# Mindfulness meditation and self-monitoring reduced maladaptive daydreaming symptoms: A randomized controlled trial of a brief self-guided web-based program

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## Abstract

**Objective:** Maladaptive daydreaming (MD) is a compulsive form of daydreaming that causes distress and functional impairment. We present the first treatment trial for MD. **Method**: We tested the effectiveness of an eight-session internet-based self-help training for mindfulness and self-monitoring and compared three groups across three measurement points in time. A sample of 557 people was randomly assigned. A total of 353 participants (age *M[SD]*=28.3[10.5], 76% female, 77% unmarried) completed our program: Full-intervention group (n=114, psychoeducation + motivation enhancement + mindfulness + self-monitoring), Partial-intervention group (n=125, identical excluding self-monitoring), and waiting-list group (n=125, internet-based support as usual). **Results:** All MD measures assessing daydreaming pathology, daydreaming frequency, and life functioning showed significant improvement with a large effect size from baseline to post-treatment in both intervention groups, whereas the wait-list group showed no significant improvement (MD: $F(3,349) = 35.76$, $p < 0.0001$, $\eta^2 = 0.24$; Frequency: $F(3,349) = 32.06$, $p < 0.001$, $\eta^2 = 0.22$; Functioning: $F(3,349) = 20.43$, $p < 0.001$, $\eta^2 = 0.15$). Mindfulness with self-monitoring training for MD was superior to mindfulness alone in the short term, but they both were equally efficient in the long term. Both interventions were superior to relying on internet-based support forums only. The clinically Significant Improvement rate of mindfulness with self-monitoring training was 24%, while the reliable improvement rate reached 39%. At the 6-month follow-up, achievements were maintained. **Conclusions:** A brief internet-based intervention program comprising mindfulness meditation and self-monitoring facilitated recovery or improvement in many individuals with MD.


*What is the public health significance of this article?*

Maladaptive daydreaming (MD) is a distinct yet unfamiliar mental health problem. Given the lack of available treatment protocols, the implications of an effective intervention for clinical practice, public policy, and the well-being of innumerable suffering individuals are highly significant. Our paper shows that a brief internet-based program involving mindfulness training and self-monitoring can improve various mental health indices of individuals coping with MD.


**Keywords**: maladaptive daydreaming, immersive daydreaming, RCT, dissociation, absorption, behavioral addiction, compulsive behavior.

# Introduction

Maladaptive Daydreaming (MD) is an immersive form of compulsive daydreaming that generates a sense of presence in fantasy, is rich in plot and characters, and is often activated during stereotypical movement (e.g., running, pacing, spinning, gesturing, or mouthing) and exposure to evocative music (Somer et al., 2016a; Somer et al., 2016b). Evidence suggests that MD might be a clinical syndrome rather than an isolated symptom. MD causes distress often associated with the time wasted in fantasy or the contrast between the idealized life in fantasy and reality. Although the activity may be rewarding in the short run, many individuals engaged in this mental activity report feeling negative affect such as shame and guilt afterward (Bigelsen & Schupak, 2011; Soffer-Dudek & Somer, 2018). MD can also impair academic, interpersonal, or professional functioning (Somer, 2002). It is considered an extreme form of dissociative absorption (Ross, 2018; Ross et al., 2020; Soffer-Dudek & Somer, 2021; Somer, 2019), with obsessive-compulsive characteristics (Salomon-Small et al., 2021). Because of its gratifying nature, this innate capacity for immersive fantasy can become addictive (Pietkiewicz et al., 2018).

Individuals with MD reported spending, on average, 57% of their waking hours in fantasy activity, compared to 16% of the hours for individuals with no MD (Bigelsen et al., 2016). MD and dissociative phenomena share common phenomenological characteristics, including double consciousness, vivid sensory imagery, and the activity of internally narrated characters. The protagonists in MD are sometimes experienced as exhibiting an independent agency. However, unlike the identities in dissociative identity disorder (DID), these imagined characters typically do not take control over the individual's behavior. Expounding on Somer's ontological analysis of MD (2018), Soffer-Dudek and Somer (in press, Chapter 34) showed the

distinctiveness of MD as a dissociative disorder and concluded that high dissociative absorption is a common risk factor shared by several dissociative disorders such as depersonalization/derealization disorder, DID and, MD. A recent epidemiological exploration determined that the point-prevalence of MD may be 2.5% in the general population, at least in Israel (Soffer-Dudek & Theodor-Katz, 2022).

Many persons with MD report that this mental activity started during childhood, independently of significant adversities (Somer et al., 2016a). These descriptions imply an innate predisposition for a strong sense of presence in fantasy (Schimmenti et al., 2019). Many others report that MD enables the mental escape from a childhood trauma (Somer et al., 2016b; 2019; Ross et al., 2020), painful current reality (Somer et al., 2019), or traumatic memories (Abu-Rayya et al., 2020), loneliness, or social dysfunction (Bigelsen & Schupak, 2011; Somer & Herscu, 2017). MD has high comorbidity rates with ADHD, obsessive-compulsive and related disorders, anxiety disorders, and depression (Somer et al., 2017). It is associated with high levels of psychological distress (Dujić et al., 2020) and high rates of suicidality (Soffer-Dudek & Somer, 2018).

The suffering associated with this form of mentation has led to numerous online forums and support groups dedicated to MD. For example, the Reddit community devoted to MD has over 79,000 members (www.reddit.com/r/MaladaptiveDreaming, retrieved June 13, 2022). Despite its exceptional online visibility, the phenomenon is largely unknown among professionals. The difficulty in finding mental health professionals who are cognizant of this problem, let alone know how to treat it, often results in suboptimal treatment experiences or no treatment (Somer et al., 2016b). Currently, there are only four documented case studies in the literature, and no randomized clinical trial (RCT), concerning the treatment of MD. One study

employed fluvoxamine medication to treat a 36-year-old woman (Schupak & Rosenthal, 2009), another was a case study of online psychotherapy with a male student (Somer, 2018), and a third paper reported psychotherapy of a 14-year-old girl (Witkin, 2019), and finally a treatment report of a patient with schizophrenia and excessive daydreaming (Wang et al., 2019). The obscurity of MD leads sufferers to feel as if they were the only persons with this experience. This feeling appears to enhance their sense of isolation further. An internet survey on people who suffer from MD reported that 82% had felt shame, yet only 23% had ever sought professional help for the problem (Bigelsen & Schupak, 2011).

Providing psychological services over the Internet has intensified recently (Barak et al., 2009) and peaked during the COVID-19 pandemic (Torous et al., 2020). Computerized treatment programs allow clients to work independently (Kaltenthaler et al., 2008). Some evidence shows that such programs are effective (Cuijpers et al., 2010; Massoudi et al., 2019), produce reasonable rates of change (Wilks et al., 2016), and generate high satisfaction levels (Klein et al., 2009). However, the cost-effectiveness of computerized treatment programs has yet to be determined, especially considering the varying degrees of adherence to such interventions (Spek et al., 2007), depending on the amount of human support provided (Andersson et al., 2009; Cuijpers et al., 2009; Andersson & Cuijpers, 2009). While some studies in the field of physical health problems concluded that internet-based interventions have little or no significant impact (e.g., Bender et al., 2011; McLean et al., 2010), interventions in the field of mental health seem to be effective (e.g., Andersson & Titov, 2014; Andersson et al., 2009). Specifically relevant to MD, internet-based interventions have shown promising results in treating behavioral addictions (Boumparis et al., 2022), compulsive behavior (Rees et al., 2016; Seol et al., 2016; Lenhard et al., 2017; Lee et al., 2020), and dissociative

psychopathology (Brand et al., 2019; Fung et al., 2020). Therefore, considering the unavailability of specialized treatment resources for MD (Bershtling & Somer, 2018), we chose to develop an internet-based platform for treating MD. We designed a web-based therapy protocol for MD that aligns with pertinent treatment modules (for example, Lutz et al., 2008; Segal et al., 2002). We opted to evaluate its efficiency in a randomized controlled trial setting (RCT, Jadad & Enkin, 2008).

By monitoring the online discourse of individuals with MD (e.g., posts on the Reddit group "r/Maladaptivedreaming"), corresponding with sufferers who had contacted us (e.g., Bershtling & Somer, 2018), and reviewing the interview transcripts with volunteers with MD (e.g., Somer, Somer & Jopp, 2016a,b) we concluded that when external reality demands the attention of persons with MD, such as during conversations with others, they are less able to absorb themselves in daydreaming. Because MD is experienced as an uncontrollable disregard of the external reality in favor of an inward-focused fantasy activity, we were interested in offering a treatment module that would include self-monitoring and a relevant skill, such as mindfulness meditation, that would render internal absorption incompatible. An exploratory single-case study employing self-monitoring and mindfulness training with a man suffering from MD showed that the client achieved a 50% reduction in his daydreaming time and an improvement of over 70% in his work and social adjustment (Somer, 2018). Following this single case study, Herscu (2021) conducted a qualitative pilot study with MD informants and confirmed that when people with MD must be mindful of their surroundings, their daydreaming is markedly curbed. Based on these findings, we developed the rationale and the treatment model described below.

*Mindfulness* is non-judgmental awareness of the 'here and now' (Langer, 1989). It can be practiced with different types of meditation (Kabat-Zinn, 2013). Several evidence-based interventions utilize mindfulness practice, including mindfulness-based stress reduction (MBSR; Goldin & Gross, 2010) and mindfulness-based cognitive therapy (MBCT; Segal et al., 2002). Mindfulness is also included in other evidence-based interventions such as acceptance and commitment therapy (ACT; Hayes, Strosahl & Wilson, 2011), and dialectical behavior therapy (DBT; Dimeff & Linehan, 2001). Mindfulness can improve cognitive processes (Zeidan et al., 2010), psychosocial well-being (Champion et al., 2018), personal resilience (Foureur et al., 2013), and general mental health (Hofmann et al., 2010; Shennan et al., 2011; McConville et al., 2017). It allows individuals to detect situations where attention drifts, sometimes as an escape from discomfort, and facilitates the choice of a more present and direct approach to solve the problem (Williams, 2008). Mindfulness practice decreases mind-wandering (Giannandrea et al., 2019; Takahashi et al., 2020) and improves concentration (Morrison et al., 2014). Empirical evidence based on experience sampling suggests that dissociation is related to a non-mindful state; specifically, moments of high dissociation were associated with thinking about the past or future and inversely correlated with thinking about the present (Vannikov-Lugassi & Soffer-Dudek, 2018). Because it reduces dissociative avoidance, mindfulness was described as suitable for treating dissociation (Zerubavel & Messman-Moore, 2015). Moreover, mindfulness is also effective in treating various addictions (Bowen et al., 2006; Bowen et al., 2014; Schwebel et al., 2020) and compulsive behaviors (Hanstede et al., 2008; Mathur et al., 2021), which are argued to be characteristic of MD (Pietkiewicz et al., 2018; Salomon-Small et al., 2021).

Psychoeducation is an often-included module in any treatment program where client compliance is essential (Lukens & McFarlane, 2004). Psychoeducation helps clients understand the rationale for their required cooperation (Kazantzis et al., 2005). When the target behavior is particularly rewarding, raising motivation for change can be challenging (Rollnick et al., 1992). Client cooperation can be enhanced with inspirational work, often based on motivational interviewing techniques (Miller & Rollnick, 2012).

*Motivation enhancement* is a common intervention designed to help people resolve their conflict about adopting a new health-promoting behavior or relinquishing a rewarding behavior with potentially detrimental health effects (Marín-Navarrete et al., 2017). Motivational interviewing techniques enhance intrinsic motivation to change by resolving ambivalence. Motivational interviewing reduced addiction indices among individuals with substance use disorders (Santa Ana et al., 2021).

*Self-monitoring* is a core element of self-regulation and self-management (Bandura 1991). It is a technique recommended for promoting habit change and involves the monitoring, documentation, and elevated awareness of the target behavior (Farmer & Chapman, 2016; Simkins, 1971) and its modification (Nelson, 1977). If practiced regularly, self-monitoring can be effective in the reduction of unwanted behaviors (Abrams & Wilson, 1979; Kazantsis et al., 2005; Mahoney, 1974; Sinadinovic et al., 2011), including obsessive-compulsive disorder (Van Oppen & Arntz, 1994) and addictions (Sinadinovic et al., 2010). Despite evidence of its effectiveness, compliance with self-monitoring tasks may only approach 50% (Olson et al. 2011).

To assess the feasibility and impact of self-monitoring on our mindfulness training program for MD, we decided to employ a three-arm dismantling trial to explore the

contribution of mindfulness practice and self-monitoring, combined with psychoeducation and motivation enhancement. We planned to measure our dependent variables before the intervention (baseline), immediately following it, and at a 6-months follow-up. We hypothesized that a treatment program based on the above principles would help participants control their MD and improve their functioning. Conversely, we posited that control respondents who continue to cope with their MD, as usual, will not show comparable improvements. By coping "as usual", we mean relying on internet-based forums for support (e.g., Facebook groups, Reddit).

# Method

## Participants

We recruited participants from an MD community active on Reddit, a popular social news website, and a Yahoo! MD email list. Inclusion criteria were: (a) a probable MD diagnosis determined by a mean score of 50 or above on the 16-item Maladaptive Daydreaming Scale (MDS-16, Somer et al., 2016) [1], (b) being at least 18 years old, (c) having a good command of the English language, and (d) not being in any concurrent treatment for MD. Respondents who reported being on a stable dose of medication for at least three months could participate in the

[1] A recommended cutoff of 50 was reported in Somer, Soffer-Dudek, Ross and Halpern (2017), which was later discovered to be affected by a calculation error, when the actual cutoff should have been 40 (see corrigendum reported in: https://fac0c99d-218c-46be-b5c9-06d8b9d5ddbf.usrfiles.com/ugd/fac0c9_0791d1bce773444d8a2ba10d9c2d35f1.pdf). We were not aware of the mistake at the time of this study's recruitment, which is why we used the more stringent criterion of 50. However, since recruiting enough clinical-level participants for this study did not pose a challenge, the use of a higher criterion was actually an advantage, reducing the risk of identifying false positives (i.e., individuals who do not have clinical-level MD), especially as this study did not include a clinician's interview to affirm the diagnosis.

study, provided that they did not increase their dosages while participating. The participants did not receive any financial compensation.

**Procedure**

Out of 697 respondents who gave informed consent and completed the baseline assessment (T1), we excluded 140 respondents who did not meet the study's criteria (see Figure 1). We constructed our treatment protocol as an eight-week computerized and online self-help intervention program. We tested its effectiveness with an RCT in a partial double-blind setting, in which all but the waiting list participants were blind to the treatment condition. Specifically, while the two active groups could not know which intervention they were assigned to or even if another intervention was tested, the waiting list group could have surmised their condition because they were told that the program would start in 3 months. We registered the study as a clinical trial (clinicaltrials.gov, NCT05235243) and received the approval of our institutional Human Research Ethics Committee (#035/18). We determined all components of the Methods section a-priori at the planning stage of the study and before it was launched.

Participants who met inclusion criteria ($N$=557) were randomly assigned to three study groups with equal gender ratios (Kim & Shin, 2014). The Full Intervention (FI) group received psychoeducation, motivation enhancement, mindfulness, and self-monitoring training. The Partial Intervention (PI) group received a slightly different version of the online training program; their training was identical, except that it did not include self-monitoring. In comparison, participants in the waiting list group were told that the program would commence

in three months and received no active intervention. Since all respondents were recruited from online peer-support forums, we labeled the waiting list Internet Support as Usual (ISAU). During their waiting time, participants were instructed to reduce their daydreaming activity to the best of their ability. By giving this instruction, we aimed to minimize the risk of control group dropout and gauge if our intervention has added value over and above the freely available online MD support communities. Post-intervention assessments took place eight weeks later, immediately after the program ended (T2). We conducted a third follow-up assessment six months after T2 (T3).

***Adherence and Dropout***

We defined adherence according to iCBT (Internet-Based Cognitive Behavioral Therapy) literature conventions as the number of modules completed (Sigurðardóttir et al., 2022). Participants were not allowed to continue to the next lesson before completing the previous one. In other words, adherence in this study pertains to meeting the requirements of any lesson. Completing the intervention was defined as finalizing all eight-week lessons and post-measurement assessment reports. Out of the 557 eligible participants, 353 completed the program and responded to post-measurement (dropout rate of 36.6%), 114 individuals in the FI group, 125 in the PI group, and 114 in the ISAU group. Six months after the end of the program, 70% of those participants underwent a follow-up measurement. Figure 1 presents a full reporting chart based on the CONSORT statement (Schulz et al., 2010). Our sample surpassed the minimum size required to detect a medium-sized effect (see supplementary material A for power analysis).

---Insert Figure 1 about here---

***Clinical Intervention***

We labeled each week during the eight-week intervention a "lesson". Every lesson contained at least one module. Some of the lessons included several modules, and some modules spanned over several lessons. Participants were asked to start their weekly lessons at the beginning of every week. There was a three-day window for them to complete the lesson. At the end of every lesson, participants were asked to report its completion. We sent participants a homework assignment for the upcoming week only after they had met the previous lesson's requirements. According to the participant's progress, all homework assignments and materials were available online. Six days after a lesson completion, the next one popped up with open access. This way, we equaled the rate of progression across all respondents. Participants could repeat previous lessons, provided they kept pace with the program's requirements (one lesson per week, over eight weeks in a row). Throughout the program, the researchers sent participants weekly practice and homework reminders and were available for technical support and consultation. Our internet-based program featured a notification system, a download center containing the program's materials, and individual messages from the researchers with encouragement to keep practicing the homework assignments.

We gave the two treatment groups slightly different versions of the intervention program. *The full intervention (FI) group* received a psychoeducation module about MD and its addictive mechanism, a motivation enhancement module based on motivational interviewing, mindfulness training, and instructions for self-monitoring. *The partial intervention (PI) group* received an intervention identical to the FI group without the self-

monitoring modules. To provide the same intervention dosage, the intervention for the PI group was readjusted to fit the same eight-week duration. For more details about our intervention, see supplementary material B, table S1 for the FI group, and table S2 for the PI group.

The *mindfulness module* included the following submodules: mindfulness psychoeducation, attention, and acceptance, working with the daydreaming mind, being "present when unpleasant", and turning toward difficult emotions. The following techniques were included: Three-minute breathing space, body scan, breath-sound-body meditation, mindful eating, mindful walking, mindfulness in daily-life activities, mindful movement, and MBSR yoga exercise. The *self-monitoring module* provided information on the importance of monitoring and how participants would benefit from it. We collected a daily daydreaming time report and administered a daily "Daydreaming diary" that facilitated the detection of triggers and gauged the urge to daydream, the duration of daydreaming, and any alternative responses employed. To keep our data within the scope of this trial, we used the diary data only to inspect the rate of compliance with the monitoring procedure.

The content of our program's psychoeducation and training modules comprised texts, illustrations, explanatory video and audio lectures, and interactive worksheets embedded in each week's lesson. Typically, a lesson starts with a textual description of its target and duration. Then, participants received a summary of what had been taught thus far, and finally, a novel technique or skill was introduced. Each lesson required about 50-75 minutes to complete. Users were not required to complete a lesson in one sitting and had open access to web pages of previous lessons. Data confidentiality was secured by several means: password-protected access to the research website hosted on an SSL encrypted server and the use of a secure messaging system. Participants' identifying data were saved on a local driver in an

encrypted folder, separated from the corresponding usernames, and communications with the research team.

## Measures

As outcome measures, we assessed indices of daydreaming and general psychopathology at the following phases: pre-treatment (T1, baseline), post-treatment (T2), and 6-month follow-up (T3).

### *Primary Outcome Measures*

*The 16-item Maladaptive Daydreaming Scale* (MDS-16) is based on the validated 14-item scale (Somer et al., 2016). The 16-item version is the primary self-report measure of MD (Somer et al., 2017). It employs a 10-point Likert scale. Scores may range from 0 to 100. The mean score of 40 is the updated cutoff point that best differentiates suspected clinical-level MD and individuals with no MD (Soffer-Dudek, 2021). The MDS-16 previously showed an internal consistency of Cronbach's $\alpha$=.94 (Somer et al., 2017) and has been validated in Arabic (Abu-Rayya et al., 2019), French (Balestra, 2019), Hebrew (Jopp et al., 2019), Hungarian (Sándor et al., 2020), Italian (Schimmenti et al., 2020) and, Turkish (Metin et al., 2022), demonstrating its cross-cultural usefulness in MD assessment. An investigation of the cross-cultural measurement invariance of the MDS-16 among participants from the USA, Italy, Turkey, and the UK showed configural invariance, suggesting that a hypothesized four-factor structure of the measure holds across cultures (Soffer-Dudek et al., 2021). The MDS-16 was measured at

baseline, post-intervention, and as a follow-up. Cronbach's alpha at those three measurements was α=.90.

*The Daydreaming Frequency Scale* (DDFS-12; Singer & Antrobus, 1970) is a 12-item subscale of the Imaginal Processes Inventory, gauging reported daydreaming frequency. Items are marked on a 5-point Likert scale ranging from 12 to 60. This self-report scale showed an internal consistency of Cronbach's α=.91. The DDFS-12 was measured at baseline, post-intervention, and follow-up. Cronbach's α was .87, .90, and .93, respectively.

*The Daydreaming Work and Social Adjustment Scale* (DWSAS) is a 6-item measure gauging adjustment and dysfunction concerning MD. The DWSAS is based on the original 5-item WSAS (Mundt et al., 2002), in which each of the five items referred to an unspecified "problem" and was ranked on a 9-point Likert scale with a maximum score of 40. A WSAS score above 20 suggested moderately severe or worse psychopathology. Scores between 10 and 20 are associated with significant functional impairment but less severe clinical symptomatology. Scores below 10 were indicative of a subclinical population. The original Cronbach's alpha ranged from .70 to .94, test-retest correlation of .73 and correlations of .81 to .86 with clinician interviews (Mundt et al., 2002). We added a sixth item to measure academic functioning, a likely casualty of MD (Somer, 2002). The DWSAS was also measured at baseline, post-intervention, and follow-up. Cronbach's alpha of each measurement with and without the added sixth item was similar (T1: α = .82 with the sixth item and α = .79 without it; T2: α = .88 with the sixth item and α = .85 without it; T3: α = .90 with the sixth item and α = .89 without it). While maintaining the original WSAS ratio calculation ranges, the DWSAS items were ranked on a 9-point Likert scale ranging from 0 to 48. Thus, a score of 24 or above was considered "moderately severe or worse pathology and impaired function", 12 to 24 was

regarded as "pathology and impaired function", and a score of 12 or lower was classified as "no pathology and dysfunction".

***Secondary Outcome Measures***

*The Brief Symptom Inventory* (BSI-53; Derogatis, 1993) is a 53-item scale rated on a 5-point general psychopathology scale, divided into nine subscales: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism, and four additional items. The authors report good psychometric properties with an internal consistency of Cronbach's α=.95. The current study measured the BSI at baseline, post-intervention, and as a six-month follow-up. Cronbach's α in these three measurements was .96, .95, and .96, respectively.

*The Outcome Questionnaire* (OQ-45; Lambert et al., 1996) is a 45-item scale evaluating the quality of mental health care and its outcome. It features three sub-scales: subjective discomfort, interpersonal relations, and social role performance. The OQ-45 ranged from 0 to 180 and was reported to have an internal consistency of Cronbach's α=.93. In this study, the OQ-45 was also measured at baseline, post-intervention, and as a six-month follow-up demonstrated Cronbach's α of .92, .93, and .94, respectively.

***Additional Measures***

*The Mindful Attention Awareness Scale* (MAAS; Brown & Ryan, 2003) refers to awareness and mindful attention and is a standard measurement tool in psychological studies on mindfulness, assessing the extent to which participants acquired the target mindfulness skill. This is a 15-item, 6-point Likert scale with scores ranging from 15 to 90. The authors reported internal consistency of Cronbach's α=.87. In our study, the MAAS was measured three times: before the beginning of the intervention (baseline), at the end of the intervention (post-

intervention), and six months after it (follow-up). Cronbach's α was .88, .89, and .89 on the three measurements, respectively.

*The Childhood Trauma Questionnaire* (CTQ; Bernstein et al., 2003) is a 28-item, 5-point Likert scale. The CTQ has five subscales with five items each: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. Each subscale is scored from 5 to 25. The authors report internal consistency of Cronbach's α ranging from 0.82 to 0.94 in various samples. Because many studies show a correlation between childhood trauma and dissociative states, including MD (e.g., Abu-Rayya et al., 2020), we administered the CTQ at baseline, aiming to facilitate the statistical control of its effect on our findings. In the current study, Cronbach's α of the CTQ was .93.

*The Feedback Questionnaire* (FBQ) was constructed for this study in the spirit of the Client Satisfaction Questionnaire (CSQ-8; Attkisson & Zwick, 1982). The FBQ has 21 items, 17 of which were ranked on a 5-point Likert scale: five items were general feedback questions regarding satisfaction, technical, operational aspects, and general feedback from the program, and the remaining 12 items were specific feedback questions about each of the coping tools and techniques learned during the program. The FBQ was scored as the mean of its items, ranging from 1 to 5. The FBQ was measured twice among FI and PI participants: at post-intervention (T2) and after six months as a follow-up (T3). Both measurements demonstrated an internal consistency of Cronbach's α=.91. In addition to the scale items, the FBQ included four open questions that we did not quantify.

**Statistical Analyses**

After examining baseline differences between the study groups using chi-squared tests, independent sample t-tests, and one-way ANOVAs, we conducted repeated-measures analyses

of variance (ANOVAs) to explore changes in the outcome measures from baseline to post-treatment and follow-up. Group represented a between-subjects factor, and time of measurement represented a within-subjects factor. When appropriate, significance levels were corrected using the Bonferroni adjustment to reduce type 1 error. In addition to the ITT sample and analysis, we also analyzed the participants who completed the 8-week intervention (Per-Protocol sample). In line with Jacobson, Follette, and Revenstorf (1984), we defined clinically significant improvement (CSI) in the three primary outcome measures MDS-16, DDFS, and DWSAS as (a) improvement based on calculating the reliable change index (RCI; Jacobson & Truax, 1992) and (b) scoring below the clinical cutoff score after completing the 8-week program. As the active groups also had a third assessment point (6-month follow-up), we used repeated-measures ANOVA to assess the stability of post-intervention gains. However, three repeated assessment points could also be viewed as a linear trend that may be evaluated using hierarchical (mixed) linear models (HLM/MLM), thus addressing possible dependency in the data. We also report MLM results and standardized effect sizes for fixed effects based on the semi-partial $R^2$ parameter (Edwards et al., 2008). This statistic assesses the association of the fixed effect with the repeated outcome based on the F statistic of the mixed model.

## Results

### Data screening, dropout analysis, manipulation check, and baseline characteristics

*Data screening.* Out of 557 participants included in the study and who completed the baseline assessment, five individuals scored extremely high ($Z$>3.3) on the DDFS questionnaire, representing univariate outliers. We used Winsorizing to attenuate their scores. Mahalanobis distance and Cook's distance were calculated to identify multivariate outliers, but

we did not find any in our data. All study variables were normally distributed in the IIT sample ($N$ = 557) and the PP sample ($N$ = 353).

*Dropout Analysis and Intention-to-Treat sample:* Participants in FI, PI, and ISAU groups did not significantly differ in sociodemographic or study outcomes at baseline. Thus, the randomization balance is as expected. However, participants in the ISAU group reported more clinical diagnoses and past inpatient treatment rates. We, therefore, controlled for these variables in our analysis. The Intention-to-Treat (ITT) sample included 557 participants who were randomized as follows: 186 in the FI group, 186 in the PI group, and 185 in the ISAU group. We kept a careful record of dropouts at all stages of the study following the CONSORT statement (See Figure 1). Participants' count at baseline and post-intervention revealed an average dropout rate of 36%, with no major differences between the groups (38% dropout from FI, 33% from PI, and 38% from ISAU). Notably, Little's MCAR test suggested that the missing data in the T2 outcome variables were Missing Completely At Random (MCAR; Chi-Square (df = 5) = 4.77, p = .44). We treated dropouts in the ITT sample with two acceptable approaches: multiple imputations (MI) and LOCF (i.e., as if they had not improved in treatment, $Dropout_{\text{baseline}} = Dropout_{\text{post-intervention}}$). Since similar results were accepted using both methods, we chose to report data using the LOCF approach, which we believed would be the most stringent test for this study's design, as it assumes no change for participants who drop out. For full ITT sample characteristics, see Table 1.

*Per-Protocol sample characteristics.* The Per-Protocol sample included 353 study-completers (76% female, 77% unmarried, and 69% with university education). Participants' age range was 18 to 73, yet 85% of the respondents were between 18-36 ($M$=28.3 $SD$=10.5). Half of the participants ($n$=182) resided in an English-speaking country, while the rest were

from 55 non-English-speaking countries worldwide. The PP sample characteristics are presented in Table 1.

---Insert Table 1 about here---

*Manipulation check*. We performed a manipulation check for participants who completed our intervention (PP sample). The Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003) was used to measure the extent to which participants in the FI and PI groups acquired the target mindfulness skill. The three study groups demonstrated similar baseline mindfulness skills (T1 *M*[*SD*] for FI: 42.81[13.22]; PI: 42.26[14.60]; ISAU: 41.70[14.63]; $F_{(2,350)}$=0.18, $p$=0.84, $\eta^2$=0.001). At the end of the program, a significant interaction showed a moderate effect between the study groups ($F_{(2,350)}$=21.98, $p$<0.001, $\eta^2$=0.11). While the ISAU group showed no significant between-measurements effect (T2 *M*[*SD*]: 41.92[13.97]; $t_{(113)}$=-0.33, 95% CI [-1.53, 1.09], $p$=0.74, Cohen's d=-0.02), both the FI and the PI groups showed a significant improvement with a medium effect size (FI T2 *M*[SD]: 51.98[14.48], $t_{(113)}$=-7.83, 95% CI [-11.49, -6.85], $p$<0.001, Cohen's d=0.66; and PI T2 *M*[SD]: 49.76[14.05], $t_{(124)}$=-6.94, 95% CI [-9.63, -5.36], $p$<0.001, Cohen's d=0.52). Mindfulness skill levels in the intervention groups remained high at T3 (FI: *M*=52.62, *SD*=14.85, $F_{(2,81)}$=38.36, $p$<0.001, $\eta^2$=0.32; PI: *M*=50.52, *SD*=14.21, $F_{(2,84)}$=39.32, $p$<0.001, $\eta^2$=0.32; Measurement Effect: $F_{(2,350)}$=58.74, $p$<0.001, $\eta^2$=0.26). Thus, FI and PI participants cooperated with the protocol and acquired the target skills of mindfulness.

The FI participants were also requested to practice *self-monitoring*. Inspection of the daily diaries revealed that compliance was unsatisfactory for many respondents. Specifically,

while the number of daily diary reports in the study ranged from 1 to a maximum of 56, only two participants submitted daily reports throughout the 56-day trial period. We established a criterion for the definition of compliance to test the added effect of monitoring compared to the mindfulness-only condition. As almost no participants monitored their MD activity daily, we opted for the next reasonable option. We determined that participants who submitted reports at least once every two days were considered to have practiced self-monitoring sufficiently. Only 39% of the FI group met this standard. Thus, to explore the efficiency of self-monitoring, we divided the FI group ($N$=114) into two sub-groups: FIS (full intervention, sufficient, $n$=44) and FIN (full intervention, non-sufficient, $n$=70). It is worth noting that there were no significant differences between the FIS and the FIN groups in the mindfulness skills level, not at baseline (FIS $M$[$SD$] = 41.68[10.09], FIN $M$[$SD$] = 43.53[14.98], $t_{(112)}$ = 0.79, 95% CI [-6.48, 2.79], $p$ = 0.43, Cohen's $d$ = 0.14), nor at post-intervention (FIS $M$[$SD$] = 54.41[12.41], FIN $M$[$SD$] = 50.46[15.54], $t_{(112)}$ = 1.42, 95% CI [-1.55, 9.45], $p$ = 0.16, Cohen's $d$ = 0.27).

*Baseline Characteristics*. Baseline MD levels were high, as were general mental health symptoms. As reported above, participants in the study's groups did not significantly differ in sociodemographic, clinical, or treatment-related characteristics, except for clinical diagnoses and past inpatient treatment, which were slightly higher in the ISAU group (see Table 1). Since those differences may affect the interpretation of a treatment effect, we controlled these variables in all the statistical analyses. There were no significant differences between the groups (FIS, FIN, PI, and ISAU) at baseline across all the outcomes of this study (MDS: $F_{(3,349)}$=1.4, $p$=0.23, $\eta^2$=0.012; DDFS: $F_{(3,349)}$=0.31, $p$=0.81, $\eta^2$=0.003; DWSAS: $F_{(3,349)}$=0.31, $p$=0.82, $\eta^2$=0.003; BSI: $F_{(3,349)}$=1.5, $p$=0.2, $\eta^2$=0.013; OQ: $F_{(3,349)}$=0.9, $p$=0.45, $\eta^2$=0.008). See Table 2 for baseline outcomes scores for the ITT sample and Table 3 for the PP sample.

**Primary Outcomes (pre-post changes)**

In line with our hypothesis, all three MD variables (MDS, DDFS, and DWSAS) showed marked improvements from baseline to post-intervention in the active-program groups. In contrast, the ISAU group showed no such improvements. Those results are seen in the ITT (see Table 2) and PP analyses (see Table 3).

---Insert Table 2 about here---

The Per-Protocol (PP) analysis reports the FIS, FIN, PI, and ISAU groups - based on the manipulation check presented above. A significant interaction was obtained for the MDS (group X measurement) with a very large effect ($F_{(3,349)}$=35.76, $p$<0.001, $\eta^2$=0.24), conveying change in the intervention groups but not in the ISAU group (ISAU: $t_{(113)}$=1.48, 95% CI [-0.32, 2.26], $p$=ns., Cohen's d=0.07; FIS: $t_{(43)}$=8.05, 95% CI [16.23, 27.07], $p$>0.01., Cohen's d=0.88; FIN: $t_{(69)}$=8.29, 95% CI [11.25, 18.39], $p$>0.01., Cohen's d=1.51; PI: $t_{(124)}$=10.88, 95% CI [11.61, 16.77], $p$>0.01, Cohen's d=0.89). We found a significant difference between all the study's groups (FIS, FIN, PI, and ISAU) at T2 ($F_{(3,349)}$=24.06, $p$<0.001, $\eta^2$=0.17) and also between the three intervention groups only (FIS, FIN, and PI) at T2. However, effect size was minimal ($F_{(2,236)}$= 4.66, $p$<0.01, $\eta^2$=0.04). Post-hoc tests show an advantage of FIS over FIN ($MeanDifference_{FIS\text{-}FIN}$=7.41, $p$=0.02, CI [0.81, 13.99]), and over PI ($MeanDifference_{FIS\text{-}PI}$=7.01, $p$=0.04, CI [-1.2, 9.7]), demonstrating the added value of self-monitoring. There was no significant difference between FIN and PI ($MeanDifference_{FIN\text{-}PI}$=3.20, $p$=n.s, CI [1.91,

8.32]), which could be expected, as those two groups eventually underwent the same intervention of mindfulness only.

A similar pattern was found for both the DDFS, with a significant and large interaction effect ($F_{(3,349)}$=32.06, $p$<0.001, $\eta^2$=0.22), and the DWSAS ($F_{(3,349)}$=20.43, $p$<0.001, $\eta^2$=0.15). In both cases, a significant difference between the all groups were found at T2 (DDFS: $F_{(3,349)}$=17.38, $p$<0.001, $\eta^2$=0.13; DWSAS: $F_{(3,349)}$=13.04, $p$<0.001, $\eta^2$=0.1). We found a significant difference between the three intervention groups (FIS, FIN, and PI) at T2 for the DWSAS, but the effect size was minimal ($F_{(2,236)}$= 5.1, $p$<0.01, $\eta^2$=0.04). We discovered no significant difference across the three active intervention groups for the DDFS ($F_{(2,236)}$= 2.64, $p$=0.07, $\eta^2$=0.02). There was an advantage for the FIS group over the FIN and PI groups, while the ISAU group did not improve. Figure 2 shows those results graphically. The full data report is shown in Table 3.

---Insert Figure 2 about here---

**Secondary Outcomes (pre-post changes)**

The per-protocol analyses of baseline to post-intervention changes of the secondary outcomes resulted in significant interactions with a medium effect for condition-group X time for both the BSI ($F$(3,349) = 15.17 , $p$ < 0.001 , $\eta^2$ = 0.115) and the OQ ($F$(3,349) = 10.003 , $p$ < 0.001 , $\eta^2$ = 0.08). Those effects were still significant after correction for alpha error inflation with the Bonferroni Holm method ($ps$ > $p_{corr}$ = 0.05 / 3 = 0.017). Moreover, we found a significant difference between all the study's groups (FIS, FIN, PI, and ISAU) at T2 (BSI:

$F_{(3,349)}$=13.91, $p$<0.001, $\eta^2$=0.11; OQ: $F_{(3,349)}$=10.14, $p$<0.001, $\eta^2$=0.08). For more information, see Table 3. Similar results were also seen in the ITT sample (see Table 2).

---Insert Table 3 about here---

**Clinically Significant Improvements (CSI, pre-post changes)**

CSI is defined by Jacobson et al. (1984) as a reliable change and as belonging to a functional population at post-assessment. Therefore, CSI was calculated as an intersection matrix of the Reliable Change Index (RCI, Jacobson & Truax, 1992) and the cutoff point of each questionnaire at baseline (T1) and at post-intervention (T2) assessments.

In the FIS group, 24% of the participants showed CSI in MDS compared to 13% in the FIN group, 10% in the PI group, and 0% in the ISAU group. Odds ratio (OR) of MDS for the study groups was 2.21, $Z$ = 8.35, $p$ < 0.001. Moreover, 18% of the participants in the FIS group showed CSI in DDFS compared to 6% in the FIN group, 10% in the PI group, and 0% in the ISAU group (OR for DDFS was 1.96, $Z$ = 5.15, $p$ < 0.01). Similar data were received in DWSAS, with 18% of the participants in the FIS group showing CSI, compared to 6% and 10% in the FIN and the PI group, respectively. Less than 1% of the participants showed CSI in DWSAS in the ISAU group. Odds ratio of DWSAS was 2.75, $Z$ = 9.06, $p$ < 0.01. Improvement rates (RCI only) and functional rates (cutoff point only) were higher compared to CSI rates, as expected, in all three primary outcomes (MDS, DDFS, and DWSAS), with a distinct advantage for the FIS group over FIN and PI groups. The ISAU group showed no more than a maximum

of 1% significant improvement across all the study's outcomes. For details, see supplemental Table S3.

**Treatment Effects at a 6-Month Follow-Up**

To investigate the long-term effects of our intervention, we tested how stable the post-treatment gains (T2) were in the active groups after six months (T3). An average dropout rate of 30% was observed in the follow-up measurement (as shown in Figure 1), with 38 remaining respondents in the FIS group, 44 in the FIN group, and 85 in the PI group. Regarding the outcome variables, dropout analysis using T2 data showed no significant differences between the participants who dropped out at T3 and those who did not drop out at T3. However, a non-significant trend in the MDS and DWSAS variables indicated that participants who responded to T3 may have benefited more from the program and achieved better results in T2 than those who did not respond to T3 measurement (MDS: $T2_{not\text{-}drop}$ $M$[SD] = 57.96[18.73], $T2_{drop}$ $M$[SD] = 62.46[19.38], $t_{(237)}$=1.69, 95% CI [-9.76, 0.76], $p$=0.09; DDFS: $T2_{not\text{-}drop}$ $M$[SD] = 45.78[9.42], $T2_{drop}$ $M$[SD] = 47[9.42], $t_{(237)}$=0.92, 95% CI [-3.84, 1.4], $p$=0.36; DWSAS: $T2_{not\text{-}drop}$ $M$[SD] = 25.29[12.13], $T2_{drop}$ $M$[SD] = 28.29[11.18], $t_{(237)}$=1.79, 95% CI [-6.29, 0.29], $p$=0.07).

As predicted, at a 6-month follow-up, the three intervention groups (FIS, FIN, and PI) maintained their achievements in all three primary outcomes (MDS, DDF, DWSAS) and the two secondary outcomes (BSI, OQ). Moreover, some of the participants continued to improve slightly from T2 to T3, to the point where there seemed to be no significant difference between the three intervention groups (FIS, FIN, and PI) at T3 (MDS: $F_{(2,164)}$=0.28, $p$=0.76, $\eta^2$=0.003; DDFS: $F_{(2,164)}$=0.78, $p$=0.46, $\eta^2$=0.009; DWSAS: $F_{(2,164)}$=0.66, $p$=0.52, $\eta^2$=0.008; BSI: $F_{(2,164)}$=1.14, $p$=0.32, $\eta^2$=0.014; OQ: $F_{(2,164)}$=0.26, $p$=0.77, $\eta^2$=0.003). Therefore, although the

FIS group improved faster, as evident by its advantage at T2, the FIN and PI groups caught up with the full intervention group six months after the trial ended. The data are displayed graphically in Figure 2. For the full statistics report, see Table 3.

As the three intervention groups (but not the control group, ISAU) had three measurement points, we also conducted MLM on these groups to ensure that the effects found do not stem from the nesting of the data. We report these results in full in the supplementary materials file (see table S4 and table S5). As expected, even when considering the hierarchical structure of the data, all active groups showed strong and significant negative slopes over time in all five outcome measures with a large effect size. All of these effects of time did not significantly interact with group, suggesting a similar course of improvement for all three active groups.

**Treatment Satisfaction**

A feedback questionnaire was completed at T2 and T3. Using a scale from 1 to 5, the mean treatment satisfaction was above average ($M$=3.48, $SD$=0.76), representing an overall satisfaction rate of 70% (3.48/5). We detected no group differences ($t$(237)1.61, 95% CI [-0.16, 0.10], $p$=0.11, Cohen's d=0.2) nor differences between the assessment phases T2 and T3 ($t$(165)=1.02, 95% CI [-0.13, 0.13], $p$=0.31, Cohen's d=0.16). Overall, the program was rated as very understandable ($M$=4.67, $SD$=0.63) and user-friendly ($M$=4.51, $SD$=0.79). Eighty-four percent of the participants stated they would recommend it to others ($M$=4.18, $SD$=1.05). None of the participants reported negative experiences or effects.

## Discussion

This RCT compared two versions of an 8-week, symptom-oriented, self-help internet-based intervention program in a sample of participants assessed as suffering from high levels of MD. As hypothesized, self-guided internet-based mindfulness training with self-monitoring for MD was superior in the short term to mindfulness training alone. Both were equally superior to the reliance on self-help and web-based support forums in the long term. More than one of every three individuals with MD who participated in the complete program and complied with its requirements achieved clinical improvement (39% of the FIS group). One in four (24%) achieved complete recovery, demonstrating a significant but moderate recovery treatment effect. Our intervention study represents the first randomized clinical trial of a disorder that should probably be classified as a dissociative disorder (Soffer-Dudek and Somer, 2022).

This pioneering clinical trial yielded encouraging improvement rates. Our outcomes are more modest than those reported in several web-based intervention studies addressing depression and anxiety disorders that showed change rates of 40% to almost 60% (Berger et al., 2011; Westen & Morrison, 2001). Such improvement rates attest to the effectiveness of online therapy (Andersson et al., 2009). However, MD differs from depression and anxiety in two key features that may explain the difference in the improvement rates. First, MD is an addictive behavior with both ego-dystonic and ego-syntonic properties. Therefore, a web-based clinical trial of MD would be more appropriately compared to online trials for addictions. Such comparisons suggest that our trial yielded favorable outcomes. For example, a therapist-guided web-based treatment was not more effective than a waiting list in reducing the frequency of cannabis use (Sinadinovic et al., 2020), and an Internet intervention using smartphone apps did not improve alcohol consumption among university students (Gajecki et al., 2014). Second,

MD is an escapist mental behavior often aimed at regulating depression and anxiety (Somer, Somer & Jopp, 2016a). It is conceivable that reducing a distress-regulating behavior without addressing the underlying pain would generate a sub-optimal result. Clearly, complete treatment for MD must target underlying mental health issues that may have motivated respondents to over-indulge in their immersive fantasies. Lastly, our treatment outcome was compared to that of a unique control group. The comparison group was mostly sampled from Internet MD forums. Arguably, their condition was not a classical waiting list (WL). We believe it is more accurately classified as "treatment as usual" (TAU) because they benefitted from peer support and advice and gained a sense of belonging to a significant reference group. Psychotherapy effects decrease with increasing control group intensity (Munder et al., 2022). The reduced effect of our treatment trial is, therefore, partially accounted for by the relative intensity of our TAU comparison.

The results of our trial imply cost-effectiveness and high accessibility that merit further study and development. Despite the self-help nature of the program, optimal adherence to the suggested protocol resulted in a 50% likelihood of improvement in daydreaming frequency, MD distress, and associated symptoms of stress, anxiety, depression, and social functioning. We remain concerned, however, about the sub-optimal level of adherence to our protocol. We acknowledge the respondents' difficulty in complying with the full intervention arm. Although exposure to daily feedback on MD activity may improve treatment outcomes, we suspect that difficulties in complying with self-monitoring may have reflected a low acceptance due to its demands on time and attention resources. Even though patient noncompliance in online treatment programs is common (Melville et al., 2010), clinical and research replications of our program should strive to improve patient adherence to this valuable, albeit tedious, module.

Self-monitoring was associated with an enhanced likelihood of recovery from MD in the short term but showed no added value to the mindfulness intervention in the long term. Of note is that 61.5% of those in the full-intervention group had properly practiced their mindfulness skills but failed to employ self-monitoring adequately. It is conceivable that self-monitoring is more difficult to practice on one's own. Unlike mindfulness training, self-monitoring is more demanding, and the need for consistency is essential. For example, it is possible to practice mindfulness just once or twice a day at specific times or even miss a day of practice. Self-monitoring, on the other hand, requires constant self-observation to track the urge to daydream accurately. Because self-monitoring proved to be a formidable challenge for many, we advocate an effort to improve the user-friendliness of self-monitoring in web-based MD treatment protocols. Additionally, our brief web-based intervention never included any personalized involvement of a therapist. A more extended intervention, specifically tailored to the patient's needs, involving opportunities for direct interactions with a therapist, is likely to be more effective in elevating adherence rates (Andersson et al., 2009; Cuijpers et al., 2009; Andersson & Cuijpers, 2009).

Moreover, future studies may explore the effectiveness of mindfulness meditation and self-monitoring in improving control over MD in more extensive face-to-face psychotherapy. We also recommend exploring the efficacy of other relevant interventions to address psychological problems pertinent to MD, such as emotion dysregulation (Sándor et al., 2021), social anxiety (Somer & Herscu, 2017), shame and dissociation (Ferrante et al., 2020), insecure attachment (Constanzo et al., 2021) and the sequelae of childhood trauma (Somer, Somer, & Jopp, 2016a).

Several limitations in this study warrant our acknowledgment. First, the absence of prior MD treatment programs prohibited any meaningful comparisons to existing benchmarks. Second, the study relied on a self-selected sample of persons with maladaptive daydreaming who are active online. This community may possess unique features that may not represent the wider MD population. However, since MD is not yet a formally recognized disorder, it is still impossible to study clinical and community MD samples. Our exclusive reliance on self-reported data is another limitation. The size of our sample and budgetary constraints prohibited the application of clinician-administered assessment protocols.

A caveat of this study concerns the slightly higher prevalence of psychiatric history among respondents in the ISAU condition. Although controlling for that demographic difference in our analyses did not alter the results, it would have been preferable if the composition of the trial groups was identical.

Moreover, although we presumed to improve the participants' control of their MD, control was never evaluated as a dependent variable. Still, the reduced daydreaming time and symptoms following our intervention demonstrate a potential improvement in our participants' control of this mental behavior.

Finally, our pre-post design did not allow for the inspection of the effect of the intervention on partial completers, who were treated as study dropouts. Future research is needed to explore factors that may strengthen compliance with the procedure.

Further independent replication studies are warranted to evaluate the effectiveness of our treatment program in different clinical, sociodemographic, and cultural populations and when employed in an office-based psychotherapy setting.

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# Tables and Figures

Table 1.

*Sample Characteristics*

| | Intention-To-Treat Sample | | | | | Per-Protocol Sample | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | FI grp | PI grp | ISAU | Statistics | | FI grp | PI grp | ISAU | Statistics | |
| Characteristic | (n=186) | (n=186) | (n=185) | *Test* | *P* | (n=114) | (n=125) | (n=114) | *Test* | *P* |
| Sex | | | | $\chi^2_{(4,\ N=557)} = 0.38$ | .98 | | | | $\chi^2_{(4,\ N=353)} = 2.62$ | .62 |
| Male | 38 | 39 | 38 | | | 26 | 24 | 22 | | |
| Female | 143 | 141 | 140 | | | 86 | 97 | 86 | | |
| NS | 5 | 6 | 7 | | | 2 | 4 | 6 | | |
| Family status | | | | $\chi^2_{(8,\ N=557)} = 4.88$ | .77 | | | | $\chi^2_{(8,\ N=353)} = 3.05$ | .93 |
| Unmarried | 146 | 151 | 141 | | | 85 | 99 | 88 | | |
| Married / de facto | 35 | 32 | 38 | | | 24 | 23 | 22 | | |
| Separated / divorced / w | 5 | 3 | 6 | | | 5 | 3 | 4 | | |
| Education level | | | | $\chi^2_{(6,\ N=557)} = 4.76$ | .58 | | | | $\chi^2_{(6,\ N=353)} = 4.80$ | .57 |
| High school | 71 | 56 | 73 | | | 36 | 33 | 41 | | |
| BA | 82 | 96 | 83 | | | 57 | 66 | 56 | | |
| MA | 26 | 26 | 21 | | | 14 | 21 | 14 | | |
| PhD | 7 | 8 | 2 | | | 7 | 5 | 3 | | |
| Age (years) (M/SD) [a] | 27.1 (8.3) | 28.1 (11.6) | 27.4 (9.7) | $F_{(2,554)} = 0.57$ | .57 | 28.2 (9.1) | 29.1 (12.1) | 27.7 (9.9) | $F_{(2,350)} = 0.57$ | .57 |
| Clinical diagnosis [b] | 88 | 86 | 111 | $\chi^2_{(2,\ N=557)} = 8.69$ | .02 | 51 | 59 | 66 | $\chi^2_{(2,\ N=353)} = 4.49$ | .11 |
| Treatment | | | | | | | | | | |
| Mental hospitalization | 18 | 22 | 37 | $\chi^2_{(2,\ N=557)} = 9.23$ | .01 | 7 | 13 | 23 | $\chi^2_{(2,\ N=353)} = 11.07$ | .01 |
| Medication (past) | 69 | 79 | 88 | $\chi^2_{(2,\ N=557)} = 4.16$ | .13 | 39 | 55 | 52 | $\chi^2_{(2,\ N=353)} = 3.61$ | .16 |
| Psychotherapy (past) | 70 | 75 | 79 | $\chi^2_{(2,\ N=557)} = 0.99$ | .61 | 41 | 56 | 46 | $\chi^2_{(2,\ N=353)} = 1.93$ | .38 |
| Childhood trauma [c] | 87 | 93 | 88 | $\chi^2_{(2,\ N=557)} = 0.39$ | .82 | 46 | 60 | 54 | $\chi^2_{(2,\ N=353)} = 1.69$ | .43 |
| Emotional abuse | 13.2 (5.8) | 13.9 (5.7) | 14.2 (5.9) | $F_{(2,554)} = 1.34$ | .26 | 13.1 (5.8) | 13.5 (5.7) | 14.5 (5.9) | $F_{(2,350)} = 1.93$ | .15 |
| Emotional neglect | 13.9 (5.3) | 14.7 (5.7) | 14.3 (5.8) | $F_{(2,554)} = 0.92$ | .40 | 13.5 (5.4) | 14.7 (5.5) | 14.4 (5.8) | $F_{(2,350)} = 1.54$ | .22 |
| Sexual abuse | 9.4 (6.5) | 8.5 (5.5) | 8.1 (5.6) | $F_{(2,554)} = 2.44$ | .09 | 8.8 (5.9) | 7.8 (4.9) | 8.0 (5.3) | $F_{(2,350)} = 0.99$ | .37 |
| Physical abuse | 7.8 (4.7) | 7.8 (4.5) | 8.4 (5.1) | $F_{(2,554)} = 1.02$ | .36 | 7.7 (4.5) | 7.2 (3.9) | 8.3 (4.7) | $F_{(2,350)} = 1.83$ | .16 |
| Physical neglect | 8.4 (4.0) | 8.7 (3.4) | 8.9 (4.2) | $F_{(2,554)} = 1.09$ | .34 | 8.0 (4.0) | 8.3 (3.1) | 8.8 (3.9) | $F_{(2,350)} = 1.24$ | .29 |

*Note.* FI = full intervention group; PI = partial intervention group; ISAU = internet support as usual group. [a]. Except where noted, values refer to the number of participants (*N* frequencies). In age, values refer to mean and standard deviation. [b]. The number of subjects in the sample who, besides MD diagnosis, received another clinical diagnosis from a professional (before participating in the study). [c]. The first line of childhood trauma values refers to the total number of participants who had childhood trauma., computed in line with Bernstein & Fink (1998). Childhood trauma sub-scale scores refer to mean and standard deviation.

Table 2.

*Baseline (T1) and Post-intervention (T2) scores of the outcomes (Intention-To-Treat sample)*

| Outcome | Baseline | Post | Within (pre/post) | | Between [a] | |
|---|---|---|---|---|---|---|
| | *M(SD)* | *M(SD)* | *T(df)* | ES [95% CI] | *F*(df) | ES |
| **Primary outcomes** | | | | | | |
| MDS | Interaction effect: $F(2,554) = 32.02$, $p < 0.0001$, $\eta^2 = 0.11$ | | | | | |
| FI | 76.24 (12.04) | 65.54 (19.36) | 9.48 (185) ** | 0.66 [8.47, 12.93] | $F(2,554) = 3.05$ | |
| PI | 75.34 (13.10) | 65.80 (18.71) | 9.51 (185) ** | 0.59 [7.56, 11.52] | $p < 0.05$ | |
| ISAU | 73.80 (13.88) | 73.17 (13.44) | 1.25 (184) | 0.04 [-0.36, 1.62] | $\eta^2 = 0.01$ | |
| DDFS | Interaction effect: $F(2,554) = 32.45$ , $p < 0.001$ , $\eta^2 = 0.11$ | | | | | |
| FI | 53.98 (6.02) | 48.73 (9.73) | 8.69 (185) ** | 0.65 [4.06, 6.44] | $F(2,554) = 6.45$ | |
| PI | 53.39 (6.17) | 48.98 (8.52) | 9.54 (185) ** | 0.59 [3.50, 5.33] | $p < 0.01$ | |
| ISAU | 53.59 (6.21) | 53.22 (6.40) | 1.77 (184) | 0.06 [-0.04, 0.79] | $\eta^2 = 0.02$ | |
| DWSAS | Interaction effect: $F(2,554) = 22.11$ , $p < 0.001$ , $\eta^2 = 0.07$ | | | | | |
| FI | 33.87 (10.07) | 28.69 (12.67) | 7.79 (185) ** | 0.45 [3.86, 6.49] | $F(2,554) = 2.08$ | |
| PI | 33.56 (9.57) | 29.85 (10.77) | 6.09 (185) ** | 0.36 [2.50, 4.90] | $p = 0.13$ | |
| ISAU | 33.26 (10.11) | 33.25 (9.91) | 0.00 (184) | 0.00 [-0.76, 0.76] | $\eta^2 = 0.007$ | |
| **Secondary outcomes** | | | | | | |
| BSI | Interaction effect: $F(2,554) = 14.60$ , $p < 0.001$ , $\eta^2 = 0.05$ | | | | | |
| FI | 1.99 (0.78) | 1.74 (0.84) | 6.95 (185) ** | 0.31 [0.18, 0.32] | $F(2,554) = 4.29$ | |
| PI | 1.92 (0.76) | 1.67 (0.78) | 6.28 (185) ** | 0.32 [0.17, 0.32] | $p < 0.05$ | |
| ISAU | 2.03 (0.76) | 2.01 (0.77) | 1.31 (184) | 0.03 [-0.13, 0.67] | $\eta^2 = 0.015$ | |
| OQ | Interaction effect: $F(2,554) = 12.39$ , $p < 0.001$ , $\eta^2 = 0.04$ | | | | | |
| FI | 91.46 (27.84) | 83.19 (29.68) | 6.44 (185) ** | 0.29 [5.73, 10.79] | $F(2,554) = 5.72$ | |
| PI | 89.09 (26.39) | 81.32 (27.35) | 6.62 (185) ** | 0.29 [5.04, 10.49] | $p < 0.01$ | |
| ISAU | 94.45 (27.11) | 93.62 (26.03) | 1.07 (184) | 0.03 [-0.71, 2.37] | $\eta^2 = 0.02$ | |

*Note.* The results reported in the table are adjusted for covariates. MDS = maladaptive daydreaming scale; DDFS = daydreaming frequency scale; DWSAS = daydreaming work and social adjustment scale; BSI = brief symptom inventory; OQ = outcome questionnaire; Effects on ITT sample includes FI = full intervention group (*N*=186), PI = partial intervention group (*N*=186), and ISAU = online support as usual group (*N*=185); [a] F and p values of the main effect of group, ES of eta square. ** $p < 0.01$.

Table 3.

*Baseline (T1), Post-intervention (T2), and Follow-up (T3) scores of the outcomes (Per-Protocol sample)*

| Outcome | Baseline [a] | Post [a] | Within (pre/post) [a] | | Between | | Follow-up [b] | |
|---|---|---|---|---|---|---|---|---|
| | *M(SD)* | *M(SD)* | *T(df)* | ES [95% CI] | *F*(df) | ES | *M(SD)* | Statistic [c] |
| **Primary outcomes** | | | | | | | | |
| MDS | Interaction effect: $F(3,349) = 35.76$, $p < 0.0001$, $\eta^2 = 0.24$ | | | | | | | |
| FIS | 73.65 (10.69) | 52.01 (17.17) | 8.05 (43)** | 0.88 [16.23, 27.07] | $F(3,349) = 11.34$ | | 53.78 (18.45) | $F(2,328) = 132.26$ |
| FIN | 77.64 (12.41) | 62.82 (20.39) | 8.29 (69)** | 1.51 [11.25, 18.39] | $p < 0.001$ | | 56.31 (21.93) | $p < 0.001$ |
| PI | 74.13 (12.97) | 59.93 (18.93) | 10.88 (124)** | 0.89 [11.61, 16.77] | $\eta^2 = 0.09$ | | 56.65 (20.02) | $\eta^2 = 0.45$ |
| ISAU | 75.32 (12.27) | 74.35 (12.42) | 1.48 (113) | 0.07 [-0.32, 2.26] | | | - | |
| DDFS | Interaction effect: $F(3,349) = 32.06$ , $p < 0.001$ , $\eta^2 = 0.22$ | | | | | | | |
| FIS | 54.41 (4.94) | 43.25 (10.49) | 7.31 (43)** | 1.36 [8.08, 14.24] | $F(3,349) = 6.23$ | | 44.26 (10.85) | $F(2,328) = 109.63$ |
| FIN | 53.47 (6.78) | 46.53 (9.70) | 7.25 (69)** | 0.83 [5.03, 8.85] | $p < 0.001$ | | 43.61 (11.23) | $p < 0.001$ |
| PI | 53.53 (6.08) | 46.96 (8.71) | 10.92 (124)** | 0.87 [5.38, 7.76] | $\eta^2 = 0.05$ | | 45.94 (10.42) | $\eta^2 = 0.40$ |
| ISAU | 53.57 (6.18) | 52.75 (6.64) | 1.77 (113) | 0.09 [-0.07, 1.29] | | | - | |
| DWSAS | Interaction effect: $F(3,349) = 20.43$ , $p < 0.001$ , $\eta^2 = 0.15$ | | | | | | | |
| FIS | 32.70 (9.78) | 21.11 (11.80) | 6.54 (43)** | 1.07 [8.02, 15.16] | $F(3,349) = 4.41$ | | 22.58 (12.93) | $F(2,328) = 70.395$ |
| FIN | 34.04 (9.62) | 27.57 (12.37) | 6.11 (69)** | 0.58 [4.36, 8.58] | $p < 0.001$ | | 22.43 (13.36) | $p < 0.001$ |
| PI | 32.73 (10.49) | 27.22 (11.29) | 6.41 (124)** | 0.51 [3.81, 7.21] | $\eta^2 = 0.036$ | | 24.79 (12.55 | $\eta^2 = 0.30$ |
| ISAU | 32.82 (9.89) | 32.82 (9.55) | 0.00 (113) | 0.00 [-1.25, 1.25] | | | - | |
| **Secondary outcomes** | | | | | | | | |
| BSI | Interaction effect: $F(3,349) = 15.17$ , $p < 0.001$ , $\eta^2 = 0.115$ | | | | | | | |
| FIS | 1.87 (0.65) | 1.34 (0.67) | 7.10 (43) ** | 0.80 [0.38, 0.68] | $F(3,349) = 6.65$ | | 1.25 (0.78) | $F(2,328) = 78.52$ |
| FIN | 2.07 (0.77) | 1.63 (0.82) | 6.08 (69) ** | 0.54 [0.29, 0.57] | $p < 0.001$ | | 1.49 (0.84) | $p < 0.001$ |
| PI | 1.90 (0.70) | 1.49 (0.70) | 7.41 (124) ** | 0.59 [0.30, 0.52] | $\eta^2 = 0.05$ | | 1.38 (0.65) | $\eta^2 = 0.324$ |
| ISAU | 2.05 (0.74) | 2.01 (0.72) | 1.31 (113) | 0.06 [-0.02, 0.11] | | | - | |
| OQ | Interaction effect: $F(3,349) = 10.003$ , $p < 0.001$ , $\eta^2 = 0.08$ | | | | | | | |
| FIS | 87.95 (26.09) | 70.30 (25.35) | 6.09 (43) ** | 0.69 [11.81, 23.51] | $F(3,349) = 4.78$ | | 70.95 (28.81) | $F(2,328) = 50.55$ |
| FIN | 91.14 (28.32) | 80.29 (29.81) | 4.25 (69) ** | 0.37 [5.77, 15.95] | $p < 0.05$ | | 75.23 (30.98) | $p < 0.001$ |
| PI | 87.94 (25.21) | 76.39 (25.34) | 5.86 (124)** | 0.46 [7.65, 15.45] | $\eta^2 = 0.04$ | | 72.18 (26.66) | $\eta^2 = 0.24$ |
| ISAU | 90.26 (26.53) | 91.78 (25.16) | 1.06 (113) | 0.05 [-1.16, 3.86] | | | - | |

*Note.* The results reported in the table are adjusted for covariates. MDS = maladaptive daydreaming scale; DDFS = daydreaming frequency scale; DWSAS = daydreaming work and social adjustment scale; BSI = brief symptom inventory; OQ = outcome questionnaire; [a] T1-T2 effect on a sample includes FIS = full intervention sufficient group (*N*=44), FIN = full intervention non-sufficient group (*N*=70), PI = partial intervention group (*N*=125), and ISAU = online support as usual group (*N*=114); [b] Due to participant dropout in the follow-up measurement (T3), as described in Figure.1, the T3 sample includes FIS (*N*=38), FIN (*N*=44), and PI (*N*=85); [c] F and p values of the main effect of time, ES of eta square. ** $p < 0.01$.

Figure 1.

*Study flow diagram*

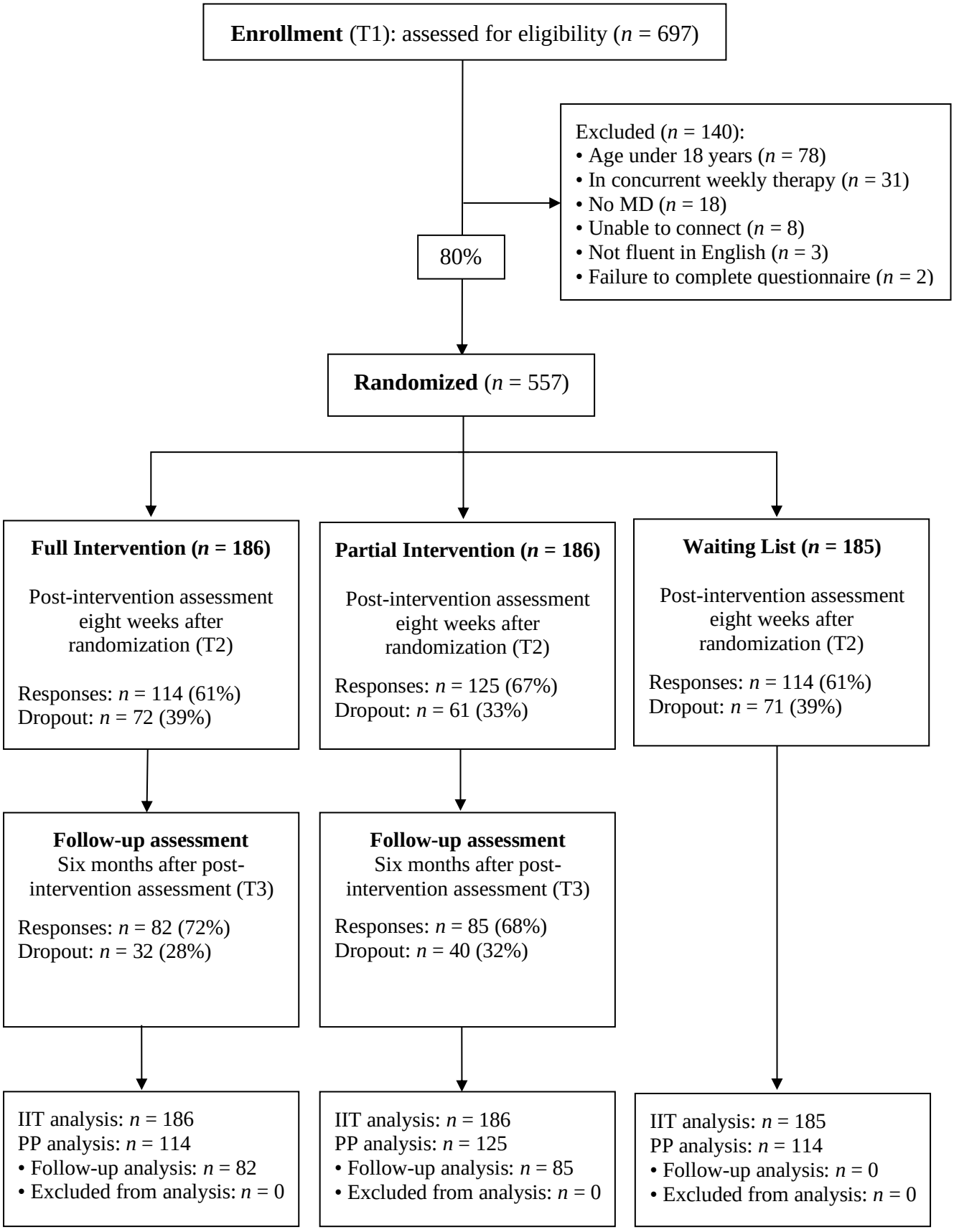
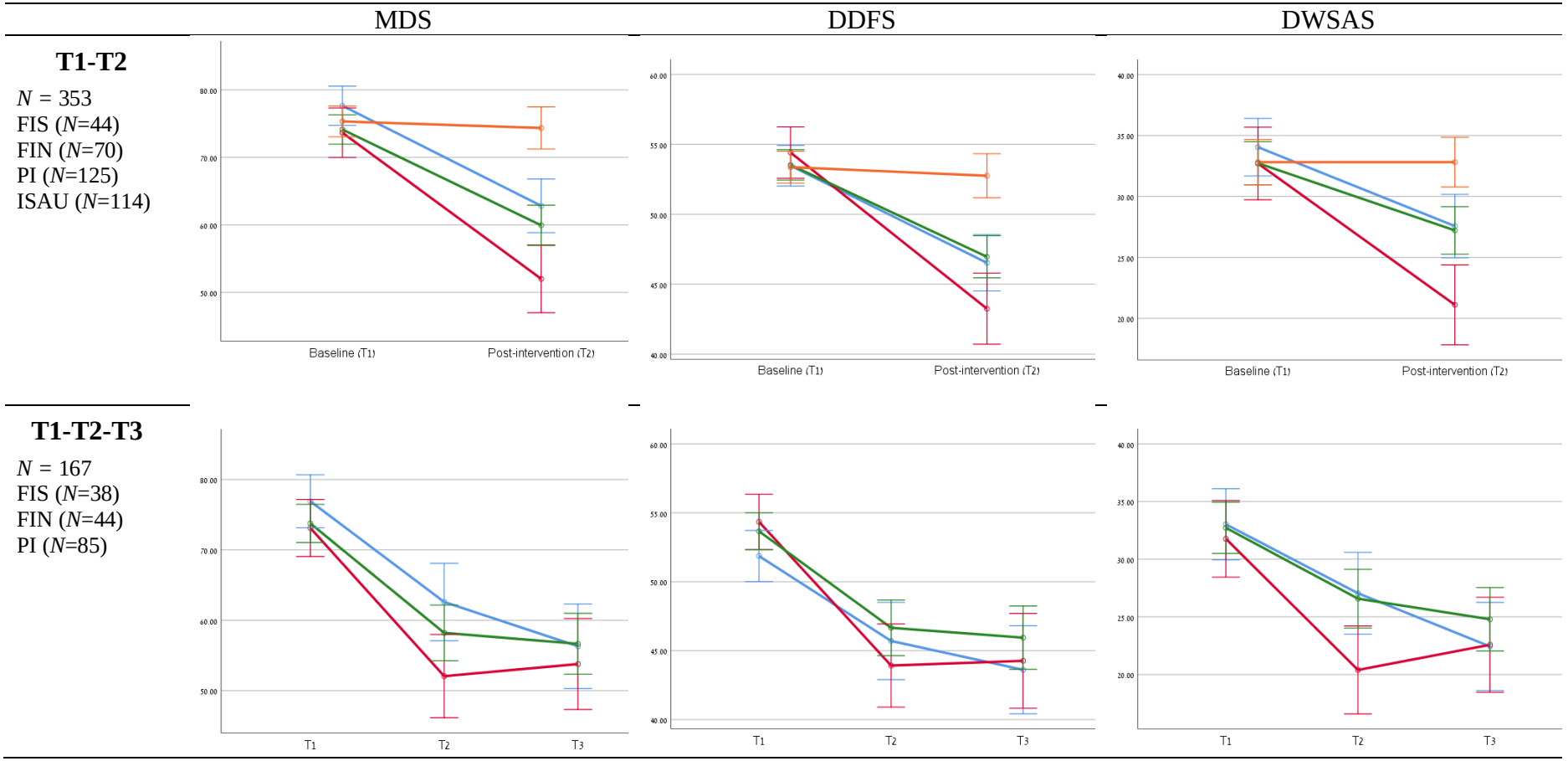


Figure 2.

*Changes in the primary outcomes across study groups (Per-Protocol sample)*




*Note*. Error bars: 95% CI.

T1 = Baseline; T2 = Post-intervention; T3 = Follow-up six months after the intervention was ended; FIS = full intervention sufficient group (Red line); FIN = full intervention non-sufficient group (Blue line); PI = partial intervention group (Green line); ISAU = online support as usual group (Orange line); MDS = maladaptive daydreaming scale; DDFS = daydreaming frequency scale; DWSAS = daydreaming work and social adjustment scale.

# Supplementary Materials A

Power Calculation

We used G*Power 3.1.9.7 for a-priori power calculation (Faul et al., 2007). Medium-sized or larger effects ($f \geq 0.25$) were deemed clinically significant and used for the analyses. We aimed to identify a medium-sized effect by using ANOVA repeated measures within-between interaction. Assuming a power (1-β error probability) of 95% and an α level of 5% for three groups and three measurements, a minimum sample size of 54 was required. To compensate for an expected dropout rate of 50%, we increased the minimum target sample size to 108. Even in restricted conditions with a smaller effect size of 0.2 and a lower correlation of 0.3 between the repeated measures, 216 was the required sample size. Our de facto total sample was 353 with effects of $f = 0.4$ or larger (corresponding to Cohen's $d = 0.8$ or larger) and a correlation of 0.6. This study's observed power (post-doc) was very high, between 1 to 0.997, depending on the tested outcome. Hence, the power of this study was sufficient to detect medium to large-sized effects.

# Supplementary Materials B

Supplemental Table S1.

*Modules of the Full-Intervention (FI) group internet-based self-help program for MD**

| # | Caption | Description | Pages | Duration | Compl.[a] |
|---|---|---|---|---|---|
| 1 | Introduction | Psychoeducation about MD and its mechanism. Identification of participants' gains and losses regarding MD as a motivation booster. Learning how to stay motivated. The first use of a daily daydreaming time report [five videos, two graphs, and texts]. | 20 | 60 min | 173/186 |
| 2 | Self-monitoring | Psychoeducation about self-monitoring and introduction of the daydreaming dairy (v1) and the three-minute breathing space [one video, one audio, one record sheet, and texts]. | 18 | 55 min | 160/186 |
| 3 | Mindfulness (part 1) | Psychoeducation about mindfulness with illustrative examples. The practice of mindful eating and body scan [two videos, two audios, and texts]. | 13 | 60 min | 149/186 |
| 4 | Attention | Psychoeducation about attention, the daydreaming mind, and mind-wandering during meditation. Daydreaming dairy (v2). The practice of breath-sound-body meditation and body scan [two videos, two audios, one record sheet, and texts]. | 12 | 65 min | 141/186 |
| 5 | Mindfulness (part 2) | Definition and practice of mindfulness in daily life. Learning to be more mindful and increase sensing in daily activities [three audios and texts]. | 9 | 50 min | 134/186 |
| 6 | Avoidance and acceptance | Psychoeducation about avoidance, the "turning towards" approach in mindfulness, and avoiding the use of daydreaming as an escape from unpleasant thoughts and feelings [one video, one audio, and texts]. | 9 | 50 min | 130/186 |
| 7 | Mindfulness (part 3) | Continued psychoeducation about being mindful of one's state and mental activities. The practice of mindful movement and MBSR Yoga with "mindful hatha yoga" [one video, two audios, and texts]. | 10 | 55 min | 124/186 |
| 8 | Summarize and relapse prevention | Organization and summary of the program content and methods to help participants maintain their improved control over their daydreaming habits [one video, one audio, and texts] | 19 | 75 min | 120/186 |

[a] The number of participants from the FI group that completed the module ($N_{T1}$ = 186 assigned, $N_{T2}$ = 114 complete post-intervention assessment).

* *Note*. This table describes the content of the FI group. The PI group received the same protocol, in the same setting, excluding content and module related to self-monitoring (from lessons #1, #2, #4 and #8 and homework assignments); all the rest of the content for the PI group was spread differently (for details, see Table S2).

Supplemental Table S2.

*Modules of the Partial-Intervention (PI) group internet-based self-help program for MD*

| # | Caption | Description | Pages | Duration | Compl.[a] |
|---|---|---|---|---|---|
| 1 | Introduction | Psychoeducation about MD and its mechanism. Identifying participants' gains and losses regarding MD as a motivation booster and learning how to stay motivated [five videos, one graph, and texts]. | 17 | 50 min | 171/186 |
| 2 | Mindfulness (part 1) | Psychoeducation about mindfulness with illustrative examples. The three-minute breathing space and body scan [two videos, one audio, and texts]. | 15 | 50 min | 162/186 |
| 3 | Mindfulness (part 2) | Continue practicing mindfulness: the practice of mindful eating and body scan [two videos, two audios, and texts]. | 11 | 55 min | 150/186 |
| 4 | Attention | Psychoeducation about attention, the daydreaming mind, and mind-wandering during meditation. The practice of breath-sound-body meditation and body scan [two videos, two audios, and texts]. | 11 | 55 min | 145/186 |
| 5 | Mindfulness (part 3) | Definition and practice of mindfulness in daily life. Learning to be more mindful and increase sensing in daily activities [three audios and texts]. | 9 | 50 min | 142/186 |
| 6 | Avoidance and acceptance | Psychoeducation about avoidance, the "turning towards" approach in mindfulness, and avoiding the use of daydreaming as an escape from unpleasant thoughts and feelings [one video, one audio, and texts]. | 9 | 50 min | 140/186 |
| 7 | Mindfulness (part 4) | Continued psychoeducation about being mindful of one's state and mental activities. The practice of mindful movement and MBSR Yoga with "mindful hatha yoga" [one video, two audios, and texts]. | 10 | 55 min | 137/186 |
| 8 | Summarize and relapse prevention | Organization and summary of the program content and methods to help participants maintain their improved control over their daydreaming habits [one video, one audio, and texts] | 18 | 70 min | 132/186 |

[a] The number of participants from the PI group who completed the module ($N_{T1}$ = 186 assigned, $N_{T2}$ = 125 complete post-intervention assessment).

# Supplemental Material C

Clinically Significant Improvements (CSI)

Supplemental Table S3.

*Percentages of Clinically Significant Improvement in the primary outcomes by study group*

| | **Improvement** | | | | **Functional** | | | | **CSI** | | | | **Deterioration** | | | | **Odds ratio** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *FIS* | *FIN* | *PI* | *ISAU* | *FIS* | *FIN* | *PI* | *ISAU* | *FIS* | *FIN* | *PI* | *ISAU* | *FIS* | *FIN* | *PI* | *ISAU* | *OR[CI]* | *Statistics* |
| MDS | 39% | 27% | 26% | 0.9% | 27% | 16% | 16% | 0% | 24% | 13% | 10% | 0% | 0% | 0% | 0% | 0% | 2.21 [1.30, 3.76] | $Z$=8.35, $p$=0.004 |
| DDFS | 43% | 31% | 26% | 0% | 20% | 11% | 14% | 4% | 18% | 6% | 10% | 0% | 0% | 0% | 0% | 1% | 1.96 [1.11, 3.46] | $Z$=5.15, $p$=0.02 |
| DWSAS | 36% | 18% | 15% | 0.9% | 20% | 11% | 12% | 4% | 18% | 6% | 5% | 0.9% | 0% | 0% | 1% | 3.5% | 2.75 [1.45, 5.19] | $Z$=9.06, $p$=0.003 |

*Note.* **MDS**=maladaptive daydreaming scale; **DDFS** = daydreaming frequency scale; **DWSAS** = daydreaming work and social adjustment scale; **Improvement**: reliable improvement by RCI $\geq$ 1.96; **Functional**: likely belonging to the non-clinical, functional population at post-assessment. Healthy norms are based on under cutoff point as reported by Soffer-Dudek (2021) for the MDS, Singer & Antrobus (1970) for the DDFS, and Mundt et al. (2002) for the DWSAS; **CSI**: Clinically Significant Improvement represents participants that made a reliable improvement and likely belonging to the non-clinical, functional population at post-assessment (improved $\cap$ functional); **Deterioration**: made reliable deterioration by RCI $\leq$ -1.96 and likely belonging to the clinical, dis-functional population at post-assessment as in above cutoff point [MDS > 40; DDFS > 36; DDSAS > 12]; **FIS** = full intervention sufficient group ($N$=44); **FIN** = full intervention non-sufficient group ($N$=70); **PI** = partial intervention group ($N$=125); **ISAU** = online support as usual group ($N$=114);

# Supplemental Material D

Mixed/Hierarchical Linear Modeling (MLM)

## Data analyses (MLM)

For analyses involving three time points (pre, post, and follow-up), the data could be viewed as nested within individuals, and thus mixed linear modeling (MLM) was performed. These analyses did not include the ISAU group as they did not have a third time point assessment. We ran five models for each of the five outcome variables (specifically, MD, DDFS, DWSAS, BSI, and OQ), including both level 1 (within persons) and level 2 (between persons) predictors. At level 2, we included group allocation as a fixed factor. We had three groups (FIS, FIN, and PI), and therefore group was inserted as a dummy variable, with PI as the reference value. At level 1, we inserted the time variable (coded as 0, 1, 2), specified as a fixed and random effect. Because only active groups were included in these analyses, we expected to observe a main negative linear effect of time in all five outcomes (i.e., across groups). We also included cross-level interactions to assess whether the effect of time (representing the effect of the intervention) differed significantly between groups. We used an "unstructured" covariance structure to avoid imposing any constraints on the model. Standardized effect sizes for fixed effects based on the semi-partial $R^2$ are calculated as suggested by Edwards et al. (2008).

## Results (MLM)

As expected, even when considering the hierarchical structure of the data, all active groups showed strong and significant negative slopes over time in all five outcome measures with large effect sizes. None of these time effects significantly interacted with group, suggesting a similar course of improvement for all three active groups (as graphically illustrated in Figure 2 and statistically reported in Table 3). The MLM results, including the three time points (pre, post, and follow-up) by three active groups (FIS, FIN, and PI), are displayed in Table S4 for the three primary outcomes (MDS, DDFS, and DWSAS), and in Table S5 for the two secondary outcomes (BIS, and OQ).

Supplemental Table S4.

*Results depicting the fixed effects of multilevel Models 1-3 predicting the three primary outcomes by time, (active) group, and their interactions.*

| | MDS (model 1) | | | | | DDFS (model 2) | | | | | DWSAS (model 3) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | b | SE | *t* | 95% CI | $R^2_\beta$ | b | SE | *t* | 95% CI | $R^2_\beta$ | b | SE | *t* | 95% CI | $R^2_\beta$ |
| Intercept | 81.30 | 1.56 | 52.11*** | 78.23, 84.37 | 0.920 | 58.81 | 0.77 | 73.55*** | 55.30, 58.33 | 0.951 | 36.22 | 1.19 | 30.50*** | 33.88, 38.56 | 0.874 |
| Time | -8.93 | 0.92 | -9.72*** | -10.74, -7.12 | 0.486 | -4.11 | 0.47 | -8.73*** | -5.03, -3.18 | 0.450 | -4.00 | 0.56 | -7.13*** | -5.10, -2.89 | 0.394 |
| Group | | | | | 0.017 | | | | | 0.002 | | | | | 0.014 |
| Group_FIS[1] | 6.31 | 2.63 | 2.40* | 1.14, 11.47 | | 0.64 | 1.30 | 0.49 | -1.91, 3.20 | | 3.15 | 1.99 | 1.58 | -0.78, 7.08 | |
| Group_FIN[2] | -0.94 | 2.96 | -0.32 | -6.76, 4.88 | | 1.35 | 1.46 | 0.92 | -1.53, 4.23 | | -0.73 | 2.28 | -0.32 | -5.22, 3.76 | |
| Interaction | | | | | 0.010 | | | | | 0.014 | | | | | 0.015 |
| Time * FIS[1] | -2.25 | 1.56 | -1.45 | -5.32, 0.81 | | -0.62 | 0.79 | -0.78 | -2.19, 0.95 | | -1.62 | 0.95 | -1.70 | -3.49, 0.26 | |
| Time * FIN[2] | -1.51 | 1.71 | -0.89 | -4.88, 1.85 | | -1.50 | 0.88 | -1.71 | -3.23, 0.23 | | -0.99 | 1.04 | -0.95 | -3.04, 1.06 | |

*Note*. The partial intervention group (PI) is the reference group of the group dummy variable. CI = 95% confidence intervals, rounded down to two decimals; MDS = maladaptive daydreaming scale; DDFS = daydreaming frequency scale; DWSAS = daydreaming work and social adjustment scale; FIS = full intervention sufficient group (N=44); FIN = full intervention non-sufficient group (N=70); PI = partial intervention group (N=125). [1] Group FIS compared to PI; [2] Group FIN compared to PI.
* $p < .05$; ** $p < .01$; *** $p < .001$

Supplemental Table S5.

*Results depicting the fixed effects of multilevel Models 4-5 predicting the two secondary outcomes by time, (active) group, and their interactions.*

| | BSI (model 4) | | | | | OQ (model 5) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | b | SE | *t* | 95% CI | $R^2_\beta$ | b | SE | *t* | 95% CI | $R^2_\beta$ |
| Intercept | 2.11 | 0.08 | 26.56*** | 1.96, 2.27 | 0.846 | 96.64 | 2.91 | 32.58*** | 88.92, 100.36 | 0.885 |
| Time | -0.26 | 0.03 | -8.42*** | -0.33, -0.20 | 0.416 | -7.91 | 1.16 | -6.82*** | -10.20, -5.62 | 0.293 |
| Group | | | | | 0.010 | | | | | 0.003 |
| Group_FIS[1] | 0.18 | 0.13 | 1.32 | -0.09, 0.44 | | 3.24 | 4.87 | .066 | -6.35, 12.84 | |
| Group_FIN[2] | -0.04 | 0.15 | -0.25 | -0.34, 0.26 | | -2.10 | 5.61 | -0.37 | -13.15, 8.95 | |
| Interaction | | | | | 0.001 | | | | | 0.000 |
| Time * Group_FIS[1] | -0.01 | 0.05 | -0.24 | -0.12, 0.09 | | 0.14 | 1.97 | 0.07 | -3.74, 4.01 | |
| Time * Group_FIN[2] | -0.02 | 0.06 | -0.34 | -0.13, 0.09 | | 0.06 | 2.15 | 0.03 | -4.18, 4.30 | |

*Note*. The partial intervention group (PI) is the reference group of the group dummy variable. CI = 95% confidence intervals, rounded down to two decimals; BSI = brief symptom inventory; OQ = outcome questionnaire; FIS = full intervention sufficient group (N=44); FIN = full intervention non-sufficient group (N=70); PI = partial intervention group (N=125). [1] Group FIS compared to PI; [2] Group FIN compared to PI.
*** $p < .001$