The Appreciation of the iThrive Chatbot and its Impact on Self-compassion and Compassion Fatigue in Healthcare Workers: A Mixed Method Feasibility Study.

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ABSTRACT

Introduction - Worldwide there are approximately 59 million healthcare workers. These healthcare workers are liable to a lot of stressors, which often leads to them suffering from burnout and compassion fatigue. Compassion fatigue is a concept that refers to the exhaustion of healthcare workers, which affects both the quality of care and their well-being. Beaumont et al. (2016) found that 'being kinder to the self', which involves being more compassionate towards the self, can decrease compassion fatigue among caregivers. Therefore, iThrive, developed a chatbot to coach healthcare workers to reduce stress and increase self-compassion. The chatbot includes theories of self-compassion and inner critics, such as: 'The Work' approach by Katie (2008) and the self-therapy approach by Chamine (2012), to help healthcare workers cope with compassion fatigue. The aim of this study is to examine the appreciation of the iThrive intervention and measure its impact on self-compassion and compassion fatigue.

Methods - A mixed methods feasibility study was conducted, including quantitative pre-posttest data as well as open ended posttest questions and semi-structured interviews. Twelve healthcare workers used the iThrive intervention, which consists of three conversations with an online chatbot and supplementing homework exercises, during a period of two weeks. Before and after the study period they fill in the Self-Compassion Scale and the Pro-QoL measuring compassion fatigue. In the interviews and open posttest questions we collected data on the participants' usage and appreciation of the iThrive intervention, as well as its self-reported impact. Data on pre- and posttest were compared and inductive and deductive coding was used to analyze the open ended posttest questions and the interviews.

Results - The usage of the chatbot-conversations was very satisfying; however a decrease in usage was reported for the homework exercises. This decrease was probably due to time constraints, too many conversations and exercises in a short time, not feeling like doing the exercises and missing guidance or feedback. The participants generally appreciated the iThrive intervention but also mentioned some points of improvement. The chatbot was described original, with smooth and pleasant interactions, humoristic, personalized and not too difficult. However, two of the biggest weak points that came forward were: too obvious that it is a robot and the answer options they had to choose from were too directive and not always in line with their opinion. The homework exercises revealed two strong points: encouraged self-reflection and logic follow-ups on the chatbot conversations, and two weak points: missing guidance and not appealing. No significant pre- post differences on self-compassion and compassion fatigue were found. However, healthcare workers did report the following impact of the intervention: awareness of inner critics, changing thinking patterns and taking different perspectives.

Conclusions - Although participants generally appreciated the iThrive intervention, further research is needed to examine the effects of the intervention on self-compassion and compassion fatigue. The current study found some pointers for further development of the intervention. Hence, improvements in the iThrive intervention need to be made and further research must demonstrate the real effects of the intervention on the concepts of self-compassion and compassion fatigue.

PREFACE

It has been two and a half years since I started my journey at the University of Twente. Bachelor of Social Work already in my pocket, but I wanted to go deeper, to understand human behavior and the human brain better. Now, see how far I got. It has been an incredible time for me with both ups and downs. I did things that I never thought I would be capable of (statistics for sure), but also personally I grew a lot.

I think the best decision in my Masters was to choose for an internship with iThrive. It is definitely the place where I learned how all the theories and knowledge I gathered within my pre-masters, can be put into practice. Learning more about the combination of health and technology, how to design web-based interventions according to the Persuasive System Design. iThrive gave me the trust to help them evaluating and improving the application that they are developing, even turning into a switch of product. Being part of all that makes me proud both on the iThrive team and myself. I want to thank all of the team, and especially Nadja, who gave me the opportunity and trust to grow as both a person as well as a professional. Also special thanks to Kfir, without his help and feedback my statistical analysis would not have been so accurate and clear.

I am grateful that I got the opportunity to write my thesis with iThrive, evaluating an existing product that has the potential to really become important in healthcare is wonderful. It is exactly what I want to stand for, improvements in healthcare by combining knowledge about health with the growing technology.

This period in which I wrote my Master Thesis, was also a very interesting time. Combining studying with working was of course not always easy, also not for the people around me. Stress and structure were the two keywords during this time. Receiving positive feedback was always motivating, but of course also constructive feedback was given, a slam in the face. But, always getting back on track due to the encouragement of my boyfriend, family and friends. Thank you for always supporting me, Jorrit, pap en mam, Suzette and all my other sweet friends.

I want to point out my special thanks to Stans, my supervisor at the University of Twente. Stans always made time for me, no matter how busy she was. She always gave me great input, helped me to think in the right direction, shared her knowledge and gave me grow opportunities as well. Also, Marcel, my second supervisor has given me constructive feedback that I could work with, which helped me to improve my final paper. Thank you.

Lastly, I want to say thank you to all the health care workers that participated in this study, without them this study would not have been possible and valuable.

Yvonne Kroon, 25.06.2018, Nijmegen.

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1. Introduction

There are approximately 59 million healthcare workers worldwide (Joseph & Joseph, 2016). According to the WHO, a healthcare worker is someone who delivers care and services to the sick and the ones in poor health (World Health Organization, n.d.). This can either be directly (e.g. a nurse or doctor) or indirectly (e.g. helpers, laboratory technicians or medical waste handlers) (Joseph & Joseph, 2016). According to Joseph & Joseph (2016) the healthcare industry in which these healthcare workers operate, is one of the most hazardous environments to work in. Healthcare workers are being liable to complex health and safety hazards such as physical and biological hazards, all the time (Galletta et al., 2016; Gazelle, Liebschutz, & Riess, 2015; Joseph & Joseph, 2016; Maslach & Goldberg, 1998). Furthermore, healthcare workers are often exposed to a range of serious stressors related to: the content of the job, long working hours, time pressure, exposure to suffering patients, reduced social support at work, ergonomic issues, etc. (Galletta et al., 2016; Joseph & Joseph, 2016). Being exposed to all these stressors, healthcare workers are at high risk of developing physiological distress or burnout. Worldwide twenty-five to sixty percent of physicians report that they are suffering from burnout (Gazelle, Liebschutz, & Riess, 2015). Furthermore, an average of twenty percent of Dutch nurses are having burnout complaints (SKB, 2017), which marks the severity of the problem in the healthcare sector.

According to Maslach & Goldberg (1998) there are three components that can cause burnout in healthcare workers: (1) the emotional exhaustion, (2) depersonalization, also called cynicism, and (3) reduced personal accomplishment (Gazelle, Liebschutz, & Riess, 2015; Maslach & Goldberg, 1998). A strong indicator for burnout in healthcare workers related to emotional exhaustion is compassion fatigue, as healthcare workers are expected to be compassionate to their patients all the time (Beaumont, Durkin, Hollins Martin & Carson, 2016; Conrad & Kellar-Guenther, 2006).

1.1 Compassion fatigue

Compassion fatigue is a concept that refers to both the emotional and physical exhaustion (e.g. having a hard time showing compassion) that can affect healthcare professionals and caregivers over time (Beaumont et al., 2016). Adams, Boscarino & Figley (2006) define compassion fatigue as followed: *"the formal caregiver's reduced capacity or interest in being empathic or "bearing the suffering of clients"* and they also say it is: *"the natural consequent behaviors and emotions resulting from knowing about a traumatizing event experienced or suffered by a person"* (p. 104). The phrase "bearing of the suffering clients" can express itself in various ways. According to Slocum-Gori et al. (2011) consequences of compassion fatigue often include a sense of helplessness, feeling confused and/or isolated, sleep disturbance,

increase in emotional intensity, decrease in cognitive ability, decreased ability to judge, depression and so on (Adams, Boscarino & Figley, 2006; Figley, 2002a). Compassion fatigue as a psychological construct is especially common in the healthcare sector, due to the context of the job, the patients they have to work with and the content of the job (Beaumont et al., 2016; Conrad & Kellar-Guenther, 2006; Figley, 1995; Adams, Boscarino & Figley, 2006). Compassion fatigue is not only a factor influencing the quality of care, but it can also have a big impact on the well-being of the healthcare worker (Adams, Boscarino & Figley, 2006; Figley, 2002a).

Being 'kinder to the self' when facing challenging situations (e.g. stressful events) at the job would be beneficial for healthcare workers, at least for students wanting a career in midwifery (Beaumont et al., 2016). To this aim, Beaumont et al. (2016) investigated to what extend compassion fatigue is correlated with self-compassion, which includes a healthy form of self-acceptance (see paragraph 1.2). The results of the study by Beaumont et al. (2016) imply that higher levels of self-judgement are correlated with lower levels of self-compassion. Besides, they also found that higher levels of self-compassion are correlated with lower levels of compassion fatigue. Unfortunately, there is limited evidence on whether or not this conclusion is accurate, as the study of Beaumont is, to our knowledge, the first to examine the relationship between self-compassion and compassion fatigue in healthcare workers. Yet, there is evidence that self-compassion, which includes not being too self-critical, can overcome burnout and compassion fatigue in the long-term (Rae Harr, Brice, Riley & Moore, 2014; Neff, 2003a). Below we go deeper into the concept of self-compassion.

1.2 Self-compassion and inner critics

Self-compassion is defined as a healthy form of self-acceptance that includes the following three elements: kind self-treatment in the face of perceived inadequacy (e.g. self-soothing and positive self-talk), recognizing one's discomfort as an unavoidable part of the human experience and the third component includes the ability to face one's own painful thoughts without avoiding or exaggerating them (e.g. managing disappointment without being melodramatic) (Neff, 2003a). The focus of the intervention is on two of these three elements; (1) kind self-treatment, and (2) the ability to face one's own painful thoughts without avoiding or exaggerating them.

Dealing with the inner critics, according to Stjernswärd & Hansson (2017), is the concept behind facing your own painful thoughts and being kind to the self (Green, Elliot & Myrick, 2014; Stjernswärd & Hansson, 2017; Stinckens et al., 2013). The inner critics, defined as internal voices that are the source of commands and negative messages (Elliot, 2006), are initially developed at one's childhood, in which individuals' interactions with

parents and other people in ones surrounding shape the inner critics (Green et al., 2014, Chamine, 2012). Criticism, neglect, excessive permissiveness and inconsistency in these interactions can lead to the child evaluating itself negatively (e.g. worthless, unlovable, inadequate) (Green et al., 2014).

Self-compassion and inner critics have been shown to be interrelated (Stjernswärd & Hansson (2017). Stjernswärd & Hansson (2017) studied whether self-compassion meditation could decrease the stress level in a sample of caregivers. They found that due to the meditation training the caregivers experienced a novel awareness of their inner critic and they widened their perception by showing a better understanding and better compassion towards others *and* themselves (Stjernswärd & Hansson, 2017). Furthermore, several caregivers reported to have a greater sense of self-acceptance and acceptance of what they could or could not have possibly done in a certain situation. The self-compassion meditation helped them to be more satisfied with their efforts, to make more balanced choices while taking into account their own needs, perceptions and wishes as well as those of the sick ones. In the end, the caregivers felt like what they did was good enough and that they could make peace with their inner critic as a result of the training (Stjernswärd & Hansson, 2017). Overall, the study also showed a decrease in stress levels due to the self-compassion meditation (Stjernswärd & Hansson, 2017). Since this is the only study that we are familiar with, showing these results, the evidence is still limited, and more research on the correlation between inner critics, self-compassion and compassion fatigue is desirable.

1.3 iThrive chatbot

For the sake of reducing distress and compassion fatigue in healthcare workers, iThrive developed an online chatbot. iThrive is a company aiming to coach healthcare workers to transform counterproductive habits to help them thrive. Their main focus is on increasing life satisfaction and energy levels and decreasing stress levels by having coaching sessions with a chatbot. According to Shawar & Atwell (2007) a chatbot is: *".. a software system, which can interact or "chat" with a human user in natural language"* (p. 89). This is the definition that we persist in this study. During this study part of the iThrive chatbot, supplemented with homework exercises, is evaluated by a group of healthcare workers. Furthermore, the impact of the chatbot on self-compassion and compassion fatigue within healthcare workers is measured.

The iThrive chatbot focusses on three things, (1) creating awareness of the inner critics, (2) identifying inner critics and (3) work and deal with the inner critics. The first part is about creating awareness of inner critics among healthcare workers, by telling them a fictional story about inner critics. Thereafter, the self-therapy approach by Chamine (2012) is deployed to identify the inner critics. According to Chamine (2012) there are 10 types of

inner critics, which can be distinguished (see Appendix A). The health care workers are asked to fill in the inner critic test that Chamine (2012) developed, to find out which inner critics are mostly present in their life. At this point there is no evidence of the impact of the self-therapy approach by Chamine (2012), so this study would be the first one to examine it.

Once the inner critics are identified, the method by Katie called 'The Work' is used, to help the participants to work and deal with their inner critics (Katie & Mitchell, 2008). The approach of 'The Work' exists of asking yourself four specific questions about your own inner critic thoughts: (1) Is this thought true?; (2) Can you be absolutely sure that this thought is true?; (3) What does your life look like believing the thought?; (4) What does your life look like not believing the thought?) (Katie & Mitchell, 2008). Other than that it also involves turning around thoughts, so looking at the inner critic thoughts from different perspectives (Katie & Mitchell, 2008; Smernoff, Mitnik & Koldner, 2015; Lev-ari, Zilcha-Mano, Rivo, Geva & Ron, 2013). Research has already shown the effectiveness of 'The Work' as a meditation technique (Leufke, Zilcha-Mano, Feld & Lev-ari, 2013). Smernoff et al (2015) found promising results, showing that 'The Work' can be an effective approach for improvement in psychological state and quality of life in the general population. Another study by Lev-ari et al (2013) concluded that the physical and mental health of breast cancer survivors improved after using "The Work". In this study the influence of 'The Work' approach on healthcare workers' self-compassion and compassion fatigue is examined.

1.4 This study

Hence, health care workers are at increased risk of suffering from distress and compassion fatigue. Whereas some recent studies have suggested that improving self-compassion and dealing with the inner critics may reduce the risk of compassion fatigue, research thus far is still limited.

In the current study we want to deepen our understanding of the role of self-compassion and the inner critics in reducing compassion fatigue. To this aim healthcare workers will evaluate a first version of the iThrive intervention in a feasibility study. The research questions addressed in this study are:

1. What is the reported usage of the iThrive intervention by healthcare workers?
2. How are the various components of the iThrive intervention appreciated by healthcare workers?
3. What is the self-reported impact of the iThrive intervention on healthcare workers?
4. Is the intervention associated with changes in self-compassion and compassion fatigue in healthcare workers?

2. Methods

2.1 Design

A mixed method design was used, including both quantitative and qualitative methods. The quantitative part consists of a one group pre-posttest design with the following self-reported outcome measures: self-compassion and compassion fatigue. Participants were asked to use the intervention for two weeks. Questionnaires were completed before, and after this period. The qualitative part consisted of open-ended posttest questions and semi-structured interviews after the study period, to measure the usage, appreciation and self-reported impact of the iThrive intervention.

2.2 Participants and procedures

This feasibility study was conducted from end-2017 to mid-2018. Participants were recruited via snowball sampling (Cohen, Manion & Morrison, 2002). 1 month prior to the pilot period the researcher send out invitations via e-mail to a number of healthcare workers that either she or iThrive personally knew. These healthcare workers were encouraged to forward the invitation mail to other healthcare workers in their own networks. Inclusion criteria were that participants a) were 18 years or older, b) had proficiency in the Dutch language and c) had an employment in the healthcare sector. The recruitment of participants was hard; with healthcare workers not responding or claiming to not have time for participation. However, in the end there were 26 participants that gave informed consent (see Appendix A). To those who confirmed participation an in depth instruction mail was send, including a link to the baseline questionnaire. During the study period participants received conversations and exercises via mail every other day. In the end of the two weeks, participants received another mail with the link to the post questionnaire and an invitation for an interview.

During the study 14 participants dropped out. Reasons for drop-out were: sickness (n=1), not enough time (n=6), technical issues (n=3), the intervention was not appealing (n=1) or the reason was unknown (n=3). In the end the sample consisted of 12 participants, of which nine also took part in an interview. Characteristics of the participants are shown in the results section (see paragraph 3.1).

2.3 The intervention

The intervention includes three conversations with the online iThrive chatbot (see Table 1). This chatbot functions as a coach and is called ‘Jean’. It includes pre-programmed

conversations in which the participants can reply to Jean by choosing between answer buttons (see Figure 1), or typing in their own answers (see figure 2). The chatbot is adaptive and replies differently on each of the answer buttons. All of the conversations have an additional offline exercise to complete afterwards (e.g. exercise 1 belongs to conversation 1). The last exercise is about the overall content that the participants dealt with in the intervention.

Table 1. Description and aim of the different elements of the iThrive intervention.

Element	Aim	Description
Conversation 1 *Story about inner critics*	Introducing the concept of inner critics and illustrating their meaning in life.	The first conversation is an introduction to the inner critics. It tells the story of pirates, portraying your inner critics, who are holding you back from doing what is really important to you. The participant has to fill in what is truly important to them in life, and they have to choose between buttons to determine the direction of the story.
Exercise 1 *Well-being wish*	Realizing what is really important to you and improving self-compassion.	This exercise is focused on realizing what is truly important to the participant, and thinking about what they wish for themselves. Then also speaking out loud this wish to themselves and others, to focus more on these positive thoughts and wishes instead of the inner critic thoughts.
Conversation 2 *Identify your inner critics*	Finding out which inner critics are most present in your life.	In this conversation the participant has to fill in a test with 39 statements, in the end they receive a top 3 inner critics that are mostly present with them according to the test. Participants receive a description of the inner critic and some typical thoughts that that belong to the inner critic.
Exercise 2 *Get to know your inner critic thoughts*	Get to know your inner critics thoughts better.	The participants are asked to write down their top 3 inner critics and write down 3 thoughts for each inner critic, which they sometimes have. Then they ask themselves the questions of 'The Work' approach, to find out if this thought is true and what your life looks like with and without this thought.
Conversation 3 *Work with your inner critics*	Learning how to turn your inner critic thoughts around to look at them from another perspective.	In this conversation participants choose which inner critic thought they want to work with. They are then asked to describe a situation in which they had this thought. Next, they are asked to answer the four questions of 'The Work' approach to find out how true the thought is and what life looks like having or not having this inner critic thought. Then the participant is guided to turn around the thought in three ways.
Exercise 3 *Turnaround your inner critic thoughts*	Turn more inner critic thoughts around, to learn how to deal with them.	The participant takes one of the thoughts written down in exercise 2. Go through the same approach of 'The Work' as in conversation 3, and try to turn the thought around in different ways. For example replacing the emotion by something else.
Exercise 4 *The compassionate observer*	Get in contact, and reflect on different parts of yourself. Learn how to be a self-compassionate person.	In this exercise the participant is asked to do a roleplay. The exercise is to put three chairs in a triangle. Each chair has its own role, one being your inner critic voice, one being your criticized self and one being the compassionate observer. The participant has to think of a problem in his life and play each of the three roles. In the end the participant reflects on this roleplay, how it made them feel and what he learned from it.

Figure 1. User chooses button.

Figure 2. User fills in own answer.

2.4 Instruments

Quantitative instruments

Quantitative data was collected in pre- and posttest, about demographics of the participants and the outcome measures self-compassion and compassion fatigue. The participants were asked to fill in the following demographics: gender, age, highest completed education level and their profession. They were asked for their demographics twice to measure individual changes overtime. Self-compassion was measured using the SCS and Compassion fatigue was measured using the Pro-QoL.

Self-Compassion Scale (SCS)

The 24-item Dutch SCS, is a self-report measure of self-compassion (Neff & Vonk, 2009). The version used in this study as a pre- posttest measure, is a Dutch translation of the original

English 26-item SCS by Neff (Neff, 2003a). The Dutch version consists of 24 items instead of the 26 items in the original version, due to translation difficulties (Neff & Vonk, 2009). Previous studies found the Dutch version reliable (α = .92) and valid (Neff & Vonk, 2009). In this study the scale was also found reliable (α= .88). The constructs of self-compassion which are measured in the SCS are: self-kindness, including self-criticism (α= .79) (e.g. When I'm going through a very hard time, I give myself the caring and tenderness I need.) , common humanity, including Isolation (α= .58) (e.g. When things are going badly for me, I see the difficulties as part of life that everyone goes through.) and mindfulness, including over-identification (α= .75) (e.g. When something painful happens I try to take a balanced view of the situation.) (Raes, Pommier, Neff & Van Gucht, 2011; Neff, 2003a). To complete the Dutch version of the SCS one has to fill in choices on a 0 (Not at all applicable) to 7 (Very much applicable) Likert scale (Neff & Vonk, 2009). This differentiates from the original SCS which makes use of a 5-point Likert scale.

Professional Quality of Life Scale (Pro-QoL)

The Dutch 30-item Pro-QoL scale is a self-report measure of the Professional Quality of Life (Stamm, 2010). In this study the Pro-QoL is used as a pre- posttest measure to measure compassion fatigue. The instrument it is a fourth revision of the original Compassion Fatigue Self-Test survey tool (Figley, 1995). For the current study the items of this instrument were translated according the WHO guidelines with forward backward translation (World Health Organization, n.d.). The Pro-QoL consists of three 10-item subscales: compassion satisfaction, burnout, and secondary traumatic stress. The scores on burnout and secondary traumatic stress together indicate the level of compassion fatigue. According to Stamm (2010) construct validity testing has verified that the subscales on the Pro-QoL R-IV measure different constructs. Compassion satisfaction (α= .75) is defined as the pleasure derived from being able to do your work well (e.g. I have happy thoughts and feelings about those I help and how I could help them); burnout (α= .79) is defined as difficulties in dealing with work or in doing a job effectively (e.g. I feel overwhelmed because my case work load seems endless) , and secondary traumatic stress (α= .81) is defined as work-related exposure to extremely stressful events (e.g. I think that I might have been affected by the traumatic stress of those I help). To complete the Pro-QoL one has to fill in choices on a 0 (never) to 5 (very often) Likert scale. A number of items required reverse coding so that high scores on all items indicate high compassion satisfaction, burnout, and secondary traumatic stress.

Qualitative instruments

Open-ended questions posttest

The posttest included open-ended questions about (1) usage, (2) favorite elements, (3) positive and negative experiences with the chatbot and (4) self-reported changes (see Table 2). These questions were included in the posttest to gather qualitative data from the whole sample (n=12) and not only from the participants that participated in an additional interview (n=9).

Table 2. Open-Ended Questions Posttest

Topic	*Open-ended questions*
1. Usage	▪ How many conversations did you have with the chatbot? ▪ How many homework exercises did you execute?
2. Favorite Elements	▪ Which conversation was most appealing to you? ▪ Why was this conversation most appealing to you? ▪ Which exercise was most appealing to you? ▪ Why was this exercise most appealing to you?
3. Positive and Negative experiences with the chatbot	▪ Can you describe how you experienced the exercises? Appoint at least 1 negative and 1 positive experience. ▪ Can you describe how you experienced the conversations with the chatbot? Appoint at least 1 negative and 1 positive experience.
4. Self-reported changes	▪ Do you feel like the chatbot helped you in anyway? How? ▪ Do you feel like the exercises helped you in anyway? How? ▪ Do you feel like the intervention had any influence on your compassion?

Semi-structured interviews

A semi-structured interview scheme was used (see Table 3). The interview consisted of four parts, (1) asking about the usage of the intervention, (2) focusing on the appreciation of the intervention, (3) asking about the impact of the intervention (4) closing questions. First participants were asked about the frequency of use and the device used for the intervention. Second their experiences regarding the: (a) intervention in general; (b) instructions/installation; (c) chatbot; and (d) exercises were investigated. Third, for each of these topics, participants were asked about what they did and did not appreciate, what they had learned from it and if it had an impact on their compassion. Lastly, participants were asked for possible improvements of the intervention. During the interview, participants were encouraged to explain, and motivate their answers and experiences.

Table 3. Interview scheme

Topic	*Semi-structured questions*
1. Usage	▪ How did you make use of the intervention? Mobile phone or laptop? ▪ How many of the three conversations did you do with the chatbot? Which ones? ▪ How many of the four exercises have you executed? Which ones?
2. Appreciation	
o General	▪ What do you think was good (useful, fun, enjoyable) in the intervention? ▪ What do you think was not so good (stupid, annoying, inconvenient) in the intervention? ▪ How easy or difficult was the intervention for you? Please indicate with a number between 1 and 10.
o Per component	▪ How was your experience with the [instructions- installation /conversations/ exercises]? ▪ What do you think was good about the [instructions- installation/ conversations/ exercises]? ▪ What do you think was not so good about the [instructions- installation /conversations/ exercises]?
3. Self-reported impact	▪ Did the intervention help you in some way? Why? How? ▪ What did you learn from the intervention? From the chatbot? From the exercises? ▪ Did you encounter any counterproductive effects? ▪ Do you feel like your inner critics have an influence on your compassion? ▪ Is your compassion influenced by this study? How?
4. Closing questions	▪ Would you recommend the intervention to others? ▪ Do you have suggestions to improve the intervention?

2.5 Analysis

Quantitative analysis

The demographics of the participants were analyzed creating descriptive tables in SPSS and converting them into a summarized table. Furthermore, the pre- posttest questionnaires were delivered to the participants, using Qualtrics. After they filled in the questionnaires the data of the pre- and posttest was exported into one SPSS database. In SPSS some items for both the SCS and the Pro-QoL were reversed, after that the mean scores of the subscales of both questionnaires were calculated. Thereafter, from both of the scales it was explored whether they were normally distributed. After that, to compare pre- and posttest scores, a paired sample t-test was executed for each of the subscales of the SCS and the Pro-QoL.

Qualitative analysis

The data of the open-ended posttest questions and the semi-structured interviews were merged into one dataset and analyzed together. The data was analyzed with the use of open coding, axial coding and selective coding, applying both deductive and inductive analysis. First, relevant fragments were selected. Then, these were organized into four predefined themes, namely: (1) usage of the intervention; (2) appreciation of the intervention; (3) self-reported impact of the intervention; (4) suggestions for improvements. Third the codes within each theme were further analyzed into subcategories, using inductive analysis, meaning that the subthemes arrived from data, instead of predefined categories. After obtaining all codes,

code schemes with exemplary codes were developed by constant comparison of similarities and differences in the data. All analysis were conducted by one coder, however, the results were frequently discussed with two supervisors.

3. RESULTS

3.1 Characteristics of the study group

The sample included mainly females (n=11) and only one male. Half of the participants was aged 18 to 25 (n=6), no participants were in the age of 41 to 50 (n=0). Higher professional education is completed by nine participants, and none of the participants had a degree in Academic Education. The profession of the sample varies widely. Further characteristics are summarized in Table 4.

Table 4. Participants Characteristics (n=12).

Characteristics	*n*	*%*
Gender		
Female	11	91.7
Male	1	8.3
Age group (years)		
25<	6	50.0
26 – 40	3	25.0
41 - 50	-	-
51>	3	25.0
Completed education		
Secondary School[1]	2	16.7
Intermediate vocational education[2]	1	8.3
Higher professional education[3]	9	75.0
Academic Education[4]	-	-
Profession		
Radiation expert	2	16.7
Social worker	3	25.0
Nurse in training	2	16.7
Training officer	1	8.3
Pedagogue	1	8.3
Healthcare worker disability care	2	16.7
HRD Adviser	1	8.3

Note. Educational levels in Dutch: [1]: middelbaar onderwijs,[2]: middelbaar beroepsonderwijs (MBO), [3]:hoger beroepsonderwijs (HBO), [4]: wetenschappelijk onderwijs.

3.2 Research question 1: What is the reported usage of the iThrive intervention by healthcare workers?

In table 5 the reported usage of the iThrive intervention by healthcare workers is shown in detail. First of all, we can see that the overall usage rates are high for the conversations with the chatbot, most participants completed all three conversations (n=10). However, the adherence to the homework exercises started high with the first exercise, but shows a decrease over time: 'well-being wish' is completed by almost all participants (n=11), while 'the compassionate observer' is completed by only a quarter of the sample (n=4).

Table 5. Usage of the Intervention

Element	*Completed the component (n)*
Device	
Mobile phone	*3*
Laptop	6
Conducted conversations	
1. Story about inner critics	12
2. Identify your inner critics	11
3. Work with your inner critics	10
Executed homework exercises	
1. Well-being wish	11
2. Get to know your inner critic thoughts	10
3. Turnaround your inner critic thoughts	8
4. The compassionate observer	4

Three reasons for the decrease in usage of the homework exercises were given by the participants. Three of the participants said it took a lot of time to execute the exercises after they already conducted a conversation with the chatbot: *"Because, then I took half an hour to do a conversation, so I took my time. Therefore I did not do the exercises so extensive"*. Another two participants reported to not feel like doing the exercises. Furthermore, there were two participants that felt overwhelmed with all the conversations and exercises, as illustrated here: *"It came to quickly after each other, and then I didn't have time […] then I think 'Oh never mind', then I already dropped out"*. Lastly, one participant said because there was no feedback from the researcher involved, she was not motivated to fill in the exercises. She explained: *"Actually I would need some kind of feedback or something, if you really want me to write it down"*.

3.3 Research question 2: How are the various components of the iThrive intervention appreciated by healthcare workers?

Appreciation of the Instructions and installation

The participants revealed one strong point and two weak points about the instructions and installation of the intervention (see Table 6). Firstly, what was appreciated by all nine participants, is that they received clear instructions for the intervention. However, there were also two weak points that came forward in the interviews.

Table 6. Appreciation of the Instructions and Installation (n=12)

Subthemes	*n*	Example Quote
Strong point		
Clear instruction mails	9	*"... in terms of description it was completely clear to me"*
Weak points		
Installation issues	5	*"... then things don't work properly, which makes me wonder if I did something wrong… or then it seemed that it presumably only went wrong because of the internet connection."*
Purpose of intervention unclear	1	*"... a colleague of mine wanted to participate in the study, but she thought that you really had to have a face-to-face conversation on Skype, so to say, therefore she pulled out."*

The first point was technical issues with installing Skype or the iThrive chatbot, which was reported by five participants. They related their technical issues to different causes. Two of them said it might have been the settings in Skype that were not correct, illustrated by one participant here: *"... I checked whether my settings in Skype were wrong, because I didn't use Skype for a while and Skype was completely renewed. So I didn't know anymore, how to add it [chatbot]"*. Another participant related the technical issues to the internet connection which was probably not working properly. In another two cases the reasons for technical issues was unknown: *"… I think in the first instance I could not make contact or so, I don't remember why it happened"*.

Appreciation of the chatbot

The evaluation of the chatbot brought forward nine strong points and three weak points (see Table 7). Furthermore, the open-ended posttest questions and interviews also gave insight in the appreciation of the specific conversations.

Table 7. Appreciation of the Chatbot (n=12)

Subthemes	*n*	Example Quote
Favorite conversation		
1. Story about inner critics	5	*"The mentioned metaphors were interesting and applicable."*
2. Identify your inner critics	4	*"It really helped me. Taught me what my negative thoughts are."*
3. Work with your inner critics	3	*"Because here I get to work on my own thoughts with clear examples of the chatbot."*
Strong points		
Personalized conversations	8	*"... it [chatbot] calls your name every now and then. So, then you think, yes, he is talking to ME."*
Easy/clear	8	*"It was easily understandable what was expected of me, what they meant, so to say, especially with the chatbot I thought: 'ah yes'".*
Predefined answer options	6	*"...sometimes it was easy to have multiple choices […] Then you have a better idea of the direction you are getting in".*
Humor	6	*"Humor, I thought it was genius [...] those crazy answers you could choose from […] that was really motivating."*
Similar to real-life coaching	3	*"... it is really your own responsibility, which is also the case in real coaching [...] there I don't notice any difference".*
Pleasant, smooth and fast interactions	2	*"... I think it was a nice interaction. It was also quick and smooth, that's positive I would say. And also a very pleasant way of speaking…"*
Original and hot	2	*"What attracted me was that I thought this is interesting: we are now in a time with social media, fast and busy, but we are still seeking for help. So a coach online is really hot!"*
Compliments	1	*"... what I liked about it, is that he often called me by my name and the compliments…".*
Tokens	1	*"... I also saw these tokens passing by, that I deserved them. It was funny to encounter them".*
Weak points		
Predefined answer options	6	*"And if you can choose from: 'yes, very much' or 'a little bit' and not: 'no, actually not', if this option is not available, in my experience it means that this opinion is not allowed. That was a bit weird."*
Clearly a robot	5	*"It makes you think: 'well, all of it is pre-programmed."*
Breaks not allowed	1	*"Then I actually wanted to pause the conversation and [...] then for example in the evening I thought, 'oh, let's continue' and then I had to start all over again."*
Chat style overdone	1	*"Sometimes it was a bit overdone how he behaved: 'Yaaay, come one, go on and you deserved something' […] I am not so sensitive to that kind of things."*

Table 7 shows that 'Story about inner critics' is marked as favorite conversation (n=5), closely followed by the other two conversations. Reasons for liking the 'Story about inner critics' were similar among all five participants. According to them this conversation was easiest comparable to real-life and therefore they could easily relate to it. The conversation 'Identify your inner critics' was favored by four participants. All four of them reported that it gave them insight in their own thoughts and personality, as illustrated by one participant here: *"Very interesting to get an inside in your own personality and to know that there are these*

inner critics that everyone has". The last conversation, 'Work with your inner critics', was favored by three participants. They all stated that this conversation was most goal-oriented with clear guidelines and examples to work with on your own thoughts.

We continue describing the strong points of the chatbot that came forward in the open-ended posttest questions and interviews. First of all, eight participants mentioned that it was a strong point that conversations were sufficiently personalized, as stated by one participant here: *"Yes, you could make it as personal as you wanted it to be, depending on the answers you gave. So yes, it was sufficiently"*. Another eight participants indicated that the difficulty of the chatbot was good, it was easy and clear. Choosing between predefined answer options was pointed out as a strong point by six participants, since it made it easier and quicker to continue the conversation. Another reason given by one participant is that it is convenient if you do not have to think of a suiting answer yourself. The participant stated: *"Yes, in itself [answer options] pretty nice, because then you did not have to think of a suiting answer yourself*".

Another strong point that came forward was humor. Six participants appreciated the fact that the chatbot included funny or humoristic influences. Furthermore, the similarity with real-life coaching was much appreciated by three of the participants. One participant talked about having the same responsibility in both online and real-life coaching. Another two participants recognized questions from real-life coaching in the chatbot, as explained by one participant here: "*Of course I had these kind of coaching sessions before in real-life [...] then you also get these questions that make you think: 'hmm what should I fill in' […] that was somewhat recognizable"*. Besides, also the pleasant, smooth and fast interactions were pointed out by two participants as something positive. One of the participants said that the intentions and expectations were clear very quickly, because of the interaction: *"... and with the chatbot was more interactive, the intentions and expectations were quickly clear"*. Furthermore, there were two participants that decided to participate because they were curious to try the chatbot, because it is original or "hot". Lastly, there was one participant that pointed out that she liked getting compliments and one participant that was positively surprised about the tokens that they could earn in the conversations.

In contrast to these strong points, we also found three weak points of the chatbot indicated by the participants. In the first place, choosing between predefined answers was mentioned by six participants to be a weak point of the chatbot. Reasons for that were: It made it difficult to give your own input: *"... you have to give standard answers [...] but you can't just tell what you want to tell [...] then he says: I don't recognize this"*. Besides, sometimes you had to choose between answers, but the answer the participant wanted to give, was not an option.

This made that they had to choose an answer they did not agree with, to continue the conversation. One participant illustrates: *"But sometimes you could not pick your [answer] option. For example, there was something like: "Do you think this is awesome?", 'Yes' or 'Mehh'. Then I thought, 'no' […] that should have been an option here"*. Another reason for not appreciating the choosing between predefined answer options was that two participants felt like they were pushed into a certain direction by these options they had to choose from.

A second weak point pointed out by five of the participants, was that it is clearly a robot that they were talking to. That was less appreciated; because they could not tell their own story and moreover, the responses from the chatbot seemed pre-programmed. Also, when things went wrong, it became clear to participants that it is just a device they were talking to: *"But as soon as something went wrong, I really got the feeling 'ah I am talking to a device', I didn't like that"*. Furthermore, one participant pointed out as a weak point that they were not allowed to have long breaks in a conversation. Once you left de conversation you could not continue later in the day, but you had to start all over again. One last weak point according to one participant is that the chat style was a bit overdone sometimes, which was not so appealing.

Appreciation of the exercises

The evaluation of the exercises brought forward two strong points and two weak points (see Table 8). Besides, table 8 also gives insight in the appreciation per exercise, as participants explained in the open-ended posttest questions and interviews.

First, we have a look at the appreciation of the various exercises. The exercise 'Turnaround your inner critic thoughts' is marked as favorite (n=5) while it was only executed by some of the participants (n=8). Two participants indicated that this exercise helped them to look at their thoughts from another perspective. As illustrated here by one participant: *"Change your thinking pattern into something more positive or self-assured"*. One other participant mentioned that the exercise was helpful to reflect consciously on the self. From the other two participants the reasons for favoring exercise 3 are unknown. The least favored exercise was 'The compassionate observer'. This might be related to the decrease in usage described in the previous paragraph. However, one participant also mentioned that a lack of guidance made it difficult to execute the exercise appropriate.

We continue describing the strong points of the exercises. The first strong point was mentioned by four participants. They said they could relate to, or use, the exercises in real-life situations. An example quote from one participant is: *"Yes, I think that if these voices, or these things appear in your head again, it is going to be helpful"*.

Table 8. Appreciation of the Exercises. (n=12)

Subthemes	*n*	Example quote
Favorite exercise		
3. Turnaround your inner critic thoughts	5	*"Consciously reflecting on yourself."*
2. Get to know your inner critic thoughts	3	*"Turning thoughts around was very clarifying and clear."*
1. Well-being wish	2	*"Motivated me to check how critical I am in real-life."*
4. The compassionate observer	1	*"I am convinced that it will help when you do this […] saying it out loud can help."*
Strong points		
Relates to real-life situations	4	*"In particular the second exercise, to deepen your thoughts […] helps you to stop and hold for a moment, and think about what does this thought mean to me, what does it do to me and for what am I responsible [...] That kind of questions do help you in real-life."*
Logic follow-up on the conversations	3	*"Well, those were pretty logical. In line with my expectations. There was a logical structure, so you could predict what was going to be the next exercise."*
Weak points		
Guidance/feedback from coach was missing	3	*"The fourth exercise, the roleplay, I think is better to do together with a coach, so with guidance of a coach, because it is very difficult..."*
Not appealing	3	*"[Exercise 1] that was not really my thing […] that was logical for me. There was no added value for me in writing it down or speaking it out…"*

The second strong point that three participants stated was that the exercises were a logical follow-up on the conversations, as one participant said here: *"... and it became easier to execute the exercises, because I had this conversation up front…"*.

However, there were also weak points according to the participants. Three participants missed feedback on the exercises, one participant saying: *"Actually I would need some kind of feedback or something, if you really want me to write it down"*. Moreover, one participant stated that more guidance would be necessary for the fourth exercise.

Furthermore, there were three participants who said that some of the exercises were not really appealing to them: *"... I think it was the second or third exercise that I did not really execute seriously, because it was no so appealing to me"*.

Suggestions for improvement

During the interviews some suggestions were given by the participants, to improve the intervention (see Table 9). These are additional findings to our research.

Table 9. Suggestions for Improvement of the Intervention.

Suggestions	*n*	Example quote
Extend time period	4	*"... but it is fairly short to bring about a change. I think that you can here only create awareness and later on see… if it also had a real effect."*
Tailor/Personalize conversations	3	*"Please continue with it, see if you can extend a bit more, and take everyone's wishes into account."*
Make conversations more realistic	3	*"... or see if there are still some places where you can make the conversation function as realistic as possible. That's my feedback".*
Make it technically easy to use	2	*"It should be very simple to add it to your mobile phone, so you can start immediately. It should not be too complicated."*
Add reminders	1	*"And add something like reminders or so [...] because otherwise it is quickly forgotten."*
Improve answer options	1	*"Yes especially what I said with these choices [...] I think if you elaborate a bit more on this, it could be useful."*

First of all, four participants stated that it would have been better to extend the time period of this study. According to them the time period is too short to really accomplish behavior change. Another three participants suggested tailoring and personalizing the conversations to the users as much as possible, as is illustrated by one of the participants here: *"I would personalize it as much possible, make it even more personal"*. Furthermore, three participants made a suggestion to increase the humanness in the conversations as much as possible. Another suggestion for improvement made by two participants is that the intervention should be technically easy to use. Additionally, one participant mentioned that it would be good if the intervention included reminders, to increase the usage of the intervention. Lastly, one participant mentioned that it would be beneficial and useful if the answer options would be improved or extended.

3.4 Research question 3: What is the self-reported impact of the iThrive intervention on healthcare workers?

The self-reported impact of the intervention could be divided into three categories; (1) creating awareness, (2) changing thinking patterns and (3) taking different perspectives (see Table 10).

Table 10. Self-reported impact of the intervention. (n=12)

Themes & subthemes	*n*	Example Quote
Thinking patterns	7	
Self-reflection on own thoughts	5	*"Yes, I think it mostly gives insight in my self-reflection because of that."*
Turnaround thoughts	7	*"... then some sentences or texts came forward, and I thought, ah, that's actually turning around negative things so they become positive."*
Creating awareness	7	
Awareness of inner critics	6	*"I think the most useful thing was to be aware of what your own inner critics are […] Then you are confronted with the truth, and you think 'ah, those are the things that obstruct me and that come up over and over again."*
Inner critics influence Compassion	5	*"Yes, I think that when I am critical towards myself [...] I'm sometimes having a hard time accepting that you can't handle it… […] that you can't do it because it is too much […] Maybe I should then also think, you have so many things to take care of, it is not your fault."*
Taking different perspectives	5	
Look at a situation/thought from a different perspective	5	*"... then I think, 'oh I should look or think about that from a different perspective".*
Taking the other persons perspective	2	*"... your perspective is not always the only perspective. And you can also look at it in another way and someone else will always look at it in another way, because it is a different person."*

Thinking patterns

First of all, seven participants stated this intervention had an impact on their thinking patterns. Five of these seven participants talked about learning to turn around their "negative" or "unpleasant" thoughts into something more positive or motivating, illustrated by this quote from one participant: "*Yes, by all means converting your thinking patterns into something more positive or self-assured or something like that"*. Besides, there were also another five out of these seven participants that explained that the intervention encouraged them to reflect on themselves and to be more aware of their own thinking patterns: "*... awareness to pay attention to what you are doing and thinking and being more aware of your thoughts"*.

Creating awareness

According to seven participants this intervention had an impact on their awareness. Six of them reported that the intervention created awareness of the existence of the inner critics, as is stated by one participant in this quote: "*...at a certain point you get these three persons that you are, so to say, those personality traits, and that was mega confronting, but very true"*. Furthermore, five of the seven participants said to be more aware about the fact that their inner critics have an influence on their self-compassion, meaning that they learned about the

impact of the inner critic on self-compassion. For example: *"Yes, I think indeed, in any case, the, I think it was the punisher or so, [...] whereby you don't really have a lot of self-compassion, there is no space for that"*.

Taking different perspectives

The intervention also had an impact on the perspectives of the participants. There were five participants talking about the intervention supporting them to look at a situation or thought from another perspective. All five of them mentioned that the intervention helped them to look at a situation or thought from a different perspective, one of them saying: *"I often look at things from my own point of view, and that makes me feel threatened or annoyed, and now I think if I look at things in another way, I can also handle it differently"*. Another two of them also said that the intervention changed their attitude towards the perspective of the other person involved, as explained here: *"...what I do think now is that sometimes you should look at things from another perspective, with some people and what they say [...] to empathize with why the other person does or says something"*.

3.5 Research question 4: Is the intervention associated with changes in self-compassion and compassion fatigue in healthcare workers?

Compassion

Both, in the posttest as well as during the interviews participants were asked as a final question: 'Do you think that this study had an influence on your compassion?' In the posttest eight out of 12 participants said 'yes' this study had an influence on my compassion. However, in the interviews only two out of nine participants said 'yes' this study had an influence on my compassion. These results are in contrast with each other.

Overall seven participants said 'yes' because they said to be more aware of their own critical look and thoughts. Example quote: *"I am more aware of the critical look towards myself"*. Another two participants mentioned that they said 'yes' because they learned that you should not let things in your head, such as negative thoughts, hold you back. As illustrated here: *"Don't let things in your head hold you back, but just do it"*. Lastly, one participant said the following about the impact of this study on her compassion: *"I can empathize with others faster and more neutral"*.

The participants that said: 'no this study did not influence my compassion' gave different reasons. Four participants noted that they were already compassionate, so this study did not change that, as illustrated by one participant here: *"No, I think I was already very emphatic."*

Furthermore, three participants stated that an actual change did not occur, they only increased their awareness of the critical look they have towards themselves. One participant explained: *"No not really. Just the awareness that we are sometimes too critical towards ourselves"*. Finally, one participant claimed that other methods and homework exercises she knew from real-life coaching had more impact for her. So therefore this study did not have an impact on her compassion. She said: *"Other face-to-face methods and (homework) exercises that I know from life-coaching have more effect on me."*

Self-Compassion and Compassion fatigue

Table 11 shows the T0 and T1 scores on the subscales and the total score of the SCS and two subscales of the Pro-QoL. The paired t-test showed only minor and non-significant changes in Self-Compassion and Compassion Fatigue

Table 11. Mean Scores SCS and Pro-QoL at T0 and T1. Including: Self-Kindness, Common Humanity, Mindfulness, Burnout, Secondary Traumatic Stress and Total Score SCS. (n=12)

	T0		**T1**				**Paired t-test**	
	M	(SD)	M	(SD)	Mean Difference	95% CI	t (11)	*P-value*
SCS								
Self-Kindness	3.9	(0.8)	3.9	(0.9)	0.0	[-0.5 – 0.6]	0.1	0.90
Common Humanity	4.5	(0.7)	4.5	(0.8)	0.0	[-0.5 – 0.4]	-0.1	0.92
Mindfulness	4.4	(0.7)	4.3	(0.9)	-0.1	[-0.7 – 0.9]	0.3	0.75
Total Score	12.9	(2.0)	12.7	(2.2)	-0.2	[-1.4 – 1.7]	0.2	0.86
Pro-QoL								
Burnout	1.9	(0.4)	1.9	(0.9)	0.0	[-0.5 – 0.3]	-0.5	0.62
Secondary Traumatic Stress	1.8	(0.4)	2.0	(2.2)	0.2	[-0.6 – 0.2]	-1.2	0.27

Note. M= Mean, SD= Standard Deviation. The scale scores of SCS range from 1 to 7. The scale scores of the Pro-QoL range from 1 to 5. The higher the score, the higher the self-compassion and compassion fatigue.

4. DISCUSSION

This study aimed to examine the usage and appreciation of the iThrive intervention and its impact on self-compassion and compassion fatigue among healthcare workers. To our knowledge, the current study was one of the first once to examine the use of a chatbot as an e(mental) health intervention. Besides, this study also gives insight in the self-reported impact of the iThrive intervention on healthcare workers, and how this impact relates to the concepts of inner critics, self-compassion and compassion fatigue.

Usage of the iThrive intervention

Overall the usage rates of the intervention were satisfactory. The reported usage revealed that most participants did conduct all three conversations with the online iThrive chatbot. However, for the exercises a decrease in usage was visible over time (between the first and last exercise). Several reasons given by the participants for not completing the exercises were: time constraints, not feeling like doing it, overload of exercises and a lack of feedback from the researcher to motivate execution of the exercises. Some of these reasons for bad adherence are similar to what other studies revealed about the usage and adherence to online interventions, for instance: time constraints, lack of intrinsic motivation and low frequency of interaction with a counselor (Beatty & Binnion, 2016; Donkin & Glozier, 2012; Kelders, Kok, Ossebaard & Van Gemert-Pijnen, 2012). In addition, these studies also show factors that can stimulate adherence to online interventions, such as: increasing interaction with a counselor, more frequent updates and identifying the personal benefits of contributing to the intervention (Donkin & Glozier, 2012; Kelders, Kok, Ossebaard & Van Gemert-Pijnen, 2012). A possible recommendation for future research could therefore be to investigate how online web-based interventions could be improved using these factors. In this case, this might lead to higher usage rates to the iThrive intervention in general.

Appreciation of the iThrive intervention

Although chatbots are increasingly used in e(mental)health, relatively little empirical research is known, and much more knowledge is needed to know why, how, and under which conditions chatbots can be used in e(mental)health interventions. Our study revealed some strong points and weak points of the use of the iThrive intervention.

Firstly, the instructions and expectations of the study were clear to all participants. However, the technical installation of the chatbot was pointed out as difficult, which was either related to wrong Skype settings, a bad internet connection or the reason was unknown. Considering that technical issues were also the reason three participants in this study dropped out, it can be interpreted as a crucial point that needs improvement. A justification for the

technical issues in this study might be the chatbot still being a first version in development. However, other studies evaluating the user experience with chatbots, show similar technical issues (Fitzpatrick, Darcy & Vierhile, 2017). Hence, a recommendation in the development of chatbots in general would be to optimize the technical usability of the chatbot and make it as user-friendly as possible. The System Usability Scale by Brooke (1996) might be a useful instrument to test for usability in future research on chatbots.

Furthermore, the appreciation of the chatbot in particular revealed the following strong points: easy and clear to use, the use of predefined answer options, humor, similarity with real-life coaching, pleasant, smooth and fast interaction, original and hot concept and receiving tokens and compliments. These results are partly in accordance with other research on the evaluation of chatbots or conversational agents (Dybala, Ptaszynski, Higuchi, Rzepka & Araki, 2008; Veletsianos & Miller, 2008). For instance, the study by Dybala et al. (2008) found that humor does have a positive influence on the dialogue between humans and computers. Another study by Deci (1972) found that verbal reinforcements, such as compliments, enhance intrinsic motivation of participants. Unfortunately, the knowledge on the use of chatbots is still limited. Therefore further research on the pros and cons of the use of chatbots in general is desirable.

Another interesting finding is that most participants in this study indicated the personalization of the conversations as sufficient or good. This is positive, considering that personalization is found to be one of the most challenging features to implement in a chatbot (Kuligowska, 2015). In addition, the study by Donkin & Glozier (2012) found that ‘personalized intervention content’ can be a predictor of better adherence to web-based interventions. Therefore, a recommendation for future research would be to examine the factors that contribute to the personalization of a chatbot. This could be helpful to make personalization of chatbots a less challenging feature to implement.

Interestingly, predefined answer options were both seen as a strong point, as well as a weak point. Strong because it was fast and easy, moreover participants did not have to think about what to respond. This is in accordance with a patent on an active response feature that we found. According to this patent a simplified interaction, such as a “one-touch' response, can increase the ease-of-use of online communication platforms (U.S. Patent No. 7,619,584 B2). However, choosing between predefined answer options was also seen as a weak point by the healthcare workers in this study. Participants said that it restricted them in giving their own input and they had to choose answers that did not match with what they wanted to say. According to Fitzpatrick et al. (2017) this can impact the level of personalization and the sense of humaneness experienced in a chatbot. Hence, we can conclude that is important to find the right balance between ease-of-use and personalization and humanness when developing a chatbot. Future research might be conducted to examine what is the right balance between those two features and which factors contribute to that.

Furthermore, some other weak points of the chatbot reported by the participants were: no breaks allowed within a conversation, the chat style being overdone and it being too obvious that the chatbot was a robot. The latter refers to a lack of humanness of the chatbot that was observed by the participants for the following reasons: getting quick pre-programmed answers, technical issues during the conversation and it was not possible to have a human-like conversation with the chatbot. The lack of humanness is an issue that is often encountered when developing chatbots (Kowatsch, Volland, Shih, Rüegger, Künzler, Barata & l'Allemand, 2017; Poola, 2017). According to the study by AbuShawar & Atwell (2016) the perceived humanness and engagement of conversational agents, like the iThrive chatbot, can be increased when the chatbot provides responses based on the input of the participants. This is in line with the above mentioned findings on pre-defined answer options (Fitzpatrick et al., 2017). These findings should be taken into account in future development of chatbots, in order to increase the humanness and improve the user experience with chatbots.

Lastly, the evaluation of the exercises yielded that a lack of guidance and feedback had an influence on both the appreciation and the usage rates of the exercises. Beck, Rush, Shaw, and Emery (1979) complement this finding, by pointing out that reviewing exercises from previous coaching sessions (e.g. summarizing progress made or conclusions drawn from the exercises), is one of the four behaviors that can increase adherence to homework exercises. Therefore, we suggest to always build-in feedback or evaluation moments when interventions include homework exercises.

Impact of the iThrive intervention

To our knowledge only one previous study has used the concept of inner critics and self-compassion to tackle compassion fatigue in nurses (Beaumont et al., 2016). In contrary to the study by Beaumont et al (2016), the current study did not find any relation between self-compassion and compassion fatigue. Moreover, the quantitative results only revealed minor non-significant changes on self-compassion and compassion fatigue overtime. However, the qualitative results show that the iThrive intervention did have an impact on the self-compassion of some healthcare workers in this study. The intervention focused on two elements of self-compassion: (1) being kinder to the self and (2) facing ones own painful thoughts without exaggerating them, also called being more mindful (Neff, 2003). In the first place our results reveal that seven participants learned to face their own painful thoughts by creating awareness of their inner critic thoughts. This finding is in line with the results of the study by Stjernswärd and Hansson (2017), revealing that self-compassion exercises created a novel awareness of the inner critics among informal caregivers.

Secondly, seven participants said that due to the iThrive intervention they now reflect on their inner critic thoughts, and they learned to turn them into something more positive or

nuanced. The later relates to the element of self-compassion that involves being kinder to the self (Neff, 2003; Frederickson, 2001). This finding is in line with the study by Neff and Vonk (2009) who described that being more mindful involves shifting ones' attention away from negative thoughts. The above illustrates that the indicated self-reported impact of the iThrive intervention did made some changes to the self-compassion of the healthcare workers in this study. However, these results should be taken into account with caution, considering that they could not be corroborated by quantitative results. Therefore, future research on the impact of the iThrive intervention on self-compassion is desirable. Moreover, future research should focus on the relation between self-compassion and compassion fatigue, since this study did not find any significant results on that.

Promising is that the three above described changes: (1) awareness of the inner critics, (2) changes in thinking patterns and (3) taking different perspectives are the exactly what 'The Work' approach by Katie (2008) is trying to achieve. Therefore, it seems to be a suitable approach in the iThrive chatbot, to teach healthcare workers how to deal with their inner critic thoughts and to improve their self-compassion. This is partly in line with the results of the study by Smernoff et al (2015) who also found 'The Work' approach to be an effective meditation technique for improvement in the psychological state and quality of life of the general population. However, more research on the effect of 'The Work' approach on self-compassion is needed to draw reliable conclusions.

In contrast to 'The Work' approach, healthcare workers in this study indicated that the self-therapy approach by Chamine (2012) might not be that accurate in its results. At least half of the participants pointed out that they could not relate their thoughts to the top 3 inner critics that came forward in the test by Chamine (2012). A recommendation for future research would be to test the validity and reliability of the test by Chamine (2012), to decide whether it is an evidence-based approach to identify inner critics.

Lastly, we found that the SCS might not have been the most validate and reliable choice to measure self-compassion. Lopez et al. (2015) found that the suggested six factor structure proposed by Neff (2003a) could not be replicated, therefore the total score is not a good indicator for self-compassion (Lopez, Sanderman, Smink, Zhang, Van Sonderen, Ranchor & Schroevers, 2015; Williams, Dalgleish, Karl & Kuyken, 2014). The two factors that were found by Lopez et al. (2015) are positive items (self-kindness, common humanity and mindful) and negative items (self-judgement, isolation and over-identification), the positive ones relate to self-compassion and the negative ones relate to self-criticism. Hence, the implication for future research could be to use only the positive items as an indicator for self-compassion. Other options would be to either examine whether there are other self-compassion scales that are more reliable, or to develop your own scale to measure self-compassion.

4.1 Limitations

This study had some limitations that could have had an impact on the outcomes. First of all, the small sample size probably declares why only non-significant changes were measured. In addition, the small sample size makes it difficult to generalize the quantitative results on self-compassion and compassion fatigue (Faber & Fonseca, 2014). Furthermore, the fact that in general the healthcare workers that participated in this study, at baseline already had moderate to high levels of self-kindness, common humanity and mindfulness, and low levels of burn-out and secondary traumatic stress, implies that this might not have been the best sample for this study (Neff, 2009; Stamm, 2010). Another limitation is that the participants indicated that the time span might have been too short to measure significant effects on both self-compassion and compassion fatigue. A fourth limitation is the high drop-out rate, which was partly related to technical issues that could have been controlled for by using a more developed version of the iThrive chatbot, and partly due to the fact that healthcare workers were too busy to participate in the study. The later actually implies that the urgency for an intervention targeting stress in healthcare workers is high. A last limitation is that the results were coded and analyzed by only one coder, which makes it impossible to check whether the inter-coder reliability was good. This might led to biases in the analysis of the qualitative results.

4.2 Further research

This feasibility study has acquired a lot of information on the strong and weak points of the iThrive intervention. First of all, the results of the current study could be integrated in the iThrive intervention to improve its functionality. It could be valuable to include members of the target group in the development process of the iThrive intervention, to improve the efficiency and effectiveness of the intervention (Abras, Maloney-Krichmar & Preece, 2004). Furthermore, this study found some changes in the awareness, thinking patterns and perspectives of healthcare workers, which are related to the concept of inner critics and self-compassion. However, since the quantitative results only measured non-significant changes on self-compassion and compassion fatigue, more research on the effectiveness of the iThrive intervention on self-compassion is desirable. Moreover, future research is needed to determine the relationship between self-compassion and compassion fatigue. It would be beneficial to first integrate the findings of this study into a new version of the iThrive intervention. Thereafter, another pilot study including: a bigger sample, a suitable target group, a longer time span and a control group, could be conducted.

4.3 Conclusion

The current study found some pointers for further development of the iThrive intervention itself. Although participants generally appreciated the intervention, further research is needed to examine the effects of it on self-compassion and compassion fatigue. The reported impact of this study, such as awareness of inner critics, changes in thinking patterns and shifting perspectives, do indicate minor changes in self-compassion among healthcare workers. However, the impact of these changes on compassion fatigue is still unknown. Therefore improvements in the iThrive intervention need to be made and further research must demonstrate the real effects of the intervention on the concepts of self-compassion and compassion fatigue.

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Appendix A. 10 Types of inner critics by Chamine (2012).

1. Judge

The Judge is the master Saboteur, the one everyone suffers from. It compels you to constantly find faults with yourself, others, and your 29 conditions and circumstances. It generates much of your anxiety, stress, anger, disappointment, shame, and guilt. Its self-justifying lie is that without it, you or others would turn into lazy and unambitious beings who would not achieve much. Its voice is therefore often mistaken as a tough-love voice of reason rather than the destructive Saboteur it actually is.

2. Stickler

The Stickler is the need for perfection, order, and organization taken too far. It makes you and others around you anxious and uptight. It saps your own or others' energy on extra measures of perfection that are not necessary. It also causes you to live in constant frustration with yourself a n d others over things not being perfect enough. Its lie is that perfectionism is always good and that you don't pay a huge price for it.

3. Pleaser

The Pleaser compels you to try to gain acceptance and affection by helping, pleasing, rescuing, or flattering others constantly. It causes you to lose sight of your own needs and become resentful of others as a result. It also encourages others to become overly dependent on you. Its lie is that you are pleasing others because it is a good thing to do, denying that you are really trying to win affection and acceptance indirectly.

4. Hyper-Achiever

The Hyper-Achiever makes you dependent on constant performance and achievement for self-respect and self-validation. It keeps you focused mainly on external success rather than on internal criteria for happiness. 30 It often leads to unsustainable workaholic tendencies and causes you to fall out of touch with deeper emotional and relationship needs. Its lie is that your self-acceptance should be conditional on performance and external validation.

5. Victim

The Victim wants you to feel emotional and temperamental as a way of gaining attention and affection. It results in an extreme focus on internal feelings, particularly painful ones, and can often result in a martyr streak. The consequences are that you waste your mental and emotional energy, and others feel frustrated, helpless, or guilty that they can never make you happy for long. The Victim's lie is that assuming the victim or martyr persona is the best way to attract caring and attention for yourself.

6. Hyper-Rational

The Hyper-Rational involves an intense and exclusive focus on the rational processing of everything, including relationships. It causes you to be impatient with people's emotions and regard emotions as unworthy of much time or consideration. When under the influence of the Hyper-Rational, you can be perceived as cold, distant, or intellectually arrogant. It limits your depth and flexibility in relationships at work or in your personal life and intimidates less analytically minded people. Its lie is that the rational mind is the most important and helpful form of intelligence that you possess.

7. Hyper-Vigilant

The Hyper-Vigilant makes you feel intense and continuous anxiety about all the dangers surrounding you and what could go wrong. It is constantly vigilant and can never rest. It results in a great deal of ongoing stress that wears you and others down. Its lie is that the dangers around you are bigger than they actually are and that nonstop vigilance is the best way to tackle them.

8. Restless

The Restless is constantly in search of greater excitement in the next activity or through perpetual busyness. It doesn't allow you to feel much peace or contentment with your current activity. It gives you a never ending stream of distractions that make you lose your focus on the things and relationships that truly matter. Other people have a difficult time keeping up with the person ruled by The Restless and often feel distanced from him or her. Its lie is that by being so busy you are living life fully, but it ignores the fact that in pursuit of a full life you miss out on your life as it is happening.

9. Controller

The Controller runs on an anxiety-based need to take charge, control situations, and bend people's actions to one's own will. It generates high anxiety and impatience when that is not possible. In the Controller's worldview, you are either in control or out of control. While the Controller allows you to get short-term results, in the long run it generates resentment in others and prevents them from exercising and developing their own fullest capabilities. Its lie is that you need the Controller to generate the best results from the people around you.

10. Avoider

The Avoider focuses on the positive and the pleasant in an extreme way. It avoids difficult and unpleasant tasks and conflicts. It leads you to the habits of procrastination and conflict avoidance. It results in damaging eruptions in festering conflicts that have been sidestepped and causes delays in getting things done. Its lie is that you are being positive, not avoiding your problems.

APPENDIX B. Informed consent.

Toestemmingsverklaringformulier (informed consent)

Titel onderzoek:

……

Verantwoordelijke onderzoeker:

……

In te vullen door de deelnemer

Ik verklaar op een voor mij duidelijke wijze te zijn ingelicht over de aard, methode, doel en [indien aanwezig] de risico's en belasting van het onderzoek. Ik weet dat de gegevens en resultaten van het onderzoek alleen anoniem en vertrouwelijk aan derden bekend gemaakt zullen worden. Mijn vragen zijn naar tevredenheid beantwoord. [indien van toepassing] Ik begrijp dat film-, foto, en videomateriaal of bewerking daarvan uitsluitend voor analyse en/of wetenschappelijke presentaties zal worden gebruikt. Ik stem geheel vrijwillig in met deelname aan dit onderzoek. Ik behoud me daarbij het recht voor om op elk moment zonder opgaaf van redenen mijn deelname aan dit onderzoek te beëindigen.

Naam deelnemer: ……..
Datum: …… Handtekening deelnemer: …..…….....

In te vullen door de uitvoerende onderzoeker

Ik heb een mondelinge en schriftelijke toelichting gegeven op het onderzoek. Ik zal resterende vragen over het onderzoek naar vermogen beantwoorden. De deelnemer zal van een eventuele voortijdige beëindiging van deelname aan dit onderzoek geen nadelige gevolgen ondervinden.
Naam onderzoeker:……...
Datum: …… Handtekening onderzoeker: ...….....

Appendix C. Screenshots of the chatbot.

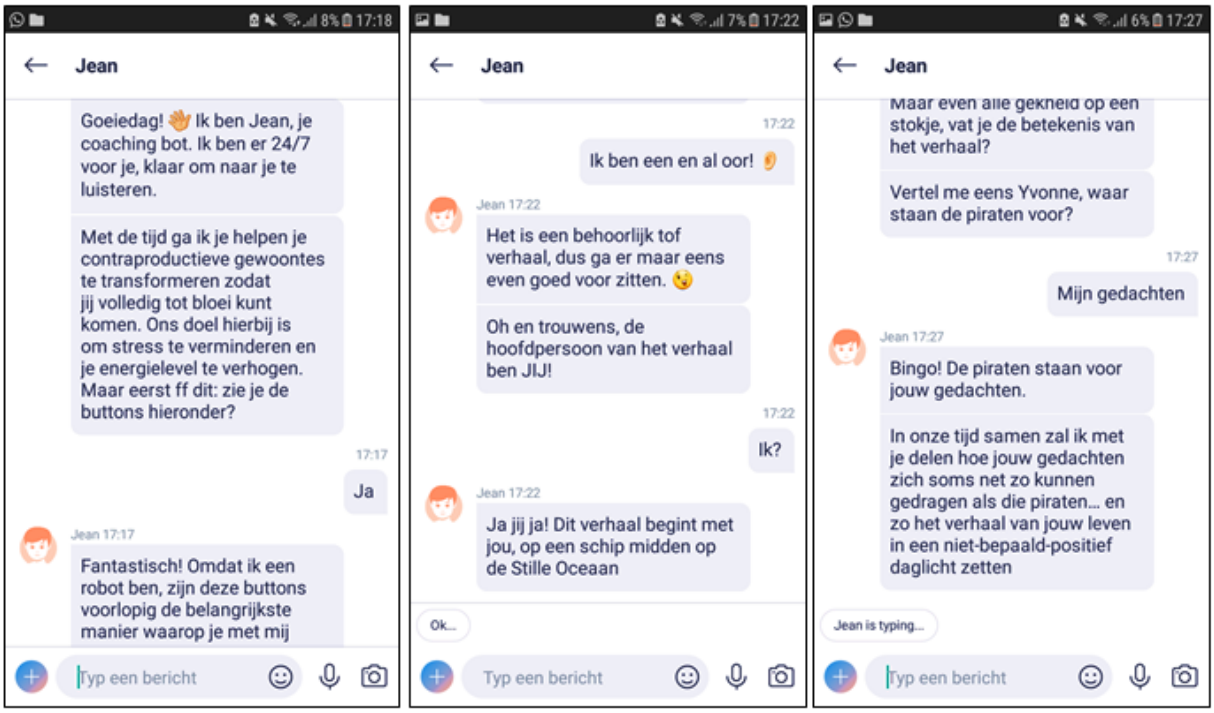

Figure 3. Conversation 1: creating awareness of the inner critic.

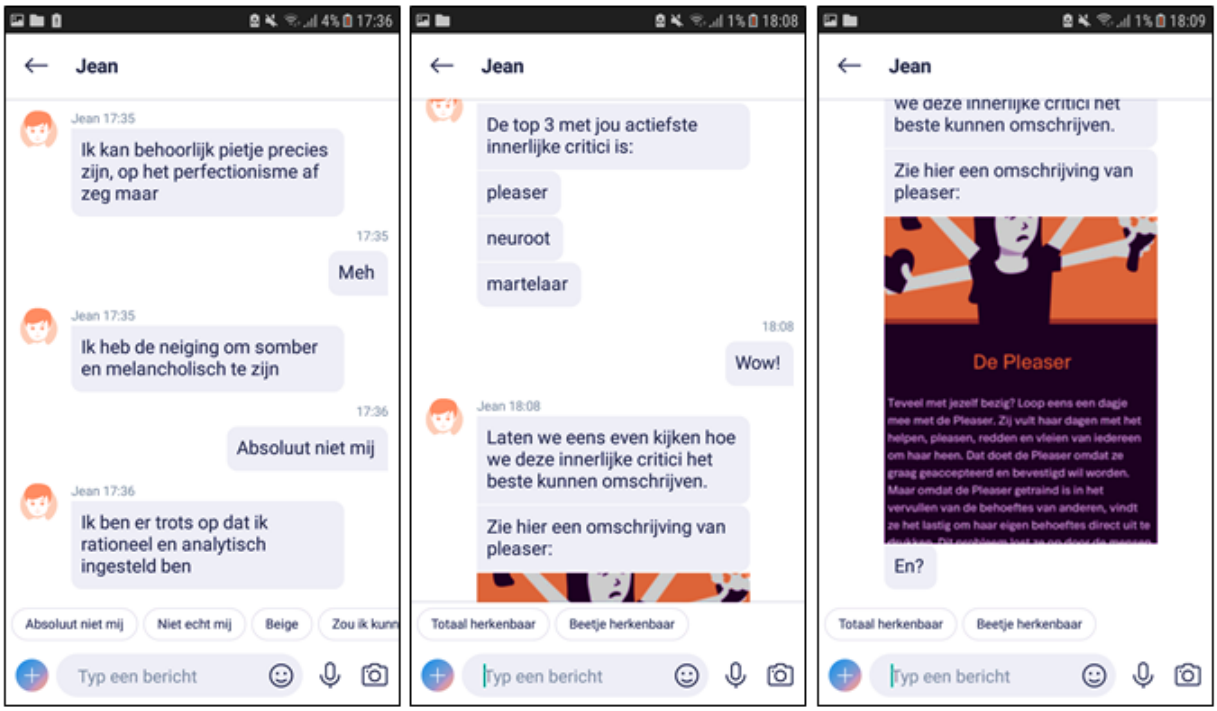

Figure 4. Conversation 2: identifying the inner critics using the test by Chamine (2012).

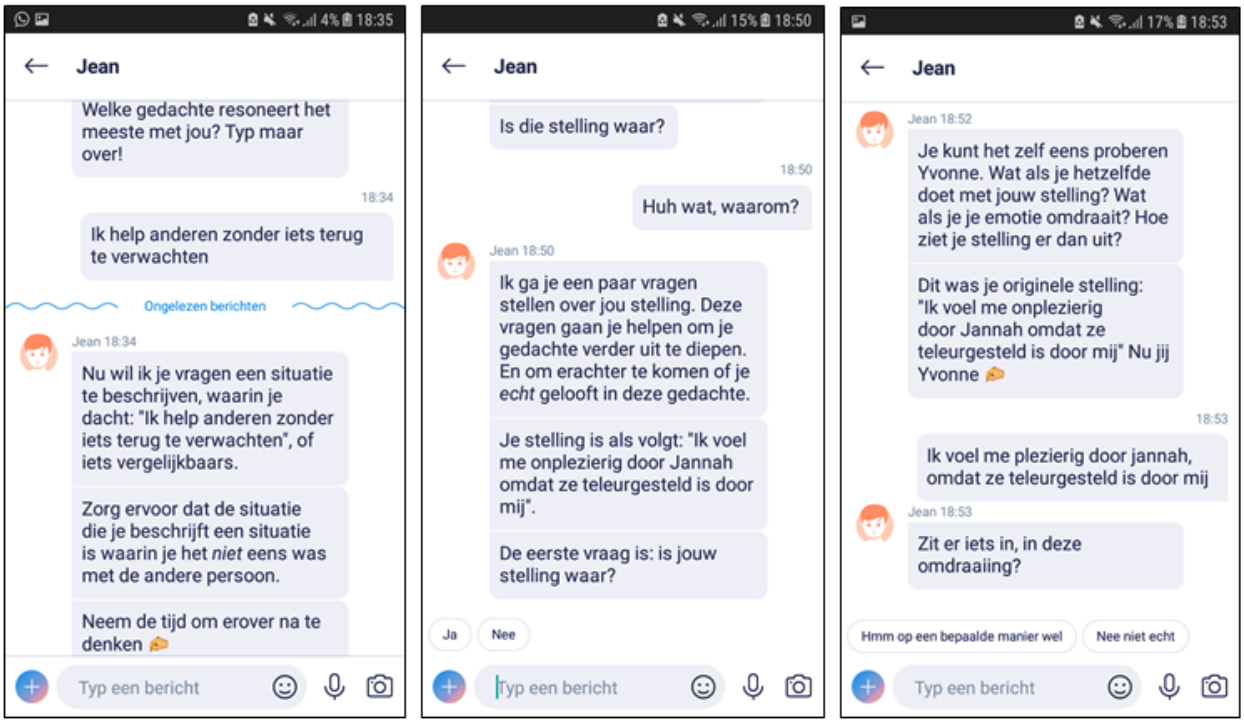

Figure 5. Conversation 3: working with the inner critics by using 'The Work' by Katie (2008).