

Dance Movement Therapy: Improving Adolescent Mental Health

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ABSTRACT

Cognitive Behavioral Therapy (CBT) is a key treatment for anxiety and depression. However, CBT alone has limitations in adolescents due to emotional imbalances. Dance Movement Therapy (DMT) allows adolescents to express emotions in a way that is active and socially acceptable. In adults, DMT in combination with CBT is an effective approach for treating mental health conditions. However, there is limited literature on the impact of DMT in adolescents and no studies on potential long-term benefits. This paper reviews current publications on DMT as a therapeutic tool for mental health treatment in adolescents, including background on DMT, neurophysiological concepts, the mirror neuron system (MNS) and the potential benefits of combined CBT/DMT. This review suggests that due to the challenges of studying DMT (e.g., limited use of functional MRI (fMRI) in a moving dancer), more studies are necessary to evaluate the efficacy and application of combined therapy. This review also recommends exploration of new platforms to deliver DMT, such as smartphone apps, metaverse and virtual reality (VR). This could make combined therapy more successful, affordable, and accessible to a wider population. Future research should be focused on longitudinal studies on combined CBT/DMT in adolescents.

Keywords: Dance Therapy; Mirror Neurons; Neuroplasticity; Action Observation Network; Mental Health; Adolescents; Virtual Reality; App; Metaverse

INTRODUCTION

The World Health Organization estimates that nearly 15% of 10–19-year-olds experience mental health conditions (1). The COVID-19 pandemic increased social isolation to 24% in the US, Europe, and China up from 10% pre-pandemic (2). The effect of COVID-19

on depression and anxiety in schoolchildren and adolescents was reviewed in a meta-analysis by Racine *et al.*, which included over 80,000 individuals (age 4-18). During the pandemic, about 25% of children and 20% of adolescents had moderate to severe depression (e.g., sadness, hopelessness or mood lability) or anxiety (e.g., excessive worry or fear) symptoms during the pandemic. There is a critical need to address this surge in mental health conditions in adolescents (3).

CBT is a first line, highly effective treatment for anxiety and depression. It is a type of psychotherapy proven to have a profound effect on cognition, mood and overall emotional regulation (4). DMT uses movement to improve emotional, cognitive, physical, spiritual, and

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social aspects of the individual. DMT also was shown to alleviate anxiety and depression in youth (5). Used in combination, CBT and DMT complement each other (6). During COVID, DMT shifted to virtual platforms, such as Zoom, Skype, and Google Classroom (5). This change fostered wider use of DMT, including through mobile apps and potentially through virtual reality in the post-COVID era. In this literature review, the use of DMT as a tool in behavioral health is highlighted through novel methods such as smartphone apps and VR. This review will explore the need for more research on the use of DMT/CBT, specifically in adolescent mental health and potential application via mobile apps and metaverse.

DMT HISTORY

The American Dance Therapy Association (ADTA) defines DMT as “the psychotherapeutic use of movement to promote emotional, social, cognitive, and physical integration of the individual, for the purpose of improving health and well-being” (7). Throughout history, dance appears in rituals and cultural traditions. It is also associated with a pleasure cycle, which makes people intrinsically want to dance (8). It was common to use dance to escape bad spirits or mental illness. Roman poet Lucien (2nd century CE) thought dance to be the best offering of the Muses and a mirror of universal harmony (8). Indian culture describes the world as “a dance of God” (8). The dance of God is a metaphor for individual’s life journey, seeking balance and connection with the divine through movements. In Italy, the tarantella is a dance thought to relieve the symptoms known as tarantism, specifically, emotional distress or hysteria, caused by a bite of the tarantula spider. Dance is a part of human life and culture. Therefore, it is not surprising that DMT is proven effective in improving well-being, especially in individuals who struggled with trauma or elevated levels of stress.

DMT evolved, starting with Marian Chase, a former dance educator and performer, who worked in late 1940 with WWII POWs suffering from post-traumatic stress syndrome (PTSD) at St. Elizabeth’s Hospital in Washington, DC (9). She had remarkable success with patients who were unable to speak. Through copying and repeating their movements, establishing eye contact, then physical contact through dance, she was able to help patients alleviate symptoms. She had a significant impact in the development of DMT and

with colleagues created the American Dance Therapy Association. Another foundational principal of DMT is Freud’s theory of psychoanalysis. Using improvisation, dance movement therapy created a way to incorporate the unconscious that Freud argued is present in each of us (10). According to French psychoanalyst Anzieu, the connection between mind and body was not recognized in most psychotherapies (11). DMT helped acknowledge this connection and develop it as a therapy.

DMT KEY CONCEPTS

“Dance is the hidden language of the soul,” according to Martha Graham (45). It is not just a series of movements set to music, it’s a language of expression, a medium to convey a story. DMT aims to interpret and utilize one’s movements to promote the emotional, cognitive, and social integration of a person and improve their mental health (12). It empowers persuasive communication through body movements, enabling non-verbal communication between the therapist and treated individual. The integration of body and mind is a critical component for effective dance movement therapy (13). By combining physical movement, body awareness, mindfulness, and creativity, DMT provides psychological healing (14). A key component of DMT, body awareness (8), includes proprioception (sense of self-movement, force, and body position) and interoception (sense of bodily state including emotion) (8). The link between body awareness, emotion, and cognition is pivotal for emotional regulation and sense of self (15). Emotional regulation is the process by which individuals influence their emotions and how they experience them. It is essential for healthy psychological functioning (16). Deficits in emotional regulation are linked to disorders such as anxiety and depression (17). Individuals with anxiety or depression need to learn effective ways to optimize emotional regulation (18). DMT promotes health through coordinating physical, mental, emotional, and social aspects of an individual.

DMT therapists help clients connect to their emotions through dance movement and body awareness and gauge their client’s emotional state. Therapists precisely mirror their patients’ movements and mimic the qualities and emotional tone of their movements. By skillful application of DMT, therapists guide clients’ emotions with modified movements and connect them on a psychological level, leading to decreased symptoms and overall enhancement of well-being (19).

The connection between the therapist and the client forms a continuous non-verbal empathic dialogue.

MIRROR NEURON SYSTEM

The act of “mirroring” is based on physiological knowledge of the mirror neuron system (MNS) (20, 22). Mirror neurons were first discovered in macaque monkeys in the 1990s in Italy. These specialized neurons become activated when an individual performs an action while simultaneously observing someone else performing the same action, linking action observation with action execution (21). Various parts of the brain engage in this process and make up the MNS. The premotor cortex is an important part of this complex system (23). The MNS has a role in controlling behavior, specifically the trunk muscles, in planning movement and in special guidance of movements. Dance training and dance observation can help advance knowledge of the human mirror neuron system. During dance movements, scientists performed fMRI (functional MRI) scans, revealing activation of the premotor cortex (frontal MNS), parietal lobe (parietal MNS) and superior temporal sulcus, as shown in Figure 1 (23). The parietal lobe integrates multiple sensory movements. Activation of the superior temporal sulcus is responsible for dance imitation, rhythm synchronization, and melody discrimination tasks (42).

Research shows that mirror neurons not only provide action response but also foster empathy and contribute to interpersonal and communication skills (25). These skills are especially critical during brain development in adolescence, e.g., when brain undergoes significant

structural and functional changes. A strong functional relationship between mirror neurons and empathic projection, intrinsic to DMT, is shown on Figure 2. The therapist engages in a mirroring process with clients by copying their precise movements (MNS activity) and by reflecting the emotional tone (limbic activity) behind each movement. Both types of mirroring lead to shared activation in MNS networks between therapist and client, enhancing empathy (19).

The discovery of the MNS led to a deeper understanding of neuroplasticity, e.g., the brain’s ability to change and adapt in response to experience and learning dance movements (24). Positive changes in brain structure, after implementing dance therapy, increase plasticity of grey and white matter, especially in regions of the brain associated with motor and auditory functions (24). Building empathy through MNS and enhancing neuroplasticity are the key physiological factors in the therapeutic application of DMT.

ADOLESCENT BRAIN DEVELOPMENT

There is a need to further explore the role of MNS and neuroplasticity in DMT applications for treatment of people of different ages, but especially important is to learn about impact of DMT on adolescents. The adolescent brain undergoes considerable maturation during the teen years, leading to more efficient socio-emotional regulation and improved decision making (28). In humans, brain size overall does not change beyond early school age (27), however, an increase in white matter and a decrease in grey matter, along with improved cortical connections (29) enhance brain

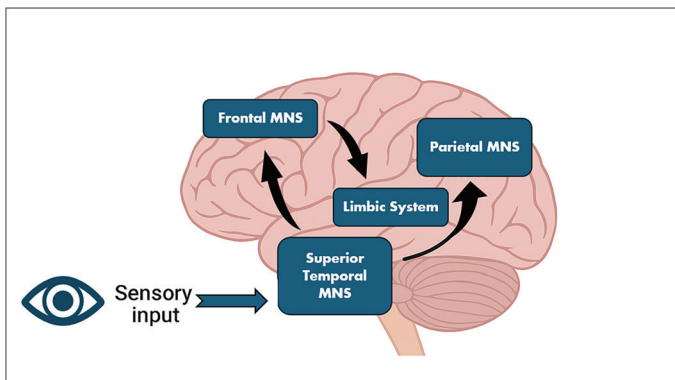


Figure 1. The human mirror-neuron system: sensory input is relayed to the premotor cortex and parietal cortex via the superior temporal sulcus.

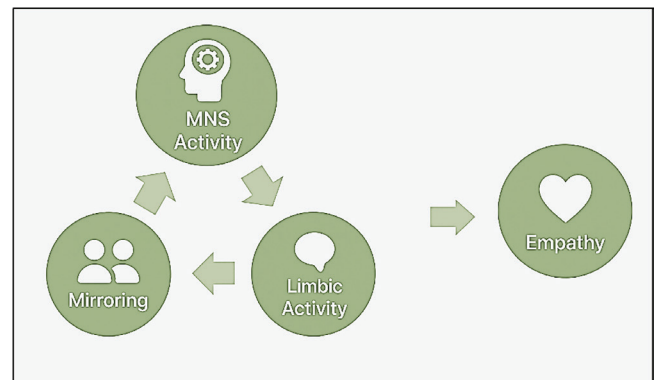


Figure 2. Schematic figure depicting the proposed relationship between MNS activity, mirroring, limbic activation, and one’s capacity for empathy.

function. The changes in the prefrontal cortex, limbic system, and thalamus lead to improved cognitive processing.

Brain structures responsible for emotional processing further mature but remain incompletely developed. Neuroimaging shows that the adolescent brain develops faster in regions linked to emotional reactivity (amygdala) but develop slower in locations linked to emotional regulation (medial prefrontal cortex, anterior cingulate cortex, lateral pre-frontal cortex) (26). Dopamine as a neurotransmitter plays an essential role in the so-called “reward system” which also evolves during the teenage years. Increased dopamine levels create a rush of excitement responsible for the choices teenagers make between safer and riskier behaviors. This explains how adolescents can be prone to emotional dysregulation, poor communication skills and lack of empathy as their brain development evolves. (30). Adolescence can be a time of increased self-awareness, perceived self-absorption, and a reluctance to engage emotionally. In addition, adolescent emotional regulation skills are still developing. This could explain an increased likelihood of mood disorders (anxiety or depression) in teens (54). Adolescents with behavioral health conditions are likely to have trouble with keeping friends and to be a victim of bullying (43). Without treatment, adolescents may be more likely to have generalized anxiety disorders and depression as adults. CDC data from 2021-2022 (31) showed that over half (55%) of US adolescents discussed mental health with a healthcare professional, 14% of adolescents reported taking medication to help with their emotions, and 20% of adolescents reported receiving mental health therapy. There is a need to provide adolescents with more options to address mental health challenges as they go through a period of brain maturation.

COGNITIVE BEHAVIORAL THERAPY

CBT is a well-studied, highly effective treatment for mood disorders, including during adolescence (47). A key principle of CBT is to identify a person’s unhelpful thought patterns and behaviors with an aim to reframe and modify them. Through various tools and techniques, CBT therapists help clients restructure cognitive patterns, develop coping strategies, and prevent symptom relapse (48). Methodology of CBT is especially important for adolescents while they are experiencing emotional instability during their growth. Cognitive restructuring, such as shifting negative

thought patterns to more positive thinking, leads to positive emotions and behaviors. When a person states, “If I get dizzy, I will go crazy”, the therapist helps to deconstruct their feelings by encouraging a modified thought (48). CBT treatment for anxiety is based on continued exposure to situations or stimuli that trigger “bodily sensations”, anxiety or panic response, in turn reducing the fear of symptoms. The aim of this exposure is to demonstrate that the sensations are benign and not indicative of danger. It is highly engaging, interactive, helps teens take ownership of their feelings, and alter perceptions in a positive way. Applying CBT in adolescents with mood disorders can have quick positive results (55).

DANCE MOVEMENT THERAPY

DMT is widely used for treating neurodegenerative diseases including Parkinson’s disease, Alzheimer’s disease, and spectrum disorders in adults (32, 34). In DMT, various brain regions become active through a combination of music and exercise, improving emotional response and sense of well-being (33, 35). There is sparse data available on the application of DMT for mental health disorders. A systematic review by Christopher *et al.*, indicated inconclusive effects of dance therapy on depression, but DMT was found to be beneficial in reducing stress (49). The review focused primarily on adults, thus the benefits of DMT in adolescence is not clear. However, studies show a growing need to focus on this area of research. In a study by Jeong *et al.*, 40 adolescents with mild depression were randomized to DMT for 12 weeks or no intervention (36). The goal of the study was to track changes in neurohormones linked to depression, including serotonin and dopamine. Comprehensive depression scales measured psychological distress and interpersonal sensitivity. Results showed increased serotonin and decreased dopamine concentrations in the DMT group. Negative psychological symptoms also improved in the DMT group with no change in the control group. Serotonin and dopamine production might be a mechanism for improvement in depression using DMT. However, studies of neurohormonal changes would add to the understanding of DMT on adolescent mental health.

COMBINATION THERAPY: DMT AND CBT

CBT alleviates mental health symptoms, but the long-term effect remains unclear (37). Therapists trained in

both CBT and DMT suggest using both modalities in combination to achieve better therapeutic effect (39). CBT is an “anchor” on which the therapist can “lean” while applying “embodiment techniques” of sensory awareness with DMT (39). The combined approach involves body and mind intervention techniques, such as mindfulness, complemented by neuroscience and embodied cognition (39). Combining CBT and DMT could enhance the effectiveness of each (39).

There is little research on using DMT with CBT in people with mental health challenges. According to Weitz *et al.*, the value of adding DMT to CBT in youth is that because DMT emphasizes the connection of body and mind, patients can non-verbally express their feelings. DMT can relieve symptoms of anxiety and promote healing. A relationship between these therapies, as described by Weitz, is known as the “top down” plus “bottom up” approach (Figure 3).

The top-down approach (i.e., CBT alone) may not succeed in improving anxiety symptoms, such as pain or fatigue, which do not involve the body response and the nervous system. The bottom-up approach (i.e., DMT alone) reduces symptoms of anxiety physiologically, but may not be fully effective, since it does not involve cognition. Together they improve treatment outcomes in a more balanced way (38). It is essential to learn more about this integrative approach. Randomized controlled, non-inferiority trials are necessary to establish practical application of combined CBT/DMT in mental health. This will allow the development of more precise and effective treatments in adolescents with anxiety or depression. Combined CBT/DMT, with

its emphasis on the mind-body connection, should be a focus of future studies with the goal of achieving meaningful therapeutic benefits.

DMT/CBT THERAPY AND SMARTPHONE APPS

Researchers continue to identify better ways to deliver combined treatments. The COVID-19 pandemic provided an opportunity to use innovative technologies to successfully deliver CBT and DMT, particularly in adolescents since they are innately adaptable to modern technology (39). During the pandemic, healthcare delivery transitioned to telemedicine, such as with online visits on Zoom, Doxy, and other platforms. These tools were utilized in mental health therapy, including in the application of DMT (53).

Smartphone-based CBT apps are now widely available, including *Sanvello*, *MindDoc*, *MindShift*, *Clarity*, *Happyfi*, and others (46). *Sanvello* is an evidence-based CBT app which includes self-care tools, guided meditations, mindfulness, journaling, sleep hygiene, and exercise modules. The app can recognize behavioral patterns and provide customized CBT tools to alleviate stress, and reduce anxiety and depression symptoms (44). However, *Sanvello* (along with other CBT apps currently available on the market) doesn't have a DMT module, essentially lacking a potential benefit of combined with CBT (“top-bottom” and “bottom-up”) approach. Incorporating a DMT module with adolescent-friendly content into the CBT app could potentially greatly enhance the body-mind connection, thus robustly improving the effectiveness of mental health treatment in both adults and adolescents.

In 2020, researchers in South Korea developed a mobile app for DMT intervention to reduce anxiety and enhance mindfulness in adolescents (40). The app was named *Koala* (in Korean, an abbreviation for “Being aware of oneself through nasal breathing”). Four modules were employed: meditation, psychoeducation, music therapy, and DMT. The DMT module aimed to reduce anxiety by addressing physiological symptoms and to increase mindfulness with adolescent-friendly content. The participants, 60 middle school students, were randomly assigned to experimental or control groups. The experimental group practiced the app-based mindfulness meditation and breathing exercise over 10 weeks. The DMT group showed statistically significant reduced anxiety compared to the control group. One limitation, however, was the absence of a CBT module

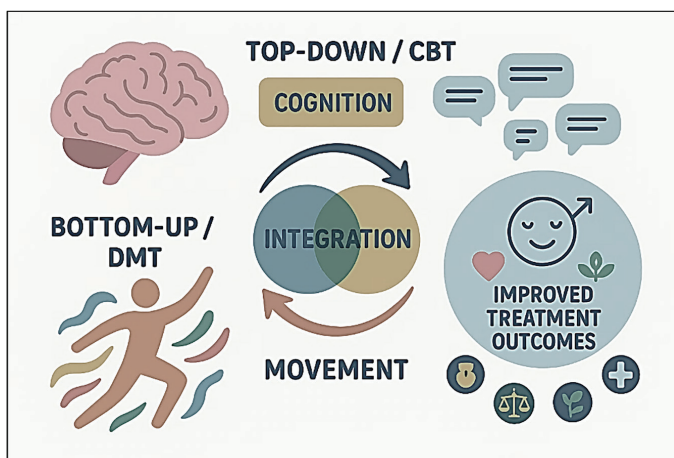


Figure 3. Combining of DMT (bottom-up) with CBT (top-down) leading to improved treatment outcome.

(cognitive restructuring, behavioral activation, and exposure therapy). App-based DMT/CBT has valuable potential in improving mental health in adolescents. Delivery of CBT/DMT via smartphone app may become incorporated into future clinical practice.

DMT/CBT THERAPY AND METAVERSE

The metaverse, including extended reality (XR), augmented reality (AR), virtual reality (VR) and mixed reality (MR) environments also offers breakthroughs in delivering alternative therapies (52). Over the past few decades, the metaverse has continued to evolve with exponential growth. Researchers have seen positive results in treating post-traumatic stress disorder (PTSD) using metaverse sessions (50). Additional studies involving 9/11 survivors and Iraq War veterans reported a significant decrease in PTSD symptoms following treatment with VR sessions (51). An immersive, sensory-rich virtual 3D environment pushes the boundaries of the physical world. By using nonverbal communication, the metaverse has limitless options for mental health treatments.

In 2023, researchers at Oxford University, UK explored the use of metaverse in DMT for the treatment of anxiety and depression (41). The goal was to evaluate the effectiveness of DMT when integrated into a virtual 3D environment and determine whether data collected through wearables and XR could help personalize DMT sessions. The research team hypothesized that the metaverse can simulate environments through sensory experiences. Treatment data collected via wearables technologies showed changes that suggested increased relaxation and emotional regulation. The results confirm that DMT applied in the metaverse significantly reduces symptoms of anxiety and depression.

The use of combined therapy CBT/DMT in virtual environments has great therapeutic potential and should be a future direction of research. These applications would create healing experiences otherwise not available and could be personalized to match individual needs. The virtual setting would allow treatments to be delivered without regard to the patient's geographical location. However, the cost of VR equipment and sessions may be prohibitive for widescale use. In addition, insurance coverage is variable, potentially constraining robust adaption. Despite these challenges, the use of virtual platforms could capitalize on the intrinsic ability of this generation to embrace emerging digital technology and advances.

CONCLUSION

Adolescence is a critical phase of human development, when young individuals experience rapid physical, social, and emotional growth. There has been a recent increase in the prevalence of mood disorders (anxiety and depression) in adolescents, in part due to the COVID pandemic. To combat this trend, identifying better options to study, evaluate, and treat mood disorders is necessary. CBT can improve depression and anxiety in adolescents. DMT, with its emphasis on mind-body connection, provides additional emotional support. Cognitive and behavioral studies suggest that movement therapy strengthens the mind-body connection, utilizing an integrated approach to treating mind, body, and emotion.

Future research should explore the long-term effect of CBT/DMT for mental health treatment in adolescents and would provide a new perspective or novel treatment options. Longitudinal studies of CBT/DMT will provide insight on behavioral treatments to achieve better remission rates in adolescents. Including anxiety scores reduction as an endpoint would also help determine efficacy and optimal treatment regimens.

Exploration of DMT delivery via smartphone app or virtual reality should be a next step. Combined CBT/DMT, can be effectively delivered through mobile apps or virtual reality. This novel direction in behavioral health is particularly applicable to adolescents due to their ability to adapt to evolving digital technology. The therapeutic effectiveness of CBT/DMT apps or metaverse on adolescents should be a key focus of future research.

This literature review has multiple limitations. Using DMT in adolescent mental health is a relatively new concept; most of the studies reviewed have a small sample size, limiting generalizability, precision and reliability of the findings. The studies reviewed were of short duration, restricting definitive conclusions about long-term efficacy of DMT in adolescents. This review emphasizes the need for longitudinal research on DMT as adjunctive therapy to CBT in adolescent mental health, incorporating the use of metaverse and mobile apps and.

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CONFLICT OF INTERESTS

The author declares that there are no conflicts of interest regarding the publication of this article.

REFERENCES

- Mental Health of Adolescents. Available from <https://www.who.int/news-room/fact-sheets/detail/adolescent-mental-health> (accessed on 2025-9-01)
- Humphries A, *et al.* Acutely Enhancing Affective State and Social Connection Following an Online Dance Intervention During the COVID-19 Social Isolation Crisis. *BMC Psychol.* 2023; 11: 13. <https://doi.org/10.1186/s40359-022-01034-w>
- Madigan S, *et al.* Changes in Depression and Anxiety Among Children and Adolescents from Before to During the COVID-19 Pandemic. A Systematic Review and Meta-analysis. *JAMA Pediatrics.* 2023; 177 (6): 567-581. <https://doi.org/10.1001/jamapediatrics.2023.0846>
- Curtiss J, *et al.* Cognitive-Behavioral Treatments for Anxiety and Stress-Related Disorders. *Focus. Am Psychiatr Publ.* 2021. Jun; 19 (2): 184-189. <https://doi.org/10.1176/appi.focus.20200045>
- Ruvolo Grasser L, *et al.* Virtual Arts and Movement Therapies for Youth in the Era of COVID-19. *J Am Acad Child Adolesc Psychiatry.* 2021. Nov; 60 (11): 1334-1336. <https://doi.org/10.1016/j.jaac.2021.06.017>
- Weitz N, *et al.* The Effectiveness of DMT-CBT Combination in Anxiety Disorders Treatment: Therapists Perceptions. In V. Chis, & I. Albulescu (Eds.), Education, Reflection, Development - ERD 2018, vol 63. European Proceedings of Social and Behavioral Sciences. ISBN: 978-1-80296-062-4, p. 600-606. <https://doi.org/10.15405/epsbs.2019.06.72>
- What is Dance Movement Therapy? Available from: <https://www.adta.org> (accessed on 2025-9-01)
- Volpe U. Art Therapies Arts Therapies in Psychiatric Rehabilitation. Springer, 2021. ISBN: 9783030762087, p. 85-88. <https://doi.org/10.1007/978-3-030-76208-7>
- Berrol C. Neuroscience Meets Dance/Movement Therapy: Mirror Neurons, the Therapeutic Process and Empathy. *The Art of Psychotherapy.* 2006; 33 (4): 302-315. <https://doi.org/10.1016/j.aip.2006.04.001>
- Chaiklin S, *et al.* The Art and Science of Dance Movement Therapy: Life Is Dance (1st ed.). Routledge, 2009. ISBN: 9780203874202, p. 4-6. <https://doi.org/10.4324/9780203874202>
- Anzieu D, *et al.* The Skin Ego. Routledge, 2018. ISBN: 9781782201007, p. 35-36. <https://doi.org/10.4324/9780429483202>
- Ethical Code 2010 of the European Association of Dance Movement Therapy. Available from: <https://eadmt.com/eadmt/ethical-code> (accessed on 2025-9-01)
- Li H, *et al.*, Mind-Body Integration in Dance Movement Therapy. Available from: <https://inpact-psychologyconference.org/wp-content/uploads/2021/05/2021inpact081.pdf> (accessed on 2025-9-01)
- Zhang X, *et al.* The Role of Dance Movement Therapy in Enhancing Emotional Regulation: A Literature Review. *Heliyon.* 2024; 10 (15): 35733. <https://doi.org/10.1016/j.heliyon.2024.e35733>
- Mehling W, *et al.* Body Awareness: A Phenomenological Inquiry into the Common Ground of Mind-body Therapies. *Philos Ethics Humanit Med.* 2011 Apr; 6: 6. <https://doi.org/10.1186/1747-5341-6-6>
- Gross J. Emotion Regulation: Emotion Affective, Cognitive, and Social Consequences. *Phytosociology.* 2023; 33 (3): 281-291. <https://doi.org/10.1017/S0048577201393198>
- Shafir T. Using Movement to Regulate Emotion. *Front. Psychol.* 2016; 7, art.1451. <https://doi.org/10.3389/fpsyg.2016.01451>
- Menefee D, *et al.* The Importance of Emotional Regulation in Mental Health. *American Journal of Lifestyle Medicine.* 2022; 16 (1); 28-31. <https://doi.org/10.1177/15598276211049771>
- McGarry M, *et al.* Mirroring in Dance/Movement Therapy: Potential Mechanisms Behind Empathy Enhancement. *The Arts in Psychotherapy.* 2011; 38 (3): 178-184. <https://doi.org/10.1016/j.aip.2011.04.005>
- Heyes C, *et al.* What Happened to Mirror Neurons? *Perspectives in Psychological Science.* 2021; 17 (1): 153-168. <https://doi.org/10.1177/1745691621990638>
- Vér AE, *et al.* Development of a Device for Mirror Therapy. *Studia UBB Educatio Artis Gymn.* 2024; 68: p. 61-74. [https://doi.org/10.24193/subbeag.68\(4\).32](https://doi.org/10.24193/subbeag.68(4).32)
- Patel J. Advances in the Study of Mirror Neurons and Their Impact on Neuroscience. *Cureus.* 2024; 16 (5): 61299. <https://doi.org/10.7759/cureus.61299>
- Jeon H, *et al.* From Neurons to Social Beings: Short Review of the Mirror Neuron System Research and Its Socio-Psychological and Psychiatric Implications. *Clinical Psychopharmacology and Neuroscience.* 2018; 16 (1): 18-31. <https://doi.org/10.9758/cpn.2018.16.1.18>
- Foster O, *et al.* The Neuroscience of Dance: A Conceptual Framework and Systematic Review. *Neuroscience and Biobehavioral Reviews.* 2023. Jul; 150: 105197. <https://doi.org/10.1016/j.neubiorev.2023.105197>

25. Corradini A, *et al.* Mirror Neurons and their Function in Cognitively Understood Empathy. *Consciousness and Cognition*. 2013; 22 (3): 1152-1161. <https://doi.org/10.1016/j.concog.2013.03.003>
26. Kim EJ, *et al.* Cognitive and Emotional Empathy in Young Adolescents: an fMRI Study. *Soa Chongsonyon Chongsin Uihak*. 2020; Jul; 31 (3): 121-130. <https://doi.org/10.5765/jkacap.200020>
27. Pfefferbaum A, *et al.* A Quantitative Magnetic Resonance Imaging Study of Changes in Brain Morphology from Infancy to Late Adulthood. *JAMA Neurology*. 1994; 51 (9): 874-887. <https://doi.org/10.1001/archneur.1994.00540210046012>
28. Barnea-Goraly M, *et al.* White Matter Development during Childhood and Adolescence: A Cross-Sectional Diffusion Tensor Imaging Study. *Cerebral Cortex*. 2005; 15 (12): 1848-1854. <https://doi.org/10.1093/cercor/bhi062>
29. Huttenlocher P, *et al.* Regional Differences in Synaptogenesis in Human Cerebral Cortex. *Journal of Comparative Neurology*. 1997; 387: 167-178. [https://doi.org/10.1002/\(SICI\)1096-9861\(19971020\)387:2<167::AID-CNE1>3.0.CO;2-Z](https://doi.org/10.1002/(SICI)1096-9861(19971020)387:2<167::AID-CNE1>3.0.CO;2-Z)
30. Wetheril R, *et al.* Adolescent Brain Development Substance Use and Psychotherapeutic Change. *Psychol. Addict Behavior*. 2013 Jun; 27 (2): 393-402. <https://doi.org/10.1037/a0029111>
31. Data and Statistics on Children's Mental Health. Available from: <https://www.cdc.gov/children-mental-health/data-research/index.html> (accessed on 2025-9-01)
32. Hausdorff J, *et al.* Impaired Regulation of Stride Variability in Parkinson's Disease Subjects with Freezing of Gait. *Experimental Brain Research*. 2003 Jan; 149: 187-194. <https://doi.org/10.1007/s00221-002-1354-8>
33. Yan A, *et al.* Effectiveness of Dance Interventions on Psychological and Cognitive Health Outcomes Compared with Other Forms of Physical Activity: A Systematic Review with Meta-analysis. *Sports Medicine*. 2024; 54: 1179-1205. <https://doi.org/10.1007/s40279-023-01990-2>
34. Ruiz-Muelle A, *et al.* Dance for People with Alzheimer's Disease: A Systematic Review. *Current Alzheimer Research*. 2019; 16 (10): 919-933. <https://doi.org/10.2174/1567205016666190725151614>
35. Wu CC, *et al.* Dance Movement Therapy for Neurodegenerative Diseases: A Systematic Review. *Neurocognitive Aging and Behavior*. 2022; 14: 975711. <https://doi.org/10.3389/fnagi.2022.975711>
36. Jeong Y, *et al.* Dance Movement Therapy Improves Emotional Responses and Modulates Neurohormones in Adolescents with Mild Depression. *International Journal of Neuroscience*. 2005; 115 (12): 1711-1720. <https://doi.org/10.1080/00207450590958574>
37. Hofmann CG, *et al.* The Efficacy of Cognitive Behavioral Therapy: A Review of Meta-analyses. *Cognit Ther Res*. 2012; 36: 427-440. <https://doi.org/10.1007/s10608-012-9476-1>
38. Weitz N, *et al.* Combining Dance/Movement Therapy with Cognitive Behavioral Therapy in Treatment of Children with Anxiety Disorders: Factors Explaining Therapists' Attitudes. *Amj Dance Ther*. 2022; 44 (2): 186-209. <https://doi.org/10.1007/s10465-022-09369-y>
39. Li J. Digital Technologies for Mental Health Improvements in the COVID-19 Pandemic: a Scoping Review. *BMC Public Health*. 2023; 23 (1): 413. <https://doi.org/10.1186/s12889-023-15302-w>
40. Ko K, *et al.* A preliminary Study Using a Mobile App as a Dance/Movement Therapy Intervention to Reduce Anxiety and Enhance the Mindfulness of Adolescents in South Korea. *The Arts of Psychotherapy*. 2023; 85: 102062. <https://doi.org/10.1016/j.aip.2023.102062>
41. Radanliev P. Dance Sport Movement Therapy in the Metaverse: A New Frontier for Alternative Mental Health Therapies. *Digital Health*. 2024; 10. <https://doi.org/10.1177/20552076241258273>
42. Karpati FJ, *et al.* Dance and Music Share Gray Matter Structural Correlates. *Brain Research*. 2017; 1657: 62-73. <https://doi.org/10.1016/j.brainres.2016.11.029>
43. Sappenfield O, *et al.* Adolescent Mental and Behavioral Health, National Survey. 2023 National Survey of Children's Health Data Briefs. Rockville (MD): Health Resources and Services Administration. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK608531/> (accessed on 2025-09-01)
44. Bautista J, *et al.* Multi-Media Field Test: Cognitive-Behavioral Therapy at Our Fingertips: Sanvello Provides On-Demand Support for Mental Health. *Cognitive and Behavioral Practice*. 2025; 32 (2): 206-213. <https://doi.org/10.1016/j.cbpra.2023.12.008>
45. Graham M. Martha Graham Reflects on Her Art and a Life in Dance. New York Times Archive. 1985. Available from: <https://archive.nytimes.com/www.nytimes.com/library/arts/033185graham.html> (accessed on 2025-09-01)
46. The Best CBT Apps of 2025. Available from: <https://www.choosingtherapy.com/best-cbt-apps/> (accessed on 2025-9-01)
47. David D, *et al.* Why Cognitive Behavioral Therapy is the Current Gold Standard of Psychotherapy. *Frontiers in Psychiatry*. 2018; 9. <https://doi.org/10.3389/fpsy.2018.00004>
48. Curtiss J, *et al.* Cognitive-Behavioral Treatments for Anxiety and Stress-Related Disorder. *Am Psych Publ*. 2021 Jun; 19 (2): 184-189. <https://doi.org/10.1176/appi.focus.20200045>
49. Christopher N, *et al.* Dance Therapy as an Intervention for Stress and Depression: A Systematic Review and Meta-analysis. *Body Movement and Dance Psychotherapy*. 2025; 20 (1): 22-39. <https://doi.org/10.1080>

- /17432979.2024.2377389
50. Rizzo A, *et al.* VR PTSD Exposure Therapy Results with Active Duty OIF/OEF Combatants. *Studies in Health Technology and Informatics*. 2009; 142: 277-82. <https://doi.org/10.3233/978-1-58603-964-6-277>
 51. Difede J, *et al.* Virtual Reality Exposure Therapy for World Trade Center Post-Traumatic Stress Disorder: A Case Report. *Cyberpsychology & Behavior*. 2004; 5 (6). <https://doi.org/10.1089/109493102321018169>
 52. Patel. Exploring the Implications of the Metaverse: Opportunities and Challenges for Dance Movement Therapy. *Body Movement and Dance in Psychotherapy*. 2024; 19 (4): 340-351. <https://doi.org/10.1080/17432979.2024.2306581>
 53. Grasser L, *et al.* Virtual Arts and Movement Therapies for Youth in the Era of COVID-19. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2021. Nov; 60 (11): 1334-1336. <https://doi.org/10.1016/j.jaac.2021.06.017>
 54. Hoops D, *et al.* Making Dopamine Connections in Adolescence. *Trends in Neurosciences*. 2017; 40 (12): 709-719. <https://doi.org/10.1016/j.tins.2017.09.004>
 55. Ouda M, *et al.* Effectiveness of CBT for Children and Adolescents with Depression: A Systematic Review and Meta-Regression Analysis. *European Psychiatry*. 2019 Apr; 55 (33): 45. <https://doi.org/10.1016/j.eurpsy.2018.12.008>