0
Nursing specialist/Physician assistant	10 (35%)	3 (21%)	7 (47%)
Support management	3 (10%)	1 (7%)	2 (13%)
Other	8 (27%)	5 (36%)	3 (20%)

Use

The majority of the participants used an Android smartphone. One person (android user) reported technical problems with the app. The problem was that after opening a quote on the homescreen, this quote disappeared. The participant reported that this technical problem did not affect his motivation. One person did not complete a single module. Four people finished all modules.

Table 2*Use of the TiP-App(N=15)*

	N(%)
Device	
Smartphone with android	10 (66.7%)
Smartphone with IOS	4 (26.7%)
PC or Laptop	1 (6.7%)
Time spend on exercise	
< 5 minutes	3 (20%)
Approx. 5 min	6 (40%)
Approx. 10 min	6 (40%)
Technical problems	
Yes	1 (6.7%)
No	14 (93.3%)
Completed Modules	
None	1 (7.1%)
Module 1 Joy	12 (85.7%)
Module 2 Trust in yourself	12 (85.7%)
Module 3 Confidence in the future	10 (71.5%)
Module 4 Being kind to vulnerability	7 (50%)
Module 5 Resilience	4 (28.6%)
Module 6 Connectedness	4 (28.6%)

Satisfaction and Appreciation

While the quality (item 1) and the satisfaction (item 2) with the TiP-app were rated as rather good, only a small percentage of the participants felt that they received the expected support (item 3) and that the app fulfilled their needs (item 4). More than half of the participants said that they would recommend the app to others (item 5). A third of the respondents said they would use the TiP-app again (item 6). Over half of the participants indicated that the app could help their patients (Item 7). The average CSQ-8 overall score indicates moderate satisfaction with the TiP-app

Table 3

Satisfaction about TiP, scores and means (SD) on separate items of CSQ8 adapted for TiP (N=15)

	Score N(%)				M(SD)
	1	2	3	4	
Quality of Tip (item1)	0	1(7%)	14(93%)	0	2.9(.3)
Satisfaction with TiP (item 2)	0	3(20%)	9(60%)	3(20%)	3(.6)
Support hoped for (item 3)	1(6%)	7(47%)	7(47%)	0	2.4(.6)
Needs met (item 4)	1(7%)	9(60%)	5(33%)	0	2.3(.6)
Recommended (item 5)	0	6(40%)	6(40%)	3(20%)	2.8(.8)
Use TiP again (item 6)	4(27%)	6(40%)	3(20%)	2(13%)	2.2(1)
TiP suitable for patients (item7)	3(20%)	6(40%)	3(20%)	3(20%)	2.4(1.1)
CSQ-8(for TiP) Total					18.2 (3.9)

Note. CSQ-8(for TiP) 1,2 = negative worded answer, 3,4 = positive worded answer; total range 7-28

The structure and components of the app were rated moderate to good. Particularly noticeable are the negative ratings of the daily quotes, as well as the ability to pin images and quotes. The question “Which aspects of TiP appealed to you?” was answered by 13 participants. Participants mentioned induced awareness, the quotes, the photogallery, or the listening exercise. The open question “Are there any aspects that you found less satisfying?” was answered by 12 participants. The fact that you had to involve other people in the strength task in order to move on was not appreciated by 4 people. In addition, the repetitions, for example of the listening tasks, were rated negatively by 4 people. In addition, 3 people reported that they could not identify with the tasks of the app.

Table 4*Rating of the structure and components of the TiP-App (N=15)*

Item	Badly/Moderate(N)	Fair (N)	Good/Very good (N)	M(SD)
Ease of use	0	3(20%)	12(80%)	4.1(.7)
Design	0	2(14%)	13(86%)	4(.5)
Videos/Animations	0	5(33%)	10(67%)	3.9(.8)
Language	1(7%)	1(7%)	13(86%)	3.9(.7)
Number of parts	0	5(33%)	10(67%)	3.8(.7)
Texts	1(7%)	3(20%)	11(73%)	3.8(.8)
Amount of Text	2(13%)	1(7%)	12(80%)	3.7(.8)
Daily quotes	4(27%)	2(13%)	9(60%)	3.7(1.2)
Listening exercises	2(13%)	4(27%)	9(60%)	3.5(1.2)
Ability to pin pictures/quotes	5(33%)	2(14%)	8(53%)	3.5(1.5)
Exercises	3(20%)	4(27%)	8(53%)	3.4(.9)

Note. Rating of the different components of the Tip-App (1 = badly, 2 = moderate, 3 = fair, 4 =good, 5 = very good)

Module 1 was most selected by participants as the most helpful module. Three people did not find a single module helpful. The open question “What is the most important thing TiP has given to you?” was answered by 11 participants. Ten of them mentioned awareness or similar aspects. The aspect of self-reflection was also mentioned. One person revealed that the app has given only little. Eight people answered the open-ended question about whether the app might also be appropriate for their patients. Two participants felt that the app could be a good fit for their patients (oncology, chronic pain). Others thought that it is either not suitable or that a pre-selection would have to be made beforehand. In addition, the difficult language was mentioned as a point of exclusion, as well as the repetitions.

Table 5*Most helpful parts of the Tip-App (N=15)*

Module	N (%)
Module 1 Joy	6(43%)
Module 2 Trust in yourself	4(29%)
Module 3 Confidence in the future	2(14%)
Module 4 Being kind to vulnerability	3(21%)
Module 5 Resilience	1(7%)
Module 6 Connectedness	0
None	3(21%)

Potential Effectiveness

For all variables, except for self-compassion and intention to leave, high values were found in T0. The values were moderate for self-compassion and low for intention to leave. All scores except emotional, and social well-being, which marginally worsened, improved at T1 compared to T0. Intention to leave remained identical in T1 to T0. The results of the t-test showed a significant increase for self-compassion, all other examined variables showed no significant changes.

Table 6*Means and Change of Well-being, Self-compassion, Job Satisfaction, Intention to Leave before/after App-use**(N=15)*

	T0 M(SD)	T1 M(SD)	Change score M(SD)	Cohen's <i>d</i>	T	p-value
Well-being	46.4(7.97)	49.4(7.58)	3(9.92)	.30	1.71	.261
Emotional	12.53(1.85)	12.47(1.3)	-0.7(2.40)	-.30	-.11	.916
Social	15.20(3.65)	14.07(4.25)	-1.13(4.79)	-.24	-.92	.375
Psychological	21.73(4.46)	22.87(3.60)	1.13(5.57)	.20	.79	.443
Self-compassion	3.48(.83)	4.59(.4)	1.1(0.9)	1.22	4.74	<.001**
Job satisfaction	4.20(1.52)	4.80(1.01)	.60(1.5)	.40	-1.55	.144
Intention to leave	2(1.13)	2(1.36)	0(1.25)	0	0	1

Note. paired sample t-test; ranges (Well-being 0-70; Emotional: 0-15; Social: 0-25; Psychological: 0-30; Self-compassion: 1-7; Job satisfaction: 1-5 & Intention to leave: 1-5)

Discussion

The aim of this pilot-study was to evaluate the use and satisfaction with the TiP-App in HCWs and to evaluate the well-being, self-compassion, job satisfaction and intention to leave job, from pre- to post- usage of the App.

Even though non-participation in the T1 questionnaire does not clearly indicate that a participant did not use the app, the high drop-out rate gives a hint. However, poor adherence is a common issue among web-based interventions, with about 50% of the participants adhere to web-based interventions (Kelders et al., 2012). In the systematic review, Kelders et al. (2012) found that increased interaction with a counselor, more frequent intended use, more frequent updates, and more extensive use of dialogue support significantly predicted better adherence. Since the intervention with the TiP app did not include any support except for reminders to complete the modules, this would be a possible starting point to increase adherence. As literature shows that one of the most endorsed reasons for stopping using interventions is time consuming questionnaires (Schroé et al., 2022), the long questionnaire of the present study could be another reason for the poor adherence. In addition, it can be speculated that the high workload of HCPs in general could contribute to the poor adherence and why MST employees did not want to take on an additional workload in the form of a study, since this is not only associated with the daily use of the app, but also with answering questionnaires before and after use. This is also supported by the fact that no person used the app for more than 10 minutes per day and only four participants completed all modules of the TiP-app. All but one person used a smartphone for the app, which shows the importance of fully developing an app that is directly available through the app store or android store. Except for the once reported problem with disappearing quotes, no technical problems were reported, which is a very important aspect, as more technical problems can lead to higher drop-out rates in digital health interventions (Schroé et al., 2022). However, it is also possible

that some of the drop-outs did not continue participation in the study due to technical problems. For this instance, the technical accuracy of the app must be checked further.

The results indicate moderate satisfaction with the app. Positively highlighted can be the that ease of use and design were found to be good and were not rated negatively by any of the study participants. The results about which aspects of the app were found to be good are very heterogeneous and do not allow a clear statement. While some study participants positively emphasized the quotes or the listening exercises, others rated them negatively. Nevertheless the awareness that some participants experienced through the app is noteworthy. Although the first modules in particular were found to be good, hardly any study participants advanced to the last modules, so that an evaluation of the results does not appear to make sense here. One aspect that was repeatedly found to be annoying is the repetitions, which were mentioned by multiple participants in the open answers. It could be a possible reason why many participants have lost the interest in continuing the modules. For this it would be important to inquire further which repetitions are meant, since this did not emerge from the responses. The fact that some study participants did not find any of the modules helpful, as well as the statements made that one must be made for the app, indicate that the TiP-app in its current form is not suitable for every person. It was repeatedly stated by the respondents that pre-selection should have taken place. In a study on a self-guided online program for depression and anxiety, it has already been shown that higher levels of conscientiousness and acceptance of internet-based psychological programs predicted higher uptake, and that failure to complete a module was predicted by lower levels of acceptance (Gulliver et al., 2021).

The significant increase in self-compassion does not allow a firm conclusion due to the study format without control group, but still gives hope for further studies with the TiP-app. In a randomized control trial, it has already been shown that an unguided digital mindfulness-

based self-help App (Headspace) has positive, although small, effects on the well-being and self-compassion of HCPs (Taylor et al., 2022). This and the significant improvement in self-compassion in this study raises hope that similar results can be replicated in a RCT with the TiP-app. No significant changes were found for the other variables, which is probably related to the fact that high (well-being, job satisfaction) respectively low (intention to leave) scores were already measured in T0. It should also be borne in mind that in an existing RTC with a PPI that indicates the effectiveness, the interventions were carried out over a longer period than three weeks and that intervention also included e-mail support (Schotanus-Dijkstra et al., 2017). Since it has already been demonstrated that face to face mindfulness-based interventions can have an effect on the well-being of HCPs (Sulosaari et al., 2022), a possible step would be to combine app use with face to face sessions app use could possibly increase adherence and reduce the number of face to face sessions and thus save resources.

Strengths and Limitations

The present study provides initial input for further development of a multicomponent positive psychology intervention for HCPs. The small number of participants in the study and the lack of a control group for the valid evaluation of a possible change of the variables is a clear weakness of this study. Even though men make up only 22% of nursing occupations in Europe, the low percentage of male study participants is a weakness. Moreover, the phenomenon of social desirability should not be neglected, especially from the point of view that the study was run through the employer. Therefore, it is possible that a positive evaluation of the app and especially of the job satisfaction and intention to leave took place. In addition, the gradual structure of the app turned out to be limiting for the evaluation of the acceptance of the modules, since it is possible that a participant cancels the use of the app because he/she does not like a certain module and thus cannot go on to the next module, which may offer him

added value. Here it would be useful to adapt the app so that a selection can be made by the user as to which module is processed next. This would make it possible to individualize the experience and tailor it more to the user's interests. For future research the app should be adapted based on the critique and a study with a higher sample-size, as well as a control group, should be conducted to make more valid statements about the effectiveness of the app on HCPs' self-compassion and other parameters (well-being, job satisfaction, intention to leave). The high initial score in the variables well-being and job satisfaction (and low in intention to leave) leaves little room for improvement, which is why pre-selection of HCPs with low score on well-being and job satisfaction and high score in intention to leave could make sense in future studies.

Conclusion

This study, which is the first study of a multicomponent app-based positive psychology intervention among HCPs, offers initial findings that can be used to improve the TiP-app and to design further studies. The results of the present study suggest that the TiP-app is a user-friendly and well-designed app, which, with further improvements and more evidence, could support the mental health of HCPs in the future. The initial findings made through this study underscore the difficulty of achieving high adherence and uptake for digital mental health interventions. Therefore, special attention should be paid to finding ways to improve the adherence of the TiP-app. The literature suggests that dialogue support and interaction with a counselor can improve adherence, which could be considered in future interventions with the TiP-app. In the next step, an attempt should be made to conduct a study with a higher sample size and a control group in order to be able to make a valid statement about possible effects on well-being, self-compassion, job satisfaction and intention to leave job, especially for the already promising findings for self-compassion. The study participants' suggestions for improvement need to be incorporated into further app development to further

tailor the app to meet the needs of users. The findings from the parallel qualitative study should also be used for this purpose.

References

- Attkisson, C., & Zwick, R. (1982). The client satisfaction questionnaire. *Evaluation and Program Planning*, 5(3), 233–237. [https://doi.org/10.1016/0149-7189\(82\)90074-x](https://doi.org/10.1016/0149-7189(82)90074-x)
- Bohlmeijer, E., & Hulsbergen, M. (2013). *Dit is jouw leven: ervaar de effecten van de positieve psychologie* (This is your life. Experience the Effect of Positive Psychology) (1. ed.). Boom uitgevers Amsterdam.
- Bohlmeijer, E., & Hulsbergen, M. (2018). *Using Positive Psychology Every Day*. Routledge.
- Bolier, L., & Abello, K. M. (2014). Online Positive Psychological Interventions: State of the Art and Future Directions. *The Wiley Blackwell Handbook of Positive Psychological Interventions*, 286–309. <https://doi.org/10.1002/9781118315927.ch16>
- Braithwaite, M. (2008). Nurse Burnout and Stress in the NICU. *Advances in Neonatal Care*, 8(6), 343–347. <https://doi.org/10.1097/01.anc.0000342767.17606.d1>
- Bryant, F. (2003). Savoring Beliefs Inventory (SBI): A scale for measuring beliefs about savouring. *Journal of mental health* (Abingdon, England), 12(2), 175–196. <https://doi.org/10.1080/0963823031000103489>
- Chio, F. H., Mak, W. W., & Yu, B. C. (2021). Meta-analytic review on the differential effects of self-compassion components on well-being and psychological distress: The moderating role of dialecticism on self-compassion. *Clinical Psychology Review*, 85, 101986. <https://doi.org/10.1016/j.cpr.2021.101986>
- Chutiyami, M., Cheong, A. M. Y., Salihu, D., Bello, U. M., Ndwiga, D., Maharaj, R., Naidoo, K., Kolo, M. A., Jacob, P., Chhina, N., Ku, T. K., Devar, L., Pratitha, P., & Kannan, P. (2022). COVID-19 Pandemic and Overall Mental Health of Healthcare Professionals Globally: A Meta-Review of Systematic Reviews. *Frontiers in Psychiatry*, 12. <https://doi.org/10.3389/fpsyt.2021.804525>
- Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385–396. <https://doi.org/10.2307/2136404>

- Favrod, C., Jan Du Chêne, L., Martin Soelch, C., Garthus-Niegel, S., Tolsa, J. F., Legault, F., Briet, V. & Horsch, A. (2018). Mental Health Symptoms and Work-Related Stressors in Hospital Midwives and NICU Nurses: A Mixed Methods Study. *Frontiers in Psychiatry*, 9. <https://doi.org/10.3389/fpsy.2018.00364>
- Ferré-Grau, C., Raigal-Aran, L., Lorca-Cabrera, J., Lluch-Canut, T., Ferré-Bergadà, M., Lleixà-Fortuño, M., Puig-Llobet, M., Miguel-Ruiz, M. D. & Albacar-Riobóo, N. (2021). A Mobile App-Based Intervention Program for Nonprofessional Caregivers to Promote Positive Mental Health: Randomized Controlled Trial. *JMIR mHealth and uHealth*, 9(1), e21708. <https://doi.org/10.2196/21708>
- Fung, S.-F. (2020). Validity of the Brief Resilience Scale and Brief Resilient Coping Scale in a Chinese sample. *International Journal of Environmental Research and Public Health*, 17(4), 1265. <https://doi.org/10.3390/ijerph1704126>
- Goetz, J. L., Keltner, D., & Simon-Thomas, E. (2010). Compassion: An evolutionary analysis and empirical review. *Psychological Bulletin*, 136(3), 351–374. <https://doi.org/10.1037/a0018807>
- Gulliver, A., Calcar, A. L., Sunderland, M., Kay-Lambkin, F., Farrer, L. M. & Batterham, P. J. (2021). Predictors of acceptability and engagement in a self-guided online program for depression and anxiety. *Internet Interventions*, 25, 100400. <https://doi.org/10.1016/j.invent.2021.100400>
- Guo, Y., Lam, L., Plummer, V., Cross, W. & Zhang, J. (2020). A WeChat-based “Three Good Things” positive psychotherapy for the improvement of job performance and self-efficacy in nurses with burnout symptoms: A randomized controlled trial. *Journal of Nursing Management*, 28(3), 480–487. <https://doi.org/10.1111/jonm.12927>
- Hendriks, T., Schotanus-Dijkstra, M., Hassankhan, A., de Jong, J., & Bohlmeijer, E. (2019). The Efficacy of Multi-component Positive Psychology Interventions: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *Journal of Happiness Studies*, 21(1), 357–390. <https://doi.org/10.1007/s10902-019-00082-1>
- Kelders, S. M., Kok, R. N., Ossebaard, H. C. & Van Gemert-Pijnen, J. E. (2012). Persuasive System Design Does Matter: a Systematic Review of Adherence to Web-based

- Interventions. *Journal of Medical Internet Research*, 14(6), e152.
<https://doi.org/10.2196/jmir.2104>
- Keyes, C. L. M. (2002). The Mental Health Continuum: From Languishing to Flourishing in Life. *Journal of Health and Social Behavior*, 43(2), 207.
<https://doi.org/10.2307/3090197>
- Keyes, C. L. M. (2005). Mental Illness and/or Mental Health? Investigating Axioms of the Complete State Model of Health. *Journal of Consulting and Clinical Psychology*, 73(3), 539–548. <https://doi.org/10.1037/0022-006x.73.3.539>
- Keyes, C. L. M. (2007). Promoting and protecting mental health as flourishing: A complementary strategy for improving national mental health. *American Psychologist*, 62(2), 95–108. <https://doi.org/10.1037/0003-066x.62.2.95>
- Khasawneh, A., Malkawi, H., Ababneh, S., Al-Araidah, O. & Kremer, G. O. (2021). Empirical study on mental stress among healthcare staffs and the influencing workplace stressors. *Engineering Management in Production and Services*, 13(2), 54–67. <https://doi.org/10.2478/emj-2021-0012>
- Kloos, N., Drossaert, C. H., Bohlmeijer, E. T. & Westerhof, G. J. (2019). Online positive psychology intervention for nursing home staff: A cluster-randomized controlled feasibility trial of effectiveness and acceptability. *International Journal of Nursing Studies*, 98, 48–56. <https://doi.org/10.1016/j.ijnurstu.2019.06.004>
- Kotera, Y., & van Gordon, W. (2021). Effects of Self-Compassion Training on Work-Related Well-Being: A Systematic Review. *Frontiers in Psychology*, 12.
<https://doi.org/10.3389/fpsyg.2021.630798>
- Lamers, S. M., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M. & Keyes, C. L. (2010). Evaluating the psychometric properties of the mental health Continuum-Short Form (MHC-SF). *Journal of Clinical Psychology*, 67(1), 99–110.
<https://doi.org/10.1002/jclp.20741>

- Lamers, S. M., Westerhof, G. J., Glas, C. A. & Bohlmeijer, E. T. (2015). The bidirectional relation between positive mental health and psychopathology in a longitudinal representative panel study. *The Journal of Positive Psychology, 10*(6), 553–560.
<https://doi.org/10.1080/17439760.2015.1015156>
- Lee, S. M., Kang, W. S., Cho, A. R., Kim, T., & Park, J. K. (2018). Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. *Comprehensive Psychiatry, 87*, 123–127.
<https://doi.org/10.1016/j.comppsy.2018.10.003>
- Lu, H., Zhao, Y. & While, A. (2019). Job satisfaction among hospital nurses: A literature review. *International Journal of Nursing Studies, 94*, 21–31. <https://doi.org/10.1016/j.ijnurstu.2019.01.011>
- Luo, Y. H., Li, H., Plummer, V., Cross, W. M., Lam, L., Guo, Y. F., Yin, Y. Z. & Zhang, J. P. (2019). An evaluation of a positive psychological intervention to reduce burnout among nurses. *Archives of Psychiatric Nursing, 33*(6), 186–191.
<https://doi.org/10.1016/j.apnu.2019.08.004>
- Masum, A. K. M., Azad, M. A. K., Hoque, K. E., Beh, L. S., Wanke, P. & Arslan, Z. (2016, 26. April). Job satisfaction and intention to quit: an empirical analysis of nurses in Turkey. *PeerJ, 4*, e1896. <https://doi.org/10.7717/peerj.1896>
- Neff, K. (2003). Self-Compassion: An Alternative Conceptualization of a Healthy Attitude Toward Oneself. *Self and Identity, 2*(2), 85–101.
<https://doi.org/10.1080/15298860309032>
- Roelen, C., Magery, N., van Rhenen, W., Groothoff, J., van der Klink, J., Pallesen, S., Bjorvatn, B. & Moen, B. (2013, März). Low job satisfaction does not identify nurses at risk of future sickness absence: Results from a Norwegian cohort study. *International Journal of Nursing Studies, 50*(3), 366–373. <https://doi.org/10.1016/j.ijnurstu.2012.09.012>
- Rompanen, J. & Häggman-Laitila, A. (2016). Interventions for nurses' well-being at work: a quantitative systematic review. *Journal of Advanced Nursing, 73*(7), 1555–1569.
<https://doi.org/10.1111/jan.13210>

- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57(6), 1069–1081. <https://doi.org/10.1037/0022-3514.57.6.1069>
- Salvagioni, D. A. J., Melanda, F. N., Mesas, A. E., González, A. D., Gabani, F. L. & Andrade, S. M. D. (2017). Physical, psychological and occupational consequences of job burnout: A systematic review of prospective studies. *PLOS ONE*, 12(10), e0185781. <https://doi.org/10.1371/journal.pone.0185781>
- Santini, Z. I., Nielsen, L., Hinrichsen, C., Nelausen, M. K., Meilstrup, C., Koyanagi, A., McDaid, D., Lyubomirsky, S., VanderWeele, T. J. & Koushede, V. (2021). Mental health economics: A prospective study on psychological flourishing and associations with healthcare costs and sickness benefit transfers in Denmark. *Mental Health & Prevention*, 24, 200222. <https://doi.org/10.1016/j.mhp.2021.200222>
- Saragih, I. D., Tonapa, S. I., Saragih, I. S., Advani, S., Batubara, S. O., Suarilah, I., & Lin, C. J. (2021). Global prevalence of mental health problems among healthcare workers during the Covid-19 pandemic: A systematic review and meta-analysis. *International Journal of Nursing Studies*, 121, 104002. <https://doi.org/10.1016/j.ijnurstu.2021.104002>
- Schotanus-Dijkstra, M., Drossaert, C. H., Pieterse, M. E., Boon, B., Walburg, J. A. & Bohlmeijer, E. T. (2017). An early intervention to promote well-being and flourishing and reduce anxiety and depression: A randomized controlled trial. *Internet Interventions*, 9, 15–24. <https://doi.org/10.1016/j.invent.2017.04.002>
- Schroé, H., Crombez, G., De Bourdeaudhuij, I. & Van Dyck, D. (2022, 31). Investigating When, Which, and Why Users Stop Using a Digital Health Intervention to Promote an Active Lifestyle: Secondary Analysis With A Focus on Health Action Process Approach–Based Psychological Determinants. *JMIR mHealth and uHealth*, 10(1), e30583. <https://doi.org/10.2196/30583>
- Seligman, M. E. P., Steen, T. A., Park, N., & Peterson, C. (2005). Positive Psychology Progress: Empirical Validation of Interventions. *American Psychologist*, 60(5), 410–421. <https://doi.org/10.1037/0003-066x.60.5.410>

- Serrano-Ripoll, M. J., Zamanillo-Campos, R., Fiol-DeRoque, M. A., Castro, A., & Ricci-Cabello, I. (2022). Impact of Smartphone App-Based Psychological Interventions for Reducing Depressive Symptoms in People With Depression: Systematic Literature Review and Meta-analysis of Randomized Controlled Trials. *JMIR mHealth and uHealth*, *10*(1), e29621. <https://doi.org/10.2196/29621>
- Sin, N. L., & Lyubomirsky, S. (2009). Enhancing well-being and alleviating depressive symptoms with positive psychology interventions: a practice-friendly meta-analysis. *Journal of Clinical Psychology*, *65*(5), 467–487. <https://doi.org/10.1002/jclp.20593>
- Ślusarska, B., Nowicki, G. J., Niedorys-Karczmarczyk, B., & Chrzan-Rodak, A. (2022). Prevalence of Depression and Anxiety in Nurses during the First Eleven Months of the COVID-19 Pandemic: A Systematic Review and Meta-Analysis. *International Journal of Environmental Research and Public Health*, *19*(3), 1154. <https://doi.org/10.3390/ijerph19031154>
- Smith, B. W., Dalen, J., Wiggins, K., Tooley, E., Christopher, P., & Bernard, J. (2008). The brief resilience scale: Assessing the ability to bounce back. *International Journal of Behavioral Medicine*, *15*(3), 194–200. <https://doi.org/10.1080/10705500802222972>
- Sulosaari, V., Unal, E., & Cinar, F. I. (2022). The effectiveness of mindfulness-based interventions on the psychological well-being of nurses: A systematic review. *Applied Nursing Research*, *64*, 151565. <https://doi.org/10.1016/j.apnr.2022.151565>
- Taylor, H., Cavanagh, K., Field, A. P. & Strauss, C. (2022). Health Care Workers' Need for Headspace: Findings From a Multisite Definitive Randomized Controlled Trial of an Unguided Digital Mindfulness-Based Self-help App to Reduce Healthcare Worker Stress. *JMIR mHealth and uHealth*, *10*(8), e31744. <https://doi.org/10.2196/31744>
- Weiss, L. A., Westerhof, G. J., & Bohlmeijer, E. T. (2016). Can We Increase Psychological Well-Being? The Effects of Interventions on Psychological Well-Being: A Meta-Analysis of Randomized Controlled Trials. *PLOS ONE*, *11*(6), e0158092. <https://doi.org/10.1371/journal.pone.0158092>

- Woodhead, E. L., Northrop, L. & Edelstein, B. (2014). Stress, Social Support, and Burnout Among Long-Term Care Nursing Staff. *Journal of Applied Gerontology*, 35(1), 84–105. <https://doi.org/10.1177/0733464814542465>
- World Health Organization. (2005). Promoting mental health: Concepts, emerging evidence, practice. Geneva: WHO.
- World Health Organization. (2013). A Universal Truth: No Health Without a Workforce Retrieved from. Forum Report Third Global Forum on Human Resources for Health. Geneva: WHO.
- World Health Organization. (2019). Global Preparedness. A World at Risk: annual report on global preparedness for health emergencies. Geneva: WHO.
- Wu, P., Fang, Y., Guan, Z., Fan, B., Kong, J., Yao, Z., Liu, X., Fuller, C. J., Susser, E., Lu, J., & Hoven, C. W. (2009). The Psychological Impact of the SARS Epidemic on Hospital Employees in China: Exposure, Risk Perception, and Altruistic Acceptance of Risk. *The Canadian Journal of Psychiatry*, 54(5), 302–311. <https://doi.org/10.1177/070674370905400504>