THE POSITIVE PSYCHOLOGY APP 'TRAINING IN POSITIVITY' FOR STRESS IN HEALTHCARE WORKERS

MASTER THESIS

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Abstract

Healthcare professionals (HCP) working in the healthcare system are at risk for suffering of stress-related problems due to the complex work environments and the need for continuous adaptation to evolving medical circumstances. Decreasing stress in them is crucial as many HCP are currently fighting extensive mental health issues. Positive psychology interventions (PPI) offer promising avenue to improve well-being and decrease depressive symptoms and may be beneficial for HCP. The aim of this study was to assess the effectiveness of a multicomponent positive psychology app among HCP and examine whether there is a change in the psychological variables well-being, self-compassion, perceived stress, savoring beliefs and resilience. Twenty-nine HCP received a training via the Training in positivity-App (TiP-App) for 3 weeks. HCP completed an online questionnaire on these psychological variables and moreover on job satisfaction and intention to leave the job prior to and after the training. The TiP-App was built up with six evidence-based exercises of Positive Psychology.

A paired sample t test was utilized on each variable to determine the significance level pre- and post app intervention. In general HCPs evaluated the TiP-App as acceptable in terms of usability and satisfaction. Perceived stress decreased and self-compassion increased in HCP significantly after using the app. Nevertheless, the high drop-out rate leaves great potential for improvement.

Introduction

Today's health care system and all actors within are driven to its limits. The healthcare industry is marked by increasing demands, complex work environments and in need for continuous adaptation to evolving medical practices. Several studies showed that occupational perceived stress is higher in healthcare professionals (HCP) compared to other professions (Harrald & Sulla, 2018; Rostami et al., 2021 & Strauss et al. 2016). The National Institutes of Health (NIH) studied the prevalence of mental health disorders in highly stressed occupations and consulted employees out of 130 jobs. Nursing was ranked 27th (Salari et al., 2020). HCP are exposed to many different stressors: patient-related and work-related. Patient-related stressors include physical and verbal aggression, daily exposure to diseases, suffering and death of patients (Kunzler et al., 2020). Work-related stressors include time pressure, responsibility of medical decision making and social expectations of health professionals (Kunzler et al., 2020). Consequently, the imbalance between HCP high workload and the limited resources and increasing responsibilities are reasons for mental health issues and risk factors for burnout, job dissatisfaction and HCP leaving their job (Khamisa et al., 2015 & Köhle et al., 2021). Investigating interventions that mitigate these factors can inform about strategies to retain skilled HCP. Job satisfaction is a critical factor in retaining a skilled healthcare workforce. HCP who are satisfied with their work are more likely to provide high-quality care. Job dissatisfaction in nurses leads to absenteeism, poor performance and affects the quality of patients care (Rostami et al., 2021). High levels of stress, low job satisfaction and burnout are often associated with an increased likelihood of professionals leaving their jobs.

The COVID-19 pandemic posed additional unpredictable demands to HCP and the healthcare system (Vizeh et al. 2020). Working at frontline in treating COVID-19 patients meant for HCP fear of infecting themselves or the own family and the feelings of vulnerability (Naser et al., 2020). Healthcare staff working in pandemics in general are at increased risk of a range of mental health outcomes like stress, burnout and depression (Allan et al., 2020; Jose, Dhandapi, & Cyriac, 2020; Khanal et al., 2020; Naser et al., 2020). Since, according to WHO (2019), there is a growing risk of pandemic outbreaks, understanding the impact of the pandemic on the mental health of HCP is crucial for tailoring interventions that not only address pre-existing challenges but also respond to the evolving needs of the

healthcare workforce in the wake of the global health crises. This risk of increased perceived stress among HCP underlines the urge to develop interventions to secure, strengthen and improve well-being.

Literature defines stress as the degree to which an individual believes their contemporary demands or challenges exceed their ability to cope (Jeste et al. 2015). In general stress is an useful bodily reaction due to evolution (Starcke & Brand, 2012). The body prepares itself for fight-or-flight. However, experiments with permanently stressed participants show worsened health conditions and impaired mental abilities (Schwabe et al., 2012). Like problems in concentration, ability to think and judgement (Botha, Gwin & Purpora, 2015). Impaired mental health in HCW is associated with medication errors, near misses, patient unsafety and patient dissatisfaction (Gärtner et al., 2010). Recognizing the challenges faced by HCP, there is an increasing interest in interventions that promote their well-being, resilience and job satisfaction. In recent years, positive psychology interventions (PPI) have gained attention for their potential to enhance mental health and job-related outcomes. PPI are designed to enhance an individuals well-being and cultivate positive emotions, focusing on strengths rather than weaknesses (Using positive psychology everyday, 2018). PPI make use of exercises, which make an individual be more satisfied with life and allows them to function optimally (Schotanus-Dijkstra et al. 2018). PPI are convenient and cost-effective and there is much less stigma associated with them. PPI also help to buffer against relapse (Jeste et al., 2015). Two meta-analyses examined the efficacy of Positive Psychology interventions. One found large effects for enhanced well-being and decreasing effects for depressive symptoms (Hendriks et al., 2019). And the other meta-analysis reported that PPIs improved well-being and decreased psychological distress in mildly depressed individuals, in patients with mood and depressive disorders, in patients with psychotic disorders and improving quality of life and well-being in breast cancer patients (Chakhassi et al. 2018). PPI have shown promising results in promoting mental health in the healthcare workforce.

In order to protect HCP from the stressful environment it would be plausible to train them to react more relaxed to stressful situations. Focusing on resilience can be effective, as it has been shown to increase mental health because it is associated with low depression as well as high social functioning and overall better quality of life (Anderson et al., 2021; Terrill et al., 2014). Resilience refers to the capacity to recovery from or positive adaptation to illness or other adversities (Jeste et al., 2015; Ryff, 1998). Resilience is associated with the ability to bounce back from challenges and can pose as a protective factor. In threatening

situations, resilient people appropriately adjust the level of emotional resources needed to meet the situational demands (Mistry et al., 2009). In more resilient individuals stress level drops faster. Which means they recover faster from stress and at the same time get used to it. Levone et al. (2015) showed that fostering resilience decreases perceived stress. This can be particularly important for nurses to renew physical and emotional energies and enhance their emotional resources, because of their high demands from manager, patients, and themselves.

Moreover, the integration of technology, particularly apps, offers a convenient and accessible platform for delivering PPI. Xu et al. (2021) demonstrated that a self-oriented smartphone mindfulness apps can reduce stress and burnout as well as promote mindfulness and well-being of healthcare staff. Prior studies evaluated the cost-effectiveness of PPI, with an online multicomponent intervention for people with mild to moderate depressive symptoms (Schotanus-Dijkstra et al., 2018). At follow-up the intervention was not effective in improving mental well-being, but it was effective in reducing depressive symptoms. A later study demonstrated that the intervention was effective, showing improvements in mental well-being while also decreasing anxiety and depressive symptoms. However, web-based self-help interventions have been shown to be effective in improving mental well-being but have not often been studied in the context of healthcare professionals and mostly been studied abroad and not in the Netherlands. Since related factors to HCP stress can be multifaceted, intervention programmes should be multi-component studies (Hendriks et al., 2019). Multicomponent-PPIs contain a variety of evidence-based individual exercises and target two or more theoretically well-being components.

The University of Twente has developed an app to train positivity and improve well-being. The TiP-App consists of six components: savoring, strength, optimism, self-compassion, benefit finding and positive relationships (Jansen, 2022). The app is based on positive psychology and a proven effective intervention for increasing positivity (Schotanus-Dijkstra et al., 2018). A feasibility study conducted effectiveness and acceptability in nursing home staff found that nurses were generally positive about the positive psychology training (Kloos et al., 2019). However, the online multi component positive psychology intervention has not been effective in improving well-being, even for people with low initial well-being. In the current study we wanted to examine the effectiveness of a multicomponent positive psychology smartphone app among healthcare professionals. The focus lies on whether the app can impact perceived occupational stress, increase resilience and job satisfaction. Furthermore, use, satisfaction and engagement of the app will be assessed. One aspect in evaluating the satisfaction of the intervention is the Twente Engagement with Ehealth

Technologies Scale (TWEETS), as this can improve further developments on the app (Berden, 2020). Since healthcare staff has little time for their own well-being a smartphone app is time efficient. Self-help interventions are lucrative because it is affordable and accessible to many people who might not be reached otherwise (Rijnders et al., 2016). It offers flexibility that fits well with shift-working nursing staff and makes it easy to provide to all employees of the care organizations (Kloos et al., 2019).

Research questions:

To what extent is the app useful (time spend on app per day), appreciated (quality and engagement with app) and possible effective to HCP's?

Do HCPs show changes in perceived stress, resilience, job satisfaction and intention to leave before and after using the app?

Methods

This study was approved by the Ethics Committee of the University of Twente. All participants gave their active informed consent before participating in the study.

Design

The current study is a one-group pre-post design. An online questionnaire was completed at baseline and one 4-6 weeks after baseline. After T1, 15 participants who were willing were further interviewed related to satisfaction and engagement with the app and whether they would consider it for patient use, which is not part of this study.

Multicomponent TiP-App

The app's homepage features a maze and as completing the exercises, participants travel through the maze and arrive at the center, their own strength (see Figure 1). The app is a theory-based intervention, which is made up of six modules, each module containing an introductory video of the module, psychoeducation of the content in the module, and a positive psychology-based exercise (see table 1). The six modules are: Module 1: savoring, Module 2: strength, Module 3: optimism, Module 4: self-compassion, Module 5: benefit finding and Module 6: positive relationships. Modules must be completed after the other and a new module only opens after the participants has finished each module entirely and has practiced for three days in a row with the module. After every module, there is a short explanation about the following module. The whole intervention can be done in a period of 3

weeks in which the user spends 10 to 15 minutes every day doing the training. To reduce attrition, daily email reminders are sent during the day when not engaging with the app. Examples of the exercises are: 1.) "three good things exercise": savor the things that went well that day, 2.) "wish yourself something good": use your inner voice to repeat compassionately your greatest need at that moment and 3.) "Strength exercise": user has to think of 3 strengths 4 different others might hold about him. The user receives feedback after finishing an exercise. This is done by informing about the usefulness of the exercise.

Figure 1. Visualization of TiP-App

Table 1. Make-up of TiP-App

Module	Exercise
1. Savoring	3-good things exercise
2. Strength	Strengths exercise
3. Optimism	Formulate goals
4. Self-compassion	Vulnerabilities
5. Positive reframing	
6. Positive relationships	

Participants and Procedure

Emails were sent to HCW of two departments: rheumatology and oral surgery department of MST in Enschede. Participation was voluntarily. Participants had to be able to understand and read the Dutch language. Furthermore, participants had to be willing and capable to

spend about 10-15 minutes each day to follow the training via the TiP-App, during a period of 3 weeks and complete the questionnaires prior to and after the training. For using the app, the participants had to own a valid email address to receive practical information, a smartphone and an internet connection. In March 2020 an E-mail was send to HCP of two departments of MST to participate in the pilot study of the TiP-App. Participants were recruited by using convenience sampling in order to guarantee a comprehensive evaluation of the intervention. Those who wanted to participate registered via a website. After registering and completing a questionnaire, participants received a link and an access code for the app. Assessment took place between March 2022 and April 2022.

Questionnaires

All participants completed two online questionnaires (at baseline T0 and three weeks after completing the training T1). Demographics and job-related variables were only obtained at T0. Psychological variables (perceived stress, resilience, etc.) were obtained at T0 and T1. And use, satisfaction and engagement were only assessed at T1.

App use

App usage was measured with 5 items and 2 of these items having one follow-up question. Participants were asked to indicate whether they used the app on a smartphone with Android, Smartphone with IOS, tablet and PC or Laptop. Furthermore, participants were asked *"How much time did you spend on an exercise per day on average?"* Respondents could choose between 5 minutes a day, 10 minutes a day, 15 minutes a day 20 minutes a day or more than 20 minutes a day. Then participants were asked whether they had technical problems. In the case of technical problems, a follow-up answer possible was given, where participants could write down their answer. After that participants were asked whether the occurring problems affected their motivation. Respondents could answer *"No, definitely not", "No I don't think so", "Oh yes, I think so"* or *"Yes, definitely"*. In addition, participants indicated what modules they completed, with no restriction on the number of modules they could tick. Finally, a follow-up open answer option gave respondents the opportunity to indicate why they did not complete all parts.

Engagement

The Twente Engagement with Ehealth Technologies Scale (TWEETS) contains nine items that assess user-engagement with eHealth technologies across three different areas (Kelders, Kip & Greeff, 2019). It includes each three items to assess the areas of behavioral engagement (items 1-3), cognitive engagement (items 4-6) and affective engagement (items

7-9). An example item is: *"Using the app has become part of my daily routine".* Participants could answer from 1 (totally agree) to 4 (totally disagree). The TWEETS can be used to measure engagement at 3 different moments in time: after first use which measures the expectations of engagement, during usage which measures the current engagement and after finishing usage which measures the past engagement. Total score ranges from 9 to 28, with the higher number indicating higher engagement with the app. The internal consistency of the questionnaire was good, with Cronbach's alpha =.86.

Mental well-being

Mental well-being was measured with the Mental Health Continuum Short Form (MHC-SF) used by (Keyes, 2002). The MHC-SF is a valuable tool in understanding and assessing an individuals mental well-being. It consists of 14 items that were selected to represent each fact of well-being. It contains 3 emotional well-being items (e.g. "during the past month, how often do you feel satisfied in life?"), 6 psychological well-being items (e.g. "during the past month, how often do you feel that you had experiences that challenged you to grow and become a better person?") and 5 social well-being items ("During the past month, how often do you feel that you had something important to contribute to society"). Items are summed 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. Flourishing mental health is defined by reporting >1 of 3 hedonic signs and > 6 of 11 eudaimonic signs (social and psychological subscales combined) experienced "every day" or "5-6 times a week". Higher scores indicates greater levels of well-being. Cronbachs alpha: Well-being T0=.88, T1=.85; Emotional well-being T0=.64, T1=.61; Social well-being T0=.62, T1=.79; Psychological well-being T0=.84, T1=.80.

Self-compassion

To measure self-compassion the Self-compassion Scale Short-Form (SCS-SF; Neff, 2003) was used. The scale is designed to assess an individuals level of self-compassion. This shortened version consists of 12 items and maintains the key components of self-compassion: self-kindness, self-judgment, common humanity, isolation mindfulness and overidentification. Respondents rate on a 7-point scale from 1 "almost never" to 7 "almost always" (e.g. "When I'm going through a very hard time, I give myself the caring and tenderness I need"). Subscales are computed by calculating the mean of subscale item responses. The self-compassion score is calculated by reversing the negative subscale items

self-judgment, isolation and over-identification. High scores stand for higher levels of self-compassion. At both measurements, the scale showed a good reliability (T0=.93, T1=.68)

Resilience

Resilience was measured with the 6-item Brief resilience scale (BRS). The BRS assesses the ability to bounce back or recover from stress (Smith et al, 2008). Respondents rate on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). An example item is: *"I tend to bounce back quickly after hard times".* Items 2, 4, and 6 need to be reversed and the mean of the six items needs to be found. The score can range from 1 to 5. Scores from 1 to 2.99 indicate low resilience, from 3 to 4,3 normal resilience and from 4,31 to 5 high resilience. At both measurements, the scale showed poor reliability (Cronbach's alpha T0= .59, T1= .50).

Perceived stress

Perceived stress was measured using the Perceived stress scale (PSS) which is a well-validated instrument to measure perceived stress with good internal consistency and which was developed by Cohen and Williamson (Cohen, Kamarck, & Mermelstein, 1983). PSS assess subjective perceptions of stress over the past months. The scale consists of 10 questions, measuring the degree to which situations in one's life are viewed as demanding and stressful. Items are rated on a 5-point scale, ranging from 0 (never) to 4 (very often). An item example is: *"In the last month, did you feel you were unable to control important things in your life?"* The scores for the items 4,5,7 and 8 are reversed and all item scores were combined into a total score, by summing. Higher mean scores indicating higher levels of perceived stress. At both measurements, the scale showed good reliability (Cronbach's alpha T0=.77, T1=.86).

Savoring beliefs

To measure savoring beliefs four out of 24 items of the Savoring Belief Inventory (SBI) has been used (Bryant, 2003). The SBI is psychometric tool designed to measure an individuals propensity to engage in cognitive processes that enhance the experience of positive events. It offers valuable insights into an individuals cognitive orientation towards positive emotions. Respondents rate on a 7-point scale from 0 "strongly disagree" to 6 "strongly agree". Itemscores are summed up for total score which is ranging from 0 to 24. The scale showed good reliability (T0=.86, T1=.50)

Job satisfaction and intention to leave

Job satisfaction was measured with 1 item. "*How satisfied or unsatisfied are you with work?*" Respondents rated on a 5-point scale from 1 (very dissatisfied) to 5 (very satisfied). A higher total sum score indicating higher work satisfaction. Intention to leave was also measured with one 1 item. *"How likely or unlikely is it that you are going to leave MST in the next year?"* Respondents rated on a 5-point scale from 1 (very unlikely) to 5 (very likely).

Corona questions

The impact of the corona virus was measured with a self-developed scale consisting of 5 questions. Items are rated on a 5-point scale, ranging from 0 (not at all) to 5 (very much). An example item is: *"To what extent is the corona crisis having a negative impact on your well-being?"* Higher scores on this scale indicate more involvement in the corona crisis.

Data-analysis

The Statistical Package for the Social Sciences (Spss) was used for data processing and statistical analysis. Descriptive statistics of frequencies, means, range and standard deviations were calculated to describe participants demographics. An independent t-test was used to analyze if there were any changes in age between participants that completed T0 but not T1 and participants that completed T0 and T1. To analyze the potential effect of the intervention a paired t-test including Cohens d were used to compare participants before (T0) and after (T1) responses on well-being, self-compassion, perceived stress, resilience and job satisfaction and intention to leave the job. Dropout and adherence, as well as the level of engagement with the intervention, was analyzed through frequency distribution. Participants were excluded from the study in the case of incomplete questionnaires or not finishing T1.

Results

Participants

The descriptive characteristics of the participants have been summarized in Table 1. The mean age was 47.93 years (SD = 9.03), and participants were predominantly female (86.7%). 4 Medical specialist (in Training), 4 nurses (in Training), 10 nursing specialist or physician assistant, 3 support/management (not patient care) and 8 other. Most participants did not belong to any COVID-19 risk group.

Table 1

Characteristics of participants (N=29), T0 completers, T0 completers but not T1 and T1 completers

	Completed T0 (n=29)	Completed T0 but not T1 (n= 14)	Completed T1 (n=15)
Age (Mean, SD)	47.93 (9.03)	48.43(9.30)	47.47(9.09)
Gender (N, %)			
Female	26 (86.7%)	12(85.7%)	14(93.3%)
Male	3 (13.3%)	2(14.3%)	1(6.7%)
Function (N, %)			
Medical specialist	4(13.8%)	1(7.1%)	3(20%)
Nurse	4(13.8%)	4(28.6%)	0
Nursing specialist or Physician	10(34.5%)	3(21.4%)	7(46.7%)
assistant	3(10.3%)	1(7.1%)	2(13.3%)
Support management	8(27.6%)	5(35.7%)	3(20%)
Other			
Covid (N, %)			
Risk group	2(6.9%)	1(6.7%)	1(6.7%)
No risk group	27(93.1%)	13(92.9%)	14(93.3%)

Completers, non-completers and missing data

At baseline, 32 participants started the T0 questionnaire. 3 participants did not complete the questionnaire and had to be excluded because of that. Out of 29 participants 14 did not complete 29 and 15 participants completed the T1 questionnaire.

There was no statistically significant difference between mean ages of the group that completed T0 but not T1 and the group that completed T1, $t(27) = .37$, $p = .717$. For gender and function no statistical difference could be found due to the small variety in the sample.

Use of the App

Table 2 displays 4 questions asked concerning the use of the App.

Two additional open questions explored what problems participants experienced and what prevented participants from completing. Firstly, only one person (android user) reported technical problems with the App. It was mentioned that after opening a quote on the homescreen, this quote disappeared afterwards. However, that participant reported that this occurrence did not affect his motivation. Secondly, six out of 15 participants named time as the cause for not completing the app. Thirdly, two out of the 15 participants stated that the app was not fitting to them personally. And lastly three participants criticized the app by being repetitive, providing too much information and requiring too much writing and finding module 3 (Optimism) very difficult.

Table 2

Use of the Tip-App (N=15)

Device	N(%)
Smartphone with android	10 (67%)
Smartphone with IOS	4 (27%)
PC or Laptop	1 (7%)
Time spend on exercise	**N(%)**
< 5 minutes	3(20%)
Approx. 5 min	6 (40%)
Approx. 10 min	6 (40%)
Technical problems	**N(%)**
Yes	1 (7%)
No	14 (93%)
Completed Modules	**N (%)**
None	1(7%)
Module 1 Joy	12(86%)
Module 2 Trust in yourself	12(86)
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%)

Engagment with the App

Table 3 shows the patients engagement with the app by means of the TWEETS. All
participants declined using the app as part of their daily routine. More than 90% found the
app easy to use. 80% got insight from the App to experience more positivity. More than half
of the participants did not like the progress they made in the app. For 60% the app both
motivated and facilitated to experience more positivity. 80% did not think the Tip-App suits
them as a person. Furthermore, patients had the chance to write down what aspects they
found appealing and less satisfying. Three of 15 participants mentioned awareness as being
appealing to them. Others highlighted the listening exercise, photo gallery and citation as
appealing. Less satisfying was repetition which was mentioned by five out of 15 participants.
Three participants felt uncomfortable asking others for help to complete a module.

Appreciation of the App

Participants appreciation with the App is displayed in Table 4 and 5. More than 80% found language, amount of text, design, and ease of use at least good. Two third of the participants found the number of parts at least good. However, almost 30% rated the texts fair or badly. Exercises, daily quotes and the ability to pin pictures/quotes was rated good by at least 50%. 40% of the participants rated the first module as most helpful. With every module decreasing in helpfulness. One fifth of the participants rated none of the modules as helpful.

Table 4.
Ratings for the structure and components of the TiP-App (N=15)

Item	Badly/Moderate N (%)	Fair (N)	Good/very good (N)	M (SD)
Language	1(7)	1 (7%)	13 (86%)	3.9 (.70)
Amount of Text	2 (13)	1 (7%)	12 (80%)	3.7 (.80)
Design	0	2 (13%)	13 (87%)	4 (.54)
Ease of use	0	3 (20%)	12 (80%)	4.1 (.70)
Number of parts	0	5 (33.3%)	10 (66.7%)	3.8 (.68)
Texts	1 (6.7%)	3 (20%)	11 (73.3%)	3.8 (.78)
Videos/Animations	0	5 (33.3%)	10 (66.7%)	3.93 (.80)
Exercises	3 (20%)	4 (26.7%)	8 (53.3%)	3.4 (.91)
Listening exercises	2 (13.3%)	4 (26.7%)	9 (60%)	3.47 (1.19)
Daily quotes	4 (26.7%)	2 (13.3%)	9 (60%)	3.67 (1.23)
Ability to pin pictures/quotes	5 (33.3%)	2 (13.3%)	8(53.3%)	3.47 (1.55)

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

Table 5.
Most helpful modules

Modul	N (%)
Module 1 Joy	6(42.8%)
Module 2 Trust in yourself	4(28.5%)
Module 3 Confidence in the future	2(14.3%)
Module 4 Being kind to vulnerability	3(21.4%)
Module 5 Resilience	1(7.1%)
Module 6 Connectedness	0
None	3(21.4%)

Change on psychological variables after App-use

It was assumed that participants would show reduced stress and intention to leave. Next to that it was expected that resilience and job satisfaction would increase after using the Tip-app. A paired sample t test was utilized on each variable to determine the significance level pre- and post app intervention (Table 6). The results of the paired t-test showed a significant reduction in perceived stress in T1 compared to T0.

Table 6.

Paired t test of stress, resilience, job satisfaction and intention to leave before and after App use (N=15)

	T0 M (SD)	T1 M(SD)	Change score M(SD)	Cohen's d	Two-sided p-value	T-test
Well-being	46.4(7.97)	49.4(7.58)	3(9.92)	9.92	.26	1.71
Emotional	12.53(1.85)	12.47(1.3)	-0.7(2.40)	2.40	.92	-.11
Social	15.20(3.65)	14.07(4.25)	-1.13(4.79)	4.79	.38	-.92
Psychological	21.73(4.46)	22.87(3.60)	1.13(5.57)	5.57	.44	.79
Stress	13.20 (3.82)	9.47(4.22)	-3.73(5.34)	5.34	.02*	-2.71
Resilience	3.46(.57)	3.42(.55)	-0.30(0.76)	0.76	.87	4.74
Savoring beliefs	18.67(2.69)	18.27(2.25)	-0.40(2.44)	2.44	.54	-6.3
Self-compassion	3.48(.83)	4.59(.4)	1.1(0.9)	0.90	<.001**	4.74
Job satisfaction	4.20(1.52)	4.80(1.01)	.60(1.5)	1.50	.14	-1.55
Intention to leave	2(1.13)	2(1.36)	0(1.25)	1.25	1	0

Note: Paired sample ttest; ranges (Well-being: 0-70, Stress: 0-40, Resilience: 1-5, Savoring beliefs: 0-24, Self-compassion: 1-7, Job satisfaction: 1-5 & Intention to leave: 1-5)

Discussion

The first aim of this study was to evaluate the use and engagement with the Tip-App in HCPs. A second aim was to evaluate the potential changes in mental health variables by measuring HCP well-being, stress, resilience, savoring beliefs, self-compassion, job satisfaction und intention to leave the job pre- and post- the usage of the app.

Participants interest in the app, use, and adherence and final completion was ambiguous. This is shown by the overall evaluation of the app, which was fair to good, the low number of participants, the high drop-out rate and the low number of people who completed all modules. These findings are in line with several studies who witnessed high interest from participants in the beginning but saw low adherence during the studies

(McCurdie et al. 2012; Torous, Nicholas, Larsen, Firth and Christencen, 2018; Punukollu & Marques, 2019). One possible reason for this could be the lack of tailoring the intervention to the participants individual needs. An intervention that does not cater to the specific needs and preferences of HCP may result in disinterest. Tailoring the app content and features to the unique challenges faced by participants can enhance relevance and engagement.

The fact that only 32 HCP out of two departments registered for the study makes apparent that participants interest was low in general. One reason for that could be that HCP often have demanding schedules, leaving little time for additional activities. If the intervention requires a substantial time commitment, participants may struggle to integrate it into their routines, leading to low adherence. Next to that advertising the app to awaken HCPs interest can be improved.

No technical problems were reported, except for one problem with disappearing quotes. It is unclear and impossible now to say that drop-outs might also had technical problems. Therefore, the technical problems must be checked further.

Except for one participant all used a smartphone to engage with the app. For that reason, accessibility can be improved. For example, to make it accessible through the app store so participants can easily download and use it as quickly as possible.

In this study features like language, amount of text, design etc. were scored as very good the best possible answering option. Within the components most participants also rated text, videos/animation, exercises, daily quotes and the ability to pin pictures as very good. Particularly perceived awareness was highlighted positive by participants. However, most participants completed four of six modules and only one of the participants completed all 6 modules, what makes the evaluation of the results hard. Furthermore, participants engaged 5-10 minutes with the app and not longer.

Some study participants did not find any of the modules helpful or some participants agreed on the statement that one must be made for the app. This indicates that the Tip-App in its current form is not suitable for every HCP. Pre-selecting participants based on specific criteria like exact profession could possibly improve participants engagement with the app. Since the study participants already had high scores on well-being, self-compassion, savoring beliefs, resilience and low scores in perceived stress, respectively further improvement in

these scores after app use was unlikely. Pre-selecting participants based on their mental well-being range could make it possible to the tailor the app more on participants individualistic needs and increase users significance. Nevertheless, this study found a significant reduction in perceived stress and a highly significant increase in self-compassion.

Limitations

This study focused on a monocenter pilot setting, acknowledging potential limitations in generalizability of findings to other healthcare contexts. The small sample size (N=29/15) with only 3 male participants and self-reported measures introduce potential biases. The research will be limited to specific well-being metrics and the effectiveness of the intervention may vary among different healthcare professions. Furthermore, due to the sampling method, this study might have not captured the real actual stressed HCP, because these would not engage in such a study. One reason for that could be that only HCPs who are anyways more stressed would not voluntarily participate in such a study, because they would expect more workload. But most importantly this study lacked a control group. Without a control group, establishing a causal link between app-based intervention and changes in psychological variables like stress becomes challenging. It is difficult to determine whether observed improvements are a direct result of the intervention or influenced by external factors. Next to that participants who are aware of receiving the intervention may experience placebo effects, where the expectation of improvement influences their reported outcomes. A control group receiving a placebo or alternative intervention would help differentiate between the actual effects of the app and psychological responses.

Conclusion

Until now this is one of the first studies to evaluate the Tip-App. Eventhough, this study outlines limitations there is great potential in the App. The study contributes to the growing body of literature on well-being interventions in healthcare settings. Future research should include a control group to make sure that references about effectiveness between groups can be drawn. Larger-scale studies involving diverse healthcare settings and populations are suggested to enhance the generalizability of results. Longitudinal studies could provide insights into sustained impact of positive psychology interventions on healthcare professionals well-being.

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