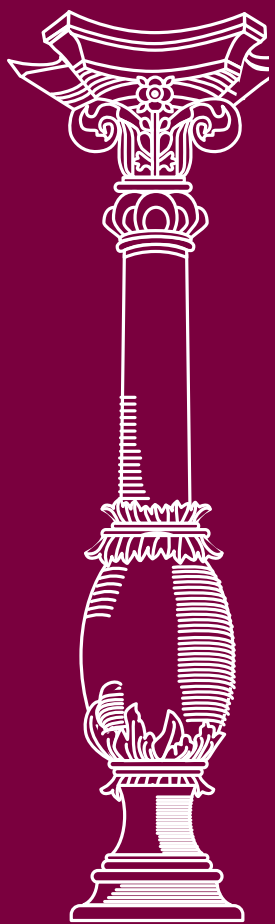
Vilnius University

The efficacy of mindfulness-based internet-delivered interventions in the context of stress and trauma



Austėja Dumarkaitė

DOCTORAL DISSERTATION
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Social Sciences
Psychology **S 006**

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Austėja Dumarkaitė

Dėmesingu įsisąmoninimu paremtų internetu teikiamų intervencijų veiksmingumas streso ir traumų kontekste

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ABBREVIATIONS

AjD - Adjustment disorder
APA - American Psychological Association
CBT - Cognitive behavior therapy
Complex PTSD - Complex posttraumatic stress disorder
CPT - Cognitive processing therapy
CT - Cognitive therapy
EMDR - Eye movement and desensitization therapy
GAD-7 - The Generalized Anxiety Disorder Scale-7
ICD-11 - 11th revision of the International Classification of Diseases
ISTSS - International Society for Traumatic Stress Studies
ITQ - The International Trauma Questionnaire
LEC-5 - The Life Events Checklist
MIOS - The Moral Injury Outcome Scale
PHQ-4 - The Patient Health Questionnaire-4
PHQ-9 - The Patient Health Questionnaire-9
PE - Prolonged exposure therapy
PGD - Prolonged grief disorder
PMH - The Positive Mental Health Scale
PSS-4 - The Perceived Stress Scale
PTSD - Posttraumatic stress disorder
REQ - The Recovery Experiences Questionnaire
RCT - Randomized controlled trial
WHO - World Health Organization
WHO-5 - The World Health Organization Well-being Index

CONTENTS

LIST OF PUBLISHED PAPERS

This doctoral dissertation is based on the following papers:

1. Jovarauskaite, L., **Dumarkaite, A.**, Truskauskaite-Kuneviciene, I., Jovaisiene, I., Andersson, G., Kazlauskas, E. (2021). Internet-based stress recovery intervention FOREST for healthcare staff amid COVID-19 pandemic: Study protocol for a randomized controlled trial. *Trials, 22, 559*. https://doi.org/10.1186/s13063-021-05512-1

2. **Dumarkaite, A.**, Truskauskaite, I., Andersson, G., Jovarauskaite, L., Jovaisiene, I., Nomeikaite, A., Kazlauskas, E. (2023). The efficacy of internet-based stress recovery intervention FOREST for nurses amid COVID-19 pandemic: Randomized controlled trial. *International Journal of Nursing Studies, 138, 104408.* https://doi.org/10.1016/j.ijnurstu.2022.104408

3. **Dumarkaite, A.**, Truskauskaite-Kuneviciene, I., Andersson, G., Mingaudaite, J., Kazlauskas, E. (2021). Effects of mindfulness-based internet intervention on ICD-11 posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A pilot randomized controlled trial. *Mindfulness, 12,* 2754–2766. https://doi.org/10.1007/s12671-021-01739-w

4. **Dumarkaite, A.**, Truskauskaite-Kuneviciene, I., Andersson, G., Kazlauskas, E. (2022). The effects of online mindfulness-based intervention on posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A randomized controlled trial with 3-month follow-up. *Frontiers in Psychiatry, 13, 799259*. https://doi.org/10.3389/fpsyt.2022.799259

PREFACE

Stressful experiences and traumatic life events, although can be reduced by various means, are inevitable in human life. In such a context, it is a wonderful achievement that we, mental health specialists, can provide support for those in need. During the past years, psychological interventions were developed and tested in many trials to provide people with the best possible evidence-based help. Related to that, we can offer specialized, high-quality interventions that help people live more fulfilling lives. However, there are questions without clear answers in the field, such as, are there alternative ways to help people who do not respond to the existing interventions well? What about more extreme cases - high levels of stress or complex traumatization? How are psychological interventions working when delivered remotely for these groups of people? How do people feel about receiving psychological interventions? Do we have enough evidence to offer specific interventions?

All these questions led to the development and exploration of psychological interventions in more depth. With a research group at the Center for Psychotraumatology, Vilnius University, in collaboration with the Department of Behavioural Sciences and Learning, Linköping University, we created and tested the efficacy of mindfulness-based internet-delivered interventions for those with high levels of stress and difficulties after traumatic experiences. We have chosen to explore mindfulness-based internet-delivered interventions since mindfulness in recent years has received attention as a promising alternative or complementary way to help people by training them to be more in touch with their experience, and internet-delivered interventions demonstrated that psychological support could be accessible even for those to whom it would be otherwise beyond reach. Although the number of studies in the field is growing, there are still many questions that require clarification, and research in this context is more than welcome.

I am lucky to have had such an exceptional experience developing and exploring psychological interventions for those with life difficulties. It is of great interest to me as a person, a clinical psychologist, and a researcher. I would not have done it without the help, consultations, and discussions with my great supervisors: prof. dr. Evaldas Kazlauskas, assoc. prof. dr. Inga Truskauskaitė, and prof. dr. Gerhard Andersson. I am very grateful to them for leading me all this way and sharing their expertise in a supportive and growing atmosphere. Also, I am glad that during all this time, I met and worked with bright and warm people, including colleagues, Ph.D. students, and master students involved in the projects. All the conversations were very enjoyable and fruitful. A very inspiring experience for me was meeting

researchers from around the world and exchanging views, ideas, and plans with them - it has broadened my perspective significantly, and I am very grateful for that.

Further, I present the work, which summarizes the studies planned and conducted during the last four years on the efficacy of mindfulness-based internet-delivered interventions in the context of stress and trauma.

1. INTRODUCTION

1.1. Stressors and stress reactions

In 2022, the World Health Organization (WHO) introduced the 11th revision of the International Classification of Diseases (ICD-11) and set a new milestone in the classification of mental disorders (Maercker & Eberle, 2022). In a new grouping of disorders specifically associated with stress, the ICD-11 distinguishes two related but separate categories: stressors and various stress reactions to these stressors. Disorders specifically associated with stress are directly related to exposure to a stressful or traumatic event or a series of such events or adverse experiences; however, not all individuals exposed to an identified stressor will develop a disorder (World Health Organization, 2022). Further, based on the ICD-11, we can view both stressful events and stress reactions to these events on a continuum: stressful events within a normal range of stressful life experiences (e.g., divorce, socio-economic problems) on the one end, and stressors of a highly threatening or horrific nature (i.e., the experience of rape or witnessing of a murder), which in extreme cases can be prolonged or repetitive, on the other end. These events may lead to different stress responses and mental disorders, such as adjustment disorder (AjD), prolonged grief disorder (PGD), posttraumatic stress disorder (PTSD), or complex posttraumatic stress disorder (complex PTSD).

As the ICD-11 (World Health Organization, 2022) indicates, PTSD may develop following exposure to an extremely threatening or horrific event or series of events. Such events include, but are not limited to, directly experiencing natural or human-made disasters, combat, serious accidents, torture, sexual violence, terrorism, assault or acute life-threatening illness; witnessing the threatened or actual injury or death of others in a sudden, unexpected, or violent manner; and learning about the sudden, unexpected or violent death of a loved one. Three core symptoms characterize PTSD (1) re-experiencing the traumatic event or events in the present in the form of vivid intrusive memories, flashbacks, or nightmares; (2) avoidance of thoughts and memories of the event or events, or avoidance of activities, situations, or people reminiscent of the event(s); and (3) persistent perceptions of heightened current threat, for example as indicated by hypervigilance or an enhanced startle reaction to stimuli such as unexpected noise. This formulation conceptualizes PTSD primarily as a conditioned fear response and the re-experiencing and avoidance symptoms are specifically tied to the traumatic event (Cloitre, 2020).

In addition to PTSD, a distinct diagnosis of complex PTSD was included in the ICD-11 to recognize the effect that chronic or repeated trauma can have on self-organization-related mechanisms (Maercker et al., 2022). In the mental health field, there have been debates, inspired by J. Herman (1992), that prolonged traumatization can lead to more complex sequelae than PTSD. Thus, the ICD-11 formulation and characterization of the two disorders follow from a long history of clinical observation that individuals who experienced chronic, repeated and prolonged traumas, such as childhood sexual abuse or domestic violence, tended to experience more complex reactions extending beyond those typically observed in PTSD (Cloitre, 2020). In ICD-11, complex PTSD is characterized by three core PTSD symptoms and three additional symptoms of severe and persistent (1) problems in affect regulation; (2) beliefs about oneself as diminished, defeated, or worthless; and (3) difficulties in sustaining relationships and in feeling close to others. These symptoms, as with PTSD, should persist for at least several weeks and cause significant impairment in personal, family, social, educational, occupational, or other important areas of functioning (World Health Organization, 2022). Further in the dissertation, I will use the term "posttraumatic stress disorders" when referring to PTSD and complex PTSD together.

Numerous studies reported that traumatic experiences and posttraumatic stress disorders are highly prevalent in the general population samples. A recent study conducted in the Lithuanian general population adult sample found 81.4% prevalence of life-time traumatic experience, and the prevalence of PTSD and complex PTSD was 5.8% and 1.8%, respectively (Kvedaraite et al., 2022). The prevalence of PTSD and complex PTSD in Lithuania, with some variations, is in line with data from other countries worldwide. E.g., the prevalence of PTSD and complex PTSD in Germany, Israel, and the United States vary from 1.5% to 9.0% (PTSD) and from 0.5% to 3.8% (complex PTSD) (Ben-Ezra et al., 2018; Cloitre et al., 2019; Maercker et al., 2018).

Research shows that some groups are more vulnerable to exposure to traumatic events and to develop posttraumatic stress disorders. For example, young adults tend to report higher rates of trauma exposure and the development of PTSD compared to older adults (Reynolds et al., 2016; Wittchen et al., 2011). In a study by Kvedaraite et al. (2020), 67.5% of undergraduate non-clinical sample students reported at least one lifetime potentially traumatic experience, and the prevalence of PTSD was 17.5%. In another recent study of young adults, the majority (77.2%) had been exposed to traumatic experiences; however, the prevalence of probable ICD-11 PTSD and complex PTSD was lower, 4.6% and 3.4%, respectively (Truskauskaite et al., 2023).

Of no less relevance is the experience of stressful life events; and similarly as with traumatic experiences, some groups are exposed to more stressors and experience higher stress levels, as compared with others. One such group is healthcare staff with heavy workload, long work hours, fatigue, emotional interactions, and cognitive demands, among others (Wallace et al., 2009). Healthcare staff reports higher levels of work-related stress and poorer mental health as compared to available norms (Cieri et al., 2019). The COVID-19 pandemic demanded even more physical and mental efforts; a significant number of healthcare workers experienced extremely acute stress or medium to high emotional load (Mira et al., 2020). Moreover, many reported mental health problems, including distress, anxiety, depression, fear, and burnout (Chow et al., 2020; Norkiene et al., 2021; Prasad et al., 2021). Additional COVID-19 pandemic-specific stressors comprised quarantines, heavy workload, the fear of infecting themselves and their family members, witnessing patients' poor and deteriorating conditions, and the requirement to wear protective gear (Chow et al., 2020). In addition, the presence of posttraumatic stress disorders among healthcare staff ranged between 7.4% and 35.0%, and it was more salient among women, nurses, frontline workers, and workers who experienced physical symptoms (Benfante et al., 2020; Marvaldi et al., 2021). Under such circumstances, almost half of the healthcare workers exhibited career change ideation related to higher stress, anxiety, depression, and lower well-being (Norkiene et al., 2021).

High levels of stress, and in particular posttraumatic stress disorders, have a profound impact on individuals and society’s functioning. Chronic stress affects cognition and increases vulnerability to various mental illnesses, among other issues (Marin et al., 2011; Habib et al., 2017). Regarding PTSD, it is important to note that it varies in severity and duration between individuals; however, chronicity, impairment, comorbidity, and somatization are significantly related to and can influence the course of PTSD and subsequent outcome (Breslau, 2001). In addition, individuals with PTSD experience severe stress, compounded by significant comorbid illness, which critically impacts the quality of life, resulting in serious functional and emotional impairment (Davidson, 2000). The impairment associated with PTSD is comparable to, or greater than, that of other seriously impairing mental disorders. The risk of suicide attempts is particularly high among people with PTSD (Kessler, 2000). Subsequently, there is a detrimental cost to society with high financial and social consequences from the significantly elevated rates of hospitalization, suicide attempts, and alcohol abuse (Davidson, 2000). Moreover, although treatments are reasonably efficacious, too many patients fail to respond optimally, and many more are not able to

access them, which results in major public health burden (Bryant, 2019). Studies evaluating functional impairment have reported that complex PTSD was associated with more severe impairment than PTSD, suggesting the greater symptom load represented in complex PTSD translated to greater difficulties in daily living (Brewin et al., 2017).

To sum up, stress reactions, including PTSD and a new diagnosis of complex PTSD, are highly prevalent, with some groups, such as healthcare staff and traumatized young adults, potentially being more vulnerable than others. The impact of these reactions can be severe both to individual and society's functioning. Therefore, timely and appropriate interventions targeted towards reduction of stress responses and posttraumatic stress disorders symptoms are critical.

1.2. Psychological interventions in the context of stress

Experience of life stressors and traumatic events is an inevitable part of human life. On the one hand, facing reality which makes it impossible to eliminate stressors exposure, people can learn how to manage stress. On the other hand, it is of great importance to ensure and provide psychological interventions for people who experience high levels of stress, including posttraumatic stress disorders. In modern psychosocial and healthcare services, reliance on evidence-based methods should be acknowledged as a golden standard when providing psychological interventions.

Numerous reviews and meta-analyses have revealed the efficacy of cognitive behavior therapy (CBT) for stress reduction and related outcomes. For example, CBT-based interventions for work-related stress are consistently shown to be effective (van der Klink et al., 2001; Richardson & Rothstein, 2008). According to Richardson & Rothstein (2008), these interventions are efficacious because they promote the development of proactive as well as reactive responses to stress; that is, they encourage individuals to take charge of their negative thoughts, feelings, and resulting behavior by changing their cognitions and emotions to more adaptive ones and by identifying and practicing more functional behavioral responses. Furthermore, in non-clinical samples, CBT-based interventions were superior to interventions based on other theoretical backgrounds, but only in groups with high levels of stress; in unselected populations, traditional CBT, third-wave CBT, and mind-body interventions were equally efficacious (Amanvermez et al., 2021).

Multiple effective psychological therapies for PTSD have been developed and evaluated in research over the last several decades (Bisson & Olff, 2021). These effective treatments for PTSD include cognitive behavioral therapy

(CBT), cognitive processing therapy (CPT), cognitive therapy (CT), prolonged exposure therapy (PE), eye movement and desensitization therapy (EMDR) (Cusack et al., 2016; Kline et al., 2018; Lewis et al., 2020a). Typically, these are the recommended treatments included in the guidelines of internationally-recognized organizations, such as the American Psychological Association (APA, 2017) and the International Society for Traumatic Stress Studies (ISTSS, 2018). Empirically supported PTSD treatments (usually referred to as trauma-focused treatments) have a lot in common; in one or another way, all of them include psychoeducation on trauma and posttraumatic stress, emotion regulation and coping skills training, imaginal exposure, cognitive processing, restructuring, and/or meaning making, focus on emotions and memory processes (Schnyder et al., 2015). However, a substantial proportion of indivduals with PTSD continue to experience symptoms after trauma-focused therapies (Bradley et al., 2005). Moreover, high dropout rates associated with trauma-focused PTSD treatments reduce effectiveness of such therapies (Lewis et al., 2020b).

Given that complex PTSD is a newly defined condition in ICD-11 diagnostic classification, there is a lack of knowledge on the best treatment approaches, as research in this field is scarce. It has been proposed by experts in the field that therapies developed for PTSD are suitable in the context of complex and multiple trauma (Murray et al., 2022); however, evidence shows fewer benefits for individuals who are likely to have complex PTSD (Karatzias & Cloitre, 2019). Since complex PTSD is comprised of a greater number and diversity of symptoms and is associated with greater impairment, its treatment may require a greater number of interventions or a longer course of therapy (Cloitre, 2020). It has been suggested that a phased approach, which starts with stabilization techniques helping trauma survivors to deal with affect regulation symptoms, or multi-component treatments, where the components are selected and ordered flexibly according to the salient symptoms and problems of a particular patient, should be applied in the complex PTSD treatment (Brewin, 2020; Maercker et al., 2022). Based on a recent review (Willis et al., 2023), a phase-orientated treatment approach was proposed to achieve the largest improvement in trauma symptoms. However, alternative approaches such as using EMDR targeting traumatic memories in treatment for complex PTSD without phased approach has been suggested with promising results as well (Bongaerts et al., 2022; van Vliet et al., 2021). In addition, opponents strongly propose that complex PTSD treatment guidelines (suggesting to start with stabilization techniques) were developed based on studies without a clear definition of complex PTSD and have serious methodological limitations (De Jongh et al., 2016).

In summary, there are available evidence-based interventions for stress and posttraumatic stress disorders. However, not all people respond to the existing treatments succesfully, and there is a lack of evidence from research on interventions targeting complex PTSD symptoms. Therefore, intervention alternatives should be considered to meet the needs of people with high levels of stress and posttraumatic stress disorders. As having the potential to reduce stress levels and treat various mental health problems, including PTSD, mindfulness-based interventions have recently received attention.

1.3. Mindfulness-based interventions in the context of stress

Mindfulness is most frequently described as the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to unfolding experience moment by moment (Kabat-Zinn, 2003). However, mindfulness is no exception among complex constructs in psychology with considerable disagreement about definitions (Van Dam et al., 2018). Quite a few theoretical models of mindfulness have been proposed, which aim to explain mental processes and mechanisms that might facilitate insight and adaptive personal change (Van Dam et al., 2018). On the other hand, even if different schools of thought emphasize specific characteristics of mindfulness more than others, they overlap and are mutually supportive, so they should not be regarded as entirely distinct (Brown et al., 2007).

The concept of mindfulness is most firmly rooted in the Buddhist tradition. However, it shares conceptually similar ideas with various philosophical and psychological traditions (including ancient Greek philosophy; phenomenology, existentialism, and naturalism in later Western culture; transcendentalism and humanism in America), referring to this mode of being as central to the human experience (Brown et al., 2007). Major leaders in psychotherapy have also discussed this concept, but the general integration of mindfulness practices into evidence-based psychotherapy started around the 1970s (Bach et al., 2015). This happened mainly due to the development and widespread application of standardized protocols, which integrate the essence of traditional mindfulness practice with contemporary psychological practice to improve psychological functioning and well-being (Gu et al., 2015). Currently, mindfulness is usually seen as one of the methods within a group of so-called third-wave CBT. According to Hayes & Hofmann (2021), third-wave methods come from both traditionally behaviorally (focus on overt action) and cognitively (focus on cognitive content) oriented treatments, but all concentrate on the person's relationship to her/his own experience.

In this dissertation, I have chosen a theoretical model of mindfulness proposed by Shapiro et al. (2006) as the comprehensive model applicable in the context of stress. Shapiro and colleagues (2006) provided a model with three separate core components of mindfulness: intention ("on purpose"), attention ("paying attention"), and attitude ("in a particular way"). The model suggests that intentionally attending with openness and non-judgmentalness leads to a significant shift in perspective, which can be termed reperceiving. Reperceiving is a meta-mechanism of action, which overarches additional direct mechanisms that lead to change and positive outcome (Shapiro et al., 2006).

In the context of PTSD, a more specific model summarizing the mechanisms by which mindfulness-based approaches may target PTSD symptom clusters has been proposed (Boyd et al., 2018). It is suggested that PTSD intrusion symptoms in mindfulness interventions are targeted through shifting attention to the present moment and reduced attentional bias to trauma stimuli, avoidance - through increased openness to experience and willingness to approach fearful stimuli, alterations in arousal and reactivity - through reduced attentional bias to trauma stimuli and greater ability to remain in the present moment (Boyd et al., 2018). The benefit of mindfulness is also highlighted in reducing alterations in mood and cognition and also reducing dissociative symptoms which may be a part of complex PTSD. The former is hypothesized to be targeted via nonjudgmental acceptance of trauma-related cognitions, and the latter - through connection and awareness of somatic sensations and enduring aversive internal experiences (Boyd et al., 2018).

In empirical studies, it has been reported that mindfulness-based stress reduction programs may help a broad range of individuals to cope with their clinical and nonclinical problems (Grossman et al., 2004). When it comes to stress, evidence supports that mindfulness-based interventions can reduce stress levels (Chiesa & Serretti, 2009) and yield positive changes in both psychological and physiological outcomes related to stress and anxiety (Sharma & Rush, 2014) in healthy individuals. In addition, mindfulness-based interventions can be beneficial and significantly reduce stress in non-clinical populations exposed to high stressor load, such as healthcare workers (Burton et al., 2017; Ramachandran et al., 2023; Wexler & Schellinger, 2023). Moreover, there is a significant association between practicing mindfulness at home as an extent of formal practice and positive intervention outcomes for a wide range of people (Parsons et al., 2017). Thus, there is an existing base of evidence in favor of mindfulness-based interventions for stress reduction; however, significant methodological limitations in most of these studies have been debated, including the lack of randomized controlled design and small

sample sizes, among other issues (Burton et al., 2017; Chiesa & Serretti, 2009; Ramachandran et al., 2023; Sharma & Rush, 2014; Wexler & Schellinger, 2023).

Empirical evidence in clinical and subclinical samples also supports the notion that mindfulness-based interventions may reduce PTSD symptoms in various populations (Colgan et al., 2016; Jasbi et al., 2018; Possemato et al., 2016; Valenstein-Mah et al., 2019). Moreover, mindfulness-based treatments may reduce comorbid symptoms of depression and anxiety (Jasbi et al., 2018), and improve positive mental health aspects, such as resilience (Reyes et al., 2020) following traumatic experiences. Additionally, mindfulness-based therapies have the potential to regulate the affect (Guendelman et al., 2017), improve self-concept (Crescentini & Capurso, 2015), and interpersonal relationships (Karremans et al., 2017). Each of these constitutes complex PTSD disturbances in self-organization symptoms and, therefore, indicates that mindfulness have a potential to reduce ICD-11 complex PTSD symptoms. However, to the best of my knowledge, no existing studies have yet explored mindfulness's effects on a newly included in ICD-11 diagnosis of complex PTSD. Moreover, even if lately there is a growing number of studies demonstrating the positive effects of mindfulness in reducing PTSD symptoms (Liu et al., 2022; Zhu et al., 2022), further high-quality studies are needed on mindfulness for PTSD to increase confidence in its effectiveness (Zhang et al., 2021).

In addition, the existing evidence often reveals only the short-term effects of mindfulness-based treatments for PTSD at post-intervention (Colgan et al., 2016; Jasbi et al., 2018; Joss et al., 2020). However, little is known about whether these effects tend to last after the intervention is over. Only a few studies have conducted follow-ups of mindfulness-based interventions for PTSD, and the results suggest that effects tend to remain from one to five months after the intervention (Grupe et al., 2019; Müller-Engelmann et al., 2017, 2019; Murray-Swank et al., 2020; Possemato et al., 2016). However, most existing evidence is based on single-group studies or small study samples, and not randomized controlled trials (RCT).

To conclude, mindfulness-based interventions have some empirical evidence demonstrating the effects on stress and PTSD. However, the existing evidence has relevant methodological limitations that need to be considered. In addition, there is a lack of studies that explored mindfulness's effects on a new diagnosis of complex PTSD, which potentially could be a viable option.

1.4. Internet-delivered interventions in the context of stress

Remarkable progress has been made in developing and assessing the efficacy of various psychological interventions for a broad range of psychological difficulties and mental disorders. However, essential barriers stand in the way of people seeking or receiving psychological support, such as an insufficient number of trained professionals, travelling to the location of a qualified therapist constraints, and stigma, among others (Kazdin, 2017). In the specific context of providing health care for people exposed to traumatic experiences, additional challenges can be identified. Among these are an acknowledgment of survivors, avoidance and trauma disclosure, limited resources, and ongoing conflicts and disasters (Kazlauskas, 2017). Considering the millions of people directly affected by trauma, the limited success in providing the majority of them with efficacious treatments is resulting in a major public health burden (Bryant, 2019). Given the barriers to providing and receiving psychological support, internet-delivered interventions can be a potentially good solution.

Internet-delivered interventions, although there are a multitude of terms to define these interventions, such as e-therapy, online intervention, and teletherapy, among many others (Smoktunowicz et al., 2020) refer to interventions that are adapted to be delivered and used via a device with an internet access, such as mobile phone, computer, or tablet. There are numerous versions of internet-delivered interventions, but all require software platforms to deliver and manage the intervention (Andersson et al., 2019b). Such platforms are used to upload and deliver to clients assessment instruments, intervention materials, and technology to facilitate interactions between a clinician and a client (Vlaescu et al., 2016). Internet-delivered interventions can be based on various theoretical approaches, be of different lenghts, and be delivered as therapist guided or self-help interventions, and therapist support may range from active synchronious to optional support upon request, among other variations.

The field of internet-delivered interventions over the last 20 years (Andersson, 2018) accumulated a robust evidence supporting efficacy of internet-delivered interventions for various mental health conditions. A narrative umbrella review of meta-analyses examining the effects of internet-delivered interventions for different mental health outcomes suggested that internet-delivered CBT could be effective for a range of mental health problems, including panic disorder, social anxiety disorder, generalized anxiety disorder, PTSD, and major depression (Andersson et al., 2019a). A recent meta-analysis revealed the efficacy of internet-delivered interventions based on psychodynamic treatment models as well (Lindegaard et al., 2020).

Moreover, increasing evidence shows that internet-delivered interventions can be as effective as face-to-face therapies (Carlbring et al., 2018; Hedman-Lagerlöf et al., 2023). Furthermore, the outbreak of the COVID-19 pandemic shed new light on it (Wind et al., 2020) by showing the importance of the possibility of using technology for remote delivery of psychological interventions when other ways are not possible, e.g., in times of pandemic.

For conditions specifically associated with stress, web- and computer-based stress-management interventions can be effective similarly to depression and anxiety, and effects for stress interventions are maintained for six months (Heber et al., 2017). Heber et al. (2017) also concluded that interventions using the third-wave CBT and CBT approach as a theoretical basis yielded larger effect sizes as compared to alternative interventions (i.e., exercise break, career identity training for stress management). Similar findings were provided in other studies as well. Even though the number of studies published in the past decade is limited, results from a meta-analysis indicate that CBT delivered via the internet can effectively reduce self-rated perceived stress, anxiety, and depression with effects on perceived stress that are stable over time in samples suffering from elevated perceived stress and stress-related disorders (Svärdman et al., 2022). Also, promising findings regarding internet-delivered interventions among healthcare staff were recently presented (López-Del-Hoyo et al., 2023).

The knowledge about the effects of mindfulness-based internet-delivered interventions for stress reduction is limited from research; however, the field is evolving and the numbers of studies are growing. Preliminary findings reveal that mindfulness-based internet-delivered interventions have positive outcomes on various mental health indicators, particularly stress (Spijkerman et al., 2016). A recent meta-analysis yielded similar findings, showing that mindfulness-based internet-delivered interventions reduce stress levels in the general population (Zhang et al., 2020). Substantial stress reduction were also found after using preventive mindfulness-based internet-delivered interventions in non-clinical populations from various settings, including academic, workplace, or community (Jayewardene et al., 2017). Recent systematic reviews and meta-analyses also indicated promising findings (Alrashdi et al., 2023; Chen et al., 2023; Yeun & Kim, 2022). Thus, mindfulness-based internet-delivered interventions can be a promising approach, especially in busy, hard-to-reach, but digitally-accessible populations (Jayewardene et al., 2017). However, further investigation into whether the effect of internet-delivered interventions is generalizable also to individuals with specific stressors exposure or psychosocial circumstances is of importance (Svärdman et al., 2022). Moreover, the existing evidence due

to various methodological shortcomings needs to be confirmed by further findings (Jayewardene et al., 2017; Spijkerman et al., 2016; Yeun & Kim, 2022).

Internet-delivered interventions for PTSD were found to be superior to the waiting list (Olthuis et al., 2016) or active controls (Steubl et al., 2021), and a recent study showed non-inferiority to face-to-face intervention (Bisson et al., 2022). However, while beneficial effects of internet-delivered CBT for PTSD are constantly found, the certainty of the evidence is very low due to the small number of included trials (Simon et al., 2021), suggesting the need for further work in this field. Regarding mindfulness-based internet-delivered interventions in traumatized samples, initial findings are promising (Davis et al., 2023; Sabri et al., 2021); however, there is very little evidence. In addition, to the best of my knowledge, there were no available empirical RCT studies published which reported outcomes of internet-delivered interventions based on CBT and mindfulness for reducing PTSD and complex PTSD symptoms based on ICD-11 criteria. With the recent inclusion of complex PTSD in the ICD-11, empirical evidence about the efficacy of various treatment approaches is needed to seek the best treatments for these disorders for clinical practice.

In summary, internet-delivered interventions could be of great value given the existing barriers to providing and receiving psychological interventions. A growing base of evidence supports internet-delivered interventions for stress and PTSD. However, there is a lack of knowledge on mindfulness-based internet-delivered interventions in specific samples with elevated stress levels and posttraumatic stress disorders, and certainty of the existing evidence is low.

1.5. Novelty and knowledge gap

Given what is already known about mindfulness-based internet-delivered interventions for stress and posttraumatic stress disorders, there are still significant knowledge gaps that require more research in the field. First, there is little evidence of specifically mindfulness-based internet-delivered interventions in the context of high levels of stress, especially in professional groups that are routinely exposed to high levels of occupational stress, such as healthcare staff. In such groups, more studies are needed to test the outcomes of mindfulness-based internet-delivered interventions on mental health, including new skills acquisition to recover from stress. Second, significant recent renewals in definitions of disorders specifically associated with stress were made in the ICD-11, with a new diagnosis of complex PTSD added. Inevitably, it requires research to broaden the perspectives of the best treatment options for posttraumatic stress disorders, particularly complex PTSD. More studies are needed to assess whether mindfulness-based internet-delivered interventions can be efficacious for reducing disturbing symptoms of posttraumatic stress disorders. Third, current research on mindfulness-based interventions, both face-to-face and internet-delivered, for stress and posttraumatic stress disorders often has methodological concerns, such as non-randomized controlled trials, small sample sizes, and lack of follow-up measures to test long-term effects, among other issues. More RCTs conducted following modern international standards are needed to test the outcomes of internet-delivered interventions, particularly mindfulness-based interventions.

Equally important is the implementation of the discussed psychological interventions since research in this field provides answers to scientific questions which may be translated into clinical practice. Considering that many people experiencing a high level of stress and posttraumatic stress disorders do not benefit from existing evidence-based interventions, mindfulness-based interventions could widen the scope of psychological support. In the modern world, the possibility of delivering and getting psychological interventions remotely using the internet could significantly contribute to reducing the existing psychological support barriers.

1.6. Aim of the dissertation

The aim of my dissertation research was to develop and explore the efficacy of two mindfulness-based internet-delivered interventions in two separate adult samples experiencing high levels of stress and posttraumatic stress disorders symptoms. More specifically, I aimed to assess the efficacy of the interventions on various psychological outcomes, including stress, PTSD and complex PTSD symptoms, symptoms of depression and anxiety, and positive aspects of mental health, among other outcomes, immediately after the intervention and three months after the intervention in the samples of healthcare staff and young adults with PTSD and complex PTSD symptoms.

This doctoral dissertation is based on two studies (including four papers) and addresses the following research questions.

Research questions

1. How efficacious is a mindfulness-based internet-delivered intervention for healthcare staff exposed to high levels of stress on stress recovery and mental health? (Study I - Paper 2)

2. How efficacious is a mindfulness-based internet-delivered intervention for traumatized young adults on ICD-11 PTSD and complex PTSD-specific symptoms and mental health? (Study II - Papers 3-4)

3. How do healthcare staff and traumatized young adults evaluate mindfulness-based internet-delivered interventions? (Studies I-II - Papers 2-3)

2. METHOD

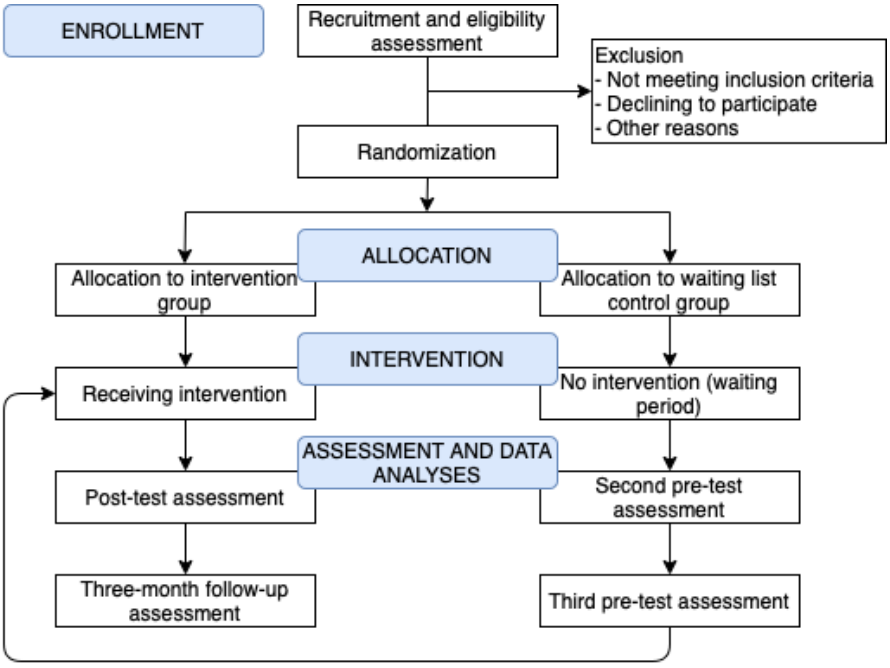
This doctoral dissertation is based on the data from two studies (four published papers). Both of these studies were conducted at the Center for Psychotraumatology, Institute of Psychology, Vilnius University, Lithuania, in collaboration with the Department of Behavioural Sciences and Learning, Linköping University, Sweden. The author of the dissertation was a lead researcher in both of these studies, and participated in the processes of conceptualization, development of the content of the internet-delivered interventions, investigation, data curation and analysis, research papers preparation, and is the first author in three of the published papers. Since both studies included applied science activities, such as delivery of internet-based interventions for participants, the author also served in a role of clinical psychologist and clinical supervisor in both studies.

2.1. Design of empirical studies

Randomized controlled trial design comparing the intervention group with a waiting list control group was used in empirical studies on which this dissertation is based on. Both studies were registered at www.clinicaltrials.gov (reference number for Study I - NCT04817995 and Study II - NCT04333667) prior to the start of the studies. In both studies, the data from randomized controlled trials were reported following the CONSORT statement for reporting parallel group trials (Schulz et al., 2011).

Participants were recruited via disseminating information about the ongoing studies, participants‘ eligibility was evaluated based on inclusion/exclusion criteria discussed and selected before the beginning of the studies, and randomized allocation to two groups (intervention or control) was completed. All data were collected online via a secure platform Iterapi (Vlaescu et al., 2016), at three time-points: pre-test, post-test, and three-month follow-up. In Study I, data was collected in April 2021 (pre-test), June-July 2021 (post-test), and September-October 2021 (three-month follow-up). In Study II, data was collected in March-April 2020 (pre-test), June-July 2020 (post-test), and September-October 2020 (three-month follow-up). Participants, who were allocated to the intervention group, started using the intervention immediately after randomization. In contrast, participants assigned to the waiting list control group started using intervention five to six months after randomization. A flowchart of the design (randomized controlled trial) used in the studies is presented in Figure 1. All the demographic data reported were collected during the pre-test phase.

Figure 1. *Flowchart of the design (randomized controlled trial) used in the studies*



2.2. Interventions

In the following section, a description of the interventions used in the studies of the dissertation is provided. Both interventions were developed by a group of clinical psychologists and researchers experienced in stress-related disorders and internet interventions at the Center for Psychotraumatology, Institute of Psychology, Vilnius University, in collaboration with the Department of Behavioural Sciences and Learning, Linköping University. The leading developer of both interventions was the author of this dissertation. Both interventions are mindfulness-based. They are internet-delivered, last for six to eight weeks, and trained psychologists are involved in these interventions. Interventions were delivered via a secure internet intervention platform Iterapi, where each intervention has its own individual website, URL address, and layout, all data communication takes place via encrypted protocols, and two-factor authentication is used during all entries onto the platform, among other functionalities that ensure security (Vlaescu et al., 2016). The platform had been used in Lithuania previously (Biliunaite et al., 2021).

Intervention in Study I. In Study I, an intervention entitled FOREST (For Recovery from Stress) was used. The intervention was developed specifically for healthcare staff as an adjusted version of a previously used program for distressed employees (Asplund et al., 2021). It was modified significantly: it was adapted to the Lithuanian context, the structure, length, and content were modified to meet the needs of healthcare staff, and additional exercises were added (mindfulness-based audio recordings among them), or unnecessary ones were removed.

FOREST is a psychologist-guided six-week mindfulness-based internet-delivered intervention. It is comprised of six modules: Introduction, Detachment (relaxation and sleep), Distancing, Mastery (challenge), Control, and Keeping the change alive. All the modules include three main elements: psychoeducation (via texts and video recordings), two or three exercises (written and audio recordings), and a reminder of the opportunity to text a psychologist. Each module was opened to the participants on the same weekday every week, and once opened, they remained open till the end of the intervention. Also, short reminders were sent to the participants who had yet to open the new module or had yet to complete exercises in the new module.

The psychologist's role included providing feedback to participants when they completed exercises and answering their additional personal messages. All the communication between psychologists and participants was organized via text messages within the platform; in addition, two brief telephone calls were made (in the middle and at the end of the intervention) to encourage participation and ask about experiences of using the intervention. The feedback was structured according to the guidelines developed specifically for the intervention, but personalized responses were also encouraged to correspond to the particular cases. Eight clinical psychologists and master students in the clinical psychology program were involved as psychologists in Study I. They received special training before the study. Weekly supervisions were organized to discuss the cases, and supervisions on demand were organized as well.

Intervention in Study II. In Study II, an intervention entitled Still Me was used. Still Me was developed specifically for young adults who had been exposed to traumatic event or events during their life and, as a consequence, experienced PTSD or complex PTSD symptoms. It was designed as a self-help intervention with a psychologist's support on demand. Participants used the intervention themselves - read the psychoeducation and carried out the exercises - and could also contact a psychologist via text messaging on the intervention platform. The psychologist's role included answering

participants' messages according to the guidelines developed for the study. The communication between psychologists and participants was organized via text messages within the platform and one brief telephone call was made at the end of the intervention to ask about experiences of using the intervention. Three psychologists (two clinical psychologists and one master's student in the clinical psychology program) were involved in the study. Besides answering participants, weekly meetings were scheduled to discuss the cases. Also, meetings on demand were held during the intervention time.

Still Me is an eight-week duration intervention, and it is comprised of eight modules: Introduction, Awareness and nonjudgment of physical senses, Physical senses in everyday life, Awareness and nonjudgment of thoughts, Thoughts in everyday life, Awareness and nonjudgment of emotions, Emotions in everyday life, and Summary. All the modules include psychoeducation (via written texts) and mindfulness-based exercises (delivered as audio recordings). The intervention explicitly focuses on posttraumatic stress, its effect on a person's life, and the benefits of practicing mindfulness in such a context. Each module opened every week on the same day and remained open till the end of the intervention. Weekly reminders were sent to participants as well to encourage their participation in the intervention.

2.3. Participants and procedures

Participants and procedures in Study I. Invitations to participate in the study were disseminated via medical nurses' social networks, various healthcare institutions, and press releases throughout the country. Interested in participation nurses registered for the study, gave informed consent and filled in the pre-test questionnaires. Nurses who fully completed pre-test questionnaires were contacted via telephone for a short structured interview, after which their eligibility for the study was finalized. To be included in the current study, participants had to be working (in a healthcare setting) medical nurses, at least 18 years old, understand Lithuanian and have a device with an internet connection. The exclusion criteria were a currently experienced acute psychiatric crisis, high suicide risk, alcohol or drug addiction, and interpersonal violence.

Overall, 208 interested individuals registered for the study. After excluding 24 of them, 184 participants were randomized to either the intervention (n = 93) or waiting list control (n = 91) group. Of these, 16 participants from the intervention group were excluded from the study because of declining to participate or never logged in to the intervention platform. Thus, 168 participants participated in the study: 77 in the intervention group and 91 in

the waiting list control group. All of these participants completed the pre-test questionnaires, and participants from the intervention group logged in to the intervention at least once. Most of the participants were female (97.0%) with a mean age of *M* (*SD*) = 42.12 (11.38). More than half of the participants worked more than full-time (56.9%) and had work experience of more than ten years (64.9%). No differences were observed in demographic characteristics and main measures between the intervention and waiting list control groups and between the retained and dropped out participants.

Participants and procedures in Study II. Information about the study was disseminated to all the students of Vilnius University through their academic e-mails. Also, an invitation to participate was posted on Vilnius University's Facebook and on separate Facebook pages of different university faculties. Students' Representation sent additional invitations via e-mails. After registering and providing informed consent, interested students filled in pre-test questionnaires. Those who fully completed the pre-test questionnaires were contacted by telephone for a brief structured interview to finalize their eligibility to participate in the study.

The predefined inclusion criteria were: age (at least 18 years), language (fluent in Lithuanian), access to a device with an internet connection, traumatic experience (at least one traumatic event during a lifetime) and clinically significant PTSD, complex PTSD, or complex PTSD-specific disturbances in self-organization only with or without functional impairment. Exclusion criteria included current acute psychiatric crisis, currently experienced interpersonal violence, and current abuse of alcohol or drugs.

Overall, 125 interested individuals registered for the study. After excluding 43 of them, 82 participants were randomized to either the intervention (n = 41) or waiting list control (n = 41) group. Of these, 12 participants were excluded from the study because of declining to participate or not providing post-test assessment. Thus, from the pre-test to post-test (Paper 3), 70 individuals participated in the study: 31 in the intervention group and 39 in the waiting list control group. All of these participants completed the pre-test and post-test questionnaires, and participants from the intervention group logged in to the intervention at least once. Most of the participants were female (87.1%) with a mean age of *M* (*SD*) = 23.34 (3.11). The most prevalent traumatic event were severe human suffering (over 70%) and childhood physical abuse (over 50%). Most prevalent index trauma as reported by participants themselves were death of someone close (25.8% vs. 17.9%), sexual trauma (16.1% vs. 12.8%), and physical abuse (12.9% vs. 20.5%).

From the pre-test to the three-month follow-up (Paper 4), 53 participants participated in the study: 17 in the intervention group and 36 in the waiting list control group. All of these participants fully completed pre-test, post-test, and three-month follow-up questionnaires, and participants from the intervention group logged in to the intervention at least once. Most of the participants were female (84.9%) with a mean age of *M* (*SD*) = 23.21 (2.81).

In both samples (Papers 3-4), no differences were observed in demographic characteristics and main measures between the intervention and waiting list control group, except for gender (there were significantly more male participants in the intervention group). Also, no differences were observed in demographic characteristics and main measures between the retained and dropped out participants.

2.4. Measures

Further is provided a description of the measures used in both studies of the dissertation. A summary of the measures used is also provided in Table 1.

Table 1. *Measures used in Study I (Paper 2) and Study II (Papers 3-4)*

Measure	**Study I**	**Study II**	
	Paper 2	**Paper 3**	**Paper 4**
The Perceived Stress Scale (PSS-4)	✓		
The Recovery Experiences Questionnaire (REQ)	✓		
The Patient Health Questionnaire-4 (PHQ-4)	✓		
The Patient Health Questionnaire-9 (PHQ-9)		✓	
The Generalized Anxiety Disorder Scale-7 (GAD-7)		✓	
The World Health Organization Well-being Index (WHO-5)	✓		
The Positive Mental Health Scale (PMH)		✓	
The Life Events Checklist (LEC-5)		✓	✓
The International Trauma Questionnaire (ITQ)	✓	✓	✓
The Moral Injury Outcome Scale (MIOS)	✓		
User satisfaction and program usability	✓	✓	

Perceived stress (Paper 2). The Perceived Stress Scale (PSS-4; Cohen et al., 1983) was used to measure the changes in self-reported stress. The PSS-4 is comprised of four questions (e.g., "In the last month, how often have you felt that you were unable to control the important things in your life?"); each question is ranked on a 5-point Likert scale ranging from 0 "never" to 4 "very often". The total score of the PSS-4 ranges from 0 to 16, with a higher score indicating a more pronounced perceived stress. In Paper 2, Cronbach's alpha for the PSS-4 at pre-test was $\alpha = 0.73$.

Stress recovery (Paper 2). The Recovery Experiences Questionnaire (REQ; Sonnentag & Fritz, 2007) was used to measure the changes in self-reported stress recovery. The REQ is comprised of four subscales with four items on each subscale (total of 16 items): (1) psychological detachment (e.g., "I forget about work"), (2) relaxation (e.g., "I kick back and relax"), (3) mastery (e.g., "I learn new things"), and control (e.g., "I feel like I can decide for myself what to do"). Each item is ranked on a 5-point Likert scale ranging from 1 "totally disagree" to 5 "totally agree". The total score of the REQ ranges from 16 to 80 (from 4 to 20 for each subscale), with a higher score indicating a more pronounced stress recovery. In Paper 2, Cronbach's alpha for the total REQ at pre-test was $\alpha = 0.89$. Cronbach's alpha for each subscale was as follows: psychological detachment ($\alpha = 0.83$), relaxation ($\alpha = 0.85$), mastery ($\alpha = 0.78$), and control ($\alpha = 0.82$).

Depression and anxiety symptoms (Papers 2-3). The Patient Health Questionnaire-4 (PHQ-4; Kroenke et al., 2009) was used to measure the changes in self-reported depression and anxiety symptoms. The PHQ-4 is comprised of two subscales with two items on each subscale (total of four items): (1) depression symptoms (e.g., "Little interest or pleasure in doing things") and anxiety symptoms (e.g., "Feeling nervous, anxious or on edge"). Each item is ranked on a 4-point Likert scale ranging from 0 "not at all" to 3 "nearly every day". The total score of the PHQ-4 ranges from 0 to 12 (from 0 to 6 for each subscale), with a higher score indicating more pronounced depression and anxiety symptoms. In Paper 2, Cronbach's alpha for the PHQ-4 at pre-test was $\alpha = 0.88$.

The Patient Health Questionnaire-9 (PHQ-9; Kroenke et al., 2001) was used to measure the changes in self-reported depression symptoms. The PHQ-9 is comprised of nine items (e.g., "Little interest or pleasure in doing things"); each question is ranked on a 4-point Likert scale ranging from 0 "not at all" to 3 "nearly every day". The total score of the PHQ-9 ranges from 0 to 27,

with a higher score indicating more pronounced depression symptoms. In Paper 3, Cronbach's alpha for the PHQ-9 at pre-test was $\alpha = 0.80$.

The Generalized Anxiety Disorder Scale-7 (GAD-7; Spitzer et al., 2006) was used to measure the changes in self-reported anxiety symptoms. The GAD-7 is comprised of seven items (e.g., "Feeling nervous, anxious or on edge"); each question is ranked on a 4-point Likert scale ranging from 0 "not at all" to 3 "nearly every day". The total score of the GAD-7 ranges from 0 to 21, with a higher score indicating more pronounced anxiety symptoms. In Paper 3, Cronbach's alpha for the GAD-7 at pre-test was $\alpha = 0.90$.

Psychological well-being (Paper 2). The World Health Organization Well-being Index (WHO-5; Bech, 2004) was used to measure the changes in self-reported psychological well-being. The WHO-5 is comprised of five items (e.g., "I have felt cheerful and in good spirits"); each question is ranked on a 6-point Likert scale ranging from 0 "at no time" to 5 "all the time". The total score of the WHO-5 ranges from 0 to 25, with a higher score indicating more pronounced psychological well-being. In Paper 2, Cronbach's alpha for the WHO-5 at pre-test was $\alpha = 0.89$.

Positive mental health (Paper 3). The Positive Mental Health Scale (PMH; Lukat et al., 2016) was used to measure the changes in self-reported positive mental health. The PMH is comprised of nine items (e.g., "I am often carefree and in good spirits"); each question is ranked on a 4-point Likert scale ranging from 0 "do not agree" to 3 "agree". The total score of the PMH ranges from 0 to 27, with a higher score indicating more pronounced positive mental health. In Paper 3, Cronbach's alpha for the PMH at pre-test was $\alpha = 0.84$.

Trauma exposure (Papers 3-4). The Life Events Checklist (LEC-5; Weathers et al., 2013) was used to assess lifetime exposure to various traumatic experiences. The LEC-5 is comprised of 18 different traumatic events, including accidents, physical assault, sexual assault, life-threatening danger, sudden deaths, and other events, with one additional item assessing any other extremely stressful life event. Each traumatic event is assessed with five possible options: 1 "happened to me", 2 "witnessed it", 3 "learned about it", 4 "not sure", and 5 "doesn't apply". Exposure to the traumatic event was considered if participants reported that the traumatic event happened to them or they witnessed it. The Lithuanian version of the LEC-5 has been used previously (Kazlauskas et al., 2018).

Symptoms of PTSD and complex PTSD (Papers 2-4). The International Trauma Questionnaire (ITQ; Cloitre et al., 2018) was used to measure the changes in self-reported PTSD and complex PTSD symptoms. The ITQ responses were collected only from participants who reported exposure to a potentially traumatic event or events; participants had to indicate the event that affected them the most and respond to the ITQ regarding the event reported. The ITQ is comprised of two subscales with nine items on each subscale: PTSD subscale (six items, two for assessment of each of three symptom clusters: re-experiencing, avoidance, and sense of threat, e.g., "Having upsetting dreams that replay part of the experience or are clearly related to the experience", and three additional items measuring functional impairment in social, work, and other important life areas) and complex PTSD-specific disturbances in self-organization subscale (six items, two for assessment of each of three symptom clusters: affective dysregulation, negative self-concept, and disturbances in relationships, e.g., "When I am upset, it takes me a long time to calm down", and three additional items measuring functional impairment in social, work, and other important life areas). Each item is ranked on a 5-point Likert scale ranging from 0 "not at all" to 4 "extremely". The total score of the ITQ without additional functional impairment items ranges from 0 to 48 (from 0 to 24 for each subscale), with a higher score indicating more pronounced PTSD and complex PTSD-specific disturbances in self-organization symptoms. In Paper 2, Cronbach's alpha for the ITQ at pre-test was $\alpha = 0.86$. Cronbach's alpha for the PTSD subscale was $\alpha = 0.86$, and for disturbances in the self-organization subscale - $\alpha = 0.83$. In Paper 3, Cronbach's alpha for the ITQ at pre-test was $\alpha = 0.82$. Cronbach's alpha for the PTSD subscale was $\alpha = 0.75$, and for the disturbances in self-organization subscale - $\alpha = 0.68$. In Paper 4, Cronbach's alpha for the ITQ at pre-test was $\alpha = 0.70$. Cronbach's alpha for the PTSD subscale was $\alpha = 0.73$, and for the disturbances in self-organization subscale - $\alpha = 0.75$.

In Study II, not only a dimensional but also a categorical approach was used. A score of ≥ 2 for at least one of the two items representing particular PTSD and the disturbances in self-organization symptom cluster indicates clinical significance (Cloitre et al., 2018). A risk for PTSD diagnosis is given if all three PTSD symptoms are clinically significant and if they significantly impair functioning in at least one area. A risk for complex PTSD diagnosis is given if all three PTSD symptoms are clinically significant, all three disturbances in self-organization symptoms are clinically significant, and disturbances in self-organization symptoms significantly impair functioning in at least one area.

Moral injury (Paper 2). The Moral Injury Outcome Scale (MIOS; Litz et al., 2020) was used to measure the changes in self-reported moral injury. The MIOS responses were collected only from participants who reported exposure to potentially morally injuring event or events as measured with the moral injury events exposure screening. The MIOS is comprised of 14 items (e.g., "I have lost faith in humanity"); each question is ranked on a 5-point Likert scale ranging from 0 "strongly disagree" to 4 "strongly agree". The total score of the MIOS ranges from 0 to 56, with a higher score indicating more pronounced moral injury. In Paper 2, Cronbach's alpha for the MIOS at pre-test was $\alpha = 0.89$.

User satisfaction and program usability (Papers 2-3). Additional items were used to measure user satisfaction and program usability. Participants were asked to evaluate how useful (from 1 "not useful at all" to 5 "very useful"), satisfactory (from 1 "I did not like it at all" to 5 "I liked it a lot"), and easy to use (from 1 "it was not easy at all" to 5 "it was very easy") the program for them had been. Also, participants were asked to report their impression regarding the improvement of their mental well-being (from 1 "worsened a lot" to 5 "improved a lot"), physical health (from 1 "worsened a lot" to 5 "improved a lot"), general understanding of oneself and one's well-being (from 1 "not at all" to 5 "definitely improved"), and recommending the program to others (from 1 "not at all" to 5 "definitely would recommend").

2.5. Data analyses

Study I. To estimate intervention effects, the latent change modeling approach (Duncan et al., 2006) was used. The latent change analyses were performed with Mplus 8.2 (Muthén & Muthén, 2017). No data imputation was applied. The full information maximum likelihood (FIML) estimator was used in latent change analyses for handling the missing data. Also, within-group and between-group effect sizes were calculated, following the correct effect size calculation recommendations for latent change models (Feingold, 2009).

Study II. A series of multivariate repeated measures ANOVAs with time (pre-test and post-test in Paper 3, and pre-test, post-test, and follow-up in Paper 4) as a within-subject factor and group (intervention vs. control) as a between-subject factor were performed with IBM SPSS Statistics version 26. Also, within-group and between-group effect sizes were calculated.

2.6. Research ethics

All procedures in Study I and Study II were consistent with the ethical standards. Vilnius University Psychology Research Ethics Committee approved both studies (reference number for Study I - 2021-03-22/61 and Study II - 27-02-2020/36). All participants were informed about the aims and procedures of the studies, with the possibility to ask for any additional information of interest. Also, participants gave informed consent for participation in the studies prior to filling out the pre-test questionnaires. Data were collected using a secure online platform (Vlaescu et al., 2016), which had been used in Lithuania previously (Biliunaite et al., 2021). Participants were given anonymous identifying numbers, and access to all the participants' data was restricted to researchers directly involved in the studies through a secure login with two-step authentication. Data was kept confidential, and it was impossible to identify any individual in public papers or presentations. Participants could refuse to participate in the studies at any time with the removal of all the data collected.

Since the samples of Study I and Study II consisted of help-seeking participants, the researchers of the study were ready to refer participants to acute or specialized mental health care if it was necessary or if participants asked for additional support. The contacts were forwarded to the participants either via e-mail or telephone call. The same procedure was applied to those individuals who registered for the studies but were not included due to failing to meet inclusion or meeting exclusion criteria.

3. RESULTS

The following section presents the main results found in both studies of the dissertation.

3.1. Principal findings from Study I

The between-group effect sizes showed a large intervention effect on the increase of psychological detachment (*d* [95% CI] = 0.83 [0.52; 1.15]) and relaxation (*d* [95% CI] = 0.93 [0.61; 1.25]), a moderate intervention effect on the increase of mastery (*d* [95% CI] = 0.64 [0.33; 0.95]), and a small intervention effect on the increase of control (*d* [95% CI] = 0.46 [0.15; 0.76]) from pre-test to post-test; a large intervention effect on the increase of psychological detachment (*d* [95% CI] = 0.90 [0.58; 1.22]) and a moderate intervention effect on the increase of relaxation (*d* [95% CI] = 0.67 [0.36; 0.98]) and mastery (*d* [95% CI] = 0.56 [0.25; 0.87]) from pre-test to follow-up.

The between-group effect sizes showed a moderate intervention effect on the increase of psychological well-being (*d* [95% CI] = 0.53 [0.23; 0.84]) and a small intervention effect on the decrease of perceived stress (*d* [95% CI] = -0.49 [-0.80; -0.18]), anxiety (*d* [95% CI] = -0.31 [-0.62; -0.01]) and depression (*d* [95% CI] = -0.49 [-0.80; -0.18]) symptoms from pre-test to post-test; a moderate intervention effect on the decrease of perceived stress (*d* [95% CI] = -0.79 [-1.10; -0.47]) and a small intervention effect on the decrease of depression symptoms (*d* [95% CI] = -0.33 [-0.64; -0.03]) and increase of psychological well-being (*d* [95% CI] = 0.49 [0.18; 0.80]) from pre-test to follow-up.

More than half of the participants from both the intervention group and waiting list control group (66.2% and 76.9%, respectively) reported having experienced at least one traumatic event during lifetime. Change of PTSD and complex PTSD-specific disturbances in self-organization symptoms was assessed in these samples. No between-group effects were found. Similarly, more than half of the participants from both groups reported having experienced event or events that may lead to moral injury (in the intervention group: 63.6%; in the waiting list control group: 51.6%). Change of moral injury was assessed in these samples. No between-group effects were found.

3.2. Principal findings from Study II

No between-group effects were found on PTSD and its separate symptom clusters, except for sense of threat symptom cluster (*d* [95% CI] = -0.48 [-0.96; -0.01]), from pre-test to post-test. The between-group effect sizes showed a small intervention effect on the decrease of complex PTSD-specific disturbances in self-organization symptoms (*d* [95% CI] = -0.48 [-0.96; 0.00]) and moderate intervention effect on the decrease of its two separate symptom clusters - negative self-concept (*d* [95% CI] = -0.72 [-1.21; -0.24]) and disturbances in relationships (*d* [95% CI] = -0.55 [-1.03; -0.07]) from pre-test to post-test. Also, the between-group effect sizes showed a moderate intervention effect on the increase of the positive mental health (*d* [95% CI] = 0.51 [0.03; 0.99]) from pre-test to post-test.

No between-group effects were found on PTSD and its separate symptom clusters from pre-test to follow-up. The between-group effect sizes showed a large intervention effect on the decrease of complex PTSD-specific disturbances in self-organization symptoms (*d* [95% CI] = -0.84 [-1.44; -0.24]) and moderate to large intervention effect on the decrease of its two separate symptom clusters - negative self-concept (*d* [95% CI] = -0.66 [-1.25; -0.07]) and disturbances in relationships (*d* [95% CI] = -0.87 [-1.47; -0.27]) from pre-test to follow-up.

3.3. Usability of the interventions

Usability of the intervention in Study I. Most participants from the intervention group who logged in to the intervention at least once and completed post-test questionnaires (*n* = 61) reported that the intervention had been useful (83.6%), satisfactory (86.9%), and easy to use (91.8%); also, as reported by a great part of participants, it had improved mental well-being (73.8%), physical health (45.9%), and general understanding of themselves (60.7%). Most of the participants (88.5%) would recommend the intervention to others.

Usability of the intervention in Study II. Most participants from the intervention group who completed post-test questionnaires (*n* = 31) reported that the intervention had been useful (80.7%), satisfactory (83.9%), and easy to use (93.6%); also, as reported by more than a half participants, it had improved mental well-being (61.3%) and general understanding of themselves (64.6%). A great part of the participants (77.5%) would recommend the intervention to others.

4. DISCUSSION

In this dissertation, based on the two studies, I aimed to develop and explore the effects of mindfulness-based internet-delivered interventions in two separate adult samples experiencing high levels of stress and the symptoms of ICD-11 posttraumatic stress disorders. I also aimed to assess the usability of the interventions among their users. We found promising interventions effects indicating that mindfulness-based internet-delivered interventions can be efficacious on mental health of people experiencing high levels of stress or complex PTSD symptoms. In a non-clinical sample of medical nurses experiencing high levels of stress, a mindfulness-based internet-delivered intervention fostered stress recovery skills, including psychological detachment, relaxation, mastery, and control. Most of the effects remained stable three months after the intervention. Moreover, the intervention was efficacious in reducing its users' stress, depression, and anxiety symptoms as well as increasing psychological well-being with stable decreased stress and depression symptoms as well as improved psychological well-being over three months after the intervention. Regarding the young adults experiencing PTSD and complex PTSD symptoms, the mindfulness-based internet-delivered intervention reduced complex PTSD-specific disturbances in self-organization symptoms, more specifically, symptoms of negative self-concept and disturbances in relationships which remained reduced three months after the intervention. In addition, the intervention also had positive effects on its users' positive mental health. Finally, we found that users of both interventions were satisfied with the programs and assessed them as helpful and easy-to-use tools for a better understanding of themselves and their condition.

4.1. Interventions effects on stress and posttraumatic stress disorders symptoms

Studies findings revealed that using a six-to-eight-week mindfulness-based internet-delivered intervention can be beneficial for both non-clinical and subclinical samples in enhancing stress recovery skills and reducing complex PTSD symptoms. The results of the dissertation indicate that mindfulness-based internet-deliverd intervention targeted at stress recovery was beneficial in improving healthcare staff's skills of disengaging from work both physically and mentally, taking time for relaxation, getting involved in challenging experiences that distract from work and learning opportunities in other domains, as well as for deciding which activities to pursue during leisure

time as well as when and how to do that. Although I have not found other studies that explored the aquisition of stress recovery skills while using the mindfulness-based intervention in healthcare staff, our results can indirectly be compared to studies that evaluated the effects of mindfulness on other mental health outcomes. In that sense, our findings are in line with the results from previous research studies. We should be aware of methodological limitations, including the lack of randomized controlled design and small sample sizes, reported in relation to various mindfulness-based stress reduction interventions; however, the existing evidence shows that these interventions have the potential to improve mental health among healthy persons, including individuals exposed to more stressors, such as healthcare staff (Burton et al., 2017; Chiesa & Serretti, 2009; Ramachandran et al., 2023; Sharma & Rush, 2014; Wexler & Schellinger, 2023). Our findings expand the field, demonstrating that not only various symptoms can be reduced or mental health improved after using a mindfulness-based intervention, but also important skills that could potentially lead to better mental health acquired.

Regarding young adults with PTSD and complex PTSD symptoms, they reported positive changes in negative self-concept, meaning that beliefs about oneself as diminished, defeated, and worthless were reduced. At the same time, feelings of shame, guilt, and failure, which commonly accompany negative beliefs about oneself, were reduced after using the intervention. Also, trauma-exposed young adults seemed to encounter fewer difficulties sustaining relationships and feeling close to others after using an eight-week mindfulness-based internet-delivered intervention. Although research is still scarce in exploring mindfulness effects on a new diagnosis of complex PTSD, previous studies revealed that mindfulness is related to better self-concept (Crescentini & Capurso, 2015) and relationships (Karremans et al., 2017). Thus, our study confirms the earlier findings in a randomized controlled trial with a subclinical sample of traumatized young adults. Our results revealing that mindfulness-based internet-delivered intervention was beneficial in improving self-concept is extremely important in light of the fact that self-concept is a central aspect of complex PTSD (Karatzias & Cloitre, 2019). According to these experts in the field, identification of the most significant symptoms of the disorder can, potentially, mark the most important treatment targets.

However, young adults with PTSD or complex PTSD symptoms did not improve regarding their PTSD core symptoms, such as avoidance or re-experiencing, after the intervention. PTSD core symptom changes in our sample were not in line with the other studies on mindfulness-based interventions for PTSD. We did not find significant changes in overall PTSD

symptoms in our study, except for the sense of threat symptoms, which did not remain reduced after three months. Previous randomized controlled trials provided promising initial findings that various PTSD-experiencing samples could benefit from mindfulness-based PTSD interventions (Colgan et al., 2016; Jasbi et al., 2018; Valenstein-Mah et al., 2019). Also, two recent meta-analyses demonstrated positive results (Liu et al., 2022; Zhu et al., 2022). Furthermore, our findings differ from recent studies on internet-delivered mindfulness-based interventions for PTSD which demonstrated positive effects on PTSD symptoms reduction (Davis et al., 2023; Reyes et al., 2020). Inconsistent findings are of great interest; they might be related to different classifications used to assess PTSD symptoms, differences in mindfulness practices, and methodologies used. We have used the ICD-11, a new version of one of two broadly used classifications; and one of the main challenges in the PTSD field is the fact that we have two official definitions of the disorder that are somewhat different (Bryant, 2019). Similarly, there is considerable disagreement about the definition of mindfulness (Van Dam et al., 2018). Therefore, there is a possibility that due to these factors inconsistent findings of the so-called same interventions for the same outcomes are obtained. Moreover, we have used a randomized controlled trial design as opposed to a pre-post design often used in earlier studies. Nevertheless, I believe that the best treatments for PTSD are trauma-focused PTSD therapies that explicitly address previous traumatic experiences and traumatic memories. It is continuously confirmed across research studies (Cusack et al., 2016; Kline et al., 2018; Lewis et al., 2020a) and is recommended by internationally recognized mental health organizations (APA, 2017; ISTSS, 2018). In contrast, mindfulness-based therapies focus on the present; thus, traumatic experiences might be avoided during the mindfulness intervention process, and therefore no treatment effects on PTSD core symptoms may occur. However, our study revealed promising findings on potential of mindfulness-based intervention on complex PTSD-specific symptoms. Therefore, mindfulness could be considered as part of the modular treatment for complex PTSD (Karatzias & Cloitre, 2019).

It is important to note that most of the skills gained or reduced symptoms remained stable three months following the intervention. All stress recovery skills remained stable several months later, except for the control. It may be that control skill is the most difficult to acquire compared to psychological detachment, relaxation, and mastery skills. Also, all the information and exercises regarding control were presented in the intervention's last and single module. In contrast, other components were introduced earlier and were reminded in further modules. Therefore, the acquisition of the control skill

could be related to its insufficient representation, especially considering that the last modules were used less by its users compared to the first modules. Concerning young adults with complex PTSD symptoms, they could still feel more positive about themselves, and their relationships with others remained more satisfactory three months after the intervention. Among healthy people, including healthcare professionals, conclusions regarding the long-term impact of mindfulness-based interventions on stress and other symptoms cannot be drawn with confidence due to the high variability in the follow-up period, various results obtained, or the lack of reliable data (Burton et al., 2017; Chiesa & Serretti, 2009; Sharma & Rush, 2014). Similarly, to the best of my knowledge, there is a lack of data on mindfulness-based interventions for complex PTSD that we could compare our findings to. Nevertheless, our findings showing that the effects remained stable over the three months look very promising, considering difficult experiences of both healthcare staff and traumatized young adults.

4.2. Interventions effects on other mental health outcomes

At the same time, after using the intervention, both healthcare staff and young people with PTSD and complex PTSD symptoms experienced less pronounced various other mental health symptoms or improved mental health in general. Healthcare staff in response to the intervention was less stressed, depressed, and anxious. Similar findings are presented in other studies showing that mindfulness-based stress reduction have impact not only on stress reactions but also on other outcomes, such as ruminative thinking, depression, and anxiety, among others (Chiesa & Serretti, 2009; Sharma & Rush, 2014; Wexler & Schellinger, 2023). Moreover, a great part of the symptoms remained reduced three months after the intervention: healthcare staff still felt less stressed and depressed. However, anxiety symptoms returned to the baseline level, revealing that more long-term follow-up studies are needed to study the longevity of positive effects of the mindfulness-based interventions on mental health. Concerning traumatized young adults, we found that no additional symptoms, that is, symptoms of depression and anxiety, were reduced after using an eight-week mindfulness-based internet-delivered intervention. It is of importance to explore that into more depth but it may be that more specific interventions may be needed to address some of the other mental health outcomes. It seems that this is even more pronounced in the subclinical sample as compared to healthy individuals with elevated stress levels since the latter experience more additional benefits than the former.

Attention, however, should be drawn to the fact that not all fields of healthcare staff's functioning have improved. They did not benefit from the intervention regarding the reduction of PTSD and complex PTSD symptoms, as well as moral injury. Most likely, it is related to the aims and content of the intervention used by healthcare staff. The intervention was designed and developed specifically to target stress recovery skills, namely, psychological detachment, relaxation, mastery, and control. At the same time it helped to reduce other mental health difficulties, which may be related to the main target. However, there were no psychoeducation and exercises related to traumatic experiences, possible reactions after exposure to traumatic events (including PTSD and complex PTSD), and moral injury. As stated previously, trauma-focused interventions should be provided when considering psychological support for traumatized populations, as recommended by APA (2017) and ISTSS (2018) guidelines, or interventions with at least some psychoeducation on posttraumatic stress and exposure should be included. Also, we should keep in mind that our sample was non-clinical and consisted of medical nurses working at the time of the study. It may be that in this sample, PTSD and complex PTSD symptoms did not reach such a level of dysfunction that we could notice a change after the intervention.

Of no less relevance is that people experiencing high levels of stress or symptoms of posttraumatic stress disorders, after using a brief mindfulness-based internet-delivered intervention, started to feel more positively in general. After using the program, participants felt more rested, calm, and balanced, as well as more active, cheerful, and interested in life, among other positive outcomes. Other studies have also reported that mindfulness-based interventions have benefits in enhancing positive outcomes, for example can increase empathy and self-compassion (Chiesa & Serretti, 2009; Wexler & Schellinger, 2023). It has also been reported previously that internet-delivered interventions might enhance positive aspects of mental health, such as resilience or well-being (Chen et al., 2023; López-Del-Hoyo et al., 2023; Reyes et al., 2020). I believe that while delivering psychological interventions, not only the reduction of various mental health symptoms is important but also the general improvement of a person's life.

4.3. Theoretical conceptualization

The focus of my dissertation is to evaluate the effects of mindfulness-based internet-delivered interventions on mental health outcomes in two samples experiencing high levels of stress and posttraumatic stress disorders symptoms. I did not have an aim to explore the mechanisms of change in the

dissertation; however, it is of great importance to discuss and understand what mechanisms could have worked while using the interventions. I have chosen a conceptual model proposed by Shapiro and colleagues (2006), which suggests that intentionally attending with openness and non-judgementalness leads to a significant shift in perspective, and such a reperceiving overarches additional direct mechanisms that lead to change and positive outcomes. Based on this model, I believe that registering for and using a six-to-eight-week duration mindfulness-based intervention led people to stop and concentrate more on their life and condition with a different attitude that was new for them. More particularly, people with high levels of stress and symptoms of posttraumatic stress disorders searched for psychological support; throughout the intervention, they got access to reliable psychoeducation focusing on their condition, completed mindfulness-based exercises developed for the specific group, and had an opportunity to communicate with a psychologist. These components (psychoeducation, mindfulness-based exercises that required involvement, and psychologist's support) most likely helped these people to see their life and psychological condition in a new light. Before using the intervention, they were probably occupied by stress, difficulties, and stressful memories. Reading (or listening) about their condition, trying to focus purposefully and nonjudgementally on the present via the exercises, and contacting a specialist let them change their perspective with more openness at least a bit which led to the acquisition of new skills (such as disengaging from work, taking time for relaxation, getting involved in challenging experiences, and deciding more for how to spend the time) as well as positive changes in self-concept and interpersonal relationships. With the interventions, we explicitly focused on stress recovery skills acquisition (Study I) and symptoms of posttraumatic stress disorders reduction (Study II). However, at the same time, other significant changes occurred without explicitly focusing on that. For example, healthcare staff reported experiencing less stress, depression, and anxiety symptoms; both non-clinical and subclinical groups felt more positive about their lives after using the intervention. It looks like other vital processes may be activated besides those we explicitly focus on.

A more specific model concerning mindfulness's impact exceptionally on PTSD was presented by Boyd et al. (2018); in brief, the model suggests that shifting attention to the present moment with increased openness to experience might affect separate PTSD symptoms through different mechanisms typical to mindfulness. It looks that our findings showing no stable changes in PTSD symptoms, that is, re-experiencing traumatic event or events in the present, avoidance of trauma-related internal or external reminders, and persistent

perceptions of heightened current threat, do not fit the proposed model. However, knowing the fact that many people may not respond to trauma-focused treatments (Bradley et al., 2005), or considerable numbers of patients drop out from them (Lewis et al., 2020b), and that other studies find mindfulness-based interventions efficacious (Colgan et al., 2016; Jasbi et al., 2018; Joss et al., 2020; Liu et al., 2022; Possemato et al., 2016; Valenstein-Mah et al., 2019; Zhu et al., 2022), a personalized approach should be considered. The changes of compex PTSD-specific disturbances in self-organization symptoms, in particular, negative self-concept and disturbances in relationships, can be at least partially explained by the Boyd et al. (2018) model. Based on it, alterations in self-concept and relationships might change through nonjudgemental acceptance of trauma-related cognitions as well as connection and awareness of somatic sensations and enduring aversive internal experiences.

There is an ongoing debate among experts on trauma treatment on whether trauma-focused interventions such as exposure should be offered to clients with complex PTSD or if a phased trauma treatment approach should be used instead, which would imply starting the complex PTSD treatment with stabilization techniques to aid better coping skills of the emotional regulation (Brewin, 2020). On the one hand, recent studies show promising findings of treatments without a phased approach (Bongaerts et al., 2022; van Vliet et al., 2021), whereas other evidence reveals fewer benefits of such interventions for individuals who are likely to have complex PTSD (Karatzias & Cloitre, 2019). The present study indicates that mindfulness-based intervention may be an important first step for survivors of prolonged or severe trauma exposure with complex PTSD as an effective technique for reducing disturbances in self-organization symptoms during the first stabilization phase. Alternatively, based on our findings, mindfulness could be integrated into complex PTSD multicomponent trauma treatment targeted for specific complex PTSD symptoms in clinical practice. Notably, clients suffering from negative self-concept and disturbances in relationships could benefit from mindfulness-based interventions. Therefore, findings of our study fit the position of those experts who suggest a greater number of interventions or a longer course of therapy for people experiencing complex PTSD (Cloitre, 2020).

4.4. Usability of internet-delivered interventions

Considering the existing barriers to providing and receiving psychological support in populations experiencing high levels of stress (Kazlauskas, 2017), our findings add to the literature showing that internet-delivered interventions

could serve as a viable option in such a context. We know from the previous studies conducted in various populations that internet-delivered interventions are efficacious on many mental health outcomes (Andersson et al., 2019a). Our studies add to this field, suggesting that mindfulness-based interventions delivered remotely via the internet can effectively help populations experiencing high levels of stress. Our findings align with the results from other studies, showing that internet-delivered interventions may effectively reduce stress levels, depression, and anxiety (Heber et al., 2017; López-Del-Hoyo et al., 2023; Svärdman et al., 2022). Promising results are found in favor of mindfulness-based internet-delivered interventions as well (Alrashdi et al., 2023; Jayewardene et al., 2017; Spijkerman et al., 2016; Zhang et al., 2020).

Considering the more specific sample of healthcare staff (which usually encounters more stressors as compared to other occupational groups), our findings are also similar to other studies showing that internet-delivered interventions may reduce stress levels (Gollwitzer et al., 2018; López-Del-Hoyo et al., 2023; Smoktunowicz et al., 2021) and equip with stress management skills (Morrison Wylde et al., 2017) in various healthcare professionals groups. These results suggest that internet-delivered interventions may be a good solution to improve healthcare staff‘s, usually considered as a specific group experiencing more stressors, well-being. Moreover, our findings add to the evidence base on the internet-delivered interventions for PTSD and complex PTSD, suggesting that mindfulness may be a promising option in aiming to reduce complex PTSD-specific symptoms. However, we have not replicated similar results found in other studies stating that internet-delivered interventions for PTSD were superior to the waiting list or active controls (Olthuis et al., 2016; Simon et al., 2021; Steubl et al., 2021). This may be to the different theoretical backgrounds of the interventions used since most of the studies evaluated the efficacy of CBT-based internet-delivered interventions.

Interestingly, improvements in mental health and equipment with new skills for managing life stressors with more confidence are at least partially independent of the psychologist‘s involvement. Both interventions involved psychologists but with different amounts of support - in one study psychologist‘s role was an active one (providing feedback on all the exercises completed and answering additional messages), and in the other one - more passive (replying only to personal messages if received). Generally, it is found that guided interventions are superior to unguided ones (Baumeister et al., 2014); however, different findings are also obtained showing that internet interventions may be equally efficacious when delivered with therapist support, optional support, or standalone program without any support (Berger

et al., 2011; Eimontas et al., 2018; Rheker et al., 2015). Our studies do not answer whether more active psychologists' involvement produces higher effects; however, we see that promising effects can be found in either way.

Moreover, equally promising is the feedback from the participants about their positive experience using the interventions. Our results revealed that persons with high levels of stress or posttraumatic stress disorders symptoms evaluated mindfulness-based internet-delivered interventions very positively. According to the majority of users, the interventions seemed satisfactory, practical, and beneficial in understanding themselves better. In addition, they would recommend such interventions for other people experiencing high levels of stress and posttraumatic stress disorders symptoms. Notably, not all healthcare workers and traumatized young adults had such a positive reaction towards our interventions. We should take that into account when suggesting and providing mental health services. On the one hand, internet-delivered interventions, like any other thing, cannot fit all; on the other, it would be interesting to explore people's attitudes towards the psychological support delivered via internet. Related to that, although we see promising effects of internet-delivered interventions, they are in no way replacing traditional therapy. More likely, they can be used as an alternative or complementary means, given the unmet psychological support needs.

4.5. Limitations

Several limitations, including methodological considerations, should be taken into account when interpreting the results. First of all, although for assessing the efficacy of the interventions randomized controlled trial design was used, which is considered a golden standard, the interventions were compared with waiting list control groups. It allows us to see whether the interventions are efficacious or not; however, we cannot draw conclusions about their place among other interventions. Study design does not allow us to provide the information about their superiority or inferiority as compared to other interventions (internet-based vs. face-to-face, mindfulness-based vs. other theoretical orientation-based, etc.). On the other hand, the active control condition, as a comparison to the intervention condition, could be used as the further step; that is, when we know that something works, we can go further and explore it in more detail. Another limitation regarding the waiting list control group is the questionability of such condition per se (Cristea, 2019). In both studies, the intervention group started using the intervention immediately after randomization, whereas the waiting list control group got access to the intervention almost half a year later. However, all the participants

were informed in advance about the study conditions. Moreover, and most importantly, we included all interested individuals regardless of other psychological support they receive. In other words, participants did not have to refuse other psychological support and could use other resources at the time of the study.

Another limitation that should be addressed in the studies conducted is the usage of self-reported measures. It is of great importance, especially when discussing the second study, in which a subclinical sample was assessed. Participants' trauma exposure and PTSD and complex PTSD symptoms were assessed using self-reported measures without a clinical interview, which could have led to an inaccurate estimation of PTSD and complex PTSD symptomatology. However, at the time of conducting the study, ICD-11 complex PTSD diagnostic interviews were not yet available. Related to that, in the second study, we included participants who reported clinically significant PTSD or complex PTSD symptoms and participants with subclinical levels of PTSD and complex PTSD, which could have affected non-significant changes in PTSD symptoms. The results should be replicated in a sample of participants with full PTSD or complex PTSD diagnosis assessed by a clinician using clinical interviews.

Of no less importance is a short follow-up period. Although we found promising results showing the effects of both interventions on various mental health outcomes, with most of them remaining stable in three months; however, such a period is still too short of drawing solid conclusions about the stability of the effects. At least six months or preferably one year should be considered as a recommended follow-up period for the future studies, with a preference for an even more extended period.

One more aspect that should be considered is the generalizability of the results. In the studies, we included medical nurses and young adults experiencing symptoms of PTSD and complex PTSD. Thus, we cannot generalize our findings to other populations, such as other healthcare workers or other professions in general (Study I), or people of other ages and young adults who do not study at the university (Study II), with high confidence. In addition, most of the participants in both studies were female, and there is a lack of knowledge about whether the interventions fit non-female medical nurses and traumatized young adults. Moreover, all the participants in our studies were self-referred, which may present the risk of volunteer bias. Related to that, it is a great chance that people who registered for the interventions and participated in them have some distinctive qualities compared to those not interested in such interventions. It may be that our participants are more interested in psychologists, psychology in general, may

have more experience and knowledge related to that. In addition, we cannot be sure how the participants of the studies were affected by other important life events, e.g., serious infections or deaths of others during the COVID-19 pandemic, and other various life experiences (both positive and negative) that happened at the time of participating in the study.

Finally, both interventions were more or less multicomponent, that is, made of several main elements, including psychoeducation, exercises, and communication with a psychologist. Moreover, several modalities for these elements were used, such as written texts, audio and video recordings. Of no less importance is the purity of the theoretical background. Both interventions were mindfulness-based; however, at the same time, they included psychoeducation and exercises that could be considered as not entirely or necesseraly mindfulness. Therefore, we can only speculate what parts of the intervention worked or worked mostly. In other words, we know from the findings that the interventions are efficacious, but we do not have any information about what makes the interventions efficacious. Similarly, we are not aware of the mechanism of change – we know that people benefited from the interventions; however, it is not clear what was the mechanism of this change. Related to that, it remains unknown what dosage of the intervention is enough for the change and whether it is different across people.

4.6. Future research

Given the limitations provided and the remaining questions to be answered, further research studies should be organized and conducted. First, an active control group instead of a waiting list condition should be considered as a comparison to the intervention group. This would allow us to find the place of the interventions used among others interventions. Second, clinical interviews should be conducted in clinical and subclinical samples over using self-reported measures. It could lead to a more accurate assessment of symptomatology. Related to this, it is essential to replicate results in a sample of participants with full diagnoses instead of subclinical samples. It would provide relevant information on whether mindfulness-based internet-delivered psychological support is efficacious for people with a full diagnosis. Third, in future studies, it is necessary to organize a longer follow-up, at least six months, with a preference for an even more extended period. It would allow for more precise conclusions about the stability of the effects. Fourth, for an ability to generalize results to a broader population, research studies in other samples should be conducted. Concerning this, it would be of great importance to explore the effectiveness of the interventions used in non-self-

referred samples but suggest the interventions, for example, to healthcare staff working in some specific department or in a clinical setting for people experiencing symptoms of PTSD or complex PTSD as a self-help tool. Fifth, factorial designs to test mechanisms of change are very much welcome in future trials. Such a design would allow for more precise information on what components of the interventions mainly work and, according to the results, develop future interventions more confidently. There is growing evidence showing the efficacy of mindfulness-based internet-delivered interventions; however, there still needs to be more knowledge through what mechanisms the change is possible.

4.7. Practical implications

Our findings provide relevant information not only in the research context but also concerns the practical field. The results suggest that mindfulness-based internet-delivered interventions are promising for people experiencing high levels of stress or complex PTSD-specific disturbances in self-organization symptoms. A mindfulness-based approach broadens the perspective of alternative and complementary interventions for high levels of stress and complex PTSD-specific symptoms for those who do not benefit from currently available treatments (such as CBT-based therapies and trauma-focused treatments). Also, internet-delivered interventions enable us to reach individuals with high levels of stress or experiencing disturbing symptoms of complex PTSD, as important barriers to the delivery of face-to-face interventions are recognized. Notably, internet-delivered interventions are not replacing traditional therapy; more likely, they could be of great value given the enormous unresponded need for psychological support.

From the user‘s perspective, the mindfulness-based internet-delivered intervention seems to be useful, satisfactory, and easy to use. In addition, the intervention allows individuals to improve their well-being and a general understanding of themselves and their well-being. These are important factors contributing to an enhanced understanding of one’s condition and could be used at least as a first step in providing basic support in the context of high levels of stress.

Although mindfulness-based interventions alone may not be a viable replacement for evidence-based trauma-focused therapies, mindfulness-based programs may serve in the initial stabilization phase of complex PTSD treatment before the application of exposure-based treatments, particularly among individuals with high levels of disturbances in self-organization symptoms. Alternatively, mindfulness-based interventions could be integrated

into complex PTSD multicomponent trauma treatment which targets specific complex PTSD symptoms. Considering the non-clinical samples with high levels of stress, mindfulness-based interventions might be sufficient in acquiring new skills and improving one‘s mental health.

CONCLUSIONS

1. Mindfulness-based internet-delivered intervention for healthcare staff exposed to high levels of stress:

1.1. proved to be efficacious on stress recovery. More specifically, it fostered skills of psychological detachment, relaxation, mastery, and control. Psychological detachment, relaxation, and mastery remained stable three months after the intervention, whereas control skill returned to baseline;

1.2. was efficacious in reducing perceived stress and symptoms of depression and anxiety and enhancing psychological well-being. Perceived stress, depression symptoms, and psychological well-being remained stable three months after the intervention, whereas anxiety symptoms returned to baseline. The intervention showed no effects on PTSD and complex PTSD symptoms - neither immediately nor three months after the intervention.

2. Mindfulness-based internet-delivered intervention for traumatized young adults:

2.1. proved to be efficacious on complex PTSD-specific disturbances in self-organization symptoms. More specifically, it reduced symptoms of negative self-concept and disturbances in relationships which remained reduced three months after the intervention;

2.2. was efficacious in enhancing positive mental health immediately after the intervention. However, the intervention showed no effects on depression and anxiety symptoms.

3. Users of mindfulness-based internet-delivered interventions - healthcare staff exposed to high levels of stress and traumatized young adults - were satisfied with the programs and assessed them as helpful and easy-to-use tools to understand themselves and their condition better.

4. Mindfulness-based internet-delivered interventions might be a viable option to broaden the perspective of alternative and complementary interventions for people experiencing high levels of stress and complex PTSD-specific symptoms, and has a potential to offer a cost-effective solution to reduce barriers to psychological interventions.

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PUBLISHED PAPERS

Paper 1

Internet-based stress recovery intervention FOREST for healthcare staff amid COVID-19 pandemic: Study protocol for a randomized controlled trial

Jovarauskaite, L., Dumarkaite, A., Truskauskaite-Kuneviciene, I., Jovaisiene, I., Andersson, G., Kazlauskas, E. (2021). Internet-based stress recovery intervention FOREST for healthcare staff amid COVID-19 pandemic: Study protocol for a randomized controlled trial. *Trials, 22, 559.* https://doi.org/10.1186/s13063-021-05512-1

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Trials

STUDY PROTOCOL Open Access

Internet-based stress recovery intervention FOREST for healthcare staff amid COVID-19 pandemic: study protocol for a randomized controlled trial

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Abstract

Background: The demand for care during the COVID-19 pandemic has affected the mental health of healthcare workers (HCWs), thus increasing the need for psychosocial support services. Internet-based interventions have previously been found to reduce occupational stress. The study aims to test the effects of an Internet-based stress recovery intervention—FOREST—among HCWs.

Methods: A randomized controlled trial (RCT) parallel group design with three measurement points will be conducted to assess the efficacy of an Internet-based stress recovery intervention FOREST for nurses. The FOREST intervention is a 6-week Internet-based CBT and mindfulness-based program which comprises of six modules: (1) Introduction, (2) Detachment (relaxation and sleep), (3) Distancing, (4) Mastery (challenge), (5) Control, and (6) Keeping the change alive. We will compare the intervention against a waiting list group at pre-test, post-test, and follow-up. Stress recovery, PTSD, complex PTSD, moral injury, the level of stress, depression, anxiety, and psychological well-being will be measured.

Discussion: The study will contribute to the development of mental healthcare programs for the HCWs. Based on the outcomes of the study, the FOREST intervention can be further developed or offered to healthcare staff as a tool to cope with occupational stress.

Trial registration: ClinicalTrials.gov NCT04817995. Registered on 30 March 2021

Keywords: Internet-based intervention, Stress recovery, PTSD, Moral injury, Healthcare staff

Background

The coronavirus disease 2019 (COVID-19) pandemic has been an enormous challenge for healthcare worldwide, thus putting the mental health of healthcare workers at risk. The increased demand for care during the COVID-19 pandemic has significantly affected healthcare workers' (HCWs) levels of stress [1, 2], depression [3, 4], and burnout [5–7] and posttraumatic stress disorder [8]. These mental health challenges might be also associated with an experience of moral injury which refers to psychological distress caused by particular actions or absence of them thus violating a person's moral beliefs [9, 10]. Moral injury is not a mental disorder but it may be related to a negative self-concept and intense negative emotional reactions [10]. Nurses, in particular, are exposed to high psychological distress

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because they play a crucial role in managing the pandemic-related healthcare crisis [5]. As studies suggest, in the context of the COVID-19 pandemic, nurses may experience emotional exhaustion, depersonalization, and reduced personal accomplishment [6] among other mental health issues.

Despite the obvious increase in demand for psychosocial support during the pandemic, access to tailored psychological services focused on reducing occupational stress in nurses and other medical personnel is limited. Additionally, healthcare workers' unwillingness to seek psychological help also contributes to this [11]. Furthermore, public health measures and the closure of healthcare services during the pandemic restrict access to traditional mental health services. Internet-based interventions have been found to be effective for a range of mental health conditions [12], including life-stressor-related adjustment disorders [13] as well as burnout among HCWs [14]. Moreover, especially during the COVID-19 pandemic, online therapies are particularly relevant for HCWs because of their flexibility, access to a large-scale number of medical staff, and the possibility to provide psychosocial care for HCWs from isolated regions [15].

The current study aims to test the efficacy of stress recovery intervention FOREST among HCWs, in particular, nurses with high levels of stress in the context of the COVID-19 pandemic. The FOREST intervention was developed based on the theoretical framework of stress recovery [16] which emphasizes the importance of stress self-awareness, life-work balance, and self-care. The program was specifically developed to address the needs of HCWs amid the COVID-19 pandemic and was designed as a CBT and mindfulness-based Internet-delivered intervention to reduce barriers to accessing the intervention.

The primary objective of the trial is:

1. To evaluate the efficacy of the Internet-based for stress recovery (FOREST) intervention in improving stress recovery among nurses in comparison to a waiting list control group in the context of the COVID-19 pandemic

The secondary objectives are:

2. To assess the effect of the FOREST intervention on posttraumatic stress disorder (PTSD) as well as complex posttraumatic stress disorder (CPTSD) symptoms
3. To investigate the effect of the FOREST intervention on moral injury
4. To evaluate the effect of the FOREST program on the perceived level of stress
5. To assess the effect of the FOREST program on depression and anxiety
6. To evaluate the effect of the FOREST program on psychological well-being

Methods

Study design and setting

A randomized controlled trial (RCT) parallel groups waiting list design with three measurement points will be used to assess the efficacy of an Internet-based stress recovery intervention FOREST for HCWs, i.e., nurses (superiority trial). We aim to recruit 600 participants in Lithuania and, based on previous e-health studies [17], we expect a dropout of 30%. This will generate sufficient statistical power to detect differences between the groups on the primary outcome measure of stress recovery given a significance level of .05 and a power of 80% [18]. Participants will be randomly allocated to the intervention or a waiting list control group with an allocation ratio of 1:1. Participants allocated to the intervention condition will receive the intervention immediately after randomization, and participants in the waiting list condition will be offered the same intervention 6 months later. The intervention will last for 6 weeks. The pre-test, the post-test, and the 3-month follow-up will be carried out at the same time in both study groups. We will compare stress recovery, PTSD and CPTSD symptoms, moral injury, perceived stress, anxiety, depression, and psychological well-being in nurses who participate in the FOREST intervention vs. those on the waiting list. All study measures will be self-reported and administrated via a secure web application [19]. All participants included in the study will get personalized login data on the first day of using the program. Once participants of the study create a secure password, they will be able to log into the platform where they will have access to the content of the intervention, as well as communication with a psychologist. All the content on the platform is private and protected by end-to-end encryption and participants use secure login for each connection to the platform.

This study protocol is following the Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) 2013 Checklist [20]. The information regarding enrolment, intervention, and assessments in the trial are presented in Table 1. In addition, the details of the rationale of the study are shown in the flowchart (Fig. 1). The ethics approval for the trial was obtained from the Institutional Psychological Research Ethics Committee of Vilnius University (2021-03-22/61). All study participants will be also asked to give a written consent online in order to participate in the study.

Table 1 Enrolment, interventions, and assessments of the FOREST

	Enrolment	Allocation	Post-allocation				Close-out
Timepoint	t_1		t_2	t_3	t_4	t_5	
Enrolment							
Informed consent	X						
Assessment	X						
Eligibility screen		X					
Randomization		X					
Final allocation		X					
Interventions							
Intervention group		X	X				
Waiting list control group				X	X		
Assessments							
Recovery experiences	X		X	X	X	X	
PTSD and CPTSD	X		X	X	X	X	
Moral injury	X		X	X	X	X	
Stress	X		X	X	X	X	
Depression	X		X	X	X	X	
Anxiety	X		X	X	X	X	
Psychological well-being	X		X	X	X	X	
Post-assessment interviews							X

Participants and inclusion/exclusion criteria

The study will enroll self-referred participants after dissemination of invitations to professional HCWs' social networks (e.g., social networks of nurses in different regions of Lithuania), healthcare institutions (e.g., primary healthcare centers, hospitals), and press release to national media. The healthcare institutions and administrative staff of HCWs' social networks will be asked to share the invitation with nurses. No monetary compensation will be offered for the dissemination of study advertisements. Licensed nurses working in the healthcare system throughout the country will be enrolled in the study. To be eligible to participate in the study, applicants must provide written informed consent online, are required to complete a baseline assessment prior to randomization, and meet all of the following criteria: to be at least 18 years old, to comprehend Lithuanian to the degree that one understands the content and instructions of the study, and to have a computer, tablet, smartphone, or similar device with access to the Internet. Applicants meeting any of the following criteria will be excluded from participation in this study: acute psychiatric crisis, high suicide risk, alcohol/drug addiction, and interpersonal violence. For the secondary eligibility check, before the randomization, all the participants will be contacted by phone call for a brief interview to clarify their eligibility for the study.

Randomization

Randomization will be conducted by the researcher not associated with the study team using the random number calculation procedure using www.random.org. In the randomization process, eligible participants' IDs will be used to allocate HCWs to the intervention or the waiting list groups. All study participants will be informed whether they are allocated to the intervention or the control group after completing the study measures at the baseline measurement point. Furthermore, participants allocated to the waiting list will be asked to fill in the measures at the same measurement points as the intervention group and will be invited to participate in the FOREST intervention after that.

Intervention condition

The FOREST intervention is a modification of the intervention for distressed employees which has been adjusted to the specific needs of the HCWs, i.e., nurses, meaning that the current intervention is more focused on the specific HCWs' profession-related stressors and mental health issues. The intervention is developed as a guided program with active individualized messaging-based feedback from psychologists following the completed tasks of the intervention as well as psychologist's support on-demand as a response to the written messages initiated by the intervention participants [21]. In addition, all intervention participants will be contacted

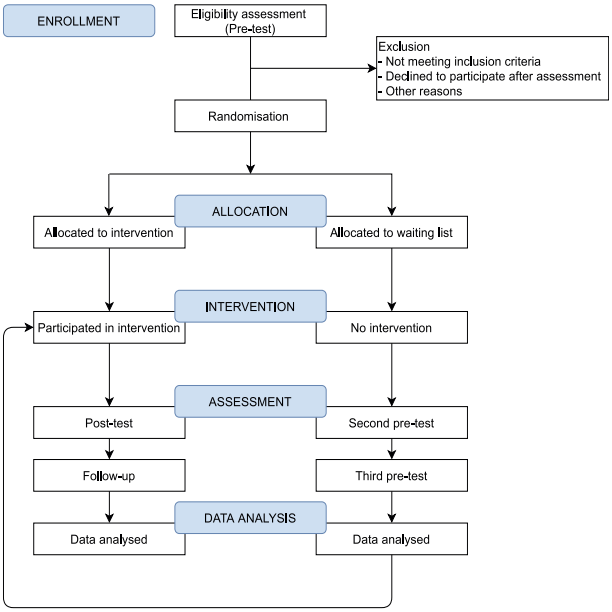

Fig. 1 Flowchart of the intervention

by a phone call in the middle of the intervention (after 3 weeks) and at the end of the intervention (after 6 weeks) by their psychologist for a brief interview regarding the usage of the program. The FOREST will be delivered through a secure online platform [19], which has been used in various previous studies and has been translated into Lithuanian.

The content of the FOREST intervention has been developed by the team of clinical psychologists and it is based on cognitive behavior therapy (CBT) principles and mindfulness. The FOREST intervention comprises six modules (the interface of the FOREST is presented in Fig. 2): (1) Introduction, (2) Detachment (relaxation and sleep), (3) Distancing, (4) Mastery (challenge), (5) Control, and (6) Keeping the change alive. The content of the FOREST intervention is presented in Table 2. Each of the six intervention modules consists of psychoeducation (written texts as well as video recordings), two or three exercises for a participant, and a reminder of the opportunity to contact the therapist. Also, tasks for participants will be provided in several formats, namely, listening for audio records, or in the form of written responses to module-related questions. All the audio records will be available for download. Moreover, study participants will be able to choose the intensity of the program according to their personal needs but will be encouraged to complete the exercises to reach the best results on weekly basis. Access to a new module will be provided every week on the same weekday over the 6 weeks. Once accessible, modules will remain available throughout the intervention.

Five clinical psychologists and five master students in the clinical psychology program will be involved as psychologists in the FOREST intervention. They will all receive special training according to the guidelines specifically developed for the study. Weekly supervision meetings will be scheduled, and supervision will also be provided on request. The role of each psychologist will be to give feedback to study participants regarding the use of the intervention and their psychological well-being or answer their other questions. Psychologists' feedback will be largely structured and standardized; nevertheless, personalized responses will be encouraged to correspond to the particular case. Study participants and psychologists will communicate within a secure platform [19]. Psychologists will be

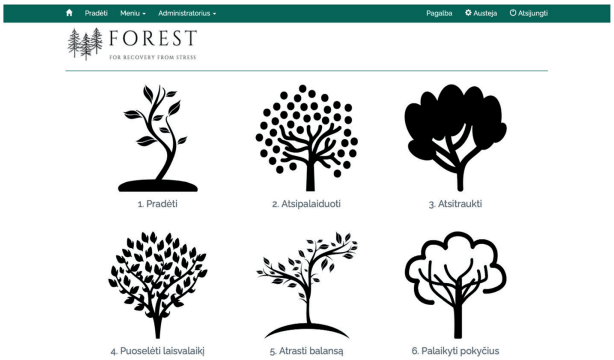

Fig. 2 The interface of the FOREST intervention

asked to provide feedback to participants' comments in 24 h.

Psychologists will respond to signs of deterioration of mental health noticed from the communication with the intervention participant, e.g., suicide threat, by referring to other mental health services. Study participants in need will be provided with the information regarding the mental health services in the community.

Data management

Outcome data will be collected at the three time points using the secure online platform [19]. In addition, data on the usability of the program, such as number of logins, completed exercises, or texts to a psychologist, will be collected within the same platform. All participants will be given an anonymous identifying number. Access to data will be restricted to researchers directly

Table 2 The content of the six modules of the FOREST intervention

Module	Aim and content of the module	Module exercises
1. Introduction	Introduction to the intervention (aims, benefits, instructions of usage) Psychoeducation about stress and burnout, its benefits and harms Brief psychoeducation about stress recovery: detachment (relaxation and sleep), distancing, mastery (challenge), control	1. Selecting stressors from the list and naming three most prominent work- and personal life-related stressors 2. Selecting burnout symptoms from the list 3. Short breathing exercise (an audio record)
2. Detachment (relaxation and sleep)	Psychoeducation about body relaxation and its benefits Psychoeducation about sleep, its benefits, and harms of prolonged sleep difficulties	4. Body relaxation (an audio record), evaluation of stress before and after the exercise, naming associations that emerged during relaxation 5. Sleeping relaxation (an audio record)
3. Distancing	Psychoeducation about distancing (both physically and mentally) and its benefits in dealing with work and personal life challenges Psychoeducation about intrusive thoughts	6. Naming three activities that help to keep the distance from work 7. Awareness of thoughts (an audio record) and naming emotions briefly after it 8. Mindful walking (an audio record)
4. Mastery (challenge)	Psychoeducation about mastery in day-to-day activities and its benefits Psychoeducation about physical exercise, its benefits, and relations to stress recovery	9. Selecting activities from the list (both active and less active) or filling in one's own 10. Short pause (an audio record) 11. Short body stretching (video record)
5. Control	Psychoeducation about control over one's life and its benefits Psychoeducation about the importance of self-care and control over one's working day structure and its benefits	12. Naming unnecessary and bothering activities, changing them to pleasant and relaxing activities 13. Reflecting on daily goals (an audio record)
6. Keeping the change alive	Summarizing the program and main aspects of the provided information Encouraging to further practice the intervention exercises after completion of the intervention	14. Brief relaxation exercise (an audio record)

involved in the study only and via a secure login with two-step authentication. All data collected will be stored and managed according to current national regulations of personal data management. All participants will be informed that the data provided will be treated confidentially and will be made aware that in published reports it will not be possible to identify any individual or attribute any information to them.

The collected data will be exported and inputted into SPSS files for analyses and saved on secure university storage. The data file with personal information will be accessible for the researchers directly involved in the study only. Access to the data file with an anonymous identifying number may be provided for the senior and/or junior data analyst as well as made publicly available as a part of the open research data policy required by the journal as a condition for publication of research outputs.

Dropout or premature termination from the study at any point after randomization will be recorded. Participants will be able to choose to withdraw from the study at any point and may ask that previously collected data not be used. Unless a participant has withdrawn consent to participation, repeated attempts will be made to contact participants who will not complete the outcome assessments. All participants will be asked to complete the study measures at each point of measurement, regardless of protocol adherence or any previously uncompleted measures.

Primary outcome

Stress recovery

The Recovery Experiences Questionnaire (REQ) [22] will be used to evaluate the changes in self-reported recovery of stress in HCWs. All 16 items of the REQ are ranked on a 5-point Likert scale ranging from 1 (= totally disagree) to 5 (= totally agree). The scores of the total REQ scale range from 16 to 80. A higher score indicates a more pronounced recovery of stress. Good psychometric properties have been reported previously for the total REQ (Cronbach α = 0.92) as well as for subscales, i.e., psychological detachment (Cronbach α = 0.88), relaxation (Cronbach α = 0.86), mastery (Cronbach α = 0.84), and control (Cronbach α = 0.89) [23].

Secondary outcomes

Posttraumatic stress disorder

The International Trauma Questionnaire (ITQ) [24, 25] will be used to measure self-reported symptoms of posttraumatic stress disorder (PTSD) and complex posttraumatic stress disorder (CPTSD). The ITQ is a widely used measure for ICD-11 PTSD and CPTSD. All 18 ITQ items are evaluated on a 5-point Likert scale ranging from 0 (= not at all) to 4 (= extremely). The scores of the total PTSD and DSO range from 0 to 24. A higher score indicates more severe symptoms of PTSD or CPTSD. Additionally, we will apply a diagnostic algorithm for the diagnosis of PTSD and CPTSD based on the clinical significance of the symptoms and functional impairment [24]. Good psychometric properties were reported for both PTSD as well as DSO subscales (Cronbach $\alpha \geq 0.79$) [24].

Moral injury

The Moral Injury Outcome Scale (MIOS) [26] will be used to measure self-reported rates of moral injury. The MIOS is comprised of 14 items. All the MIOS items are ranked on a 5-point Likert scale ranging from 0 (= strongly disagree) to 4 (= strongly agree). The scores of the total MIOS range from 0 to 56. A higher score indicates a more pronounced moral injury. The MIOS is a state-of-the-art measurement instrument for moral injury and ongoing studies are currently being implemented regarding the investigation of the psychometric properties of the MIOS in HCWs.

Stress

The Perceived Stress Scale (PSS-4) [27] will be used to assess the level of perceived stress. The PSS-4 is a brief scale comprising of 4 items ranked on a 5-point Likert scale ranging from 0 (= never) to 4 (= very often). The scores of the total PSS-4 range from 0 to 16. A higher score indicates more pronounced perceived stress. Good psychometric properties were reported previously for the PSS-4 (Cronbach α = 0.75) [28].

Depression and anxiety

The Patient Health Questionnaire-4 (PHQ-4) [29] will be used to measure depression and anxiety symptoms. The PHQ-4 is a self-reported scale comprising of 4 items. All the items are ranked on a 4-point Likert scale ranging from 0 (= not at all) to 3 (= nearly every day). The scores of the total PHQ-4 vary from 0 to 12. A higher score indicates more pronounced depression and anxiety symptoms. Good psychometric properties were reported previously for the total scale (Cronbach α = 0.86) in the sample of HCWs [30].

Psychological well-being

The World Health Organization Well-being Index (WHO-5) [31] will be used to measure psychological well-being. The WHO-5 index is a self-report scale comprising of 5 items. All the items are ranked on a 6-point Likert scale ranging from 0 (= at no time) to 5 (= all the time). The scores of the total WHO-5 vary from 0 to 25. A higher score indicates higher psychological well-being. Good psychometric properties were found in a previous

study of the Lithuanian version of WHO-5 (Cronbach α = 0.92) in the sample of HCWs [1].

Other measures

Study participants will be asked to evaluate the usability of the FOREST intervention by ranking how useful (1 = not useful at all to 5 = very useful), satisfactory (1 = I did not like it at all to 5 = I liked it a lot), and easy to use (1 = it was not easy at all to 5 = it was very easy) the intervention has been. They will also be asked to report their subjective impression regarding the improvement of mental well-being (1 = worsened a lot to 5 = improved a lot), general understanding of oneself, and one's well-being (1 = not at all to 5 = definitely improved) and recommending the program to others (1 = not at all to 5 = definitely would recommend).

Statistical analyses

As the study aims to capture the possible change in primary and secondary outcomes in the intervention group, in comparison to the control group, a series of mixed multivariate repeated-measures ANOVAs with time (pre-test, post-test, and follow-up) as a within-subject factor and group (intervention vs. control) as a between-subject factor will be performed. Continuous data aggregation will be used; the change from baseline of the outcome measures sum scores will be recorded. Additionally, we will calculate both within- and between-group effect sizes. The between-group effect sizes will be calculated by using the mean difference from pre-test to post-test (for the short-term effect) and from pre-test to follow-up (for the long-term effect) in the intervention and control groups and the standard deviations of each group at the pre-test [32]. The within-group effect sizes will be calculated by using the means in each group at pre- and post-test/follow-up and standard deviations at each measurement point. The magnitude of the effect expressed in d will be interpreted as follows: 0.50 = medium effect and ≥ 0.80 = large effect [18]. The data will be analyzed by using the intention-to-treat principle [33]. The missingness of the data will be treated by using the multiple imputation method [34].

Discussion

This study will be among the first which will evaluate the effects of the Internet-based psychosocial intervention on stress levels and mental health of nurses in the context of the COVID-19 pandemic. Work overloads and long working hours contribute to high levels of stress in nurses [3] and new solutions are needed for psychosocial care. Nurses are particularly burdened and are at risk for burnout [5]; thus, the study is targeted to nurses.

The current intervention is developed to address the needs of the HCWs by using digital technologies which increases the usability of the program by providing flexibility while accessing the intervention. Access to intervention via their digital device reduces barriers of help-seeking, as participants of the trial can access the program with high flexibility without the need for appointments with mental health professionals which is particularly important for healthcare staff who often have long working hours and busy schedules. Media resources developed for this intervention, such as audio and video recordings, will make the intervention usable and attractive for the users.

The current study will contribute to the development of mental healthcare programs for HCWs. Based on the outcomes of the study, the FOREST intervention can be further developed or offered to the healthcare staff as a tool to cope with work-related stress and increase well-being if outcomes will show positive effects of the intervention on the study participants. Specifically, the study will fill the gap in the scientific knowledge regarding the short- and long-term effects of Internet-based stress recovery intervention on the mental health of HCWs. Additionally, the study will provide evidence of the impact of Internet-based stress recovery intervention on a moral injury which is an especially relevant experience for HCWs [10].

The study contains several potential risks. The target group of the study has high working loads during the COVID-19 pandemic, thus, leading to potential issues in terms of the study participants' recruitment, data collection, and adherence. Data collection and compliance with study procedure risks will be managed via communication with a psychologist on the platform, periodic reminders to enter the new intervention session, and phone calls aimed to receive feedback about the study.

Trial status

Recruitment of participants began 01/04/2021 and will continue to 30/06/2021.

Abbreviations

CPTSD: Complex posttraumatic stress disorder; COVID-19: The coronavirus disease 2019; HCW: Healthcare worker; MIOS: Moral Injury Outcome Scale; PHQ-4: Patient Health Questionnaire; PSS-4: Perceived Stress Scale; PTSD: Posttraumatic stress disorder; REQ: Recovery Experiences Questionnaire; RCT: Randomized controlled trial; WHO-5: World Health Organization Well-being Index

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Not applicable.

Authors' contributions

EK principal investigator; LJ first draft of the manuscript; GA supervision; AD, EK, LJ, and ITK content of the intervention; AD and ITK design of the intervention; EK, GA, and IJ critical review of the manuscript; GA provides access to an online platform for intervention; GA supervision; AD, LJ, and ITK investigation, data collection, and data analysis; AD and IJ recruitment of

participants. All authors commented upon and approved the final manuscript.

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Availability of data and materials
The data file will not be publicly available. An anonymous copy of the data file of this study will be available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
The study was approved on 22 March 2021 by the Psychological Research Ethics Committee in Lithuania (document number 2021-03-22/61). All participants will be asked to provide a written informed consent online in order to participate in the study. The trial was registered on 26 March 2021 via www.clinicaltrials.gov.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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Publisher's Note

Paper 2

The efficacy of internet-based stress recovery intervention FOREST for nurses amid COVID-19 pandemic: Randomized controlled trial

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The efficacy of the internet-based stress recovery intervention FOREST for nurses amid the COVID-19 pandemic: A randomized controlled trial

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ABSTRACT

Background: The COVID-19 pandemic demanded exceptional physical and mental effort from healthcare workers worldwide. Since healthcare workers often refrain from seeking professional psychological support, internet-delivered interventions could serve as a viable alternative option.
Objective: We aimed to investigate the effects of a therapist-guided six-week CBT-based internet-delivered stress recovery intervention among medical nurses using a randomized controlled trial design. We also aimed to assess program usability.
Methods: 168 nurses working in a healthcare setting ($M_{age} = 42.12$, $SD_{age} = 11.38$; 97 % female) were included in the study. The intervention group included 77 participants, and the waiting list control group had 91 participants. Self-report data were collected online at three timepoints: pre-test, post-test, and three-month follow-up. The primary outcome was stress recovery. Secondary outcomes included measures of perceived stress, anxiety and depression symptoms, psychological well-being, posttraumatic stress and complex posttraumatic stress symptoms, and moral injury.
Results: We found that the stress recovery intervention FOREST improved stress recovery, including psychological detachment ($d = 0.83$ [0.52; 1.15]), relaxation ($d = 0.93$ [0.61, 1.25]), mastery ($d = 0.64$ [0.33; 0.95]), and control ($d = 0.46$ [0.15; 0.76]). The effects on psychological detachment, relaxation, and mastery remained stable at the three month follow-up. The intervention was also effective in reducing its users' stress ($d = -0.49$ [−0.80; −0.18]), anxiety symptoms ($d = -0.31$ [−0.62; −0.01]), depression symptoms ($d = -0.49$ [−0.80; −0.18]) and increasing psychological well-being ($d = 0.53$ [0.23; 0.84]) with the effects on perceived stress, depression symptoms, and well-being remaining stable at the three-month follow-up. High user satisfaction and good usability of the intervention were also reported.
Conclusions: The present study demonstrated that an internet-based intervention for healthcare staff could increase stress recovery skills, promote psychological well-being, and reduce stress, anxiety, and depression symptoms, with most of the effects being stable over three months.
Trial registration: NCT04817995 (https://clinicaltrials.gov/ct2/show/NCT04817995). Registration date: March 30, 2021. Date of first recruitment: April 1, 2021.

What is already known

- The COVID-19 pandemic demanded exceptional physical and mental efforts from healthcare workers worldwide.
- There is some evidence that internet-delivered programs targeting various mental health components might be effective in healthcare professionals' sample.
- However, no efficacy studies on stress recovery have been conducted with healthcare workers.

What this paper adds

- The present study demonstrated that an internet-based intervention for healthcare staff could increase stress recovery skills, promote psychological well-being, and reduce stress, anxiety, and depression symptoms, with most of the effects being stable over three months.

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- Participants assessed the intervention as very good, and their satisfaction with the program was high.
- Since healthcare workers face various emotional challenges and seldom seek professional psychological support, an internet-based stress recovery intervention could be a feasible option for increasing the well-being of medical nurses.

1. Background

The COVID-19 pandemic demanded exceptional physical and mental efforts from healthcare workers worldwide. A significant number of healthcare workers experienced medium to high emotional load or extremely acute stress (Mira et al., 2020). Additionally, many reported psychological symptoms, including anxiety, fear, distress, and depression, leading to stress-related conditions and insomnia (Chow et al., 2020). Distress factors comprised quarantine, heavy workload, the fear of infecting themselves and their family members, witnessing patients' poor and deteriorating conditions, and the requirement to wear protective gear (Chow et al., 2020). Also, the presence of trauma-related stress among healthcare staff ranged between 7.4 and 35 %. In particular, this occurred among women, nurses, frontline workers, and workers who experienced physical symptoms (Benfante et al., 2020). Moreover, a significant proportion of healthcare professionals began to consider a career change, and this ideation was related to higher levels of depression, stress, anxiety, and lower psychological well-being (Norkiene et al., 2021). This context highlights the need for psychosocial support for healthcare workers targeted at recovery from stressful experiences.

Since healthcare workers face various emotional challenges as well as trauma related to the specifics of their work and seldom seek professional psychological support, often due to the mental health stigma (Mehta and Edwards, 2018; Knaak et al., 2017; Søvold et al., 2021), internet-delivered interventions could serve as a viable alternative option for providing psychological services. There is some evidence from previous randomized controlled trials that internet-delivered programs targeting various mental health components might be effective in both healthcare professionals and other non-clinical samples. Among healthcare professionals, internet-delivered programs showed potential in equipping participants with coping skills to manage stress (Morrison Wylde et al., 2017), reducing stress levels (Gollwitzer et al., 2018), improving some components of well-being (Smoktunowicz et al., 2021), and enhancing work engagement (Gollwitzer et al., 2018; Sasaki et al., 2021). A decrease in perceived stress (Heber et al., 2016) and changes in anxiety, depression, productivity, and academic work impairment (Harrer et al., 2018), among other positive outcomes, have also been observed in other adult samples.

However, to the best of our knowledge, no efficacy studies on stress recovery have been conducted with healthcare workers. Stress recovery refers to a process during which individual functional systems that have been called upon during a stressful experience return to their prestress levels (Meijman and Mulder, 1998). An understanding of successful recovery experiences highlights the importance of refraining from work demands and avoiding activities that call upon the same functional systems or internal resources as those required at work. Alternatively, gaining new internal resources such as energy, self-efficacy, or positive mood should also help restore threatened resources (Sonnentag and Fritz, 2007). Using a data-driven approach, four distinct recovery experiences have been differentiated: psychological detachment, relaxation, mastery, and control (Sonnentag and Fritz, 2007). Psychological detachment refers to refraining from being occupied by work-related duties and disengaging oneself mentally from work. Relaxation is a process that contrasts psychological strains and is often associated with leisure activities. Mastery experiences imply off-job activities that distract from the job and provide challenging experiences and learning opportunities in other domains. Control refers to the degree to which a person can decide which activity to pursue during leisure time and when and how to pursue this activity (Sonnentag and Fritz, 2007).

Although there is some research on internet-based stress intervention programs, and evidence suggests that they are effective in reducing stress within the healthcare staff and other samples, no randomized controlled trials have assessed whether internet-delivered interventions can improve stress recovery. High physical and emotional load among healthcare workers, especially in the context of difficult pandemic conditions, highlights the need for brief and easily accessible interventions that help reduce stress, which is inevitable during extreme pandemic conditions. Interventions should also enhance stress recovery skills, which could equip medical personnel with relevant psychological resources to sustain the effects of stress reduction. Therefore, we aimed to investigate the effects of an internet-based stress recovery intervention on stress recovery skills among nurses in the context of the COVID-19 pandemic using a randomized controlled trial design and comparing the intervention group with a waiting list control group. We also aimed to investigate the effects of the intervention on perceived stress, anxiety and depression symptoms, psychological well-being, posttraumatic stress and complex posttraumatic stress symptoms, and moral injury. Additionally, we aimed to assess the usability of the stress recovery intervention.

2. Methods

2.1. Design

A two-armed randomized controlled trial was conducted in Lithuania, comparing the six-week online intervention FOREST participants against a waiting list control group. We randomly allocated participants to the intervention or the waiting list control group (allocation ratio 1:1). Participants assigned to the intervention group received the intervention immediately after randomization, whereas participants in the waiting list control group received the same intervention six months later. Assessments took place at three-time points: pre-test T1 (April/2021), post-test T2 (June–July/2021), and 3-month follow-up T3 (September–October/2021). Self-report data were collected using a secure encrypted treatment platform – Iterapi (Vlaescu et al., 2016). All procedures involved in the trial were consistent with the ethical standards. The study was approved by Vilnius University Psychology Research Ethics Committee (Reference No. 2021-03-22/61). The trial was registered at www.clinicaltrials.gov (NCT04817995, March 30, 2021). In the current study, the data were reported following the CONSORT statement for reporting parallel group trials (Schulz et al., 2011).

2.2. Participants

Participants were enrolled after disseminating invitations to participate in the program through social networks of nurses, healthcare institutions, and press releases to national media throughout the whole country. Recruitment was carried out in April/2021 (date of first recruitment: April 1, 2021). Individuals interested in participation registered on the study website www.forestmedikams.lt, where all the information about the study was presented. Potential participants were informed about the length of the program, its overall structure, and each module's structure; it was also highlighted that the program is internet-based, delivered remotely, and the intensity of the program can be chosen by the participants themselves. Participants provided informed consent and completed pre-test assessment questionnaires during the online registration. After registration, individuals who fully completed the online pre-test assessment were contacted by phone for a brief interview to finalize their eligibility for the current study; also, their questions regarding the program and all the procedures were answered. A flowchart of the study is presented in Fig. 1.

To be included in the study, participants had to be nurses working in a healthcare setting, at least 18 years old, comprehend Lithuanian, and have a device with an Internet connection. Predefined exclusion criteria

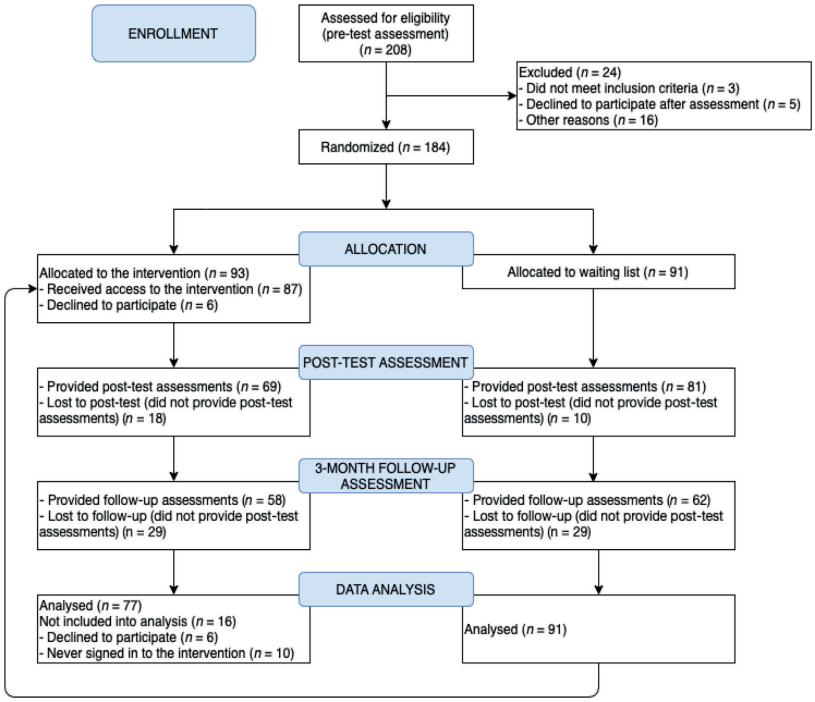

Fig. 1. Flowchart of the study.

were an acute psychiatric crisis, high suicide risk, alcohol/drug addiction, and interpersonal violence.

2.3. Randomization

Eligible participants were randomly assigned to either the intervention or the waiting list control group. Randomization was conducted by a researcher not associated with the current study using the random number calculation procedure (www.random.org). No stratification was applied. Before registering for the study, participants were informed that they would get access to the intervention either in April/2021 or October/2021.

2.4. Intervention

The intervention FOREST has been described in detail previously (Jovarauskaite et al., 2021). In brief, it is a six-week online program based on cognitive behavior therapy (CBT), with the inclusion of mindfulness principles. The program used for the current study was developed by clinical psychologists and researchers with expertise in stress-related conditions and internet-delivered interventions; the program FOREST is available for researchers interested upon a reasonable request. The program consists of six modules: Introduction, Psychological detachment, Distancing, Mastery, Control, and Keeping the change alive. Every module consists of psychoeducation on the specific topic, several exercises, and a reminder to message the psychologist who responds to the participant within 24 h. Participants were provided with access to a new program module weekly on the same weekday, and they received an email stating the availability of the new module. Also, additional weekly reminders were sent to the participants who had not signed into the intervention platform, had not read the new material, or had not done the new exercises. Eight psychologists were involved in the study. The psychologists' role included giving feedback to participants after completing the intervention exercises, answering questions, and providing psychological support. Responses by the psychologists were standardized according to the guidelines, and weekly supervision meetings were held.

2.5. Measures

2.5.1. Stress recovery

The Recovery Experiences Questionnaire (REQ) (Sonnentag and Fritz, 2007) was used to measure stress recovery. The REQ comprises 16 items measuring four components of stress recovery: (1) psychological detachment (e.g., "I forget about work"), (2) relaxation (e.g., "I kick back and relax"), (3) mastery (e.g., "I learn new things"), and (4) control (e.g., "I feel like I can decide for myself what to do") with 4 items on each subscale. The participants indicated their level of agreement with the REQ items on a 5-point Likert scale ranging from 1 "totally disagree" to 5 "totally agree". Cronbach's alpha was good for the total REQ in the current study at T1 ($\alpha = 0.89$), indicating sufficient internal consistency. Each subscale also showed good or acceptable internal

consistency: psychological detachment ($\alpha = 0.83$), relaxation ($\alpha = 0.85$), mastery ($\alpha = 0.78$), and control ($\alpha = 0.82$).

2.5.2. Stress

The Perceived Stress Scale (PSS-4) (Cohen et al., 1983) was used to measure the perceived level of stress. The PSS-4 comprises 4 items (e.g., "In the last month, how often have you felt that you were unable to control the important things in your life?"). The participants indicated their level of agreement with items on a 5-point Likert scale ranging from 0 "never" to 4 "very often". Cronbach's alpha was acceptable for the PSS-4 in the current study at T1 ($\alpha = 0.73$).

2.5.3. Depression and anxiety symptoms

The Patient Health Questionnaire-4 (PHQ-4) (Kroenke et al., 2009) was used to measure depression and anxiety symptoms. The PHQ-4 comprises 4 items and 2 subscales with two items each: anxiety symptoms (e.g., "Feeling nervous, anxious or on edge"), and depression symptoms (e.g., "Little interest or pleasure in doing things"). The participants indicated their level of agreement with the PHQ-4 items on a 4-point Likert scale ranging from 0 "not at all" to 3 "nearly every day". Cronbach's alpha was good for the PHQ-4 in the current study at T1 ($\alpha = 0.88$).

2.5.4. Psychological well-being

The World Health Organization Well-being Index (WHO-5) (Bech, 2004) was used to measure psychological well-being. The WHO-5 comprises 5 items (e.g., "I have felt cheerful and in good spirits"). The participants indicated their level of agreement with the WHO-5 items on a 6-point Likert scale ranging from 0 "at no time" to 5 "all the time". Cronbach's alpha was good for the WHO-5 in the current study at T1 ($\alpha = 0.89$).

2.5.5. Posttraumatic stress symptoms

The International Trauma Questionnaire (ITQ) (Cloitre et al., 2018) was used to measure symptoms of posttraumatic stress and complex posttraumatic stress. As posttraumatic stress and complex posttraumatic stress are reactions to trauma exposure, the ITQ responses were collected only from participants who reported exposure to at least one lifetime traumatic event as measured with the trauma exposure screening. The ITQ comprises 18 items constituting two parts, that is, a subscale of the core posttraumatic stress symptom cluster (6 symptom items, e.g., "Having upsetting dreams that replay part of the experience or are clearly related to the experience") and a subscale for complex posttraumatic stress-specific symptoms of disturbances in self-organization (6 symptom items, e.g., "When I am upset, it takes me a long time to calm down"). The additional 6 items measure functional impairment either related to posttraumatic stress symptoms (3 items) or disturbances in self-organization symptoms (3 items). The participants indicated their level of agreement with ITQ items on a 5-point Likert scale ranging from 0 "not at all" to 4 "extremely". Cronbach's alpha was good for the ITQ in the current study at T1 ($\alpha = 0.86$), as well as for subscales of posttraumatic stress ($\alpha = 0.86$) and disturbances in self-organization ($\alpha = 0.83$).

2.5.6. Moral injury

The Moral Injury Outcome Scale (MIOS) (Litz et al., 2020) was used to measure moral injury. The MIOS comprises 14 items (e.g., "I have lost faith in humanity"). The participants indicated their level of agreement with the MIOS items on a 5-point Likert scale ranging from 0 "strongly disagree" to 4 "strongly agree". Cronbach's alpha was good for the MIOS in the current study at T1 ($\alpha = 0.89$).

2.5.7. Usability of the FOREST intervention

Participants were asked to evaluate the usability of the FOREST intervention by indicating how useful (from 1 "not useful at all" to 5 "very useful"), satisfactory (from 1 "I did not like it at all" to 5 "I liked it a lot"), and easy to use (from 1 "it was not easy at all" to 5 "it was very easy") the program had been. Participants were also asked to report their subjective impression regarding the improvement of mental well-being (from 1 "worsened a lot" to 5 "improved a lot"), physical health (from 1 "worsened a lot" to 5 "improved a lot"), general understanding of oneself and one's well-being (from 1 "not at all" to 5 "definitely improved"), and recommending the program to others (from 1 "not at all" to 5 "definitely would recommend").

2.6. Data analysis

To estimate intervention effects, we used the latent change modeling approach (Duncan et al., 2006). In latent change models, the *intercept* represents the mean level of the measure at the first measurement point (pre-test), and the *slope* represents the change from one measurement point to the other. To compare the intervention and control groups in terms of outcome measures at the baseline, we regressed the intervention condition (0 = waiting list control group; 1 = intervention group) on the intercepts of variables of interest. To indicate the intervention effects, we regressed the intervention condition on the slopes of outcome variables. The immediate intervention effects were indicated by the regression coefficients on slopes from pre- to post-tests, and the sustainability of effects over the period of three months was indicated by the regression coefficients on slopes from the pre-test to follow-up. To contrast the changes in the intervention and control groups, we ran the series of multiple-group latent change models, indicating the change of outcome variables from the pre- to post-test and from the pre-test to follow-up in each group separately. We tested the intervention effects on separate stress recovery components of psychological detachment, relaxation, mastery, and control using the sum scores for each subscale. We tested the intervention effects on secondary outcomes (perceived stress, anxiety and depression symptoms, and well-being) using the sum scores of the respective measures. Finally, we tested the effects on posttraumatic stress and disturbances in self-organization symptoms in a sample of participants who had experienced at least one traumatic event and moral injury in a sample of participants who had experienced an event or events that may lead to moral injury using the sum scores of respective measures. To have the latent change models identified, in all models, we fixed the residuals to zero.

Further, we calculated between-group and within-group effect sizes, following the correct effect size calculation recommendations for latent change models (Feingold, 2009). The between-group pre- to post-test and pre-test to follow-up effect sizes were calculated using the mean slopes from the pre- to post-test and from the pre-test to follow-up in the intervention group and waiting list control group, respectively, and the standard deviations of the intercept in each group. The within-group pre- to post-test and pre-test to follow-up effect sizes were calculated by using the intercepts in each group indicating the level of the measure at the pre-test, estimated means at the post-test or follow-up, and standard deviations of the intercepts. Bias-corrected effect sizes (Fritz et al., 2012) were reported. In all analyses, the magnitude of the effect expressed in *d* was interpreted according to Cohen (Cohen, 1988), that is, 0.50 = medium effect, and 0.80 = large effect.

The independent samples *t*-test and χ^2-test were used to test for between-group differences in demographic characteristics using IBM SPSS Statistics version 26. The latent change analyses were performed with Mplus 8.2 (Muthén and Muthén, 2017). No data imputation was applied. The full information maximum likelihood (FIML) estimator was used in latent change analyses for handling the missing data (Enders, 2010).

3. Results

3.1. Participants

The participant flowchart is presented in Fig. 1. Overall, 208 individuals registered for the study and completed the pre-test

assessment. After the exclusion of 24 individuals (due to not meeting inclusion or meeting exclusion criteria (two were not medical nurses, and one had an alcohol addiction), declining to participate, and other reasons), 184 participants were randomly assigned to the intervention group ($n = 93$) or waiting list control group ($n = 91$). Sixteen participants from the intervention group declined to participate after randomization ($n = 6$) or never signed into the intervention application ($n = 10$); therefore, were excluded from the analysis.

The final study sample comprised 168 nurses ($M_{age} = 42.12$, $SD_{age} = 11.38$; 97 % female): 77 in the intervention group and 91 in the waiting list control group. Descriptive data on study participants at the pre-test are presented in Table 1. Analysis of the chi-square and *t*-test showed no statistically significant differences between the intervention and waiting list control groups at the pre-test for any of demographic characteristics. Also, there were no differences between intervention and waiting list control groups at the pre-test in terms of stress recovery components of psychological detachment, relaxation, mastery, and control, as well as no differences were found for perceived stress, anxiety and depression symptoms, well-being, posttraumatic stress and disturbances in self-organization symptoms, and moral injury between the two groups (Table 2).

Table 1
Characteristics of the study participants ($N = 168$) at pre-test.

Variable	Intervention group ($n = 77$) *n* (%)	Control group ($n = 91$) *n* (%)	Significance statistics
Gender			
Female	75 (97.4)	88 (96.7)	$\chi^2(1) = 0.07, p = .790$
Male	2 (2.6)	3 (3.3)	
Age			
M (*SD*)	40.39 (11.90)	43.58 (10.77)	$t(166) = 1.82, p = .070$
Range	23–61	23–65	
Position			
Nurse	72 (93.5)	88 (96.7)	$\chi^2(1) = 0.94, p = .332$
Assistant nurse	5 (6.5)	3 (3.3)	
Education			
Secondary or lower	1 (1.3)	1 (1.1)	$\chi^2(2) = 0.56, p = .756$
Higher or non-university higher	43 (55.8)	56 (61.5)	
Higher university	33 (42.9)	34 (37.4)	
Working status			
Part-time	6 (7.8)	1 (1.1)	$\chi^2(2) = 4.93, p = .085$
Full-time	28 (36.4)	39 (42.9)	
More than full-time	43 (55.8)	51 (56.0)	
Department			
Surgical	6 (7.8)	8 (8.8)	$\chi^2(5) = 3.35, p = .646$
Therapy	32 (41.6)	38 (41.8)	
Anesthesiology and intensive care	14 (18.2)	14 (15.4)	
Outpatient care	12 (15.6)	9 (9.9)	
Emergency	7 (9.1)	8 (8.8)	
Other	6 (7.8)	14 (15.4)	
Work experience			
<2 years	10 (13.0)	6 (6.6)	$\chi^2(3) = 6.04, p = .109$
2–5 years	12 (15.6)	12 (13.2)	
6–10 years	12 (15.6)	7 (7.7)	
>10 years	43 (55.8)	66 (72.5)	
Long-term relationship			
No	18 (23.4)	26 (28.6)	$\chi^2(1) = 0.58, p = .445$
Yes	59 (76.6)	65 (71.4)	
Consulting a psychologist			
No	70 (90.9)	87 (95.6)	$\chi^2(1) = 1.50, p = .220$
Yes	7 (9.1)	4 (4.4)	
Taking medication due to mental health difficulties			
No	72 (93.5)	86 (94.5)	$\chi^2(1) = 0.07, p = .785$
Yes	5 (6.5)	5 (5.5)	
Recently used other self-help app			
No	65 (84.4)	79 (86.8)	$\chi^2(1) = 0.20, p = .658$
Yes	12 (15.6)	12 (13.2)	
Worked with COVID-19 patients			
No	23 (29.9)	28 (30.8)	$\chi^2(1) = 0.02, p = .900$
Yes	54 (70.1)	63 (69.2)	
Experienced the death of COVID-19 patient(s)			
No	50 (64.9)	52 (57.1)	$\chi^2(1) = 1.06, p = .303$
Yes	27 (35.1)	39 (42.9)	
Was diagnosed with COVID-19			
No	60 (77.9)	68 (74.7)	$\chi^2(1) = 0.24, p = .628$
Yes	17 (22.1)	23 (25.3)	
Had someone close to them diagnosed with COVID-19			
No	34 (44.2)	42 (46.2)	$\chi^2(1) = 0.07, p = .795$
Yes	43 (55.8)	49 (53.8)	
Lost a loved one due to COVID-19			
No	72 (93.5)	88 (96.7)	$\chi^2(1) = 0.94, p = .332$
Yes	5 (6.5)	3 (3.3)	
Was vaccinated against COVID-19			
No	21 (27.3)	24 (26.4)	$\chi^2(1) = 0.02, p = .896$
Yes	56 (72.7)	67 (73.6)	

Table 2
Baseline comparison and intervention effects as well as mean intercepts and slopes for intervention ($n = 77$) and the control ($n = 91$) groups.

$N = 168$	Intercept		$\beta_{baseline}$	Slope (pre-post)		$\beta_{pre\text{-}post}$	Slope (pre-follow-up)		$\beta_{pre\text{-}follow\text{-}up}$
	M	Var		*M*	Var		*M*	Var	
Psychological detachment									
Intervention	10.87	12.71	0.05	2.49***	17.36	0.35***	2.60***	13.53	0.37***
Control	10.58	7.34		−0.13	9.34		−0.23	12.06	
Relaxation									
Intervention	13.18	10.46	−0.06	2.14***	11.82	0.41***	1.71***	14.49	0.30***
Control	13.55	7.15		−0.60*	7.43		−0.27	5.90	
Mastery									
Intervention	12.96	8.87	−0.03	1.47***	10.20	0.30***	1.27**	13.49	0.24**
Control	13.17	9.52		−0.49	9.03		−0.45	11.04	
Control									
Intervention	14.46	7.76	0.02	1.19***	7.16	0.26***	0.89	11.62	0.14
Control	14.36	9.64		−0.17	6.19		0.10	5.30	
Perceived stress									
Intervention	7.99	6.07	0.05	−1.61***	5.29	−0.24***	−2.02***	8.92	−0.33***
Control	7.70	8.10		−0.29	9.29		0.10	9.71	
Anxiety symptoms									
Intervention	2.66	2.43	−0.10	−0.66***	2.40	−0.15*	−0.44*	2.20	−0.10
Control	2.99	3.22		−0.13	3.24		−0.13	2.74	
Depression symptoms									
Intervention	2.53	1.86	−0.03	−0.75***	2.44	−0.22**	−0.53*	2.75	−0.15
Control	2.64	2.85		0.01	2.98		−0.01	3.02	
Well-being									
Intervention	9.61	21.80	0.01	2.65***	21.06	0.28***	2.84***	25.67	0.25**
Control	9.51	23.50		0.09	16.98		0.50	16.71	
Posttraumatic stress symptoms ($N = 121$)									
Intervention ($n = 51$)	6.86	23.88	−0.06	−0.69	24.75	−0.20*	0.02	31.47	−0.05
Control ($n = 70$)	7.57	41.79		1.19*	19.27		0.74	38.75	
Disturbances in self-organization symptoms ($N = 121$)									
Intervention ($n = 51$)	8.77	21.20	0.01	−1.11	22.07	−0.16	−1.14	17.92	−0.07
Control ($n = 70$)	8.69	28.59		0.27	13.18		−0.55	19.29	
Moral injury ($N = 96$)									
Intervention ($n = 49$)	20.76	95.53	−0.13	−1.83	52.12	−0.03	−4.78**	83.12	−0.09
Control ($n = 47$)	22.96	47.87		−1.31	59.43		−3.26*	65.54	

* $p \leq .05$.
** $p \leq .01$.
*** $p \leq .001$.

3.2. Engagement in the intervention and attrition

In the intervention group, participants were considered engaged in the present study if they had signed into the intervention platform at least once. Most of the participants (77/87, 88.5 %) met this criterion. Of those who signed into the intervention platform, 24.7 % (19/77) signed in <5 times, 37.7 % (29/77) signed in 5–10 times, and 37.7 % (29/77) signed in 11–20 times. Participants signed into the separate modules of the intervention as follows: 98.7 % (76/77) to the first (Introduction), 88.3 % (68/77) to the second (Psychological detachment), 80.5 % (62/77) to the third (Distancing), 67.5 % (52/77) to the fourth (Mastery), 62.3 % (48/77) to the fifth (Control), and 53.2 % (41/77) to the sixth (Keeping the change alive) module. More than half of the participants from the intervention group provided post-test (61/77, 79.2 %) and follow-up (52/77, 67.5 %) assessments. From the waiting list control group, 89.0 % (81/91) of participants provided post-test and 68.1 % (62/91) follow-up assessments. Thus, the attrition rates were 15.5 % (26/168) at the post-test and 32.1 % (54/168) at the follow-up.

3.3. Intervention outcomes

The results of latent change analyses are presented in Table 2. The analyses revealed a statistically significant intervention effect on the increase of stress recovery components of psychological detachment, relaxation, and mastery both from the pre- to post-test and from the pre-test to follow-up; the positive effect on the change of control scores was observed from the pre- to post-test only. During the study period, psychological detachment, relaxation, and mastery increased in the intervention group. Psychological detachment and mastery remained stable in the control group over three months. Relaxation decreased in the control group from the pre- to post-test and returned to the baseline level at the three-month follow-up. The control increased in the intervention group from the pre- to post-test and returned to the baseline level at the three-month follow-up, while in the control group, it remained stable over the study period. Effect sizes are presented in Table 3. The between-group effect sizes from the pre- to post-test indicated a large intervention effect on the increase of psychological detachment and relaxation scores, a moderate intervention effect on the increase of mastery score, and a small intervention effect on the increase of control score. Also, a large increase in psychological detachment, a moderate increase in relaxation, and mastery scores were observed from the pre-test to follow-up. The within-group effect sizes from the pre- to post-test and from the pre-test to follow-up indicated a moderate increase in psychological detachment and relaxation scores and a small increase in mastery and control scores in the intervention group. No statistically significant within-group changes were observed in the control group.

The latent change analyses of the secondary outcomes (perceived stress, anxiety symptoms, depression symptoms, and well-being) indicated statistically significant intervention effects on a decrease in perceived stress and increase in well-being both from the pre- to post-test and from the pre-test to follow-up. The statistically significant intervention effects on decrease in depression and anxiety symptoms were observed from the pre- to post-test only. Perceived stress, depression, and anxiety symptoms decreased, and well-being increased in the intervention group over three months, while all these outcomes

Table 3
Intervention effect sizes.

Variable	Group	Within-group Pre-test and post-test *d* [95 % CI]	Within-group Pre-test and follow-up *d* [95 % CI]	Between-group Pre-test and post-test *d* [95 % CI]	Between-group Pre-test and follow-up *d* [95 % CI]
Psychological detachment	Intervention	0.70 [0.37; 1.02]	0.73 [0.40; 1.05]	0.83 [0.52; 1.15]	0.90 [0.58; 1.22]
	Control	−0.05 [−0.34; 0.24]	−0.08 [−0.38; 0.21]		
Relaxation	Intervention	0.66 [0.33; 0.98]	0.53 [0.21; 0.85]	0.93 [0.61; 1.25]	0.67 [0.36; 0.98]
	Control	−0.22 [−0.52; 0.07]	−0.10 [−0.39; 0.19]		
Mastery	Intervention	0.49 [0.17; 0.81]	0.42 [0.10; 0.74]	0.64 [0.33; 0.95]	0.56 [0.25; 0.87]
	Control	−0.16 [−0.45; 0.13]	−0.15 [−0.44; 0.15]		
Control	Intervention	0.42 [0.10; 0.74]	0.32 [0.00; 0.64]	0.46 [0.15; 0.76]	0.27 [−0.04; 0.57]
	Control	−0.05 [−0.35; 0.24]	0.03 [−0.26; 0.32]		
Perceived stress	Intervention	−0.65 [−0.98; −0.33]	−0.82 [−1.15; −0.49]	−0.49 [−0.80; −0.18]	−0.79 [−1.10; −0.47]
	Control	−0.10 [−0.39; 0.19]	0.03 [−0.26; 0.33]		
Anxiety symptoms	Intervention	−0.42 [−0.74; −0.10]	−0.28 [−0.60; 0.04]	−0.31 [−0.62; −0.01]	−0.18 [−0.49; 0.12]
	Control	−0.07 [−0.36; 0.22]	−0.07 [−0.36; 0.22]		
Depression symptoms	Intervention	−0.55 [−0.87; −0.23]	−0.39 [−0.71; −0.07]	−0.49 [−0.80; −0.18]	−0.33 [−0.64; −0.03]
	Control	0.01 [−0.28; 0.30]	−0.01 [−0.30; 0.28]		
Well-being	Intervention	0.56 [0.24; 0.89]	0.61 [0.28; 0.93]	0.53 [0.23; 0.84]	0.49 [0.18; 0.80]
	Control	0.02 [−0.27; 0.31]	0.10 [−0.19; 0.39]		
Posttraumatic stress symptoms	Intervention	−0.14 [−0.53; 0.25]	0.00 [−0.38; 0.39]	−0.32 [−0.68; 0.04]	−0.12 [−0.48; 0.24]
	Control	0.18 [−0.15; 0.52]	0.11 [−0.22; 0.45]		
Disturbances in self-organization symptoms	Intervention	−0.24 [−0.63; 0.15]	−0.25 [−0.64; 0.14]	−0.27 [−0.63; 0.09]	−0.12 [−0.48; 0.25]
	Control	0.05 [−0.28; 0.38]	−0.10 [−0.43; 0.23]		
Moral injury	Intervention	−0.19 [−0.58; 0.21]	−0.49 [−0.89; −0.08]	−0.06 [−0.46; 0.34]	−0.18 [−0.58; 0.22]
	Control	−0.19 [−0.59; 0.22]	−0.47 [−0.88; −0.06]		

remained stable in the control group. Effect sizes are presented in Table 3. The between-group effect sizes from the pre- to post-test indicated a moderate intervention effect on the increase of well-being score and a small intervention effect on the decrease of perceived stress, anxiety symptoms, and depression symptoms scores. Also, a moderate decrease in perceived stress score and a small decrease in depression symptoms score, and a small increase in well-being score were observed from the pre-test to follow-up. The within-group effect sizes from the pre- to post-test indicated a moderate decrease in perceived stress and depression symptoms scores, a moderate increase in well-being scores, and a small decrease in anxiety symptoms scores in the intervention group. Also, a large decrease in perceived stress score, a moderate increase in well-being score, and a small decrease in depression symptoms score were observed from the pre-test to follow-up in the intervention group. No statistically significant within-group changes were observed in the control group.

Finally, the latent change analyses of posttraumatic stress symptoms and disturbances in self-organization symptoms in a sample of participants who had experienced at least one traumatic event and moral injury were performed in a sample of participants who had experienced an event or events that may lead to moral injury. Traumatic experiences were reported by 66.2 % ($n = 51$) of the intervention group participants and 76.9 % ($n = 70$) of the participants from the waiting list control group. The analyses revealed a statistically significant intervention effect on posttraumatic stress symptoms from the pre- to post-test, but not from the pre-test to follow-up. No intervention effects on disturbances in self-organization symptoms were observed. In the intervention group, posttraumatic stress symptoms and disturbances in self-organization symptoms remained stable over three months; in the control group, posttraumatic stress symptoms increased from the pre- to post-test and returned to baseline level at the follow-up when disturbances in self-organization symptoms remained stable over time. Neither between- nor within-group effects were found in either of the groups.

Events that may lead to moral injury were reported by 63.6 % ($n = 49$) of the intervention group participants and 51.6 % ($n = 47$) of the participants from the waiting list control group. The analysis revealed no statistically significant intervention effects on moral injury scores. Moral injury decreased statistically significantly over three months in the intervention and control groups. No between-group effects were found, but a small decrease in moral injury score was observed from the pre-test to follow-up in the intervention and control groups.

3.4. Usability of the FOREST intervention

After using the program, of those intervention group participants who had provided post-test assessments and signed into the intervention at least once ($n = 61$), most of them assessed the program FOREST as useful (51/61, 83.6 %), satisfactory (53/61, 86.9 %), and easy to use (56/61, 91.8 %). Also, a great part of the participants reported that the program FOREST improved their mental well-being (45/61, 73.8 %), physical health (28/61, 45.9 %), and a general understanding of themselves and their well-being (37/61, 60.7 %). Finally, most participants (54/61, 88.5 %) indicated that they would recommend the program FOREST to others. We have also explored the links between the level of engagement to the intervention and participants' perception of its usefulness. We found that participants' perception of the intervention as useful was positively related to the times logged in to the intervention ($p = .044$, $rho = 0.259$), but not with the number of modules logged in ($p = .079$, $rho = 0.226$).

4. Discussion

4.1. Principal findings

In the present study, we aimed to investigate the effects of the internet-based stress recovery intervention on stress recovery, as well as perceived stress, anxiety and depression symptoms, psychological well-being, posttraumatic stress and complex posttraumatic stress symptoms, and moral injury among medical nurses in the context of the COVID-19 pandemic. We also aimed to assess the usability of the program among its users. We found promising intervention effects indicating that the stress recovery intervention FOREST fostered stress recovery skills, including psychological detachment, relaxation, mastery, and control, and most of the effects remained stable three months after the intervention. In addition, the intervention was effective in reducing its users' stress, depression, and anxiety symptoms as well as increasing psychological well-being with stable decreased stress and depression symptoms as well as improved psychological well-being

three months after the intervention. Finally, we found that participants assessed the intervention as very good, and their overall satisfaction with the program was high.

Study findings revealed that using a six-week duration internet-based stress recovery intervention improved healthcare workers' skills of disengaging from work both physically and mentally, taking time for relaxation, getting involved in challenging experiences that distract from work and learning opportunities in other domains, as well as for deciding which activities to pursue during leisure time as well as when and how to do that. All the skills gained remained stable several months later, except for the control skill. It may be that control skill is the most difficult to acquire compared to psychological detachment, relaxation, and mastery skills. Also, all the information and exercises regarding control were presented in the intervention's last and single module. In contrast, other components were introduced earlier in time and were reminded in further modules. Therefore, the acquisition of the control skill could be related to its insufficient representation, especially having in mind that the last modules were used less by its users than the first modules. Nevertheless, most of the stress recovery skills acquired while using the intervention were stable over the three months, and this looks promising, taking into consideration the heavy workloads and stressful experiences of medical staff.

It is important to note that healthcare workers who were using this CBT-based internet-delivered intervention not only gained stress recovery skills that remained active after three months, but their perceived stress levels were also reduced and remained reduced over three months. It would be interesting to explore whether stress recovery works as a mediator in reducing stress levels; possibly, the intervention could have indirect effects on reducing stress levels through the increase of recovery skills. It is also important that anxiety and depression symptoms were reduced while using the intervention. However, only depression symptoms remained reduced over three months, while anxiety symptoms returned to the baseline level. It may be that more specific intervention may be needed to address anxiety symptoms. One of the most relevant findings of the current study is that the intervention helped reduce various symptoms and improved its participants' quality of life. After using the program, they felt more rested, calm, cheerful, active, and more interested in their daily lives.

Another interesting aspect that should be considered is the benefits of the intervention despite the decreasing engagement with every module. We believe that the intervention started providing benefits from its very beginning. We hypothesize that people, in this case, medical nurses, benefited from the intervention from its first module, meaning that simply identifying all the stressors experienced, naming the most important ones, and trying to understand their possible impact on a person's daily life can be of extreme importance in order to improve mental health. It is possible that the more the intervention is used, the more effective it is, but the very first effect starts with the first engagement. The possibility of addressing experiences, difficulties, and challenges might help to understand the links between these experiences and daily lives.

To the best of our knowledge, it was among the first studies that explored the efficacy of internet-based stress recovery interventions for healthcare workers. However, there are several studies that our results could indirectly be compared. Other studies that assessed the effectiveness of online programs in the healthcare professionals sample showed similar results to ours. Internet-based interventions were effective in improving well-being (Smoktunowicz et al., 2021), reducing stress levels (Gollwitzer et al., 2018), and equipped with stress management skills (Morrison Wylde et al., 2017). The results suggest that online programs have the potential to help healthcare workers to improve their well-being.

4.2. Limitations

Several limitations should be addressed regarding the current study. First, the study was conducted with a waiting list as a control condition. The results could be replicated with an active control condition in future trials, which would allow testing whether the stress recovery intervention has unique benefits compared to other interventions. Second, the intervention comprised multiple components (psychoeducation via texts and videos, various exercises, and communication with a psychologist). Due to the study design, it is impossible to identify which components contributed to the intervention effects the most. Therefore, future research should address these questions. Third, the study focused on medical nurses, and it remains unclear whether these findings can be generalized to other healthcare workers or other professions in general. Also, regarding the generalizability of results, all study participants were self-referred, which may present the risk of volunteer bias. Finally, the current study explored the effects of the intervention right after the intervention and after three months; such a follow-up period is still too short to assess the stability of the intervention effects in the long term, and future studies should address this issue.

5. Conclusion

The current study demonstrates that the internet-based stress recovery intervention for healthcare staff can effectively increase stress recovery skills, such as psychological detachment, relaxation, and mastery, and have a positive effect on reducing stress and depression symptoms and increasing psychological well-being. In addition, the intervention has the potential to increase stress recovery skill control and reduce anxiety symptoms. Moreover, participants assessed the intervention as very good, and their satisfaction with the program was high. Since healthcare workers face various emotional challenges and seldom seek professional psychological support, internet-based stress recovery interventions could be a feasible option for increasing the well-being of medical nurses.

Data availability

The raw data supporting the conclusions of this article will be made available by the authors upon reasonable request.

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CRediT authorship contribution statement

Austeja Dumarkaite: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Writing – original draft. **Inga Truskauskaite:** Conceptualization, Methodology, Investigation, Formal analysis, Writing – review & editing, Supervision. **Gerhard Andersson:** Conceptualization, Writing – review & editing, Supervision. **Lina Jovarauskaite:** Investigation, Writing – review & editing. **Ieva Jovaisiene:** Writing – review & editing. **Auguste Nomeikaite:** Investigation, Formal analysis, Writing – review & editing. **Evaldas Kazlauskas:** Conceptualization, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Paper 3

Effects of mindfulness-based internet intervention on ICD-11 posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A pilot randomized controlled trial

Dumarkaite, A., Truskauskaite-Kuneviciene, I., Andersson, G., Mingaudaite, J., Kazlauskas, E. (2021). Effects of mindfulness-based internet intervention on ICD-11 posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A pilot randomized controlled trial. *Mindfulness, 12*, 2754–2766. https://doi.org/10.1007/s12671-021-01739-w

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ORIGINAL PAPER

Effects of Mindfulness-Based Internet Intervention on ICD-11 Posttraumatic Stress Disorder and Complex Posttraumatic Stress Disorder Symptoms: a Pilot Randomized Controlled Trial

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Abstract

Objectives A substantial proportion of trauma survivors with posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) continue to experience symptoms even after trauma-focused therapies. Internet-based interventions could facilitate access to treatment for PTSD and CPTSD. The current pilot study aimed to investigate the effects of mindfulness-based internet intervention on PTSD and CPTSD symptoms.

Methods A randomized controlled trial (RCT) design with two measurement points (pre-test and post-test) was used to investigate the effects of a structured mindfulness-based internet intervention on PTSD and CPTSD symptoms as well as anxiety, depression, and positive mental health. In total, 70 university students with high levels of PTSD and CPTSD symptoms based on ICD-11 criteria participated in the study: 31 in the intervention group and 39 in the waiting list control group.

Results We found that the mindfulness-based internet intervention reduced CPTSD disturbances in self-organization (DSO) symptoms (ES = − 0.48 [− 0.96; 0.00]), particularly negative self-concept (ES = − 0.72 [− 1.21; − 0.24]) and disturbances in relationships (ES = − 0.55 [− 1.03; − 0.07]). Moreover, the intervention reduced the symptoms of PTSD sense of threat (ES = − 0.48 [− 0.96; − 0.01]) and promoted positive mental health (ES = 0.51 [0.03; 0.99]). High user satisfaction and good usability of the intervention were reported.

Conclusions Promising treatment effects were found, indicating that mindfulness-based internet intervention can reduce CPTSD symptoms and have a positive effect on mental health among youth in general. The findings of the current study contribute to the further development of trauma care using internet-delivered interventions.

Trial registration: ClinicalTrials.gov NTC04333667 (3 April 2020)

Keywords Posttraumatic stress disorder · Complex posttraumatic stress disorder · Mindfulness · Internet intervention · Effects · RCT

Posttraumatic stress disorder (PTSD) is among the most often diagnosed mental disorders worldwide (Maercker et al., 2013), resulting in a high burden and high costs for society. Effective treatments for PTSD have been developed over the last decade (Bisson & Olff, 2021). Currently, American Psychological Association (APA, 2017) and International Society for Traumatic Stress Studies (ISTSS, 2018) include cognitive behavioral therapy (CBT), cognitive processing therapy (CPT), cognitive therapy (CT), prolonged exposure therapy (PE), eye movement and desensitization therapy (EMDR). However, a substantial proportion of persons with PTSD continue to experience symptoms even after trauma-focused therapies (Bradley et al., 2005). In addition, high dropout rates have been associated with trauma-focused PTSD treatments (Lewis et al., 2020b).

The World Health Organization (2018) has included a new diagnosis of complex posttraumatic stress disorder (CPTSD) in the International Classification of Diseases

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(ICD-11) in addition to PTSD. According to the ICD-11, PTSD can be diagnosed if a person was exposed to traumatic experiences and meets all PTSD diagnostic criteria (symptoms of re-experiencing, avoidance, sense of threat, and functional impairment associated with these symptoms). CPTSD can be diagnosed if all criteria for PTSD and additional criteria for symptoms of disturbances in self-organization (DSO) (affect dysregulation, negative self-concept, disturbances in relationships) and functional impairment associated with these DSO symptoms are met (World Health Organization, 2018).

However, the new CPTSD diagnosis raises a lot of questions regarding treatment approaches of complex trauma. There is an ongoing debate over whether CPTSD requires a different kind of treatment to PTSD (Brewin, 2020), and there is an urgent need to research the effects of available and new psychological therapies for treatment of CPTSD. The current debate is also focused on the question of whether traditional exposure-based treatments are feasible for CPTSD. It has been suggested that an alternative phased approach, which starts with stabilization techniques helping trauma survivors to deal with affect regulation symptoms, should be applied in CPTSD treatment (Brewin, 2020). After reviewing two meta-analyses of recent treatment outcome studies, Karatzias and Cloitre (2019) suggested that although current PTSD therapies are effective, they have fewer benefits for individuals who are likely to have CPTSD, and thus multicomponent therapies might be an approach by which outcomes could be improved.

Mindfulness-based therapies have recently received attention as having the potential to treat various mental health problems, including PTSD (Colgan et al., 2016; Jasbi et al., 2018; Valenstein-Mah et al., 2019). Mindfulness can be described as the awareness that emerges through purposefully paying attention to the present moment and nonjudgmentally experiencing the unfolding moments (Kabat-Zinn, 2003). It is hypothesized that practicing mindfulness diminishes physiological arousal, increases attention control, and fosters acceptance of unwanted experiences, each of which addresses processes that maintain PTSD (Lang et al., 2012). Empirical evidence supports the view that mindfulness-based interventions may reduce PTSD symptoms in various populations (Colgan et al., 2016; Jasbi et al., 2018; Valenstein-Mah et al., 2019). Moreover, mindfulness-based treatments may reduce comorbid symptoms of depression and anxiety (Jasbi et al., 2018), as well as improve positive mental health aspects, such as resilience (Reyes et al., 2020) after traumatic experiences. Although a more detailed investigation is needed, dropout rates for existing mindfulness treatments for PTSD seem to be low (from none to 13.3%; Jasbi et al., 2018; Valenstein-Mah et al., 2019). Additionally, mindfulness-based therapies have potential to regulate affect (Guendelman et al., 2017), improve self-concept (Crescentini & Capurso, 2015) and relationships (Karremans et al., 2017). Each of these constitutes CPTSD DSO symptoms and, therefore, indicates that mindfulness could be delivered as an approach to reduce CPTSD symptoms. Thus, mindfulness-based treatments could be used in the initial stabilization phase of CPTSD treatment before the application of exposure-based treatments, particularly among individuals with high levels of DSO symptoms, such as emotional dysregulation. Alternatively, mindfulness could be integrated into CPTSD multicomponent trauma treatment which targets specific CPTSD symptoms.

To tackle the barriers of accessing PTSD treatments, internet-based interventions have been suggested as an alternative (Kazlauskas, 2017). The widespread availability of digital technology has caused a significant change in the delivery of the psychological treatments for mental health problems (Fairburn & Patel, 2017). The COVID-19 pandemic has highlighted that internet-delivered interventions may be necessary to consider not only as an alternative but also as the only possible intervention strategy (Wind et al., 2020). A narrative umbrella review of recent meta-analyses examining the effects of internet-based interventions for various mental health outcomes suggested that internet-delivered cognitive behavior therapy can be effective for a range of mental health problems, including panic disorder, social anxiety disorder, generalized anxiety disorder, post-traumatic stress disorder (based on DSM-IV criteria), and major depression (Andersson et al., 2019). Likewise, a meta-analysis of internet-delivered cognitive behavioral therapy for PTSD showed beneficial effects of internet-based interventions for PTSD, based on DSM and ICD (Lewis et al., 2018). However, to the best of our knowledge, no studies have explored internet-delivered interventions based both on cognitive behavioral therapy or mindfulness principles for the treatment of PTSD and CPTSD symptoms based on ICD-11 criteria. With the recent inclusion of CPTSD in the ICD-11 empirical evidence is needed for using it in a clinical setting (Karatzias & Cloitre, 2019).

The lack of knowledge about ICD-11 PTSD and CPTSD treatments highlights the need for identifying feasible treatments for these clinical conditions. Mindfulness-based treatments could be a promising option as an internet-based intervention. Therefore, the primary aim of the current pilot study was to investigate the effects of a mindfulness-based internet intervention on PTSD and DSO symptoms (prerequisite criteria to diagnose CPTSD) in a randomized controlled trial which compared an intervention group with a waiting list control group of young adults experiencing high levels of ICD-11 PTSD, CPTSD, or DSO symptoms. The secondary aim was to investigate the effects of the intervention on depression and anxiety symptoms, and positive mental health. Finally, we sought to evaluate user satisfaction

and program usability of the newly developed mindfulness-based internet intervention.

Method

Participants

In total, 70 university students (M_{age} = 23.34, SD_{age} = 3.11; 87.1% female) exposed to various traumatic experiences were included in the trial and were randomly allocated to intervention (n = 31) or control (n = 39) group. The power analysis revealed that the total sample of 66 participants was sufficient to detect the effect sizes of 0.25, indicating the differences between the two groups by using the multivariate two-measures data analytic approach (given a significance level of .05 and a power of 80%). Descriptive data on study participants at the pre-test are presented in Table 1. No differences were observed in terms of demographic characteristics between the groups, except for gender. There were significantly more male participants in the intervention group as compared to the control group (see Table 1).

We included participants who met the following criteria: (1) were 18 years old or older; (2) were fluent in the Lithuanian language; (3) had access to a device with an internet connection; (4) had experienced at least one traumatic event in their lifetime; (5) met the clinical significance criteria for PTSD, CPTSD, or DSO only with or without functional impairment as measured with the International Trauma Questionnaire (Cloitre et al., 2018). Participants without functional impairment were included in the study regardless, given the fact that the study was carried out during the beginning of the COVID-19 pandemic, and therefore, functional impairment in social, occupational, and other areas might have been affected significantly due to the context of the pandemic. The pre-defined exclusion criteria were as follows: (1) current acute case of psychiatric care; (2) currently experienced ongoing interpersonal violence; (3) current abuse of alcohol or drugs. None of the participants met the exclusion criteria. In addition, a suicidal crisis intervention plan was prepared, which included contacting study participants via phone call and directing them to crisis assistance services in a community. However, there were no participants with suicidal risk in the study.

Participants' Exposure to Traumatic Events. The exposure to traumatic events at the pre-test is presented in Table 2. No differences were found between the intervention and waiting list control groups regarding the mean score of experienced traumatic events. Also, there were no differences in exposure to specific traumatic events, except for life-threatening illness or injury, which was significantly more often reported in the intervention group than in the control group. The most prevalent traumatic event types both in the intervention and control groups were severe human

Table 1 Characteristics of the study participants at pre-test

Variable	Intervention group (n = 31), n (%)	Control group (n = 39), n (%)	Significance statistics
Gender			
Male	7 (22.6)	2 (5.1)	$\chi^2(1) = 4.70$, $p = .030$
Female	24 (77.4)	37 (94.9)	
Age			
M (SD)	23.06 (2.85)	23.56 (3.32)	$t(68) = 0.67$, $p = .508$
Range	20–32	20–35	
Nationality			
Lithuanian	30 (96.8)	36 (92.3)	$\chi^2(1) = 0.64$, $p = .424$
Other	1 (3.2)	3 (7.7)	
In partnership			
Yes	14 (45.2)	21 (53.8)	$\chi^2(1) = 0.52$, $p = .470$
No	17 (54.8)	18 (46.2)	
Employed			
Yes	11 (35.5)	19 (48.7)	$\chi^2(1) = 1.24$, $p = .266$
No	20 (64.5)	20 (51.3)	
Financial situation			
Cannot afford food	0	0	$\chi^2(3) = 7.57$, $p = .056$
Cannot afford clothes	2 (6.5)	0	
Can save some money	6 (19.4)	18 (46.2)	
Can afford expensive things	20 (64.5)	17 (43.6)	
Can afford everything	3 (9.7)	4 (10.3)	

Table 2 Participants' exposure to traumatic events at pre-test

	Intervention group (n = 31)	Control group (n = 39)	Significance statistics
Number of traumatic events			
M (SD)	4.84 (2.57)	4.95 (1.92)	$t(68) = 0.21$, $p = .838$
Range	1–11	1–9	
Traumatic event type	***n* (%)**	***n* (%)**	
Natural disaster	2 (6.5%)	8 (20.5%)	$\chi^2(1) = 2.79$, $p = .095$
Fire or explosion	9 (29%)	8 (20.5%)	$\chi^2(1) = 0.68$, $p = .409$
Transportation accident	12 (38.7%)	12 (30.8%)	$\chi^2(1) = 0.48$, $p = .487$
Other serious accident	9 (29%)	10 (25.6%)	$\chi^2(1) = 0.10$, $p = .751$
Exposure to toxic substance	1 (3.2%)	0	$\chi^2(1) = 1.28$, $p = .259$
Childhood physical abuse	17 (54.8%)	22 (56.4%)	$\chi^2(1) = 0.02$, $p = .895$
Physical assault	12 (38.7%)	20 (51.3%)	$\chi^2(1) = 1.10$, $p = .294$
Assault with a weapon	4 (12.9%)	3 (7.7%)	$\chi^2(1) = 0.52$, $p = .470$
Childhood sexual abuse	0	1 (2.6%)	$\chi^2(1) = 0.81$, $p = .369$
Sexual assault	2 (6.5%)	6 (15.4%)	$\chi^2(1) = 1.36$, $p = .243$
Other unwanted sexual experience	10 (32.3%)	17 (43.6%)	$\chi^2(1) = 0.94$, $p = .333$
Combat or exposure to a war-zone	0	0	-
Captivity	0	0	-
Life-threatening illness or injury	15 (48.4%)	10 (25.6%)	$\chi^2(1) = 3.89$, $p = .049$
Severe human suffering	22 (71.0%)	31 (79.5%)	$\chi^2(1) = 0.68$, $p = .409$
Sudden, violent death	3 (9.7%)	1 (2.6%)	$\chi^2(1) = 1.62$, $p = .203$
Sudden, unexpected death of someone close to you	10 (32.3%)	14 (35.9%)	$\chi^2(1) = 0.10$, $p = .750$
Serious injury, harm or death caused to someone	1 (3.2%)	2 (5.1%)	$\chi^2(1) = 0.15$, $p = .696$
Any other stressful event or experience	21 (67.7%)	28 (71.8%)	$\chi^2(1) = 0.14$, $p = .713$

suffering (exposure rate over 70%) and childhood physical abuse (exposure rate over 50%). The index trauma of the participants from the intervention and control groups were as follows: death of someone close (25.8% vs. 17.9%), sexual trauma (16.1% vs. 12.8%), physical abuse (12.9% vs. 20.5%), serious illness (9.7% vs. 7.7%), psychological abuse (9.7% vs. 17.9%), transportation accident (0% vs. 2.6%), several traumatic events (0% vs. 2.6%), and other traumatic events (25.8% vs. 17.9%). The time when the traumatic event occurred varied both in the intervention and control groups: exposure less than 6 months ago (16.1% vs. 23.1%), 6–12 months ago (12.9% vs. 12.8%), 1–5 years ago (29.0% vs. 28.2%), 5–10 years ago (12.9% vs. 15.4%), 10–20 years ago (22.6% vs. 17.9%), and more than 20 years ago (6.5% vs. 2.6%).

Intervention-Control Comparison. Descriptive information on participants' PTSD and DSO symptom scores as well as depression symptom scores, anxiety symptom scores, and positive mental health scores at the pre-test are presented in Table 3. The t-tests showed no significant differences between the intervention and waiting list control groups at pre-test for any primary or secondary outcomes. No differences were found on PTSD symptoms ($t(68) = 1.55$, $p = .125$) or DSO symptoms ($t(68) = -0.02$, $p = .983$). Also, no differences were found between the two groups for depression symptoms ($t(68) = 0.62$, $p = .538$), anxiety symptoms ($t(68) = 0.35$, $p = .724$), and positive mental health ($t(68) = 0.94$, $p = .350$). In the intervention group, 9.7% ($n = 3$) of the participants met criteria for diagnostic status of PTSD, and 38.7% ($n = 12$) of the participants met criteria for diagnostic status of CPTSD. In the control group, 25.6% ($n = 10$) of the participants met criteria for diagnostic status of PTSD, and 46.2% ($n = 18$) of the participants met criteria for diagnostic status of CPTSD. There were no differences between the intervention and control groups in terms of current mindfulness practices (3.2% vs. 5.1%; $\chi^2(1) = 0.15$, $p = .696$), current visits to a psychologist (19.4% vs. 12.8%; $\chi^2(1) = 0.56$, $p = .456$), and current use of medicine due to mental health problems (19.4% vs. 30.8%; $\chi^2(1) = 1.18$, $p = .278$). In the context of the COVID-19 pandemic, participants were also asked about their experiences related to COVID-19. None of the participants were or had been infected with coronavirus. None of the participants from the control group had a close family member or friend infected; there was one such case in the intervention group.

Table 3 Multivariate statistics of the intervention outcomes and effect sizes

	Group	Pre-test, *M*(*SD*)	Post-test, *M*(*SD*)	Time × group (univariate), *F*(*df*)	*p*	Within-group pre-test and post-test effect size *d* [95% CI]	Time × group (multivariate), *F*(*df*)	*p*	Between-group pre-test and post-test difference effect size *d* [95% CI]
PTSD	Intervention	13.55 (5.09)	9.55 (4.49)	2.32 (1)	.132	− 0.82 [− 1.34; − 0.30]	3.43 (2, 67)	.038	− 0.39 [− 0.87; 0.09]
	Control	15.49 (5.26)	13.54 (4.67)			− 0.39 [− 0.84; 0.06]			
DSO	Intervention	9.45 (3.01)	7.65 (3.03)	5.85 (1)	.018	− 0.59 [− 1.10; − 0.08]			− 0.48 [− 0.96; 0.00]
	Control	9.44 (3.04)	9.10 (2.85)			− 0.11 [− 0.56; 0.33]			
Re-experiencing	Intervention	3.42 (2.50)	2.61 (1.93)	0.11 (1)	.739	− 0.36 [− 0.86; 0.14]	1.40 (3, 66)	.251	− 0.08 [− 0.55; 0.39]
	Control	4.49 (2.25)	3.87 (2.26)			− 0.27 [− 0.72; 0.17]			
Avoidance	Intervention	4.58 (2.13)	3.10 (1.89)	1.72 (1)	.194	− 0.73 [− 1.24; − 0.21]			− 0.36 [− 0.84; 0.11]
	Control	5.38 (2.43)	4.74 (2.23)			− 0.27 [− 0.72; 0.17]			
Sense of threat	Intervention	5.55 (2.05)	3.84 (2.03)	3.81 (1)	.055	− 0.83 [− 1.35; − 0.31]			− 0.48 [− 0.96; − 0.01]
	Control	5.62 (2.07)	4.92 (1.68)			− 0.37 [− 0.82; 0.08]			
Affective dysregulation	Intervention	4.23 (1.71)	3.42 (1.69)	3.75 (1)	.057	− 0.47 [− 0.98; 0.03]	4.58 (3, 66)	.006	− 0.36 [− 0.83; 0.12]
	Control	4.05 (1.50)	3.82 (1.25)			− 0.16 [− 0.61; 0.28]			
Negative self-concept	Intervention	5.26 (2.63)	3.45 (2.20)	11.18 (1)	.001	− 0.74 [− 1.25; − 0.22]			− 0.72 [− 1.21; − 0.24]
	Control	4.79 (2.34)	4.79 (2.19)			0 [− 0.44; 0.44]			
Disturbances in relationships	Intervention	4.58 (1.71)	3.65 (1.74)	5.98 (1)	.017	− 0.53 [− 1.04; − 0.03]			− 0.55 [− 1.03; − 0.07]
	Control	4.67 (2.03)	4.79 (2.04)			0.06 [− 0.39; 0.50]			
Depression	Intervention	12.55 (6.03)	10.03 (4.81)	3.14 (1)	.081	− 0.46 [− 0.96; 0.05]	3.10 (3, 66)	.033	− 0.40 [− 0.87; 0.08]
	Control	13.36 (4.94)	13.03 (4.77)			− 0.07 [− 0.51; 0.38]			
Anxiety	Intervention	10.97 (5.39)	8.71 (4.57)	2.69 (1)	.106	− 0.45 [− 0.95; 0.06]			− 0.38 [− 0.85; 0.10]
	Control	11.41 (5.04)	11.13 (4.97)			− 0.06 [− 0.50; 0.39]			
Positive mental health	Intervention	11.32 (5.61)	13.74 (5.26)	9.10 (1)	.004	0.44 [− 0.06; 0.94]			0.51 [0.03; 0.99]
	Control	12.44 (4.29)	12.31 (4.28)			− 0.03 [− 0.47; 0.41]			

Procedure

Data were collected at two timepoints, March to April (pre-test/T1) and June to July (post-test/T2) 2020. Information about the study and the invitation to participate was sent by academic e-mail to all students at one of the largest research-oriented comprehensive Lithuanian universities and posted on the University's Facebook page. In addition, information was announced via University Students' Representation which posted information on separate faculties' Facebook

pages and encouraged students to participate in the study by sending them additional e-mails. Individuals interested in participation registered on the study website (www.stillme.lt) and completed the pre-test measures. After registration, individuals who had completed all the required measures were contacted for a structured phone interview. Inclusion was finalized after the phone interviews. A flowchart of the inclusion in the study is presented in Fig. 1.

Participants who met all inclusion criteria and had completed the pre-test measures were randomly assigned to either the intervention or waiting list control group. Randomization was based on a computer-generated randomization list (www.random.org) and was performed by an independent researcher. No stratification was applied. Participants were informed that they would be randomly allocated to either the intervention or waiting list control group. Participants assigned to the intervention group started using the program right after the randomization, whereas participants assigned to the waiting list control group were informed that they would get access to the program in 5 months.

All data reported in the trial were collected online, and participants were given standardized reminders to complete the assessments using the online assessment system. The study was approved by Vilnius University Psychology Research Ethics Committee (Reference No. 27-02-2020/36). All participants gave their informed consent for participation before filling the pre-test questionnaires. In the current study, the data are reported following the CONSORT statement for reporting parallel group trials (Schulz et al., 2011).

Intervention. A mindfulness-based internet intervention was developed specifically for the current study. It was aimed at university students who had been exposed to traumatic life events and experienced PTSD or CPTSD symptoms. The intervention was designed as a self-help program with the possibility of sending messages to a psychologist. The program was delivered through a secure online platform *Iterapi* (Vlaescu et al., 2016), which had been used in many previous studies, and translated into Lithuanian. The content of the intervention was developed by a team of psychologists, based on mindfulness principles with a focus on psychoeducation (which explicitly addressed traumatic experiences as well as PTSD and CPTSD symptoms followed by mindfulness benefits) and mindfulness techniques training. Eight modules included: (1) Introduction, (2) Awareness and nonjudgment of physical senses, (3) Physical senses in everyday life, (4) Awareness and nonjudgment of thoughts, (5) Thoughts in everyday life, (6) Awareness and nonjudgment of emotions, (7) Emotions in everyday life, and (8) Summary. The content of the program is presented in Table 4. Each module consisted of psychoeducation, two or three mindfulness exercises, and a reminder of the possibility to contact the psychologist. The mindfulness exercises were provided as audio recordings. The length of the audio recordings was approximately 2 to 7 minutes. Participants had the possibility to download each of the audio recordings to their devices. Participants could choose the intensity of the program according to their personal needs but were encouraged to practice at least one exercise every day. Access to a new module was provided every week on the same weekday over the 8 weeks. Once accessible, modules remained available throughout the intervention.

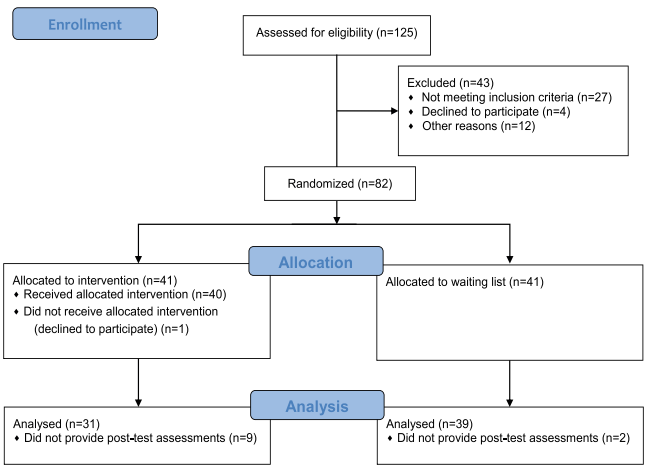

Fig. 1 Flowchart of the intervention

Table 4 Content of the intervention program

Module	Psychoeducation	Exercises
(1) Introduction	Introduction to the program (aims, benefits, instructions of usage) Education about PTSD (symptoms, their onset, related physical senses, thoughts, and emotions) Information about core mindfulness components that may promote recovery from PTSD (attention, mindful cognitive style, and non-judgment)	Defining individual goals for the program Two brief breathing exercises (audio recordings) Short quiz consisting of information provided in the first module
(2) Awareness and nonjudgment of physical senses	Education about trauma impact on body reactions and underlying mechanisms (automatic reactions vs. conscious information processing) Education about how to alleviate intense body reactions through awareness and nonjudgment	Three exercises (audio recordings) on awareness and nonjudgment of physical senses: body scan meditation, nonjudgment of physical senses, awareness of intense body reactions
(3) Physical senses in everyday life	Education about how mindfulness practices can help regulate body reactions through regulation of brain activity, experiencing and recognizing emotions, reducing anxiety, and promoting dormant state	Three exercises (audio recordings) on physical senses in everyday life: mindful eating, mindful walking, and sleeping relaxation
(4) Awareness and nonjudgment of thoughts	Education about trauma impact on thoughts and underlying mechanisms (subjective experience of traumatic event vs. objective reality, avoidance, controlling one's thoughts) Education about how to alleviate negative thoughts through awareness and nonjudgment	Three exercises (audio recordings) on awareness and nonjudgment of thoughts: awareness of thoughts, nonjudgment of thoughts, awareness of negative thoughts
(5) Thoughts in everyday life	Education about how mindfulness practices can help regulate negative thoughts through developing mindful cognitive style and its benefits (reducing rumination, experiencing less anxiety and more positive emotions, reducing avoidance, increasing productive thinking process)	Three exercises (audio recordings) on thoughts in everyday life: making bed, brushing teeth, and washing dishes
(6) Awareness and nonjudgment of emotions	Education about trauma impact on emotions and underlying mechanisms (disturbances in emotion regulation, feeling of unsafety, avoidance) Education about how to alleviate negative emotions through awareness and nonjudgment Education on variety of emotions	Three exercises (audio recordings) on awareness and nonjudgment of emotions: awareness of emotions, nonjudgment of emotions, awareness of negative emotions
(7) Emotions in everyday life	Education about how mindfulness practices can help enhance overall well-being through understanding one's emotions, increasing awareness and kindness for oneself, accepting one's negative emotions	Three exercises (audio recordings) on overall well-being: daily goals, practice of gratitude, and reflecting on relationships
(8) Summary	Summarizing the program and main aspects of provided information Encouraging to further practice mindfulness and presenting its benefits (mindfulness as protective factor)	Reflecting on individual goals and their progress throughout the program Two brief relaxation exercises (audio recordings)

Two clinical psychologists and one Master's student in the Clinical psychology program were involved as psychologists in the study. They received special training according to the guidelines developed specifically for the study. Weekly supervision meetings were scheduled, and extra supervisions were provided on request. The psychologist's role included supporting the participants, offering feedback, and answering questions. The psychologist's feedback was largely standardized, but individualization was encouraged to fit specific questions of the participants. Participants communicated with the psychologists asynchronously by writing and uploading their texts within a secure platform (Vlaescu et al., 2016), while psychologists provided feedback subsequently within 24 h. In total, psychologists wrote 15 texts of feedback to 8 participants of the study; other participants did not contact psychologists. Each feedback from psychologists took from 10 to 60 min.

Measures

Exposure to Traumatic Experiences. The DSM-5 Life Events Checklist (LEC-5) (Weathers et al., 2013) was used to assess the lifetime exposure to 18 traumatic experiences such as physical or sexual assault, life-threatening illness, or injury with one additional item assessing any other extremely stressful life event. The type of exposure to traumatic events was assessed with five possible response options: 1 (= "happened to me"), 2 (= "witnessed it"), 3 (= "learned about it"), 4 (= "not sure"), and 5 (= "does not apply"). In the current study, exposure to traumatic experience was considered if participants reported that traumatic experience either happened to them (1) or they witnessed it (2). The Lithuanian version of the measure has been used in previous research (Kazlauskas et al., 2018).

Symptoms of PTSD and CPTSD. The International Trauma Questionnaire (ITQ) (Cloitre et al., 2018), based on the WHO ICD-11 principles for PTSD and CPTSD diagnosis, was used to measure PTSD and CPTSD symptoms. Participants were instructed to indicate an experience based on DSM-5 Life Events Checklist (LEC-5; Weathers et al., 2013) that affected them the most, to briefly describe it, and provide responses to the ITQ regarding that traumatic experience. The ITQ is comprised of 18 items. Six items, two for assessment of each of the three PTSD symptom clusters in the past month, are divided into three subscales: two items for re-experiencing, two items for avoidance, and two items for a sense of threat symptoms. The score of the ITQ PTSD symptom part has a range from 0 to 24. The DSO symptoms in the past month are also measured with the six symptom items on the three subscales, in particular, affective dysregulation, negative self-concept, and disturbances in relationships symptoms, with two items for each of the DSO symptom clusters. The score of the ITQ DSO part has a range from 0 to 24. Additional six functional impairment items of the ITQ assess how PTSD (three items) and DSO (three items) symptoms impaired functioning in the past month. Participants rate the ITQ items on a 5-point Likert scale ranging from 0 (= "not at all") to 4 (= "extremely"). A score of ≥ 2 for at least one of the two items representing a particular PTSD and DSO symptom cluster indicates clinical significance based on the diagnostic algorithm proposed by the authors of the ITQ (Cloitre et al., 2018). A probable PTSD diagnosis is given when all three PTSD symptoms are clinically significant and if they significantly impair their functioning in at least one area of life. Diagnosis of CPTSD requires that the diagnostic criteria for PTSD are met, all three symptom clusters of DSO are clinically significant, and DSO symptom-related significant functional impairment in at least one area in life is reported. In the current sample, the internal consistency was high for the full ITQ scale (Cronbach's alpha, $\alpha = .82$) and acceptable for the subscales of PTSD symptoms ($\alpha = .75$) and DSO symptoms ($\alpha = .68$).

Depression. Patient Health Questionnaire-9 (PHQ-9) (Kroenke et al., 2001) was used to measure symptoms of depression. The Lithuanian version of PHQ-9 was used (Montvidas, 2018). Participants rate the statements on a 4-point Likert scale ranging from 0 (= "not at all") to 3 (= "nearly every day") by assessing whether they have been bothered by the loss of interest in doing things, fatigue, appetite problems, negative depressive thoughts within the last 2 weeks. The total score of PHQ-9 has a range from 0 to 27. The 10th item assesses how these problems impede work (from 0 = "not difficult at all" to 3 = "extremely difficult"). In the current study, good internal consistency of the PHQ-9 ($\alpha = .80$) was found.

Anxiety. The Generalized Anxiety Disorder Scale-7 (GAD-7) (Spitzer et al., 2006) was used to measure anxiety symptoms. The Lithuanian version of GAD-7 was used (Butkutė-Šliuožienė, 2019). GAD-7 measures general anxiety symptoms over the past two weeks. Seven statements (such as "Not being able to stop or control worrying") are scored on a Likert scale from 0 (= "not at all") to 3 (= "nearly every day"). The total score of GAD-7 has a range from 0 to 21. In the current study, Cronbach's alpha of the full scale was high ($\alpha = .90$).

Positive Mental Health. Positive Mental Health Scale (PMH) (Lukat et al., 2016) was used to assess positive mental health. The PMH comprises nine items measuring the emotional, cognitive, and social aspects of positive mental health. Participants rated statements such as "In general, I am confident," "Much of what I do brings me joy," on a Likert scale from 0 (= "do not agree") to 3 (= "agree"). The total score of PMH has a range from 0 to 27. The Lithuanian version of the scale has been used in previous

research and demonstrated good psychometric characteristics (Truskauskaite-Kuneviciene et al., 2020). In the current study, Cronbach's alpha of the full scale was high (α = .84).

User Satisfaction and Program Usability. Six items were used to assess satisfaction with using the program and program usability. The participants in the intervention group were asked to rate how useful (from 1 = "not useful at all" to 5 = "very useful"), satisfactory (from 1 = "I didn't like it at all" to 5 = "I liked it a lot"), and easy to use (from 1 = "it was not easy at all" to 5 = "it was very easy") the program was. They were also asked to report their subjective impression regarding the improvement of mental well-being (from 1 = "worsened a lot" to 5 = "improved a lot"), general understanding of oneself and one's well-being (from 1 = "not at all" to 5 = "definitely yes"), and recommending the program to a person who had experienced a traumatic event in their lifetime (from 1 = "not at all" to 5 = "definitely yes").

Data Analyses

Since we aimed to capture the possible change in used constructs, we performed a series of multivariate repeated measures ANOVAs with time (pre-test and post-test) as a within-subject factor and group (intervention vs. control) as a between-subject factor. First, we tested the intervention effects on PTSD and DSO symptoms using the sum scores for each measure. Then, we separately tested the PTSD symptoms subscales of re-experiencing, avoidance, and sense of threat. We also performed an analysis of the DSO symptoms subscales of affective dysregulation, negative self-concept, and disturbances in relationships. Finally, we tested the secondary outcomes (depression, anxiety, and positive mental health) using the sum scores of the respective measures.

We calculated both within-group and between-group effect sizes. The between-group effect sizes were calculated using the mean difference from pre-test to post-test in the intervention and control groups and the standard deviations of each group at pre-test (Morris, 2008). The within-group effect sizes were calculated using the means in each group at pre-test and post-test and standard deviations at each measurement point. Bias-corrected effect sizes (Fritz et al., 2012) were reported. The magnitude of the effect expressed in *d* was interpreted according to Cohen (1988), that is, 0.50 = medium effect, and 0.80 = large effect.

We used the Reliable change index (RCI) to calculate clinically significant changes (Iverson, 2019). For RCI calculations, we used the PTSD and CPTSD sum scores, standard deviations of the pre-test in the intervention group, and test-retest reliability of the respective scale. Independent samples *t*-test and χ^2-test were used to test for between-group differences on demographic characteristics, trauma exposure prevalence, primary and secondary outcomes. Data analyses were performed using IBM SPSS Statistics version 26.

Results

Engagement and Dropout

Participants from the intervention group were considered engaged in the current study if they had logged in to the intervention site at least once. All intervention group participants met this criterion. Of those who provided post-test assessments, 35.5% logged in < 5 times, 12.9% logged in 5–10 times, 19.4% logged in 11–20 times, and 32.3% logged in > 20 times. A majority (77.5%) of participants from the intervention group and 95.1% from the waiting list control group provided post-test assessments. Participants who provided post-test assessments were considered completers, while the remaining were considered dropouts.

There were no differences in terms of demographic characteristics between completers and dropouts at pre-test including gender ($\chi^2(1) = 0.03$, $p = .864$), age ($t(39) = -0.04$, $p = .972$), nationality ($\chi^2(1) = 0.33$, $p = .565$), partnership status ($\chi^2(1) = 2.27$, $p = .132$), employment status ($\chi^2(1) = 3.66$, $p = .056$), and financial situation ($\chi^2(3) = 2.68$, $p = .444$). Also, completers and dropouts did not differ in their current mindfulness practices ($\chi^2(1) = 0.33$, $p = .565$), current visits to a psychologist ($\chi^2(1) = 2.27$, $p = .132$), current use of medicine due to mental health problems ($\chi^2(1) = 2.27$, $p = .132$) as well as COVID-19 experiences. Completers and dropouts did not significantly differ in terms of any primary or secondary outcomes. No differences were observed between completers and dropouts for PTSD symptoms ($t(39) = -0.24$, $p = .816$), DSO symptoms ($t(39) = -0.14$, $p = .888$), depression symptoms ($t(39) = -0.35$, $p = .730$), anxiety symptoms ($t(39) = -0.52$, $p = .606$), and positive mental health ($t(39) = 0.55$, $p = .586$) at pre-test.

Intervention Effects on Primary and Secondary Outcomes

The results of the repeated measures MANOVA analyses and the between-group, as well as within-group effect sizes, are presented in Table 3. At the multivariate level, the analyses revealed a significant difference in change of PTSD and DSO symptoms sum scores over time between the intervention and control groups (Wilks' $\lambda = 0.91$). At the univariate level, we found a significantly higher decrease in the DSO score in the intervention group compared to the control group. No significant differences in the change of PTSD scores were found between the groups. The between-group effect size indicated a small intervention effect on the reduction of DSO score. The within-group effect sizes indicated

a large decrease in the PTSD score and a moderate decrease in the DSO score in the intervention group.

Separate repeated measures MANOVA analyses of the PTSD symptom clusters (re-experiencing, avoidance, and sense of threat) and DSO symptom clusters (affective dysregulation, negative self-concept, and disturbances in relationships) were performed. At the multivariate level, the analyses revealed no significant difference in change of the PTSD symptom clusters over time between the intervention and control groups (Wilks' $\lambda = 0.94$). Likewise, no significant differences in change of the PTSD symptom clusters were found among the two groups at the univariate level. The between-group effect sizes showed a small intervention effect on the reduction of the PTSD sense of threat symptoms. The within-group effect sizes indicated a moderate decrease in PTSD avoidance symptoms and a large decrease in sense of threat symptoms in the intervention group.

The repeated measures MANOVA analyses showed a significant difference in change of DSO symptom clusters over time between the intervention and control groups (Wilks' $\lambda = 0.83$). At the univariate level, we observed a significantly higher decrease of DSO negative self-concept and disturbances in relationships symptoms in the intervention group compared to the control group. No significant differences in change of affective dysregulation were found among the two groups. Between-group effect sizes indicated moderate intervention effects on the reduction of negative self-concept and disturbances in relationships. The within-group effect sizes showed a moderate decrease in negative self-concept and disturbances in relationships in the intervention group.

Finally, the repeated measures MANOVA analyses of change in depression, anxiety, and positive mental health revealed a significant difference between the intervention and control groups (Wilks' $\lambda = 0.88$). At the univariate level, we found a significantly higher increase of positive mental health in the intervention group compared to the control group. No significant differences in change of depression and anxiety were found among the two groups. Likewise, the between-group effect size indicated a moderate intervention effect on the increase of the positive mental health (see Table 3).

Clinical Significance of the Intervention Effects

The results of the RCI analyses by using PTSD and CPTSD symptoms sum scores indicated that 32.3% ($n = 10$) of the participants in the treatment group experienced a clinically significant decrease in their PTSD symptoms from pre-test to post-test. In the control group, 2.6% ($n = 1$) experienced a clinically significant reduction in their PTSD symptoms over time. Similarly, 52.6% ($n = 16$) of the treatment group experienced a clinically significant decrease in their CPTSD symptoms from pre-test to post-test. In the control group, 23.1% ($n = 9$) of participants experienced a clinically significant reduction in their CPTSD symptoms.

User Satisfaction and Program Usability

At the end of the intervention, a majority of the intervention group participants reported that the program had been useful (80.7%), satisfactory (83.9%), and easy to use (93.6%). Also, more than half of the participants reported that the program improved their mental well-being (61.3%) as well as general understanding of themselves and their well-being (64.6%). Finally, a greater part of participants indicated that they would recommend the program to a person who had experienced a traumatic event in their lifetime (77.5%).

Discussion

The current study investigated the effects of a mindfulness-based internet intervention on ICD-11 PTSD and CPTSD symptoms. We found promising treatment effects indicating that mindfulness-based internet intervention can reduce CPTSD symptoms of negative self-concept and disturbances in relationships, as well as have positive effects on positive mental health. Our study also revealed that participant user satisfaction was high, and the usability of our intervention was perceived as very good.

The PTSD symptom changes in the present study were not in line with the other studies on mindfulness-based interventions for PTSD. We did not find significant changes in overall PTSD symptoms in our study, except for the sense of threat symptoms. Previous randomized clinical trials provided promising initial findings that various PTSD experiencing samples could benefit from mindfulness-based PTSD treatments (Colgan et al., 2016; Jasbi et al., 2018; Valenstein-Mah et al., 2019). Furthermore, our findings are different from a recent study on internet-delivered mindfulness intervention for PTSD (Reyes et al., 2020). Possibly, the best treatments for PTSD are trauma-focused PTSD therapies that explicitly address previous traumatic experiences and traumatic memories (APA, 2017; ISTSS, 2018; Lewis, et al., 2020a). In contrast, mindfulness-based therapies focus on the present, and thus, traumatic experiences can be avoided during the mindfulness intervention process, and therefore no treatment effects on PTSD symptoms may occur.

However, the present study revealed the potential of a mindfulness-based intervention for a new ICD-11 diagnosis of CPTSD. Overall, the intervention was effective for DSO symptoms which are required for the diagnosis of CPTSD in addition to the three core PTSD symptom clusters. In particular, participants who received mindfulness-based internet intervention reported positive changes in the DSO negative self-concept, meaning that beliefs about oneself as

diminished, defeated, and worthless were reduced. In addition, feelings of shame, guilt, and failure, which commonly accompany negative beliefs about oneself, were reduced in the intervention group. Also, trauma-exposed young adults seemed to encounter fewer difficulties in sustaining relationships and feeling close to other people after using an 8-week mindfulness-based internet intervention.

The findings of the present study suggest that mindfulness-based interventions could have a significant positive impact on DSO symptoms, which accompany PTSD symptoms when CPTSD is diagnosed. There is an ongoing debate among experts on trauma treatment whether trauma-focused interventions such as exposure should be offered to clients with CPTSD, or if a phased trauma treatment approach should be used instead which would imply starting the CPTSD treatment with stabilization techniques to aid better coping skills of the emotional regulation (Brewin, 2020). The current study indicates that mindfulness can be an important first step for survivors of prolonged or severe trauma exposure with CPTSD, as an effective technique for reducing DSO symptoms during the first stabilization phase. Alternatively, based on our findings, mindfulness could be integrated into CPTSD multicomponent trauma treatment targeted for specific CPTSD symptoms in clinical practice. In particular, clients suffering from negative self-concept and disturbances in relationships could benefit from mindfulness-based interventions.

Recent theoretical conceptualizations aimed to explain potential mechanisms of change on how mindfulness-based interventions could reduce PTSD symptoms. It has been hypothesized that mindfulness diminishes physiological arousal, increases attentional control, and fosters acceptance of unwanted experiences, each of which addresses processes that maintain PTSD (Lang et al., 2012). We assume that this could also be applied to the DSO symptoms, as mindfulness could increase self-regulation capacity, which could positively impact self-concept and relationships. While this pilot study could not reveal the mechanisms underlying the identified therapeutic changes, further studies could explore the factors contributing to DSO symptoms changes. The DSO symptoms change observed in our study is a promising finding that is valuable for the future development of CPTSD interventions, as it indicates that mindfulness could be beneficial in DSO symptoms reduction and could be potentially used as an integral part of CPTSD intervention to reduce DSO symptoms, and exposure-based or cognitive therapies could be used to tackle PTSD symptoms.

Limitations and Future Research

Several limitations of the present study should be considered when interpreting the findings. To begin with, it was a pilot study and therefore, the sample size was relatively small, which may have resulted in less statistical power to detect smaller differences between the two conditions. As the study provided promising initial findings, future studies with larger samples would allow testing the differences between two conditions with more confidence. Furthermore, the study was conducted with a waiting list as a control condition. The results could be replicated with an active control condition using treatment as usual or alternative trauma-focused evidence-based treatment protocol in future trials. This would allow testing whether mindfulness-based PTSD and CPTSD treatments have unique benefits compared to other treatments. In addition, the focus of the study was the reduction in PTSD and CPTSD symptoms. We included participants who reported clinically significant PTSD or CPTSD symptoms, and participants with subclinical levels of PTSD and CPTSD, which could have affected non-significant changes in PTSD symptoms. The results should be replicated in a sample of participants with full PTSD or CPTSD diagnosis. The participants in the study had the possibility to download mindfulness exercises to their devices to aid usability; however, this restricted the possibility of monitoring the use of the downloaded intervention exercises. We have chosen an operationalization of engagement to the study as logging in to the intervention site at least once. However, more accurate measures of engagement such as exercise completion should be used in future studies.

Regarding the measurement of the outcomes, participants' trauma exposure and PTSD and CPTSD symptoms were assessed using self-reported measures without a clinical interview, which could have led to an inaccurate estimation of PTSD and CPTSD symptomatology. In future trials, the clinician's administered assessment could be implemented to facilitate a more accurate evaluation of PTSD or CPTSD symptoms as experienced by the participants. However, at the time of the study, ICD-11 CPTSD diagnostic interviews were not yet available. Additionally, the ITQ DSO scale's Cronbach alpha was low compared to other studies (Murphy et al., 2020) possibly due to the relatively small sample size.

Conclusions about the generalizability of our findings in treating ICD-11 PTSD and CPTSD using mindfulness in other populations across the lifespan are limited. Thus, it would be valuable to test whether this intervention is only helpful for young adults or could also be beneficial in other samples. Finally, the study was conducted in the context of the COVID-19 pandemic. Pandemic-related stressors could have contributed to participants' mental health and potentially could have played a role in the study outcomes. It has been hypothesized that PTSD and CPTSD symptoms can increase during such circumstances (Liu et al., 2020). Therefore, it would be useful to evaluate whether mindfulness-based internet intervention effects would be the same in regular conditions after the end of the coronavirus pandemic.

The current study showed the potential of internet-based mindfulness interventions to alleviate disturbances in self-organization symptoms which are prerequisites to a new ICD-11 diagnosis of CPTSD in a sample of young adults. A mindfulness-based approach could broaden the perspective of treatments for CPTSD as an integral part of multicomponent modular CPTSD therapy in addition to trauma-focused treatment. Also, our study revealed that internet-delivered interventions could be beneficial for adults who experience CPTSD symptoms. In the context of existing barriers for the delivery of face-to-face treatments, internet-based interventions for traumatized individuals should be further explored. Moreover, it is of great importance to explore in future trials whether the effects of mindfulness-based internet interventions in traumatized populations sustain over time.

Author Contribution AD: writing—first draft, data collection, data analysis, study design; ITK: writing—review and editing, data collection, data analysis, study design; JM: data collection; GA: writing—review and editing, supervision; EK: writing—review and editing, supervision.

Data Availability The datasets generated and/or analyzed during the current study are not publicly available but are available from the corresponding author on reasonable request.

Declarations

Conflict of Interest The authors declare no competing interests.

Ethical Approval This study was approved by the Vilnius University Psychology Research Ethics Committee (Reference No. 27-02-2020/36). All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent All participants gave their informed consent for participation prior to filling the pre-test questionnaires. An information sheet that has been formally approved by the ethics committee was available to participants when they registered for the intervention. Participants were free to decide whether to participate in the study, and they could withdraw from the study at any time.

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Paper 4

The effects of online mindfulness-based intervention on posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A randomized controlled trial with 3-month follow-up

Dumarkaite, A., Truskauskaite-Kuneviciene, I., Andersson, G., Kazlauskas, E. (2022). The effects of online mindfulness-based intervention on posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A randomized controlled trial with 3-month follow-up. *Frontiers in Psychiatry, 13, 799259*. https://doi.org/10.3389/fpsyt.2022.799259

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BRIEF RESEARCH REPORT
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The Effects of Online Mindfulness-Based Intervention on Posttraumatic Stress Disorder and Complex Posttraumatic Stress Disorder Symptoms: A Randomized Controlled Trial With 3-Month Follow-Up

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Objectives: Mindfulness-based interventions have recently been shown to be a promising option for treating posttraumatic stress. The current study aimed to investigate the effects of an online mindfulness-based intervention on ICD-11 posttraumatic stress disorder (PTSD) and complex PTSD (CPTSD) symptoms at a 3-month follow-up.

Methods: An RCT design with three measurement points (pre-intervention, post-intervention, and 3-month follow-up) was used to investigate the effects of an 8-week online mindfulness intervention. In total, 53 traumatized young adults (M_{age} = 23.21, SD_{age} = 2.81; 84.9% female) participated in the study: 17 in the intervention group and 36 in the waiting list control group.

Results: Intervention group and waiting list control group comparison revealed that the intervention was effective for reducing CPTSD disturbances in self-organization symptoms (d = −0.84 [−1.44; −0.24]), specifically, negative self-concept (d = −0.66 [−1.25; −0.07]) and disturbances in relationships (d = −0.87 [−1.47; −0.27]), at 3-month follow-up. There were no between-group effects for PTSD symptoms from pre-test to follow-up.

Conclusion: This is one of the first RCT studies to report follow-up effects of an online mindfulness-based intervention for ICD-11 PTSD or CPTSD symptoms. Our study yielded that the effects of mindfulness-based internet intervention on CPTSD symptoms tend to retain over time.

Trial Registration: This study was registered with ClinicalTrials.gov (NCT number: NCT04333667; https://clinicaltrials.gov/ct2/show/NCT04333667). Registered April 3, 2020.

Keywords: posttraumatic stress disorder, complex posttraumatic stress disorder, mindfulness, internet intervention, effects, RCT, follow-up

THE EFFECTS OF ONLINE MINDFULNESS-BASED INTERVENTION ON POSTTRAUMATIC STRESS DISORDER AND COMPLEX POSTTRAUMATIC STRESS DISORDER SYMPTOMS: RANDOMIZED CONTROLLED TRIAL WITH 3-MONTH FOLLOW-UP

Internet-delivered interventions for treating symptoms of posttraumatic stress disorder (PTSD) have been found to be effective in randomized controlled trials (1–4). Internet-delivered support in the context of posttraumatic stress is a promising solution since various barriers accessing face-to-face PTSD treatments have been recognized (5). Nevertheless, most internet-based treatments for PTSD have been based on trauma-focused cognitive behavioral therapy (3). Trauma-focused treatments seem to have limitations, such as high dropout rates (6) and persistent symptoms even after successfully finalized treatment (7). Moreover, a new diagnosis of Complex posttraumatic stress disorder (CPTSD) has been included in the 11th edition of the International Classification of Diseases (ICD-11) (8). For the diagnosis of CPTSD, in addition to the three core PTSD symptoms of (1) re-experiencing, (2) avoidance, and (3) sense of threat, three additional symptoms of disturbances in self-organization, particularly, (1) the affect dysregulation, (2) negative self-concept, and (3) disturbances in relationships, are a prerequisite (5). There is still little knowledge of the effects of various treatment strategies for CPTSD (9).

Mindfulness-based interventions have recently been shown to be a promising option for treating posttraumatic stress (10–15), including evidence from efficacy studies of internet-delivered mindfulness-based interventions on PTSD and CPTSD (16, 17). Mindfulness is described as the awareness that emerges through purposefully paying attention to the present moment and non-judgment to the unfolding experience (18). It is suggested that mindfulness diminishes physiological arousal, increases attentional control, and fosters acceptance of unwanted experiences; all these processes have the potential to interrupt the maintenance of PTSD (19). The existing evidence highlights the short-term effects of both face-to-face and internet-delivered mindfulness-based treatments on posttraumatic stress (10, 12–14, 16, 17). However, little is known about whether these effects tend to last after the intervention is over. To the best of our knowledge, only a few studies have explored the long-term effects of mindfulness-based interventions in PTSD, and the results suggest that effects tend to remain from one to 5 months after intervention (15, 20–23). However, most existing evidence is based on single group studies or small study samples. In addition, research has yet only explored face-to-face mindfulness-based therapies for PTSD.

The current study aimed to investigate the 3-month follow-up effects of an online mindfulness-based intervention on ICD-11 PTSD and CPTSD symptoms. Previously, randomized controlled trial comparing intervention group with a waiting list control group was carried out to assess short-term effects at post-treatment of 8-week mindfulness-based internet intervention on PTSD and CPTSD in a sample of young adults exposed to traumatic experiences. We have reported short-term effects with significant reductions in disturbances in self-organization symptoms at post-treatment, as well as significant improvement in positive mental health (16). In the current study, we sought to report the 3-month follow-up results by investigating intervention effects on PTSD and specific for CPTSD disturbances in self-organization symptoms in young adults' sample comparing the intervention group with a waiting list control group.

METHODS

Design

A randomized controlled trial (RCT) design was used for the current study, comparing the intervention group with a waiting list control group. The data was collected at three measurement points: pre-intervention, post-intervention, and 3-month follow-up. The outcomes from pre-test to post-test have been reported previously (16). We investigated the effects of an online mindfulness-based intervention on PTSD and CPTSD-specific disturbances in self-organization symptoms at a 3-month follow-up. Participants were randomly assigned to the intervention group or the waiting list control group. Those allocated to the intervention group received the intervention immediately after randomization, whereas participants allocated to the waiting list control group received the intervention 5 months later. The intervention lasted for 8 weeks. T1, T2, and T3 were carried out at the same time in both groups. The flowchart of the study is presented in **Figure 1**. This study relied on self-reported measures using a secure web application (24). In the present study, all the data are reported following the CONSORT statement for reporting parallel group trials (25).

Participants and Procedure

Participants and procedures have been described in detail previously (16). In brief, eligible participants were university

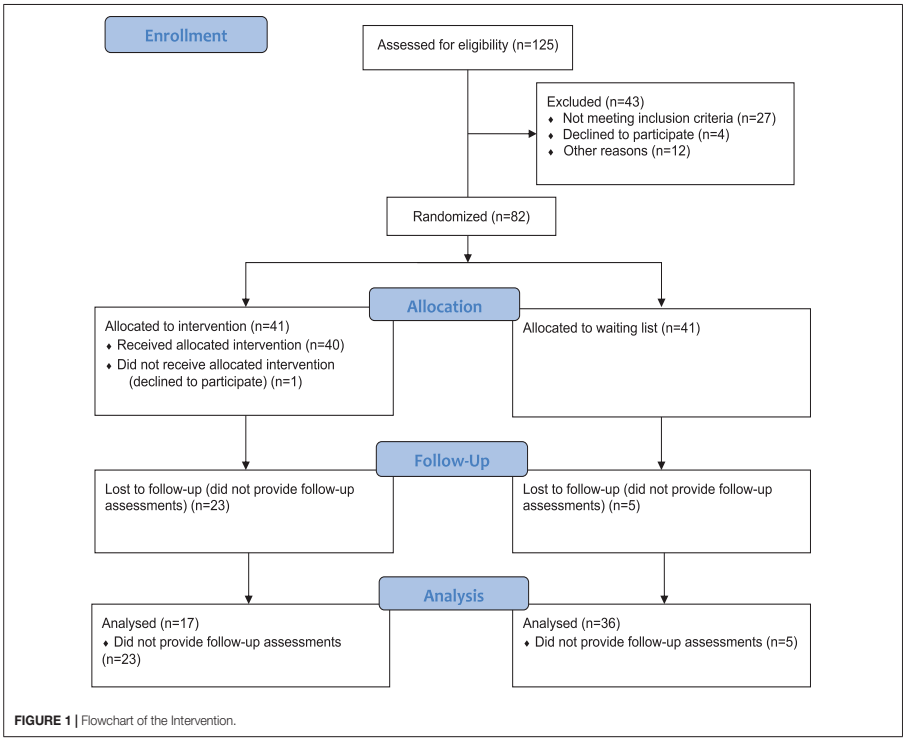

FIGURE 1 | Flowchart of the Intervention.

students who were 18 years old or older; were fluent in Lithuanian; had access to a device with Internet; had experienced one or more traumatic events during their life; met the clinical significance criteria for PTSD, CPTSD, or disturbances in self-organization symptoms with or without functional impairment as measured with the International Trauma Questionnaire (26). The ongoing treatment was not an exclusion criterion. Participants who completed the pre-test measures and met all inclusion criteria were randomly assigned to either the intervention or waiting list control group.

Data were collected at three time points, March to April 2020 (T1), June to July 2020 (T2), September to October 2020 (T3). All data were collected online. The present study was approved by Psychology Research Ethics Committee (Reference No. 27-02-2020/36) and registered with ClinicalTrials.gov (NCT number: NCT04333667). Study participants gave active informed consent for participation before filling the pre-test questionnaires.

In the current study, 53 participants (M_{age} = 23.21, SD_{age} = 2.81; 84.9% female) who completed T1, T2, and T3 measures were included in the comparison analysis: 17 from the intervention group and 36 from the waiting list control group. In the intervention group, participants who logged in to the intervention site at least once were included in the analysis (29.5% logged in <10 times, 29.5% logged in 10–20 times, and 41.3% logged in >20 times; modules completed: M = 6.59, SD = 2.55). The power analysis revealed that the total sample of 46 participants was sufficient to detect the effect sizes of 0.35, indicating the differences between the two groups by using the multivariate three measurement points data analytic approach (given a significance level of 0.05 and a power of 80%). No differences were observed in demographic characteristics between the intervention group and waiting list control group at T1 in the current study sample, including age, partnership status, employment status, number of traumatic events, except for gender. There were more male participants in the intervention group as compared to the waiting list control group. Descriptive data on study participants at T1 are presented in **Table 1**. Additionally, the t-tests showed no significant differences between the intervention group and waiting list control group at T1 for PTSD ($t(51)$ = 0.23, p = 0.822) and disturbances in self-organization ($t(51)$ = −0.20, p = 0.841).

Moreover, there were no differences between the two groups in terms of current visits to a psychologist (17.6% vs. 13.9%; $\chi 2(1) = 0.13$, $p = 0.721$) and current use of medicine due to mental health problems (23.5% vs. 33.3%; $\chi 2(1) = 0.53$, $p = 0.468$).

The most prevalent traumatic event types were severe human suffering (exposure rate 75.5%), childhood physical abuse (exposure rate 50.9%), and physical assault (exposure rate 49.1%). A traumatic experience that affected the most, as indicated by the participants, was as follows: death of someone close (24.5%), physical abuse (17.0%), sexual trauma (15.1%), psychological abuse (15.1%), serious illness (7.5%), transportation accident (1.9%), several traumatic events (1.9%), and other traumatic events (17.0%).

There were no differences in demographic characteristics at T1 between retained and dropped out participants including gender ($\chi^2(1) = 0.36$, $p = 0.546$), age ($t(80) = 0.35$, $p = 0.729$), partnership status ($\chi^2(1) = 0.98$, $p = 0.321$), employment status ($\chi^2(1) = 0.52$, $p = 0.470$), and number of traumatic events ($t(80) = -0.36$, $p = 0.717$). Also, the t-tests showed no significant differences at T1 between retained and dropped out participants for PTSD ($t(80) = -1.32$, $p = 0.190$) and disturbances in self-organization ($t(80) = 1.22$, $p = 0.226$).

TABLE 1 | Characteristics of the study participants ($n = 53$) at pre-test.

Variable	Intervention group ($n = 17$), n (%)	Control group ($n = 36$), n (%)	Significance statistics
Gender			
Male	6 (35.3%)	2 (5.6%)	$\chi^2(1) = 7.97$, $p = 0.005$
Female	11 (64.7%)	34 (94.4%)	
Age			
M (SD)	23.06 (2.84)	23.28 (2.83)	$t(51) = 0.26$, $p = 0.794$
Range	20–32	20–31	
In partnership			
Yes	6 (35.3%)	19 (52.8%)	$\chi^2(1) = 1.42$, $p = 0.234$
No	11 (64.7%)	17 (47.2%)	
Employment			
Yes	6 (35.5%)	17 (47.2%)	$\chi^2(1) = 0.67$, $p = 0.413$
No	11 (64.5%)	19 (52.8%)	
Number of traumatic events			
M (SD)	4.59 (2.03)	4.97 (1.96)	$t(51) = 0.66$, $p = 0.514$
Range	1–8	1–9	
Visiting psychologist			
Yes	3 (17.6%)	5 (13.9%)	$\chi^2(1) = 0.13$, $p = 0.721$
No	14 (82.4%)	31 (86.1%)	
Using medicine due to mental health problems			
Yes	4 (23.5%)	12 (33.3%)	$\chi^2(1) = 0.53$, $p = 0.468$
No	13 (76.5%)	24 (66.7%)	

Measures

Exposure to Traumatic Experiences

The DSM-5 Life Events Checklist (LEC-5) (27) was used to assess the lifetime exposure to 18 different traumatic experiences (e.g., natural disaster, sexual or physical violence, etc.) with one additional item assessing exposure to any other not-listed traumatic experience. Exposure level for each event was assessed by five types of responses: 1 (= "happened to me"), 2 (= "witnessed it"), 3 (= "learned about it"), 4 (= "not sure"), and 5 (= "does not apply"). In the present study, exposure to traumatic experience was considered if participants responded with either 1 (= "happened to me") or 2 (= "witnessed it"). The Lithuanian version of LEC-5 has been validated and used earlier (28, 29).

Symptoms of Posttraumatic Stress Disorder and Complex Posttraumatic Stress Disorder

The International Trauma Questionnaire (ITQ) (26) was used to assess symptoms of PTSD and CPTSD. The ITQ is comprised of 18 items. The PTSD symptoms in the past month are assessed with the six symptom items on the three subscales (Re-experiencing, Avoidance, and Sense of Threat symptoms), with two items for each of the PTSD symptom clusters. The CPTSD-specific disturbances in self-organization symptoms in the past month are also assessed with the six symptom items on the three subscales (Negative Self-Concept, Affective Dysregulation, and Disturbances in Relationships symptoms) with two items for each of the disturbances in self-organization symptom clusters. Additional six functional impairment items assess how PTSD (three items) and disturbances in self-organization (three items) symptoms impaired functioning in the past month. Participants rated the ITQ items on a 5-point Likert scale ranging from 0 (= "not at all") to 4 (= "extremely"). A score of ≥ 2 for at least one of the two items representing a particular PTSD and disturbances in self-organization symptom cluster indicates clinical significance based on the algorithm proposed by the ITQ authors (21). A probable PTSD diagnosis is given when all three PTSD symptoms are clinically significant and if they significantly impair functioning in at least one area of life. A probable diagnosis of CPTSD is given when all three PTSD symptoms are clinically significant, all three disturbances in self-organization symptoms are clinically significant, and if disturbances in self-organization symptoms significantly impair functioning in at least one area of life. In the study sample, Cronbach's alpha of the scale and the subscales of PTSD and disturbances in self-organization symptoms separately at T1 were acceptable ($\alpha = 0.70$, $\alpha = 0.73$, $\alpha = 0.75$, respectively).

Intervention

The intervention has been described in detail previously (16). In brief, an online mindfulness-based intervention was developed for the present study. It was aimed at young adults with traumatic life events and PTSD or CPTSD symptoms. The intervention was designed as a self-help program (focusing on psychoeducation and mindfulness techniques training) with the possibility of messaging with a psychologist. The intervention consisted of eight modules: (1) Introduction, (2) Awareness and non-judgment of physical senses, (3) Physical senses in everyday

life, (4) Awareness and non-judgment of thoughts, (5) Thoughts in everyday life, (6) Awareness and non-judgment of emotions, (7) Emotions in everyday life, and (8) Summary. The screenshot of the intervention is presented in **Supplementary Figure 1**.

Data Analyses

To calculate intervention effects, we ran a series of multivariate repeated measures ANOVAs with time (T1, T2, and T3) as a within-subject factor and group (intervention group vs. waiting list control group) as a between-subject factor. First, we tested the intervention effects on PTSD and disturbances in self-organization symptoms using the sum scores for each measure. Then, we tested the PTSD symptoms subscales of Re-experiencing, Avoidance, and Sense of Threat. Also, we performed an analysis of the disturbances in self-organization symptoms subscales of Affective Dysregulation, Negative Self-Concept, and Disturbances in Relationships. We calculated within-group and between-group effect sizes. The between-group pre-test to follow-up effect sizes were calculated by using the mean difference from T1 to T3 in the intervention group and waiting list control group and the standard deviations of each group at T1 (30). The within-group pre-test to post-test, post-test to follow-up, and pre-test to follow-up effect sizes were calculated by using the means in each group at T1 and T2, T2 and T3, and T1 and T3, respectively, and standard deviations at each measurement point. Bias-corrected effect sizes (31) were reported. In all analyses, the magnitude of the effect expressed in *d* was interpreted according to Cohen (32), that is, 0.50 = medium effect, and 0.80 = large effect.

RESULTS

At the multivariate level, ANOVA analyses revealed a significant difference in change of PTSD and disturbances in self-organization sum scores over time between the intervention group and waiting list control group ($F(4, 202) = 3.11$; $p = 0.016$; Wilks' $\lambda = 0.80$). At the univariate level, we found a significantly higher decrease in the disturbances in self-organization score in the intervention group compared to the waiting list control group ($F(2) = 4.90$; $p = 0.009$). No significant differences in the change of PTSD scores were found between the groups ($F(2) = 2.22$; $p = 0.114$). The change of PTSD and disturbances in self-organization scores and effect sizes are presented in **Figure 2** and **Table 2**. The between-group effect size from pre-test to follow-up indicated a large intervention effect on the reduction of disturbances in self-organization score. Additionally, the within-group effect size from pre-test to post-test and from pre-test to follow-up indicated a large decrease in PTSD in the intervention group.

Separate repeated measures MANOVA analyses of the PTSD symptom clusters (Re-experiencing, Avoidance, and Sense of Threat) and disturbances in self-organization symptom clusters (Affective Dysregulation, Negative Self-Concept, and Disturbances in Relationships) were performed. At the multivariate level, the analyses revealed no significant difference in change of the PTSD symptom clusters over time between the intervention group and waiting list control group ($F(6, 200) = 0.96$; $p = 0.451$; Wilks' $\lambda = 0.95$). Likewise, no significant differences in change of the PTSD symptom clusters were found among the two groups at the univariate level (Re-experiencing: $F(2) = 0.54$; $p = 0.584$; Avoidance: $F(2) = 2.04$; $p = 0.136$; Sense of Threat: $F(2) = 1.93$; $p = 0.151$). The change of PTSD symptom clusters and effect sizes are presented in **Figure 2** and **Table 2**. There were no between-group effects from pre-test to follow-up. The within-group effect sizes from pre-test to post-test indicated a large decrease in Avoidance and Sense of Threat symptoms in the intervention group. Also, a moderate decrease in Avoidance symptoms and a large decrease in Sense of Threat symptoms were observed in the intervention group, and a small decrease in Re-experiencing symptoms was observed in the waiting list control group from pre-test to follow-up.

The analyses revealed no significant difference in change of disturbances in self-organization symptom clusters over time between the intervention group and waiting list control group at the multivariate level ($F(6, 200) = 1.90$; $p = 0.083$; Wilks' $\lambda = 0.90$). At the univariate level, we observed a significantly higher decrease of Negative Self-Concept ($F(2) = 4.20$; $p = 0.019$) and Disturbances in Relationships ($F(2) = 3.39$; $p = 0.038$) in the intervention group compared to the waiting list control group. No significant differences in change of Affective Dysregulation ($F(2) = 1.03$; $p = 0.362$) were observed among the two groups. The change of disturbances in self-organization symptom clusters and effect sizes are presented in **Figure 2** and **Table 2**. Between-group effect sizes from pre-test to follow-up indicated moderate intervention effect on the reduction of Negative Self-Concept symptoms and large intervention effect on the reduction of Disturbances in Relationships symptoms. No within-group effects were observed.

DISCUSSION

The current study adds to the growing body of literature showing that mindfulness-based internet interventions can benefit individuals exposed to traumatic events. The findings of the study expand data from the previous research, which showed that online mindfulness-based intervention was effective for CPTSD disturbances in self-organization symptoms (16), revealing that most intervention effects sustain 3 months after the end of the intervention. Disturbances in self-organization symptoms, specifically, Negative Self-Concept and Disturbances in Relationships, remained decreased in 3 months as intervention group and waiting list control group comparison revealed.

To the best of our knowledge, no previous RCTs have explored follow-up effects of internet-delivered interventions based on mindfulness principles for individuals experiencing high levels of traumatic stress. The findings of the current study are in line with other studies on mindfulness-based face-to-face interventions. Previous studies revealed a potential of mindfulness-based interventions as having lasting effects on posttraumatic stress (15, 20–23). Based on our findings, it seems that internet-delivered mindfulness-based intervention

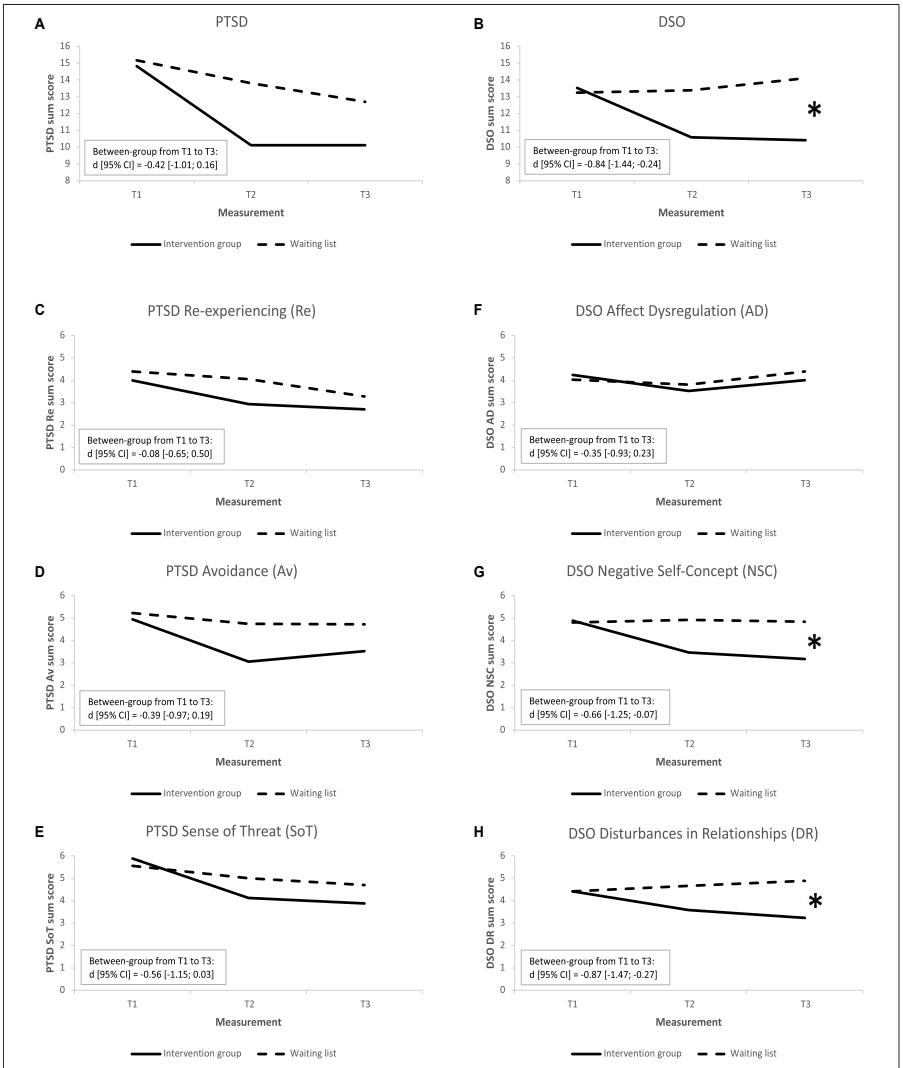

FIGURE 2 | Trajectories of change of intervention outcomes in the IG (n = 17) and WL control group (n = 36). **(A)** PTSD – posttraumatic stress disorder, **(B)** DSO – disturbances in self-organization, **(C–E)** PTSD symptom clusters, **(F–H)** DSO symptom clusters. * Between-group effect size from T1 to T3 is significant.

is a promising option with potentially sustaining effects. This could be relevant specifically for trauma-exposed individuals who cannot access professional psychological treatment due to existing barriers to face-to-face therapy (5). Also, it is optimistic news in the face of the COVID-19 pandemic, which has dramatically changed the understanding of providing

TABLE 2 | Within-group effect sizes.

	Group	Pre-test – post-test *d* [95% CI]	Post-test – follow-up *d* [95% CI]	Pre-test – follow-up *d* [95% CI]
PTSD	IG	−0.90 [−1.60; −0.19]	0.00 [−0.67; 0.67]	−0.89 [−1.60; −0.19]
	WL	−0.27 [−0.73; 0.20]	−0.22 [−0.68; 0.25]	−0.45 [−0.92; 0.01]
DSO	IG	−0.54 [−1.22; 0.14]	−0.03 [−0.70; 0.64]	−0.55 [−1.24; 0.13]
	WL	0.03 [−0.43; 0.49]	0.18 [−0.28; 0.64]	0.21 [−0.25; 0.68]
Re	IG	−0.44 [−1.12; 0.24]	−0.10 [−0.78; 0.57]	−0.55 [−1.23; 0.14]
	WL	−0.14 [−0.61; 0.32]	−0.33 [−0.80; 0.13]	−0.47 [−0.94; 0.00]
Av	IG	−0.87 [−1.57; −0.16]	0.21 [−0.46; 0.89]	−0.72 [−1.41; −0.03]
	WL	−0.20 [−0.66; 0.27]	−0.01 [−0.47; 0.45]	−0.20 [−0.67; 0.26]
SoT	IG	−0.85 [−1.56; −0.15]	−0.10 [−0.77; 0.57]	−0.96 [−1.67; −0.25]
	WL	−0.29 [−0.75; 0.17]	−0.16 [−0.63; 0.30]	−0.41 [−0.88; 0.05]
AD	IG	−0.37 [−1.05; 0.31]	0.25 [−0.42; 0.93]	−0.12 [−0.80; 0.55]
	WL	−0.15 [−0.62; 0.31]	0.42 [−0.05; 0.88]	0.24 [−0.23; 0.70]
NSC	IG	−0.51 [−1.20; 0.17]	−0.11 [−0.79; 0.56]	−0.60 [−1.29; 0.09]
	WL	0.05 [−0.41; 0.51]	−0.05 [−0.51; 0.42]	0.01 [−0.45; 0.47]
DR	IG	−0.42 [−1.10; 0.26]	−0.17 [−0.84; 0.51]	−0.60 [−1.28; 0.09]
	WL	0.12 [−0.34; 0.59]	0.10 [−0.36; 0.57]	0.23 [−0.23; 0.69]

IG, intervention group; WL, waiting list control group; PTSD, posttraumatic stress disorder; DSO, disturbances in self-organization; Re, reexperiencing; Av, avoidance; SoT, sense of threat; AD, affect dysregulation; NSC, negative self-concept; DR, disturbances in relationships.

psychological interventions by introducing the shift toward internet-delivered psychological services.

The key finding of the current study was that in 3 months, disturbances in self-organization symptoms, which are prerequisite to the new ICD-11 diagnosis of CPTSD, remained decreased. As the CPTSD is a new diagnosis raising a lot of debates about what the best treatment approach for this condition is (8), our findings are in line with the idea that for CPTSD, multicomponent therapies might be an approach that could improve the outcomes (9). Our study showed that online mindfulness-based therapy could help trauma-exposed persons to see themselves more positively and connect with others in an emotionally closer manner. Previously, it has been suggested that mindfulness-based therapies could decrease psychological arousal, increase attentional control, and foster acceptance of unwanted experiences (19). It is possible that it could be applied not only to PTSD symptoms but also could be beneficial for disturbances in self-organization symptoms in a way that practicing mindfulness could increase self-regulation capacity, which could positively impact self-concept and quality of interpersonal relationships. We assume that the same mechanisms of decreasing psychological arousal, increasing attentional control, and fostering acceptance of adverse feelings, thoughts, memories, experiences etc., could play an important role in disturbances in self-organization symptoms. And it seems that these changes tend to remain over time. However, further studies are necessary to reveal the mechanisms underlying the identified changes. Contrary to other studies in this field, our study did not show significant sustaining effects of the intervention on PTSD symptoms. We assume that the most suitable interventions for PTSD are trauma-focused therapies that address traumatic experiences and memories explicitly through trauma exposure (33, 34) whereas mindfulness-based interventions focus on purposefully paying attention to the present moment and traumatic experiences without direct addressing can remain avoided.

The current study has several limitations that should be addressed. First, regarding the measurement of outcomes, participants' trauma exposure, as well as PTSD and disturbances in self-organization symptoms, were assessed *via* self-report, which can lead to an overestimation or underestimation of PTSD and CPTSD symptomatology. In future studies, clinical interviews administered by a trained professional should be implemented to facilitate more accurate identification of PTSD and CPTSD symptomatology and its change over time. Second, we should have in mind the fact that not all participants retained in the study at the 3-month follow-up. Despite the similarities between the retained and dropped out participants, it is possible that the participants with better outcomes remained in the study. Also, both complete cases and intention to treat analyses could be considered in the future studies to represent this field even more accurately. Third, although the results of 3-month follow-up effects of online mindfulness-based intervention on PTSD and disturbances in self-organization are promising, the intervention comprised multiple components (such as psychoeducation and different types of mindfulness exercises), and due to the study design, it is impossible to identify which of the components contributed to the symptom reduction most. Further work is required to explore mechanisms of change in the current intervention. Moreover, we cannot be sure whether the observed effects were affected by other treatments the participants were receiving. Finally, the 3-month follow-up period is still too short of drawing conclusions regarding the stability of the therapeutic gains in the long term, and future trials should address this issue. Despite these limitations, our study yielded promising results showing that mindfulness-based internet intervention can be a viable option for reducing CPTSD

symptoms with the stability of the intervention effects over several months after the intervention delivery.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors upon reasonable request.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Psychology Research Ethics Committee, Vilnius University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AD: writing – first draft, data collection, data analysis, and study design. IT-K: writing – review and editing, data collection, data analysis, and study design. GA and EK: writing – review and editing, supervision.

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.799259/full#supplementary-material

Supplementary Figure 1 | Screenshot of the intervention.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

CONFERENCE PRESENTATIONS

National conferences

Dumarkaitė, A. (2022). Efficacy results of the internet-delivered stress recovery program FOREST [Internetinės streso įveikos programos FOREST veiksmingumo rezultatai]. *Online Psychological Interventions in Lithuania: Research Findings and Future Perspectives*, public webinar, December 6, 2022.

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SUMMARY IN LITHUANIAN

DĖMESINGU ĮSISĄMONINIMU PAREMTŲ INTERNETU TEIKIAMŲ INTERVENCIJŲ VEIKSMINGUMAS STRESO IR TRAUMŲ KONTEKSTE

Mokslinės publikacijos, kurių pagrindu parengta disertacija

1. Jovarauskaite, L., **Dumarkaite, A.**, Truskauskaite-Kuneviciene, I., Jovaisiene, I., Andersson, G., Kazlauskas, E. (2021). Internet-based stress recovery intervention FOREST for healthcare staff amid COVID-19 pandemic: Study protocol for a randomized controlled trial. *Trials, 22, 559*. https://doi.org/10.1186/s13063-021-05512-1

2. **Dumarkaite, A.**, Truskauskaite, I., Andersson, G., Jovarauskaite, L., Jovaisiene, I., Nomeikaite, A., Kazlauskas, E. (2023). The efficacy of internet-based stress recovery intervention FOREST for nurses amid COVID-19 pandemic: Randomized controlled trial. *International Journal of Nursing Studies, 138, 104408.* https://doi.org/10.1016/j.ijnurstu.2022.104408

3. **Dumarkaite, A.**, Truskauskaite-Kuneviciene, I., Andersson, G., Mingaudaite, J., Kazlauskas, E. (2021). Effects of mindfulness-based internet intervention on ICD-11 posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A pilot randomized controlled trial. *Mindfulness, 12*, 2754–2766. https://doi.org/10.1007/s12671-021-01739-w

4. **Dumarkaite, A.**, Truskauskaite-Kuneviciene, I., Andersson, G., Kazlauskas, E. (2022). The effects of online mindfulness-based intervention on posttraumatic stress disorder and complex posttraumatic stress disorder symptoms: A randomized controlled trial with 3-month follow-up. *Frontiers in Psychiatry, 13, 799259*. https://doi.org/10.3389/fpsyt.2022.799259

ĮVADAS

Šioje daktaro disertacijoje pristatomi dviejų tyrimų, kuriais vertintas dviejų dėmesingu įsisąmoninimu paremtų internetu teikiamų intervencijų, skirtų dviems suaugusiųjų grupėms, patiriančioms aukštą streso lygį ir potrauminio streso sutrikimų požymius, veiksmingumo rezultatai. Disertacijoje yra remiamasi naujame Tarptautinės ligų klasifikacijos 11-ajame leidime (TLK-11) pristatoma streso kaip reakcijos į įvairaus lygio stresorius apibrėžtimi bei klasifikacija, į kurią greta potrauminio streso sutrikimo (PTSS) yra įtraukta nauja kompleksinio PTSS diagnostinė kategorija. Šiame darbe apžvelgiamas įvairių streso reakcijų, apimant PTSS ir kompleksinį PTSS, paplitimas bei neigiamos pasekmės tiek individui, tiek visuomenei, išskiriant dvi grupes – medicinos personalą ir jaunus suaugusiuosius – kaip potencialiai susiduriančias su didesne rizika patirti šias reakcijas. Toliau disertacijoje yra aptariama savalaikių ir tinkamų psichologinių intervencijų reikšmė, pristatomi mokslu pagrįsti pagalbos būdai, jų veiksmingumas bei stebima problematika, skatinanti ieškoti ir tirti alternatyvius pagalbos būdus su įvairaus lygio streso reakcijomis susiduriantiems asmenims. Šiame kontekste pastaruoju metu nemenkai dėmesio susilaukia dėmesingu įsisąmoninimu paremtos intervencijos. Disertacijoje yra apžvelgiami tiek teoriniai modeliai, tiek esami empiriniai duomenys, nurodantys apie dėmesingu įsisąmoninimu paremtų intervencijų veiksmingumą bei galimus veikimo mechanizmus su įvairaus lygio streso reakcijomis susiduriantiems asmenims; greta yra pristatoma egzistuojanti šio tyrimų lauko problematika, nurodanti apie tolesnių tyrimų, atitinkančių šiuolaikinius standartus, reikalingumą. Atsižvelgiant į stebimus barjerus suteikti bei gauti psichologinę pagalbą, disertacijoje yra apžvelgiamas internetu teikiamų intervencijų vaidmuo bei veiksmingumas. Visgi, veiksmingumo tyrimų apie dėmesingu įsisąmoninimu paremtas internetu teikiamas intervencijas su įvairaus lygio streso reakcijomis susiduriantiems asmenims trūksta. Šioje disertacijoje pristatomi du tyrimai, kuriais vertintas dėmesingu įsisąmoninimu paremtų internetu teikiamų intervencijų veiksmingumas su aukštu streso lygiu susiduriančiam medicinos personalui (I tyrimas) bei PTSS ir kompleksinio PTSS požymius patiriantiems jauniems suaugusiesiems (II tyrimas); veiksmingumo rezultatai aptariami kitų empirinių tyrimų bei teoriniame kontekste.

Nors mokslinių tyrimų apie dėmesingu įsisąmoninimu paremtas internetu teikiamas intervencijas streso ir traumų kontekste daugėja, šioje srityje vis dar stebimas žinių trūkumas. Pirma, nėra daug mokslu pagrįstų įrodymų apie dėmesingu įsisąmoninimu paremtų internetu teikiamų intervencijų veiksmingumą aukšto streso lygio kontekste, ypač profesinėse grupėse, kurios nuolat patiria aukštą streso lygį, pavyzdžiui, medicinos personalas. Todėl disertacijos tyrimais buvo siekiama tirti šių intervencijų poveikį šios grupės psichikos sveikatai, įskaitant ir atsistatymo nuo streso įgūdžių stiprinimą. Antra, neseniai buvo atlikti TLK-11 su stresu susijusių sutrikimų skyriaus atnaujinimai, įtraukiant naują kompleksinio PTSS diagnostinę kategoriją. Šiame kontekste itin svarbu atlikti tyrimus, kad būtų praplėstos geriausių PTSS, o ypač – kompleksinio PTSS, intervencijų galimybės. Taigi, atliekant šioje disertacijoje pristatomus tyrimus buvo siekiama atsakyti į klausimą, ar dėmesingu įsisąmoninimu paremtos internetu teikiamos intervencijos gali būti veiksmingos siekiant sumažinti sudėtingus potrauminio streso sutrikimų požymius. Trečia, esami dėmesingu įsisąmoninimu paremtų intervencijų, teikiamų tiek tradiciniu būdu, tiek internetu, tyrimai dažnai turi reikšmingų metodologinių trūkumų, pavyzdžiui, atliekami ne atsitiktinių imčių kontroliuojami tyrimai, sudaromos mažos imtys, intervencijos poveikis vertinamas tik po intervencijos be tolesnio poveikio stebėjimo. Siekiant gauti patikimus rezultatus, disertacijoje pristatomi tyrimai buvo atlikti taikant šiuolaikinius moksliniams tyrimams keliamus standartus.

Ne mažiau svarbus yra aptartų intervencijų pritaikymas praktikoje. Atsižvelgiant į tai, jog nemenkai daliai asmenų, patiriančių aukštą streso lygį ir potrauminio streso sutrikimų požymius, esamos mokslu pagrįstos intervencijos nėra veiksmingos, disertacija buvo siekiama įvertinti, ar dėmesingu įsisąmoninimu paremtos intervencijos galėtų praplėsti psichologinės pagalbos galimybių lauką. Be to, galimybė tokias intervencijas teikti nuotoliu galėtų reikšmingai prisidėti prie psichologinės pagalbos kliūčių mažinimo.

Disertacijos tikslas

Šios daktaro disertacijos tikslas buvo sukurti dvi dėmesingu įsisąmoninimu paremtas internetu teikiamas intervencijas dviems suaugusiųjų grupėms, patiriančioms aukštą streso lygį ir potrauminio streso sutrikimų požymius, bei įvertinti šių intervencijų veiksmingumą. Tiksliau, tyrimais buvo siekta įvertinti įvairių psichologinių rodiklių (streso, PTSS ir kompleksinio PTSS požymių, depresijos ir nerimo požymių, pozityvios psichikos sveikatos, kt.) pokyčius medicinos personalo (I tyrimas) ir jaunų suaugusiųjų, patiriančių PTSS ir kompleksinio PTSS požymius (II tyrimas), grupėse prieš intervenciją, po intervencijos ir po intervencijos praėjus trims mėnesiams. Ši daktaro disertacija yra paremta dviejų tyrimų (keturių publikuotų straipsnių) duomenimis ir atsako į toliau pateiktus tyrimų klausimus.

Disertacijos tyrimų klausimai

1. Kiek veiksminga yra dėmesingu įsisąmoninimu paremta internetu teikiama intervencija medicinos personalo, patiriančio aukštą streso lygį, atsistatymui nuo streso bei psichikos sveikatai? (I tyrimas – 2 publikacija)

2. Kiek veiksminga yra dėmesingu įsisąmoninimu paremta internetu teikiama intervencija jauniems suaugusiesiems, patiriantiems potrauminio streso sutrikimo ir kompleksinio potrauminio streso sutrikimo požymius, šių požymių mažinimui bei psichikos sveikatai? (II tyrimas – 3 ir 4 publikacijos)

3. Kaip medicinos personalas, patiriantis aukštą streso lygį, bei jauni suaugusieji, patiriantys potrauminio streso sutrikimo ir kompleksinio potrauminio streso sutrikimo požymius, vertina dėmesingu įsisąmoninimu paremtas internetu teikiamas intervencijas? (I-II tyrimai – 2 ir 3 publikacijos)

METODIKA

Abu tyrimai buvo atlikti Vilniaus universiteto Psichologijos instituto Psichotraumatologijos centre, bendradarbiaujant su Elgesio ir mokymosi mokslų katedra Linšiopingo universitete, Švedijoje. Disertacijos autorė abiejuose tyrimuose buvo pagrindinė tyrėja ir reikšmingai prisidėjo prie intervencijų turinio kūrimo, tyrimų konceptualizavimo, planavimo, duomenų rinkimo ir analizės, mokslinių straipsnių rengimo (ir yra trijų mokslinių publikacijų pirmoji autorė). Kadangi abu tyrimai apėmė ir taikomosios psichologijos dalis, disertacijos autorė taip pat buvo aktyviai įsitraukusi kaip klinikinė psichologė ir supervizorė.

Tyrimų dizainas

Buvo atlikti atsitiktinių imčių kontroliuojami tyrimai lyginant intervencinę grupę su laukimo sąrašo kontroline grupe. Prieš atliekant tyrimus buvo gauti Vilniaus universiteto Psichologinių tyrimų etikos komiteto leidimai (2021-03-22/61 ir 27-02-2020/36); tyrimai užregistruoti klinikinių tyrimų duomenų bazėje www.clinicaltrials.gov (NCT04817995 ir NCT04333667). Duomenys pristatomi remiantis CONSORT standartu (Schulz et al., 2011).

Tyrimo dalyviai buvo kviečiami dalyvauti tyrime, atrenkami pagal iš anksto numatytus įtraukimo / atmetimo kriterijus, atrinkti dalyviai atsitiktiniu būdu paskirstyti į dvi grupes – intervencinę ir kontrolinę. Duomenys rinkti internetu tris kartus: prieš intervenciją, iš karto po intervencijos ir po intervencijos praėjus trims mėnesiams. I tyrime duomenys buvo renkami 2021 m. balandį (prieš intervenciją), 2021 m. birželį-liepą (po intervencijos) ir 2021 m. rugsėjį-spalį (po intervencijos praėjus trims mėnesiams); II tyrime – 2020 m. kovo-balandžio mėn. (prieš intervenciją), 2020 m. birželio-liepos mėn. (po intervencijos) ir 2020 m. rugsėjo-spalio mėn. (po intervencijos praėjus trims mėnesiams). Intervencinei grupei priskirti dalyviai ėmė naudotis intervencija iš karto po priskyrimo šiai grupei; kontrolinei grupei priskirti dalyviai ėmė naudotis intervencija po penkių-šešių mėnesių.

Intervencijos

Intervencijas kūrė klinikiniai psichologai ir tyrėjai iš Vilniaus universiteto Psichologijos instituto Psichotraumatologijos centro (bendradarbiaujant su Elgesio ir mokymosi mokslų katedra Linšiopingo universitete, Švedijoje), turintys patirties su stresu susijusių sutrikimų ir internetu teikiamų intervencijų srityje. Abi intervencijos yra paremtos dėmesingo įsisąmoninimo

principais ir buvo teikiamos internetu, naudojant saugią intervencijų platformą Iterapi (Vlaescu et al., 2016). Jos truko šešias-aštuonias savaites; kas savaitę buvo atveriamas vis naujas intervencijos modulis, kuris išlieka atviras iki intervencijos pabaigos. Dalyviams neprisijungus prie naujo intervencijos modulio arba neatlikus pratimų, buvo išsiunčiami trumpi priminimai. Intervencijų įgyvendinimui buvo pasitelkti apmokyti psichologai, kurie dalyviams teikė struktūruotą grįžtamąjį ryšį; atsakymai buvo individualizuojami taip, jog atlieptų kiekvieno dalyvio poreikius. Visas bendravimas tarp dalyvių ir psichologų vyko žinučių forma naudojantis intervencijų platforma.

Intervencija I tyrime. Pirmame tyrime buvo naudojama intervencija su psichologo pagalba FOREST (For Recovery from Stress), sukurta medicinos personalui ir skirta jų atsistatymo nuo streso įgūdžiams stiprinti. Ją sudaro šeši moduliai: (1) Pradėti, (2) Atsipalaiduoti, (3) Atsitraukti, (4) Puoselėti laisvalaikį, (5) Atrasti balansą, (6) Palaikyti pokyčius. Visi moduliai susideda iš trijų pagrindinių elementų: (1) psichoedukacijos (tekstas ir vaizdo įrašai), (2) keleto pratimų (raštu ir garso įrašai), (3) priminimų apie galimybę parašyti psichologui. Psichologo vaidmuo intervencijoje apėmė grįžtamojo ryšio suteikimą apie pratimų atlikimą bei atsakymus į papildomas dalyvių žinutes. Be to, psichologai telefonu skambino dalyviams intervencijai įpusėjus bei jai pasibaigus pasiteirauti įspūdžių apie naudojimąsi programa, paskatinti dalyvavimą.

Intervencija II tyrime. Antrame tyrime buvo naudojama intervencija Still Me, sukurta jauniems suaugusiesiems, patiriantiems PTSS ir kompleksinio PTSS požymius. Ji buvo sukurta kaip savigalbos intervencija su psichologo pagalba pagal poreikį. Dalyviai naudojosi intervencija savarankiškai – skaitė psichoedukacinę medžiagą bei atliko dėmesingu įsisąmoninimu paremtus pratimus (pateiktus garso įrašų forma) – bei galėjo parašyti žinutę psichologui. Psichologo vaidmuo intervencijoje buvo atsakyti į dalyvių žinutes (taip pat – intervencijai pasibaigus telefonu pasiteirauti įspūdžių apie naudojimąsi intervencija). Intervenciją sudaro aštuoni moduliai: (1) Pradžia, (2) Fizinių pojūčių įsisąmoninimas ir nevertinimas, (3) Fiziniai pojūčiai kasdieniame gyvenime, (4) Minčių įsisąmoninimas ir nevertinimas, (5) Mintys kasdieniame gyvenime, (6) Emocijų įsisąmoninimas ir nevertinimas, (7) Emocijos kasdieniame gyvenime, (8) Apibendrinimas. Intervencijos psichoedukacijos dalyje koncentruojamasi į potrauminį stresą, jo įtaką asmens gyvenimui bei dėmesingo įsisąmoninimo šiame kontekste praktikavimo naudą.

Tyrimų dalyviai

I tyrimas. Tyrime dalyvavo 168 medicinos slaugytojai bei jų padėjėjai iš visos Lietuvos: 77 intervencinėje ir 91 kontrolinėje grupėje. Visi šie dalyviai užpildė klausimynus prieš intervenciją, o intervencinės grupės dalyviai bent kartą prisijungė prie intervencijos platformos. Dauguma dalyvių buvo moterys (97.0%), jų amžiaus vidurkis: *M* (*SD*) = 42.12 (11.38). Daugiau nei pusė dalyvių dirbo daugiau nei visą darbo dieną (56.9%) ir turėjo daugiau nei dešimt metų darbo patirties (64.9%).

II tyrimas. Pirmame tyrimo etape dalyvavo 70 jaunų suaugusiųjų (Vilniaus universiteto studentų), patiriančių PTSS ir kompleksinio PTSS požymius: 31 intervencinėje ir 39 kontrolinėje grupėje. Visi šie dalyviai užpildė klausimynus prieš intervenciją ir po jos, o intervencinės grupės dalyviai bent kartą prisijungė prie intervencijos platformos. Dauguma dalyvių buvo moterys (87.1%), jų amžiaus vidurkis: *M* (*SD*) = 23.34 (3.11). Labiausiai paplitę trauminiai įvykiai, tyrimo dalyvių nurodyti kaip svarbiausi, buvo artimo žmogaus mirtis (25.8% vs. 17.9%), seksualinė trauma (16.1% vs. 12.8%) ir fizinis smurtas (12.9% vs. 20.5%). Antrame tyrimo etape dalyvavo 53 jauni suaugusieji (Vilniaus universiteto studentai), patiriantys PTSS ir kompleksinio PTSS požymius: 17 intervencinėje ir 36 kontrolinėje grupėje. Visi šie dalyviai užpildė klausimynus prieš intervenciją, po intervencijos ir po intervencijos praėjus trims mėnesiams, o intervencinės grupės dalyviai bent kartą prisijungė prie intervencijos platformos. Dauguma dalyvių buvo moterys (84.9%), jų amžiaus vidurkis: *M* (*SD*) = 23.21 (2.81).

Tyrimų instrumentai ir duomenų analizė

Stresui vertinti buvo naudojama Suvokiamo streso skalė (The Perceived Stress Scale, PSS-4; Cohen et al., 1983), atsistatymui nuo streso – Atsistatymo patirčių klausimynas (The Recovery Experiences Questionnaire, REQ; Sonnentag & Fritz, 2007), depresijos ir nerimo požymiams – Paciento sveikatos klausimynas (The Patient Health Questionnaire-4, PHQ-4; Kroenke et al., 2009 ir The Patient Health Questionnaire-9, PHQ-9; Kroenke et al., 2001) ir Generalizuoto nerimo sutrikimo skalė (The Generalized Anxiety Disorder Scale-7, GAD-7; Spitzer et al., 2006), psichologinei gerovei – Pasaulio sveikatos organizacijos psichologinės gerovės klausimynas (The World Health Organization Well-being Index, WHO-5; Bech, 2004), pozityviai psichikos sveikatai – Pozityvios psichikos sveikatos skalė (The Positive Mental Health Scale, PMH; Lukat et al., 2016), potencialiai

trauminiams įvykiams – Gyvenimo įvykių sąrašas (The Life Events Checklist, LEC-5; Weathers et al., 2013), PTSS ir kompleksinio PTSS požymiams – Tarptautinis traumos klausimynas (The International Trauma Questionnaire, ITQ; Cloitre et al., 2018), moraliniam sužeidimui – Moralinio sužeidimo skalė (The Moral Injury Outcome Scale, MIOS; Litz et al., 2020), intervencijų vertinimui – papildomi klausimai apie intervencijas.

Pirmajame tyrime intervencijos poveikiui vertinti buvo taikoma latentinių pokyčių analizė (naudojant programą Mplus 8.2), o antrajame tyrime – daugiamatė pasikartojančių matavimų ANOVA (naudojant programą IBM SPSS Statistics 26 versiją). Abiejuose tyrimuose buvo apskaičiuoti efekto dydžiai grupėse ir tarp grupių.

REZULTATAI

Pagrindiniai pirmojo tyrimo rezultatai

Pirmuoju disertacijos tyrimu buvo vertinamas dėmesingu įsisąmoninimu paremtos internetu teikiamos intervencijos veiksmingumas medicinos personalo atsistatymui nuo streso bei psichikos sveikatai. Šiuo tyrimu atskleista, jog intervencija buvo veiksminga psichologinio atsitraukimo (d = 0.83), atsipalaidavimo (d = 0.93), meistrystės (d = 0.64) ir kontrolės (d = 0.46) įgūdžių gerėjimui iš karto po intervencijos. Taip pat tyrimas parodė intervencijos veiksmingumą psichologinio atsitraukimo (d = 0.90), atsipalaidavimo (d = 0.67) ir meistrystės (d = 0.56) įgūdžių gerėjimui po intervencijos praėjus trims mėnesiams.

Tyrimu taip pat buvo nustatytas intervencijos poveikis psichologinės gerovės didėjimui (d = 0.53) bei streso (d = -0.49), nerimo (d = -0.31) ir depresijos (d = -0.49) požymių mažėjimui iš karto po intervencijos. Intervencijos veiksmingumas streso (d = -0.79) ir depresijos požymių (d = -0.33) mažėjimui bei psichologinės gerovės didėjimui (d = 0.49) išliko po intervencijos praėjus trims mėnesiams.

Daugiau nei pusė tyrimo dalyvių tiek iš intervencinės grupės, tiek iš laukimo sąrašo kontrolinės grupės (atitinkamai 66.2% ir 76.9%) nurodė per gyvenimą patyrę bent vieną traumuojantį įvykį. Šiose imtyse buvo vertinamas PTSS ir kompleksiniam PTSS būdingų sutrikusios asmenybės organizacijos požymių pokytis prieš intervenciją, po intervencijos ir po intervencijos praėjus trims mėnesiams. Tyrimu nebuvo nustatytas intervencijos poveikis PTSS ir kompleksinio PTSS požymiams. Taip pat daugiau nei pusė tyrimo dalyvių iš abiejų grupių nurodė patyrę įvykį ar įvykius, galinčius sukelti moralinį sužeidimą (intervencinėje grupėje – 63.6%; laukimo sąrašo kontrolinėje grupėje – 51.6%). Šiose imtyse buvo vertinamas moralinio sužeidimo pokytis. Tyrimu nebuvo nustatytas intervencijos poveikis moraliniam sužeidimui.

Pagrindiniai antrojo tyrimo rezultatai

Antruoju disertacijos tyrimu buvo vertinamas dėmesingu įsisąmoninimu paremtos internetu teikiamos intervencijos veiksmingumas trauminių patirčių turinčių jaunų suaugusiųjų PTSS ir kompleksinio PTSS požymiams bei psichikos sveikatai. Šiuo tyrimu nebuvo nustatytas intervencijos poveikis PTSS ir atskirų jo požymių grupių mažėjimui, išskyrus nuolatinio padidėjusio grėsmės jausmo požymių grupės mažėjimui (d = -0.48) iš karto po intervencijos. Tyrimu atskleistas intervencijos poveikis kompleksiniam PTSS

būdingų sutrikusios asmenybės organizacijos požymių mažėjimui (d = -0.48) ir dviejų atskirų požymių grupių – neigiamo savęs vaizdo (d = -0.72) ir tarpasmeninių santykių sunkumų (d = -0.55) – mažėjimui iš karto po intervencijos. Be to, tyrimas parodė intervencijos poveikį pozityvios psichikos sveikatos gerėjimui (d = 0.51) iš karto po intervencijos. Tyrimu taip pat nustatyta, kad intervencijos poveikis kompleksiniam PTSS būdingų sutrikusios asmenybės organizacijos požymių mažėjimui (d = -0.84) ir dviejų atskirų požymių grupių – neigiamo savęs vaizdo (d = -0.66) ir tarpasmeninių santykių sunkumų (d = -0.87) – mažėjimui išliko po intervencijos praėjus trims mėnesiams.

Intervencijų vertinimas

I tyrimo intervencijos vertinimas. Pirmojo tyrimo, kuriuo vertinome dėmesingu įsisąmoninimu paremtos internetu teikiamos intervencijos veiksmingumą medicinos personalo atsistatymui nuo streso ir psichikos sveikatai, dalyviai atskleidė, kad ši intervencija jiems buvo naudinga (83.6%), patiko (86.9%) ir ja buvo lengva naudotis (91.8%); taip pat didelė dalis dalyvių nurodė, kad naudojimasis intervencija pagerino jų psichologinę (73.8%) ir fizinę (45.9%) savijautą bei bendrą supratimą apie save (60.7%). Dauguma tyrimo dalyvių (88.5%) rekomenduotų šią intervenciją kitiems.

II tyrimo intervencijos vertinimas. Antrojo tyrimo, kuriuo buvo vertintas dėmesingu įsisąmoninimu paremtos internetu teikiamos intervencijos veiksmingumas trauminių patirčių turinčių jaunų suaugusiųjų PTSS ir kompleksinio PTSS požymiams bei psichikos sveikatai, dalyviai nurodė, jog ši intervencija jiems buvo naudinga (80.7%), patiko (83.9%) ir ja buvo lengva naudotis (93.6%); taip pat daugiau nei pusė dalyvių teigė, kad naudojimasis intervencija pagerino jų psichologinę savijautą (61.3%) ir bendrą supratimą apie save (64.6%). Daugiau nei trys ketvirtadaliai tyrimo dalyvių (77.5%) rekomenduotų šią intervenciją kitiems.

IŠVADOS

1. Dėmesingu įsisąmoninimu paremta internetu teikiama intervencija su aukštu streso lygiu susiduriančiam medicinos personalui:

1.1. buvo veiksminga atsistatymui nuo streso. Tiksliau, ji pagerino psichologinio atsitraukimo, atsipalaidavimo, meistrystės ir kontrolės įgūdžius. Psichologinio atsitraukimo, atsipalaidavimo ir meistrystės įgūdžiai išliko pagerėję praėjus trims mėnesiams po intervencijos, o kontrolės įgūdis grįžo į prieš intervenciją buvusį lygį;

1.2. veiksmingai mažino stresą, depresijos ir nerimo požymius bei didino psichologinę gerovę. Stresas ir depresijos požymiai išliko sumažėję, psichologinė gerovė – padidėjusi praėjus trims mėnesiams po intervencijos, o nerimo požymiai grįžo į prieš intervenciją buvusį lygį. Intervencija neturėjo poveikio potrauminio streso sutrikimo ir kompleksinio potrauminio streso sutrikimo požymiams – nei iš karto, nei praėjus trims mėnesiams po intervencijos.

2. Dėmesingu įsisąmoninimu paremta internetu teikiama intervencija trauminių patirčių turintiems jauniems suaugusiesiems:

2.1. buvo veiksminga kompleksiniam potrauminio streso sutrikimui būdingiems sutrikusios asmenybės organizacijos požymiams. Tiksliau, ji sumažino neigiamo savęs vaizdo ir sutrikusių tarpasmeninių santykių požymius, kurie išliko sumažėję praėjus trims mėnesiams po intervencijos;

2.2. buvo veiksminga gerinant pozityvią psichikos sveikatą iš karto po intervencijos. Intervencija neturėjo poveikio depresijos ir nerimo požymiams.

3. Dėmesingu įsisąmoninimu paremtų internetu teikiamų intervencijų vartotojai – su aukštu streso lygiu susiduriantis medicinos personalas ir trauminių patirčių turintys jauni suaugusieji – buvo patenkinti intervencijomis ir vertino jas kaip naudingas ir lengvai naudojamas priemones, padedančias geriau suprasti save ir savo būseną.

4. Dėmesingu įsisąmoninimu paremtos internetu teikiamos intervencijos gali praplėsti alternatyvių ir papildomų intervencijų galimybes su aukštu streso lygiu ir kompleksiniam potrauminio streso sutrikimui būdingais požymiais susiduriantiems asmenims. Be to, jos gali būti ekonomiškai veiksmingas sprendimas siekiant didinti psichologinių intervencijų prieinamumą.

ABOUT THE AUTHOR

Austėja Dumarkaitė prepared her doctoral dissertation in 2019-2023 at the Center for Psychotraumatology, Institute of Psychology, Vilnius University. Her research interests include clinical psychology and the efficacy of psychological interventions. The dissertation results were published in international scientific peer-reviewed journals and presented at national and international conferences. Overall, during her Ph.D. studies, Austėja Dumarkaitė co-authored more than ten scientific publications related to her doctoral research. She enhanced her researcher's competencies at Linköping University (Sweden), Jaume I University (Spain), Macquarie University (Australia), University of Porto (Portugal), and Free University of Berlin (Germany). As a Ph.D. student, she got several awards for her research results. Besides her research activities, Austėja Dumarkaitė has worked as a clinical psychologist in mental health settings and lecturer at Vilnius University.

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Postilla
CATHOLICKA.
Tai est:
Iżguldimas Ewangeliu kiekwienos Nedelos ir szwentos per wissus metus.
Per Kuniga MIKALOIV DAVKSZA
Su walá ir dalaidimu wireſniuiu.
W Wilniui/
Drukarnioi Akademios SOCIETATIS IESU.

Fragmentas iš Vilniaus jėzuitų kolegijos rektoriaus Jakubo Vujeko (1541–1597) didžiausios apimties ir reikšmingiausio XVI a. lietuvių kalbos rašto paminklo, pamokslų rinkinio *Postilla catholicka* (Vilnius, 1599), Mikalojaus Daukšos (tarp 1527 ir 1538–1613) vertimo iš lenkų į lietuvių kalbą.

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Fragment from the Lithuanian edition of *Postilla catholicka* (Vilnius, 1599), a collection of sermons written by the Rector of Vilnius Jesuit College Jakub Vujek (1541–1597) and the most significant and largest example of 16th c. Lithuanian writing, translated from the Polish by Mikalojus Daukša (1527/1538–1613).

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