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Mindfulness-Based Cognitive Therapy, Mood, and Autobiographical Memory Specificity

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Terapia Cognitiva Baseada em Mindfulness, Humor e Especificidade da Memória Autobiográfica

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Time's flow is irreversible. The singular exception is provided by the human ability to remember past happenings. When one thinks today about what one did yesterday, time's arrow is bent into a loop. The rememberer has mentally traveled back into her past and thus violated the law of the irreversibility of the flow of time. She has not accomplished the feat in physical reality, of course, but rather in the reality of the mind, which, as everyone knows, is at least as important for human beings as is the physical reality. When Mother Nature watches her favorite creatures turning one of her immutable laws on its head, she must be pleased with her own creativity.

—Endel Tulving, Episodic Memory: From Mind to Brain

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List of Abbreviations, Acronyms, and Symbols

α	Cronbach's alpha (internal consistency index).
AMS	Autobiographical memory specificity.
AMT	Autobiographical Memory Test.
ANOVA	Analysis of variance.
BDI-II	Beck Depression Inventory.
CBT	Cognitive Behavioral Therapy.
F	Fisher's F (ANOVA statistic).
η_p^2	Partial eta-squared (measure of effect size for use in ANOVAs).
IAPS	International Affective Picture System.
M	Mean.
MAAS	Mindfulness Attentional and Awareness Scale.
MBCT	Mindfulness-Based Cognitive Therapy.
MBSR	Mindfulness-Based Stress Reduction Intervention.
MIP	Mood induction procedure.
N	Sample size.
n	Subsample size.
NICE	National Institute for Health and Clinical Excellence in Great Britain.
OGM	Overgeneral autobiographical memory.
p	p-value, $p\left(Data \lor H_0\right)$.
PANAS	Positive Affect Negative Affect Scale.
s	Seconds.

SD	Standard deviation.
t	t statistic.
TAU	Treatment-as-usual.
UNIFESP	Federal University of São Paulo.

Abstract

A reduced autobiographical memory specificity (AMS) is known not only as a characteristic of the depressed mood state but also as a steady cognitive marker of depression and a potential marker of sensitivity to future depression. Previous research has demonstrated that Mindfulness-Based cognitive therapy (MBCT) increases the AMS in depressed participants. However, few studies have investigated the possible effects of MBCT on the AMS of nonclinical participants. The objectives of the present study were twofold: to evaluate the effects of an MBCT intervention on the AMS of nonclinical adults with no history of depression and to investigate the combined effects of MBCT and mood induction procedures on the AMS of the same sample. In Phase 1, we assessed the effects of an MBCT program on the autobiographical memory of 71 nonclinical adults in a mixed 2×2 factorial design with participants randomly assigned to either the MBCT group ($n = 35$) or the waiting-list control group ($n = 36$). Despite similar levels of Autobiographical Memory Test scores across groups at baseline, the MBCT group scored significantly more specific memories at post-treatment than the control group. In Phase 2, a factorial $2 \times 2 \times 2$ was conducted to assess the effects of combined MBCT intervention and a mood induction procedure (negative and neutral valence) on the AMS of the same sample. The mood manipulation was successful; however, autobiographical memory was higher for the MBCT group when compared to the control group, and no other main or interaction effects were significant. Phase 2 did not have a matched baseline, so the interpretation must be made with caution. These findings support prior results suggesting that MBCT interventions increase AMS. Further, it extends these findings to a never-depressed sample, supporting that AMS can be trained by MBCT. Future study in this area seems promising since stable depression cognitive

factors may reveal how asymptomatic depression-vulnerable individuals process emotional data differently than nondepressed individuals.

Keywords: mindfulness, mindfulness-based cognitive therapy, cognitive functioning, autobiographical memory, mood induction

Resumo Expandido

Memória autobiográfica é a memória de uma pessoa sobre sua própria experiência de vida. Já as memórias autobiográficas específicas se referem a experiências e eventos em particular, que possuem localizações temporal e espacial definidas e que não duraram mais que um dia (e.g., "o show que fui com meus amigos na viagem de faculdade"). A dificuldade de lembrar memórias autobiográficas específicas, chamada de memória autobiográfica supergeneralizada ou reduzida especificidade de memória autobiográfica, é conhecida não apenas como uma característica do estado de humor deprimido, mas também como um marcador cognitivo estável de depressão e um marcador potencial de sensibilidade para depressão futura. A memória autobiográfica supergeneralizada está associada ao aumento da frequência de episódios depressivos e a tentativas de suicídio. Além disso, a supergeneralização da memória pode indicar a progressão da depressão, incluindo recaídas. Finalmente, descobriu-se que a memória autobiográfica supergeneralizada é um traço estável de depressão, mesmo em pacientes em remissão. Estudos prévios demonstraram que passar por um programa de Terapia Cognitiva Baseada em Mindfulness (MBCT) pode aumentar a especificidade das memórias autobiográficas em participantes deprimidos. No entanto, poucos estudos investigaram os possíveis efeitos da MBCT sobre a especificidade da memória autobiográfica de participantes saudáveis. Os objetivos do presente estudo foram os seguintes: avaliar os efeitos da intervenção MBCT sobre a especificidade da memória autobiográfica de adultos saudáveis (sem histórico de depressão) e, posteriormente, avaliar os efeitos combinados da MBCT e de um procedimento de indução de humor sobre a especificidade da memória autobiográfica da mesma amostra. A amostra final foi composta por 71 adultos (56 mulheres) com idade entre 18 e 50 anos ($M = 35$, $DP = 8$). Este estudo foi dividido em duas fases. A fase 1 ($N = 71$) avaliou os efeitos de um programa MBCT

sobre a especificidade da memória autobiográfica de adultos sem histórico de depressão por meio em um experimento fatorial misto 2 × 2 com participantes aleatoriamente designados para condição MBCT (n = 35) ou condição controle (n = 36). Conforme previsto, os indivíduos do grupo MBCT, mas não os do grupo controle, experimentaram aumento da especificidade da memória autobiográfica após o grupo MBCT de 8 semanas. Apesar das pontuações semelhantes de memória autobiográfica específicas no início do estudo, o grupo MBCT obteve memórias significativamente mais específicas pós-tratamento do que o grupo controle. Já na Fase 2, um estudo fatorial 2 × 2 × 2 foi conduzido para avaliar os efeitos do treinamento combinado de MBCT e um procedimento de indução de humor na especificidade da memória autobiográfica da mesma amostra. No entanto, apesar da manipulação do humor ter se mostrado bem-sucedida, a memória autobiográfica foi maior para o grupo MBCT somente quando comparado ao grupo controle e nenhum outro efeito principal ou de interação alcançou significância estatística. Como previamente mencionado, a Fase 2 teve como principal limitação uma linha de base não similar entre os grupos, portanto a interpretação desta fase deve ser feita com cautela. Em conclusão, esses achados dão suporte aos resultados de estudos anteriores sugerindo que o treinamento de MBCT aumenta a especificidade das memórias autobiográficas recuperadas. Além disso, o presente estudo estende os resultados dos estudos anteriores a uma amostra sem histórico de depressão, apoiando a ideia de que a especificidade das memórias autobiográficas pode ser treinada com a MBCT. Embora intrigantes, devido às limitações metodológicas, para compreender os resultados da segunda fase serão necessárias novas pesquisas que investiguem a possível relação entre MBCT e procedimentos de indução de humor sobre a especificidade da memória autobiográfica. Futuros estudos nesta área aparentam ser promissores, uma vez que os marcadores cognitivos da depressão podem revelar como os indivíduos assintomáticos, porém

vulneráveis à depressão, processam conteúdos emocionais de maneira diferente de indivíduos não deprimidos.

Palavras-chave: mindfulness, terapia cognitiva baseada em mindfulness, funcionamento cognitivo, memória autobiográfica, indução do humor

Mindfulness-Based Cognitive Therapy, Mood, and Autobiographical Memory Specificity

Mindfulness is a moment-to-moment state of awareness of one's emotions, thoughts, and environment (Kabat-Zinn, 1990). Bishop et al. (2004) also defines mindfulness as a self-regulation of attention to the present moment and an orientation of curiosity, openness, and acceptance encompassing sustained and alternating attention and inhibitory control. Shapiro et al. (2006) extended Bishop et al.'s (2004) two-component mindfulness model, adding the intention or the motivation behind the practice as an important factor. Meditation is one of the practices that can develop the state of mindfulness; however, mindfulness can be regulated and used in activities other than meditation, as the necessary skills are trainable (Bishop et al., 2004; Langer & Moldoveanu, 2000). In fact, the word *mindfulness* can describe not only a state of awareness but a psychological trait and a psychological intervention. Henceforth, in this study, the term mindfulness will be used to describe a psychological intervention, but the other definitions mentioned will be further elaborated.

When studied as a trait, mindfulness (henceforth, *mindfulness trait*) is measured using self-report scales. A widely used scale in mindfulness studies is the Mindfulness Attentional and Awareness Scale (MAAS), developed by Brown and Ryan (2003) and validated in its Brazilian version by Barros et al. (2015). This scale comprised 15 items that measure the ability to focus attention on the present moment. Another widely used scale is the Five Facets of Mindfulness Questionnaire (Baer et al., 2006), which consists of 39 items and treats mindfulness trait as a multifactorial construct: the ability to observe moment by moment; the ability to describe feelings and sensations; be present moment to moment; act without reacting to emotions and act without judgment. This scale was also validated in its Brazilian version (Barros et al., 2015).

Hence, due primarily to the efforts of Kabat-Zinn and colleagues, mindfulness has emerged as an important clinical intervention within psychology and medicine over the past decades (Baer, 2003). The first structured mindfulness protocol was the Mindfulness-Based Stress Reduction Intervention (MBSR; Kabat-Zinn et al., 1992), which initially steered to help reduce stress and anxiety, also acting on the better quality of life of patients with chronic back pain (for a review, see Yogeswaran & El Morr, 2021). The protocol consists of 8-week, 2-hr meetings of guided practices, health instructions, and home practices (Shapiro et al., 2005). Later, researchers incorporated psychoeducation and other Cognitive Behavioral Therapy (CBT) activities (Beck & Alford, 2011) into this protocol, originating a new one, the Mindfulness-Based Cognitive Therapy (MBCT; Segal et al., 2013).

The MBCT intervention consists of the same number of encounters and duration as MBSR but was created to help prevent depression relapse in patients who have recovered from Major Depressive Disorder, as the relapse rate is alarming (Piet & Hougaard, 2011). Later, the program was adapted for other populations—clinical and nonclinical (Segal et al., 2013). As with CBT, in the MBCT intervention, there is a focus on understanding thoughts as mental events—and how this differs from reality and concrete actions. However, as stated by Segal et al. (2013), the main difference is the clear intention of the MBCT to allow thoughts to be what they are, which differs from the cognitive restructuring proposed by Beck's CBT (Beck & Alford, 2011).

Mindfulness interventions have been studied and integrated into institutional settings and clinical treatment such as schools, military sectors, and prisons (Dimidjian & Segal, 2015) and present evidence for the treatment of different psychological disorders, especially for conditions related to anxiety and mood disorders (Demarzo et al., 2014). Also, the MBCT program is a mental health strategy recommended by the National Institute for Health and Clinical Excellence

in Great Britain (NICE) as the intervention of choice for preventing depression relapse for patients who have already experienced three or more relapses (Crane & Kuyken, 2013), but also have applications for different disorders as well as with nonclinical populations (Cousin & Crane, 2016).

Over the past decade, there has been a considerable increase in randomized controlled trials of mindfulness, and MBCT has been applied to a wide range of clinical populations and delivery formats and settings (Cladder-Micus et al., 2015; Shapiro et al., 2005). These studies present several potential benefits for mindfulness practice, including mental health and cognition (Demarzo et al., 2014; Jha et al., 2007; Ludwig & Kabat-Zinn, 2008). A meta-analysis of randomized controlled trials (Chiesa & Serretti, 2011) found that 32% of patients with three or more previous depressive episodes relapsed in the 12 months following MBCT compared to 60% of patients receiving treatment-as-usual (TAU) only. Further trials showed that MBCT considerably postponed relapse compared to TAU and that depression relapse rates after MBCT were equivalent to individuals on antidepressants, indicating that it might be an alternative to medication.

From a neuroscientific perspective, mindfulness practice may generate structural and functional changes in brain areas associated with attentional processing (e.g., anterior cingulate cortex). Functional and structural neuroimaging research has investigated these components' neuroscientific processes. Mindfulness practice may alter neuroplasticity in the anterior cingulate cortex, insula, temporoparietal junction, front-limbic network, and default mode network (for a review, see Holzel et al., 2011). A systematic review of the neurocognitive effects of manualized mindfulness programs, such as MBCT, uncovered preliminary evidence of enhancements to cognitive flexibility, working memory, and autobiographical memory (Lao et al., 2016).

Mindfulness-Based Cognitive Therapy and Autobiographical Memory

There is a growing understanding that memory is not a unified skill but a series of integrated systems (Cubillas, 2017). Such systems can be explained differently (for a review, see Cubillas, 2017). For this project's purposes, memory can be defined as declarative (or explicit) and non-declarative (or implicit; Tulving, 2002). Non-declarative memory includes diverse systems such as procedural knowledge, knowledge of how to do things, skills, and actions done with little or no awareness. Declarative memory, on the other hand, is the process of information encoding, storage, and retrieval, all done intentionally and in a way that is available to consciousness (Cubillas, 2017). Tulving (2002) distinguished between semantic and episodic memory within declarative memory. Tulving's understanding aligns with current theories suggesting that semantic and episodic memories are connected but still distinct (Renoult & Rugg, 2020). Semantic memory is the explicit knowledge about the world, although it is unclear where or how it was learned (e.g., the definition of neurosciences), as well as personally relevant conceptual knowledge (e.g., "I have always been happy"). Episodic memory refers to the recall of personally experienced events that took place in a particular spatial and temporal context (e.g., "I remember seeing neuroscience class last Friday"; Renoult et al., 2019).

There is a discussion in the literature regarding whether autobiographical memory is an episodic memory or a separate memory (Fivush, 2010). From Tulving's view (2002), autobiographical memory is an episodic memory and includes all memories of past events. Autobiographical memory involves episodic remembering of dates, events, and personal happenings, considering their temporal and spatial relationship. Still, within this author's view, a specific aspect of this memory concerns the awareness that a particular event that happened to someone and it is part of oneself's personal history. In addition, Tulving (2002) presents another

critical feature of autobiographical memory called "autonoetic consciousness," which is the feeling of reliving a fact from the past.

On the other hand, current theories distinguish episodic memory from autobiographical memory, stating that every species have episodic memory, characterized as representations of specific past events that include details about who, what, when, and where (for a review, see Fivush, 2010). In contrast, autobiographical memory expands on the episodic system to incorporate memories of oneself participating in events that connect one's past to the present along a unique timeline that constitutes life. Second, autobiographical memory is said to vary socially and culturally, and it is experimentally linked to engagement in particular social activities. Finally, according to some authors (e.g., Nelson & Fivush, 2020), autobiographical memory is a late-developing skill unique to humans.

Reduced *autobiographical memory specificity* (AMS)—also known as *overgeneral autobiographical memory* (OGM) or difficulty accessing specific memories—has been proven to be an established marker of clinical depression (for a review, see Hallford et al., 2022). There is a discussion about whether reduced AMS is a long-term trait marker that serves as a risk factor for depression or a temporary state marker associated with depressive symptoms (Hallford et al., 2021). Two meta-analyses on this topic support the trait-marker theory by demonstrating that reduced AMS is a significant predictor of symptoms of depression at follow-up (Hallford et al., 2021; Sumner et al., 2010). Reduced AMS is associated with an increased frequency of depressive episodes and suicide attempts (Kuyken & Brewin, 1995) and forecasts the progression of depression, including relapse (for a review, see Hallford et al., 2022). Finally, reduced AMS was found to be a defining trait even in remitted patients (Mackinger et al., 2000).

There are two main mechanisms by which reduced AMS might affect mental health problems. First, reduced AMS impairs abilities that provide access to memories that are crucial for successful psychological functioning, including problem-solving, planning and imagining future events, and fostering intimacy in social relationships through sharing memories. Second, the recall of a particular autobiographical memory helps to distinguish generalized beliefs about oneself or the outside world from that memory (for a review, see Dalgleish & Hitchcock, 2023).

Most research in this domain has focused on mood disorders (for a review, see Levi & Rosenstreich, 2018). Still, other mental health issues, such as psychotic, stressor-related, and trauma-related disorders, are characterized by a decreased capacity to recall specific autobiographical memories, demonstrating strong evidence of transdiagnosticity (Dalgleish & Hitchcock, 2023). Hence, reduced AMS causes and prospectively predicts a worse clinical prognosis for mental health problems. There are three possible explanations for the prevalence of reduced AMS in clinical populations: functional avoidance, capture and rumination, and diminished executive control (Williams et al., 2007). Capture and rumination refer to the ruminations sparked by the retrieval cue word (e.g., *exhausted*) during the memory test. As a result, the cue word would block the patient's ability to retrieve detailed autobiographical information further (Levi & Rosenstreich, 2018).

AMS can be enhanced with different types of training (Hallford et al., 2022; Piet & Hougaard, 2011). MBCT intervention trains individuals to focus on concrete, specific detailed cognition that reduces generalized context-based cognition and improves AMS and rumination (Piet & Hougaard, 2011). In a systematic review, Levi and Rosenstreich (2018) organized the main evidence of the beneficial effects of mindfulness interventions on different memory subsystems, including episodic memory and, more specifically, autobiographical memory.

Studies examining the effects of MBCT suggested that autobiographical memory might be related to increased cognitive flexibility (Heeren et al., 2009) and an improved capacity to adopt a detached perspective of oneself (Hargus et al., 2010).

MBCT enhances autobiographical memories by training participants to become aware of specific aspects of their experiences (for a review, see van der Velden et al., 2015). MBCT practice would facilitate the encoding and retrieval of specific memories and reduce the overgeneralization of memory and rumination, which are crucial factors in depression symptoms (Levi & Rosencheirch, 2018; Rosencheirch, 2014; Williams et al., 2000). Evidence suggests that MBCT may function by modifying memory-specific cognitive processing styles and enhancing cognitive flexibility (Bishop et al., 2004; Kuyken et al., 2008). Mindfulness practice may inhibit the secondary elaboration of ideas, emotions, and sensations that arise (e.g., Bishop et al., 2004). Other findings suggest that persistent attention to exact features may teach a more specialized processing style. Finally, William et al.'s (1986) indicated that reduced AMS might be linked to rumination, a major emphasis of MBCT.

Studies that investigated the effects of MBCT intervention on AMS coded participants' autobiographical memory responses as generalized or categorical (general or repeated past events) or specific (personal events from the past that occurred in a defined time and place). Significant improvements were found in the retrieval of specific autobiographical memories after MBCT interventions (Hargus et al., 2010; Williams et al., 2000). Hence, MBCT intervention have proven to be efficient in increasing the specificity of the retrieved information (Heeren et al., 2009; Williams et al., 2000), with specificity understood as personal event-level experiences, no longer than a day in duration (e.g., a run at the local beach with family; for a review, see Hallford et al., 2022).

Mood Induction Procedures and Autobiographical Memory

As already mentioned, much of the literature on mood and autobiographical memory focuses on clinical populations, more specifically on the study of the cognitive vulnerability to depression (Conway, 1996; Dalgleish et al., 2007; Van Minnen et al., 2005). Many studies show that individuals with mood disorders, especially those with a history of depression, demonstrate difficulty in recalling specific autobiographical memories (Williams et al., 2007). However, fewer nonclinical studies have examined the phenomenon of overgeneralization of autobiographical memories induced by mood induction procedures (MIPs) in healthy participants (Belcher & Kangas, 2013; Yeung et al., 2006).

MIPs may allow experimental manipulation of emotional states as levels of an independent variable and induce sad mood states (Raes et al., 2006; Yeung et al., 2006). This induction of mood can occur with a variety of stimuli, including—but not limited to—words, images, and stories. Other studies have demonstrated that pictures facilitate the retrieval of information from semantic memory (Smith et al., 2005). Specifically, pictures tend to activate semantic memory first, followed by lexical information (Pinto et al., 2011).

The experimental induction of mood state through stimuli of different valence (affective charge) may interfere with the encoding, storage, and retrieval of memories. Consequently, experimental conditions were designed to assess the impact of different mood states on human behavior (Bradley et al., 1996; Raes et al., 2006). There are two underlying dimensions to emotions: valence and arousal (Rivers et al., 2008). Valence can be either positive, negative, or neutral, and represents an individual's evaluation of stimulus pleasantness or unpleasantness. Arousal is how stimulating (or calming) a stimulus is and is defined as a level of activation that ranges from calm to excited (Rivers et al., 2008).

In studies of the overgeneralization of autobiographical memories, the mood is experimentally induced through one type of stimuli or more, and then the autobiographical memory is tested through the material—usually word lists (Pergher & Stein, 2008). More specifically, evidence shows that changes in AMS can be affected by experimentally adopting MIP in participants with no reported history of depression (Belcher & Kangas, 2013) and that levels of AMS are significantly associated with mood state (Svaldi & Mackinger, 2003; Yeung et al., 2006). In an experimental study, Yeung et al. (2006) showed that AMS can be changed by a state mood (emotional and neutral) induction procedure in healthy participants and that levels of AMS were related to the current mood state.

Although prior research suggests that MIPs are effective on average (for a review, see Zangri et al., 2022), there are important theoretical and empirical ramifications due to the heterogeneity of procedures and methods in the literature. For instance, different criteria have been utilized to operationally identify a MIP-induced sad mood. Most frequently, researchers compare the pre- and post-MIP mean mood scores statistically, and if the post-MIP mood is significantly sadder than the pre-MIP mood, then researchers conclude that the sad mood was successfully created (Gillies & Dozois, 2021).

Mindfulness, Mood, and Autobiographical Memory Specificity

Mindfulness as a state, trait, and therapeutic intervention has been intensively explored. Yet, the underlying mechanisms of mindfulness interventions are still unknown. There are mixed findings regarding the influence of MBCT on cognitive performance, more specifically on autobiographical memory (Docteur et al., 2020; Jermann et al., 2013; Lao et al., 2016; Williams et al., 2000). For example, a higher trait of mindfulness was associated with lower memory specificity (Crawley, 2015), which differs from mindfulness intervention studies that have shown

an increased memory specificity for those who underwent MBCT (Heeren et al., 2009; Williams et al., 2000). The cognitive processes that may be affected by mindfulness interventions or that account for reported benefits must be clarified (Bishop et al., 2004).

As already contextualized, there is extensive literature on mindfulness intervention and autobiographical memories with clinical populations (Chiesa et al., 2011; Chiesa & Serreti, 2011; Williams et al., 2000). Yet, few MBCT studies have investigated autobiographical memories in nonclinical populations (Heeren et al., 2009; Jermann et al., 2013). To the best of our knowledge, only one study has investigated the effects of MBCT on the AMS in never-depressed participants. However, Heeren et al. (2009) did not endeavor to control for the history of depression in their sample. If the AMS is a stable cognitive marker that shows decreased values even in individuals in remission (when compared to matched healthy controls), it is necessary to screen out not only currently depressed participants but any history of depression. An individual patient data meta-analysis (Hitchcock et al., 2022) reported that most studies investigating the effects of MBCT on AMS are conducted with a European population, making it difficult to understand whether or not it is possible to extend the findings to other populations. Finally, the majority of studies have small sample sizes, lack experimental control, and use different protocols and mindfulness interventions, factors that make it challenging to interpret their results both about possible benefits to cognition (Levi & Rosencheirch, 2018) or mood (Williams et al., 2000).

Regarding combined MIP and mindfulness intervention on autobiographical memory, until now, no study has been found (Hitchcock et al., 2022). Given the effectiveness of mindfulness in improving the retrieval of AMS and the possibility of experimentally manipulating mood states to study MIPs effects on AMS, it is plausible to think of combining the

two interventions to study this important cognitive marker of depression. Stable depression cognitive factors may reveal how asymptomatic depression-vulnerable persons process emotional information differently from their nondepressed counterparts (Lao et al., 2016; Yeung et al., 2006).

Present Study and Objectives

In the present study, we aimed to (a) investigate the effects of MBCT on the AMS of healthy participants, and (b) investigate the possible combining effects of MBCT and a MIP on the AMS. In order to achieve these aims, a two-phase study is presented. In Phase 1, we investigated the effects of an 8-week MBCT intervention on AMS of nonclinical adults using an autobiographical memory test. We intended to replicate William et al.'s (2000) study but extend their results to a never-depressed sample. In Phase 2, which followed the same healthy adult sample, the combined effects of MBCT and MIP on AMS were explored. Moreover, as far as we are aware, there are no studies investigating the possible relationship between these variables

Phase 1's Hypotheses

Our main objective was to investigate the effects of an 8-week MBCT program on the AMS of nondepressed adult participants. AMS was indexed by an increase in the percentage of specific memories recalled following MBCT relative to the control group (Pergher & Stein, 2008). More specifically, it was hypothesized that participants that underwent the mindfulness intervention (henceforth, *MBCT group*) would recall a higher rate of specific autobiographical memories compared with the waiting-list control group (henceforth, *control group*). Furthermore, it was hypothesized a higher recall rate of specific autobiographical memories in post-treatment than in pre-treatment, but this would be qualified by a Group × Time interaction,

where differences in the recall rate of specific autobiographical memories between the MBCT and control groups are expected only at post-treatment.

This result is expected because most studies in the area claim that mindfulness interventions impact the specificity of autobiographical memory retrieval by providing training so that participants become aware of the specific aspects of their experiences, which would facilitate the encoding and retrieval of specific memory (Hargus et al., 2010; Levi & Rosenstreich, 2018; Williams et al., 2000). In addition, in a review on this topic, Levi and Rosenstreich (2018) stated that, as mindfulness helps to promote greater emotional regulation and as human memory stores events based on their emotional context, mindfulness would affect the retrieval of specific memory episodes. Finally, studies have shown that learning new coping mechanisms for thoughts and emotions would make it easier to focus on specific events in one's life, reducing dysfunctional attitudes and ruminative patterns (Chiesa et al., 2011).

Phase 2's Hypotheses

Phase 2 of the study followed up on the main findings of Phase 1, investigating the effects of combined MBCT and MIP on nonclinical participants. To achieve this, after Phase 1's post-treatment, participants from MBCT and control groups were randomly assigned to one of two types of MIP (negative, neutral). The factorial crossing of the intervention and MIP led to the formation of four groups: MBCT/negative, MBCT/neutral, control/negative, and control/neutral. Participants from all groups were tested twice. The first test corresponds to the post-treatment measure from Phase 1, after the 8-week MBCT program. The second test was administered after the MIP.

Several studies and experimental conditions were designed to assess the impact of mood on human cognition because evidence shows that the experimental induction of mood through

stimuli of distinct valences (affective charge) interferes with the encoding, storage, and retrieval of autobiographical memories. If mindfulness would act to decrease rumination (Williams et al., 2000), one of the main factors of mood lowering (Beck, 2011), which would be, in turn, linked to a greater generalization of autobiographical memories even in subjects of nonclinical samples (Lao, 2016; Levi & Rosenstreich, 2018; Au Yeung et al., 2006), it seems reasonable to expect that there would be a relationship between mindfulness training, mood and the ability to retrieve specific autobiographical memories.

It was hypothesized that (a) the group that practiced MBCT and went through the neutral mood induction would have greater recall of autobiographical memories than the other groups; (b) the group that practiced MBCT and underwent negative mood induction, it is expected that there will be a greater retrieval of autobiographical memories than the control group that also underwent negative mood induction and did not participate on the MBCT group; and, finally, (c) no other significant interactions are expected. These results are expected due to the studies in which MBCT intervention helped increase AMS (Williams et al., 2000), and according to the possibility that decreased AMS is a result of acute negative mood states (Maccallum et al., 2000; Svaldi & Mackinger, 2003).

Method

Participants

Recruitment was done online during the COVID-19 pandemic through social media ads, online magazines, and university pages. Inclusion criteria were: being between 18 and 50 years old and having higher education (or attending). Exclusion criteria were: history of depressive disorder, active phase depression (Beck Depression Inventory [BDI-II] score > 12; Beck et al.,

1996) or any other psychiatric disease in the active phase, diagnosis of neurological disorder, use of psychiatric medication that may interfere with cognition and presence of visual, cognitive deficit that may interfere with reading and performing tests, meditation training and other planned psychological interventions during the course of the study. Therefore, depression history was screened in three ways: (1) participants who signed up for the volunteer panel and said they were depressed or had a history of depression; (2) participants were asked again if they had been diagnosed with depression by their medical practitioner or a mental health practitioner; and (3) score greater than 12 on the BDI-II, a well-validated measure of depressive symptoms (Beck et al., 1996).

One hundred and forty-one participants contacted us by email and received all the information about the study and eligibility questionnaire. Of the 81 participants who were interested and completed the questionnaire, ten were excluded from the analyses due to: (a) safety (e.g., score greater than 12 on the BDI-II; Beck et al., 1996) or reported history of depression or having ever been diagnosed ($n = 5$); (b) age higher or lower than required due to the variable studied ($n = 1$); and (c) declined to participate ($n = 4$). The final sample consisted of 71 participants (56 women), aged between 18 and 50 years ($M = 35$, $SD = 8$). Table 1 summarizes sample sociodemographic characteristics.

Based on their participation in Phase 1, participants from MBCT and control groups also took part in Phase 2 of this research. Of the 35 MBCT participants (gender: 82.8% female) who were 33 years on average (range: 18–50), only 3 did not complete the 8-week MBCT protocol (< 3 classes missed). All of the participants completed the assessment in Phase 2, so the demographics in Phase 2 were identical to those in Phase 1. The minimum required sample size (n per group = 15) was estimated with an a priori power analysis with G*Power 3.1.9.2 (Faul et

al., 2007), with sample loss of 10%, alpha level set at .05, and power set at .80 to detect an absolute mean difference of 5.96 in the AMT score (MBCT post-test vs. MBCT pre-test; $SD_{baseline}=5.38$), as observed in Docteur et al. (2020).

Table 1

Sample Characteristics

Descriptive variable	MBCT group ($n = 35$)	Control group ($n = 36$)
Age (mean ± SD)	33 ± 8	35 ± 7
BDI-II (mean ± SD)	4.2 ± 2.17	5.6 ± 2.1
Females, *n* (%)	29 (82.8)	27 (75)
Education, *n* (%)		
Bachelor's degree	17 (48.6)	14 (38.9)
Graduate degree	13 (37.1)	17 (47.2)
Master's degree	4 (11.4)	3 (8.3)
PhD	1 (2.9)	2 (5.6)

Note. n = *population size.* BDI-II = Beck Depression Inventory. *Means and standard deviations are shown as M(±SD).*

Design

Phase 1

As a way to test the hypotheses of this phase of the study, a randomized controlled trial was conducted with a 2 × 2 mixed-factorial design, with intervention (MBCT, control) and moment of application of the test (pre-treatment, post-treatment) as between- and within-subject variables, respectively. The dependent variable was the AMS, measured by the AMT. The assignment of participants to groups was random, and the control group was inactive.

Phase 2

Secondly, to combine the effects of MBCT and MIP on autobiographical memory, we carried out a 2 × 2 × 2 mixed-factorial design, with the intervention (MBCT, control) and MIP (negative, neutral) as between-subject variables and time of application of the test (post-treatment, follow-up) as a within-subject variable. Participants were randomly assigned to one of four groups, defined by the factorial crossing of the variables intervention and MIP.

Measures

Eligibility Questionnaire

Participants completed an 11-item questionnaire informing their sociodemographic data (gender, age, and education level) and mental health conditions, such as depression history and medication use (Appendix C). Participants were also asked about current formal mindfulness practices and advised about the need to practice only in the group (and home practices) for the duration of the study if they decided to participate.

Beck Depression Inventory

To assess the severity of depressive symptoms, the BDI-II (Beck et al., 1996) was used in its version adapted to the Brazilian population (Cunha, 2001). The BDI-II is a widely used self-report questionnaire for assessing depression with 21 items. Each item was rated on a 4-point Likert scale (range 0–3). The total score ranges from 0 to 63, with higher scores indicating more severe symptoms of depression. In the present study, BDI-II was used as a screening measure for depression symptoms, with a cutoff score of 13 or higher (e.g., Williams et al., 2007). Thus, the aim was to exclude confounders related to existing depressive symptoms, which could influence autobiographical memory scores.

Autobiographical Memory Test

To measure AMS, the oral version of the Autobiographical Memory Test (AMT; Williams & Broadbent, 1986; Brazilian version: Pergher, 2005) was used. This test is widely used to assess the phenomenon of OGM, that is, the difficulty of recalling AMS. The original list (Pergher, 2005) consists of 15 words (5 positive, 5 negative, and 5 neutral), and the list selected for this study consisted of 12 words (e.g., *occasion*, *excited*, *mad*), removing one word from each valence (negative, neutral, and positive) due to the reduced time for testing. Three distinct versions of the test list were used in each one of the different time assessments. Stimuli and instructions are provided in Appendix D.

All the autobiographical memories recalled by the participants were coded as (a) semantic associated or non-memories (coded with a score of 0) that constitute a failure to recall a memory or a nonautobiographical report; (b) categorical memory (coded with a score of 1) one of the types of generalized memory in which repeated events are observed without any reference to a specific time; (c) extended memory (coded with a score of 2) is another type of generalized memory, in which the recall refers to a certain period, with a specific beginning and end, but lasting more than one day; and (d) specific memories (coded with a score of 3), which has as characteristic the reference to a specific temporal location, with a maximum duration of 1 day (for some examples, see Table 2). In prior studies, no principal effects of the emotional valence of AMT cue words were observed (Pergher & Stein, 2008). The measure used as a dependent variable in the analyses was the mean specificity of responses. The closer to 3, the more specific the participant's answers were, and the closer to 0, the more overgeneralized their memories were (Pergher & Stein, 2008).

Table 2

Summary of the Classification of Responses in the Autobiographical Memory Test

Category	Definition	Example	Score
Semantic associates	Response without reference to the person's past	"I love going to parties"	0
Categoric memories	Recall of event category, with no defined beginning or end	"My best friend's parties"	1
Extended memories	Recall periods of life lasting more than a day	"The parties I threw at my apartment"	2
Specific memories	Recall of specific events, no longer than a day	"My 18th birthday party"	3

Mindfulness-Based Cognitive Therapy (MBCT)

The MBCT group received the intervention according to the MBCT's manual (Segal et al., 2013). The group sessions were carried out by three experienced certified instructors (two psychologists and one psychiatrist) who graduated from the Oxford Mindfulness Center of the University of Oxford and the Open Mind Center at the Federal University of São Paulo (UNIFESP). Prior to this trial, they had all led at least three supervised MBCT groups and maintained a regular MBCT practice. All instructors were blind to the research objectives and hypotheses.

The protocol consisted of one meeting per week for eight weeks, with two hours of meeting each, and was delivered online and live through the Zoom platform. The participants were asked to keep their webcams open during the meetings. All the meetings have the same

structure; however, each meeting has its own theme and specific psychoeducation and mindfulness practices, with moments for inquiry and sharing. Guided body scans, sitting and walking meditations, mindful movement, 3-min breathing spaces, and focused awareness of ordinary daily activities are among the formal and informal meditation techniques used in instruction. In the first sessions, there are more guided meditations that focus on breathing or physical sensations. Later, there is a greater emphasis placed on creating a practice for oneself and expanding mindful awareness of mental events, such as thoughts and emotions. Participants are encouraged to spend 45 min each day engaging in mindfulness exercises as part of their home practice, which involves guided meditation recordings (for the complete program's protocols, see Segal et al., 2013).

Positive and Negative Affect Scale

To evaluate the mood of the participants, they completed the Brazilian version of the Positive and Negative Affect Scale (PANAS; Carvalho et al., 2013). PANAS is a widely used scale developed to measure positive and negative affects both as states and traits. Previous studies using the scale have shown excellent validity for negative and positive moods, as well as sensitivity to mood changes (Watson & Clark, 1999). The scale is composed of 20 words, with 10 items representing positive affects (e.g., *active*, *alert*; Cronbach's $\alpha_{post-test} = 0,29$ and $\alpha_{follow-up} = 0,98$) and 10 items representing negative affects (e.g., *ashamed*, *distressed*; Cronbach's $\alpha_{post-test} = 0,32$ and $\alpha_{follow-up} = 0,87$). The items were individually presented based on a 5-point scale ranging from 0 (*very slightly or not at all*) to 5 (*extremely*). Participants then indicated the extent to which they felt this way at that moment. The sum of the scores was calculated independently for negative and positive affect, and the mood state of each participant was understood as the sum of the evaluations of each affect.

International Affective Picture System

Participants underwent a MIP through the presentation of images of negative or neutral affect. The International Affective Picture Set (IAPS; Lang et al., 1988) is a standardized image system widely used in research with experimental manipulation of emotions to induce mood states for a short period (Lang et al., 2001). This occurs through the presentation of slides with similar valence and arousal dimensions (Bradley et al., 1996; Smith et al., 2005). IAPS was used in its version adapted to the Brazilian population (Ribeiro et al., 2004). Fifteen images were selected for negative mood induction and 15 for neutral mood induction (see Appendix E). For the induction of a negative mood state, valence images of nonpleasure ($M = 1.89$, $SD = 1.41$) and high arousal ($M = 7.80$, $SD = 1.71$). Neutral images, on the other hand, were chosen by mean valence ($M = 4.80$, $SD = 1.90$) and low arousal activation ($M = 4.40$, $SD = 2.00$). The set of images of the slide presented was chosen following the characteristics of valence and arousal of the selection made in a study with Brazilian participants (Pinto et al., 2011) that is under the characteristics standardized in the literature (Bradley et al., 1996; Smith et al., 2005). A positive condition was not included because our main interest was to investigate the impact of a negative experience on AMS (Raes et al., 2006), and there were no significant differences found between positive and neutral MIPs on AMS in prior studies (Raes et al., 2006; Yeung et al., 2006).

Procedure

Ethical approval was given by the Science Research Ethics (CEP/CHS) of the University of Brasilia (CAE: 55119721600005540), and all participants signed informed consent forms before the commencement of this study. This study was registered in the Brazilian Clinical Trials Registry (ID: U1111-1286-7661). All interested participants received explanations about the research by mail message and received information about the study's duration,

inclusion criteria, and objectives. If they consented to participate, they filled out the first screening and assessment for eligibility. If they met the inclusion criteria in the study, they went through the second screening, the inventory for depression (BDI-II; Beck et al., 1996). Those not meeting the criteria were kindly asked to end their participation. Their participation was voluntary and unpaid. The specific procedures are detailed below in their respective stages (Figure 1).

Phase 1

Participants were randomized to one of two groups, namely, MBCT and control. Two weeks before the start of the 8-week program, participants in both groups attended a scheduled individual internet meeting on Zoom (~30 min) with the experimenter for the pre-treatment assessments with the AMT. They were then instructed orally on the AMT, in which they were trained with three cue words, with feedback, to exemplify the commands provided. After training, the words were presented orally and one at a time. Participants were instructed to recall specific events of their life that happened once in a particular place at a particular time and lasted no longer than 24 hr related to each one of the cue words.

Figure 1

Flowchart of Participants and Phases of the Study
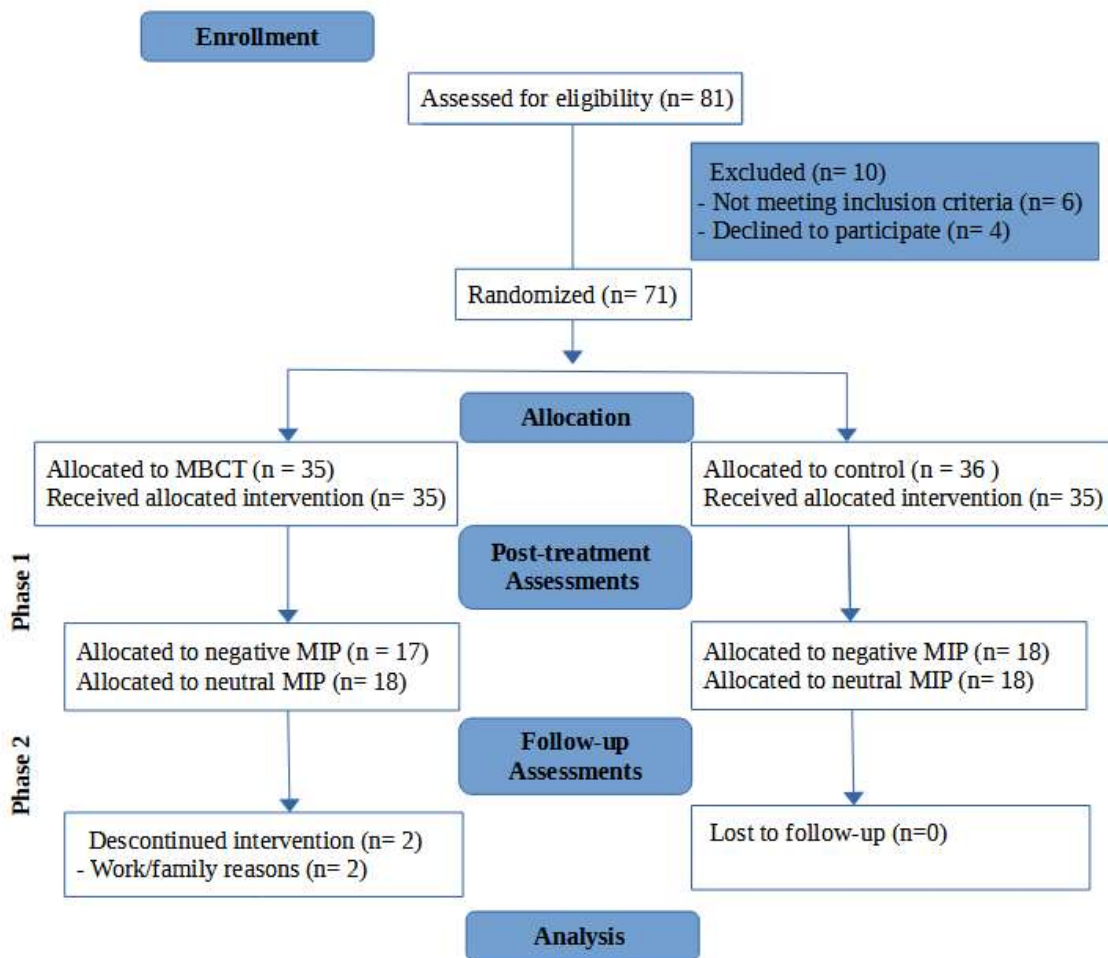

Note. MIP = mood induction procedure.

After the pre-treatment assessment individual meeting, the MBCT group went through an 8-week MBCT program online on the Zoom platform while the participants in the control group were inactive. No later than 1 week after the end of the 8-week program, participants from both groups attended a second individual meeting for the post-treatment assessment with the AMT. Different versions of the list were used for each assessment time.

Phase 2

The participants attended a scheduled internet individual meeting (~30 min) with the experimenter for the assessments. Participants in both groups (MBCT and control) went through the MIP for which they were randomly assigned (neutral or negative). Therefore, four conditions were formed: (1) MBCT/negative, (2) MBCT/neutral, (3) control/negative, and (4) control/neutral.

First, participants responded orally to the PANAS and then to the AMT. After that, participants underwent a MIP through the presentation of IAPS images slides of negative or neutral affects according to their assigned condition. Before the procedure, participants were instructed to watch the images carefully. The images were presented one at a time, in the same fixed sequence across participants. There were 15 images, and the presentation duration of each image was 4 s, interpolated by 1 s of a black screen between the images, with a total duration of 75 s (for a stimulus sample, see Figure 2). All participants were advised in advance to use computers. After the MIP, the participants responded to the PANAS in order to check if the MIP was successful (manipulation check) and then had their AMT assessed (follow-up). At the end of the study, a positive MIP was administered to participants from MBCT/negative and control/negative groups to help them return to baseline mood state. Thereafter, participants in the control group began the MBCT program as well.

Figure 2

Mood Induction Procedure Stimulus Presentation Example
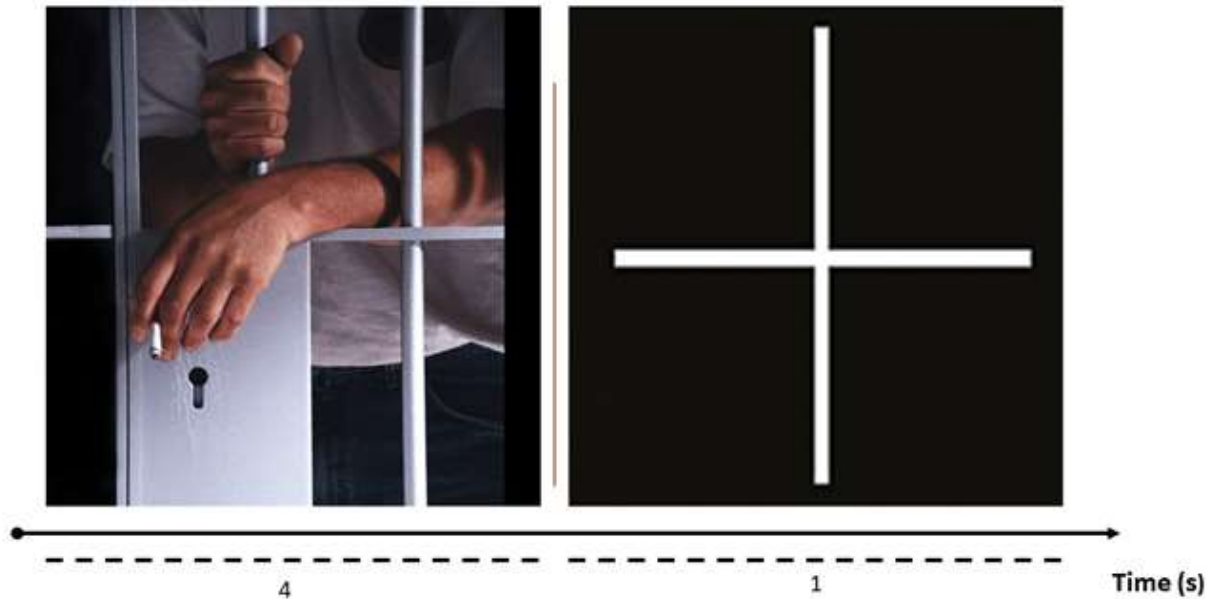
Data Analyses

A series of analyses of variance (ANOVAs) were performed as follows: (1) Phase 1, a 2 (intervention) × 2 (time) mixed factorial ANOVA, taking AMT scores as the dependent variable; (2) Phase 2, two 2 (intervention) × 2 (induced mood) × 2 (time) mixed factorial ANOVAs, one for neutral affect and one for negative affect (i.e., manipulation check); and (3) Phase 2, a 2 (intervention) × 2 (induced mood) × 2 (time) mixed factorial ANOVA, taking AMT scores as the dependent variable.

The significance level was set at .05. Post-hoc *t*-tests were performed when the analyses had significant interaction effects. Effect-size indices were reported as Cohen's *d* (for *t* tests) and as partial-eta squared (η_p^2; for ANOVAs). All analyses were conducted using R (R Core Team, 2023).

Results

Phase 1

Table 3 shows the effects of 8-week MBCT on the autobiographical memory performance of participants. We hypothesized that the MBCT group would recall a higher rate of specific autobiographical memories compared with the control group. Secondly, we hypothesize a higher recall rate of specific autobiographical memories post-treatment than pre-treatment; however, this would be qualified by an Intervention × Time interaction, where differences in the recall rate of specific autobiographical memories between the MBCT and control groups are expected only at post-treatment. Our results support these hypotheses, as detailed below.

Table 3

Effects of 8-Week MBCT Program on Autobiographical Memory Performance of Nonclinical Adults

Time	Intervention			
	MBCT group ($n = 35$)		Control group ($n = 36$)	
	M	*SD*	*M*	*SD*
Pre-test	2.15	0.25	2.09	0.12
Post-test	2.53	0.22	1.99	0.22

Note. n = population size. M = mean. SD = standard deviation.

Effects of MBCT on Autobiographical Memory

The mixed factorial ANOVA showed a main effect of the intervention (MBCT vs. control) on AMS, $F(1, 69) = 58.49$, $p < .001$, $\eta_p^2 = .46$. The effect of the intervention showed that autobiographical memory was, on average, higher for the MBCT group ($M = 2.34$, $SD = 0.19$) when compared to the control group ($M = 2.04$, $SD = 0.13$).

Effects of Time on Autobiographical Memory

Also, there was a significant effect of time, $F(1, 69) = 22.91$, $p < .001$, $\eta_p^2 = .25$. The main effect of time indicated that scores on the AMT increased from pre-test ($M = 2.12$, $SD = 0.19$) to post-test ($M = 2.26$, $SD = 0.35$).

Effects of MBCT Versus Time on Autobiographic Memory

More importantly, we found the predicted significant interaction, $F(1, 69) = 69.40$, $p < .001$, $\eta_p^2 = .50$. Post hoc tests indicated that, at the pre-test, there were no significant differences in autobiographical memory between the MBCT group ($M = 2.15$, $SD = 0.25$) and the control group ($M = 2.09$, $SD = 0.12$), $t(69) = 1.31$, $p = .56$. In the post-test, in turn, autobiographical memory was higher in the MBCT group ($M = 2.53$, $SD = 0.22$), when compared to the control group ($M = 1.99$, $SD = 0.22$), $t(69) = 10.38$, $p < .001$.

Phase 2

Manipulation Check

Figure 3 shows the participants' scores on the negative (left panel) and positive (right panel) effects of PANAS. In both panels, the data were collapsed to the intervention variable, which, as will be shown in the following analyses, had no significant effect. Two 2 (intervention) × 2 (induced mood) × 2 (time) mixed factorial ANOVAs were carried out, one for negative affect and one for positive affect. This was done to assess whether MIP indeed modulated mood (i.e., manipulation check). The ANOVA model for negative affect indicated significant effects of mood, $F(1, 67) = 1,148.00$, $p < 0,001$, $\eta_p^2 = .94$, and time, $F(1, 67) = 1,423.04$, $p < .001$, $\eta_p^2 = .96$. More importantly, these main effects were qualified by a Mood × Time interaction, $F(1, 67) = 1,423.04$, $p < .001$, $\eta_p^2 = .94$.

Post hoc tests indicated that, before the MIP (post-test), there were no significant differences in negative affects between the two groups that underwent the negative mood induction ($M = 10.17$, $SD = 0.57$) and the other two that underwent neutral mood induction ($M = 10.19$, $SD = 0.40$), $t(67) = -0.22$, $p_{Tukey} = .99$. On the other hand, after the MIP (follow-up), negative affects were higher in the negative mood group ($M = 24.06$, $SD = 2.15$) when compared to the neutral mood group ($M = 10.19$, $SD = 0.40$), $t(67) = 37.38$, $p_{Tukey} < .001$. This result showed that the mood induction protocol was successful in selectively inducing negative mood in one of the experimental groups. No other main or interaction effects reached statistical significance, Fs < 1, ps $\geq .69$.

The right panel of Figure 3 shows the participant's scores on the positive affects of PANAS. As can be seen in this panel, the results involving positive affects corroborate those shown for negative affects. The ANOVA model for positive affects indicated significant effects of mood, $F(1, 67) = 624.39$, $p < ;001$, $\eta_p^2 = .90$, and time, $F(1, 67) = 2,128.39$, $p < .001$, $\eta_p^2 = .97$. More importantly, these effects were qualified by a Mood × Time interaction, $F(1, 67) = 2,145.48$, $p < .001$, $\eta_p^2 = .97$. Post hoc tests indicated that, before the MIP (post-test), there were no significant differences in positive affect between the negative-mood groups ($M = 38.85$, $SD = 3.19$) and neutral-mood groups ($M = 37.42$, $SD = 2.47$), $t(67) = 2.10$, $p_{Tukey} = .16$. On the other hand, after the MIP (follow-up), positive affects were lower in the negative-mood groups ($M = 11.06$, $SD = 1.16$) when compared to the neutral-mood groups ($M = 37.47$, $SD = 2.48$), $t(67) = -56.53$, $p_{Tukey} < .001$. No other main or interaction effects reached statistical significance, Fs < 1, ps $\geq .36$.

Figure 3

Negative and Positive Affects as a Function of Mood Induction Procedure and Time
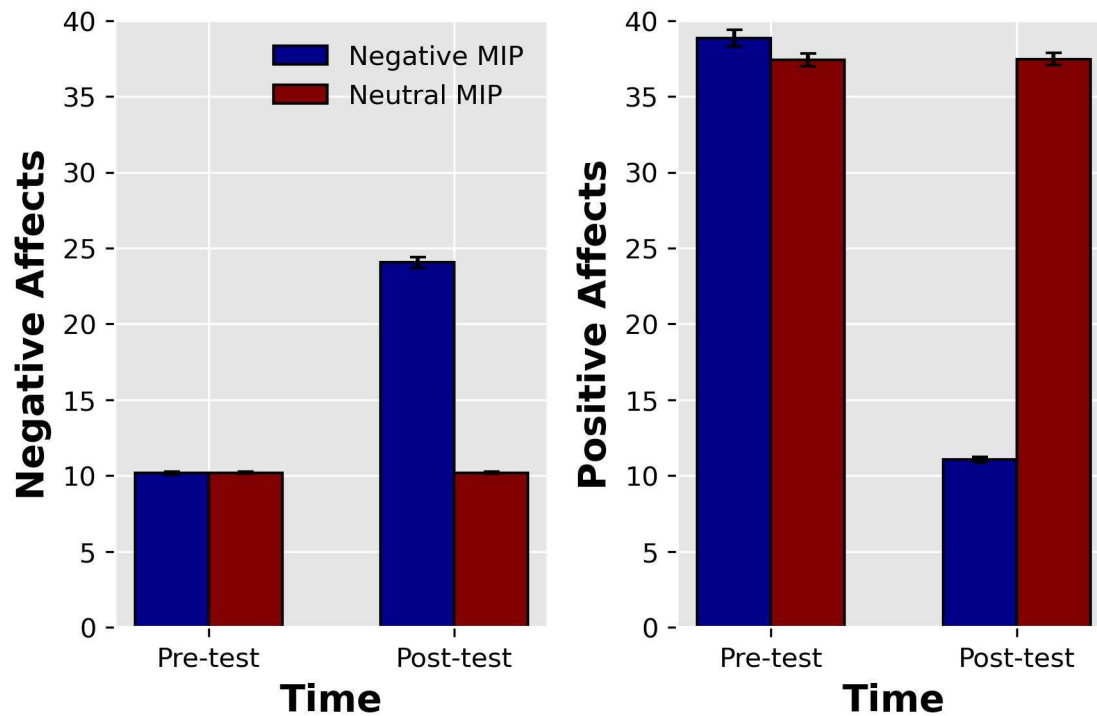
Note. Error bars represent ±1 standard error of the means. Data were collapsed by intervention, as this variable did not have significant effects in the ANOVAs.

Effects of MBCT, Induced Mood, and Time on Autobiographical Memory

Figure 4 shows the participants' autobiographical memory scores. A 2 (intervention) × 2 (induced mood) × 2 (time) mixed factorial ANOVA on the AMT scores did not show the predicted significant interaction. Only the intervention indicated a significant effect, $F(1, 67) = 141.22$, $p < .001$, $\eta_p^2 = .68$. This effect showed that autobiographical memory was, on average, higher for the MBCT group ($M = 2.51$, $SD = 0.17$) when compared to the control group ($M = 1.98$, $SD = 0.20$). No other main or interaction effects reached statistical significance, $Fs \leq 3.58$, $ps \geq 0.06$.

Figure 4

Autobiographical Memory Scores as a Function of Intervention, Mood Induction Procedure, and Time
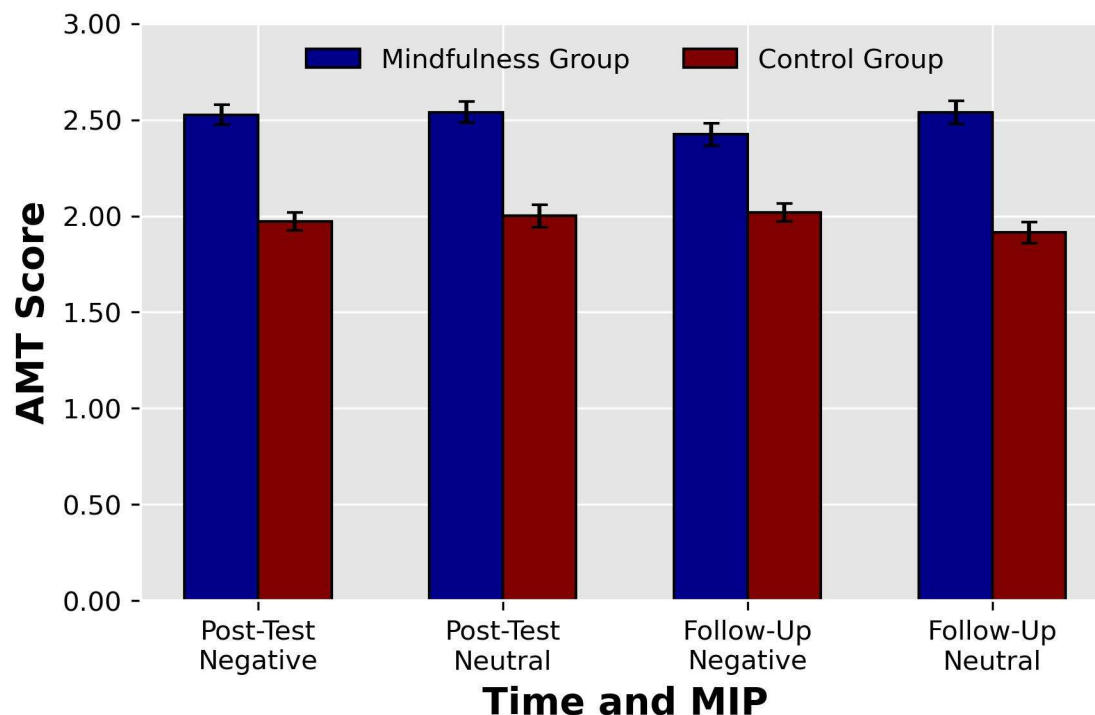
Note. MIP = mood induction procedure. Error bars represent ±1 standard error of the means.

Discussion

In this study, we evaluated the effects of an 8-week MBCT intervention on the AMS of nondepressed adults. Before and after the 8-week intervention, all participants had their autobiographical memory measured using the AMT. As expected, individuals in the MBCT group had an increased AMS after the 8-week course when compared to the control group. In Phase 2 of this study, MBCT was associated with a MIP of negative and neutral affects, aiming to investigate their possible additive effects on autobiographical memory. Although the MIP

successfully changed participants' affects, the findings contradicted the prediction that MBCT and MIP combined could change AMS. These results are discussed below.

Phase 1

Our results support the initial hypothesis that the MBCT group would have a better recall of specific autobiographical memory when compared to the control group. As predicted, individuals in the MBCT group, but not those in the control group, experienced increased AMS after the 8-week course. Despite similar levels of AMT scores at baseline, the MBCT group in our trial scored significantly more specific memories at post-treatment than the control group.

These findings are consistent with previous studies that highlighted MBCT as an intervention that promotes AMS (Heeren et al., 2009; Williams et al., 2000). The results of the present study replicate the findings of Williams et al. (2000) but extend their results to a never-depressed sample. Moreover, this is the first study with a non-European sample. Among the few studies conducted in this area, most previous investigations have been with depressed patients or patients with depression in remission (Jermann et al., 2013; Williams et al., 2000). This is an important distinction, as significant differences in memory specificity were found between depressed patients in remission and healthy control participants without a history of depression (Kuyken & Dalgleish, 2011; Mackinger et al., 2000). Therefore, in this study, we tried to control this confounder and extend these findings to never-depressed participants. There was one prior replication of William et al.'s (2000) study with nonclinical participants (Heeren et al., 2009) that is in line with our data; however, there are important differences between our study and those of Heeren et al.: (a) our study controlled for previous depression history; (b) we followed an experimental design, assigning participants randomly to conditions; and (c) our study had an appropriate sample size and statistical power. Our data extend these results (Herren et al., 2009;

William et al., 2000), suggesting that even with participants with no history of depression, memory specificity can be improved significantly by MBCT intervention.

From a clinical perspective, this pattern of results supports the notion that MBCT increases AMS (Heeren et al., 2009; Williams et al., 2000). That is, our data support the idea that psychological interventions can train AMS, and not only in people with emotional problems. According to available studies, people with emotional problems, particularly those who have experienced depression, have trouble recalling autobiographical memories (for a review, see Hallford et al., 2021). Hence, several findings suggest that reduced AMS is a cognitive marker for depression.

Furthermore, reduced AMS is known for influencing negative self-beliefs that underlie depression and is associated with a higher frequency of depressive episodes and suicide attempts (Kuyken & Brewin, 1995). Finally, reduced AMS is a risk factor for depression (Gibbs & Rude, 2004) and a maintaining factor for people who are depressed (Williams et al., 2007). This study's findings suggest the utility of attention training interventions for nonclinical individuals as a possible form of prevention. Thus, our findings also appear to rule out the hypothesis that MBCT might be effective only for those with lower pre-treatment specificity, such as depressed participants (Hitchcock et al., 2022).

Concerning intervention adherence, it is important to emphasize that in this study, the MBCT was delivered by accredited MBCT instructors (Segal et al., 2013) in real-time, with participants present in the virtual room with an open camera at the time of the intervention. Most of the previous studies use the term internet-delivered for interventions that are not delivered in real-time, and generally, low program usage and participation was reported (Yogeswaran & El Morr, 2021). However, prior trials indicated that internet-delivered interventions, even when not

delivered in real-time, could have equivalent effects to face-to-face interventions (Querstret et al., 2018). These disparities, along with the protocol's adherence, require additional research. In addition, teachers' adherence to the MBCT protocol (Segal et al., 2013) was high in this study (Bondolfi et al., 2010), as well as the participant's attendance rates. All instructors were certified by Oxford Mindfulness Centre (Oxford University) and Open Mind Center (UNIFESP), and selected for their experience in delivering MBCT protocol. When compared to other studies, the sociodemographic characteristics and depressive history of participants in this study are quite different. As already mentioned, most of the studies were carried out with Europeans and North Americans (Hitchcock et al., 2022), so this is the first study with a Latin American population.

Regarding the cognitive factors which possibly promote the efficacy of MBCT, this pattern of findings seems consistent with the idea that mindfulness intervention might work by changing the memory-specific cognitive processing style and increasing cognitive flexibility (Bishop et al., 2004). Mindfulness practice may prevent the secondary elaboration of thoughts, feelings, and sensations that come to mind (e.g., Bishop et al., 2004). Further, other experimental studies suggest that repeated attention to concrete, specific details may train the use of an explicit processing mode. Finally, Williams and Broadbent (1986) also suggested that reduced AMS may be related to rumination, one of the main focuses of this MBCT intervention. Ruminative thinking, according to their hypothesis, might be sustaining or causing reduced AMS. There is a belief that reduced AMS and rumination are mutually reinforcing, even though experimental investigations to now have only demonstrated the impact of ruminating on reducing AMS (Teasdale & Russel, 1983; Watkins & Teasdale, 2004). Future studies may consider which of these possible mechanisms are important mediators in the effects of MBCT on increasing AMS.

While the results of the present study are promising, they contrast with prior research suggesting that participants in remission from chronic depression who had undergone an MBCT group had similar autobiographical memories retrieved to that of healthy control participants (Hitchcock et al., 2022; Jermann et al., 2013). In the present trial, nonclinical individuals in the MBCT group experienced significantly higher scores on the test AMT when compared to nonclinical controls. Two reasons could explain these differing results. First, statistical power may be a limitation in these previous studies since small-to-moderate group differences might have been undetected because of the small sample size (Hitchcock et al., 2022). There is also the possibility of greater differences when we compare nonclinical individuals after a MIP. However, this seems to be unlikely since autobiographical memory is known as a cognitive marker for depression, and the scores are usually higher in people who have the diagnosis (Williams et al., 2000). More studies with nonclinical participants will be needed to address these mixed findings.

The present study does have limitations. First, a placebo effect cannot be ruled out because there was no reasonable treatment comparison group, and the control participants were inactive. Second, although the participants were randomly assigned to conditions, and the instructors were blinded to conditions and the study's objectives, the raters were not blinded. A final limitation is the small number of men among our participants; it is unclear whether our results can be generalized to males.

To conclude, these findings extend Williams et al.'s (2000) findings to a never-depressed sample, indicating that MBCT intervention can help to change OGM bias. That is, MBCT intervention can help increase AMS, even in patients without a history of depression. In line with previous experimental research, it suggests that one of the mechanisms underlying the MBCT

effects on remission of depression is the possible effect of increased recall of autobiographical memories. A point that must be considered is the fact that the underlying mechanisms of the effects of MBCT on cognition need to be further explored. This seems to be a promising line for future investigations.

Phase 2

In Phase 2 of this study, healthy participants from MBCT and control groups (Phase 1) underwent either a negative or a neutral MIP. Our goal was to investigate whether combining MBCT intervention with a negative MIP in nonclinical participants would generate effects on AMS. The results did not support the hypothesis that the MBCT group would have a greater recall of autobiographical memories in a negative MIP condition when compared to the control group who did not receive MBCT intervention. Autobiographical memory was higher for the MBCT group when compared to the control group, but no other interaction effects reached statistical significance.

The manipulation check analysis indicated that the MIP was effective in modulating the participant's moods. Thus, probably the absence of Intervention × Induced Mood interaction cannot be attributed to a failure in mood manipulation. The MIP created for this study with IAPS pictures on specific valence and arousal was successful in experimentally manipulating negative and neutral moods in MBCT and control groups. Additionally, post hoc tests indicated no significant differences in negative and neutral mood across groups at the baseline. In the follow-up, however, negative effects were higher in the negative-mood groups. However, as mentioned before, different criteria have been utilized to operationally identify a MIP-induced negative mood and this heterogeneity should be considered. Usually, studies compare the pre- and post-MIP mean mood scores statistically, and if the post-MIP mood is significantly sadder than the

pre-MIP mood, then researchers conclude that the negative mood was successfully created (for a review, see Zangri et al., 2022). Unfortunately, most of the previous studies did not check the effectiveness of the MIP (Zangri et al., 2022), a factor that we tried to control in our study assessing the mood of the participants just before the MIP and right after (Gillies & Dozois, 2021).

This is the first study, as far as we are aware, to examine the combined effects of MBCT intervention and negative MIP on healthy participants. The experimental induction of mood state through stimuli of various valences (affective charge) interferes with the encoding, storage, and retrieval of memories; as a result, several studies and experimental conditions were devised to investigate the effect of this variable on human behavior, specifically on autobiographical memory (Van Minnen et al., 2005; Yeung et al., 2006). Regarding MBCT and the specificity of autobiographical memories, studies with clinical (Chiesa et al., 2011) and nonclinical populations (Heeren et al., 2009) reported benefits in the recall of specific autobiographical memory when compared to controls. Taken together, it seems plausible to propose that a negative mood would impair the ability to recall specific autobiographical memories and, more specifically, that the MBCT group would have a greater recall of autobiographical memories in a negative MIP condition when compared to the control group who did not receive MBCT intervention.

Our results did not support the previous hypothesis, since the AMS was higher for the MBCT group when compared to the control group, but no other interaction effects reached statistical significance. This pattern of findings is, in part, consistent with Vanderveren et al.'s (2020). In their study, both positive and negative MIPs led to increasing autobiographical memory coherence, while neutral MIP did not show significant changes. However, the present

study is not consistent with most studies in the area, which indicate that induced negative mood states in healthy participants can lead to a decrease in AMS (Maccallum et al., 2000; Svaldi & Mackinger, 2003; Yeung et al., 2006). More specifically, prior research has demonstrated that negative affect is associated with poorer autobiographical memory performance (Maccallum et al., 2000; Svaldi & Mackinger, 2003; Yeung et al., 2006). Two main reasons could explain these differing results. The high variability of the MIP protocols used may be one of the reasons for the different results in the literature. According to a recent review (Zangri et al., 2022), picture clips are the most effective MIPs for negative mood inductions. Another possible reason for the heterogeneity of results is the absence of a manipulation check for the evaluation of the induced mood before and after the MIP (Gillies & Dozois, 2021). Future research should, whenever feasible, use proven paradigms and carefully choose the mood induction method based on the emotion to be evoked (Joseph et al., 2020).

However, Phase 2 of this study has limitations. MIPs usually used in psychological research have restrictions and to which extent they are representative or generalizable is still unknown (Gillies & Dozois, 2021; Joseph et al., 2020). A recent metanalysis was conducted on the efficacy of mindfulness to regulate induced emotions in the laboratory and relatively small size effects were found (Zangri et al., 2022). Although there is a significant emotional change after induction, the subjects' overall affective tone is positive, and this is likely because the effects are brief and only modest inductions were used. The variability of inductions and stimuli used in the literature has substantial theoretical and empirical repercussions, even though past research demonstrates that MIPs are generally beneficial (Joseph et al., 2020). For instance, different criteria have been utilized to operationally identify a MIP-induced sad mood. As mentioned before, most frequently researchers statistically evaluate the pre- and post-MIP mean

mood ratings, and if the post-MIP mood is noticeably depressed compared to the pre-MIP mood, they conclude that the depressive mood was effectively induced (Gillies & Dozois, 2021).

Another important limitation factor is that we used the same sample of participants from Phase 1, so the AMT "baseline" scores of the MBCT and control groups in Phase 2 were not equivalent, as participants from the MBCT groups had significantly more autobiographical memory recall than those in the control groups. This makes comparisons difficult because if the groups had started from a similar baseline, it is possible that another result would have been found. Therefore, the absence of an Intervention × Induced Mood interaction at follow-up may be due to the ceiling effect of these different baselines. New studies that guarantee adequate training for the MBCT group and that control for a history of depression but ensure that groups are matched on baseline AMT scores need to be done so that we can understand the combined effect of these two variables.

In summary, Phase 2 showed that it is possible to manipulate mood state in healthy participants with no reported history of depression (Maccallum et al., 2000; Yeung et al., 2006) but did not show the predicted interaction between MBCT intervention and a negative mood induction on AMS. As already mentioned, few nonclinical studies examine the overgeneralization of autobiographical memories induced by MIPs in healthy participants (Belcher & Kangas, 2013; Yeung et al., 2006). Future studies in this area seem promising since the experimental induction of mood states allows us to study mechanisms underlying emotional regulation in clinical and nonclinical populations. Since MIPs allow us to study the cognitive vulnerability to depression (Conway, 1996; Dalgleish et al., 2007; Van Minnen et al., 2005), future studies addressing the heterogeneity of procedures and methods in the literature are needed.

Conclusion

This study extends Williams et al.'s (2000) findings to a never-depressed sample, indicating that MBCT intervention can increase autobiographical memory specificity. Additionally, this is also the first study as far as we are aware to examine the combined effects of MBCT intervention and negative mood induction on healthy participants. In line with previous experimental research, the present findings support the notion that MBCT intervention increases autobiographical memory specificity. It suggests that autobiographical memory can be trained through psychological interventions such as MBCT, even in patients without a history of depression. Further, the study of stable depression cognitive factors may provide an understanding of why asymptomatic depression-vulnerable individuals process emotional information uniquely compared to nondepressed individuals. These results bring important social and scientific contributions and, especially, indicate paths for therapeutic practice and prevention interventions.

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Appendix A: Local Ethics Committee Approval

INSTITUTO DE CIÊNCIAS
HUMANAS E SOCIAIS DA
UNIVERSIDADE DE BRASÍLIA -
UNB

PlataForma Brasil

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Mindfulness, humor e a supergeneralização de memórias autobiográficas
Pesquisador: Jade Ramos de Araújo
Área Temática:
Versão: 2
CAAE: 55119721.6.0000.5540
Instituição Proponente: Instituto de Psicologia - UNB
Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 5.460.109

Apresentação do Projeto:
Inalterado em relação ao parecer consubstanciado emitido pelo CEP/CHS no dia 25 de fevereiro de 2022.

Objetivo da Pesquisa:
Inalterado em relação ao parecer consubstanciado emitido pelo CEP/CHS no dia 25 de fevereiro de 2022.

Avaliação dos Riscos e Benefícios:
Inalterado em relação ao parecer consubstanciado emitido pelo CEP/CHS no dia 25 de fevereiro de 2022.

Comentários e Considerações sobre a Pesquisa:
Inalterado em relação ao parecer consubstanciado emitido pelo CEP/CHS no dia 25 de fevereiro de 2022.

Considerações sobre os Termos de apresentação obrigatória:
Foram anexados todos os termos obrigatórios, como descrito em Conclusões ou Pendências e Lista de Inadequações.

Recomendações:
Foram anexados todos os termos obrigatórios, como descrito em Conclusões ou Pendências e Lista de Inadequações.

Endereço: CAMPUS UNIVERSITÁRIO DARCY RIBEIRO - FACULDADE DE DIREITO - SALA BT-01/2 - Horário de
Bairro: ASA NORTE   **CEP:** 70.910-900
UF: DF   **Município:** BRASILIA
Telefone: (61)3107-1592   **E-mail:** cep_chs@unb.br

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Appendix B: Written Informed Consent

Termo de Consentimento Livre e Esclarecido

Você está sendo convidado a participar da pesquisa "Mindfulness, humor e memória", de responsabilidade de Jade Ramos de Araújo, estudante de mestrado do Programa de Ciências do Comportamento do Instituto de Psicologia da Universidade de Brasília. O objetivo desta pesquisa é estudar a relação entre mindfulness, memória e humor em uma amostra de adultos brasileiros. Assim, gostaria de consultá-lo/a sobre seu interesse e disponibilidade de cooperar com a pesquisa. Você receberá todos os esclarecimentos necessários antes, durante e após a finalização da pesquisa.

1. **Privacidade**

Lhe asseguro que o seu nome não será divulgado, sendo mantido o mais rigoroso sigilo mediante a omissão total de informações que permitam identificá-lo/a, bem como sob qualquer dado proveniente da sua participação na pesquisa, tais como questionários, entrevistas ou filmagem necessárias. Todos os materiais e dados ficarão sob a guarda do/da pesquisador/a responsável pela pesquisa. Dados sensíveis serão excluídos permanentemente após a coleta e armazenamento de dados relevantes para a pesquisa. Quaisquer publicações científicas posteriores não identificarão nenhum voluntário.

2. **Coleta de dados e procedimentos**

Caso você aceite participar, primeiramente a coleta de dados será realizada por meio da aplicação de questionário on-line para avaliar critérios de saúde importantes para a participação nesta pesquisa. Caso você não possa participar neste momento do estudo por não preencher algum destes pré-requisitos, você será avisado por e-mail.

Após a inscrição e triagem, serão agendados dois encontros privados com o pesquisador para a realização da entrevista com aplicação de instrumentos de memória e humor. Estas duas entrevistas terão a duração de trinta minutos aproximadamente e ocorrerão de forma remota, por meio da plataforma Zoom (gratuita para o participante) e serão gravados (vídeo e áudio) para a finalidade de coleta de dados e transcrição das informações relevantes à pesquisa apenas. Todos os dados coletados são sigilosos e de responsabilidade do pesquisador responsável pela pesquisa. Após a coleta dos dados relevantes para a pesquisa por parte do pesquisador, os vídeos da

entrevista serão excluídos permanentemente.Além disso, você fará parte de um grupo de Mindfulness que será conduzido por oito semanas de forma remota, também por meio da plataforma Zoom. Os participantes serão alocados aleatoriamente em um dos grupos e todos passarão pelo programa de Mindfulness. O grupo não será gravado e não serão aplicados instrumentos de coleta de dados durante os encontros do programa. Para participar deste estudo, é necessário ter acesso a internet e a disponibilidade para o preenchimento completo dos instrumentos apresentados, bem como participação no grupo.

3. Possíveis benefícios, riscos e desconfortos:

Sua participação pode acarretar, em alguns casos, em algum desconforto decorrentes da manipulação de humor, porém isto será minimizado sempre com atividades que te permitam retornar ao humor seu humor habitual. Quaisquer outros incômodos relatados por você serão assistidos cuidadosamente por parte da equipe de pesquisa e **profissional capacitado para desenvolver a instrução do grupo estarádisponível para suporte psicológico, durante e após o término do estudo.**

Além disso, devido aos riscos inerentes a coleta de dados em ambiente virtual, serão tomadas medidas de segurança para a proteção de dados pessoais sensíveis, como na escolha da plataforma para os encontros e entrevistas, bem como uso de formulários e não armazenamento dos dados em ambiente virtual para evitar vazamentos de informações pessoais sensíveis.

Quanto aos benefícios, os resultados do presente estudo poderão auxiliar no planejamento de estratégiasde promoção de saúde a partir da prática de mindfulness. O estudo também contribuirá para o aprimoramento das intervenções existentes e o desenvolvimentode novas intervenções baseadas em *mindfulness*, voltadas às necessidadesespecíficas de diferentes grupos.

4. Custeio

Sua participação é voluntária e livre de qualquer remuneração ou custo. Eventuais custos do projeto serão absorvidos pelo orçamento da pesquisa.

5. Voluntariedade

Você é livre para recusar-se a participar, retirar seu consentimento ou interromper sua participação a qualquer momento e por qualquer motivo. A recusa em participar não irá acarretar qualquer penalidade.

Se você tiver qualquer outra dúvida em relação à pesquisa, você pode me contatar através do telefone ███████ ou pelo e-mail ████████████. A equipe de pesquisa garante que os resultados do estudo serão devolvidos aos participantes por meio de e-mail, podendo ser publicados posteriormente na comunidade científica.

Este projeto foi revisado e aprovado pelo Comitê de Ética em Pesquisa em Ciências Humanas e Sociais (CEP/CHS) da Universidade de Brasília. As informações com relação à assinatura do TCLE ou aos direitos do participante da pesquisa podem ser obtidas por meio do e-mail do CEP/CHS: cep_chs@unb.br ou pelo telefone: (61) 3107 1592.

Este documento foi elaborado em duas vias, uma ficará com o/a pesquisador/a responsável pela pesquisa e a outra com você.

Assinatura do/da participante   Assinatura do/da pesquisador/a

Brasília, ____ de _____ de _____

Appendix C: Eligibility Questionnaire

Ficha de inscrição

Seja bem-vindo(a). Este questionário breve é confidencial e utilizado somente para os propósitos desta pesquisa como explicitado no Termo de Consentimento Livre e Esclarecido (TCLE) enviado. É importante ter conhecimento do TCLE antes de enviar este questionário respondido. Agradecemos desde já por sua participação!

Dados gerais:

Nome:

Data de nascimento:

Estado civil:

Gênero: ( )Feminino ( )Masculino ( ) Não binário

RG:

Profissão:

Endereço:

Cidade:

Telefone:

Você concluiu ou está cursando atualmente Ensino Superior?

Sim (   ) Não (   )

Curso e Instituição de Ensino:

_____

Ano em que se formou ou ano de previsão de formatura:
_____

Assinale a opção que melhor se encaixa em seu momento:

( ) Nunca pratiquei mindfulness ou Não pratico no momento ( ) Pratico Mindfulness regularmente

Caso você pratique mindfulness regularmente, você estaria disposto(a) a praticar somente em nosso grupo durante 8 semanas?

( ) Sim ( ) Não

Questionário de saúde:

Pedimos que responda de forma cautelosa as próximas perguntas visando o seu bem-estar e segurança. Certas situações de saúde exigirão cuidados especiais, outras são questionadas somente a título de conhecimento para a pesquisa e algumas ainda podem impossibilitar a participação neste estudo específico. Todas as informações serão tratadas de forma sigilosa.

Atualmente você faz tratamento para alguma condição de saúde? Se sim, qual?

_____

Atualmente você está em crise ou fase aguda de algum transtorno psiquiátrico? Se sim, por favor especifique qual no campo abaixo.

_____

Durante sua vida você já foi diagnosticado com Depressão ou algum outro transtorno psiquiátrico? Se sim, por favor especifique qual no campo abaixo.

_____

Se respondeu sim a pergunta anterior, você está em tratamento psiquiátrico atualmente?

Sim ( ) Não ( )

Caso esteja em tratamento psiquiátrico, por favor, escreva o nome das medicações que faz uso atualmente e a respectiva dosagem.

_____

Você foi diagnosticado com algum transtorno neurológico durante sua vida? Se sim, por favor especifique qual no campo abaixo.

_____

Você foi diagnosticado com alguma deficiência ou déficit cognitivo durante sua vida? Se sim, por favor especifique qual no campo abaixo.

_____

Você possui alguma dificuldade ou déficit visual, auditivo ou de fala? Se sim, por favor, especifique qual no campo abaixo.

_____

Caso deseje nos relatar ou esclarecer qualquer outra informação sobre sua saúde, você pode utilizar o espaço abaixo:

Appendix D: Cue Word Lists and Instructions of Autobiographical Memory Test in

Brazilian Portuguese

Instruções: Estou interessada em investigar sua memória para eventos que aconteceram na sua vida. Por isso vou leralgumas palavras para você, uma de cada vez. Para cada palavra, quero que você pense em um evento que aconteceu com você e que tenha relação com a palavra lida, o primeiro que vier a mente. O evento pode ter ocorrido recentemente (ontem, semana passada) ou há algum tempo atrás. Pode ser um evento importante, ou um evento comum do dia a dia.Só mais uma coisa: a memória que você recordar deve ser de um evento específico. Então, se eu disser apalavra "bom", não seria correto dizer "Eu sempre gosto de uma boa festa", porque isto não se refere aum evento específico no tempo e espaço – um evento que durou menos que um dia. No entanto, seria correto dizer "Foi legal ter ido na festa da Maria" (porque isto éum evento específico). É importante tentar dizer uma memória ou evento diferente para cada palavra apresentada.

Depois do início do teste, *cada participante era ajudado até que uma memória específica fosse recuperada ou o tempo de 60 segundos decorresse.*

Frase de ajuda: "Você se lembra de um episódio ou momento em particular?"

Versão A
Palavras-estímulo de treino:
1. Carro
2. Árvore
3. Cadeira
Palavras-estímulo do teste:
1. Infantil
2. Elogio
3. Trágico

4. Moderado

5. Agradável

6. Infeliz

7. Novo

8. Diversão

9. Miséria

10. Ocasião

11. Animado

12. Raivoso

Versão B

Palavra-estímulo de treino:

Bicicleta

Palavras-estímulo do teste:

1. Sucesso

2. Jardim

3. Perigo

4. Sorriso

5. Conversa

6. Erro

7. Presente

8. Tarde

9. Raiva

10. Relaxado

11. Conselho

12. Lágrimas

Versão C:

Palavras-estímulo de treino:

1. Planta

Palavras-estímulo do teste:

1. Ensolarado
2. Escolha
3. Problema
4. Bonito
5. Fileira
6. Difícil
7. Música
8. Menino
9. Sozinho
10. Elogio
11. Início
12. Culpa

Appendix E: List of Pictures of IAPS Valence and Arousal Split by Categories (Negative,

Neutral, and Positive) Used in the Mood Induction Procedure

Table E1

List of Pictures Used in the Mood Induction Procedure

Title	Image code	Valence *M* (*SD*)	Arousal *M* (*SD*)
		Negative Pictures	
Mendigo	2750	1.71 (1.30)	7.42 (2.23)
Prisão	2722	1.93 (1.13)	6.57 (1.99)
Drogado	2710	1.94 (1.61)	8.41 (1.15)
Tumor	3170	1.24 (0.62)	8.08 (1.56)
Acidente	3551	1.58 (1.29)	7.96 (1.63)
Assédio	4621	2.56 (1.63)	6.89 (2.03)
Tornado	5971	2.61 (1.86)	7.69 (1.63)
Prisão	6010	2.29 (1.82)	7.04 (2.08)
Arma	6200	2.07 (1.66)	7.87 (1.65)
Ataque	6211	2.10 (1.67)	7.73 (1.82)
Assalto	6571	1.48 (0.98)	8.70 (0.87)
Polícia	6831	1.48 (1.27)	7.81 (1.92)
Ataque	6560	1.41 (1.01)	8.21 (1.76)
Tanque	6940	1.82 (1.42)	8.08 (1.57)
Incêndios	9120	2.19 (2.02)	8.10 (1.76)
		Neutral Pictures	
Cachorro	1303	4.84 (2.58)	5.12 (2.98)
Adulto	2020	5.97 (1.54)	3.93 (1.67)
Digital	2206	4.41 (1.28)	5.22 (1.60)
Pássaro	1616	4.52 (2.60)	4.20 (2.16)
Rosto	2210	4.48 (2.00)	4.45 (2.13)

Homem	2190	4.84 (1.07)	4.69 (1.41)
Menino	2280	5.04 (0.92)	4.75 (1.29)
Lâmpada	7175	5.13 (1.57)	3.28 (1.83)
Mãe	2312	5.00 (2.16)	5.04 (2.20)
Quadro	7182	4.93 (2.27)	5.59 (2.69)
Relógio	7190	5.02 (1.96)	5.28 (2.34)
Abstrato	7184	4.72 (1.86)	4.64 (1.47)
Mulher	2372	5.00 (1.00)	4.32 (2.01)
Vaca	1670	3.77 (3.55)	2.12 (2.64)
Garota	2381	5.37 (2.15)	4.11 (2.17)
Pleasant Pictures			
Sorvete	7270	8.28 (1.28)	3.99 (2.96)
Natureza	5780	8.66 (0.77)	1.93 (2.11)
Bebê	2660	8.48 (1.62)	3.23 (2.76)
Elefantes	1812	8.59 (0.97)	2.63 (2.06)
Montanhas	5700	7.61 (2.41)	2.71 (2.75)
Filhotes	1710	8.63 (0.79)	2.52 (2.40)
Golfinhos	1920	8.10 (1.73)	3.73 (2.87)
Céu	5594	8.26 (1.38)	1.95 (1.83)
Romance	4641	8.37 (1.42)	3.93 (2.99)
Peixe	1990	8.16 (1.45)	2.82 (2.25)
Torta	7260	7.58 (1.78)	3.88 (2.62)
Violinista	5410	7.48 (1.76)	2.78 (2.26)
Pôr-do-sol	5830	8.47 (1.90)	2.77 (2.90)
Criança	2341	8.33 (1.51)	2.60 (2.23)
Flores	5010	7.68 (1.76)	2.15 (1.59)