



Review article

The role of dance movement therapy in enhancing emotional regulation: A literature review

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ABSTRACT

Background: Emotion regulation is a crucial skill that can significantly impact mental health, social interactions, and overall well-being. Dance Movement Therapy (DMT) is a form of psychotherapy that uses dance and movement to promote emotional, social, cognitive, and physical integration.

Objectives: This literature review aims to provide a comprehensive and systematic analysis of scholarly research and publications exploring the impact of DMT on enhancing emotion regulation capabilities.

Methods: A literature search was conducted in various databases, and specific inclusion and exclusion criteria were established to ensure the relevance and quality of the chosen research. The data extraction and analysis phase involved carefully extracting pertinent information from each selected study and a methodical approach to analysis aimed at synthesizing and interpreting the findings cohesively.

Results: The review highlights the potential benefits of DMT in regulating emotions and identifies gaps and disparities in existing research, emphasizing potential areas that warrant further investigation.

Conclusion: The findings of this review contribute to a robust exploration of the relationship between emotion regulation and DMT, shedding light on the impact of DMT on emotion regulation and providing insights into future research directions.

1. Introduction

Emotion is a complex psychological state that involves feelings, thoughts, and physiological responses [1]. It plays a crucial role in shaping human behavior, thoughts, and interactions with others [2]. Emotions encompass a broad spectrum of experiences that, rather than inherently positive or negative, serve as vital indicators of our internal states and inform our interactions with the world around us [3]. Emotions notably influence the body, significantly impacting various physiological processes such as heart rate, blood pressure, and hormone levels [4]. Therefore, it is essential to understand the benefits, methods, and meanings of emotion regulation. Emotion regulation is managing and controlling one's emotions effectively [5]. It is an essential skill with numerous benefits, including improved mental health, better interpersonal relationships, and increased resilience [6]. Emotion regulation can additionally aid

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individuals in effectively managing stress and negative emotions, thus lowering the likelihood of developing mental health issues [7]. Emotion regulation encompasses a range of methods that, while diverse in approach — from cognitive reappraisal and expressive suppression to mindfulness — all engage the body as a fundamental component in processing and regulating emotions [8]. Cognitive reappraisal is the process of modifying our thoughts about a situation in order to adjust our emotional response [9]. Expressive suppression entails restraining the outward expression of emotions, whereas mindfulness involves maintaining awareness of our emotions without passing judgment on them [10]. In psychology, emotion regulation refers to effectively managing and controlling one's emotions [11]. In sports and performance, emotion regulation refers to managing emotions to enhance performance [12]. In general, emotion regulation is about managing emotions in a way that is adaptive and beneficial to the individual [13]. Emotions can have a significant impact on the body, and they can affect various physiological processes [14].

Dance Movement Therapy (DMT) is a psychotherapeutic approach that employs dance and movement to facilitate individuals' emotional, social, cognitive, and physical integration [15,16]. It is a holistic approach that recognizes the interconnectedness of the mind and body and aims to address emotional and psychological issues through movement expression [17]. DMT has a rich history dating back to the early 20th century. In 1916, Carl Gustav Jung recorded the idea of dance as psychotherapy [18]. Marian Chace, a key figure in the establishment and development of DMT, was invited to join the staff at St. Elizabeth's Hospital in Washington, D.C., in 1942. Her work laid foundational practices for integrating dance and therapeutic processes, significantly shaping the field of DMT [19]. Remarkably, in 1993, the National Institute of Health's Office of Alternative Medicine granted one of its initial exploratory research awards to investigate the application of dance therapy for individuals coping with medical illnesses [20]. The historical progression of DMT can be divided into three stages of professional focus: Emotional body/movement, Body/mind, and Social/-relational [21]. DMT employs the body and its movement patterns in assessment and treatment strategies, believing that movement mirrors our personality [22]. DMT is grounded in the concept that the mind and body are intricately linked and interdependent, and that movement is a functional and expressive medium for this interconnectedness [23]. DMT can help individuals improve body image, reduce stress, and enhance emotional, cognitive, social, and physical integration. DMT can be applied in various settings, such as mental health, medical, educational, and community [24]. The utilization of DMT as an intervention for enhancing emotional regulation and control has garnered increasing attention within psychological and therapeutic research. The practice of DMT is guided by trained professionals known as Dance Movement Therapists [22]. Dance Movement therapists are rigorously trained at the master's level, equipping them with a comprehensive understanding of psychotherapeutic approaches, movement observation and analysis, and DMT's theoretical and methodological underpinnings. This training ensures therapists are adept in facilitating sessions that harness the power of bodily movement to mirror, communicate, and modify the emotional experiences of individuals. Integrating of movement with psychotherapeutic principles allows for a holistic approach to treatment, addressing the interconnectedness of the mind, body, and emotion [25]. Dance/Movement Therapists facilitate psychotherapeutic sessions that employ dance and movement within a structured theoretical framework, aiming to explore and express feelings, thoughts, and emotions. This approach transcends mere 'activities' and embodies a sophisticated psychotherapeutic practice that leverages the body's movement as a medium for psychological exploration and healing.

DMT has been investigated as a potential approach to enhance emotional regulation [26]. One study published in 2022 provides an in-depth qualitative assessment of DMT techniques and interventions based on the analysis of therapy logs from treatments of children aged 8–11 with anxiety symptoms. It identifies four main intervention axes in DMT for children with anxiety disorders: action-promoting interventions, separation-promoting interventions, interventions for strengthening the sense of self, and integration-promoting interventions. The study also highlights the role of various "mirroring" interventions in forming the therapeutic relationship and additional therapeutic interventions involving movement. This model allows children to explore their experiences of the relationship, understand themselves in new ways, and create meaning. The findings contribute to the understanding of therapeutic processes in children coping with anxiety and propose an initial model for using DMT in treating such disorders [27]. This, in turn, boosts their confidence and self-awareness, thereby alleviating anxiety and assisting them in achieving more adaptive emotion regulation [28]. Furthermore, among college students, there is a proposal for enhancing emotional intelligence through DMT [29]. This suggests the development of a DMT Emotional Intelligence (EI) Educational Model by integrating DMT principles, emotional intelligence development, emotional regulation, and the advantages of movement [29]. In a study focused on the effects of Chinese classical dance movements on college students' self-awareness and emotion regulation, it was found that the group engaged in Chinese classical dance therapy experienced improvements in their daily life awareness, overall physical awareness, physical use, muscle tension, and physical control [30]. However, this study used a quasi-experimental design and did not have a randomized controlled trial, which may limit the generalizability of the findings. In a 2018 qualitative study by García-Díaz, 57 adults participating in Authentic Movement sessions, a practice from DMT, reported a marked decrease in anxiety levels and a greater capacity for emotional expression, as measured by self-report questionnaires and observational analysis over a 10-session treatment period [31]. In addition, DMT can also be combined with educational psychology and applied to life and death education (LDE). The objective is to effectively implement life-death education, address psychological issues, and decrease the incidence of suicide accidents through the integration of DMT and LDE. However, it's important to note that the application of DMT to college students' life-death education under educational psychology has certain limitations. These include a small sample size and the absence of a randomized controlled trial, which restricts the generalizability of the findings.

In summary, the intricate relationship between emotions and physiological processes underscores the critical importance of emotion regulation in enhancing mental health, interpersonal relationships, and overall well-being. DMT emerges as a promising psychotherapeutic approach that leverages the inherent connection between body and mind to facilitate emotional, social, cognitive, and physical integration. Through the application of DMT in various contexts, from aiding children with anxiety to enhancing emotional intelligence among college students, and even in the realm of life-death education, we witness the potential of movement-

based therapy to offer profound benefits. The studies and interventions highlighted within this introduction underscore DMT's versatility and effectiveness in promoting adaptive emotion regulation and providing a holistic avenue for psychological healing and growth.

2. Methodology

This article serves as a literature review, presenting a comprehensive and systematic analysis of scholarly research and publications about a specific topic. The process involves meticulously gathering, evaluating, and synthesizing pertinent information from diverse sources, including academic journals, books, and research papers. The primary objective of a literature review is to offer an extensive perspective on the current state of knowledge concerning a particular subject, pinpoint any gaps or disparities in existing research, and emphasize potential areas that warrant further investigation [32]. This study followed five steps: (1) Research Objective and Questions; (2) Literature Search Strategy; (3) Selection Criteria and Data Extraction; (4) Data Extraction and Analysis; and (5) presentation of the review and a summary of the knowledge.

2.1. Research Objective and Questions

This literature review aims to systematically examine the current research on the role of DMT in facilitating emotion regulation. The central question this review wants to understand is: 'What are the primary emotional regulation benefits of DMT?'

2.2. Literature Search Strategy

For our literature review, we adopted a rapid review approach to ensure a thorough and unbiased collection of studies related to DMT and emotion regulation. This method was selected for its ability to synthesize research findings in a timely manner, allowing for the integration of the most recent and relevant studies into our review. The rapid review approach provided a balanced perspective, combining depth and breadth of analysis within the constraints of our research timeline, ensuring that we could offer timely insights into DMT's role in emotion regulation. A comprehensive literature search was performed in the Cochrane Central Register of Controlled Trials (CENTRAL), PubMed (U.S. National Library of Medicine, National Institutes of Health), Scopus, and APA PsycINFO (American Psychological Association databases) [33], with the period delimited to 2000–2023, exploring the development of DMT in the first two decades of the 21st century. The following search terms were used in various combinations: "dance movement therapy" or "dance therapy", and "emotion regulation". The search in the databases occurred in July 2023.

2.3. Selection Criteria and Data Extraction

Selecting studies for inclusion in this literature review followed a systematic approach to ensure the relevance and quality of the chosen research. Specific inclusion criteria were established to maintain the focus on exploring the relationship between emotion regulation and DMT. These criteria encompassed publications reporting empirical research with various study designs, such as controlled or noncontrolled experimental designs, before-and-after designs, or cross-sectional analyses. The scope of the review extended to studies that investigated the effects of DMT on emotion regulation, encompassing aspects of biology, psychology, emotion, and social interaction. The language criterion was set to English, and accessibility was ensured through selected electronic databases.

In order to uphold the rigor of the review, certain exclusion criteria were applied. Research reports and abstracts from conference proceedings were omitted due to their potentially limited depth. At the same time, grey literature sources like these, dissertations, specialization courses, and news articles were excluded from prioritizing established peer-reviewed research. Duplicate publications were identified and removed to avoid redundancy and ensure a comprehensive yet concise analysis.

Two separate researchers conducted the process of selecting studies for inclusion, and any discrepancies were resolved through consensus or by consulting with a third researcher. The study selection process comprised several steps, including screening titles to align with the research objective, removing duplicate publications, evaluating abstracts for compatibility with criteria, and examining full texts to ensure eligibility. Additionally, a thorough cross-referencing of references from the included studies was performed to identify any overlooked relevant sources.

A standardized data collection instrument was employed to facilitate a consistent and organized data extraction process. This tool enabled the retrieval of relevant information, encompassing article details (title, journal name, publication year, databases used, and study location), study particulars (objectives, study type, healthcare domains, findings, and conclusions), as well as researcher information (professional background and affiliation). This comprehensive data extraction process ensured the reliability and validity of the findings presented in the literature review, contributing to a robust exploration of the relationship between emotion regulation and DMT.

2.4. Data extraction and analysis

The data extraction phase was a meticulous and systematic endeavor involving carefully extracting pertinent information from each selected study. A structured data extraction form was utilized, capturing crucial details such as study characteristics (title, authors, publication year, study design), participant demographics (age, gender, sample size), specifics of the DMT intervention (components, frequency, duration), outcome measures (emotional expression, awareness, coping strategies), key findings, and

authors' conclusions. This process ensured a comprehensive understanding of the studies' contributions to the review's objectives.

With the data in hand, a methodical approach to analysis was adopted, aimed at synthesizing and interpreting the findings cohesively. A qualitative analysis involving thematic coding was undertaken, wherein data points were categorized into recurring themes such as emotional expression, awareness, and coping strategies. These themes were compared and contrasted across studies to uncover patterns and variations. The resultant synthesis of findings formed the basis for addressing the research questions and objectives of the literature review, shedding light on the impact of DMT on emotion regulation.

Throughout the analysis, careful consideration was given to potential limitations inherent in the included studies. Variations in study designs, sample sizes, intervention protocols, and outcome measures were thoughtfully factored into interpreting results and

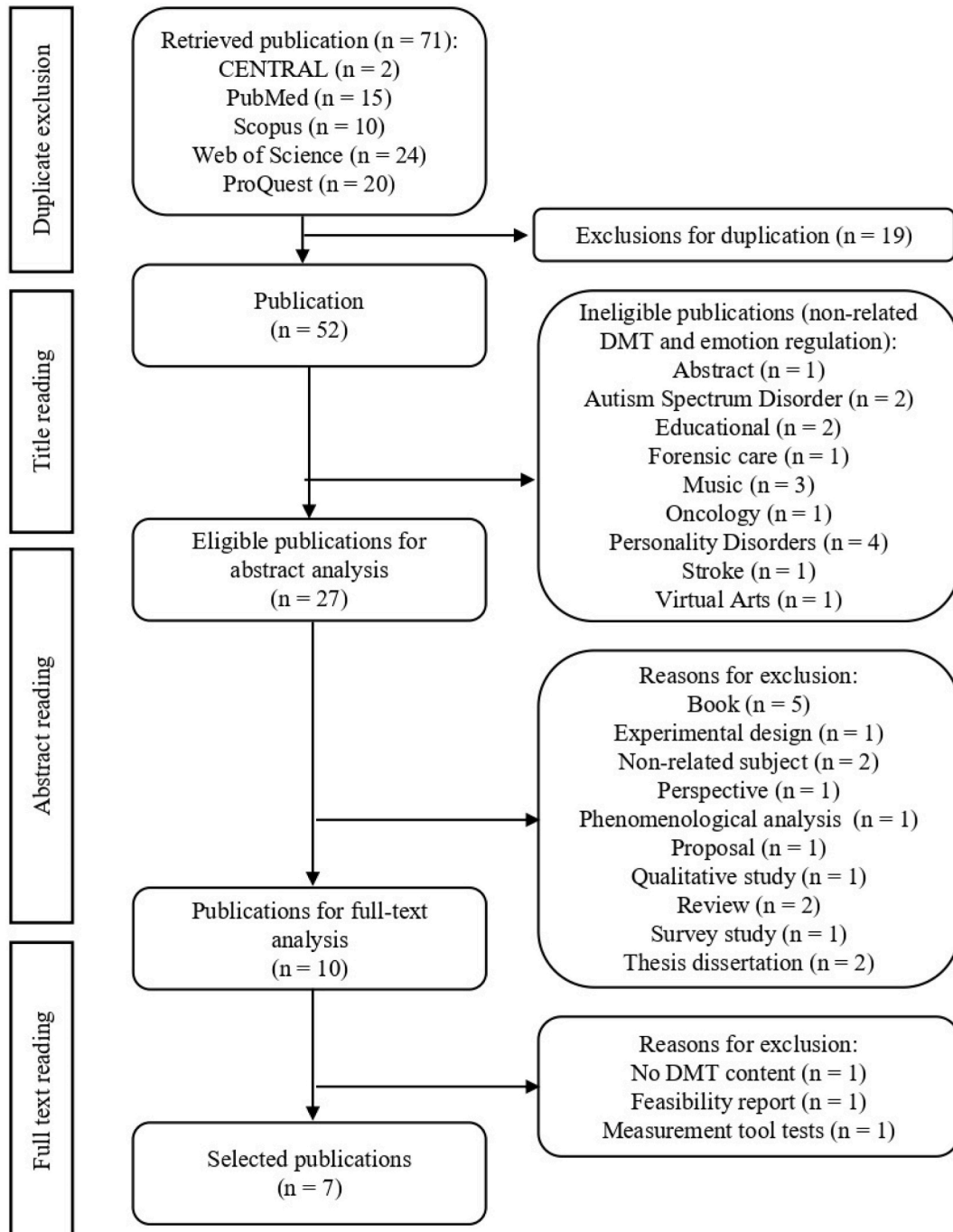


Fig. 1. Flowchart of the literature search and reduction process.

drawing conclusions. The implications of these limitations were thoughtfully discussed in the context of the review's findings, thereby providing insight into areas necessitating further research and exploration.

The meticulous data extraction and analysis processes collectively served to unravel the effects of DMT on emotion regulation outcomes. By unearthing overarching themes and discernible patterns, this section not only enhances our comprehension of the literature but also lays the groundwork for the subsequent synthesis and presentation of the review's findings.

2.5. Presentation of the review and a summary of the knowledge

To conclude this literature review, an exhaustive summary table was compiled. This table encompasses the authors' names, article titles, affiliations, journal information, publication years, populations under study, interventions, outcomes, assessment tools, and primary findings for each chosen study. The presentation of knowledge from the reviewed literature embraced a descriptive data analysis approach, elucidating trends and variations across studies. This approach facilitated a comprehensive understanding of the collective findings and their implications in emotion regulation and DMT. The review concluded with a succinct summary of key insights and contributions from the synthesis, offering readers a concise yet comprehensive overview of the field's developments and implications.

2.6. Risk of bias assessment

In the methodology section, we incorporated a detailed risk of bias assessment to ensure the credibility of our review findings. We utilized a standardized set of criteria adapted from Joanna Briggs Institute's critical appraisal tools 60, focusing on study design, participant selection, blinding, data collection methods, and analysis. Two reviewers independently conducted the risk of bias assessment for each included study, employing a 'Yes,' 'No,' or 'Not applicable' risk rating for each criterion. Discrepancies between reviewers were resolved through discussion or consultation with a third reviewer, ensuring a consensus-based approach to bias evaluation. The findings from the risk of bias assessment informed our interpretation of the review results. Studies identified with a high risk of bias in key areas were weighed accordingly in the synthesis of evidence, with such considerations explicitly discussed in the results and discussion sections. This risk of bias assessment process underscores our commitment to a rigorous and transparent review methodology, providing a solid foundation for the conclusions drawn from our analysis of the literature on DMT and emotion regulation.

3. Results

Seven articles were included in this review after a literature search, analysis and selection procedure carried out following the steps described in Fig. 1. Table 1 shows the results of the risk of bias analysis of the included studies [34]. The final seven articles selected

Table 1

Summary of the methodological quality assessment of the quasi-experimental (nonrandomized) studies included in the review, according to the Joanna Briggs Institute's critical appraisal tools 60.

	Punkanen, M., et al., 2014	Koch, S., et al., 2015	García-Díaz, S. 2018	Van Geest, J., et al., 2021	Tao, Q., et al., 2021	Moula, Z., et al., 2022	Rodríguez-Jiménez, RM. et al., 2022
1. Is it clear in the study what is the "cause" and what is the "effect"?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2. Were the participants included in any similar comparisons?	Yes	Yes	Not applicable	Yes	Yes	Yes	Yes
3. Were the participants included in any comparisons receiving similar treatment, other than the exposure or intervention of interest?	No	No	Yes	No	No	No	No
4. Was there a control group?	Not applicable	Yes	Yes	Not applicable	Not applicable	Yes	Yes
5. Were there multiple measurements of the outcome both before and after the intervention/exposure?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6. Was follow-up complete, and if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Not applicable	Not applicable	Yes	Not applicable	Not applicable	Yes	Yes
7. Were the outcomes of participants included in any comparisons measured in the same way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8. Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes	Yes	Yes

were all with a low risk of bias. Regarding the geographical distribution of published articles, except for one from China, the other six studies were all conducted in Europe, as shown in [Table 2](#). Three (42.86 %) were published in *The Arts in Psychotherapy*, followed by two (28.57 %) in *Frontiers in Psychology*. The authors are affiliated with the Schools of Psychology, Kinesiology, Music, Art, and Health Studies. Two articles explicitly state that the paper's first author has a Ph.D. [Table 3](#) shows three before-and-after studies and four randomized controlled trials that split the seven articles equally. It comprehensively summarizes the articles reviewed, detailing the first author's name, publication year, examined population, location, study design, interventions, study duration, examined outcomes, evaluation method, analysis method, main results, and limitations. This table encapsulates the core aspects and findings of each study included in the review, offering a quick reference to understand the scope, methodologies, and conclusions of the research covered.

3.1. Quality of research

Seven articles met all applicable items of the bias assessment tool, as shown in [Table 1](#). The only one that showed a risk was that the participants simultaneously had other treatments on hand. Among the seven articles included, three are before-and-after designs, and two are Randomized controlled trials.

Only one of the seven articles has a research sample size of more than 50, and the small sample size is a common limitation of every article.

3.2. Groups participating in DMT on emotion studies

[Table 4](#) summarizes the participant characteristics in each of the seven articles. The studies cover diverse populations, including adults with depression, people who are incarcerated, adults receiving psychotherapy, adults with substance use disorder, children with emotional difficulties, and participants with varied levels of experience. In examining the basic characteristics of participants from the included studies, as detailed in [Table 4](#), we considered various demographic and diagnostic factors that could influence the outcomes of DMT on emotion regulation. For instance, the studies encompassed a wide age range from 7 to 62 years, with diverse primary diagnoses including depression according to ICD-10 classification (F32 or F33) in German prisons, methamphetamine use disorder, and work-related stress, as well as mild emotional and behavioral difficulties. The gender distribution also varied, from predominantly female samples in some studies to exclusively male or female. These demographic details were crucial in our analysis, providing insights into how different populations may respond to DMT. We recognized that factors such as age, gender, cultural background, and specific emotional or behavioral challenges could significantly impact the effectiveness of DMT. Accordingly, our discussion of the results has been nuanced to reflect these varied participant characteristics, which supports the need for tailored approaches in DMT interventions based on individual and group profiles.

3.3. DMT intervention process

Across all seven articles reviewed, a common treatment goal is the application of DMT to facilitate emotional regulation. These studies frequently employ a blended approach that includes both group sessions — highlighting the therapeutic value of shared experiences — and individual sessions tailored to address personal emotional needs. The individual sessions also provide opportunities for one-on-one interactions, enhancing personalized care within the group dynamic. The group sessions highlight the benefit of shared therapeutic experiences while also recognizing the value of individual sessions when they are used to address personal emotional needs. All DMT sessions, whether in groups or individually, are conducted exclusively by certified dance/movement therapists. These professionals are trained and credentialed in DMT, ensuring ethical practice and adherence to the profession's established standards. Whether conducted individually or in groups, the duration and frequency of these interventions are tailored, typically spanning several weeks, with sessions lasting around 60 min, providing a structured timeframe for participants to engage in DMT and experience its benefits.

DMT, in its application for emotional regulation, encompasses a variety of approaches and methodologies, each tailored to the specific needs and contexts of the studied populations. Dr. Marko Punkanen utilized a short-term group format of DMT for adults with depression, integrating solution-focused psychotherapy in twenty sessions over ten weeks, demonstrating a significant reduction in depressive symptoms as evidenced by the Beck Depression Inventory scores [35]. Contrastingly, German researchers employed a 5-day training format with delayed control group training in a German prison setting, showing notable improvements in subjective well-being among incarcerated individuals [36]. Authentic Movement, as explored by Sergio García-Díaz in his focused study on translating physical sensations into motion and his subsequent exploration into Authentic Movement Therapy, underscores the unique aspect of DMT in facilitating emotional expression and introspection. This approach reveals significant enhancements in positive and negative affect and mood states. It incorporates elements of memorization and sound, employing experimental conditions (AM and VM), thereby emphasizing the depth and breadth of DMT in navigating and enhancing the emotional landscape through embodied practices [37]. Netherlands research, led by Jenneke van Geest, adopted a within-subject design to investigate the effect of specific Laban Movement Analysis elements on happiness. This study spanned three conditions, with a strong emphasis on movement sequences for enhancing happiness. Notably, one condition featured therapist attunement, highlighting its significance in emotional modulation within the therapeutic process [38]. Qian Tao contrasted dance exercise with cycling, pinpointing the superior efficacy of dance in augmenting emotional regulation and prefrontal cortex activation, thereby highlighting the distinct neurological impacts of DMT compared to other physical activities [39]. Zoe Moul demonstrated the feasibility and effectiveness of school-based dance

Table 2

Characterization of the articles included in the review regarding authorship, title, authors' affiliation, declaration of conflicts of interest, journal, and publication year.

Authors	Article title	Authors' affiliation	Declaration of conflicts of interest	Journal and publication year
Marko Punkanen, Suvi Saarikallio, Geoff Luck	Emotions in motion: Short-term group form Dance/Movement Therapy in the treatment of depression: A pilot study	Finnish Centre of Excellence in Interdisciplinary Music Research, University of Jyväskylä, PO Box 35 (M), 40014, Finland	All authors declare that they have no conflicts of interest.	The Arts in Psychotherapy, 2014.
Sabine C. Kocha,d, Thomas Ostermann,c, Anna Steinhaged, Philip Kended, Karl Hallerd, Fabian Chyleb	Breaking barriers: Evaluating an arts-based emotion regulation training in prison	a SRH University Heidelberg, University of Heidelberg, Germany b University of Applied Science Düsseldorf, Germany c University of Witten-Herdecke, Germany d University of Heidelberg, Germany	Not declared	The Arts in Psychotherapy, 2015.
Sergio García-Díaz	The effect of the practice of Authentic Movement on the emotional state	Universidad Nacional de Educación a Distancia (UNED), Spain	Not declared	The Arts in Psychotherapy, 2018.
Jenneke van Geesta, Rosemarie Samaritterra,b, Susan van Hoorena,b, d	Move and Be Moved: The Effect of Moving Specific Movement Elements on the Experience of Happiness	a Faculty of Health Care, Academy of Arts Therapies, Zuyd University of Applied Science, Heerlen, Netherlands b KenVaK Research Centre for the Arts Therapies and Psychomotricity, Heerlen, Netherlands c Department of Arts Therapies, Codarts University of the Arts, Rotterdam, Netherlands d Faculty of Psychology, Open University of the Netherlands, Heerlen, Netherlan	The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.	Frontiers in Psychology, 2021.
Qian Taoa, Chenping Zhangb, Xiawen Lic	Dancing Improves Emotional Regulation in Women With Methamphetamine Use Disorder But Use of a Cycle Ergometer Does Not	a Affiliated Sport School, Shanghai University of Sport, Shanghai, China b School of Psychology, Shanghai University of Sport, Shanghai, China c Department of Physical Education, Shanghai University of Medicine and Health Sciences, Shanghai, China	The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.	Frontiers in Neuroscience, 2021.
Zoe Moulaa, Joanne Powellb, Shirley Brocklehurstb, Vicky Karkoub	Feasibility, acceptability, and effectiveness of school-based dance movement psychotherapy for children with emotional and behavioral difficulties	a Imperial College London, London, United Kingdom b Faculty of Health, Social Care & Medicine and Faculty of Psychology, Edge Hill University, Ormskirk, United Kingdom	The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.	Frontiers in Psychology, 2022.
Rosa-María Rodríguez-Jimé neza,b, Manuel Carmonac, Sonia García-Merino,d, Begoña Díaz-Rivase, Israel J. Thuissard-Vasallof	Stress, subjective wellbeing and self-knowledge in higher education teachers: A pilot study through bodyfulness approaches	a STEAM School, Universidad Europea, Villaviciosa de Odón, Madrid, Spain b European Association of Dance Movement Therapy, Berlin, Germany c Institute for Regional Development (IDR), Universidad Castilla la Mancha, Albacete, Spain d School of Exercise and Sports Sciences, Universidad Francisco de Vitoria, Pozuelo de Alarcón, Madrid, Spain e El Viso Psicólogos, Madrid, Spain	The authors have declared that no competing interests exist.	PLOS ONE, 2022.

(continued on next page)

Table 2 (continued)

Authors	Article title	Authors' affiliation	Declaration of conflicts of interest	Journal and publication year
		f Faculty of Biomedical Sciences and Health, Universidad Europea, Villaviciosa de Odón, Madrid, Spain		

movement psychotherapy in enhancing children's emotional and behavioral well-being, with sustained benefits observed up to six months post-intervention [40]. The international study conducted by Spain and Germany was a comparative study between DMT and Yoga, aiming to explore their effects on various aspects of well-being. Through its distinct approach and methodology, this study contributes valuable perspectives on the comparative efficacy of DMT and Yoga in enhancing physical and emotional health despite not finding significant differences in physiological stress markers between the two groups [41].

This nuanced overview, grounded in the specificity of DMT interventions across diverse studies, elucidates the multifaceted nature of DMT in fostering emotional regulation. It showcases the adaptability of DMT to various populations and settings, the importance of the therapist's role in modulating the therapeutic process, and the potential for DMT to elicit significant psychological and physiological outcomes, thereby affirming its validity as a distinct therapeutic modality distinct from mere dance or physical exercise.

3.4. Approaches used for measurement

The post-intervention outcomes assessed across the 7 articles on DMT for emotional regulation encompass a range of dimensions. These include evaluations of depression and anxiety symptoms, subjective well-being, affective traits, demographic variables, positive affect, happiness, and other emotions. Additionally, studies explore emotional regulation and prefrontal cortex activation, verbal and non-verbal expressions in children's feelings and thoughts on well-being, standardized quality of life and well-being measures, and biomarkers related to children's sleep duration. The outcomes also encompass assessments of physical activity, suitability for physical activity, body awareness, mindfulness, life satisfaction, perceived stress levels, heart rate variability, sleep quality, cortisol levels, and participants' perceptions, collectively providing a comprehensive understanding of the impacts of DMT on emotional regulation.

The measurement approaches utilized across the 7 articles exploring DMT's effects on emotional regulation encompass a range of tools (Table 5). Tables 6 and 7 detail the measurement techniques and biometric indicators examined in the studies, highlighting their association with emotional regulation.

3.5. Outcomes after intervention

The collective outcomes from the 7 articles on DMT for emotional regulation reveal consistent and positive impacts. DMT interventions demonstrated significant reductions in depression symptoms, as evidenced by decreased mean scores in the Beck Depression Inventory (BDI) and improvements in various secondary measures related to emotional well-being. In DMT sessions, participants experienced enhanced subjective well-being, with notable improvements in aspects crucial for emotional regulation, including increased positive affect and relaxation, as well as decreased negative affect, anxiety, tension, and depression. These changes contribute to a more regulated emotional state by fostering effective coping mechanisms and a balanced affective experience, thereby underlining the comprehensive impact of DMT on emotional well-being. Authentic Movement (AM) practices also led to noteworthy positive shifts in positive affect, negative affect, and mood state. Notably, DMT facilitated emotional expression and state changes, particularly associated with enhancing happiness among young adults. Moreover, DMT showed potential in enhancing emotional regulation and prefrontal cortex activation, with dancing interventions displaying greater trends than cycling interventions. DMT generated multifaceted improvements in children encompassing emotional and behavioral well-being, life functioning, and sleep duration, sustained up to 6 months post-intervention. Interviews revealed self-expression, emotional regulation, enhanced self-confidence, stress reduction, and positive relationship development. In reviewing the literature, it became apparent that there is a discernible preference among participants for smaller group sizes in DMT sessions, as well as an inclination towards extended session durations. Smaller group sizes and longer sessions were associated with enhanced therapeutic effects, suggesting a trend towards more personalized and intensive DMT interventions. This inference aligns with the broader themes of our review, emphasizing the importance of adapting DMT practices to meet individual needs and optimize therapeutic outcomes. To provide context for this conclusion, I have now included a summary of key findings from the literature that support this trend, ensuring that readers can understand the basis for this observation. DMT exhibits promising and enduring effects on emotional regulation across diverse populations.

4. Discussion

The present research aims to comprehensively explore and evaluate the implications of DMT in fostering emotional regulation, drawing from insights gleaned from a diverse range of studies. The review presents an overview of the studies examined, highlighting the diversity of populations and settings where DMT has been applied, including its varied effects on emotional regulation and well-

Table 3

Summary of the articles included in the review, showing first author's name, publication year, examined population, location, design, intervention, study duration, examined outcomes, evaluation method and analysis method, main results and limitations.

	Punkanen, M. et al., 2014	Koch, S. et al., 2015	García-Díaz, S. 2018	Van Geest, J. et al., 2021	Tao, Q. et al., 2021	Moula, Z. et al., 2022	Rodríguez-Jiménez, RM. et al., 2022
Examined population	21 (88 %) participants were eligible to participate in the study. 18 (85.7 %) were female, and their ages ranged from 18 to 60 years (M = 40.00, SD = 13.0). The inclusion criteria required that the participants' primary diagnosis be depression, F32 or F33, according to the ICD-10 classification (WHO, 1992).	47 male people who are incarcerated from three German prisons participated in this matched waiting list multicenter pilot study. Their mean age was 34.0 years (SD = 10.3), and 91.5 % were German native speakers, 6.4 % Russian, and 2.1 % Turkish. 29 participants were allocated to the experimental group (EG) and 18 to the control group (CG).	57 individuals, 44 women and 13 men (mean age = 40.37; SD = 8.42; with an age range between 26 and 62 years). Amongst total participants, 51 were receiving or had received psychotherapy (mean time in therapy: 3.2 years; with 77 mean number of sessions). 33 had previous experience in authentic movement (mean 14.6 sessions per person); while 24 people had no previous experience in authentic movement.	25 participants (5 males, 36 women with Dutch residents, 3 non-Dutch residents)	Methamphetamine use disorder aged 20–34 years and residing in the Drug Rehabilitation Bureau of Mogan Mountain in Zhejiang province	16 children who experienced mild emotional and behavioral difficulties were recruited from two primary schools across the Northwest of England.	31 participants (11 men, 20 women) with a wide range of experience in terms of years (mean 10 years). More than 75 % of the participants were married and 65 % had children.
Location	Central Finland Health Care District's psychiatric health centers and the psychiatric polyclinics of Jyväskylä City.	German prison	Premises of Qingrup (Association for the Development of Personal Growth) located in Barcelona (Spain)	Research Centre on Arts Therapies and Psychomotricity, HAN University of Applied Sciences, Nijmegen, Netherlands.	Drug Rehabilitation Bureau of Mogan Mountain in Zhejiang province	Primary schools across the Northwest of England	Universidad Europea de Madrid (UEM), Madrid, Spain
Design	Before-and-after study	Randomized controlled trial	Before-and-after study	Before-and-after study	Randomized controlled trial	Pilot randomized controlled trial	Randomized controlled trial
Intervention	The intervention consisted of a short-term, group Dance Movement Therapy (DMT) conducted over ten weeks with sessions held twice weekly, totaling 20 sessions of 60 min each. Participants were divided into four therapy groups that met simultaneously, with an average of five participants per group. Two female dance movement therapists, trained in both dance movement therapy and solution-focused psychotherapy and with extensive DMT clinical experience, facilitated the study. Each therapist led two groups, conducting 20 sessions per group.	The control group's incarcerated individuals received their training three months after the experimental group. The training spanned five days, from Monday to Friday, 9 a. m. to 4 p.m., including a 1.5-h lunch break.	Each experimental condition lasted 7 min. After the experiment, participants had around 30 min to discuss any doubts or concerns and to receive emotional support if needed. In Group A (AM), participants stood barefoot on a parquet surface with closed eyes. They were instructed to focus on their physical sensations upon hearing a bell sound and let these sensations guide their movements without speaking, though making sounds was permitted. There was no requirement to remember the movements. Group B (VM) followed a similar setup with participants standing	The study utilized a within-subject design, with each participant experiencing all three conditions. In Condition A, participants executed a movement sequence designed to enhance happiness using specific Laban Movement Analysis (LMA) elements, in tandem with a Dance Movement Therapist who mirrored their movements. Condition B involved participants performing a solo movement sequence using LMA elements aimed at enhancing happiness. In Condition C, participants completed a solo movement sequence with LMA elements not linked to enhancing happiness.	Dance exercise and cycling exercise	The intervention method was dance movement psychotherapy.	The programs utilized a variety of materials including elastics, various fabrics, soft balls, and balloons. Experienced specialists in Yoga and Dance Movement Therapy, each with over 20 years in their respective fields, led the programs. Reflective diaries were gathered weekly from both experimental groups, and saliva samples were taken at the conclusion of each session.

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Table 3 (continued)

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Study duration	10 weeks	5 Days	2 months	1 h	30 min	8 weeks	2 months; 6-month follow-up
Examined outcomes	Symptoms of depression and anxiety	Subjective well-being	Affective Trait	Demographic Variables; Positive Affect; Happiness	Emotional regulation and prefrontal cortex activation	Verbal and non-verbal expressions relating to children's feelings and thoughts on their wellbeing,	Physical activity, suitability for physical activity, levels of body awareness, mindfulness, subjective

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Table 3 (continued)

Examined outcomes	Symptoms of depression and anxiety	Subjective well-being	Affective Trait	Demographic Variables; Positive Affect; Happiness and Other Emotions	Emotional regulation and prefrontal cortex activation	Verbal and non-verbal expressions relating to children's feelings and thoughts on their wellbeing, self-reported standardized outcome measures relating to quality of life, wellbeing, and life functioning, and biomarkers relating to children's duration of sleep.	Physical activity, suitability for physical activity, levels of body awareness, mindfulness, subjective wellbeing, life satisfaction, perceived stress level, heart rate variability, sleep quality, cortisol levels, and participants' perceptions.
				and Other Emotions		self-reported standardized outcome measures relating to quality of life, wellbeing, and life functioning, and biomarkers relating to children's duration of sleep.	wellbeing, life satisfaction, perceived stress level, heart rate variability, sleep quality, cortisol levels, and participants' perceptions.
Evaluation methods	Beck Depression Inventory (BDI) and several secondary outcome measures (including the Toronto Alexithymia Scale and the Relationship Questionnaire)	Heidelberg State Inventory (HSI) questionnaire	The self-report scales on the Affective Trait (Positive Affect and Negative Affect, PANAS) and the self-reporting questionnaire for mood assessment (EVEA1)	Positive and Negative Affect Schedule (PANAS) and digital visual analog scales (VAS)	Self-reported emotional dimension scores and near-infrared spectroscopy (NIRS) system to measure the changes in hemoglobin oxygenation in the prefrontal cortex (PFC) during the exercise intervention	Biomarkers (FitBits)Quality of Life for Children (EQ-5D-Y), Child Outcome Rating Scale (CORS) and Child Session Rating Scale (CSRS). The teacher-reported questionnaire was the Strengths and Difficulties Questionnaire with impact supplement (SDQ).	GPAQ, PARQ+, BAQ, FFMQ, WHO-5, SWSL, PSS, heart rate variability, sleep quality, cortisol levels, and participants' perceptions.
Analysis methods	Alpha reliabilities and correlations were calculated for the secondary outcome measures; a within-subject one-way MANOVA was used to analyze the differences between pre- and post-intervention scores	MANOVA, ANOVA, t-tests	Independent samples t-test, paired t-test for related samples, and descriptive statistics such as means and standard deviations.	Paired sample t-tests and GLM repeated measure analyses to analyze the data.	Independent-samples t-tests and two-way repeated-measures analyses of variance	IBM's SPSS (version 25)	Descriptive and paired-sample t-tests, ANOVA tests, Cohen's d effect sizes and SPSS
Main results	The BDI mean score significantly dropped from 21.67 pre-intervention to 10.50 post-intervention ($p < 0.001$), with notable improvements also observed in secondary outcomes, barring the EOT subscale of the TAS and the Fearful and Dismissing styles of the RQ.	Participants in the dance movement intervention group experienced marked enhancements in subjective well-being, positive affect, relaxation, and coping abilities, along with reductions in negative affect, anxiety, tension, and depression, compared to the control group.	The study highlighted that engaging in AM led to notable increases in positive affect and mood state, and decreases in negative affect.	Findings suggest dance movement therapy aids in emotional expression and state alteration, with certain movement elements boosting happiness in young adults.	In emotional regulation and prefrontal cortex activation, the dance group outperformed the cycling group, showing greater improvements. Post-exercise, both groups reported higher scores on the self-rated emotional scale for viewing negative images, with the dance group exhibiting a significant rise in left PFC HbO2 concentration.	DMP was found to enhance children's life functioning, well-being, sleep duration, and emotional and behavioral difficulties, maintaining these improvements up to six months post-intervention, despite no change in quality of life. Children reported benefits in self-expression, emotional regulation, self-confidence, stress	Both intervention groups saw significant gains in physical activity, body awareness, mindfulness, well-being, life satisfaction, and sleep quality compared to the control group, with no marked differences in cortisol levels or heart rate variability, underscoring the role of physical activity programs in enhancing <i>(continued on next page)</i>

Table 3 (continued)

<p>Limitation</p> <p>The absence of a control group, lack of follow-up assessments, and a relatively small sample size are notable limitations of this pilot DMT study for depression, although the sample size is moderate compared to similar studies. Future research should address these issues.</p>	<p>The study's limitations include a small sample size, lack of randomization, uncontrollable participant distribution by institutions, low sensitivity of measures for short-term changes, and lack of training standardization.</p>	<p>Limitations include a small, non-probabilistic sample size, no control group, reliance on self-report measures prone to bias, and inability to generalize results to a broader population.</p>	<p>The study is limited by a small sample size, overrepresentation of females, limited generalizability across age groups, reliance on self-assessment tools, and unanticipated outcomes in one of the conditions, highlighting the need for more equitable experimental conditions.</p>	<p>The research faces limitations such as a small sample size, focus on female methamphetamine-dependent participants, analysis of only acute exercise effects, lack of a non-exercise control group, reliance on self-reported emotional responses, and focus solely on prefrontal cortex activation.</p>	<p>reduction, and relationship building, but expressed a preference for smaller, longer sessions.</p>	<p>mental and physical health among healthcare professionals.</p>
				<p>Challenges included difficult group dynamics due to randomization, suggesting alternative randomization methods and pre-group meetings to assess support needs. Additionally, offering workshops for school staff at the start could improve study understanding and referrals.</p>		<p>The study's limitations include a small sample size affecting generalizability, potential bias from voluntary participation, lack of individual cortisol pattern analysis, no consideration of optimal cortisol measurement timing, and unaccounted influences of the experiment setting and participant motivations on stress markers.</p>

Table 4
Basic characteristics of participants.

	Punkanen, M., et al., 2014	Koch, S., et al., 2015	García-Díaz, S., 2018	Van Geest, J., et al., 2021	Tao, Q., et al., 2021	Moula, Z., et al., 2022	Rodríguez-Jiménez, RM., et al., 2022
Sample size	21	47	57	25	36	16	31
Gender	85.7 % female (18 participants), 14.3 % male (3 participants)	100 % male	77.2 % female (44 women), 22.8 % male (13 men)	5 males, 20 females; 22 Dutch residents, 3 non-Dutch residents	100 % female	12 girls and 4 boys.	35.5 % male (11 men), 64.5 % female (20 women)
Age	Ranged from 18 to 60 years (Mean = 40.00, SD = 13.0)	Mean age of 34.0 years (SD = 10.3)	Mean age of 40.37 years (SD = 8.42), age range between 26 and 62 years	Young adults between the age of 18 and 25 (M = 20.72, SD = 2.05)	Aged 20–34 years	Aged 7 to 8	SD = 43.3 ± 7.5
Primary diagnosis	Depression (ICD-10 classification F32 or F33)	in German Prisons	/	/	Methamphetamine Use Disorder	Mild emotional and behavioral difficulties	Work-related stress

being. The studies span from 2014 to 2022, covering diverse groups such as incarcerated men, individuals with methamphetamine use disorder, children with mild emotional and behavioral difficulties, and participants from general populations with varying levels of experience in DMT. The findings from these studies collectively demonstrate the broad applicability and effectiveness of DMT across different contexts and populations. For instance, the study involving 47 incarcerated men from German prisons participating in a matched waiting list multicenter pilot study underscores DMT's potential in correctional settings, suggesting its value as a rehabilitative tool. Similarly, the study on 36 women with methamphetamine use disorder aged 20–34 years from the Drug Rehabilitation Bureau of Mogan Mountain in Zhejiang province highlights DMT's role in substance abuse recovery, indicating its therapeutic benefits in addressing addiction-related emotional and behavioral issues. Furthermore, including children who experienced mild emotional and behavioral difficulties from two primary schools across the Northwest of England reflects DMT's adaptability and effectiveness in educational and pediatric settings. The wide age range of participants, from children to adults, and the varied settings, including psychiatric health centers, prisons, and schools, illustrate the versatility of DMT in catering to different needs and contexts. The design of the studies, including both before-and-after studies and randomized controlled trials, provides a robust methodological framework, enhancing the credibility of the findings. The central theme emerging from these studies is the significant impact of DMT on improving emotional regulation, showcasing its potential as an integrated component of well-being interventions across diverse demographic groups and settings.

By delving into the overarching themes, methodologies, findings, and potential mechanisms underlying DMT's effects on emotional regulation, this paper seeks to shed light on the emerging landscape of DMT as a viable therapeutic avenue for promoting emotional well-being. Across the studies examined, a consistency emerges in the findings, pointing towards the efficacy of DMT interventions in bolstering emotional regulation and control. Notably, various quantitative measures, such as self-reported emotional scales, physiological markers like heart rate variability, and neuroimaging techniques, have been employed to assess the impact of DMT on emotional regulation [42]. The collective outcomes reveal a robust trend towards improved emotional regulation post-DMT intervention. These findings align with existing evidence on the positive impacts of physical movement and embodiment on emotional states, underscoring the distinct effectiveness of DMT in this area [38,43]. The observed improvements in emotional regulation encompass a wide spectrum of emotional dimensions, including positive affect, negative affect, mood state, and emotional expression. Many studies underscore the significance of dance and movement in promoting positive emotions and reducing negative affect [24, 44–46]. This aligns with theories proposing that physical movement can be an outlet for emotional expression, facilitating emotional release and regulation. The interplay between the physical and emotional realms within DMT is underscored by neuroscientific evidence indicating changes in prefrontal cortex activation and hemoglobin oxygenation levels, reflecting the underlying neurobiological mechanisms of emotional regulation [47]. The sustained effects of DMT interventions on emotional regulation are particularly noteworthy. The follow-up survey conducted 6 months after the DMT intervention revealed sustaining effects on the participants. The Body-Mind Approach (BMA) program, in particular, demonstrated a capability to maintain reduced cortisol levels longer after the intervention, indicating a prolonged stress reduction benefit. Additionally, the BMA program produced significant outcomes regarding self-awareness, self-knowledge, and social interaction. This suggests that the interventions had an immediate impact on stress and body awareness and contributed to longer-term psychological and physiological well-being. The significance of these findings lies in the potential for DMT and related body-mind approaches to offer sustainable stress management and personal development strategies. By sustaining reduced stress levels and enhancing self-awareness and social interactions, these interventions can contribute to overall life satisfaction and well-being. This is particularly relevant in high-stress environments like higher education, where teachers and students could benefit from such programs. The sustained effects also suggest that the benefits of DMT extend beyond the intervention period, offering a lasting impact on participants' ability to manage stress and maintain a heightened sense of body awareness and personal well-being. Moreover, participant interviews reveal many positive outcomes, from enhanced self-expression and emotional mastery to improved self-confidence, stress reduction, and positive relationships. These qualitative insights offer a rich understanding of the experiential dimensions of DMT's impact on emotional regulation.

Table 5
Measurement Methods Utilized in Dance Movement Therapy Studies for Emotional regulation.

Full Name	Abbreviation	Measurement Content	Function	Limitations
Affective Trait questionnaire	EVEA1	Self-reporting questionnaire for mood assessment	Assesses mood	Dependent on self-report
Beck Depression Inventory	BDI	Measures severity of depression symptoms	Assess depressive symptoms	Self-report, subjectivity
Biomarkers (FitBits)	–	Monitors physical activity levels	Tracks physical activity	Limited to activity tracking, not emotional states
Body Awareness Questionnaire	BAQ	Measures individual's body awareness and mindfulness	Assesses body awareness and mindfulness	Focuses on body awareness and mindfulness, not emotional aspects
Child Outcome Rating Scale	CORS	Measures child's self-reported treatment outcome	Evaluates treatment outcomes	Dependent on child's self-report
Child Session Rating Scale	CSRS	Assesses child's session experience and therapeutic alliance	Evaluates session experience and alliance	Dependent on child's self-report
Cortisol Levels	–	Measures cortisol hormone levels in response to stress	Reflects physiological stress response	Requires laboratory testing, influenced by various factors like time of day and stressors
Digital Visual Analog Scales	VAS	Utilizes visual scales for subjective assessments of emotions	Measures subjective emotional responses	Subjective, susceptible to bias
Five Facet Mindfulness Questionnaire	FFMQ	Measures facets of mindfulness, including observing, describing, acting with awareness, non-judging, non-reacting	Assesses facets of mindfulness	Focuses on mindfulness, not specifically emotional regulation
Global Physical Activity Questionnaire	GPAQ	Assesses physical activity levels across work, transportation, and leisure domains	Measures overall physical activity	Self-report, subject to recall bias
Heart Rate Variability	HRV	Measures variations in time between successive heartbeats	Reflects autonomic nervous system activity	Requires specialized equipment, not specific to emotional regulation
Heidelberg State Inventory	HSI	Evaluates mood states and psychological wellbeing	Assesses mood states and wellbeing	Language-dependent, cultural bias
Near-Infrared Spectroscopy	NIRS	Measures changes in hemoglobin oxygenation in prefrontal cortex during interventions	Assesses neurophysiological changes	Complex setup, requires specialized equipment
Participant Perceptions	–	Involves participants' self-reported feelings, opinions, and experiences	Captures participants' subjective experiences and opinions	Subjective, susceptible to bias
Perceived Stress Scale	PSS	Assesses perception of stress	Measures perceived stress	Self-report, subject to bias
Physical Activity Readiness Questionnaire+	PARQ+	Assesses readiness for physical activity	Evaluates physical activity readiness	Limited to assessing readiness, not emotional effects
Positive and Negative Affect Schedule	PANAS	Measures positive and negative affective states	Captures affective states	Limited to self-reported affect
Quality of Life for Children	EQ-5D-Y	Evaluates children's quality of life and health status	Assesses quality of life and health	Limited focus on quality of life in children
Relationship Questionnaire	–	Assesses individual's capacity for emotional closeness in relationships	Measures emotional closeness	Limited to relationship context
Satisfaction with Sleep Scale	SWSL	Measures satisfaction with sleep quality	Assesses sleep satisfaction	Limited to sleep-related assessment
Strengths and Difficulties Questionnaire	SDQ	Assesses child's emotional and behavioral difficulties and strengths	Measures emotional and behavioral aspects	Subject to self-report bias, limited to child's perspective
Toronto Alexithymia Scale	TAS	Evaluates levels of alexithymia (difficulty identifying and describing emotions)	Assesses alexithymia levels	Specific focus on alexithymia
World Health Organization-Five Well-Being Index	WHO-5	Assesses overall well-being	Evaluates overall well-being	General well-being assessment

Mechanisms underlying DMT's effects on emotional regulation can be attributed to the holistic nature of the intervention. DMT integrates physical movement, kinesthetic awareness, mindfulness, and creative expression, creating a multi-modal approach that engages both the body and mind [48]. The embodiment of emotions through movement provides a medium for expression and encourages self-awareness and introspection. The proprioceptive feedback loop established through movement fosters a heightened sense of emotional awareness, enabling individuals to recognize better, process, and regulate their emotions [49]. This alignment with embodied cognition theories posits that bodily experiences are intrinsically linked to cognitive and emotional processes, making DMT a potent avenue for facilitating emotional regulation.

While the burgeoning body of research underscores the affirmative effects of DMT on emotional regulation, several considerations warrant attention. The heterogeneity in methodologies, participant characteristics, and outcome measures across studies could influence the observed effects. Variability in intervention protocols, session duration, frequency, and duration may contribute to outcome variations. Additionally, the complexity of emotions and the multifaceted nature of emotional regulation necessitate a holistic approach, combining quantitative and qualitative methodologies to capture the nuances of the therapeutic process.

Table 6
Measurement approaches and their relevance to emotional regulation in DMT studies.

Measurement Tool	Relevance to Emotional Regulation
Beck Depression Inventory (BDI)	Assesses depressive symptoms, indicating changes in emotional state post-DMT.
Toronto Alexithymia Scale and Relationship Questionnaire	Evaluates emotional awareness and interpersonal relationships, key in emotional regulation.
Heidelberg State Inventory (HSI) questionnaire	Measures psychological well-being, reflecting emotional balance.
Positive and Negative Affect Schedule (PANAS)	Gauges both positive and negative effects, crucial for understanding emotional shifts.
Affective Trait Questionnaire (EVEA1)	Assesses emotional traits, contributing to the broader picture of emotional regulation.
Self-reported emotional dimensions	Provides insights into personal emotional experiences, enhancing understanding of regulation processes.
Digital visual analog scales (VAS)	Captures immediate emotional responses, offering a snapshot of emotional state.
Near-infrared spectroscopy (NIRS)	Monitors changes in brain activity related to emotional processing.
Biomarkers like FitBits	Tracks physical activity and sleep patterns, indirectly related to emotional well-being.
Quality of Life for Children (EQ-5D-Y)	Assesses overall quality of life, indicating the broader impacts of emotional regulation.
Child Outcome Rating Scale (CORS)	Gathers feedback on therapy outcomes, reflecting changes in emotional well-being.
Child Session Rating Scale (CSRS)	Collects session-specific feedback, offering insights into immediate emotional impacts.
Strengths and Difficulties Questionnaire with impact supplement (SDQ)	Evaluates behavioral and emotional difficulties, linked to emotional regulation capabilities.
Various tools including GPAQ, PARQ+, BAQ, FFMQ, WHO-5, SWSL, PSS, heart rate variability, sleep quality, cortisol levels	Includes a variety of measures assessing physical and mental health indicators, offering a comprehensive view of factors influencing emotional regulation.

Table 7
Measured biometrics and their relation to emotion regulation.

Measured Biometric	Relation to Emotion Regulation
Prefrontal cortex activation	Indicative of neural engagement in emotional processing and regulation.
Verbal and non-verbal expressions	Reflects emotional states and the ability to communicate emotions effectively.
Quality of life and well-being measures	Provides insight into overall emotional well-being and its impact on life quality.
Biomarkers related to sleep duration	Sleep patterns can significantly affect emotional states and regulatory processes.
Physical activity assessment	Physical activity is linked to emotional well-being and can influence emotional regulation.
Suitability for physical activity	Assesses readiness for physical activities that can impact emotional states.
Body awareness	Awareness of one's body can enhance emotional regulation by improving self-awareness.
Mindfulness	Mindfulness practices are associated with better emotion regulation by fostering present-moment awareness.
Life satisfaction	Life satisfaction is often a result of effective emotion regulation strategies.
Perceived stress levels	High stress levels can impair emotion regulation, making this an important measure.
Heart rate variability	Variability in heart rate can reflect emotional stress and regulation capacity.
Sleep quality	Quality of sleep has a profound effect on emotional regulation and resilience.
Cortisol levels	Cortisol is a stress hormone; its levels can indicate stress response and emotional regulation.
Participants' perceptions	Subjective reports provide personal insights into the effectiveness of emotion regulation strategies.

The current review was conducted across multiple databases, utilizing English as the primary search language, and spanned a substantial 20-year period. Our aim was to perform a niche-targeting and focused literature review, ensuring the specificity and relevance of the included studies. Despite these efforts, we acknowledge that our search strategy may have introduced certain limitations. Specifically, the use of narrowly defined search terms, while effective in maintaining focus, may have inadvertently excluded some pertinent research. We recognize that a broader set of keywords and related concepts could have potentially captured a wider array of relevant studies, thus providing a more comprehensive overview of the existing literature. This limitation is an important consideration, as it highlights the potential for missed contributions that could have enriched our review. To address this issue in future research, we propose employing a more expansive search strategy. This approach would involve using a broader range of keywords and synonyms to ensure that important studies are not overlooked. Additionally, incorporating multiple languages and expanding the database sources could further enhance the inclusiveness of our literature search. By acknowledging and addressing these limitations, we aim to strengthen the foundation of our future research. A more comprehensive search strategy will help ensure that our literature reviews are both exhaustive and representative of the field, capturing the full spectrum of relevant studies.

5. Conclusion

This review covers the research literature on DMT in emotional regulation over the past 20 years. DMT has been shown to have positive effects on a variety of individuals, including those suffering from depression, incarcerated individuals, participants in psychotherapy, individuals struggling with substance use disorders, children experiencing affective disorders, and people with varying levels of experience, providing them with emotional and physical benefits. Notably, a preference for smaller cohort sizes and longer treatment durations suggests avenues for optimizing treatment. Together, these findings highlight the promising role of DMT in promoting emotion regulation, suggesting its potential as an integrated component of overall well-being interventions. The authors anticipate that their present study, which underscores the potential utilization of DMT as a therapeutic approach, will provide healthcare professionals with additional resources to enhance treatment planning and support.

Disclosure statement

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethics and consent

N/A.

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Paper context

This literature review systematically analyzes the connection between DMT and emotion regulation, a pivotal skill affecting mental health and overall well-being. DMT integrates dance and movement for holistic well-being. Through meticulous data scrutiny across various databases, the review underscores DMT's potential in emotion regulation, pointing out current research inconsistencies and areas needing further study. This article's insights can benefit athletes, performers, and those pursuing movement-driven emotional betterment.

CRedit authorship contribution statement

Xiaomei Zhang: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Yaming Wei:** Writing – review & editing, Writing – original draft, Supervision, Software, Resources, Project administration, Conceptualization.

Declaration of competing interest

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