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Internet-delivered modified Mindfulness-Based Cognitive Therapy (iMBCT) intervention for perceived stress and emotional distress: A pilot RCT study

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Abstract

Mindfulness-Based Cognitive Therapy (MBCT) has demonstrated its effectiveness in preventing depression relapse and reducing symptoms of depression and anxiety. Preliminary research on the online version of an eight-week MBCT (iMBCT) has shown promising results in decreasing emotional distress, aligning with the positive effects observed in traditional MBCT programs. However, there is a notable gap in our understanding regarding whether the abbreviated form of iMBCT effectively reduces perceived stress and emotional distress. This study aims to fill this knowledge gap. A total of 1,348 distressed individuals from the community participated in the study. They were randomly assigned to 30-day, modified, unguided iMBCT intervention or waiting-list condition (WLC). Our reduced iMBCT consisted of six sessions, each containing guided meditations and psychoeducation recordings and materials. Perceived stress, anxiety, depression, resilience and self-compassion measurements were assessed at baseline and after 30 days of the intervention. At post-test the iMBCT participants showed a significant decrease in perceived stress, anxiety and depression and an increase of self-compassion and resilience. Participants in WLC, contrary, did not manifest any changes over time in any of the measures. Our results indicate that an online, unguided, 30-day MBCT program may be effective for distressed individuals.

1. Introduction

Stress is ubiquitous in life and pervades all its domains (Selye, 1956). Higher levels of stress have been linked with increased rates of numerous health issues, such as heart attack, obesity, addiction, anxiety, and depression (Fink, 2010). Although the term is often colloquially used as a negative descriptor of experiences (Robinson, 2018), it actually refers to the complex process of adaptation of the human body to changing internal and external environments (O' Connor et al., 2020). Stress can be perceived and studied through the lens of various disciplines, such as physiology, endocrinology, neurosciences, psychiatry, and psychology. Given the different perspectives and theories, a definitive concept of stress remains elusive (Robinson, 2018).

One of the most frequently used conceptualizations in intervention studies is the concept of perceived stress (Cohen et al., 1983), which reflects a subjective judgment of the situation and an evaluation of one's ability to cope with and respond to the situation's demands (Lazarus & Folkman, 1986). Feeling a lack of control as an outcome of one's judgment of a situation or having too few resources to overcome obstacles results in an experience of emotional distress, which is a common term for depressive and anxiety symptoms (Arvidsdotter et al., 2016; Yan et al., 2021).

Although stress and emotional distress are inevitable facets of life, substantial evidence indicates that prolonged stress and stress-related subthreshold depressive symptoms are significant risk factors for developing severe disabilities, such as major depressive disorder (Kessler et al., 1997; Cujipers & Smit, 2004; Weissman et al., 2010; Yang et al., 2015). Therefore, even a mild prolonged experience of distress should not be neglected and should be treated with interventions focused on stress, anxiety, and depression symptom reduction, as well as improving an individual's self-regulation and resilience (Cujipers et al., 2007).

Resilience is a dynamic process of two phenomena – facing a stressful situation by an individual and a positive adaptation to changing situational demands (Ogińska-Bulik & Juczyński, 2008). Positive adaptation comes from modifying one's responses in order to bounce back from negative emotional experiences and to adapt to new circumstances (Block & Block, 1980). Resilience is related to constructs such as: emotional stability, openness to experience and sense of self efficacy (Semmer, 2006) but also to processes and abilities that can be developed later on in life such as: cognitive flexibility, tolerance of negative affect or experiencing positive emotions (Southwick & Charney, 2012) that are crucial for effective coping with stress and maintaining mental health (Gloria & Steinhardt, 2016). Studies have shown that higher level of resilience is not only related to lower intensity of stress and emotional distress (Bacchi & Licinio, 2017; Strain, 2018) but it also predicts better coping in the face of significant life adversities (Min, Yoon, Lee et al., 2013; Kimhi, Marciano, Eshel et al., 2020).

One psychological intervention with extensive empirical support for improving self-regulation, resilience and decreasing symptoms of emotional distress is based on cultivating mindfulness (Friese & Hofmann, 2016; Nila et al., 2016; Solati, 2017). Mindfulness-based interventions (MBI), mindfulness-based therapies, and mindfulness-based programs are commonly used terms for psychological interventions based on meditation training, wherein the main goal is to develop mindfulness.

Mindfulness is often characterized as awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience for each moment (Kabat-Zinn, 2003). Meta-analyses studying the effects of Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) — the two most popular and scientifically examined stationary eight-week MBI programs—have shown that these interventions reduce symptoms of stress (Chiesa & Seretti, 2009; Gu et al., 2015) and emotional distress in both clinical and non-clinical samples with depression (e.g., Goldberg et al., 2019; Strauss et al., 2014) and anxiety (e.g., Hofmann et al., 2010; Piet et al., 2012). Meta-analyses have also shown the increase of self-compassion (Golden et al., 2021; Wasson et al., 2020), which is attitude of kindness and acceptance towards oneself that decreases the distress and suffering (Neff, 2003).

With the accelerated development of information technology in the last two decades, internet psychological interventions (IPI) have been increasingly used to help people alleviate their emotional problems (Andersson, 2018). The majority of IPI programs are based on cognitive-behavioral therapy; notably, several online adaptations of MBIs (iMBIs) have also been developed (Zhang et al., 2021). In 2016, the first meta-analysis of iMBI studies (N=17) showed that similar to stationary MBI, iMBIs are effective in decreasing stress and emotional distress (depressive and anxiety symptoms) (Spijkerman et al., 2016). These findings are supported by a meta-analysis of 12 iMBI interventions that involved participants with depression or anxiety disorders diagnosis (Sevilla-Llewellyn-Jones et al., 2018). Recent meta-analyses have demonstrated that iMBI can be used as a preventive tool for mental health care (Jayawardene et al., 2017), as a treatment for distress (Sommers-Spijkerman et al., 2021), and as a treatment for emotional distress related to physical conditions (Liu et al., 2021).

Although the effects of iMBIs are promising, an important limitation of online interventions is the high attrition rate, which is one of the most challenging issues in mindfulness randomized controlled trials

(RCTs), with a rate as high as 79% (Mak et al., 2017), and more generally, in any Internet-based intervention, with attrition rates ranging from 2% to 83% with an average of 31% (Melville et al., 2010). One meta-analytic review of 70 mental health smartphone RCTs (Linardon & Fuller-Tyszkiewicz, 2020) has suggested that although there are factors that may decrease attrition (e.g., monetary compensation or sending reminders), the phenomenon is too complex to be explained by a single model.

The most popular MBIs last for eight weeks and require a serious daily commitment. Participants who respond to the advertisement spontaneously are not necessarily aware of the effort they are going to expend. Thus, shortening the intervention duration has been postulated as one of the possible avenues to mitigate the attrition problem (Mayerowitz-Katz et al., 2020). This possibility has been studied in several iMBIs that ranged from 10 days (Howells & Ivtzan, 2016), 13 and 14 days (Glück & Maercker, 2011 and Cavanagh, 2013, respectively), 21 days (Levin et al. 2014; Carissoli et al., 2015), and up to 30 days (Yang et al., 2018). Their results are promising in terms of stress and distress reduction; however, the attrition rate remained the same as that in full eight-week courses.

Researchers have investigated attrition predictors and found that perceived low credibility of the intervention and feeling of external pressure to complete the task are linked to higher attrition (Alofonsson et al., 2016; Alfonsson et al., 2017). This finding suggests that the reduction of MBI is not enough. Minimizing the goal and, thus, external pressure and increasing the credibility of the intervention must be carefully considered.

For the above reasons, we decided to conduct a pilot study of an online, reputable Internet-delivered MBCT (iMBCT) with a shortened duration of 30 days. To our knowledge, no attempt of halved iMBCT has been published. The aim of our study is to evaluate the feasibility and effects of such modified iMBCT on stress, emotional distress, self-compassion and resilience in a distressed community sample. We hypothesized the following:

a. Participants undergoing iMBCT in comparison to the waiting-list controls would exhibit significant drops in stress and emotional distress symptoms.
b. Participants undergoing iMBCT in comparison to the waiting-list controls would exhibit significant increase in self-compassion and resilience measures.
c. There will be no significant differences in the outcome measures' mean scores between the pre-test and post-test in the control condition.
d. The attrition would be lower than in 8 weeks online MBI studies.

2. Method

2.1 Participants

The participants were recruited via the Internet. Advertisements inviting individuals to participate in research aimed at evaluating the effectiveness of online mindfulness intervention for people affected by emotional distress, marked by lower mood, anxiety, insomnia, and concentration problems, were posted on social

media and university websites. The link to the project website (www.stress-less.pl) was provided, along with a further warning that people experiencing severe mental health issues should not join the program and those under psychiatric treatment should ask their doctor for permission. Informed consent was obtained from all participants, and the study was approved by the ethics committee.

Out of 1,861 people who responded to the advertisement and signed up with their e-mail, 1,348 completed the pre-test and were randomly allocated to either the iMBCT or the waiting list. The post-test, administered following 30 days of intervention, was completed by 103 participants from the mindfulness group and 340 from the control group. Propensity score matching (PSM) was used to balance the groups (Austin, 2010). The final sample consisted of 190 participants (163 women and 27 men), with ages ranging from 20 to 56 years (M=34, *SD*=9). The majority (73%) attained higher education, 26% finished secondary education, and 1% finished vocational school. Both groups did not differ in age, gender, education, or first measurement (emotional distress, stress, and resilience). Table 1 presents the sociodemographic characteristics of the sample.

Table 1 Demographic characteristics of the two samples

	MBCT (n=91)	Control (n=99)
Male	13	14
Female	78	85
Mean age	33, 57 (SD = 8.50)	33, 87 (SD = 9.22)
Higher education	64	74
Secondary education	26	24
Vocational education	1	1

2.2 Procedure

The study was designed to be asynchronous, and the registration opened 14 days before the start of the program. During that period, e-mails were sent to the participants to provide basic information, prepare them mentally for an intervention (or waiting period), and to remind them about the upcoming parts of the study. The participants from both groups completed questionnaires on the Internet two times (i.e., before and after 30 days of intervention or waiting period). They were given seven days for each measurement. They were excluded from the study if they failed to complete it in time. Following the completion of the questionnaires, those randomly allocated to iMBCT received access to an Internet platform with the online intervention.

Throughout the 30-day MBIs, the participants in both groups were encouraged to contact the researchers or mindfulness teacher via e-mail or the chat box on the Internet platform whenever needed or when they had questions regarding the study or mindfulness training. Figure 1 presents the detailed course of the study.

2.2.1 Mindfulness Intervention

The iMBCT intervention was divided into six sessions, with a five-day period in between. The sessions were an online adaptation of the regular MBCT meetings. Subsequent sessions were unlocked gradually, but previous materials were kept accessible so the participants could revisit them during the training if necessary. The training consisted of audio recordings and a workbook. Materials were recorded by a certified MBSR/MBCT teacher with 10 years of experience in delivering mindfulness trainings. Audio recordings included guided meditations and topics raised during regular courses. A summary of the iMBCT program is presented in Table 2.

Table 2 The 30-day modified iMBCT

Day	Session	Exercises
1	1. Awareness and automatic pilot	Mindful eating, body scan
6	2. Living in our heads	Sitting meditation, body scan, calendar of pleasant experiences
11	3. Being present in the body	3-min breathing space, yoga, sitting-meditation, calendar of unpleasant experiences
16	4. Recognizing aversion	3-min breathing space, yoga, sitting-meditation
21	5. Allowing / Letting be	Meditation of difficulties, 3-min breathing space
26	6. “How can I best take care of myself?”	Behavioral activation, 3-min breathing space, sitting meditation

To enhance the motivation and commitment of the participants, e-mails were sent before and after each session. The e-mails consisted of a summary of the sessions, psychoeducation, and emotional support (i.e., “Sometimes we fail to practice regularly. It is fine; we are not perfect. However, it is important to avoid that pattern and commit to the training. Only then can we anticipate changes in our daily life”). The participants used common chat daily to ask questions related to mindfulness practice or to share their experiences. A moderator was active on the chat, supervised the threads, and answered the questions. The participants got involved in the chat and supported themselves.

2.2.2 Waiting List

In the control condition, the participants waited for 30 days for access to the training platform. During that time, they were encouraged to communicate on chat if needed. The moderator asked questions such as “What are your expectations?” or “Why have you decided to take part in the study?” to foster commitment to the platform and the upcoming training. The participants received several e-mails with encouragement to endure the waiting period and prepare for the training.

2.3 Symptom Measures

2.3.1 Emotional distress

TheHospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983; Polish validation: Nezlek et al., 2019) was used to measure the anxiety and depression scores and calculate the emotional distress score. HADS was created for healthcare workers without psychiatric backgrounds to help them evaluate patients' mental health—not as a diagnosis but as a severity rating. The scale consists of 14 statements (e.g., Worrying thoughts go through my mind) to which a person refers on a four-point scale. The results can be analyzed separately—as depression and anxiety scores or as the overall emotional distress score (Crawford, Henry, Crombie et al., 2001). The Cronbach's alpha for this scale was .84 in our study.

2.3.2 Perceived stress

The level of stress was measured with the Perceived Stress Scale (PSS-10; Cohen et al., 1983; Polish validation: Juczynski & Ogińska-Bulik, 2009). The scale consists of 10 statements (e.g., In the last month, how often have you been upset because of something that happened unexpectedly?) to which a person relates on a five-point Likert scale, choosing between "never" and "very often." The tool evaluates one's ability to cope and deal with daily challenges. A review of 12 articles indicated that the reliability of the scale exceeds .70 (Lee, 2012). In our study, the Cronbach's alpha was .94.

2.3.3 Resilience

The level of resilience was computed with polish Resilience Measurement Scale (The Resiliency Assessment Scale, SPP-25; Ogińska – Bulik, Juczyński, 2008). The scale consists of 25 statements (e. g. I can easily adapt to new situations) to which respondent relates on a five-point Likert scale. The results provide overall resilience score as well as its subscales: persistence and determination in action; openness to experience and sense of humor; personal competences to cope and tolerance for negative emotions; tolerance for failure and treating life as a challenge; optimistic attitude towards life and ability to mobilize in difficult situations. The repeated measurement conducted by the scale's authors after 4 weeks indicates high stability of the construct (.85). In our study internal consistency for the whole scale was .92 and .70 - .79 for the subscales.

2.3.4 Self-compassion

Self-compassion was measured with a short form of Self-compassion Scale (SCS-SF; Raes et al., 2011; Holas et al., 2023). The tool consists of 12 items (eg. 'I try to see my failings as part of the human condition.') to which person refers on a five-point scale. Correlation with the long form of the scale indicated strong relationship ($r \geq .97$) in all samples (Raes et al., 2011). The reliability of the shorter form of the scale was .87 in our study.

2.4 Data Analysis

To address the research questions, a 2x2 mixed-model analysis of variance (ANOVA) (iMBCT vs. control) x (pre-test vs. post-test) was carried out with IBM SPSS Statistics (version 25). Prior to the analyses, given the high disproportion of completers between groups [n = 103 in iMBCT and n = 340 in the waiting-list

condition (WLC)], we conducted the PSM method using nearest-neighbor matching (1:1). This method allows for the reduction of bias caused by uncontrolled factors and estimates a more accurate treatment effect when the group size differs (Austin, 2010). Kruskal-Wallis analysis of distribution was conducted after matching 103 participants from the control condition with 103 participants from the experimental condition. The groups did not differ in terms of metric data and initial questionnaire measurements despite general emotional distress (HADS; p =.02). To balance the sample, the 16 highest scores (HADS > 29) from both groups were excluded, after which we obtained the final sample (n = 91 and n = 99). The groups did not differ in terms of age (p = .93), gender (p = .98), education (p = .50), general emotional distress (p = .12) and stress (p = .69). The chi square test suggests no significant difference in group sizes (p = .56). Finally, to increase the reliability of findings, complete case analyses was conducted (without PSM and exclusion of 16 highest HADS scores).

3. Results

3.1 Attrition

The attrition rate in this study, which involved 1,348 subjects participating in the pre-test, was notably high, with only 443 individuals completing the post-test. This completion rate represents a 67% attrition rate for the study. However, it's important to note that due to limitations in the basic version of the internet platform used for the study, activity data that could have provided insights into participant engagement and dropout at different stages of the study were not collected. As a result of this limitation, the study was unable to ascertain the number of participants who did not log in to the platform after filling out the pretest or those who dropped out following initial engagement in the interventions. Consequently, the actual percentage of participants who engaged in the intervention and subsequently decided to resign may be lower than the 67% attrition rate indicated by the completion of the post-test.

3.2 Symptom Measures

Before the start of the treatment, no significant difference was observed in any of the symptom measures between the two groups. Table 3 presents the mean values of the measured variables pre- and post-intervention for both groups.

3.2.1 Stress (PSS-10)

Mixed MANOVA 2x2 was calculated to determine the difference between measures in iMBCT and WLC, with group as a between-subject factor and stress (PSS total score) as a within-subject factor. Analyses of the main effect of measurement revealed Wilks' $\lambda = .86$, $F(1,188) = 29.48$; $p < .001$; $\eta_p^2 = .14$. The main effect for group showed Wilks' $\lambda = .75$, $F(1,188) = 15.26$; $p < .001$; $\eta_p^2 = .08$. The interaction effect showed $F(1,188) = 63.68$; $p < .001$; $\eta_p^2 = .25$. Additional post-hoc analyses were computed using the Bonferroni test to evaluate the differences. In the pre-test, no significant difference was observed between groups, with $F(1,188) = .10$; $p = .75$; $\eta_p^2 < .01$. However, a significant difference was found in the post-test, with $F(1,188) = 50.48$; $p <.001$; $\eta_p^2 = .21$. No significant difference was found between the pre-test and post-test measures

in the WLC, with F(1,188) = 3.40; p = .067; η_p^2 = .02, whereas, differences were noted in the experimental condition, with F(1,188) = 86.28; p < .001; η_p^2 = .32.

3.2.2 Emotional Distress (HADS)

A mixed MANOVA 2x2 was calculated to determine the effects of the iMBCT on the participants' emotional distress. Analysis of the main effect showed Wilks' λ = .81 *F*(1,188) = 45.19; p <.001; η_p^2 = 0.194. The group-by-time interaction resulted in F(1,188) = 79.48; p<.001; η_p^2 = .297. Additional calculations proved that although there were no significant differences between groups in the first measurement (F(1,188) = 3.29; p = .07; η_p^2 < .017), the groups differed significantly after 30 days (F(1,188) = 30.26; p < .001; η_p^2 = .139). In the control condition, no significant differences were observed between the pre-test and post-test (F(1,188) = 2.51; p = .12; η_p^2 = .013). In iMBCT, there were significant decreases in the HADS total score of emotional distress, HADS-A, and HADS-D in the post-test compared with the pre-test (F(1,188) = 117.32; p < .001; η_p^2 = .38.

3.2.3 Resilience (SPP-25)

For the overall resilience score main effect showed Wilks' λ = .84 F(1,188) = 34.82; p < .001; ηp2 = .156. The group by time interaction suggested significant differences between groups and measurements F(1,188) = 39.40; p < .001; ηp2 = .173. Whilst there was no significant differences between groups in the first measurement F(1,188) = 2.357; p = .126; η_p^2 < .012, after 30 days conditions provided significantly different scores F(1,188) = 7.07; p = .01; η_p^2 = .036. In the control condition there was no significant differences between T1 and T2 F(1,188) = .075; p = .79; η_p^2 <.001. iMBCT group differed significantly in the second measurement comparing with the first one F(1,188) = 71.19; p < .001; η_p^2 = .28. Significant differences in mindfulness condition were also observed in all of 5 subscales of SPP-25. Table 4 presents the detailed results of the subscales' analysis.

3.2.4 Self-compassion (SCS-SF)

Analyses of the main effect of self-compassion revealed Wilks' λ = .74, F(1,188) = 67.05; p < .001; η_p^2 = .26 and the group by time interaction effect F(1,188) = 52.88; p < .001; η_p^2 = .22. In the pre-test, no significant difference was observed between groups, with F(1,188) = 3.44; p = .65; η_p^2 < .01. However, a significant difference was found in the post-test, with F(1,188) = 12.99; p <.001; η_p^2 = 0.065. No significant difference was found between the pre-test and post-test measures in the WLC, with F(1,188) = 4.39; p = .51; η_p^2 = .002. Meanwhile, differences were noticed in the mindfulness condition, with F(1,188) = 114.68; p < .001; η_p^2 = .38. Table 3 presents the mean values with standard deviations at the T1 and T2 measurements and the interaction effects.

Table 3 Mean values of the measured variables at all time points – iMBCT and WLC groups

	Dependent		Pre-test		Post-test					
	Variable		*M*	*SD*	*M*	*SD*	η^2	*F*	*df*	*p*
PSS-10	Stress	WLC	17.51	5.57	18.48	6.28	.02	3.4	1,188	.07
		iMBCT	17.8	5,40	12.67	4.84	.32	86.28	1,188	.001
HADS	Anxiety	WLC	8.87	4.1	9.33	4.55	.008	1.45	1,188	.23
		iMBCT	9.77	4	5.92	3.73	.33	91.61	1,188	.001
HADS	Depression	WLC	6.84	2.99	7.34	3.49	.018	3.53	1,188	.062
		iMBCT	7.68	3.15	4.90	3.22	.34	98.22	1,188	.001
HADS	Emotional Distress	WLC	14.83	5.92	15.67	6.91	.12	2.51	1,188	.12
		iMBCT	16.4	6	10.41	6.17	.38	117.32	1,188	.001
SPP-25	Resilience	WLC	60.85	15.32	60.57	15.35	.001	.075	1,188	.79
		eMBCT	57.42	15.47	66.53	15.55	.28	71.19	1,188	.001
SCS-SF	Self-compassion	WLC	2.71	.82	2.75	.85	.002	.44	1,188	.51
		iMBCT	2.50	.73	3.18	.80	.38	114.68	1,188	.001

M – mean value; *SD* – standard deviation; η^2 – eta-squared effect size measure;

F – value of the test for interaction; *df* – degrees of freedom; *p* – statistical significance

Table 4 Mean values of the resilience subscales at pre-test and post-test

Resilience (SPP-25) subscales		Pre-test		Post-test					
		M	*SD*	*M*	*SD*	η^2	*F*	*df*	*p*
Persistence and determination in action	WLC	12.06	3.78	11.70	3.76	.01	1.98	1,188	.16
	iMBCT	10.81	3.62	12.75	3.67	.22	54.41	1,188	.001
Openness to experience and sense of humor	WLC	14.52	3.40	14.43	3.44	.001	.11	1,188	.74
	iMBCT	14.12	3.35	15.62	2.99	.15	34.05	1,188	.001
Personal competences to cope and tolerance for negative emotions	WLC	11.43	3.79	11.52	3.84	.001	.12	1,188	.73
	iMBCT	11.93	3.76	12.66	3.22	.16	35.26	1,188	.001
Tolerance for failure and treating life as a challenge	WLC	12.73	3.31	12.58	3.47	.002	.34	1,188	.56
	iMBCT	12.16	3.71	13.92	3.44	.18	42.40	1,188	.001
Optimistic attitude towards life and ability to mobilize in difficult situations	WLC	10.11	4.03	10.32	3.90	.003	.51	1,188	.48
	eMBCT	9.29	4.18	11.58	4.22	.23	54.97	1,188	.001

M – mean value; *SD* – standard deviation; η^2 – eta-squared effect size measure;

F – value of the test for interaction; *df* – degrees of freedom; *p* – statistical significance

3.3 Complete case analysis

Although the use of the PSM method with two heterogeneous groups is common (Austin, 2010), some researchers consider it to be unjustified (Guo et al., 2020), as there are other statistical methods that do not require a reduction in the number of observations. Therefore, we decided to conduct additional MANOVA analysis. In the present study, despite unbalances groups, the criterions for analysis of variance were met (non-significant Levene's test result and preserved sphericity by Mauchly's test). The results of mixed MANOVA 2x2 remained unchanged in terms of effect sizes and significance of change in all of the measures: HADS ($F(1,544) = 123.59$; $p < .001$; $\eta_p^2 = .186$), PSS-10 ($F(1,544) = 97.62$; $p < .001$; $\eta_p^2 = .152$),), SPP-25 ($F(1,544) = 112.3$; $p < .001$; $\eta_p^2 = .171$), and SCS-SF ($F(1,544) = 140.63$; $p < .001$; $\eta_p^2 = .205$).

4. Discussion

The purpose of the current study was to investigate the potential therapeutic benefits of completing a 30-day online modified Mindfulness-Based Cognitive Therapy (iMBCT) intervention on stress and emotional distress symptoms in a community sample experiencing distress. The study aimed to determine if mindfulness training would be effective in alleviating these symptoms. The study's findings supported the hypotheses about the effectiveness of modified iMBCT. Participants who actively engaged in the iMBCT program reported significant reductions in perceived stress and emotional distress levels. Additionally, when anxiety and depression scores were separately analyzed, they also showed significant improvements

compared to the pre-test and a waiting-list group. Furthermore, the study observed a significant increase in self-compassion and resilience among participants who completed the iMBCT intervention, including improvements in the subscales related to these factors. This suggests that the mindfulness-based program not only reduced distress but also enhanced participants' self-compassion and ability to cope with stress and adversities. Conversely, there were no significant changes observed in any of the variables over the 30-day period in the waiting-list control group (WLC), highlighting the specific benefits associated with the iMBCT intervention.

The results of this study align with the findings from other internet Mindfulness-Based Interventions (iMBI) studies that utilized training durations shorter than 30 days and reported significant reductions in stress, anxiety, and depression (Howells et al., 2016; Glück et al., 2011; Cavanagh, 2013; Levin et al., 2014; Carissoli et al., 2015). In each of these research, shorter iMBIs were associated with positive effects on mental well-being, corroborating the impact of mindfulness training. Additionally, the current study's outcomes are consistent with the results of meta-analyses that have considered iMBIs with longer durations exceeding six weeks (Jayawardene et al., 2017; Liu et al., 2021; Sevilla-Llewellyn-Jones et al., 2018; Spijkerman et al., 2016; Sommets-Spijkerman et al., 2021). These meta-analyses have likely encompassed a broader range of iMBI programs, further substantiating the therapeutic benefits of mindfulness-based interventions for individuals experiencing stress, anxiety, and depression.

The study's results showing increase in self-compassion and resilience add to the expanding body of evidence affirming the efficacy of online mindfulness programs. These programs have demonstrated their effectiveness not only in addressing psychopathological issues but also in fostering positive dimensions of well-being, such as heightened self-compassion and resilience, especially in individuals experiencing distress. Support for this notion can be found in several studies, including those by MacDonald & Neville (2022), Moore, Barbour, Ngo et al. (2020), and Proeve, Anton & Kennedy (2018), which have reported increased levels of self-compassion as an outcome of participating in online mindfulness programs. Furthermore, the study's findings align with the work of Wang, Kou & Han (2023), which emphasizes the enhancement of resilience through mindfulness interventions. Results of the current study and these research contributions collectively underline the multifaceted benefits of online mindfulness programs, extending beyond psychopathology to promote well-being and resilience, particularly in individuals facing distressing circumstances.

Our hypothesis regarding the positive effect of a 30-day iMBCT on the attrition rate was not confirmed, as the attrition rate in the current study (67%) was higher than the rates reported in standard six to eight weeks online interventions (Linardon et al., 2020). However due to the lack of participants’ activity data, it is unknown to what extent the calculated attrition rate is valid. It is assumed that some participants could have never logged in to the platform after pretest as enrollments may have been done impulsively or out of curiosity without deliberate intentions to engage in the time-consuming and effortful training. Such cases could be excluded from randomization and attrition analyses as they distort the results.

Recent meta-analytic research conducted by Linardon et al. (2020) has revealed valuable insights into attrition rates in studies involving interventions delivered through various means. The findings suggest that

studies offering immediate access to interventions tend to experience higher attrition rates when compared to those that incorporate telephone or face-to-face interviews as part of the intervention process. This indicates that participants are more likely to drop out when they can access the intervention immediately. Additionally, the review highlighted another intriguing observation – a significantly higher number of post-test responses in waiting-list groups compared to intervention groups. This phenomenon was also observed in the present study but appears to be a recurring pattern.

To explain these behaviors, one can turn to the reference-based theory of motivation and effort location (Rigoli & Pezzulo, 2022). This theory revolves around individuals' perceptions of effort and reward. It suggests that the perceived effort required to engage in an intervention, especially one accessed immediately, may outweigh the perceived rewards or benefits. In contrast, waiting-list groups may perceive greater rewards or motivation to participate as they anticipate the intervention, leading to higher post-test response rates. The theory suggests that instant enrollment in an intervention may be less emotionally gratifying, potentially leading to lower motivation. This contrasts with scenarios where individuals must face and overcome specific efforts, such as enduring waiting periods to participate in the intervention. In these cases, the perceived effort and the anticipation of the reward may play pivotal roles in influencing motivation levels.

To enhance the effectiveness of online mindfulness interventions, future studies could consider the inclusion of telephone or video call assessments. These interactions could help establish a stronger relationship with participants and assist them in forming realistic expectations, ultimately heightening their anticipation of rewards. The meta-analysis conducted by Spijkerman et al. in 2016 indicated that guided online mindfulness interventions tend to produce better outcomes than unguided ones. Therefore, incorporating additional forms of contact, such as short telephone calls or online group meetings, has the potential not only to increase engagement and reduce attrition rates but also to lead to improved intervention outcomes. Nevertheless, further research is warranted in this area, as there is still limited understanding of who can benefit most from online mindfulness interventions and who might be prone to discontinuation (Nyklíček & Irrmischer, 2017).

4.1 Limitations and Future Directions

Our study has several limitations. First of all, we did not have an active control group and we did not conduct a follow-up measure. Current research, however, was meant as a pilot study. Still, we are aware that it precludes the formulation of a more valid estimation of the efficacy of the proposed intervention. Indeed, there is criticism of the over-optimistic views of MBIs based on effectiveness studies with waiting-list as a control condition (Farias & Wikholm, 2016), and more studies should be carried out in accordance with the gold standards of RTC's.

The absence of collected user activity data poses a challenge in effectively monitoring the time participants spent practicing mindfulness and identifying individuals who never engaged with the platform after the pre-test. To enhance the assessment of feasibility and adherence, it is advisable to implement controls for

participants' activity data. This would enable more comprehensive analyses and insights into the program's effectiveness and participant engagement, as suggested by research such as Kubo et al. (2018).

Furthermore, it is important to consider individual differences among participants, as certain traits like impulsivity or distractibility have been identified as contributors to dropouts in interventions, as highlighted in the findings of Melville et al. (2010). Evaluating these individual differences can help tailor interventions and support strategies to address specific challenges participants may face during mindfulness practice, thereby improving overall engagement and program effectiveness.

Another limitation of the study is the lack of validated clinical assessments. The participants were classified as distressed, and enrolled, solely based on self-report questionnaires. The lack of utilization of structured clinical interviews precludes from generalizing the current results to specific populations such as patients suffering from anxiety or depressive disorders.

4.2 Conclusions

We evaluated the effectiveness of the reduced 30 days of iMBCT for stress and emotional distressed community sample. To our knowledge, this is the first study that assessed the effects of a 30-days iMBCT. The results of the study provide significant evidence that the online mindfulness-based intervention (iMBCT) effectively reduces symptoms of stress and emotional distress among participants. Additionally, the intervention has shown the positive impact of enhancing participants' resilience and self-compassion. These findings contribute substantially to the field of online mindfulness-based interventions, highlighting their effectiveness in addressing psychological distress and promoting emotional well-being.

Moreover, the study's outcomes suggest that the abbreviated form of iMBCT holds promise for application in clinically distressed individuals. This opens up avenues for future research to delve deeper into the effectiveness of this abbreviated intervention in populations dealing with clinical levels of psychological distress. Overall, these results underscore the potential of online mindfulness-based interventions as a valuable tool for improving mental health and well-being in diverse populations.

5. Declarations

The authors have no conflicts of interest to declare that are relevant to the content of this article. No funding was received to assist with the preparation of this manuscript. Informed consent was obtained from all participants, and the study was approved by the ethics committee. Data gathered in the study is available upon reasonable request.

Please find below link to the raw data.

https://drive.google.com/file/d/1S3Qkncju9MuNXEITGk_1APDf_zM2dJB_/view?usp=share_link

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Figures

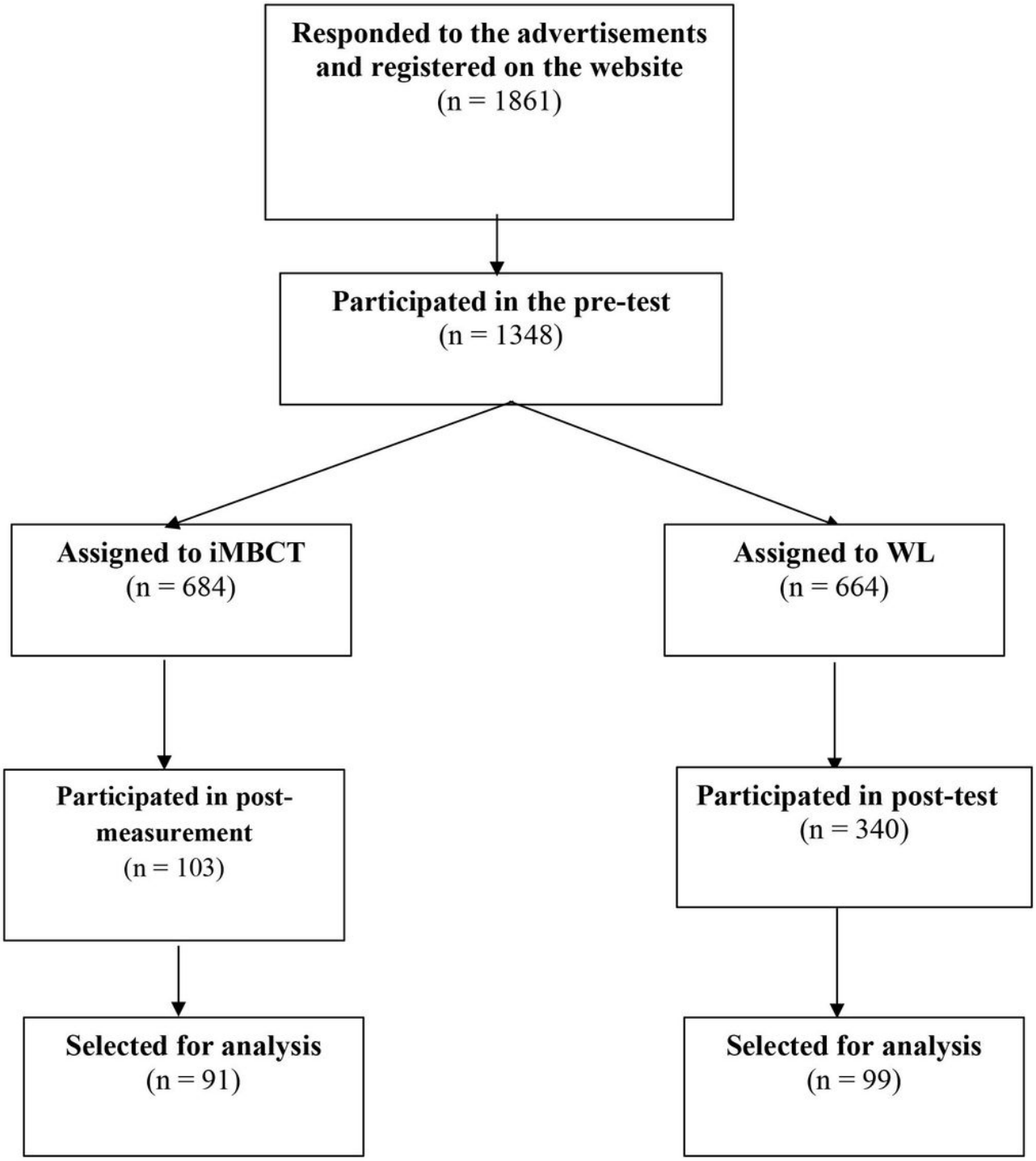


Figure 1

Consort diagram: Enrollment and study flow