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Systematic Review

Virtual Reality Mindfulness for Meta-Competence Training among People with Different Mental Disorders: A Systematic Review

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Abstract: International psychiatry is facing major challenges due to the rapid increase in mental health issues. The forthcoming mental health crisis has opened the debate about the need to broaden the therapeutic horizons with the implementation of digitally assisted mindfulness practices within psychotherapeutic interventions. Mindfulness training is developing into a promising intervention for a variety of health problems and a booster of well-being. At the same time, virtual reality (VR) and especially immersive technologies are increasingly being used as assistive tools in the training of people with special education needs and disabilities (SEND). Meta-competences refer to a set of self-development skills that incorporate meta-cognitive and meta-emotional attributes, enabling individuals to be self-conscious, self-regulated, and flexible in every aspect of human life. The current review aims to investigate (i) the efficacy of mindfulness strategies in meta-competence training for SEND and (ii) the role of VR as an assistive technology in mindfulness training. The PRISMA 2020 methodology was utilized to respond to the objectives and research questions. The database search provided 1380 records, and 29 studies met the inclusion criteria. The results showed that mindfulness training has the potential to train meta-cognitive and meta-emotional competences among people with different mental disorders, including Attention Deficit/Hyperactivity Disorder (ADHD), Autism Spectrum Disorder (ASD), Intellectual Disability (ID), Depressive Disorder, Stress Disorder, and Specific Learning Disorder. VR was found to be an effective assistive technology, providing significant advantages compared to conventional mindfulness interventions. Mindfulness training assisted by immersive technologies was found to significantly improve a wide range of cognitive and socio-emotional meta-competences, including self-awareness, inhibition control, attention regulation, flexibility, positive thinking, and emotional regulation. The results of this systematic review may provide positive feedback for creating inclusive digital training environments.

Keywords: mindfulness strategies; virtual reality; autism spectrum disorder; attention deficit and hyperactivity disorder; mood disorder; anxiety disorder; behavioral disorders; self-awareness attentional regulation; emotional regulation; self-control; impulse control; flexibility

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1. Introduction

Special Education Needs and Disabilities (SEND) corresponds to the special health needs as well as the educational support that people with neurodevelopmental disorders, mental, emotional, and behavioral disorders, as well as severe learning difficulties, must have [1,2]. SEND, as an umbrella term, encompasses a broad variety of clinical conditions and learning difficulties, including cognitive impairments, autism spectrum disorder, attention deficit and hyperactivity disorder, specific learning difficulties (i.e., dyslexia), behavioral disorders, and giftedness [1,3].

Meta-competences can be defined as a set of self-development skills that incorporate meta-cognitive and meta-emotional attributes, enabling humans to be conscious, self-regulated, and adaptive in every context of human life [4,5]. Meta-competences lay the basis for finding a psychological balance between both the external and internal world [6]. Meta-competences allow individuals to achieve in their personal and social lives and constitute an indicator of positive change, social inclusion, well-being, and self-actualization [6,7]. Meta-competences allow one to be aware of and voluntarily manage cognitive and psychophysiological operations to achieve psychological balance and maximize performance [5]. It has to do with reflection and introspection [6]. Meta-competences describe the ability to be open to and flexibly accept changes with a positive mindset [5]. Emotional meta-competences refer to the accurate identification, assessment, and manifestation of emotion in oneself and others. It is about the management of emotions in the self and others, and the voluntary induction of beneficial emotions to achieve internal and external balance [6,8,9].

In psychological terms, mindfulness can be defined as the awareness that results from intentionally monitoring whatever is happening in the present moment in an open and discerning manner [10,11]. It is the state of awareness arising from the systematic, deliberate, and uncritical observation of the moment-by-moment experience with a positive disposition to understand and accept thoughts and feelings, either positive or negative, as they arise in the field of perception [12]. Mindfulness training entails a set of self-regulation strategies that train attention and develop self-awareness with the intention of increasing conscious control over mental processes, thereby fostering general mental and emotional well-being [13].

A topic of growing scientific interest concerns the effects of mindfulness meditation practices in clinical interventions [14]. Recent research provides positive evidence about the effectiveness of mindfulness training in populations diagnosed with neurodevelopmental disorders, neuropsychiatric conditions, anxiety disorders, and other mental and behavioral disturbances [15–18]. However, there is less emphasis on the competencies developed by this type of intervention.

Technology is increasingly being used to assist mind–body interventions. Digital mindfulness training via smartphone apps has already gained significant attention [19]. Human–Computer Interaction (HCI) has begun to explore innovative technologies that may assist mindfulness training. VR, and especially immersive technologies, is considered a technology with high potential to support such approaches since it concentrates on special characteristics that might support mindfulness, health, and well-being [20].

VR technologies refer to computerized visual simulations that promote virtual immersion in digital settings, introducing users to a three-dimensional interactive world rich in sensory and emotional stimuli [21]. The therapeutic use of VR has gained significant popularity in recent years. VR is becoming more widely used in psychotherapy, with significant literature documenting its efficacy in the rehabilitation of neurodevelopmental disorders (i.e., ASD), mental, emotional, and behavioral disorders, and even in the intervention of people with learning difficulties [22–25].

Although there is an ever-increasing interest in the use of VR in mindfulness training, research is still in its early stages [26]. Less research has been done on VR as an assistive technology in mindfulness training programs designed for people with SEND [27,28]. However, researchers have provided evidence that VR-enhanced mindfulness may be particularly useful for a variety of clinical interventions [29].

The objective of the present systematic review is to fill this gap by focusing on the meta-competences developed through mindfulness training. Specifically, the current systematic review investigates the effectiveness of traditional mindfulness training on meta-competence training among people with SEND. In addition, we co-examine the impact of VR-assisted mindfulness interventions for meta-competence training in clinical populations.

The current study starts with a theoretical part that aims to better establish the study's hypothesis, according to which mindfulness provides a set of valuable strategies for the development of higher-order competences. In addition, the potential of VR technologies for the assistance of mindfulness interventions is examined.

The second part of this study summarizes the data of the chosen studies and presents the main findings regarding the efficacy of mindfulness and VR mindfulness to be applied as a meta-competence training intervention for target groups with SEND. In this section, we highlight distinct target groups, as well as the conditions surrounding the training.

The current systematic review aims to summarize the available data to answer the following two central issues in research:

1. Is mindfulness training an effective intervention for meta-competences development in SEND?
2. Can VR-assisted mindfulness support meta-competence training in target groups, such as those with SEND?

To our knowledge, the current systematic review study is one of the few that focuses on the meta-competences developed after mindfulness training, with a special emphasis on the role of VR as an assistive technology.

2. Materials and Methods

The current systematic review study collects and synthesizes evidence on the efficacy of mindfulness practices in training meta-cognitive and meta-emotional competences among people with special education needs. Furthermore, we investigate the efficacy of VR mindfulness interventions for training people with special education needs.

2.1. Review Design

The review was carried out following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Statement (PRISMA). The PRISMA 2020 checklist (available in the Supplementary Material) was utilized to structure and assure the quality of the review [30]. This systematic review was registered with the Open Science Framework (OSF) (retrieved from osf.io/v64bs, registration DOI: https://doi.org/10.17605/OSF.IO/V64BS). From December 2022 to May 2023, a team of three authors carried out a systematic research effort.

2.2. Inclusion/Exclusion Criteria

Using the inclusion and exclusion criteria, studies that met the inclusion criteria were selected for further processing and evaluation. The current study mainly concentrated on experimental studies (i.e., randomized controlled trials) that utilized mindfulness strategies with or without the assistance of VR. We mainly focused on studies that recruited participants with SEND. More specifically, we focused on populations with different mental disorders, including ASD and ADHD, ID, mood disorders, behavioral disorders, and anxiety disorders. In addition, we included cases of people with specific learning disabilities experiencing symptoms of anxiety and affective dysregulation without severe psychiatric symptoms. On the other hand, systematic reviews, and meta-analyses were excluded. VR design frameworks without any testing were excluded. Furthermore, studies that recruited only non-clinical populations, or caregivers of people with SEND were excluded. We place special emphasis on studies that provided evidence about the development of meta-cognitive and meta-emotional competences. The selected studies provided data on the study's design, the sample, the VR equipment, the type of mindfulness intervention, the period of intervention, the measurements, and the key outcomes. Table 1 shows the specified literature inclusion and exclusion criteria used to conduct the review investigation.

Table 1. Selection of studies based on inclusion and exclusion criteria.

Inclusion	Exclusion
(a) Experimental studies including randomized and non-randomized controlled trials, feasibility or pilot studies, and case studies.	(a) Systematic reviews, meta-analyses, book chapters, and posters were excluded.
(b) Published after 2000	(b) Design frameworks without any testing
(c) Mindfulness was the primary focus of the intervention with or without the assistance of VR technology	(c) Studies that applied mindfulness with other technologies
(d) Studies evaluated meta-competences related to metacognition and emotional intelligence	(d) VR interventions without mindfulness training
(e) The research group included participants diagnosed with different mental disorders	(e) Studies that tested mindfulness programs in healthy populations, parents, or populations with illnesses such as arthritis, and diabetes

2.3. Information Sources

An extensive search was conducted of the following four digital academic databases to find studies that were eligible for the current systematic review: (1) Scopus, (2) Science Direct, (3) PubMed, and (4) Google Scholar. Scopus is considered to be one of the largest academic databases with peer-reviewed studies. ScienceDirect is also a leading source for searching for high-quality academic research. MEDLINE's PubMed® database contains more than 36 million citations for biomedical literature. Google Scholar is widely recognized as a useful tool for conducting systematic reviews. It is an easy-to-use interface that provides quick access to a significant percentage of scientific papers. PubMed, Scopus, and Science Direct are considered trustworthy academic databases. These large citation search engines offer relevant digital libraries and/or publishers in the fields of Computer Science, Special Education, and Mental Health Technology. In addition, peer-reviewed publications are provided from journals that may be related to the study's objectives.

2.4. Search Strategy

The search was limited to articles published between 2000 and 2023. The database search was carried out using a combination of keywords. For the first research question, we used keywords referring to mindfulness training, SEND (i.e., neurodevelopmental disorders, ASD, ADHD, mood disorders, and anxiety disorders), and meta-competences. Specifically, we used keywords such as "mindfulness training, guided meditation, learning disabilities, intellectual disabilities, autism spectrum disorder, dyslexia, attention deficit hyperactivity disorder, giftedness, metacognitive skills, self-regulation, emotional control, impulse control, adaptability, self-awareness, and emotional awareness". For the second research question, we utilized additional keywords such as "virtual reality mindfulness, and immersive technologies". All of the selected databases provided us with the opportunity to search for studies using Boolean operators, namely simple words or symbols (i.e., AND and OR, &, |) that worked as conjunctions, connecting the main searching terms. In each academic database, the Boolean search had some differences. For instance, in Google Scholar, we used spaces between the keywords to indicate the "AND" operator. The | symbol demonstrates the operator OR. In PubMed, the search was also supported by help screens for Boolean searching in the field of advanced research. This type of search significantly helped us to narrow or broaden our research, to find more precise results, and exclude unwanted terms. If the research provided limited or excessive results, we made adaptations. As an indicative example, we can mention the searching string: "mindfulness" AND "virtual reality" AND "mental disorders" OR "Autism Spectrum Disorder" OR "Attention Deficit and Hyperactivity Disorder". The combination of the above keywords was applied to each database from 2000 until May 2023. Table 2 presents an overview of the research strategy applied in database research.

Table 2. The search terms used.

Searching String and Main Searching Terms
"Mindfulness" OR "Guided meditation" AND/OR "Virtual Reality" OR "VR" OR "3D" OR "Immersive technologies" AND "Attention Deficit/Hyperactivity Disorder" OR "Autism Spectrum Disorder" OR "Intellectual Disability" OR "Dyslexia" OR "Giftedness" OR "Specific Learning Difficulties" OR "Anxiety" OR "Depression" OR "Phobias" AND "Metacognitive Skills" OR "Self-regulation" OR "Emotion Regulation" OR "Self-awareness" OR "Emotional awareness" OR "Inhibition control" OR "Attention regulation" OR "Adaptability"

2.5. Selection Processes

Initially, we began searching across four databases. By using various combinations of keywords with the support of search operators and applying search filters, we gathered a pool of candidate studies available for further screening. The publication year, article type, and language of the article were commonly used filters. Priority was given to studies that included keywords in the title, abstract, and keywords. Several studies that included keywords in the main text were also included for further processing. Afterward, inclusion and exclusion criteria were applied to the titles and abstracts. Emphasis was given to excluding studies in which the title and abstract indicated that the studies were not in conformity with the objectives of this review. For instance, studies explicitly referred to healthy populations or employed other assistive technologies in mindfulness intervention. On the other hand, priority was given to studies that explicitly focused on mindfulness training for people with SEND with or without the use of VR. After the titles and abstracts were screened, the full text of the remaining papers was retrieved for further assessment. At this point, the focus was placed on choosing studies that met all the inclusion criteria and none of the exclusion criteria. At this stage of processing, methodological quality standards also played a significant role in our decision. For instance, the explicit description of the intervention, and the use of representative participants were positively assessed. At this stage of the final decisions, we also used the criteria in order of importance. More specifically, we decided to include studies with a small but representative sample of participants. In addition, a significant role played in the meta-competences trained during these interventions.

2.6. Data Collection and Data Items

As part of the synthesis stage, each article was further elaborated in more depth to extract the required data. The extracted data encompassed the author's information, the research design, the type of mindfulness intervention, technical aspects, such as the VR design, and the equipment. Information about the participants and their characteristics was also collected. The period of the intervention, the measurements, and the main outcomes were also gathered.

2.7. Critical Appraisal of Included Literature

Each paper was independently evaluated by two authors, and conflicts were resolved by the third author. To assess the risk of bias for the randomized studies, the Cochrane Collaboration's ROB-2 (Risk of Bias Version 2) tool was utilized [31]. RoB 2 is organized into a predetermined collection set of bias domains that focus on various aspects of trial design, conduct, and reporting. According to ROB 2, biases may occur due to: (1) randomization, (2) deviations from the intended intervention, (3) missing outcome data, (4) measurement of outcome, and (5) selection of the reported results. A generic risk of bias indicator with three degrees of risk was also created.

To evaluate the risk of bias for all of the other non-randomized studies, the ROBINS-I (Risk of Bias in Non-randomized Studies of Interventions) tool was used [32]. Biases may occur due to: (1) confounding, (2) selection of participants, (3) classification of interventions, (4) deviations from the intended interventions, (5) missing data, (6) measurement of outcomes, and (7) selection of the reported results. The authors responded to signaling questions and used the ROBINS-I assessment table to determine the risk in each category, as well as the overall risk. A Robvis visualization tool format was employed to depict risk-of-bias assessments performed as part of the review process [33].

2.8. Research Results

The preliminary search provided 1380 studies, of which 280 were common and removed, 275 were ineligible and 529 were removed for other reasons. Although the databases provided a significant number of studies as regards mindfulness training, the number of studies was significantly reduced after applying additional filters as regards the type of the study, the type of participants, and the meta-competencies trained after the intervention. In addition, the use of VR as an inclusion criterion further reduced the results. Two hundred ninety-six records were screened, and 206 records were excluded by title and abstract. The remaining 90 studies were assessed for eligibility. This process led to 29 studies that met all eligibility criteria. For the first research question, we selected 12 studies. For the second research question regarding VR mindfulness, we selected 17 studies for the final analysis. Figure 1 illustrates the general screening procedures and the flow of selecting representative research.

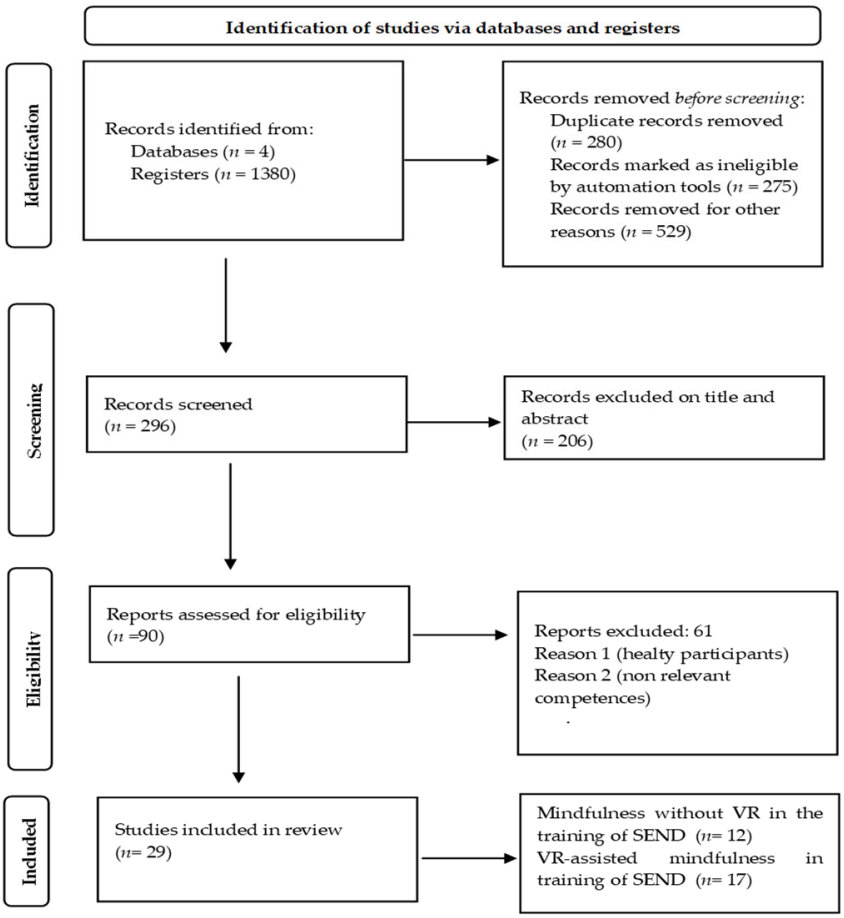

Figure 1. Flowchart depicting the literature research and selection of studies for review.

3. Theoretical Background

3.1. Mindfulness for Meta-Competence Training: The Mediation of Metacognition

Metacognition refers to the awareness, deliberate assessment, and control of one's thinking and understanding of how one's mental abilities operate [34]. Metacognition consists of both the ability to be aware of one's mental operations and to control them according to internal and external demands, with the view of promoting efficacious self-regulation of cognitive and affective mechanisms [35]. Metacognition involves a group of regulation meta-abilities and meta-skills that are voluntarily employed, aiming at the unhampered operation of the cognitive and psychophysiological mechanism. Metacognition encompasses consciousness-raising competences such as the ability to observe, regulate, and be adaptive, acknowledging the difference between functional and dysfunctional states of thinking, and voluntarily inducing those positive states of thinking that awaken the full range of self-identity [5,36].

In recent years, a dialogue has begun regarding the close relationship between mindfulness training and metacognitive development [37,38]. According to Jankowski et al. [37], mindfulness is related to the highest level of metacognition. Mindfulness requires the dynamic cooperation of metacognitive knowledge, metacognitive experiences, and metacognitive skills.

Vago et al. [39] outlined that mindfulness training raises meta-awareness, a fundamental meta-ability that enables individuals to flexibly modulate their own behavior.

According to Hölzel et al. [40], mindfulness practices train fundamental metacognitive skills, including attention control, sensory awareness, emotional control, and a positive change in self-perception. Attention regulation is considered a key training component of almost all mindfulness techniques [12,41].

Other studies outline that mindfulness training fosters inhibition control, a key metacognitive ability responsible for the regulation of impulsivity and hyperactivity [42–44]. Studies have already shown that mindfulness training can help individuals better inhibit irrelevant stimuli, enhancing their attentional and mental competency. In addition, they can more effectively deal with hypercritical self-beliefs, which in turn allows them to better manage negative thoughts and feelings [44].

Mindfulness training is an act of self-observation. Practitioners are systematically trained to monitor in real time any thoughts, sensations, and emotions [45]. Thus, mindfulness can train individuals to be reflective and to develop introspection skills. In addition to introspection skills, researchers highlight the benefits of mental flexibility [46].

Mindfulness training fosters mentalization, which describes the meta-ability to perceive, understand, and effectively interpret the mental state of oneself or others as well as the deeper motives that underlie overt and intentional behaviors [47]. Indeed, research has revealed that mindfulness-based practices improve mindreading skills [48].

Drigas and Mitsea [49] developed a new mindfulness model based on the metacognitive components involved in mindfulness practices. This model stands on eight fundamental meta-competences: (a) acquiring knowledge and understanding about mindfulness training; (b) effectively practicing mindfulness strategies in real-life situations; (c) real-time monitoring of the mental "movements" that occur in the field of perception moment by moment; (d) each time the observer identifies distractions, self-regulation strategies should be applied to restore disturbances and re-establish relaxation; (e) flexibility to re-establish balance under stressful situations; (f) accurate perception and identification of negative thoughts and feelings; (g) discerning between functional and dysfunctional thoughts and emotions, and voluntarily choosing those that assure physiological and psychological well-being; (h) being awakened in a state of relaxation and increased awareness in which cognitive processes work without any effort. Figure 2 depicts the meta-competences involved in mindfulness training.

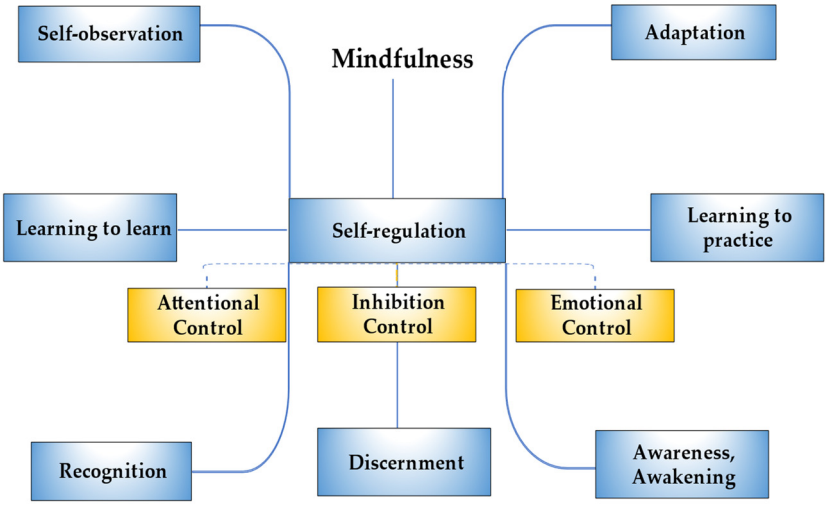

Figure 2. The meta-cognitive components involved in mindfulness interventions.

3.2. Mindfulness Training for Emotional Meta-Competences: The Mediation of Emotional Intelligence

Emotional intelligence refers to the ability to accurately perceive, appraise, and express emotion in oneself and others. Most importantly, it relates to the effective management of emotions in oneself and others, as well as the flexible use of positive emotions to attain mental and psychological balance and enhance inclusivity in a social setting [8,9].

Studies confirm that emotional intelligence constitutes the bedrock of mindfulness training strategies, ensuring the development of fundamental meta-competences [50,51]. Greater mindfulness is associated with higher emotional intelligence [52]. Mindfulness training ensures more positive affect, more life satisfaction, and less negative affect [52]. Practitioners transcend self-focused needs, develop prosocial behaviors, and create a positive relationship between themselves and others [39]. The nonjudgmental aspects of mindfulness facilitate emotional regulation and enhance individuals' recognition of their own and others' emotions [50,53]. Mindfulness corresponds to adaptive emotional functioning since it reorients individuals away from maladaptive thoughts and emotions [50]. Training practices based on mindfulness have already proven to be beneficial in promoting emotional recognition, emotional awareness, acceptance of emotions, emotional stability, and a significant reduction in emotional exhaustion [51]. Figure 3 presents the emotional meta-competences that are closely associated with mindfulness training.

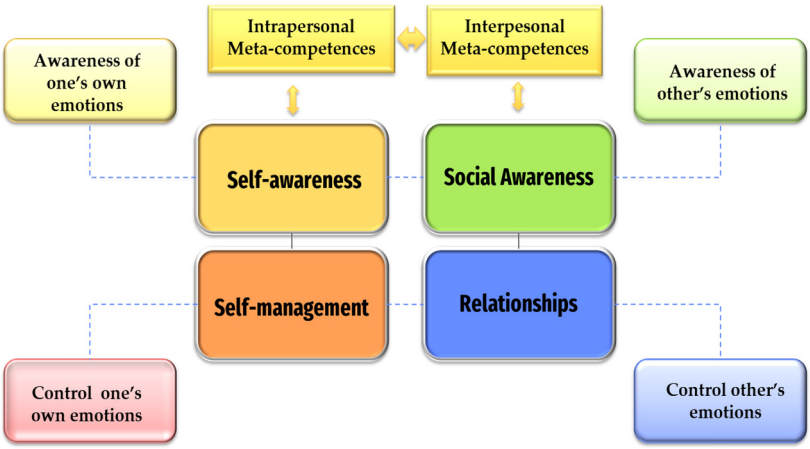

Figure 3. Emotional meta-competences closely associated with mindfulness practices.

3.3. Mindfulness Strategies for Meta-Competence Training

Focused attention techniques entail maintaining attention moment-by-moment on a specific "object", such as a subgroup of localized sensations induced by respiration. To maintain this focus, the subject must continuously monitor the quality and levels of concentration [41]. Trataka is a commonly used focused attention practice that requires focusing one's attention on a candle flame [54]. Studies have shown that such practices can improve various aspects of self-regulation, such as working memory and visual-spatial attention.

Open monitoring techniques involve non-reactive, moment-to-moment observation of the content of one's experiences without focusing on an explicit object. Nonreactive monitoring enables meditators to cultivate an attitude of acceptance, making attention and emotion regulation a less effortful task [41].

Breath control techniques teach practitioners how to actively manage their internal physiological states by adjusting one or more respiratory parameters [55]. Breath control guarantees instant as well as long-lasting improvements in meta-cognitive abilities, especially for people with mental and emotional difficulties [56,57].

Deep silence techniques aim at the pacification of the mind through the non-judgmental observation of the moment-by-moment experience. Silence training promotes the interconnectedness of brain networks responsible for attention control and emotional regulation, as well as the neurogenesis of structures important for meta-memory abilities. Deep silence speeds up the encoding of information and upgrades the ability to regulate attention, both in meditative and non-meditative states [58,59].

Guided imagery techniques combine relaxation techniques with the recalling of positive mental images that activate sensations of sight, hearing, touch, taste, and smell. It is used to deliberately evoke mental images that promote positive mental and emotional states of the mind [60,61].

Deep listening describes a state of open receptivity and compassion. Deep listening is essential for changing perspective, and being empathetic. It can also help individuals better manage their behavior [62]. Moreover, it enables subjects to make more sophisticated decisions and to flexibly solve complex problems [3].

Self-affirmation is the act of affirming one's worthiness and value. The use of positive affirmations motivates individuals to maintain a positive view of themselves as being flexible, competent, and able to be self-controlled. Self-affirmations promote a more holistic view of the self and its resources. Self-affirmations enable people to perceive the "big picture" when dealing with stressful situations. Affirmations can encourage individuals to take control over stressors and defensive mechanisms, be more adaptive, and adopt new strategies to overcome obstacles [63,64].

Gratitude is the act of recognizing and appreciating the positive things that happen [65]. As revealed by Jans-Beken et al. [66], gratitude downregulates the biomarkers of stress, boosts mental and social-emotional well-being, and trains self-regulation skills [67].

Body scan meditation instructs practitioners to consciously direct attention to various body areas and openly observe bodily sensations. Such practices train subjects to better manage distractions and to more flexibly control attention [68]. In addition, body scan strategies can help people better regulate psychological stress [69].

Researchers recognize that mindfulness practices and hypnotherapy share common ground [70]. Mindful hypnotherapy can foster metacognitive abilities through the activation of the neural pathways responsible for non-conscious self-regulation [71,72].

Neuro-linguistic programming (NLP) is a method that intends to promote positive behavioral change by employing techniques that share a common ground with mindfulness training. NLP strategies rely on the power of observation and the induction of positive beliefs. NLP has been shown to improve metacognitive skills in both clinical and non-clinical populations [73,74].

Mindfulness and positive psychology practices have a close relationship with the practices and intended goals [75]. Optimism activities, kindness practices, self-compassion

techniques, and positive thinking strategies are examples of strategies that have a common basis [76].

3.4. The Potential of VR in Assisting Mindfulness Training in SEND

VR has several features that are compatible with the practice of mindfulness, with a high potential to support the training of people with different mental disorders. VR provides safe, relaxing, and controllable training environments. Subjects can be trained in a safe and supportive environment without the risk of injury. This is especially important for people with risky behaviors, such as people with ASD [77]. VR immerses subjects in distraction-free environments. Stimuli are provided in a manageable manner, following the users' training needs. Therefore, VR seems to provide a promising environment for people with attention deficits [77,78].

The positive effect of mindfulness resides in focusing subjects' attention on the present moment [10]. VR outweighs other technologies since it induces the feeling of being present in the virtual environment [79]. Thus, VR has the potential to provide a relaxing environment, which is a requirement for people with affective disorders and anxiety disorders.

Mindfulness promotes experiential learning. Practitioners observe and reflect upon their experiences, including their mental and emotional states [80]. VR provides users with vivid experiences and encourages self-observation and reflection [81].

Mindfulness training includes positive visualization practices to induce relaxation and foster self-regulation [82]. VR facilitates visualization processes, especially for those with visual imagery deficits [83–85].

One of the principal goals of mindfulness is to train individuals' meta-ability to be aware of and flexibly direct attention to moment-by-moment experiences [10]. VR has the potential to foster attentional awareness and facilitate attention regulation processes by minimizing distraction and providing cues to direct users' attention. In addition, VR environments provide users with extraordinary and relaxing landscapes that motivate, relax, and increase their attention control capacity [86].

Sensory awareness is one of the main objectives of mindfulness training. Input/output devices serve this objective by facilitating users' ability to monitor and regulate sensory flow [83–85].

VR allows remote training. Trainers may offer instructions or observe trainees' performances. VR protects privacy. Thanks to avatars, users are encouraged to express themselves openly and without concern for criticism. Individual and group sessions are possible. Sessions can be synchronized and managed in real time using cloud-based technology [87].

Mindfulness aims to induce such positive states of mind to accelerate therapeutic outcomes. VR combined with gamification techniques has the potential to induce a positive state of mind known as the flow state [88].

4. Summary of Findings

This systematic review included twenty-nine studies. Twelve studies responded to the first research question regarding the effectiveness of mindfulness strategies in meta-competence training. The remaining seventeen papers concern the effectiveness of VR mindfulness in meta-competence training for people with SEND. In the selected interventions, 1224 subjects were recruited. In the studies that utilized conventional interventions, 301 subjects took part, while 923 subjects were included in the studies with VR mindfulness. The ages of the participants ranged from 7 to 67 years old. The studies mainly focused on target groups, such as people with different mental disorders (i.e., ADHD and ASD, mood disorders, behavioral disorders, anxiety disorders, and intellectual disabilities). In addition, studies were found with target groups of people with learning, affective, and behavioral difficulties (i.e., dyslexia).

4.1. Mindfulness Strategies for Meta-Competence Training

4.1.1. Mindfulness for Meta-Competence Training in Neurodevelopmental Disorders and Neuropsychiatric Conditions

The findings revealed that breathing techniques and focused attention practices can significantly improve cognitive and emotional meta-competences, including inhibition control, emotional regulation, and attentional control, among people with ADHD [89]. Santonastaso et al. [89] assessed a mindfulness program on attentional and behavioral self-management. Twenty-five children diagnosed with ADHD were divided into a mindfulness group and a control group. The control group received an emotional education program. The neuropsychological evaluations revealed a significant improvement in inhibition control, emotional regulation, and attentional control in the experimental group after eight weeks of systematic training.

Mindful training through games was found to bring positive behavioral changes to people with ADHD. Zaccari et al. [90] examined whether gamified mindfulness training could aid in the development of behavioral regulation abilities. Twenty-five children were recruited to either the mindfulness group or the control group. The results indicated improvements in behavioral control for the experimental group.

The results indicated that mindfulness training can be helpful for people with ADHD in improving emotional meta-competences, such as the ability to self-manage emotions. Huguet et al. [27] recruited seventy-two children with ADHD. The techniques used in the experimental group included mindful breathing, sensory awareness techniques, body scanning, and emotional awareness practices. The findings revealed improved emotional regulation in the experimental group.

School-based mindfulness programs were found to have significant potential to train executive control skills among people with ASD. A study examined the impact of a school-based mindfulness program on impulse control and selective attention among twenty-seven children with ASD. The strategies included mindful breathing, mindful postures, and deep listening. The findings revealed improved impulse control after the training intervention [91].

Improvements in self-regulation capacity among people with ASD were found in the study conducted by Spek et al. [92], which explored the efficacy of a nine-week mindfulness-based program in a total of 42 high-functioning adults with ASD. The subjects participated in either the training group or the wait-list control group. The findings revealed better improvements in self-regulation skills for the intervention group compared with the wait-list control group. Positive affect increased, whereas anxiety, rumination, and depression were more flexibly managed.

Reese et al. [93] investigated the benefits of mindfulness in a sample of eighteen participants diagnosed with Tourette syndrome and chronic tic disorder. The researchers used a mindfulness-based stress-reduction program. The training helped the subjects to better manage the intensity of impulsivity. At the one-month follow-up, therapeutic benefits were maintained.

4.1.2. Mindfulness Strategies for Meta-Competence Training in Intellectual Disabilities

Singh et al. [94] evaluated the efficacy of an NLP-based mindfulness technique aimed at treating an adult with an intellectual disability and aggressive behavior. The subject was trained to shift the focus of attention from an anger-producing stimulus to a neutral point on the body. The results indicated improvements in self-control and, as a result, improvements in mental capacity. The participants could apply the technique in real-life situations to inhibit aggressive behaviors. A similar study was conducted to re-evaluate the efficacy of the abovementioned mindfulness technique among three adults with moderate intellectual disabilities. The results confirmed that mindfulness develops anger self-management competences with long-lasting effects [95].

4.1.3. Mindfulness Strategies for Meta-Competence Training in Learning Difficulties

Mindfulness-based stress reduction techniques were beneficial for people with dyslexia to improve attention control and, in turn, improve their academic performance and self-confidence. The benefits of a Mindfulness-Based Stress Reduction (MBSR) intervention on reading, attention, and psychological well-being were examined using a sample of 34 adults with dyslexia and/or attention problems. After training, participants were more able to manage impulsivity, and attention, which in turn led to improvements in reading skills [96].

Eight weeks of mindfulness training with focused attention techniques and visual meditation was found to be beneficial for children with dyslexia. The program known as Mindfulness-Based Rehabilitation of Reading, Attention, and Memory (MBR-RAM) was investigated on a sample of three children with reading deficits, visual inattention, and visual motor incoordination. The findings demonstrated improvements in terms of impulse control and behavior regulation [97].

4.1.4. Mindfulness Strategies for Meta-Competence Training in Giftedness

Studies have revealed that mindfulness training can effectively train emotional meta-competences among gifted children. Turanzas et al. [98] evaluated an eight-week mindfulness program for gifted students experiencing existential distress, anxiety, despair, experiential avoidance, and cognitive fusion. Twenty-two gifted adolescents participated in a program of breath control and compassion techniques. Indeed, after training, students were better prepared to perceive and regulate the intensity of their emotions.

Mindfulness significantly helped gifted and talented children deal with self-oriented perfectionism, which mainly depends on well-established beliefs about the need to be perfect. Olton-Weber et al. [99] assessed the impact of a six-week intervention using a sample of 42 gifted school children. The program known as BREATHE was designed around the first six letters of the words body, reflections, emotions, attending, tenderness, and habit. It was found that the intervention helped students raise their self-awareness and better deal with self-imposed beliefs about perfection.

Table 3 presents a summary of the mindfulness training strategies for people with SEND.

4.2. VR Mindfulness for Meta-Competence Training

4.2.1. VR Mindfulness for Meta-Competence Training in Neurodevelopmental Disorders

VR Mindfulness has proven to be an effective psychological treatment for ADHD. Serra-Pla et al. [100] designed and tested the first VR mindfulness intervention for individuals with ADHD. Twenty-five subjects enrolled in four 30-min VR mindfulness training sessions, while the other twenty-five participants were treated with psychostimulants. This study supported the idea that VR mindfulness can lead to significant improvements in self-management skills.

VR combined with biofeedback technologies, gaming, and mindful breathing have been found to enhance self-regulation skills in ADHD [101]. Bossenbroek et al. [101] evaluated a VR game that employed biofeedback in a total of eight adolescents diagnosed with ADHD. Players were asked to explore the underwater virtual world using their breathing as a tool to control their movements within the game. Users were able to better moderate their anxiety and disruptive conduct after six sessions.

Virtual group–based mindfulness interventions designed for individuals with ASD were found to positively influence self-regulation [28]. Thirty-seven adults with ASD participated in a VR group-based mindfulness program. After six weeks of training, participants reported that they were more able to regulate anxiety, effectively utilize coping strategies, and build connections with other people [28].

Table 3. Summary of the mindfulness training strategies in Special Education.

Reference	Country	Target Group	Participants	Duration	Mindfulness Program	Measurement	Research Design	Findings
Singh et al., 2003 [94]	USA	ID	n = 1, 27-year-old	10 sessions, 30 mi./sessions	Soles of the Feet	Staff- and self-reported behaviors	Case study	Improved self-control
Singh et al., 2007 [95]	USA	ID	n = 3 27–43 years	10 sessions, 30 mi./sessions	Soles of the Feet	Staff- and self-reported behaviors,	Multiple baseline design	Better control of aggressive behavior
Huguet et al., 2019 [27]	Spain	ADHD	n =70 (n_{exp} = 34, n_{clt} = 36 7 to 12 years, F = 51, m = 19 M_{age} = 9	8 sessions, 75 min per session	MBCT	K-SADS-PL, Wisc-IV, DSM-IV-TR, CBCL	RCT	Enhanced emotional regulation
Tarrasch et al., 2016 [96]	Israel	LD (ADHD, DYX)	n = 24 24–48 years M_{age} = 30	8 weekly sessions	MBSR	MAAS, PSS, RRQ, SWLS	Feasibility Study	Improved impulse and attentional regulation, better reading skills
Zaccari et al., 2022 [90]	Italy	ADHD	n = 25 (n_{exp} = 15, n_{clt} = 10) M_{age} = 8.9	24 sessions, 6 min. and rising to 30 min.	Breathing, mindfulness of body parts, mindfulness of thoughts, mindful games	CBCL, CPRS-R:L, SDSC	RCT	Sleep improvements and better behavioral regulation
Reese et al., 2015 [93]	USA	TS	n = 18 16–67 years	8 weekly 2-h classes and one 4-h retreat	MBSR	SCID, YGTSS, CGI-I, ATQ, WSAS	nRCT	Better control of tic intensity
Spek et al., 2013 [92]	Netherlands	ASD	n = 41, (n_{exp} = 20, n_{Clt} = 21), 18 and 65 years	9 weeks 40–60 min daily	Mindfulness-based-therapy for autism spectrum disorders	SCL-90-R RRQ GMS VCI, WAISIII	RCT	Better self-management of anxiety, depression, and rumination
Pradhan et al., 2017 [97]	USA	LD	n = 3, 8–10 years	10 sessions, 30 min	MBR-RAM	WISC-IV, WIAT-III	Case study	Improved self-regulation, self-observation, and emotional regulation
Juliano et al., 2020 [91]	USA	ASD	n = 27 11–16 years, F = 21, M = 6, M_{age} = 13.60	16 sessions, 30 min/session	Mindful Schools curriculum	CWIT, CN	Feasibility study	Improved inhibitory control
Santonastaso et al., 2020 [89]	Italy	ADHD	n = 25 (n_{exp} = 15, n_{clt} = 10) 7–11 years M_{age} = 8.9	3 times per week for 8 weeks	Mindful breathing, body scan, self-observation of thoughts	CPT-II, CPRS-R:L, CBCL 6–18, CBCL 6–18, CDI, PSI-SF,	RCT	Improvements in attentional control, inhibition control, and emotional regulation
Turanzas et al., 2020 [98]	Spain	GIFT	n = 22 8–14 years M_{age} = 11.36	8 weekly 90-min group sessions	Mindfulness for Giftedness	CAMM, AFQ-Y, CDI, STAIC, PANAS-C, ESCQ	Pilot study	Improved emotional recognition and emotional regulation

Table 3. *Cont.*

Reference	Country	Target Group	Participants	Duration	Mindfulness Program	Measurement	Research Design	Findings
Olton-Weber et al., 2020 [99]	USA	GIFT	*n* = 42, F = 18, M = 22, NB = 2, 11 to 14 years	6 weeks	BREATHE	CAPS, CAMM	quasi-experimental design	Better recognition and regulation of self-imposed forms of perfectionism

n: number of participants, F = female, M = Male, NB: non binary, RCT: Randomized Control Trial, nRCT: non Randomized Control Trial, ASD: Autism Spectrum Disorder, ADHD: Attention Deficit/Hyperactivity Disorder, ID: Intellectual Disabilities, TS: Tourette's syndrome, ANX: anxiety, LD: Learning Difficulties, DYX: Dyslexia, GIFT: Giftedness M_{age}: mean age, F: female, M: male, Exp: Experimental group, Clt: Control group, MBCT: Mindfulness-Based Cognitive Therapy, K-SADS-PL: Kiddie Schedule for Affective Disorders and Schizophrenia for school-age children-present lifetime version, Wisc-IV: Wechsler intelligence scale for children, fourth version, PANAS-C: Positive and Negative Affect Schedule for Children, DSM-IV-TR: ADHD Rating Scale-IV, parent version, CBCL: Child Behavior Checklist, CPRS-R:L: Conners' Parent Rating Scales Long Version Revised, SDSC: Sleep Disturbance Scale for Children, CPT-II: Continuous Performance Test-II, CPRS-R:L: Conners' Parent Rating Scales Long Version Revised, CBCL 6–18: Child Behavior Checklist for Ages 6–18, CBCL 6–18: Child Behavior Checklist for Ages 6–18, CDI: Children's Depression Inventory, CAMM: Child and Adolescent Mindfulness Measure, PSI-SF: Parenting Stress Index-Short Form, CWIT: Color-Word Interference Test, CN: cancellation subtest, SCL-90-R: Symptom Checklist-90-Revised, SCID: Structured Clinical Interview for DSM-IV, YGTSS: Yale Global Tic Severity Scale, CGI-I: Clinical Global Impression-Improvement Scale, ATQ: Adult Tic Questionnaire, WSAS: The Work and Social Adjustment Scale, FFMQ: Five Facet Mindfulness Questionnaire, PSS: Perceived Stress Scale, RRQ: Rumination–Reflection Questionnaire, Satisfaction with Life Scale, SWLS: Satisfaction with Life Scale, MAAS: Mindful Attention Awareness Scale, WISC-IV: Wechsler Intelligence Scale for Children-IV, AFQ-Y: Avoidance and Fusion Questionnaire for Youth, WIAT-III: Wechsler Individual Achievement Test-3rd edition, MBSR: Mindfulness-Based Stress Reduction, MBR-RAM: Mindfulness-Based Rehabilitation of Reading, Attention & Memory, MBCT: Mindfulness-Based Cognitive Therapy, CDI: Children's Depression Inventory, STAIC: State Trait Anxiety Inventory for Children, ESCQ: Emotional Skills and Competence Questionnaire. CAPS: Child–Adolescent Perfectionism Scale.

4.2.2. VR Mindfulness for Meta-Competence Training in Anxiety Disorders and Phobias

The findings revealed that VR mindfulness training with the assistance of avatars can be beneficial for developing self-control in people with anxiety disorders. A pilot study investigated whether VR could assist group-based mindfulness therapy. The coach could offer directions over the web interface. The users joined the mindfulness sessions through their avatars. After eight weeks, the participants improved attention regulation and stress self-management. In addition, self-satisfaction increased [87].

VR and mindfulness practices based on reflection were beneficial for improving stress management competences [102,103]. In a randomized controlled trial conducted by Modrego-Alarcon et al. [102], a sample of 280 participants was divided into three groups: the VR mindfulness intervention, the conventional mindfulness training group, and the relaxation group. The program included explicit teaching of the theory, along with practices that prioritized inquiry, reflection, and debate. After six weeks, the VR mindfulness group showed significant improvements in stress control, flexibility, emotional balance, and academic engagement.

Nature-based mindfulness and positive visualizations assisted by VR can significantly improve the mindfulness experience, positive feelings, and self-regulation capacity. Mistry et al. [104] examined the benefits of VR meditation in post-traumatic stress disorder (PTSD). A total of 96 young people participated in both VR- and non-VR-guided meditations. The results revealed that the participants were more able to perceive positive emotions and, in turn, control anxiety. In addition, most participants reported that they preferred VR meditation to non-VR meditation.

VR and nature-based mindfulness were found to be therapeutically effective, with immediate, adaptive psychophysiological outcomes. Similar outcomes were found in a study conducted by Tarrant et al. [105] that compared a brief nature-based mindfulness VR experience to a resting control condition for general anxiety disorder. The VR-based meditation intervention fostered self-regulation skills. Most importantly, electrophysiological markers associated with decreased anxiety occurred only after the VR meditation experience.

VR mindfulness combined with other therapeutic interventions, such as Dialectical Behavior Therapy (DBT), was found to be effective in meta-competence training for people with anxiety [106,107]. Gomez et al. [106] applied immersive VR DBT® mindfulness training to a patient with anxiety. The results revealed that after training, the subject was more able to control negative emotions and voluntarily focus on positive emotions. Similarly, Navarro-Haro et al. [107] examined the efficacy of VR mindfulness on anxiety disorders. Forty-two individuals with generalized anxiety disorder participated either in conventional mindfulness training or mindfulness combined with DBT® and assisted by VR. VR mindfulness DBT produced considerably improved effects in terms of anxiety self-management, emotion control, and interoceptive awareness.

The selected studies revealed that VR exposure treatment combined with diaphragmatic breathing techniques can effectively help people with phobias manage stressful stimuli [108]. Twenty-nine subjects with phobias were randomly assigned to VR exposure treatment, with or without diaphragmatic breathing. The results indicated that VR exposure therapy combined with diaphragmatic breathing significantly helped the subjects develop self-control skills.

VR mindfulness combined with cognitive behavior therapy was found to be an effective strategy for cultivating optimistic thinking and training meta-memory skills and behavioral flexibility among people with specific phobias [109]. Lacey et al. [109] evaluated the effectiveness of a VR mobile application that combines mindfulness and cognitive behavior therapy in a sample of 126 subjects with specific phobias. The participants reported that they were more able to stop avoiding thinking and to adaptively manage stressful memories.

VR provided a realistic and safe environment for training self-control skills among people with panic disorders. Seol et al. [110] employed a VR-based system designed to

assist mindfulness intervention to train five subjects to inhibit panic. The basic elements of the proposed system included the use of 360-degree video to depict the panic-inducing situation, a compelling scenario, and an immersive experience with multimodal feedback for the facilitation of mindfulness training. In the panic-inducing scene, a virtual escape button allowed the patient to return to the initial peaceful scene at any time. Participants in the training session remarked that they could intentionally act to stabilize their mental state, rather than panicking even more.

4.2.3. VR Mindfulness for Meta-Competence Training in Emotional and Behavioral Disorders

Navarro-Haro et al. [111] investigated the efficacy of a VR mindfulness DBT® intervention on a woman with borderline personality disorder, a clinical condition characterized by emotional instability, aggressive behaviors, and dysfunctional interpersonal relationships. While listening to DBT® mindfulness training audios, the subject was immersed in VR and observed herself "floating down" a 3D computer-generated river. The VR mindfulness intervention helped the patient raise her self-awareness. Furthermore, she was better able to control suicide ideation, self-harm, abandonment treatment, drug misuse, and mental pain. Furthermore, she transferred mindful skills to real life.

Habak et al. [83] examined whether the use of positive visualizations could help people with emotional disorders stabilize their mood. A total of 79 participants with depression participated in the study. The subjects were immersed in magnificent landscapes that helped them relax. The results of the study revealed that the intervention helped the subjects develop a positive mindset, which in turn allowed them to inhibit negative thoughts and flexibly control emotions.

The findings revealed that VR mindfulness training compared with standard relaxation exercises can lead to better outcomes in terms of meta-competence training [112]. Veling et al. [112] evaluated the effectiveness of a VR self-management mindfulness tool with immersive 360° nature videos and interactive animated elements. A sample of fifty participants with depression, bipolar disorder, psychosis, and anxiety was divided into two groups. The experimental group received VR mindfulness relaxation exercises, while the control group received standard relaxation exercises. The results showed that the experimental group could more flexibly respond positively, taking responsibility for their role in negative situations and turning negative thoughts into positive actions.

VR mindfulness was found to decrease aggressive behaviors and train adaptive skills [113]. Ilioudi et al. [113] recruited a total of sixty subjects with depression and bipolar disorder, forty of whom utilized a VR calm room, whereas the other twenty used the physical calm room. The VR program included breathing techniques, mindfulness programs, and relaxing music. The participant could interact with the environment by gazing at various objects inside the environment using the hand-held controller to adapt preferences and create individualized scenery. After training, the participants were more able to induce a state of relaxation. The following Table 4 presents a summary of the VR mindfulness training strategies for people with SEND.

4.3. Risk of Bias Assessments

The majority of the assessed publications indicated encouraging preliminary outcomes, with significant improvements in the domains addressed. ROB2 [31] was employed to assess the thirteen randomized controlled trials. It was discovered that ten studies had a low risk of bias, one study had some concerns, and one study had a high risk of bias. ROBINS-I was used to evaluate the remaining 16 non-randomized controlled trials [32]. A total of eight studies had a low risk of bias, six studies were determined to have a moderate risk of bias, and two were determined to have a critical risk of bias. The details of the ROB-2 and ROBINS-I assessments are shown in Appendix A (Figures A1–A4) using an adapted Robvis visualization [33]. Most studies indicated a minimal risk of bias. The main issues were about the processes of randomization, the selection of samples, and the selection of the reported results. Concerns were also raised due to the participants' small sample size.

Table 4. Summary of VR mindfulness in meta-competence training for people with SEND.

Reference	Country	Clinical Condition	Sample	VR Design	Duration	Mindfulness Program	Type of Measurement	Research Design	Main Findings
Lunsky et al., 2022 [28]	Canada	ASD	n = 37 M_{age} = 31, F = 14, M = 21, NB = 2	VR meeting platform	6 weeks, 60 min per session	MBSR	DASS-21, FFMQ-SF, SCS-SF	Feasibility study	Better regulation of stress, connectedness
Veling et al., 2021 [112]	Netherlands	ANX, PSY, DEP or BPD	n = 50 (n_{exp} = 25, $n_{Clt.}$ = 25), F = 33, M = 17, M_{age} = 41.6	Samsung Galaxy S6 or S7 smartphone, connected to the Samsung Gear VR HMD, VR relaxation software	20 (minimum of 10 min, 10 consecutive days per session)	Guided meditation and progressive relaxation techniques	BAI, GPTS, IDS, PSS-10, VAS, SSQ	RCT	Improved ability to regulate negative emotions. Enhanced positive thinking.
Lacey et al., 2022 [109]	New Zealand	Specific Phobias	n = 126 (n_{exp} = 51/63 analysed, n_{clt}: 58/63 analysed), M_{age} = 42.2	Smartphone app combined with the headset that holds the smartphone and uses 360° video	6 weeks	Meditative techniques based on acceptance and flexibility around anxiety	SMSP, PHQ9, BFNE	RCT	Flexibility to behavioral change, optimism, better self-management of negative thoughts and fears
Chavez et al., 2020 [103]	USA	DEP, ANX, ADHD, BPD	n = 28 (n_1 =8, n_2= 11, n_3 = 10) M= 15, F = 14 M_{age} = 21.6	Oculus Go headset	1 session	Guided meditation	STAI-6, salivary cortisol	RCT	Anxiety regulation, no difference in cortisol levels.
Shiban et al., 2017 [108]	Germany	DEP, PB	n= 29, (n_{exp} = 15, $n_{Clt.}$= 14), M_{age} = 34.3, F = 24, M = 5	V6 Head Mounted Display	1 session	Mindful Breathing	HR, SCL, RR, ASI, FFS, FSB	RCT	Improved ability of self-control
Cikajlo et al., 2017 [87]	Ireland	ANX	n = 8 24–48 years	ReCoVR System Design, 3D VR headset	8 weeks, 30 min/per session	MBSR	SWLS, MAAS	Feasibility Study	well-being, attention regulation, and anxiety management
Navarro et al., 2016 [111]	USA	BPD	n = 1, 32 years, F = 1	Kaiser Electro-OpticsVR goggles	4 sessions	DBT Mindfulness	DBT diary card, KIMS-Short,	Case study	Improved self-regulation, observation skills, emotional regulation
Navarro et al., 2019 [107]	Spain	GAD	n = 39 (n_{exp} = 19, $n_{Ctl.}$ = 20), F = 30, M = 9, M_{age} = 45.23	Oculus Rift DK2 VR goggles with head-mounted display, with head tracking	6 sessions	DBT Mindfulness skills training	GAD-7, HADS, FFMQ, DERS, VAAS	RCT	Improved self-regulation of anxiety, depression, and emotion regulation and interoceptive awareness.
Gomez et al., 2017 [106]	Saudi Arabia	ANX	n = 1, 21 years old	Oculus Rift DK2 VR goggles	4 sessions	DBT® mindfulness skills training	PCL-C	Case study	Improvements in positive thinking, emotional regulation
Modrego-Alarcon et al., 2021 [102]	Spain	ANX	n = 280 (n_{exp} = 93, n_{Clt1} = 93, n_{clt2} = 94), F = 59, M = 221 M_{age} = 22.25 years	VR goggles	6 weeks, once a week, 90 min per session	MBSR	PSS, STAI	RCT	Better self-control, emotional balance, reduced anxiety, academic engagement
Tarrant et al., 2018 [105]	USA	GAD	n = 26 (n_{exp} = 14, $n_{Ctl.}$= 12), F = 20, M = 6, M_{age} = 46.21	Gear VR HMD powered by Samsung S7, Mindfulness in nature experience, by StoryUp VR	a brief 75 min VR meditation intervention	Participants completed VR and non-VR meditations	GAD-7, STAI EEG patterns	RCT	Improved self-regulation of anxiety. VR group showed significant electrophysiological markers indicating lower anxiety
Mistry et al., 2020 [104]	Canada	PTSD	n = 96 (clinical sample: n = 26), F = 54, M = 42, M_{age} = 24.02 96 (54 females, 42 males).	Head Mounted Display	1 session	Guided meditation	LEC-5, LES, ACE, PCL-5, MEQ, TRASC, mDES, BASS,	Within-group mixed-methods study	Positive affect increased. Improved emotional regulation ability. Better stress management.

Table 4. *Cont.*

Reference	Country	Clinical Condition	Sample	VR Design	Duration	Mindfulness Program	Type of Measurement	Research Design	Main Findings
Habak et al., 2021 [83]	Australia	DEP	n = 79, F = 53, M = 23 male, NB = 3, 25–34 years	VR headset	3 sessions	Positive Visualizations	PANAS, BHS, SWEMWBS,	Pilot study	Better regulation of negative affect
Serra-Pla et al., 2017 [100]	Spain	ADHD	n = 50, n_{exp} = 25, n_{clt} = 25	VR goggles	Four 30-min sessions	MBSR	Pre-treatment, post-treatment, and at 3- and 12-months post-treatment.	RCT	Improved self-management skills
Bossenbroek et al., 2020 [101]	Nehterlands	ADHD, ASD	n = 8 (F = 1, M = 7, M_{age}= 14.67	Immersive VR biofeedback game	4 weeks, 6 sessions. 15 min.	Mindful breathing	STAI, Likert Scale to measure disruptive classroom behavior	Single-case experimental study	Improved self-regulation skills
Seol et al., 2017 [110]	Korea	PD	n = 5	Head-mounted display, leap motion sensor, PSL-lecg2 and Falcon device	2 sessions	Mindfulness scenarios, breathing regulatory guidance	DASS	Pilot Study	Improved ability to consciously stabilize their state of mind. improved self-management of anxiety, and positive feelings of peacefulness.
Ilioudi et al., 2023 [113]	Sweden	DEP, BPD, ANX	n = 60, n_{exp} = 40, n_{Clt} = 20, F = 35, M = 25 M_{age} = 39.1	Head-mounted display (an Oculus Go) running in a mobile app	1 session	Breathing exercises, Guided relaxation	MADRS-S, BAI	Quasi RCT	Improved ability to induce self-relaxation

n: number of participants, ADHD: attention-deficit/hyperactivity disorder, ASD: autism spectrum disorder, ID: intellectual disabilities, PTSD: Post Traumatic Stress Disorder, BPD = Bipolar Disorder, GAD:Generalized Anxiety Disorder, ANX = anxiety, DEP = depression, PD = Panic Disorder, PSY = Psychosis, M_{age}: mean age, F: female, M: male, NB: non binary, Exp: experimental group, Clt: control group, RCT: randomized controlled Trial, GAD-7: Generalized Anxiety Disorder-7, STAI: State-Trait Anxiety Inventory-Y, LES: life events survey, LEC-5: life events checklist for DSM-5, ACE: adverse childhood experiences, PCL-5: posttraumatic stress disorder checklist for DSM-5, TRASC: trauma-related altered states of consciousness, Mdes: modified differential emotions scale, BASS: Buddhist affective states, MEQ: normative meditative experiences, BAI: Beck anxiety inventory, GPTS: green paranoid thoughts scale, IDS: inventory of depressive symptomatology, PSS: perceived stress scale, VAS: visual analog scales, SMSP: Severity Measures for Specific Phobia—Adults, BFNE: Brief Fear of Negative Evaluation, PHQ9: Patient Health Questionnaire 9, MADRS-S: Montgomery-Åsberg Depression Rating Scale-Self Assessment BAI: Beck Anxiety Inventory, DASS: Depression Anxiety Stress Scales, MBSR: Mindfulness-Based Stress Reduction, DASS-21: 21-item Depression, Anxiety & Stress Scales, FFMQ-SF: 24-item Five-Facet Mindfulness Questionnaire-Short form, SCS-SF: Self-Compassion Scale—Short Form, SWLS: Satisfaction With Life Scale, MAAS: Mindful Attention Awareness Scale, PSS: Perceived Stress Scale, DBT: Dialectical Behavior therapy, HADS: Hospital anxiety and depression scale, FFMQ: Five facets of mindfulness questionnaire, DERS: Difficulties of emotion regulation scale, MAIA: Multidimensional assessment of interoceptive awareness BHS: Beck Hopelessness Scale, SWEMWBS: Short Warwick–Edinburgh Mental Well-Being Scale, PCL-C: PTSD CheckList-Civilian version, KIMS: Kentucky Inventory of Mindfulness Skills, STAI-6: State-Trait Anxiety Inventory-6, HR: Heart rate, SCL: skin conductance level, RR: Respiration rate, ASI: Anxiety Sensitivity Index, FFS: Fear of Flying Scale, FSB: Flying phobia screening questionnaire.

4.4. Research Impact, Authors' Productivity, and Other Metrics

The journals of the selected papers were categorized according to the Scientific Journal Rankings (SJR), which is an indicator of the journal's academic value and impact. According to Scimago rankings, four categories/quartiles exist: Q1 is considered the quarter of the journals with the highest values. Q2 follows with the second-highest values, Q3 with the third-highest values, and Q4 with the lowest values. Fifteen studies (52%) were evaluated with the highest value. Eleven studies were assessed with the second highest value (38%). One study was assessed with the third highest value. Two studies were not yet assigned to the ranking system. However, the publisher of one paper includes journals with high value (Q1). Table 5 presents the journals of the chosen articles, the publishers, and the journal rankings to indicate the importance of the selected articles.

Table 5. Quartile scores and Scimago Journal Rank (SJR) of the selected studies.

Source	Journal	Publisher	Quartile Score	SJR (2022)
[104]	Psychological Trauma: Theory, Research, Practice, and Policy	American Psychological Association	Q1	2.11
[112,113]	Journal of Medical Internet Research (JMIR)	JMIR Publications Inc.	Q1	1.99
[109]	Australian and New Zealand Journal of Psychiatry	SAGE Publications Ltd.	Q1	1.82
[102]	Behaviour Research and Therapy	Elsevier Ltd.	Q1	1.79
[101,103]	JMIR Mental Health	JMIR Publications Inc.	Q1	1.41
[108]	BMC Psychiatry	BioMed Central Ltd.	Q1	1.29
[28,98]	Mindfulness	Springer Verlag	Q1	1.26
[93]	Journal of Psychosomatic Research	Elsevier Inc.	Q1	1.13
[90]	Psychology and Health	Routledge	Q1	1.03
[99]	Gifted Child Quarterly	SAGE Publications Inc.	Q1	0.93
[95]	Behavior Modification	SAGE Publications Inc.	Q1	0.9
[27]	Journal of Developmental & Behavioral Pediatrics (JDBP)	Lippincott Williams and Wilkins Ltd.	Q1	0.75
[96,105–107,111]	Frontiers in Psychology	Frontiers Media S.A.	Q2	0.89
[83,89]	International Journal of Environmental Research and Public Health	Multidisciplinary Digital Publishing Institute (MDPI)	Q2	0.83
[91,92,94]	Research in Developmental Disabilities	Elsevier Inc.	Q2	0.77
[87]	JMIR Research Protocols	JMIR Publications Inc.	Q2	0.53
[100]	Revista de Neurologia	Revista de Neurologia	Q3	0.29
[97]	Adolescent Psychiatry	Bentham Science Publishers B.V.	Not yet assigned	-
[110]	Proceedings of the ACM Symposium on Virtual Reality Software and Technology, VRST	Association for Computing Machinery	Not yet assigned	-

Moreover, we searched for more information about the authors' productivity with the aim of better understanding and estimating the importance of the results. Specifically, we kept track of the total publications, the total citations, and the h-index. We classified the authors based on the h-index, which is a significant citation-based metric that demonstrates authors' productivity and is dependent on their publications and citation records. The list included authors with significant productivity. It is noteworthy that their studies focus on mindfulness for training new skills for people with disabilities. Some of them have several significant works on the role of VR in mindfulness. Table 6 presents a classification of the authors according to their productivity.

Figure 4 shows the frequency of academic publications focused on mindfulness interventions with or without the use of VR for training meta-competencies among people with special education needs over the last two decades. The figure suggests an upward trend in the last decade for both types of intervention. The growing research around emerging technologies as well as the neuropsychological improvements from mindfulness intervention suggests that, in the following years, we can expect an increase in the research about the effectiveness of mindfulness training assisted by emerging technologies for populations with special training needs.

Table 6. The authors (first author) of the selected papers in terms of publication productivity.

Source	First Author Name	Total Publications	h-Index	Total Citations
[94,95]	Singh, Nirbhay	612	45	12,822
[28]	Lunsky, Yona J.	279	37	5019
[112]	Veling, Wim	116	31	3038
[27]	Huguet, Anna	64	27	3752
[96]	Tarrasch, Ricardo	78	26	2401
[109]	Lacey, Cameron J.	105	19	1436
[90]	Zaccari, Vittorio	82	19	1242
[93]	Reese, Hannah	38	17	1523
[103]	Chavez, Laura Johnson	54	16	678
[108]	Shiban, Youssef	35	15	1638
[87]	Cikajlo, Imre	77	14	900
[92]	Spek, Annelies	25	13	718
[97]	Pradhan, Basant	31	11	443
[107,111]	Navarro-Haro, María V.	25	10	438
[106]	Gómez, Jocelyn	11	9	198
[102]	Modrego-Alarcón, Marta	13	8	373
[91]	Juliano, Anthony	17	6	548
[89]	Santonastaso, Ornella	9	6	125
[105]	Tarrant, Jeffrey M.	10	5	236
[104]	Mistry, Divya	5	4	50
[83]	Habak, Stephanie	6	3	27
[100]	Serra-Pla, Juanfran Francisco	3	3	33
[98]	Turanzas, Jorge	3	3	32
[110]	Seol, Eunbi	3	3	30
[101]	Bossenbroek, Rineke	3	2	42
[99]	Olton-Weber, Sophia	1	1	28
[113]	Ilioudi, Maria	1	0	0

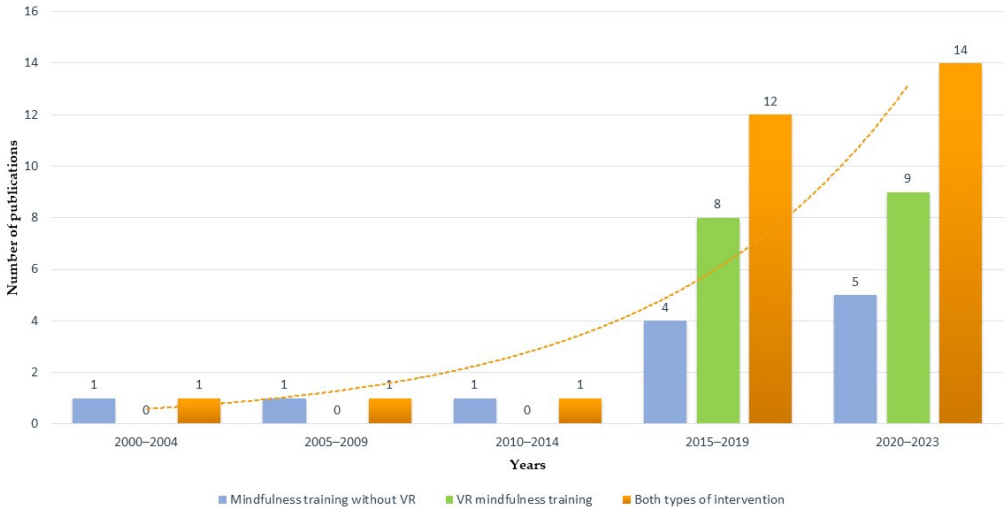

Figure 4. Distribution of the selected studies per year.

Figure 5 presents the production of the selected studies per country between 2000 and May 2023. The intensity of the colors indicates the number of papers identified. For both types of interventions, a higher number of studies originate from the United States of America (USA). From a total of 29 studies, 9 studies originated from the USA, five studies from Spain, three studies from the Netherlands, and two studies from Canada and Italy. One article was identified by Germany, Ireland, Israel, Australia, New Zealand, Korea, Sweden, and Saudi Arabia.

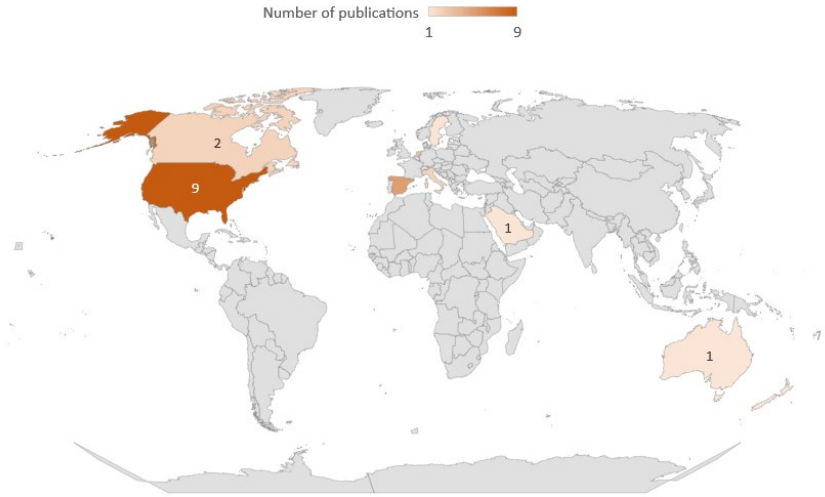

Figure 5. The production of relevant studies per country between 2000 and 2023.

5. Discussion

The current systematic review aimed to explore the effectiveness of mindfulness practices on meta-cognitive and meta-emotional competences among people with different mental disorders, mood disorders, anxiety disorders, and relevant psychiatric symptoms. Special focus was given to the role of VR as an assistive tool within mindfulness training to support the training of regulation meta-competences.

Looking at the results as a whole, we can confirm that mindfulness interventions, especially those assisted by VR, can effectively train a wide range of meta-competences that ensure an autonomous, balanced, satisfied, and inclusive life. Most importantly, the results indicated that such interventions can be beneficial for populations with special training needs, such as those with neurodevelopmental disorders, mood disorders, anxiety disorders, behavioral disorders, and anxiety disorders. These results indicate that mindfulness training assisted by VR can be a promising strategy for psychiatry international to deal with the major mental health challenges of the 21st century.

More specifically, breathing techniques, focus attention practices, and mindfulness games significantly helped individuals with ADHD improve attentional control, which in turn resulted in an increased ability to inhibit impulses and regulate emotions [89]. Relaxation induced by mindfulness training supported subjects with hyperactivity to calm down, raise self-awareness, and more flexibly regulate negative emotions and aggressive behaviors [27,90].

Significant benefits were observed in the case of ASD, which is characterized by increased impulsivity. The findings revealed improvements in the self-management of impulsivity [91]. The findings also demonstrated that mindfulness strategies can trigger positive emotions, allowing subjects with ASD to better control anxiety and depressive symptoms [92]. NLP-based mindfulness techniques were found to have a long-lasting positive influence on self-control abilities in people with mental and behavioral dysregulation [94,95].

Mindfulness techniques that trained visual attention significantly helped people with learning difficulties, such as dyslexia, develop attention regulation, which in turn led to improvements in academic skills [96,97]. In addition, mindfulness increased self-confidence, which is considered a common factor in underachievement among people with learning difficulties [96].

Mindfulness strategies that involved reflection significantly assisted gifted individuals to more accurately perceive and manage intense emotions [98]. In addition, reflective practices significantly aided gifted people in dealing with cognitive bias, self-imposed beliefs, and perfectionism [99].

VR can be an effective assistive technology for mindfulness interventions among people with SEND. Although we must proceed with care when interpreting these findings because of the small number of studies, the findings nonetheless appear to be broadly consistent with relevant studies on VR mindfulness in clinical and non-clinical populations [29,114].

VR mindfulness interventions showed equally positive outcomes in meta-competence training. It was revealed that the assistance of VR led to better outcomes compared with conventional mindfulness interventions. In some cases, participants reported that they preferred VR mindfulness interventions to non-VR mindfulness programs [104]. Subjects with neurodevelopmental disorders significantly improved their self-regulation competences when immersed in nature-based mindfulness training environments [104]. Immersion in VR combined with positive visualization strategies enhanced positive affect and thus accelerated behavioral change procedures [83,104].

VR provided fertile ground for the implementation of mindfulness training combined with other psychological approaches, such as cognitive behavioral therapy and exposure therapy [107–109]. VR combined with biofeedback technologies, gamification, and mindful strategies was found to equip subjects with disruptive behaviors with self-regulation skills.

Group-based mindfulness programs have been shown to assist individuals with social communication difficulties in developing connections and productive relationships [28,87].

The current systematic review study has several limitations. Article searches were limited to four academic databases. The use of additional databases, such as the Web of Science, could provide us with significant data. In future research, we aim to further analyze this topic using evidence from a wider range of academic databases. Several studies evaluated the effects of mindfulness intervention after a single or two sessions. This is an important limitation because meta-competence training requires time and systematic training. However, the positive outcomes after brief interventions revealed the high potential of such practices to train complex competences. The plethora of assessment tools, heterogeneous measurements, and different control interventions made accurate interpretation of the data a more difficult task.

Despite the positive outcomes found, it is necessary to take into account the risks associated with the use of VR mindfulness, especially for people with special training needs. According to Simon-Vicente et al. [115], VR may provoke various adverse events, such as cybersickness, which can cause dizziness, fatigue, and malaise, or even cause symptoms of nausea, eye strain, and bodily disorientation [115,116]. However, the research provides promising results indicating that mindfulness practices can minimize various adverse effects, including motion sickness [117]. The implementation of VR mindfulness in special education faces additional challenges. Clinical expert and educator training, cost challenges, and users' attitudes, assessments, and validation of VR applications are also included [116].

Although safety concerns have led to debates about the utility of VR in specific target groups, such as those with SEND, rather than disheartening its application, it is recommended to better examine the potential risks in the design of the following research [115]. More research is required regarding the selection of appropriate VR technology that meets the subject's strengths and weaknesses. It is essential to carefully examine the VR design according to the target group's characteristics. The type of device, the VR mindfulness content, the period of exposure, as well as the features of the required task, should be carefully examined before intervention [115]. The cooperation of professionals from different fields is also required. It is important to train therapists in the professional and ethical utilization of VR. The acceptance of VR in training for educational use should be promoted among students with SEND and their caregivers. Comprehensive manuals that provide detailed instructions about how, where, and for whom this technology is appropriate are also required [118].

The research regarding the effectiveness of VR mindfulness is in the early stages. There is an urgent need for randomized controlled trials applied to populations with

special education needs. Larger sample sizes are needed to provide more accurate data. Experimental designs using intensive long-term treatments are required. Follow-up re-evaluations after the end of interventions will provide more accurate data. Special attention should be given to various mindfulness strategies to accurately determine their impact on target meta-competences and target groups.

Furthermore, the utilization of supplementary data, including physiological markers (e.g., heart rate variability, oscillations, hormones), may provide reliable data. For this reason, the exploitation of artificial intelligence, smart technologies, and biofeedback technologies could provide fertile ground for the design and implementation of innovative VR-assisted intervention programs. Furthermore, more research is needed to evaluate the effectiveness of VR mindfulness in different settings (i.e., educational settings). Another interesting topic concerns the design and implementation of VR mindfulness interventions, both for personalized interventions and for group training programs.

Research regarding the effectiveness of mindfulness training in various domains of human life is growing rapidly. The numerous studies that have so far been conducted have provided important evidence about the health benefits of such practices [119]. Other studies have improved our knowledge about the impact of mindfulness in populations with clinical symptoms and psychiatric disorders [120–122]. More recent studies acknowledge the importance of digital technologies as assistive tools in mindfulness interventions. A few studies have been conducted to investigate the impact of mindfulness training assisted by VR technologies in populations with clinical or non-clinical symptoms [29,114,123,124]. This systematic review, taking into account this valuable knowledge, mainly focused on the meta-competencies that individuals with special education needs can develop to be autonomous, self-regulated, and adaptive in almost every aspect of life.

Promoting mental health and emotional well-being in educational institutions for people with SEND is strongly advocated in international educational policies [125]. The findings of the current systematic review can provide pointers for the implementation of mindfulness strategies with the assistance of VR to aid students with disabilities in developing the meta-cognitive and meta-emotional competencies needed to be inclusive and satisfied in school, in the workplace, and in the social context. In addition, the results of this systematic review could be utilized by therapists or educators to better design personalized mindfulness programs according to the trainees' special training needs of the trainees. In addition, this research may provide positive feedback for future research regarding the design of VR mindfulness interventions for people with SEND.

6. Conclusions

Emerging evidence indicates that mental health issues are increasing rapidly around the globe, with the largest increase occurring among children and young people [126]. Psychiatry International, in the face of major challenges in global mental health, is ready to broaden its therapeutic horizons with the newest psychological approaches inspired by mindfulness practices and assisted by digital tools [123,124,127]. The current systematic review study provided evidence about the potential of mindfulness practices, especially those assisted by VR technologies, to train metacognitive and meta-emotional competences among people with different mental disorders, including neurodevelopmental disorders, emotional, and behavioral disorders, anxiety disorders as well as specific learning disorders. Results indicated significant improvements for a wide range of meta-competences including self- and emotional awareness, attentional control, inhibition control, emotional regulation, and adaptability. VR provided safe, flexible, engaging, interactive, and engaging training environments, making it easier for people with disabilities to complete the training programs. In trying to interpret our results, we conclude that mindfulness and VR—especially in the case of immersive technologies—can join forces to maximize the benefits of the training experience. This study may provide positive feedback for future research regarding digitally assisted mindfulness interventions designed to develop meta-competences among people with psychiatric and other disorders.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/psychiatryint4040031/s1, Table S1. PRISMA Checklist.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

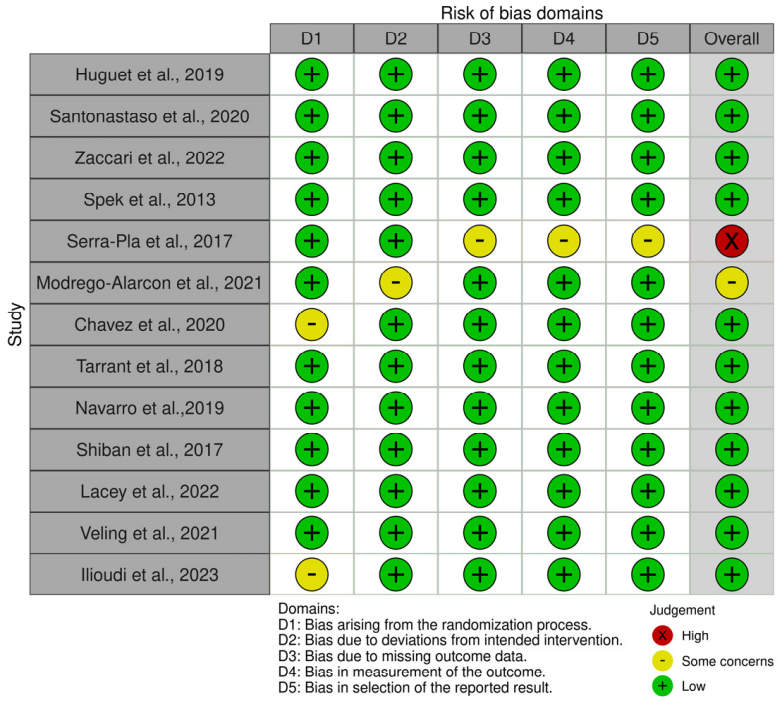

Figure A1. ROB-2 "traffic light" plots visualize the risk of bias of each randomized control study selected in this review based on five domains of assessment [27,89,90,92,100,102,103,105,107–109,112,113].

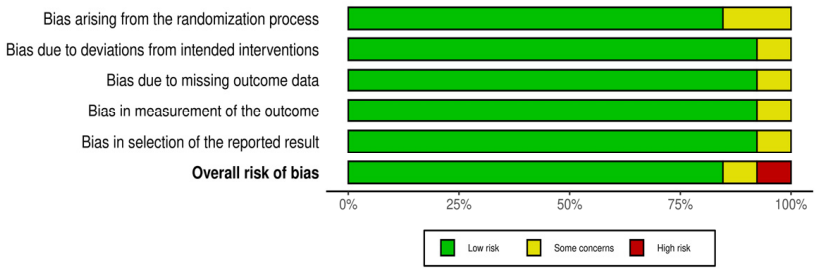

Figure A2. ROB-2 weighted bar plots visualize the distribution of the risk-of-bias of the selected randomized controlled trials based on five domains of assessment.

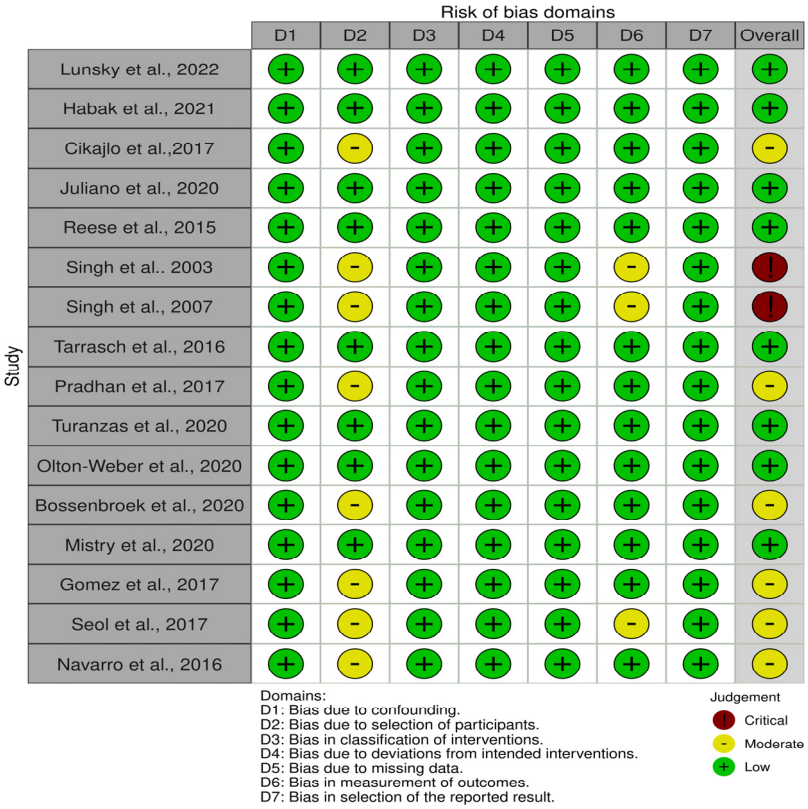

Figure A3. ROBINS-I "traffic light" plots visualize the risk of bias for each nonrandomized study included in this review. It is structured on seven domain-level judgments [28,83,87,91,93–99,101,104,106,110,111].

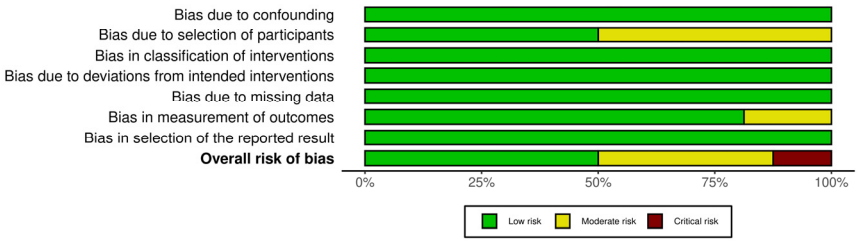

Figure A4. ROBINS-I weighted bar plots present the distribution of the risk of bias of the selected nonrandomized studies based on seven domains of assessment.

References

1. Muktamath, V.R.; Hegde, P.; Chand, S. Types of Specific Learning Disability. In *Learning Disabilities-Neurobiology, Assessment, Clinical Features and Treatments*; IntechOpen: London, UK, 2022.
2. Joyce-Beaulieu, D.; Sulkowski, M.L. The Diagnostic and Statistical Manual of Mental Disorders: Fifth Edition (DSM-5) Model of Impairment. In *Assessing Impairment*; Springer: Boston, MA, USA, 2016; pp. 167–189.
3. Sisk, D. Managing the Emotional Intensities of Gifted Students with Mindfulness Practices. *Educ. Sci.* **2021**, *11*, 731. [CrossRef]
4. Prasittichok, P.; Klaykaew, K.K. Meta-Skills Development Needs Assessment among Undergraduate Students. *Heliyon* **2022**, *8*, e08787. [CrossRef] [PubMed]
5. Drigas, A.; Mitsea, E. 8 Pillars X 8 Layers Model of Metacognition: Educational Strategies, Exercises &Trainings. *Int. J. Online Biomed. Eng. iJOE.* **2021**, *17*, 115. [CrossRef]
6. Chernyavskaya, V.S.; Malakhova, V.R. Features of Meta-Competences in Primary School Children. *Procedia—Soc. Behav. Sci.* **2016**, *233*, 352–356. [CrossRef]
7. Senova, M. Meta-skills are the key to human potential. *J. Behav. Econ. Soc. Syst.* **2020**, *2*, 133–137. [CrossRef]
8. Mayer, J.D.; Salovey, P. The Intelligence of Emotional Intelligence. *Intelligence* **1993**, *17*, 433–442. [CrossRef]
9. D'Amico, A.; Geraci, A. Beyond Emotional Intelligence: The New Construct of Meta-Emotional Intelligence. *Front. Psychol.* **2023**, *14*, 1096663. [CrossRef]

10. Kabat-Zinn, J. Mindfulness-Based Interventions in Context: Past, Present, and Future. *Clin. Psychol. Sci. Pract.* **2003**, *10*, 144–156. [CrossRef]
11. Shapiro, S.L. The Integration of Mindfulness and Psychology. *J. Clin. Psychol.* **2009**, *65*, 555–560. [CrossRef]
12. Malinowski, P. Mindfulness as Psychological Dimension: Concepts and Applications. *Ir. J. Psychol.* **2008**, *29*, 155–166. [CrossRef]
13. Walsh, R.; Shapiro, S.L. The Meeting of Meditative Disciplines and Western Psychology: A Mutually Enriching Dialogue. *Am. Psychol.* **2006**, *61*, 227–239. [CrossRef] [PubMed]
14. Creswell, J.D. Mindfulness Interventions. *Annu. Rev. Psychol.* **2017**, *68*, 491–516. [CrossRef]
15. Reangsing, C.; Punsuwun, S.; Schneider, J.K. Effects of Mindfulness Interventions on Depressive Symptoms in Adolescents: A Meta-Analysis. *Int. J. Nurs. Stud.* **2021**, *115*, 103848. [CrossRef]
16. Borquist-Conlon, D.S.; Maynard, B.R.; Brendel, K.E.; Farina, A.S.J. Mindfulness-Based Interventions for Youth with Anxiety: A Systematic Review and Meta-Analysis. *Res. Soc. Work Pract.* **2017**, *29*, 195–205. [CrossRef]
17. Lee, Y.-C.; Chen, C.-R.; Lin, K.-C. Effects of Mindfulness-Based Interventions in Children and Adolescents with ADHD: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Int. J. Environ. Res. Public Health* **2022**, *19*, 15198. [CrossRef] [PubMed]
18. Cachia, R.L.; Anderson, A.; Moore, D.W. Mindfulness in Individuals with Autism Spectrum Disorder: A Systematic Review and Narrative Analysis. *Rev. J. Autism Dev. Disord.* **2016**, *3*, 165–178. [CrossRef]
19. Linardon, J. Can Acceptance, Mindfulness, and Self-Compassion Be Learned by Smartphone Apps? A Systematic and Meta-Analytic Review of Randomized Controlled Trials. *Behav. Ther.* **2020**, *51*, 646–658. [CrossRef] [PubMed]
20. Döllinger, N.; Wienrich, C.; Latoschik, M.E. Challenges and Opportunities of Immersive Technologies for Mindfulness Meditation: A Systematic Review. *Front. Virtual Real.* **2021**, *2*, 644683. [CrossRef]
21. Mikropoulos, T.A. Presence: A Unique Characteristic in Educational Virtual Environments. *Virtual Real.* **2006**, *10*, 197–206. [CrossRef]
22. Mesa-Gresa, P.; Gil-Gómez, H.; Lozano-Quilis, J.-A.; Gil-Gómez, J.-A. Effectiveness of Virtual Reality for Children and Adolescents with Autism Spectrum Disorder: An Evidence-Based Systematic Review. *Sensors* **2018**, *18*, 2486. [CrossRef]
23. Bashiri, A.; Ghazisaeedi, M.; Shahmoradi, L. The Opportunities of Virtual Reality in the Rehabilitation of Children with Attention Deficit Hyperactivity Disorder: A Literature Review. *Korean J. Pediatr.* **2017**, *60*, 337. [CrossRef] [PubMed]
24. Nabors, L.; Monnin, J.; Jimenez, S. A Scoping Review of Studies on Virtual Reality for Individuals with Intellectual Disabilities. *Adv. Neurodev. Disord.* **2020**, *4*, 344–356. [CrossRef]
25. Lozano-Álvarez, M.; Rodríguez-Cano, S.; Delgado-Benito, V.; Mercado-Val, E. A Systematic Review of Literature on Emerging Technologies and Specific Learning Difficulties. *Educ. Sci.* **2023**, *13*, 298. [CrossRef]
26. Chandrasiri, A.; Collett, J.; Fassbender, E.; De Foe, A. A Virtual Reality Approach to Mindfulness Skills Training. *Virtual Real.* **2019**, *24*, 143–149. [CrossRef]
27. Huguet, A.; Izaguirre Eguren, J.; Miguel-Ruiz, D.; Vall Vallés, X.; Alda, J.A. Deficient Emotional Self-Regulation in Children with Attention Deficit Hyperactivity Disorder: Mindfulness as a Useful Treatment Modality. *J. Dev. Behav. Pediatr.* **2019**, *40*, 425–431. [CrossRef]
28. Lunsky, Y.; Redquest, B.; Albaum, C.; Hutton, S.; Share, M.; Share-Strom, D.; Weiss, J. Virtual Group–Based Mindfulness Intervention for Autistic Adults: A Feasibility Study. *Mindfulness* **2022**, *13*, 1706–1718. [CrossRef] [PubMed]
29. Arpaia, P.; D'Errico, G.; De Paolis, L.T.; Moccaldi, N.; Nuccetelli, F. A Narrative Review of Mindfulness-Based Interventions Using Virtual Reality. *Mindfulness* **2021**, *13*, 556–571. [CrossRef]
30. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *BMJ* **2021**, *372*, n71. [CrossRef]
31. Sterne, J.A.C.; Savović, J.; Page, M.J.; Elbers, R.G.; Blencowe, N.S.; Boutron, I.; Cates, C.J.; Cheng, H.-Y.; Corbett, M.S.; Eldridge, S.M.; et al. RoB 2: A Revised Tool for Assessing Risk of Bias in Randomised Trials. *BMJ* **2019**, *366*, l4898. [CrossRef]
32. Sterne, J.A.; Hernán, M.A.; Reeves, B.C.; Savović, J.; Berkman, N.D.; Viswanathan, M.; Henry, D.; Altman, D.G.; Ansari, M.T.; Boutron, I.; et al. ROBINS-I: A Tool for Assessing Risk of Bias in Non-Randomised Studies of Interventions. *BMJ* **2016**, *366*, i4919. [CrossRef]
33. McGuinness, L.A.; Higgins, J.P.T. Risk-of-bias VISualization (Robvis): An R Package and Shiny Web App for Visualizing Risk-of-bias Assessments. *Res. Synth. Methods* **2020**, *12*, 55–61. [CrossRef]
34. Flavell, J.H. Metacognition and Cognitive Monitoring: A New Area of Cognitive–Developmental Inquiry. *Am. Psychol.* **1979**, *34*, 906–911. [CrossRef]
35. Fleur, D.S.; Bredeweg, B.; van den Bos, W. Metacognition: Ideas and Insights from Neuro- and Educational Sciences. *NPJ Sci. Learn.* **2021**, *6*, 13. [CrossRef] [PubMed]
36. Drigas, A.; Mitsea, E. The 8 Pillars of Metacognition. *Int. J. Emerg. Technol. Learn. (iJET)* **2020**, *15*, 162. [CrossRef]
37. Jankowski, T.; Holas, P. Metacognitive Model of Mindfulness. *Conscious. Cogn.* **2014**, *28*, 64–80. [CrossRef]
38. Vickery, C.E.; Dorjee, D. Mindfulness Training in Primary Schools Decreases Negative Affect and Increases Meta-Cognition in Children. *Front. Psychol.* **2016**, *6*, 2025. [CrossRef] [PubMed]
39. Vago, D.R.; David, S.A. Self-awareness, self-regulation, and self-transcendence (S-ART): A framework for understanding the neurobiological mechanisms of mindfulness. *Front. Hum. Neurosci.* **2012**, *6*, 296. [CrossRef]

40. Hölzel, B.K.; Lazar, S.W.; Gard, T.; Schuman-Olivier, Z.; Vago, D.R.; Ott, U. How Does Mindfulness Meditation Work? Proposing Mechanisms of Action from a Conceptual and Neural Perspective. *Perspect. Psychol. Sci.* **2011**, *6*, 537–559. [CrossRef]
41. Lutz, A.; Slagter, H.A.; Dunne, J.D.; Davidson, R.J. Attention Regulation and Monitoring in Meditation. *Trends Cogn. Sci.* **2008**, *12*, 163–169. [CrossRef]
42. Soler, J.; Elices, M.; Pascual, J.C.; Martín-Blanco, A.; Feliu-Soler, A.; Carmona, C.; Portella, M.J. Effects of Mindfulness Training on Different Components of Impulsivity in Borderline Personality Disorder: Results from a Pilot Randomized Study. *Borderline Personal. Disord. Emot. Dysregulation* **2016**, *3*, 1. [CrossRef]
43. Pozuelos, J.P.; Mead, B.R.; Rueda, M.R.; Malinowski, P. Short-Term Mindful Breath Awareness Training Improves Inhibitory Control and Response Monitoring. *Prog. Brain Res.* **2019**, *244*, 137–163. [CrossRef] [PubMed]
44. Sanger, K.L.; Dorjee, D. Mindfulness Training with Adolescents Enhances Metacognition and the Inhibition of Irrelevant Stimuli: Evidence from Event-Related Brain Potentials. *Trends Neurosci. Educ.* **2016**, *5*, 1–11. [CrossRef]
45. Tang, Y.-Y.; Hölzel, B.K.; Posner, M.I. The Neuroscience of Mindfulness Meditation. *Nat. Rev. Neurosci.* **2015**, *16*, 213–225. [CrossRef] [PubMed]
46. Moore, A.; Malinowski, P. Meditation, Mindfulness and Cognitive Flexibility. *Conscious. Cogn.* **2009**, *18*, 176–186. [CrossRef] [PubMed]
47. Davis, D.M.; Hayes, J.A. What Are the Benefits of Mindfulness? A Practice Review of Psychotherapy-Related Research. *Psychotherapy* **2011**, *48*, 198–208. [CrossRef] [PubMed]
48. Tan, L.B.G.; Lo, B.C.Y.; Macrae, C.N. Brief Mindfulness Meditation Improves Mental State Attribution and Empathizing. *PLoS ONE* **2014**, *9*, e110510. [CrossRef]
49. Drigas, A.; Mitsea, E. A Metacognition Based 8 Pillars Mindfulness Model and Training Strategies. *Int. J. Recent Contrib. Eng. Sci. IT* **2020**, *8*, 4–17. [CrossRef]
50. Miao, C.; Humphrey, R.H.; Qian, S. The Relationship between Emotional Intelligence and Trait Mindfulness: A Meta-Analytic Review. *Personal. Individ. Differ.* **2018**, *135*, 101–107. [CrossRef]
51. Jiménez-Picón, N.; Romero-Martín, M.; Ponce-Blandón, J.A.; Ramirez-Baena, L.; Palomo-Lara, J.C.; Gómez-Salgado, J. The Relationship between Mindfulness and Emotional Intelligence as a Protective Factor for Healthcare Professionals: Systematic Review. *Int. J. Environ. Res. Public Health* **2021**, *18*, 5491. [CrossRef]
52. Schutte, N.S.; Malouff, J.M. Emotional Intelligence Mediates the Relationship between Mindfulness and Subjective Well-Being. *Personal. Individ. Differ.* **2011**, *50*, 1116–1119. [CrossRef]
53. Hill, C.L.M.; Updegraff, J.A. Mindfulness and Its Relationship to Emotional Regulation. *Emotion* **2012**, *12*, 81–90. [CrossRef] [PubMed]
54. Swathi, P.S.; Bhat, R.; Saoji, A.A. Effect of Trataka (Yogic Visual Concentration) on the Performance in the Corsi-Block Tapping Task: A Repeated Measures Study. *Front. Psychol.* **2021**, *12*, 773049. [CrossRef] [PubMed]
55. Zaccaro, A.; Piarulli, A.; Laurino, M.; Garbella, E.; Menicucci, D.; Neri, B.; Gemignani, A. How Breath-Control Can Change Your Life: A Systematic Review on Psycho-Physiological Correlates of Slow Breathing. *Front. Hum. Neurosci.* **2018**, *12*, 353. [CrossRef] [PubMed]
56. Mitsea, E.; Drigas, A.; Skianis, C. Cutting-Edge Technologies in Breathwork for Learning Disabilities in Special Education. *Tech. Soc. Sci. J.* **2022**, *34*, 136–157. [CrossRef]
57. Mitsea, E.; Drigas, A.; Skianis, C. Breathing, Attention & Consciousness in Sync: The Role of Breathing Training, Metacognition & Virtual Reality. *Tech. Soc. Sci. J.* **2022**, *29*, 79–97. [CrossRef]
58. Dulčić, F.J.L. La Práctica Del Silencio Como Una Herramienta Educativa: Directrices Para La Educación Basada En Competencias. *Educ. E Pesqui.* **2021**, *47*, e224651. [CrossRef]
59. Wittmann, M.; Schmidt, S. Mindfulness Meditation and the Experience of Time. In *Meditation—Neuroscientific Approaches and Philosophical Implications*; Springer: Cham, Switzerland, 2013; pp. 199–209. [CrossRef]
60. Mellenthin, C. Guided Imagery. In *Play Therapy with Children: Modalities for Change Modalities for Change*; American Psychological Association: Washington, DC, USA, 2021; pp. 125–139. [CrossRef]
61. Toussaint, L.; Nguyen, Q.A.; Roettger, C.; Dixon, K.; Offenbächer, M.; Kohls, N.; Hirsch, J.; Sirois, F. Effectiveness of Progressive Muscle Relaxation, Deep Breathing, and Guided Imagery in Promoting Psychological and Physiological States of Relaxation. *Evid. -Based Complement. Altern. Med.* **2021**, *2021*, 5924040. [CrossRef]
62. Hilert, A.J.; Tirado, C. Teaching Multicultural Counseling with Mindfulness: A Contemplative Pedagogy Approach. *Int. J. Adv. Couns.* **2018**, *41*, 469–480. [CrossRef]
63. Cohen, G.L.; Sherman, D.K. The Psychology of Change: Self-Affirmation and Social Psychological Intervention. *Annu. Rev. Psychol.* **2014**, *65*, 333–371. [CrossRef]
64. Schmeichel, B.J.; Vohs, K. Self-Affirmation and Self-Control: Affirming Core Values Counteracts Ego Depletion. *J. Personal. Soc. Psychol.* **2009**, *96*, 770–782. [CrossRef]
65. Sansone, R.; Sansone, L. Gratitude and well being: The benefits of appreciation. *Psychiatry* **2010**, *7*, 18–22.
66. Jans-Beken, L.; Jacobs, N.; Janssens, M.; Peeters, S.; Reijnders, J.; Lechner, L.; Lataster, J. Gratitude and Health: An Updated Review. *J. Posit. Psychol.* **2019**, *15*, 743–782. [CrossRef]

67. Hazlett, L.I.; Moieni, M.; Irwin, M.R.; Haltom, K.E.B.; Jevtic, I.; Meyer, M.L.; Breen, E.C.; Cole, S.W.; Eisenberger, N.I. Exploring Neural Mechanisms of the Health Benefits of Gratitude in Women: A Randomized Controlled Trial. *Brain Behav. Immun.* **2021**, *95*, 444–453. [CrossRef] [PubMed]
68. Gan, R.; Zhang, L.; Chen, S. The Effects of Body Scan Meditation: A Systematic Review and Meta-analysis. *Appl. Psychol. Health Well-Being* **2022**, *14*, 1062–1080. [CrossRef] [PubMed]
69. Schultchen, D.; Messner, M.; Karabatsiakis, A.; Schillings, C.; Pollatos, O. Effects of an 8-Week Body Scan Intervention on Individually Perceived Psychological Stress and Related Steroid Hormones in Hair. *Mindfulness* **2019**, *10*, 2532–2543. [CrossRef]
70. Penazzi, G.; De Pisapia, N. Direct Comparisons between Hypnosis and Meditation: A Mini-Review. *Front. Psychol.* **2022**, *13*, 1–7. [CrossRef]
71. Drigas, A.; Mitsea, E.; Skianis, C. The Role of Clinical Hypnosis & VR in Special Education. *Int. J. Recent Contrib. Eng. Sci. IT (iJES)* **2021**, *9*, 4–18. [CrossRef]
72. Olendzki, N.; Elkins, G.R.; Slonena, E.; Hung, J.; Rhodes, J.R. Mindful Hypnotherapy to Reduce Stress and Increase Mindfulness: A Randomized Controlled Pilot Study. *Int. J. Clin. Exp. Hypn.* **2020**, *68*, 151–166. [CrossRef]
73. Wake, L.; Leighton, M. Pilot Study Using Neurolinguistic Programming (NLP) in Post-Combat PTSD. *Ment. Health Rev. J.* **2014**, *19*, 251–264. [CrossRef]
74. Drigas, A.; Mitsea, E.; Skianis, C. Neuro-Linguistic Programming, Positive Psychology & VR in Special Education. *Sci. Electron. Arch.* **2021**, *15*, 30–39. [CrossRef]
75. Allen, J.G.; Romate, J.; Rajkumar, E. Mindfulness-Based Positive Psychology Interventions: A Systematic Review. *BMC Psychol.* **2021**, *9*, 116. [CrossRef] [PubMed]
76. Bolier, L.; Haverman, M.; Westerhof, G.J.; Riper, H.; Smit, F.; Bohlmeijer, E. Positive Psychology Interventions: A Meta-Analysis of Randomized Controlled Studies. *BMC Public Health* **2013**, *13*, 119. [CrossRef] [PubMed]
77. Yildirim, C.; O'Grady, T. The Efficacy of a Virtual Reality-Based Mindfulness Intervention. In Proceedings of the 2020 IEEE International Conference on Artificial Intelligence and Virtual Reality (AIVR), Utrecht, The Netherlands, 14–18 December 2020. [CrossRef]
78. Savickaite, S.; Husselman, T.-A.; Taylor, R.; Millington, E.; Hayashibara, E.; Arthur, T. Applications of Virtual Reality (VR) in Autism Research: Current Trends and Taxonomy of Definitions. *J. Enabling Technol.* **2022**, *16*, 147–154. [CrossRef]
79. Schuemie, M.J.; van der Straaten, P.; Krijn, M.; van der Mast, C.A.P.G. Research on Presence in Virtual Reality: A Survey. *CyberPsychology Behav.* **2001**, *4*, 183–201. [CrossRef]
80. Griffith, R.L.; Steelman, L.A.; Wildman, J.L.; LeNoble, C.A.; Zhou, Z.E. Guided Mindfulness: A Self-Regulatory Approach to Experiential Learning of Complex Skills. *Theor. Issues Ergon. Sci.* **2016**, *18*, 147–166. [CrossRef]
81. Asad, M.M.; Naz, A.; Churi, P.; Tahanzadeh, M.M. Virtual Reality as Pedagogical Tool to Enhance Experiential Learning: A Systematic Literature Review. *Educ. Res. Int.* **2021**, *2021*, 7061623. [CrossRef]
82. Hudetz, J.A.; Hudetz, A.G.; Klayman, J. Relationship between Relaxation by Guided Imagery and Performance of Working Memory. *Psychol. Rep.* **2000**, *86*, 15–20. [CrossRef]
83. Habak, S.; Bennett, J.; Davies, A.; Davies, M.; Christensen, H.; Boydell, K.M. Edge of the Present: A Virtual Reality Tool to Cultivate Future Thinking, Positive Mood and Wellbeing. *Int. J. Environ. Res. Public Health* **2020**, *18*, 140. [CrossRef]
84. Choo, A.; May, A. Virtual Mindfulness Meditation: Virtual Reality and Electroencephalography for Health Gamification. In Proceedings of the 2014 IEEE Games Media Entertainment, Toronto, ON, Canada, 22–24 October 2014. [CrossRef]
85. Bruggeman, K.J.; Wurster, S.W. The Hiatus System. In *ACM SIGGRAPH 2018 Appy Hour*; Association for Computing Machinery: New York, NY, USA, 2018. [CrossRef]
86. Seabrook, E.; Kelly, R.; Foley, F.; Theiler, S.; Thomas, N.; Wadley, G.; Nedeljkovic, M. Understanding How Virtual Reality Can Support Mindfulness Practice: Mixed Methods Study. *J. Med. Internet Res.* **2020**, *22*, e16106. [CrossRef]
87. Cikajlo, I.; Cizman Staba, U.; Vrhovac, S.; Larkin, F.; Roddy, M. A Cloud-Based Virtual Reality App for a Novel Telemindfulness Service: Rationale, Design and Feasibility Evaluation. *JMIR Res. Protoc.* **2017**, *6*, e108. [CrossRef]
88. Cruea, M.D. Gaming the Mind and Minding the Game: Mindfulness and Flow in Video Games. In *Video Games and Well-Being*; Palgrave Pivot: Cham, Switzerland, 2019; pp. 97–107. [CrossRef]
89. Santonastaso, O.; Zaccari, V.; Crescentini, C.; Fabbro, F.; Capurso, V.; Vicari, S.; Menghini, D. Clinical Application of Mindfulness-Oriented Meditation: A Preliminary Study in Children with ADHD. *Int. J. Environ. Res. Public Health* **2020**, *17*, 6916. [CrossRef] [PubMed]
90. Zaccari, V.; Santonastaso, O.; Mandolesi, L.; De Crescenzo, F.; Foti, F.; Crescentini, C.; Fabbro, F.; Vicari, S.; Curcio, G.; Menghini, D. Clinical Application of Mindfulness-Oriented Meditation in Children with ADHD: A Preliminary Study on Sleep and Behavioral Problems. *Psychol. Health* **2022**, *37*, 563–579. [CrossRef] [PubMed]
91. Juliano, A.C.; Alexander, A.O.; DeLuca, J.; Genova, H. Feasibility of a School-Based Mindfulness Program for Improving Inhibitory Skills in Children with Autism Spectrum Disorder. *Res. Dev. Disabil.* **2020**, *101*, 103641. [CrossRef] [PubMed]
92. Spek, A.A.; van Ham, N.C.; Nyklíček, I. Mindfulness-Based Therapy in Adults with an Autism Spectrum Disorder: A Randomized Controlled Trial. *Res. Dev. Disabil.* **2013**, *34*, 246–253. [CrossRef]
93. Reese, H.E.; Vallejo, Z.; Rasmussen, J.; Crowe, K.; Rosenfield, E.; Wilhelm, S. Mindfulness-Based Stress Reduction for Tourette Syndrome and Chronic Tic Disorder: A Pilot Study. *J. Psychosom. Res.* **2015**, *78*, 293–298. [CrossRef]

94. Singh, N.N.; Wahler, R.G.; Adkins, A.D.; Myers, R.E. Soles of the Feet: A Mindfulness-Based Self-Control Intervention for Aggression by an Individual with Mild Mental Retardation and Mental Illness. *Res. Dev. Disabil.* **2003**, *24*, 158–169. [CrossRef]
95. Singh, N.N.; Lancioni, G.E.; Winton, A.S.W.; Adkins, A.D.; Singh, J.; Singh, A.N. Mindfulness Training Assists Individuals with Moderate Mental Retardation to Maintain Their Community Placements. *Behav. Modif.* **2007**, *31*, 800–814. [CrossRef]
96. Tarrasch, R.; Berman, Z.; Friedmann, N. Mindful Reading: Mindfulness Meditation Helps Keep Readers with Dyslexia and ADHD on the Lexical Track. *Front. Psychol.* **2016**, *7*, 578. [CrossRef]
97. Pradhan, B.; Parikh, T.; Sahoo, M.; Selznick, R.; Goodman, M. Current Understanding of Dyslexia and Pilot Data on Efficacy of a Mindfulness Based Psychotherapy (MBR-RAM) Model. *Adolesc. Psychiatry* **2017**, *7*, 44–55. [CrossRef]
98. Turanzas, J.A.; Cordón, J.R.; Choca, J.P.; Mestre, J.M. Evaluating the APAC (Mindfulness for Giftedness) Program in a Spanish Sample of Gifted Children: A Pilot Study. *Mindfulness* **2018**, *11*, 86–98. [CrossRef]
99. Olton-Weber, S.; Hess, R.; Ritchotte, J.A. Reducing Levels of Perfectionism in Gifted and Talented Youth Through a Mindfulness Intervention. *Gift. Child Q.* **2020**, *64*, 319–330. [CrossRef]
100. Serra Pla, J.F.; Pozuelo, M.; Richarte, V.; Corrales, M.; Ibáñez, P.; Bellina, M.; Vidal, R.; Calvo, E.; Casas Brugué, M.; Ramos Quiroga, J.A. Treatment of attention deficit hyperactivity disorder in adults using virtual reality through a mindfulness programme. *Rev. De Neurol.* **2017**, *64*, S117. [CrossRef]
101. Bossenbroek, R.; Wols, A.; Weerdmeester, J.; Lichtwarck-Aschoff, A.; Granic, I.; van Rooij, M.M.J.W. Efficacy of a Virtual Reality Biofeedback Game (DEEP) to Reduce Anxiety and Disruptive Classroom Behavior: Single-Case Study. *JMIR Ment. Health* **2020**, *7*, e16066. [CrossRef] [PubMed]
102. Modrego-Alarcón, M.; López-del-Hoyo, Y.; García-Campayo, J.; Pérez-Aranda, A.; Navarro-Gil, M.; Beltrán-Ruiz, M.; Morillo, H.; Delgado-Suarez, I.; Oliván-Arévalo, R.; Montero-Marin, J. Efficacy of a Mindfulness-Based Programme with and without Virtual Reality Support to Reduce Stress in University Students: A Randomized Controlled Trial. *Behav. Res. Ther.* **2021**, *142*, 103866. [CrossRef] [PubMed]
103. Chavez, L.J.; Kelleher, K.; Slesnick, N.; Holowacz, E.; Luthy, E.; Moore, L.; Ford, J. Virtual Reality Meditation Among Youth Experiencing Homelessness: Pilot Randomized Controlled Trial of Feasibility. *JMIR Ment. Health* **2020**, *7*, e18244. [CrossRef]
104. Mistry, D.; Zhu, J.; Tremblay, P.; Wekerle, C.; Lanius, R.; Jetly, R.; Frewen, P. Meditating in Virtual Reality: Proof-of-Concept Intervention for Posttraumatic Stress. *Psychol. Trauma Theory Res. Pract. Policy* **2020**, *12*, 847–858. [CrossRef]
105. Tarrant, J.; Viczko, J.; Cope, H. Virtual Reality for Anxiety Reduction Demonstrated by Quantitative EEG: A Pilot Study. *Front. Psychol.* **2018**, *9*, 1280. [CrossRef]
106. Gomez, J.; Hoffman, H.G.; Bistricky, S.L.; Gonzalez, M.; Rosenberg, L.; Sampaio, M.; Garcia-Palacios, A.; Navarro-Haro, M.V.; Alhalabi, W.; Rosenberg, M.; et al. The Use of Virtual Reality Facilitates Dialectical Behavior Therapy® "Observing Sounds and Visuals" Mindfulness Skills Training Exercises for a Latino Patient with Severe Burns: A Case Study. *Front. Psychol.* **2017**, *8*, 1611. [CrossRef]
107. Navarro-Haro, M.V.; Modrego-Alarcón, M.; Hoffman, H.G.; López-Montoyo, A.; Navarro-Gil, M.; Montero-Marin, J.; García-Palacios, A.; Borao, L.; García-Campayo, J. Evaluation of a Mindfulness-Based Intervention with and without Virtual Reality Dialectical Behavior Therapy® Mindfulness Skills Training for the Treatment of Generalized Anxiety Disorder in Primary Care: A Pilot Study. *Front. Psychol.* **2019**, *10*, 55. [CrossRef]
108. Shiban, Y.; Diemer, J.; Müller, J.; Brütting-Schick, J.; Pauli, P.; Mühlberger, A. Diaphragmatic Breathing during Virtual Reality Exposure Therapy for Aviophobia: Functional Coping Strategy or Avoidance Behavior? A Pilot Study. *BMC Psychiatry* **2017**, *17*, 29. [CrossRef]
109. Lacey, C.; Frampton, C.; Beaglehole, B. oVRcome—Self-Guided Virtual Reality for Specific Phobias: A Randomised Controlled Trial. *Aust. New Zealand J. Psychiatry* **2022**, *57*, 736–744. [CrossRef]
110. Seol, E.; Min, S.; Seo, S.; Jung, S.; Lee, Y.; Lee, J.; Kim, G.; Cho, C.; Lee, S.; Cho, C.-H.; et al. "Drop the Beat". In Proceedings of the 23rd ACM Symposium on Virtual Reality Software and Technology, Gothenburg, Sweden, 8–10 November 2017. [CrossRef]
111. Nararro-Haro, M.V.; Hoffman, H.G.; Garcia-Palacios, A.; Sampaio, M.; Alhalabi, W.; Hall, K.; Linehan, M. The Use of Virtual Reality to Facilitate Mindfulness Skills Training in Dialectical Behavioral Therapy for Borderline Personality Disorder: A Case Study. *Front. Psychol.* **2016**, *7*, 1573. [CrossRef] [PubMed]
112. Veling, W.; Lestestuiver, B.; Jongma, M.; Hoenders, H.J.R.; van Driel, C. Virtual Reality Relaxation for Patients with a Psychiatric Disorder: Crossover Randomized Controlled Trial. *J. Med. Internet Res.* **2021**, *23*, e17233. [CrossRef] [PubMed]
113. Ilioudi, M.; Lindner, P.; Ali, L.; Wallström, S.; Thunström, A.O.; Ioannou, M.; Anving, N.; Johansson, V.; Hamilton, W.; Falk, Ö.; et al. Physical Versus Virtual Reality–Based Calm Rooms for Psychiatric Inpatients: Quasi-Randomized Trial. *J. Med. Internet Res.* **2023**, *25*, e42365. [CrossRef]
114. Ma, J.; Zhao, D.; Xu, N.; Yang, J. The Effectiveness of Immersive Virtual Reality (VR) Based Mindfulness Training on Improvement Mental-Health in Adults: A Narrative Systematic Review. *Explore* **2023**, *19*, 310–318. [CrossRef] [PubMed]
115. Simón-Vicente, L.; Rodríguez-Cano, S.; Delgado-Benito, V.; Ausín-Villaverde, V.; Cubo Delgado, E. Cybersickness. A Systematic Literature Review of Adverse Effects Related to Virtual Reality. *Neurología* **2022**. [CrossRef]
116. Baniasadi, T.; Ayyoubzadeh, S.M.; Mohammadzadeh, N. Challenges and Practical Considerations in Applying Virtual Reality in Medical Education and Treatment. *Oman Med. J.* **2020**, *35*, e125. [CrossRef]
117. Russell, M.E.B.; Hoffman, B.; Stromberg, S.; Carlson, C.R. Use of Controlled Diaphragmatic Breathing for the Management of Motion Sickness in a Virtual Reality Environment. *Appl. Psychophysiol. Biofeedback* **2014**, *39*, 269–277. [CrossRef]

118. Lie, S.S.; Helle, N.; Sletteland, N.V.; Vikman, M.D.; Bonsaksen, T. Implementation of Virtual Reality in Health Professions Education: Scoping Review. *JMIR Med. Educ.* **2023**, *9*, e41589. [CrossRef]
119. Grossman, P.; Niemann, L.; Schmidt, S.; Walach, H. Mindfulness-Based Stress Reduction and Health Benefits. *J. Psychosom. Res.* **2004**, *57*, 35–43. [CrossRef]
120. Kretschmer, C.R.; Göz Tebrizcik, B.; Dommett, E.J. Mindfulness Interventions for Attention Deficit Hyperactivity Disorder: A Systematic Review and Meta-Analysis. *Psychiatry Int.* **2022**, *3*, 363–399. [CrossRef]
121. Shapero, B.G.; Greenberg, J.; Pedrelli, P.; de Jong, M.; Desbordes, G. Mindfulness-Based Interventions in Psychiatry. *Focus* **2018**, *16*, 32–39. [CrossRef]
122. Groves, P. Mindfulness in Psychiatry—Where Are We Now? *BJPsych Bull.* **2016**, *40*, 289–292. [CrossRef] [PubMed]
123. Zhang, S.; Chen, M.; Yang, N.; Lu, S.; Ni, S. Effectiveness of VR Based Mindfulness on Psychological and Physiological Health: A Systematic Review. *Curr. Psychol.* **2021**, *42*, 5033–5045. [CrossRef]
124. Failla, C.; Marino, F.; Bernardelli, L.; Gaggioli, A.; Doria, G.; Chilà, P.; Minutoli, R.; Mangano, R.; Torrisi, R.; Tartarisco, G.; et al. Mediating Mindfulness-Based Interventions with Virtual Reality in Non-Clinical Populations: The State-of-the-Art. *Healthcare* **2022**, *10*, 1220. [CrossRef]
125. Carsley, D.; Khoury, B.; Heath, N.L. Effectiveness of Mindfulness Interventions for Mental Health in Schools: A Comprehensive Meta-Analysis. *Mindfulness* **2017**, *9*, 693–707. [CrossRef]
126. Kauhanen, L.; Wan Mohd Yunus, W.M.A.; Lempinen, L.; Peltonen, K.; Gyllenberg, D.; Mishina, K.; Gilbert, S.; Bastola, K.; Brown, J.S.L.; Sourander, A. A Systematic Review of the Mental Health Changes of Children and Young People before and during the COVID-19 Pandemic. *Eur. Child Adolesc. Psychiatry* **2022**, *32*, 995–1013. [CrossRef]
127. Zhu, J.L.; Schülke, R.; Vatansever, D.; Xi, D.; Yan, J.; Zhao, H.; Xie, X.; Feng, J.; Chen, M.Y.; Sahakian, B.J.; et al. Mindfulness Practice for Protecting Mental Health during the COVID-19 Pandemic. *Transl. Psychiatry* **2021**, *11*, 329. [CrossRef]