Understanding how mindfulness-based interventions promote work-life balance: A systematic review of randomized controlled trials

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Abstract

The effects of mindfulness-based interventions (MBIs) on work-life balance (WLB) have been documented in previous experimental studies. However, work is needed to integrate the information that is emerging. In this study, we address this need by: (a) conducting a systematic review of the effects of MBIs on WLB, and (b) proposing a logical model indicating how MBIs may contribute to WLB. The search was conducted using the *Psycnet, PubMed, Web of Science, Scopus, SciELO, Redalyc e BVS Saúde* databases, retrieving studies published up until July 2023. We selected studies involving randomized controlled trials in which the effects of an MBI on WLB and related outcomes were reported. Of the initial 575 texts, seven peer-reviewed articles were selected. Data analysis was conducted by examining key components of the MBIs considering: (a) the intervention procedures, (b) effects on WLB, (c) explanations about behavioral change mechanisms, (d) study design limitations, and (e) suggestions for further research. Findings indicated that MBIs improved work-life balance outcomes (such as perceptions of WLB, satisfaction with WLB, psychological detachment from work), and decreased work-family and work-life conflict. Follow-up studies showed that program effects were maintained. Higher retention rates were found for app-based interventions, interventions that had at least one in-person session, and programs in which participants could choose which exercises and when to practice. MBI mechanisms included self-regulation of attention, emotions and behaviors, to strengthen people's psychological resources. Further research is needed to investigate the generalizability of the findings, to understand the range of people who can benefit from MBIs, and to clarify MBI outcomes involving adjustments in personal life involvements that may affect work behaviors.

Keywords: Emotion regulation; Work-life conflict; Boundary management; Workplace wellbeing.

Balancing paid work and personal life involvements is a constant and significant challenge in the lives of people around the world (Houlfort et al., 2019). In addition, the use of information and communication technology for work tasks has created the opportunity to work at any time and from any place, blurring work-life boundaries (Allen et al., 2021). Even when workers have distinct physical environments for work and personal life activities, it can be difficult to segment these involvements psychologically (i.e., “switching off” from one domain and focusing on another) (Karabinski et al., 2021).

Researchers seeking to understand the challenges of managing both job-related and personal life responsibilities usually refer to this process using the term work-life balance (WLB). WLB is a multidimensional concept (Fan et al., 2021), and one of the most accepted definitions is that WLB refers to the “individual’s assessment of how well her or his multiple life roles are balanced" (Haar et al., 2014, p. 261). According to Keeney et al. (2013), there are eight domains that may be relevant to WLB: education, health, leisure, friendships, romantic relationships, family, household management, and community involvement. Based on this definition, WLB is assessed by examining individuals’ overall perceptions of balance with respect to the combination of their work and other life roles.

Studies on WLB are important because difficulties in coordinating involvements in different domains are associated with a series of negative outcomes, such as burnout (Kotera et al., 2021), chronic fatigue (Yang et al., 2021), depression, anxiety and higher perceived stress (Sprung & Rogers, 2021; Fotiadis et al., 2019). On the other hand, higher levels of WLB are associated with greater satisfaction with work, life, and marriage (Schnettler et al., 2020; Sharma & Suresh, 2021), as well as better overall well-being (Shams & Kadow, 2019) and mental health (Kotera et al., 2020).

The development and evaluation of strategies to promote WLB is one of the main issues addressed in this field of research (Medeiros et al., 2017).

Interventions to promote WLB

The current literature on WLB highlights various interventions that have been successful in increasing WLB or decreasing work-life conflict (WLC). Examples of these interventions are the use of flexible work hours, other forms of alternative work arrangements, and training in family-supportive supervisor behaviors (Hammer et al., 2016). However, most of these are focused on task-related logistical issues in the workplace (Allen & Eby, 2016; Hammer et al., 2016). As such, these arrangements do not address the time and skills that are needed to manage the psychological and interpersonal boundaries between different parts of our lives.

Interventions focused on individuals' socioemotional abilities are important because most workers are in organizations that do not take their personal life involvements into account (Kossek et al., 2014, Karabinski et. al, 2021). Most organizations do not offer WLB programs and even when they do, not all workers are comfortable in depending on their employers for help in managing personal life issues (Kiburz et al., 2017). Thus, individual-focused interventions can help workers develop socioemotional skills so that they can reflect on their own situation and make decisions that can result in better WLB.

In the current literature on individual-focused skills related to WLB and work-family conflict, some of the key concepts being discussed include: (a) boundary management (Boswell et al., 2016), (b) use of institutional resources (Adisa et al., 2016), (c) recovery experiences, and (d) psychological detachment (Sonnentag et al., 2016; Karabinski et al., 2021). Considering studies on the effectiveness of programs designed to help workers develop their socioemotional skills in these areas, one promising approach to promoting WLB seems to be mindfulness-based interventions (MBIs) (Good et al., 2016; Kiburz et al., 2017; Michel et al., 2014; Morganson et al., 2015; Slutsky et al., 2019).

Based on systematic reviews of WLB intervention programs (Vadvilavičius & Stelmokienė, 2020; Waddell et al., 2023), MBIs are currently the programs with the greatest amount of evidence indicating positive effects on WLB. These effects include significant improvements in satisfaction with work-life balance and other constructs associated with well-being, such as reduced conflicts, stress and burnout (Vadvilavičius & Stelmokienė, 2020; Waddell et al., 2023), increased psychological distance from work (Karabinski et al., 2021), and higher quality of marital and work relationships (Ni et al., 2021; Winter et al., 2021).

Mindfulness-Based Interventions (MBIs)

Mindfulness has been defined as the ability to focus on or pay attention to present moment experiences (Brown et al., 2007; Kabat- Zinn, 2013), intentionally observing internal information (e.g. thoughts, bodily sensations,) and external information (e.g. physical and interpersonal environment) without judging these perceptions, "[not] fixating on any particular part of that experience or engaging in any secondary processing" (Mantzios & Giannou, 2019), thereby cultivating a non-reactive and non-judgmental attitude to experience (Kabat-Zinn, 2013).

MBIs are structured training programs that help people develop "mindfulness skills", focussing on skills such as self-regulation of thoughts, behaviors, psychological reactions, and emotions (Ludwig et al., 2020; Schuman-Olivier et al., 2020). Considering that the capacity to self-regulate attention and emotions is a resource that is important for various aspects of life, mindfulness training seems to be a valuable way to enable more effective coping (Allen & Paddock, 2016).

Evidence that supports the beneficial outcomes of mindfulness is predominantly drawn from empirical studies on the Mindfulness-Based Stress Reduction protocol (MBSR) (Kabat-Zinn, 2013). However MBIs can be adapted to take place in different contexts,

structures and formats to meet the needs of specific populations, such as individual-focused and workplace mindfulness programs for employees (Bartlett et al., 2019).

In the context of work-life research, MBIs have gained the attention of professionals and scholars due to results showing significant reductions in perceived stress (Allen et al., 2015) and burnout (Lanz et al., 2019), and increases in work-life satisfaction, well-being (Allen et al., 2015; Eby et al., 2019), psychological detachment from work, and quality of recovery experiences (Karabinski et al., 2021; Michel et al., 2014). Mindfulness training has also been shown to enhance couples' relationship quality (Winter et al., 2021) and to be positively associated with spouse satisfaction (Ni et al., 2021)

Although there is a growing body of evidence on the efficacy of MBIs for improving adults' general well-being and for reducing symptoms of psychological disorders (Goldberg et al., 2021), MBIs have not been extensively researched in the field of organizational psychology (Bartlett et al., 2019). Only recently, researchers have begun to investigate how MBIs can be beneficial for WLB. In 2012, Allen & Kiburz found that individuals who had higher levels of trait mindfulness reported greater WLB. Furthermore, they suggested that the ability to pay more attention to thoughts and feelings, following mindfulness training, should enable people to notice more of the many important activities occurring in their work and non-work roles, contributing to feelings of greater effectiveness and satisfaction. From 2012 to 2023, additional studies were conducted on this theme. A systematic review of the effects of MBIs on workplace behaviors was published (Eby et al., 2019), and a meta-analysis of the effects of MBIs on workplace behaviors was also conducted (Bartlett et al., 2019). However, studies reporting the effects of MBIs on perceptions of work-life balance have not been reviewed.

The present study

Considering that the intervention programs with the greatest amount of evidence that indicates high-quality, positive effects on WLB are MBIs (Vadvilavičius & Stelmokienė, 2020; Waddell et al., 2023), synthesizing data on the effects of mindfulness programs on WLB is important: (a) to clarify what researchers have learned about the relationship between mindfulness and work-life balance, (b) to explain how MBIs have been used to promote WLB, (c) to identify issues that need further investigation, and (d) to produce relevant knowledge for scholars, professionals and decision-makers who wish to implement such programs, to test the replicability of findings from earlier studies, or to compare their program results with those observed for other programs.

In this article we present a systematic review of published studies that used randomized controlled trials to evaluate the effects of mindfulness-based training intervention programs on WLB, and integrated the findings to develop a logical model indicating how MBI programs may contribute to WLB. More specifically, the objectives of our study are to describe: (a) how the programs were structured, considering duration and modes of delivery, (b) how the programs were designed, considering intervention strategies, training components, and dose (expected time of mindfulness practices), (c) acceptability (retention rates) and impacts (considering the effects of the programs on WLB and related outcomes), (d) how the authors of the articles reviewed in the present study described the mechanisms of change involved in their programs, (e) methodological biases, (f) other limitations, and (g) recommendations for future research.

Method

The methods used throughout this review were informed by the updated version of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement (PRISMA) (Page et al., 2021). The review protocol was registered with PROSPERO in September 2021 (CRD42021272128)

Search Strategy and Study Selection

The literature search was conducted using the *Psycnet, PubMed, Web of Science, Scopus, SciELO, Redalyc e BVS Saúde* databases. These databases were chosen to include relevant international and Latin-American electronic libraries.

Publications were last retrieved on the 9th of July, 2023. The search was conducted in English, Spanish, and Portuguese, using the descriptors: ("work-life balance" OR "work-family balance" OR "work-family conflict" OR "work-life conflict") AND "mindfulness" (Table 1).

Table 1.

Descriptors Used to Search for Articles

English	Portuguese	Spanish
work-life balance AND mindfulness	trabalho-vida AND mindfulness	trabajo-vida AND mindfulness
work-family balance AND mindfulness	trabalho-família AND mindfulness	trabajo-família AND mindfulness
work-family conflict AND mindfulness	trabalho-vida AND atenção plena	trabajo-vida AND atención plena
work-life conflict AND mindfulness	trabalho-família AND atenção plena	trabajo-família AND atención plena
	trabalho-vida AND consciência plena	trabajo-vida AND consciencia plena
	trabalho-família AND consciência plena	trabajo-familia AND consciencia plena

The terms balance (*equilíbrio*) and conflict (*conflito*) were not used in the Portuguese and Spanish-language descriptors. The terms "work-life conflict" and "work-life balance" are more recent in the academic literature in these languages, and the literature is less extensive than in English. On the other hand, searches in Portuguese and Spanish included more descriptors because the translation of the term "mindfulness" includes more than one

alternative (e.g. "*atenção plena*" or "*consciência plena*"), and many authors chose not to translate this term.

The electronic libraries were accessed using the *Portal de Periódicos CAPES* platform (https://www.periodicos.capes.gov.br). The descriptors were typed on the basic search field of each database, covering title, abstract and keywords. No filters were used, to maximize the possibilities of finding studies related to MBIs and WLB. The references were exported from each database, and the files were imported to the *Parsif.al* reference manager to initiate the selection process.

PICOS and Exclusion Criteria

The inclusion and exclusion criteria for this study were defined based on the PICOS framework (Higgins et al., 2021). Eligibility criteria included studies with adults (population) who participated in a mindfulness-based intervention study (intervention) compared to a wait-list or an active control group (comparison). Targeted results involved measures of WLB or of similar constructs, such as work-family balance (outcomes), obtained using randomized controlled trials (study design). Articles were excluded if: (a) the authors did not report pre and post-test WLB-related outcomes; (b) the article was not written in English, Portuguese or Spanish; (c) the text was not an article that was published following a blind, peer-reviewed process.

Randomized controlled trials (RCT) were prioritized because this study design is considered the most appropriate to determine the effects of a specific treatment, in intervention research (Hariton & Locascio, 2018). Outcomes considered to be related to WLB were measures that reflect the relationship between work and life demands, such as scales of WLB, work-life conflict (WLC), work-family balance (WFB), work-family conflict (WFC), satisfaction with WLB and strain-based work-family balance. Although other concepts are related to WLB (e.g. stress, burnout), these outcomes were considered to be secondary

outcomes, given that measures of these constructs do not directly address the interaction between work and life domains.

Interrater Agreement

Two independent reviewers assessed information about each of the retrieved texts to decide about their inclusion in this study, achieving good inter-rater agreement (Cohen's k = 0,76, considered as substantial agreement between raters according to Cohen, 1960). During the screening phase, the title and abstract of the texts retrieved from the databases were analyzed. When this information was insufficient to evaluate eligibility, the full article was analyzed. Disagreements were resolved by reaching a consensus or, when necessary, by obtaining a third opinion.

Data Extraction and Synthesis

Each article included in the review was read by two members of the research team, and information was retrieved and recorded in a pre-structured extraction table. Information copied to this table included: study title, authors, study objectives, target population, sample size, theoretical framework, program description, intervention components, duration of program activities, instruments used to evaluate the effects of the program, retention rate, primary outcomes (outcomes related to WLB and Mindfulness), secondary outcomes (others measurements), limitations, and suggestions for future studies described by the authors of each study. This information was shared among the researchers for analysis, synthesis of the main results, and discussion.

Risk of Bias

Risk of bias was assessed using the Risk of Bias 2 (RoB 2, a tool developed by The Cochrane Collaboration for assessing factors that can lead to systematic distortions in the results) for RCTs, following Higgins et al. (2021) guidelines.

Estimates of Effect Size

Standardized mean difference (SMD) effects (e.g. Cohen's *d)* for differences between the intervention and control groups for each outcome were extracted from each of the studies. If these values were not reported, the *SD*s for change scores (SD_{diff}) were determined by dividing the difference between the mean scores on each outcome measure for each group by the pooled within-group standard deviation (Cohen, 1998). In the case of studies that also did not present this data, the SMD was calculated based on the *t*-value and the number of participants, using the formula provided by Rosenthal (1991). Interpretations of the strength of the effect size were made based on Cohen's (1998) guidelines, such that values between 0.20 and 0.49 were rated as weak effects, 0.50 to 0.80 as moderate effects, and values greater than 0.80 as strong effects.

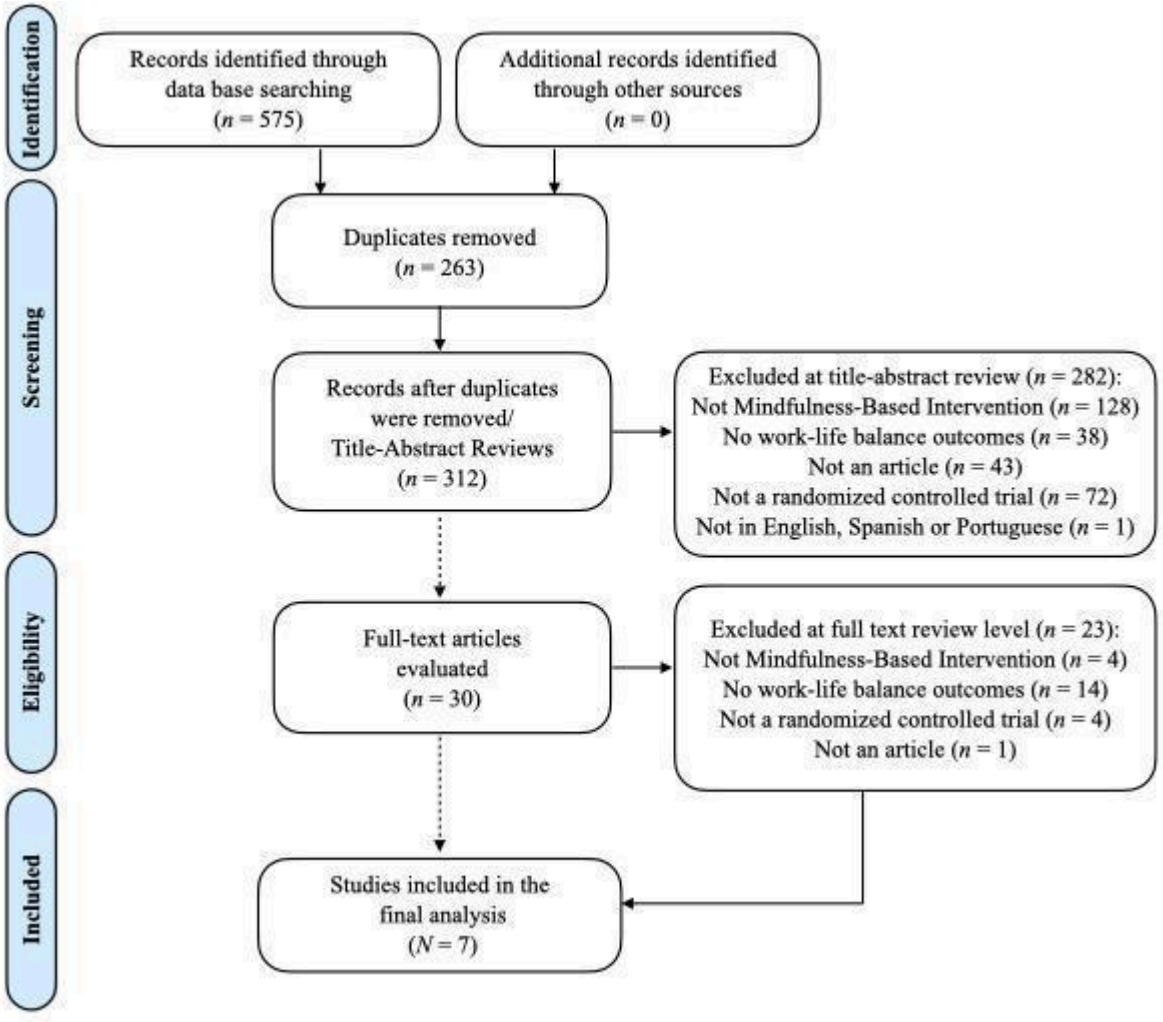
Results

Study Selection

A total of 575 studies were retrieved, but 263 were duplicates. The remaining 311 studies were evaluated using the exclusion criteria (see the PRISMA flow diagram, Figure 1). At the end of this process, seven RCTs were selected, in which mindfulness programs were used as a means of promoting WLB.

Figure 1.

PRISMA Flow Diagram: Criteria used to include and exclude texts



Risk of Bias

The degree of potential bias varied across domains (see Table D and Table E, in Online Resources). The area most commonly rated as having high risk for bias was the measurement of the outcome, due to difficulties in blinding participants and researchers to treatment and outcome assessment, and due to the use of self-report measures (all of the studies). Data analysis methods were considered appropriate to evaluate adherence to the intervention programs, however, when looking at assignment to intervention, some studies were considered biased due to the use of per-protocol analysis (i.e., a comparison of treatment and control groups that includes only those participants who completed the study and complied with all its key elements), instead of more reliable methods, such as Intention-to-Treat Analysis (Andrade, 2022). Bias related to selective reporting is unclear because study trial

protocols and analysis intentions were not available, which are needed for this assessment.

Overview of the Studies

In Table 2, methods, intervention process, and key findings for each study are presented. The studies were published between 2014 and 2023 and included a total of 848 participants who completed the pre and post-test measures.

[Insert Table 2]

Research design. In four of the studies, results were compared for those who participated in an MBI program versus those in a wait-list control group. In three other studies, MBI participants were compared with active controls: Slutsky et al. (2019) compared a high dose with a low-dose MBI group;Althammer et al. (2021) compared an MBI group with a self-monitoring group (participants completed daily questionnaires); and Nicklin et al. (2023) compared participants who all received writing prompts and self-reflection activities but participants in the intervention group completed statements on three components of self-compassion (mindfulness, common humanity and self-kindness) while the control group participants did not.

All of the programs were adaptations of traditional MBI programs (see Table 2). Some mixed mindfulness-based stress reduction exercises (MBSR) with cognitive training exercises (MBCT) (Althammer et al., 2021; Michel et al., 2014). Others used MBSR combined with other interventions, such as behavior self-monitoring (BSM) exercises (Kiburz et al., 2017), or the Google Search Inside Yourself program (SIY) (Mellner, 2022). One program was based on the Unified Mindfulness System (Slutsky et al., 2019), one study used the Headspace App (Rich et al., 2021), and one study adapted activities from the Mindful Self-Compassion Program (MSC) (Neff & Germer, 2013). Considering that Althammer et al. (2021) and Michel et al. (2014) evaluated the same intervention program, six different programs were analyzed in this review.

Sample characteristics. Samples in each of the studies varied in: (a) size (from 54 to 246 participants), (b) composition – employees in various occupations (Michel et al., 2014; Althammer et al., 2021), workers from specific contexts (e.g. university employees) or from specific companies (e.g. a digital marketing company) – and (c) average age (the mean age of the participants varied from 30.5 to 54.5 years). Participants were predominantly Caucasian, female, had a university degree and were married or living with a partner. In studies in which parenting involvements were verified, 30 to 82.5% of the participants reported having children in their households.

Duration. Duration of the intervention programs ranged from two weeks to two months. During this time period, participants needed to attend information sessions, complete individual practice tasks, and do homework assignments, as detailed in Table 2.

The Intervention Process

Intervention strategies and modes of delivery. Most of the programs included: (a) information sessions, (b) individual practice tasks, and (c) homework assignments (Table 2).

***Information sessions*.** Training sessions lasted from 20 minutes to half a day (a single session, in this case), and occurred in face-to-face group contexts (Kiburz et al., 2017; Slutsky et al., 2019; Mellner et al., 2022), online (Althammer et al., 2021; Michel et al., 2014; Rich et al., 2021; Nicklin et al. 2023), or by mixing face-to-face group sessions with recorded online content (Slutsky et al., 2019). Materials provided for participants included written materials on mindfulness and WLB, practice sheets (e.g., diary, goal sheets), audio recordings, videos, interactive quizzes, prompts and self-reflection writing activities.

Table 2.
Overview of the Studies: *Methods, Intervention Process, and Key Findings*

	Michel et al. (2014)	**Kiburz et al. (2017)**	**Slutsky et al. (2019)**	**Althammer et al. (2021)**	**Rich et al. (2021)**	**Mellner et al. (2022)**	**Nicklin et al. (2023)**
Country	Germany	United States	United States	Germany	United Kingdom	Sweden	United States
Program	Self-training adapted from MBSR and MBCT	Adapted MBSR workshop and BSM exercises	Adapted from the Unified Mindfulness System	Adapted version of Michel et al. (2014)	Headspace® App	MBSR combined with SIY (Tan, 2012)	Adapted from MSC (Neff & Germer, 2013)
Control Group	Wait-List	Wait-List	Low-dose of mindfulness	Self-monitoring	Wait-List	Wait-List	Writing prompts, self reflection activities
Sample Size	412 pre-test IG = 208; CG = 204 246 post-test IG = 96; CG = 150 191 follow-up IG = 67; CG = 124	102 pre-test IG = 53; CG = 48 78 post-test 78 follow-up	60 pre-test IG = 29; LG = 31 54 post-test IG = 27; LG = 27	332 pre-test IG = 164; CG = 168 190 post-test IG = 80; CG = 110	125 pre-test IG = 62; CG = 63 101 post-test IG = 45; CG = 56	40 pre-test IG = 20; CG = 20 39 post-test IG = 20; CG = 19 36 follow-up IG = 18; CG = 18	146 pre-test IG = 73; CG = 73 140 post-test IG = 71; CG = 69 144 follow-up IG = 73; CG = 71
Sample Information	Employed adults in various occupations Mean age = 41.4 (SD = 9.40) 71.1% women – 80.5% university graduates 80.1% married or cohabiting 32.5% had children in their household	Employees from a university and a college Mean age 45.0 (SD = 10.61) 79.4% women 79.4% Caucasian – 94,1% married or cohabiting 55.9% children in their household	Workers from a digital marketing company Mean age 30.5 (SD = 7.8) 66.7% women 95.0% White 72.7% university graduates 46.6% married	Employed adults in various occupations Mean age 42.2 (*SD* = 10.72) 75.3% women – 74.2% university graduates 76.8% married or cohabiting 30.0% had children in their household	Employees at a higher education institution No information on mean age 69.6% women – 78.4% university graduates 72.8% married or cohabiting	Managers from a telecom company Mean age 54.53 (*SD* = 5.13) 42.5% women – 85% married or cohabiting 82.5% children in their household	Alumni from a private university Mean age 40.78 (*SD* = 9.43) 68.5 % women 84.2 % White – 87.0% married or cohabiting 78.8% had children in their household

	Michel et al. (2014)	Kiburz et al. (2017)	Slutsky et al. (2019)	Althammer et al. (2021)	Rich et al. (2021)	Mellner et al. (2022)	Nicklin et al. (2023)
Duration	3 weeks 1 module with 20-min information per week 3-5 min of mindfulness practices per day, 5x per week	2 weeks 1 hour mindfulness workshop followed by 13 days of BSM	6 weeks IG & LG: 3-day experience sampling and diary assessment + one half-day mindfulness workshop IG: 10 videos (5 – 10 min each) training series, followed by 10-15 min interactive quizzes, 25-min daily mindfulness practice + post practice survey, 5 days/week. 15 min one-on-one call about participants' experiences	3 weeks 1 module with 20-min information per week 3-5 min of mindfulness practices per day, 5x per week IG & CG: daily measurements	2 months 30 sessions of 10 min available with no minimum target number of sessions + sessions could be repeated	8 weeks IG: 2.5-h session per week 5-40 min daily practice at home	10 days daily writing prompts, self-reflection activity on days 1, 4, 7 and 10, with texts three times per day.
Mode of Delivery	E-mail delivered written materials and audio recordings	In-person workshop, written material, diary, goal sheets, and e-mailed audio recordings	In-person workshop, internet-based videos, interactive quizzes and audio recordings	E-mail delivered written materials. Audios available on project's homepage	App-delivered video and audio recordings	In-person group sessions, app-based audio recordings	Phone texts delivering prompts and self-reflection activities

	Michel et al. (2014)	Kiburz et al. (2017)	Slutsky et al. (2019)	Althammer et al. (2021)	Rich et al. (2021)	Mellner et al. (2022)	Nicklin et al. (2023)
Intervention Strategies	Readings about segmentation of work and non-work domains, self-regulation of attention and mindful orientation to experiences combined with practical exercises based on MBSR and MBCT + Audio recorded mindfulness practices	Workshop with information, discussions,and reflections on mindfulness and how to integrate practices in everyday tasks BSM diary and goal sheets + Audio recorded mindfulness practices	Workshop with information on how to practice mindfulness during everyday activities, Video training series on principles of practice combined with quizzes + Audio recorded mindfulness practices	Same as Michel et al., (2014) + self-monitoring and self-education mindfulness guidebooks	Audio and Video exercises on breathing awareness, body scans, focus, motivation, and intentions, available via app	Structured group sessions focused on mindfulness, stress reduction, work-place mindfulness and emotional intelligence + Audio recorded mindfulness practices	Writing prompts and self-reflection activities (to describe something that happened over the last 3 days, related to work or family and how the event made them feel) followed with statements including the three components of self-compassion (mindfulness, common humanity and self-kindness).
Homework Practices	Evaluating daily detachment 3 min breathing space exercise[1] 4 min mindfulness of thoughts (passing clouds exercise)[2]	10 min sitting meditation: mindfulness of the breath[3] 10 min body scanning[4] 10 min walking meditation[5] Self-monitoring of mindfulness behaviors Set goals to increase frequency	25 min sitting meditation[6] 25 min five mindfulness techniques (not specified, participants could choose) 2 min survey on chosen practice and its context Informal mindfulness practices (during conversations, while eating, listening to music, etc)	Same as Michel et al. (2014) + Briefly daily surveys on mindfulness, detachment,WLB, and affective well-being.	Listening to app audios (no specific assignment)	5-40 min app-based daily practices (not specified) Informal mindfulness practices (mindful listening and speaking, a minute of silence before meetings, mindful eating, and noticing experiences)	3 writing prompts on Days 2, 3, 5, 6, 8, and 9. 2 writing prompts and 1 self-reflection activity on Days 1, 4, 7, and 10.
Minimum expected time of practice	45-75 min over 21 days	No details on practice time	750 min over 6 weeks M = 303 min SD = 236 min	45-75 min over 21 days	100 min over 2 months M = 312 min (*SD* not available)	280- 2240 min over 8 weeks	No information on activity duration

	Michel et al. (2014)	Kiburz et al. (2017)	Slutsky et al. (2019)	Althammer et al. (2021)	Rich et al. (2021)	Mellner et al. (2022)	Nicklin et al. (2023)
Retention Rates	Pre to post: 59% IG 54.3%, CG 73.5% Pre to follow-up: 77% IG 36.5%, CG 60.8% Dropouts more likely to be single, younger, higher on self-efficacy	Pre to post: 76% Returned diaries (after 13 days): 58% IG 62%; CG 54%	Pre to post: 90% IG 93%; CG 87%	Pre to post: 57% IG 49%; CG 67% Dropouts were younger	Pre to post: 80% IG 73%, CG 89%	Pre to post: 97% IG 100%,CG 95% Pre to follow-up 90% IG 90%, CG 90%	Pre to post: 95,8% IG 97.2%, CG 94.5% Pre to follow-up: 98,6% IG 100%, CG 97.2% Compliance to activities: 92.3% - prompts 95.1% - self-reflection
Pre to post-test outcomes	Increased Mindfulness (d = 0.21) Psychological detachment from work (d = 0.26) Satisfaction with WLB (d = 0.25) Decreased strain-based WFC (d = 0.44)	Increased Mindfulness (d = 0.33) Decreased WFC (d = 0.26) Greater effects among those who returned the diaries No significant results FWC	Increased Momentary attentional focus (d = 0.68) Job satisfaction (d = 0.28) Decreased WLC (d =0.22) No significant results LWC	Increased Mindfulness (d = 0.30) Psychological detachment from work (d = 0.56) Satisfaction with WLB (d = 0.35). Decreased Negative affect for IG and CG (d =0.42) Psychological WFC for IG (d = 0.30) No significant results Strain-based WFC	Increased Total mindfulness (d = 0.77) Acting with awareness (d = 0.57) Nonreactivity (d = 0.50) Non Judgment (d = 0.70) Satisfaction with WLB (d = 0.46) Emotional aspect of job engagement (d = 0.46) Decreased perceived stress (d = 0.55) No significant results citizenship, curiosity, intention to quit, describing and observing	Increased Mindfulness (d = 0.36) Psychological detachment (d = 0.39) WLB (d = 0.12) Work- nonwork boundary control (d = 0.17) Decreased Job demands (d = 0.15) Job resources (d = 0.38) .	Increased WFB (d = 0.14) Self-compassionate behaviors (d = 0.40) Decreased WFC (d = 0.06) No significant results FWC and strain-based WFC
Post-test to follow-up	All outcomes maintained at 2-week follow-up	All outcomes maintained at 2-week follow-up	No follow-up	No follow-up	No follow-up	All outcomes maintained at the 6-months follow-up	All outcomes maintained at 1-month follow-up

Notes: MBSR = Mindfulness-Based Stress Reduction; MBCT = Mindfulness-Based Cognitive Training; BSM = Behavioral Self-monitoring; IG = Intervention Group; CG = Control Group; LG = Low-dose Group; MSC = Mindful Self-Compassion Program; SIY = Google Search Inside Yourself program; WFC = Work-Family Conflict; FWC = Family-Work Conflict; WLC = Work-Life Conflict; LWC = Life-Work Conflict; WLB = Work-Life Balance; WFB = Work-Family Balance.

[1] Breathing space exercise: three-step practice, first individuals focus their attention on thoughts, emotions, and physical sensations, noting and accepting these experiences as they are, as if they were weather patterns in the mind and body. Second, they narrow their attention to focus only on their breathing. Third, they widen their attention again, to include the whole body.

[2] Mindfulness of thoughts (passing clouds exercise): practice focused on awareness of thoughts and feelings as events in the mind, noticing them arise, develop, and pass away, picturing them coming and going like passing clouds.

[3] Sitting meditation - mindfulness of breathing: sitting meditation with awareness of breathing as the primary object of attention.

[4] Body scanning: practice focused on bringing awareness to each part of the body.

[5] Walking meditation: practice focused on using the movements and sensations of walking to focus on the present.Iindividuals are invited to walk, knowing that they are walking, feeling and being with each step, without any destination.

[6] Sitting meditation: seated mindfulness practice that can be focused on awareness of one's breathing, body, thoughts, or on sounds; descriptions of mindfulness practices retrieved from Segal, Williams & Teasdale (2013).

Individual practices. The most common practices used in the programs were formal meditation (i.e. intentionally reserving a period of time for practicing, using a recording or self-instructions), and breathing exercises (e.g. a 3-minute breathing exercise) (see Table 2). Decentering practices were included in Althammer et al.'s (2021) and Michel et al.'s (2014) program (e.g., 4-minute awareness exercise); body scanning and walking meditation practices were used in Kiburz et al.'s (2017) intervention program. Other authors did not provide detailed information specifying which mindfulness techniques were used with their study participants.

Informal practices (i.e. practicing throughout the day while doing other activities) were encouraged in three programs. Kiburz et al. (2017) asked participants to set goals for using mindfulness behaviors in their daily life (e.g., attending to sensorial information, experiencing walking rather than rushing, etc). Slutsky et al. (2019) and Mellnner et al. (2022) trained mindfulness practices that could be incorporated into participants' daily activities (e.g., practicing during conversations, while eating, or while listening to music).

Although other researchers did not explicitly mention practice activities, they had features that may contribute to incorporating mindfulness activities into participants' work and non-work lives. Rich et al. (2021) used the Headspace App, which has a pleasing design and notifications to encourage participants to practice. Althammer et al. (2021) and Michel et al. (2014) focused on three-to-five-minute practices that should be performed in the transition from work to non-work roles, facilitating participants' disengagement from the previous role and engagement in the next context. Nicklin et al. (2022) worked exclusively with brief writing exercises, focused on reflecting on daily events, an activity that can also be considered an informal practice.

Homework assignments. Individual practice of mindfulness exercises, at home, was a key feature in all the programs (see Table 2). These practices were combined with

self-monitoring of mindfulness behaviors (e.g., daily evaluations of detachment, BSM diary, register of the techniques practiced, writing about daily events and emotions). With the exception of Nicklin et al. (2023), all of the programs provided audio recordings for guided practices, ranging in length from 3 to 40 minutes.

Dose. Considering that the amount of practice time could affect the results, it is important to verify how much time participants spent in sessions and activities at home. When available, information about the duration of homework practices was used to calculate the "minimum expected time of practice" (see Table 2), which varied from 45 minutes over a three-week period (about 2 minutes a day) to 706 minutes over a six-week time span (about 17 minutes a day). Studies that did monitor participants' involvement in practice activities reported an average of 303 to 312 minutes of practice over 6 to 8 weeks.

Intervention content. As described in Table 2, the MBI program content was varied. Althammer et al. (2021) and Michel et al. (2014) offered programs that were focused on the segmentation of work and non-work domains mixed with conceptual explanations of skills that can be developed through mindfulness practices (self-regulation of attention and mindful orientation to experiences). Other programs did not include content that explicitly addressed the use of mindfulness practices to work on WLB issues. The intervention programs offered by Kiburz et al. (2017) and Slutsky et al. (2019) used conceptual explanations, discussions and reflections related to mindfulness and how to integrate specific practices into everyday tasks. The program developed by Rich et al. (2021) (The Headspace App) was designed for general purposes for a non-specified population. Mellner et al. (2022) used MBSR components related to workplace mindfulness and emotional intelligence from the Google Search Inside Yourself program (SIY, Tan, 2012). And Nicklin et al. (2023) worked with mindfulness as one component of the self-compassion construct focused on work and life events, but the program did not address the interplay between work and non-work roles.

More detailed descriptions of the content of each program are available in Table A in the Online Resources.

Program Outcomes

Retention Rates. As can be seen in Table 2, retention rates (from pre to post-test) varied across studies, from a low of 57% to a high of 97%. Retention rates were higher for the programs: (a) that were longer in duration or in which there was more frequent contact with the participants (Nicklin et al. (2023) sent three texted daily reminders), and (b) that had varied homework assignment formats, such as videos, audio-recorded practices, interactive quizzes and self-monitoring tools (e.g., diary, goal sheets, questionnaires on practices, writing prompts and self-reflection activities). Higher retention rates (76 to 97%) were also associated with: (c) app-based interventions, (d) interventions that had at least one in-person session, (e) programs in which participants could choose which exercises to practice or (f) choose when to practice (see Table 2).

When the program materials were sent by email, retention rates were lower (57 to 59%). In addition, compared to those who completed the programs, dropouts: (a) were younger (Althammer et al., 2021; Michel et al., 2014), and were more likely (b) to be single and (c) to have higher self-efficacy (Michel et al., 2014). However, differences in study inclusion criteria may have affected retention rates, given that studies with higher dropout rates were the ones with larger and more heterogeneous samples.

WLB Outcomes. The most consistent findings concerning the effects of MBIs on indicators of WLB were improved WLB (Nicklin et al., 2023) or greater satisfaction with WLB (Althammer et al., 2021; Michel et al., 2014; Rich et al., 2019), decreased work-family or work-life conflict (Kiburz et al. 2017; Slutsky et al., 2019; Nicklin et al., 2023) and improved psychological detachment from work (Althammer et al., 2021; Michel et al., 2014; Mellner et al., 2022) - a subscale of the Recovery Experience Questionnaire that refers to behaviors of

being mentally disengaged ("switching off") from work roles during time off (Sonnentag, 2007, 2012).

Other findings related to work-life outcomes were a decrease in time-based WFC (Nicklin et al., 2023), and improvements in work-nonwork boundary control (Mellner et al., 2022). Michel et al. (2014) found significant reductions in strain-based WFC, but Althammer et al. (2021) and Nicklin et al. (2023) did not.

In most of the studies, only the effects of MBIs on work interference with other parts of life were evaluated. When the researchers assessed interferences between work and other life involvements in both directions, they did not find significant results for the family-work and life-work direction (Kiburz et al. 2017; Slutsky et al., 2019; Nicklin et al., 2023).

More detailed information about the instruments used to assess these and other outcomes are available in Table B in Online Resources.

Mindfulness. Participants' mindfulness skills increased from pre to post-test in all the studies and these gains were maintained, based on follow-up studies conducted two weeks to six months after the end of the programs (Table 2). Rich et al. (2021) reported findings that were significant for some aspects of mindfulness (acting with awareness, nonreactivity and non-judgment) but not for others (describing and observing) and Kiburz et al. (2017) found significant associations between using a mindfulness behavior focused on breathing and less work-family conflict.

***Other outcomes*.** Other, less frequently examined outcomes included measures of negative affect (negative emotions such as feeling sad, angry, irritated, etc), job engagement, perceived stress, citizenship, curiosity, intention to quit, job resources, and job demands. Significant effects were reported for improvements in the emotional aspect of job engagement, as well as for reductions in perceived stress (Rich et al., 2021) and job demands (Mellner et al., 2022).

Significantly greater reductions in negative affect were found for the intervention group than for the control group, but both groups reported improvements (Althammer et al., 2021).

Effect sizes and training dose. Effect sizes for the measures of work-life outcomes varied from 0.22 to 0.46, indicating small to moderate effect sizes. Effect sizes for measures of mindfulness outcomes varied from 0.21 to 0.77, also indicating small to moderate effect sizes. The HeadSpace App (Rich et al., 2019) presented the largest effect sizes for both outcomes (satisfaction with WLB and mindfulness), associated with a minimum dose of 100 minutes of practice (M = 312 min) during two months. In addition to these outcomes, effect sizes for measures of psychological detachment from work varied from 0.26 to 0.56, with the strongest effects being found in the Althammer et al. (2019) study.

Mechanisms of change

The mechanisms of change described in each study are presented in Table 3. These mechanisms were checked to clarify if these were proposed based on the researchers' own study results, or if they were inferred by the authors, based on their review of prior studies. Self-regulation of attention (Althammer et al. 2021, Kiburz et al., 2017, Michel et al., 2014, Rich et al., 2021, Slutsky et al., 2019, Mellner et al., 2022; Nicklin et al., 2023), self-regulation of emotions and behaviors (Kiburz et al., 2017, Rich et al., 2021, Mellner et al., 2022, Nicklin et al., 2023), decentering (Althammer et al. 2021, Michel et al., 2014, Rich et al., 2021), improved proactive behaviors, relationships and cognitive performance (Rich et al., 2021, Mellner et al., 2022) were the main mechanisms reported that were understood to be contributing to people's ability to make adjustments or other changes in their lives that would affect their perceptions of WLB. [Insert Table 3] [Insert Figure 2]

The three mindfulness models most frequently used in the studies under review were: the Bishop et al. (2004) two-component model of mindfulness, the Hölzel et al. (2011) conceptual and neurological model of mindfulness mechanisms, and the Good et al. (2016)

framework on how mindfulness influences human functioning in organizational contexts. Considering that these models are compatible with respect to their focus on the attentional and emotional processes involved in mindfulness practices, their key ideas were integrated and are presented in Figure 2. The Erisman and Romer (2010) model was not included in the conceptual model because their study does not propose a model involving mechanisms of change, and the Neff Germer (2013) model was not included because they work with the self-compassion construct, in which mindfulness is only one of the components.

Bishop et al. (2004) proposed that mindfulness practices have two core operational components: (a) self-regulation of attention and (b) orientation to experience. *Self-regulation of attention* was described in the Good et al. (2016) framework, using the term "attention stability". Self-regulation of attention involves: (a) sustained attention, required to maintain awareness of an ongoing experience (e.g., focusing attention on breathing), (b) switching, which involves the ability to shift one's focus from one stimuli to another (e.g., noticing when one's attention has wandered to another stimuli and being able to bring it back to the intended focal point, such as breathing), and (c) inhibiting secondary elaborative processing of observed thoughts, feelings, and sensations (e.g., noticing when one's attention has wandered to a second stimuli and interrupting thoughts regarding the new object of attention, to refocus on the intended stimuli).

Orientation to experience, on the other hand, refers to the ability to be "psychologically open" towards something that is happening, and this ability can be developed during mindfulness exercises. This ability is described as involving: (a) interest in or curiosity about what is being observed, (b) acceptance (i.e., being open to the reality of the present moment), (c) non-judgment of experiences, and non-striving (i.e., not trying to change or avoid experiences, and simply observing cognitions, emotions, or sensations as they come and go). Researchers also refer to this set of skills using the term "decentering",

“metacognitive monitoring” or “meta-awareness”, to describe people’s capacity to shift experiential perspective, psychologically distancing themselves from an immediate subjective experience and adopting a more objective, non-identified awareness of one’s experience. Thoughts are perceived to be just thoughts, transient and insubstantial mental events rather than accurate representations of reality (Schuman-Olivier et al., 2020).

Most mindfulness practices help people train both self-regulation of attention and orientation to experience skills. However, different types of practices may involve different levels of each skill set (e.g., open-awareness practices require more orientation to experience and decentering skills than self-regulation practices such as focusing on breathing.

Table 3.

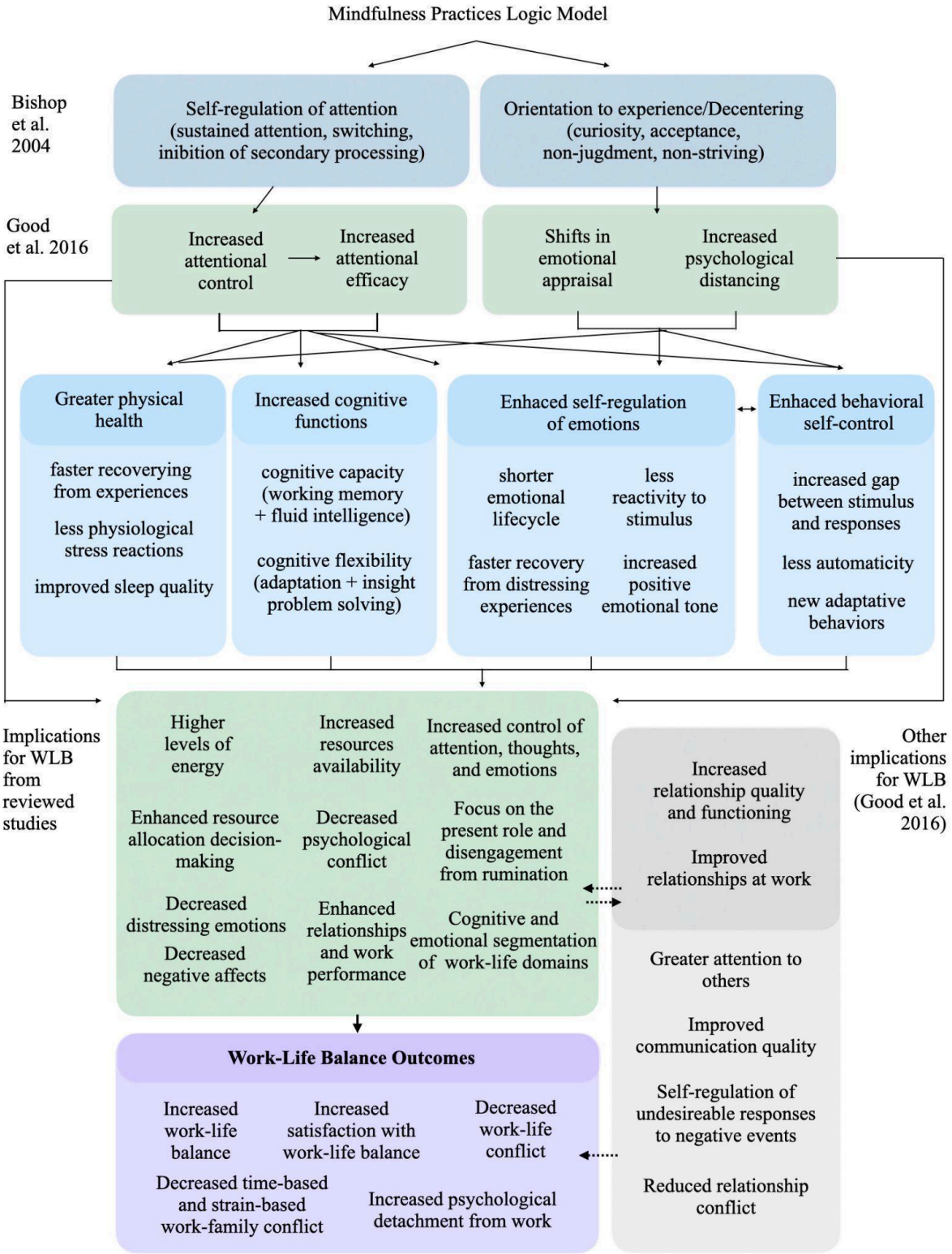
Summary of Proposed Mechanisms of Change: How Mindfulness Affects Work-Life Balance

Study	WLB theory	Mindfulness	Proposed Mechanisms of Change	Evidence for mechanisms
Michel et al. (2014)	Boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996)	Two-component model of mindfulness (Bishop et al., 2004)	The self-regulation of attention helps individuals to cognitively and emotionally segment their work-life domains, increasing psychological detachment from work as well as increasing their satisfaction with WFB. The decentering aspect of orientation to experiences improves individuals' energy levels and their ability to deal with distressing emotions, decreasing strain-based WFC.	Increased psychological detachment. Increased satisfaction with WLB. Decreased strain-based WFC.
Kiburz et al. (2017)	Conservation of resources theory (ten Brummelhuis & Bakker, 2012)	Erisman & Roemer (2010) model	Mindfulness improves self-regulation of attention, emotions, and behaviors, which improve WLB through improvements in the ability to engage in constructive decision-making, resulting in improved allocation of resources.	Increased WLB. Association of mindfulness-based behaviors with WLB.
Slutsky et al. (2019)	Not reported	Good et al. (2016)	Mindfulness improves focus of attention, increasing capacity to meet work demands and to reduce work-related cognitions during non-work time, decreasing WLC.	Increased attentional focus. Decreased work-life conflict.
Althammer et al. (2021)	Boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996)	Two-component model of mindfulness (Bishop et al., 2004)	The ability to redirect one's attention helps people to focus and to disengage from rumination, decreasing psychological conflicts and increasing psychological detachment from work, increasing satisfaction with WLB. Decentering makes emotional distress less unpleasant, reducing negative affect and increasing energy needed, reducing strain-based WFC and increasing satisfaction with WLB.	Decreased psychological conflict. Increased psychological detachment. Increased satisfaction with WLB. Greater decrease in negative affect in the IG than in the CG.
Rich et al. (2021)	Not reported	Good et al. (2016)	Mindfulness improves cognitive performance, emotional and behavior regulation through increased ability to maintain a given focus of attention, coupled with greater ability to use decentering. This leads to enhanced relationships and work performance, supporting WLB.	Decreased perceived stress. Increased WLB. More positive emotional aspect of job engagement.
Mellner et al. (2022)	The job demands-resource model (Demerouti et al., 2001; Bakker & de Vries, 2021)	Hölzel et al. (2011)	Mindfulness improves psychological resources, enhancing self-efficacy in managing negative emotions, leading to perceptions of lower work stress, improvements in psychological detachment, emotional intelligence and proactive behavior, helping individuals to recognize and regulate their fatigue, increasing WLB.	Decreased negativity about job demands. Increased psychological detachment. Work-nonwork boundary control. Increased WLB.
Nicklin et al. (2023)	Conservation of resources theory (Hobfoll, 2022) Broaden and build theory (Fredrickson, 1998, 2001)	Mindful Self-compassion (Neff & Germer, 2013)	Self-compassion and mindfulness broaden the scope of attention, cognition, and behavior, contributing to a range of personal resources that assist with coping and performance-based pressures. Gaining resources allows individuals to gain, attain and retain other resources that can promote perceptions of greater WLB, over time.	Increased WLB. Decreased work-family conflict. Decreased time-based work-family conflict.

Notes: WLR = Work-life research; WLB = Work-life Balance; WFC = Work-Family Conflict; WLC = Work-life conflict; IG = Intervention Group; CG = Control Group

Figure 2.

Logic model indicating connections among mindfulness practices, components, mechanisms and outcomes (developed by the authors).



Hölzel et al. (2011) suggested that mindfulness works through four mechanisms. However, these mechanisms are quite similar to the components proposed by Bishop et al. (2004). Two of them are related to self-regulation of attention, namely: attention regulation and body awareness (focused attention on internal experiences). The other two can be associated with the component of orientation to experience, referring to: (a) shifts in emotional regulation (approaching emotional reactions nonjudgmentally, with acceptance; exposing oneself to whatever is present in the field of awareness; letting oneself be affected by it and refraining from internal reactivity), and (b) changes in perspective with respect to oneself, experienced through metawareness (observing the contents of the mind, people come to understand that their thoughts and feelings are constantly changing and thus are transient).

According to the evidence-based review conducted by Good et al. (2016), improved self-regulation of attention based on mindfulness improves attentional control (i.e., appropriately directing attention amid competing demands) and attentional efficacy (i.e., more efficient and economical use of cognitive resources), while components related to orientation to experience facilitate shifts in emotional appraisal (i.e., more neutral and descriptive evaluations instead of interpretative ones) and increases psychological distancing (i.e., decentering). These effects are related to a series of other improvements in physical health, cognitive function, self-regulation of attention, and increased behavior control (Figure 2).

When describing models of WLB, researchers have proposed mechanisms that are based on the conservation of resources theory (ten Brummelhuis & Bakker, 2012; Hobfoll, 1989, 2002), the broaden and build theory (Fredrickson, 1998, 2001), the job demands-resource model (Demerouti et al., 2001; Bakker & de Vries, 2021) and boundary theory (Ashforth et al., 2000; Nippert-Eng, 1996).

Based on the studies reviewed in this paper, mindfulness is thought to improve WLB by increasing people's abilities to reflect carefully and make decisions with respect to resource allocation (Kiburz et al., 2017), and due to the increased availability of psychological resources (Slutsky et al., 2019; Mellner et al., 2022; Nicklin et al., 2023), considering that MBIs lead to improvements in attentional control and attentional efficacy. The model indicating that mindfulness contributes to higher energy levels (Althammer et al. 2021, Michel et al. 2014) is supported by evidence for improved sleep quality, reduced stress responses, and faster physical and psychological recovery from distressing experiences.

Theories related to increased control of attentional focus with respect to thoughts and emotions (Kiburz et al., 2017; Slutsky et al., 2021; Nicklin et al., 2023) fit with the contributions of mindfulness training, which is associated with improvements in attentional, emotional, and behavioral self-regulation. Increased satisfaction with WLB as a result of decreases in negative affect (Althammer et al., 2021), decreases in distressing emotions (Althammer et al., 2021; Michel et al. 2014) and decreases in psychological conflict (Althammer et al., 2021) are supported by MBI outcomes such as the shorter duration of emotional reactions, faster recovery from distressing experiences, less reactivity to stimuli, and increased positive emotional tone. Enhanced well-being, relationships, and work performance (Rich et al., 2021) seem to be related to outcomes involving better attentional and cognitive functioning, leading to more adaptive and self-controlled behaviors. Lastly, focus on the present, disengagement from rumination (Althammer et al., 2021), and cognitive and emotional segmentation of work-life domains (Althammer et al., 2021; Michel et al. 2014; Nicklin et al., 2023) may be facilitated by abilities such as the self-regulation of attention and orientation to experience components of mindfulness.

In addition to mechanisms mentioned in the reviewed articles, Good et al. (2016) highlighted that MBI leads to improvements in couples' relationship quality (satisfaction, relatedness, closeness, acceptance of the partner) and improved relationships at work, which are

explained by the effects of mindfulness involving greater ability to pay attention to others, improved communication quality, greater expression of other-related emotions (e.g., empathy), better self-regulation of undesirable responses to negative events, reduced relationship conflict, and reduced emotional reactivity. Considering that WLB is strongly associated with relationship quality (Akinrole & Ojo, 2020), these mechanisms should be investigated in experimental studies.

Limitations of the studies and suggestions for future studies

Frequently reported limitations included sampling problems (such as the use of convenience samples), absence of trait mindfulness measurements, and lack of information about whether participants completed homework exercises. The use of self-report measures was highlighted as a limitation in almost all of the studies, considering that although it is important to evaluate whether people are satisfied with their WLB and other subjective measures, it is also important to verify the impacts of MBIs on more objective work-related measures (e.g., indicators of productivity, days off due to illness, and turnover) (Rich et al., 2021), and to include third-party ratings (Althammer et al., 2021) that are also important for verifying possible negative effects on other people and workplace productivity.

Other suggestions for future research included learning more about the effects of dose, mode of training (daily or weekly mindfulness training programs, singular or varied mindfulness techniques) and delivery (e.g., online-based self-help training programs designed for single individuals, colleagues, or couples, compared with in-person group sessions in classrooms). In addition, the use of smartphone applications may improve program efficiency (Kiburz et al., 2017). Research on these factors is needed to understand how to improve the transfer of mindfulness practices to everyday life situations (Kiburz et al., 2017).

Authors of the studies under review also pointed to the need for future research on interpersonal differences, to understand possible relationships between the effects of MBIs and

characteristics of the activity, the person, and the workplace (Michel et al., 2014; Rich et al., 2021). Lastly, the authors pointed to the importance of evaluating long-term changes derived from MBIs, including assessments of the extent to which participants continue to engage in mindfulness practices after participating in an MBI program (Kiburz et al., 2017). Adding to this idea, Nicklin et al. (2023) called for research focused on understanding the null effects of MBIs on workplace outcomes when people make changes in family routines or in other dimensions of their personal life. A complete data set of the limitations and suggestions encountered in each of the studies is available in Table C, in Online Resources.

Discussion

This paper provides a systematic review of randomized controlled trial studies in which the effects of mindfulness-based intervention programs on outcomes involving work-life balance were evaluated. As will be discussed in further detail below, in the current study, information was synthesized about methods used in the studies under review, key aspects of the programs, acceptability of the programs (based on retention rates), effects on WLB and related outcomes, theoretical discussions about links between mindfulness and WLB, as well as limitations and recommendations for future research. As a means of integrating theoretical information presented in each of the studies, a theory of change, or logic model, indicating how MBIs may contribute to WLB was also developed.

The small number of studies that met the selection criteria suggests that the use of RCTs to evaluate the effects of mindfulness training programs on WLB outcomes is still in its infancy, compared to the evaluation of other organizational outcomes resulting from mindfulness training programs (Bartlett et al., 2019). Although mindfulness-based self-regulation and cognitive

training have been key components in the design of training programs, there is considerable variability regarding intervention content, duration and modes of delivery.

Program acceptability

Considering that retention rates were higher for the more in-depth training programs, programs with varied activities, app-delivered programs, programs that had at least one in-person session, and MBIs in which participants practiced individually, it appears that the acceptability of programs can be maximized by using these strategies. Research to investigate the effects of different program features on retention rates is also recommended, to clarify which strategies are most strongly related to ratings of program acceptability.

Participant profile

Given that the majority of the participants in the studies conducted, to date, were Caucasian, female adults between 30.5 to 54 years, who had a university degree and were married or living with a partner, our findings may be more accurate for this segment of the population of interest. More studies are needed to increase our understanding of the usefulness of these programs for socially vulnerable groups (e.g., single parents, employees in danger of burnout, or employees in emotionally or cognitively demanding jobs) (Michel et al., 2014), as these life conditions may affect people's availability to participate in these programs, limiting our understanding of program acceptability and its effects.

Researchers are also encouraged to assess additional variables that may have a significant and direct impact on WLB, such as work-life segmentation preferences (the extent to which people prefer to define distinct times for their work and personal life activities), the number and age of children in the participants' households (Allen et al., 2021; Schieman et al., 2021), and how many hours people dedicate to caring for others (e.g., children, elderly family members, or others) (Peng et al., 2020). This information would help identify situations that can make it more difficult to participate in MBI programs, and clarify whether MBIs are universally beneficial, as

skill-building programs that are helpful to most people can be scaled up for the general population.

Effects of MBIs on WLB and related outcomes

Significant effects of the programs on WLB outcomes were observed in all of the studies. Findings indicated that MBIs improved work-life balance outcomes (WLB, WFB, satisfaction with WLB, psychological detachment from work), and decreased work-family and work-life conflict. Effects were maintained, based on follow-up data gathered two weeks to six months after the end of the intervention period.

MBIs effects on mindfulness outcomes were small to moderate (d = 0.21 to 0.77) and on WLB outcomes were small (d = 0.22 to 0.46). The intervention program that achieved the largest effect sizes for both variables was conducted using a mobile app and required a minimum of 100 minutes of practice over the course of two months, although participants actually completed, on average, 312 minutes (about five hours) of practice (Rich et al., 2021). Considering that Rich et al. (2021) and Slutsky et al. (2019) offered programs with practice activities that engaged participants for a similar amount of time, (e.g., average practice times of 312 min over eight weeks, and 302 min over six weeks, respectively) and similar effects sizes on mindfulness outcomes (d = 0.77 and d = 0.68, respectively), it would be expected that these two programs would also have a similar effect on WLB outcomes. However, the effect sizes differed (d = 0,46, d = 0.22, respectively), although this may be due to the use of different WLB measures (WLB, and WLC, respectively). Therefore, it will be important to investigate whether MBIs are helpful in managing both the difficulties that people experience in managing competing demands in their lives, as reflected by work-life conflict measures, as well as in helping people develop a sense of balance with respect to the involvements they undertake. It will also be important to

investigate additional variables that may have a significant impact on the effects of MBIs on WLB, such as work-life segmentation preferences (Althammer et al., 2021).

In addition, it is important to highlight that the effect sizes for psychological interventions must be analyzed considering what small and large really mean in the context of psychological research (Funder & Ozer, 2019). According to Funder and Ozer, even small effects can be of great practical importance, because changes in psychological processes that affect people's behavior, when repeated over time, can have an important influence on their lives.

Furthermore, it is important to remember that WLB outcomes refer to a "balanced" relationship between work and non-work involvements. Therefore, it is necessary to consider when an effect size is big enough to benefit participants' balance but not so big that it might cause an imbalance, such as could happen if people systematically prioritize their non-work roles in a way that compromises their ability to manage work responsibilities (e.g., constantly missing work deadlines) or that decreases their satisfaction with their current job (e.g., leading to an intention to quit, which is usually not a favorable outcome for organizations). In this sense, small size effects of MBIs on WLB outcomes may be a promising start for the field of individual-focused interventions that contribute to work-life balance. That is, MBIs may help individuals to enhance their WLB without causing more dramatic (and potentially harmful) changes in their lives.

When looking at MBI effects, we noticed that little attention has been paid to adverse effects, which have been largely undocumented in the MBI research, in general (Goldberg et al., 2021; Schuman-Olivier, 2020). Little is known about how participants feel about the MBI programs that promote WLB, and if they consider that this experience has (or has not) led to changes in their lives. Listening to participants and valuing their experiences are important techniques to help researchers improve their interventions (Yardley et al., 2021). Thus, using

qualitative methods to explore participants' experiences with MBIs that promote WLB (including mechanisms of change and adverse effects) may help researchers evaluate the extent to which the effect sizes of MBIs are related to important changes in participants' lives.

In addition, further research is needed to clarify why MBI effects on life-to-work outcomes were not significant. Even though these null effects may be justified by a floor effect (Kiburz et al. 2017), because there is a much lower prevalence of life-work conflict compared to WLC (Slutsky et al., 2019), Nicklin et al. (2023) highlighted the importance of understanding why adjustments in personal life activities do not improve feelings about work. Strain-based work-family conflict is another outcome that requires further attention, as inconsistent results were found for this variable, using the same intervention program (Althammer et al., 2021; Michel et al., 2014).

Even though the best results for WLB were found in studies that accurately measured the time that participants spend practicing (Rich et al., 2021; Slutsky et al. 2019), many of the researchers were only able to report expected time of practice, as they did not measure how much time participants actually spent practicing. This type of design makes it difficult to clarify which components and elements of MBIs seems to be crucial for WLB outcomes. Thus, it is strongly recommended that future researchers develop strategies for monitoring participants' engagement in practice activities.

Risk of Bias

Results from our risk of bias assessment were consistent with findings from Bartlett et al.'s (2019) meta-analysis of workplace MBIs. These researchers also found a high predominance of: (a) attrition bias, which occurs when dropouts are excluded from the data set, which is a problem that can be addressed using intention-to-treat methods, and (b) concealment bias, due to difficulties in preventing participants and instructors from deducing the expected effects of each treatment condition (intervention or control group) on outcome measures.

According to Goldberg et al. (2021), in most MBI studies, it is not possible to "blind" participants and instructors to their study condition. This challenge is not exclusive to MBI trials, and exists for randomized controlled trials used to study behavioral intervention programs, in general.

One way of addressing this issue is to design studies that have an MBI group and a comparison group in which other intervention strategies are used, especially strategies that involve similarities with the MBI group (such as completing questionnaires periodically) (Goldberg & Tucker, 2020). Similarly to Goldberg et al. (2021), based on our risk of bias assessment, we also recommend the inclusion of non-self-report measures of WLB outcomes, longer time intervals prior to follow-up assessments, and the use of intention-to-treat analyses to improve the quality of the evidence regarding MBI effects on WLB.

Key Aspects of the Mindfulness-Based Interventions

The development of mindfulness skills requires practice, so homework assignments were a key component of the intervention programs. These activities helped participants integrate mindfulness practices in their daily lives and often involved listening to audio recordings and using self-monitoring strategies that required 3 to 25 min a day.

Most of the studies did not have measurements of how much time participants spent practicing, which reflects the difficulties of accurately measuring the quantity and quality of different practice procedures (Davidson, 2010). Although the time spent using recorded guided practices can be tracked using digital systems (e.g.. apps, websites, etc), other practice formats (such as practicing by yourself, using a downloadable audio, video or other apps) require other assessment strategies, such as the ones adopted by Kiburz et al. (2017), who asked participants to monitor the frequency of performance of five mindfulness-based behaviors on a daily basis.

Davidson and Kaszniak (2015) highlighted the importance of exploring methods that include the measurement of: (a) informal, non-guided practices (to reflect on personal concerns),

justifying that they may have similar or greater effects than formal, guided practices, (b) the time devoted to each specific form of practice, because different exercises are associated with the development of different cognitive abilities (e.g., focused-attention practices contribute to attentional control, while open-monitoring practices are associated with labeling and emotional nonreactivity) (Schuman-Olivier, 2020), and (c) different combinations of practices, as they may evoke different mindfulness states and contribute to being able to use multiple skills to deal with ongoing issues (Levit-Binnun et al., 2021). Thus, a clear description of the skills that are being trained, and information about the duration of training activities are needed, because differences in types of practices, duration, target population, modes of delivery, and instructors' competence can lead to different effects (Davidson & Kaszniak, 2015).

Considering MBIs used to help people outside the WLB context, Schuman-Olivier et al. (2020) pointed out that they tend to include two core groups of mindfulness meditation practices: those that are related to attentional abilities (e.g., focused attention, open monitoring) and those focused on cultivating specific emotions (e.g., self-compassion, loving-kindness, acknowledging difficult feelings or physical sensations). The MBI strategies found in the studies we reviewed were predominantly focused on attentional practices, while the second group of practices was absent from the programs and from the researchers' theoretical frameworks. Although mindfulness programs can include a smaller or larger number of activities that focus on the development of self-compassion, there is insufficient information in the studies we reviewed to clarify why particular practices were chosen over others. This question needs to be addressed in future studies.

Among the possible practices that can be evaluated in future research, several authors indicate that self-compassion – the capacity to react with a warm, kind, and understanding orientation to situations in which we suffer, fail, or feel inadequate, as one would do for a close friend (Germer & Neff, 2013) – seems to be one of the main MBI mechanisms that enable

behavior change (Schuman-Olivier et al., 2020), by increasing engagement in health-promoting behaviors (Gedik, 2019; Horan & Taylor, 2018; Sirois et al., 2015) and pro-social behaviors (Yang et al., 2021). Self-compassion is also associated with increased work-related well-being (Kotera & Van Gordon, 2021), satisfaction at work and at home (Nicklin et al., 2019), healthy family, romantic and friendship functioning, and constructive conflict and transgression repair behavior (Lee et al., 2021; Lathren et al., 2021). Given that WLB is related to these variables, it would be important to explore the effects of incorporating self-compassion exercises (such as the ones used in the MSC program developed by Neff & Germer, 2013) in MBI programs focussed on improving WLB.

Another pathway that could be investigated in future studies about how to promote WLB would be to evaluate the effects of MBIs on the quality of personal and work relationships (Good et al., 2016). Although MBI programs tend to be offered to workers as individuals, WLB is a construct that reflects workers' perceptions of their interactions with the people who are central figures in their lives (Allen & Paddock, 2016). Relationships with partners, family members, children, and work colleagues strongly affect people's sense of WLB (Allen & Paddock, 2016). Thus, assessing the outcomes of MBIs not only on individual wellbeing, but also on participants' relationships could be important in generating new insights about how MBI programs promote WLB.

Mechanisms of Change

Three primary models were cited by the researchers in the studies we reviewed, to explain how MBI programs help participants develop skills that may affect their perceptions of WLB (Bishop et al., 2004; Good et al., 2016; Hölzel et al., 2011). The concepts and evidence presented in these studies were integrated into a unified theoretical, or logic model (Figure 2), indicating that MBIs may contribute to WLB by helping participants develop skills such as: (a) self-regulation of attention, which improves attentional control and attentional efficacy, and (b)

orientation to experience, which facilitates shifts in emotional appraisal processes and contributes to psychological distancing, reducing the risk of problems such as burnout by diminishing emotional tensions and emotional over-involvement. The ability to recognize and calmly think about one's thoughts and feelings, in turn, seems to be related to better outcomes for people's physical health, cognitive functioning, self-regulation of emotion, and behavioral self-control. Finally, these improvements contribute to dealing with different tasks and relationships, as proposed by the authors, that are associated with WLB. In addition to the processes represented in the unified model presented in Figure 2, there is additional information in the psychology and mindfulness literature that might provide further insights about the skills that people develop during mindfulness practices, and how these abilities affect their perceptions of WLB.

A great challenge in working with psychological interventions is to find a way to facilitate people's ability to recognize maladaptive behaviors and to be able to improve the mental environment they live in (Carmody, 2015). In learning how to behave in new situations, we usually develop mental frameworks, or schemas, that lead us to automatically use a narrow range of possibilities to interpret our thoughts and emotional reactions to what is happening, and that predetermine how we should behave in that context (Boutyline et al., 2021). These schemas become so strongly established that alternative interpretations and ways of acting are not so apparent (Pessoa, 2008). The experiential learning component of mental processing is important to help people explore how they might respond differently to their experiences. When this happens, we may be able to avoid the schemas that fuse together negative thoughts, feelings, and behaviors making them less likely to drive distressing emotions or automatic behaviors, such as aggression or avoidance (Irving et al., 2015).

Mindfulness practices seem to involve strategies that help people notice and reflect on their mental environment. For example, participants practice the tasks of selecting a point of

focus, and of maintaining their focus of attention by paying sustained attention to something in their environment that they do not usually think about (Carmody, 2015). In a step-by-step process, physical sensations, emotions, and thoughts about this point of focus are then examined. Importantly, the emotional context in which participants work on these skills is directed to feelings of openness (or curiosity) and realism (or acceptance). These exercises help people to notice and separate out sensations, emotions, and thoughts that are often unrecognized and fused together.

By separating and reflecting on bodily sensations, thoughts and feelings, it can be easier to notice how these components interact, from moment to moment, resulting in both functional and dysfunctional responses (Carmody, 2015). By increasing people's awareness, "the trainee learns to distinguish between the three major components of experience, and their conditioned cycles of associations become apparent" (Carmody, 2015, p. 69). This ability might be important for WLB, because work-life perceptions are impacted by self-regulatory behaviors (Allen & Paddock, 2016), and behavior change is thought to begin with an awareness of one's actions and their effects (Ludwig et al., 2020), as long as this awareness does not lead to strongly negative judgments.

During mindfulness practices, individuals come to realize, based on personal experience, that they can decide where to direct their attention, developing the ability to self-regulate their attention, through training. This means that, by using these newly learned skills, people can choose to interrupt distracting or unproductive thoughts and feelings by deliberately redirecting their attention to another internal or external event (Carmody, 2015). For example, when people are distracted by thoughts about work, while spending time with people who are part of their personal life (e.g., children, partners, friends), if they are able to recognize the presence of these work-related thoughts, they can choose to continue thinking about their work or to redirect their attention back to the people they are with. When they decide to refocus on their present context,

redirecting their attention can help them to be engaged with and responsive to others, resulting in increased feelings of effectiveness and satisfaction with these relationships (Allen & Paddock, 2016). When people make the link between paying more attention to others and improvements in their relationships, they come to understand the importance of making the effort to focus on the people around them. Furthermore, feeling connected and good communication are of fundamental importance in dealing with difficult feelings or situations (Segal et al., 2013).

In addition, training the ability to choose a focus of attention, and to deliberately switch from one focus to another, may help individuals to better regulate their emotions. These skills are relevant for WLB because, sometimes, "to achieve a desired boundary between work and family, individuals may have to regulate emotions that they experience, such as suppressing negative emotions from work or expressing positive emotions to family members'' (Allen & Paddock, 2016, p. 223).

Another expected outcome of improved self-regulation of attention, and in particular of the ability to intentionally shift one's attention, is the ability to reduce emotional spillover from one context to another. People who can shift their attention, even when negative events occur in one part of their lives, are able to stop thinking about these issues so that these preoccupations do not interfere with their ability to interact with people in another context (e.g., being able to stop thinking about a problem at work while talking with an elderly parent who needs attention and assistance) (Allen & Paddock, 2016).

An improvement in skills such as self-regulation of attention and of emotions, after participating in an MBI program, were frequently mentioned as internal, psychological resources in the studies we reviewed. Thus, when linking mindfulness with the work-life literature, MBI practices are often interpreted as a way to help people improve skills that involve health-protecting factors. Mindfulness practices may be able to help people strengthen their cognitive and emotional capacity to cope with challenging work-life situations and to enhance

the quality of their relationships. These abilities can increase work-life sustainability (Mellner et al., 2022). As Mellner et al. explained, this is important because, while high job demands usually lead to negative health consequences, resources buffer the impact of job demands on workers' physical and mental health.

Limitations of the present study

As the use of MBIs to promote WLB are recent, few RCTs were found, limiting our paper to the analysis of seven studies. We used effect sizes to identify training characteristics that may be related to differences in outcomes, but methodological differences across the studies, especially with regard to instruments, meant that we could not conduct a meta-analytic analysis of outcomes.

Another challenge faced in the mindfulness literature is that the specific features of each MBI program are underspecified in published articles (Davidson & Kaszniak, 2015; Levit-Binnun et al. 2021). Due to this aspect of MBI research and the recency of research on mindfulness in the context of WLB, we were unable to answer some of our initial questions (e.g., if people in certain work-life contexts benefit more than those in other contexts, if different types of mindfulness practices promote different WLB outcomes, etc). In addition, the unified model of mechanisms of change, as proposed in this article, is not a complete framework, but rather, a contribution to help integrate existing ideas and to stimulate further discussion about logic models that describe how mindfulness-based skills can improve WLB.

Despite these limitations, our review contributes to helping practitioners and researchers examine evidence about how mindfulness training seems to be contributing to improvements in people's WLB. We also indicated questions that still need to be addressed in future research. We hope these questions will be answered as research evidence grows with respect to MBIs as a means of promoting better WLB.

Conclusions

Even though training protocols, program duration, and intervention strategies were varied, the utilization of MBIs as an individual-focused intervention approach for promoting WLB is currently supported by scientific evidence. According to the analysis of the results of seven RCTs of MBIs, evaluated with 848 participants, mindfulness training can increase WLB, satisfaction with WLB, and psychological detachment from work, and can decrease WLC. These outcomes seem to be lasting, considering that the effects were maintained at the time that follow-up evaluations were conducted, from two weeks to six months after the intervention programs were concluded. It was difficult to determine if there were changes in the life-work direction and in strain-based WLC, as these outcomes were not evaluated in most of the studies, some non-significant results were reported, and some contradictory results were also found.

Based on theoretical models about how mindfulness skills affect work-life balance, mindfulness is thought to increase people's psychological resources, allowing them to better cope with work-life demands. This pathway is illustrated in detail in the proposed logic model of how MBIs promote WLB, indicating the ways that mindfulness skills lead to primary and secondary outcomes, and their relationships with variables associated with WLB. This model, however, still needs to be empirically tested in future research.

Research on mindfulness training to promote WLB is a new field of study that has many questions to be answered. Addressing these issues will help to clarify the efficacy of different intervention features, establish evidence about the usefulness of MBI programs for people from a greater range of walks of life, verify the mindfulness skills that enable people to make helpful adjustments and changes in their lives and test the sustainability of MBIs effects for longer periods of time. Rigorous experimental research is needed to generate data with as low a risk of bias as possible, to gain new insights based on trustworthy and theoretically-relevant findings.

Data Availability Statement

Datasets developed to perform this research (such as extraction tables) are available through the corresponding author upon reasonable request.

Conflict of Interest Statement

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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