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# *A Comparative Study of Biodanza and AI-Based Interactive Dance from the Perspective of Gilles Deleuze*

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**Abstract**: This article offers a comparative analysis of Gilles Deleuze's concepts—Becoming, Body without Organs, Rhizome, and Time Crystal—in Biodanza and AI-generated dance. Biodanza emphasizes lived experience, spontaneous movement, and human interaction, embodying Becoming as an internal, fluid process. The body functions as a dynamic, multicentric, non-linear network. Conversely, AI-based dance generates movement through computational systems, translating Deleuzian ideas into structured, data-driven processes, typically resulting in a digital or virtual body lacking conscious experience. While Biodanza supports therapeutic outcomes through presence and interpersonal connection, AI-driven dance raises questions about its therapeutic limits. The study proposes integrating both approaches to develop hybrid performances combining human improvisation with AI-generated movement. Although AI cannot replicate Biodanza's embodied therapy, it offers novel stimuli and interactive possibilities, advancing artistic innovation and therapeutic methodologies in the performing arts.

**Keywords***:* Hybrid performance, Biodanza, AI dance, Deleuze, Becoming, Rhizome, Body without Organs, Time Crystal, Interactive movement therapy.

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In contemporary performing arts, particularly dance, the integration of advanced technologies has transformed the field into a complex, multifaceted domain that extends beyond the aesthetics of movement to encompass therapeutic, cognitive, and social dimensions. Gilles Deleuze's philosophical framework—particularly his concepts of Becoming, Body without Organs, and Rhizome—offers critical tools for deepening our understanding of the body and movement in performance. These concepts are especially pertinent to improvisational practices and nonlinear communication structures, providing new ways to reconceptualize performance and embodied experience.

Among the notable approaches in dance therapy and personal development, Biodanza stands out for its effectiveness and impact. Rooted in improvisation, embodied presence, and human interaction, Biodanza offers multiple therapeutic benefits, including stress reduction, enhanced mental health, and strengthened social connections. It conceptualizes the body as a free, dynamic energy field liberated from rigid structures and operating within a multicentric network of relationships—a rhizomatic system.

Concurrently, the emergence of artificial intelligence in the performing arts has enabled the development of digital and robotic dances, grounded in machine learning algorithms and automated movement generation. While these AI-based dances lack conscious lived experience and human bodily presence, they enable the creation of complex, dynamic, and multilayered movement structures, offering new horizons for both aesthetic and kinesthetic experience. The fusion of human-centered improvisational methods with AI-driven movement presents innovative possibilities for hybrid, interactive performances that are simultaneously biological and technological, human and machine. These developments also prompt critical questions regarding the therapeutic, cognitive, and social potential of AI-based dance. This research seeks to explore the following questions:

1. How are Deleuzian concepts of Becoming, Body without Organs, and Rhizome manifested in Biodanza and AI-based dance?

2. What similarities and differences exist between the lived and therapeutic experience of Biodanza and the movement and interactive structures of AI-based dance?

3. What are the capacities and limitations of AI-based dance in fulfilling therapeutic functions, particularly in comparison to Biodanza?

4. How might these two approaches be integrated within performing and therapeutic arts to generate hybrid, innovative experiences?

By addressing these questions, this study aims to advance both theoretical and practical understandings of movement and embodiment in contemporary performance, while contributing to the development of novel therapeutic and artistic methodologies.

### *Background*

Biodanza was founded in the 1960s by Rolando Toro Araneda, a Chilean psychologist and anthropologist. The term "Biodanza" consists of two parts: Bios, meaning life, and Danza, meaning dance. Therefore, Biodanza can be understood as the "dance of life," and it is based on a combination of dance, music, human contact, and improvisation[2]. Its primary goal is to strengthen the connection between the body, emotions, and others within a group setting. In Biodanza, the dancer improvises movements based on lived experience and conscious presence, with the body functioning as a free-flowing energy field connected to the environment and others. The article by P. Martin, titled "Embodiment and presence in dance therapy: The role of touch and eye contact" explores the significance of embodiment and presence in dance therapy, emphasizing the therapeutic roles of touch and eye contact. Martin argues that these elements foster deeper interpersonal connection, emotional safety, and trust within the therapeutic space. The body is viewed not merely as a physical entity but as a dynamic medium for emotional expression and relational engagement. Through phenomenological and experiential lenses, the paper highlights how bodily interaction can enhance therapeutic outcomes and support clients in accessing non-verbal dimensions of their inner experience[3]. Biodanza is a health and well-being approach using dance and group experiences to enhance personal and social resources, reduce stress, and improve mood.

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[2] Toro Araneda, R. The Vivencia – Rolando Toro System Biodanza School. International Biocentric Foundation.

[3] Martin, P. "Embodiment and Presence in Dance Therapy: The Role of Touch and Eye Contact," *Body, Movement and Dance in Psychotherapy* 10, no. 3 (2015): 89–175.

By 2016, 13 studies and a systematic review had been published. The BIONET network was established to connect researchers and standardize study quality. Seven studies on stress reduction and well-being show that Biodanza can improve mood, emotional expression, physiological responses, immune function, and stress recovery. Effects vary, with some studies showing lower stress levels in participants choosing Biodanza, though dropout rates ranged from under 10% to 42%[4]. "Affective colonizations and somatic experience" specifically focuses on the practice as a somatic practice, analyzing how it impacts gender relations and affective dynamics. Biodanza is a "somatic practice" that operates through "the establishment of experiential situations (situações vivenciais) in which ways of living, feeling, and experiencing oneself and the world are placed before otherness." These "vivencial situations" allow participants to "experience modifications ... in relation to their body, sexuality, and relationships[5]. A Comparative Study of Self-expression and Catharsis in Theory of Mystical Journey at Mantiq-ut-Tayr (Conference of the Birds) and Biodanza explores the psychological and emotional parallels between Biodanza, a dance-based therapeutic system, and Attar's mystical allegory, Conference of the Birds. The article focuses on how both systems facilitate self-expression and catharsis—the emotional release that leads to healing and transformation and argues that both journeys—one poetic, one physical—guide individuals toward ego dissolution, emotional balance, and spiritual awakening[6].

With advances in machine learning and robotics, research has increasingly explored the use of artificial intelligence in generating dance movements and performing arts. AI systems can now generate choreographic sequences, simulate performers, and even improvise movements in real time—blurring the

[4] Stueck, M., and P. S. Tofts. "Biodanza Effects on Stress Reduction and Well-Being – A Review of Study Quality and Outcome," *Signum Temporis* 8, no. 1 (2016): 57–66.

[5] Tavares, Danielle, and André Bocchetti. "Affective Colonizations and Somatic Experience: The Practice of Biodanza in the Production of Gender Relations." *Faces de Eva. Estudos sobre a Mulher*, no. 49 (2023): 85-107. https://scielo.pt/pdf/eva/n49/0874-6885-eva-49-85.pdf.

[6] Meshkati, S. "A Comparative Study of Self-Expression and Catharsis in Theory of Mystical Journey at Mantiq-ut Tayr (Conference of Birds) and Biodanza," Paper presented at the 15th Lisbon-Portugal International Conference on Literature, Languages, Humanities & Social Sciences (L2HSS-19), Lisbon, June 2019.

boundaries between human and machine creativity, "Contemporary creators have technologies that can create many visual, sonic, spatial, multimedia, and interactive "effects" that were not possible with earlier arts and media technologies. Examples include the use of projection mapping for videos in space, particle systems for animation, robotics in performance and installations, or new materials in architecture"[7]. Recent studies indicate that AI-generated dances can effectively create multisensory interactions, cognitive stimulation, and innovative experiences. Yang examines the role of intelligent dancing robots in choreography by integrating human–computer interaction (HCI) and psychological construct modeling. The study argues that such robots can extend beyond simple imitation of human movement by employing sensory input, artificial intelligence algorithms, and representations of psychological space to generate original dance patterns. Through this framework, robots are positioned not merely as mechanical tools but as potential co-creators in the choreographic process. The research highlights the dual significance of this approach: advancing artistic innovation in dance while simultaneously offering new insights into the psychological and affective dimensions of human movement.[8] Additionally, robotic applications and virtual reality are being developed for motor rehabilitation and dance therapy: "Robotics and virtual reality technologies are increasingly being integrated into motor rehabilitation and dance therapy programs, enhancing both physical engagement and emotional responsiveness"[9].

Interactive AI dance is an emerging field in which advanced technologies are used to analyze and generate dance movements. Examples include the "Dance Tech" project at MIT and Europe's "Motion Bank," which employ motion sensors such as Kinect or Motion Capture to record dancers' movements and transmit them to AI systems. These systems analyze motion data and

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[7] Manovich, L. and E. Arielli, *Artificial Aesthetics: Generative AI, Art and Visual Media*. 2024.25-29. https://manovich.net/content/04-projects/186-artificial-aesthetics/manovich_and_arielli.artificial_aesthetics.all_chapters_final.pdf.

[8] Yang, L. "Influence of Human–Computer Interaction-Based Intelligent Dancing Robot and Psychological Construct on Choreography." *Frontiers in Neurorobotics* 16 (2022): Article 819550.

[9] Zanatta, F., A. Giardini, A. Pierobon, M. D'Addario, and P. Steca. "A Systematic Review on the Usability of Robotic and Virtual Reality Devices in Neuromotor Rehabilitation: Patients' and Healthcare Professionals' Perspective." *BMC Health Services Research* 22 (2022): Article 523.

generate real-time responses through light, sound, or complementary digital movements. Projects such as MIT's Dance Tech and Europe's Motion Bank use motion capture technologies like Kinect to record dancers' movements and transmit them to AI systems, which then analyze the data and generate real-time responses through light, sound, or digital visuals[10]. This model allows dancers to engage in an interactive technological space; while the body retains physical presence, the creative process occurs in a digital and data-driven environment. However, this type of dance lacks the inner lived experience observed in Biodanza, focusing primarily on data and algorithmic patterns.

Recent developments in AI-driven choreography, such as the Choreographic Coding Lab and immersive metaverse performances featuring avatar dancers, demonstrate how generative technologies are reshaping dance into a non-linear, interactive, and co-creative experience[11]. In an artistic project, Manovich used machine learning algorithms to create interactive dances where dancers' movements were reproduced and modified in real-time by algorithms. This approach generated a multisensory and innovative space that was well received by audiences but challenged the perception of genuine lived experience. Chen & Wang[12] conducted a clinical study using interactive robots equipped with AI algorithms to assist patients with motor disorders. This method improved motor performance and patient motivation, although human presence and therapist support remained essential. Vechtomova and Bos discuss a multimodal system enabling real-time co-creation of music based on dancers' movements." A recent multimodal system enabling real-time co-creation of music based on dancers' movements exemplifies how AI-generated dance-like interactions can foster multisensory engagement and stimulate cognitive and creative processes"[13]. Wallace et al. investigate how interactive artificial intelligence can be embodied within dance practice

[10] Bernhard, A. "4 Tech Tools That Could Transform the Dance World." *Dance Magazine*, 2017. (page: n/a from https://dancemagazine.com/36988-2/#gsc.tab=0).

[11] Manovich, L., E. Arielli, *Artificial Aesthetics: Generative AI, Art and Visual Media* (Chicago: 17th ed, 2024, https://manovich.net/index.php/projects/artificial-aesthetics).

[12] Chen, L. and J. Wang. "AI-Based Motion Therapy for Motor Rehabilitation: A Review." *Journal of Rehabilitation Robotics* 12, no. 3 (2020): 45–59.

[13] Vechtomova, O., and J. Bos. "Reimagining Dance: Real-Time Music Co-Creation between Dancers and AI." (*arXiv*, 2025, https://doi.org/10.48550/arXiv.2506.12008).

by focusing on movement ideation[14]. Rather than positioning AI as a tool for generating pre-defined choreographic output, the study explores how dancers engage with AI systems as creative partners through bodily interaction. By treating movement itself as the medium of dialogue between human and machine, the research emphasizes the potential of AI to contribute to the early stages of choreographic creativity, inspiring new movement possibilities and expanding the scope of artistic collaboration. This work highlights both the theoretical implications of embodiment and the practical value of AI as a co-creative agent in dance.

## *The Philosophy of the Body and Movement in Gilles Deleuze*

Gilles Deleuze, the contemporary French philosopher, offers a radically new framework for conceiving the body and movement through his notions of *becoming*, the *Body without Organs* (BwO), and the *rhizome*. Within this framework, the body is not to be understood as a fixed biological entity, but as a dynamic, multilayered, and continuously transforming process.

***Becoming***. Deleuze conceptualizes becoming as an ongoing, non-linear process of transformation that resists fixed identities and stable states of being. In contrast to being, which privileges permanence and self-sameness, becoming emphasizes fluidity, multiplicity, and metamorphosis. In the context of dance, becoming entails liberating the body from predetermined codifications and allowing it to move toward creation, novelty, and experimentation. In Deleuze's ontology, *becoming* is not a transitional phase between two fixed states, but a continuous process of transformation that resists closure and identity[15]. Within the context of dance, this concept resonates deeply: the dancer's body is not a stable entity but a site of perpetual differentiation. As Rothfield explains, "This is becoming, and its endurance is what Deleuze

[14] Wallace, B., C. Hilton, K. Nymoen, J. Torresen, C. P. Martin, and R. Fiebrink. "Embodying an Interactive AI for Dance through Movement Ideation." In *Creativity and Cognition* (C&C '23), June 19–21, 2023, Virtual Event, USA. ACM. https://dl.acm.org/doi/10.1145/3591196.3593336).

[15] Deleuze, G. *Difference and Repetition*, trans. P. Patton (New York: Columbia University Press, 1994, 1st ed. 1968).

dubs the being of becoming, whose perpetual form is the eternal return" [16]. Here, becoming is not ephemeral—it endures, and this endurance constitutes a kind of ontological affirmation. Dance, then, becomes a lived expression of this philosophical movement: a temporal unfolding that never settles, always returning, always differing.

***The Body without Organs***. The Body without Organs (BwO) designates a plane of potentiality that exceeds conventional anatomical and functional segmentations. It is a field of energy and virtual possibilities where established corporeal structures are suspended, thereby enabling the emergence of new and unanticipated forms of movement. "It is nonstratified, unformed, intense matter, the matrix of intensity, intensity = 0; but there is nothing negative about that zero, there are no negative or opposite intensities. Matter equals energy. Production of the real as an intensive magnitude starting at zero" [17].The BwO is less a substance than a mode of opening the body to intensities and flows, undoing its rigid stratifications. It is not a thing, but a" process" [18], a field of potentialities, a "plane of consistency" [19].

***Rhizome***. Deleuze, together with Félix Guattari, develops the concept of the rhizome as a non-hierarchical, acentered, and proliferative model of organization. Unlike the arborescent model, which is grounded in linearity and hierarchy, the rhizome consists of heterogeneous nodes and connections that can expand indefinitely in multiple directions." A rhizome has no beginning or end; it is always in the middle, between things, interbeing, intermezzo" [20]. Applied to dance and corporeality, the rhizomatic model foregrounds complex, multidirectional, and decentralized relations both among bodily elements

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[16] Rothfield, P. "Dance and the Passing Moment: Deleuze's Nietzsche." In *Deleuze and the Body*, ed. L. Guillaume and J. Hughes, 220 (Edinburgh: Edinburgh University Press, 2011), published online by Cambridge University Press, September 12, 2012, 220. https://www.researchgate.net/publication/300213999_Dance_and_the_Passing_Moment_Deleuze's_Nietzsche

[17] Deleuze, G., and F. Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*, trans. B. Massumi (Minneapolis: University of Minnesota Press, 1987, 1st ed. 1980), 153.

[18] Deleuze, G., and F. Guattari. *A Thousand Plateaus:…*, 154.

[19] Deleuze, G., and F. Guattari. *A Thousand Plateaus:…*, 154.

[20] Deleuze, G., and F. Guattari. *A Thousand Plateaus:…*, 25.

and between the body and its environment. In the third chapter of *Practising with Deleuze: Design, Dance, Art, Writing, Philosophy*, Terri Bird explores how artistic practices—particularly those involving movement and form—can be understood through Deleuzian concepts such as the rhizome. Drawing on Deleuze and Guattari's notion that art renders imperceptible forces perceptible, Bird suggests that dance, as a dynamic and embodied practice, operates rhizomatically by assembling heterogeneous intensities and affects. Rather than following linear or hierarchical structures, dance forms emerge through decentralized and multidirectional flows, echoing the rhizomatic logic of connection, multiplicity, and becoming[21].

***The Crystal of Time***. Deleuze also articulates the notion of the *crystal of time*, which challenges traditional linear temporality (past → present → future) by positing time as a non-linear, multilayered, and simultaneous structure. Time is not conceived as a homogeneous continuum but as a crystalline formation in which heterogeneous layers and events coexist and interact[22].

Bert Olivier explores Gilles Deleuze's concept of the *crystal of time*, primarily through the lens of cinema and its philosophical implications. The article connects this idea to human subjectivity, suggesting that our experience of time, memory, and identity is shaped by overlapping temporal layers. Olivier also extends the discussion to social history, proposing that history itself is not a homogeneous continuum but a heterogeneous collection of events that shape and reshape subjectivity.[23]

The key features of Deleuze's *crystal of time* may be summarized as follows:

- Multidimensionality. Time does not unfold in a single dimension; each event and experience coexists in parallel and overlapping temporalities.

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[21] Bird, T. "Forming." In *Practising with Deleuze: Design, Dance, Art, Writing, Philosophy*, edited by S. Attiwill et al. (Edinburgh: Edinburgh University Press, 2017), 49–86. Available via Edinburgh Scholarship Online.

[22] Deleuze, G. C*inema 2: The Time-Image*. Translated by H. Tomlinson and R. Galeta (Minneapolis: University of Minnesota Press), 1989, 68-97.

[23] Olivier, B. "Deleuze's 'Crystals of Time,' Human Subjectivity and Social History." *Phronimon* 17, no. 1 (2016), 1–20.

- Events and Heterogeneity. The crystal of time encompasses singularities and unforeseeable events that disrupt linear order. These heterogeneities allow temporal experience to occur in multiple, non-centralized layers, making time resemble a crystal filled with facets and reflections.
- Simultaneity and Decentralization. As a crystal refracts light across different surfaces, Deleuzian time refracts events simultaneously across multiple planes, without a privileged center.
- Repetition and Difference. Just as crystalline structures arise through the repetition of geometric patterns, Deleuzian time is constituted through differentiated repetitions of events. Each repetition is marked by difference and transformation rather than by linear sameness.

### *Application of Deleuze's Philosophy in Biodanza Dance*

Biodanza is a system of movement therapy and dance therapy based on the integration of music, movement, and human interaction, with the aim of creating emotional bonds, enhancing vitality, and fostering personal growth through the experience of the body and emotions. Biodanza is carried out in group sessions without requiring prior dance skills. The movements are simple and natural, synchronized with selected music to activate different psychological and emotional states. In Biodanza sessions, specific types of music (ranging from classical to folk and contemporary) are used to evoke emotions. The exercises help increase awareness of the body, emotions, and human connection, while participants are encouraged to move spontaneously and naturally rather than repeating formalized choreographies.

Since the 1960s, Biodanza has been introduced as an innovative method in dance therapy (Toro Araneda, nd). Research has shown that Biodanza, through its emphasis on movement improvisation and bodily presence, can contribute to improved mental health, reduced anxiety, and enhanced quality of life[24]. Some studies have also highlighted the role of Biodanza in improving social skills and promoting bodily self-awareness[25]. Biodanza, as a novel

[24] Stueck, M., and P. S. Tofts. "Biodanza Effects on Stress Reduction…", 57.

[25] Calçada, J., and C. Gilham. "Biodanza and Other Dance Forms as a Vehicle for Social-Emotional Learning in Schools: A Scoping Review." *LEARNing Landscapes* 15, no. 1 (2022): 53–73.

method of movement therapy and bodily expression, holds a unique capacity to expand Deleuzian concepts such as becoming, the body without organs, rhizome, and the crystal of time in practical and embodied ways. It is not merely a dance therapy technique but a philosophical-bodily process for redefining the body and the experience of being. This section examines and analyzes how Deleuze's concepts can be applied in the design, performance, and lived experience of Biodanza dance.

*1. Becoming and the Free Flow of Change in Body and Mind*

Becoming is a continuous, irregular, and indeterminate process that, in contrast to fixed being or absolute essences, perceives reality as a state of flux and transformation. Deleuze places becoming in opposition to being: it is a process in which beings, identities, and structures are constantly transforming. In Biodanza, the body and mind of the participant are engaged in a continuous process of becoming: every movement, every breath, and every interaction is an opportunity for transformation, release, and the creation of new identities. Dance, as the language of the body, makes it possible to step outside the confines of fixed identities. The body is no longer a "fixed" body, but one that is always in the state of becoming. This becoming is both physical and psychological, leading to a sense of vitality, creativity, and deep presence in the moment. For example, in improvisational exercises in Biodanza—where participants create movements without preconceptions or planning—we can see a concrete embodiment of becoming.

*2. Body without Organs (BwO); Energy Release and Body Reconfiguration*

Deleuze and Guattari introduce the Body without Organs as a field of free and decentralized energy, which, unlike the organized and hierarchical bodily system, serves as a space for potential capacities, liberation from imposed functions, and bodily reconfiguration. In Biodanza, free and unstructured movement provides the basis for the emergence of the Body without Organs. Participants are encouraged to release themselves from habitual roles and movement patterns, experiencing the body as an open field of energy. This liberation leads to the expression of suppressed emotions and forces, as well as the creation of novel and original forms of movement. For instance, improvised

and free movements in Biodanza, combined with deep breathing and conscious physical contact within the group, exemplify the formation of the Body without Organs.

*3. Rhizome: Nonlinear and Decentralized Structure of Group Movement*

The rhizome is a model for understanding decentralized, nonlinear, multipolar, and network-like structures. Unlike tree-like or hierarchical models, the rhizome emphasizes diversity, multiple connections, and dynamism. Its characteristics include polycentrism and multiple entry points (no fixed center or starting point), unlimited and changeable connections, and nonlinear, indeterminate movement and expansion. In Biodanza, the structure of sessions and movements is often rhizomatic, in contrast to formal or traditional dances. Movements and motor interactions flow in a nonlinear and decentralized manner. Instead of following a fixed path or established form, participants can move freely and interactively in space, creating a network of connections and movement flows. In collective exercises, such as "group movement with sound" or "building a body story," the group interacts together without a fixed hierarchy or central leadership; each individual plays an active role in expanding and intertwining the rhizome. This rhizomatic characteristic of Biodanza creates a structure in which multiple parallel emotional and movement experiences emerge simultaneously, interwoven and dynamic. For example, in a circular exercise where participants take turns producing sounds and combining their movements, there is a practical illustration of the rhizome in group movement.

*4. Time-Crystal*

The issue of the movement of time and the concept of the "Time-Crystal" (le cristal du temps) is addressed in Gilles Deleuze's thought, particularly in his book Cinema 2: The Time-Image. Contrary to the classical Aristotelian view, Deleuze does not consider time merely as a "measure of movement." In his philosophy and cinema theory, time itself exists as an independent reality.

In movement cinema (image-mouvement), time is always subordinate to movement: we see the movement of objects and infer time from it. However,

in time cinema (image-temps), time separates from movement and is directly perceived; the image no longer represents external movement but reveals gaps, suspensions, and pure temporal states.

The "Time-Crystal" is a metaphor Deleuze uses to express a dual structure: the connection between the actual and the virtual. In a time-image, past and present appear simultaneously in a transparent, intertwined structure, much like a crystal, which has both a transparent surface and reflective inner facets. Therefore, in the form of a crystal, time is not linear but layered and multi-dimensional: each moment in the present immediately recedes into the past and deposits in memory/virtuality, while this virtual past simultaneously reflects back on the actual present.

For Deleuze, the movement of time is not "from present to past," but occurs within the gap between present and past. Time, like a crystal, continually generates gaps: each present moment simultaneously produces its own past. Thus, the movement of time equals the endless production of these gaps and reflections. The Time-Crystal is a metaphor illustrating the coexistence of actual-present and virtual-past within a single structure.

To describe the experience of time in Biodanza, we must note that Biodanza emphasizes the full presence of the body in the moment (here and now). In the dance experience, the body is not only situated within linear time (past → present → future) but also in an "expanded now." The moment of dance is both actual (the real experience of movements, contact, music) and virtual (layers of bodily memory, emotional associations, movement recollections).

As Deleuze states, each present moment immediately produces its own past. Similarly, in Biodanza, every bodily movement creates a "trace of memory" and an "emotional reflection." The dancer's body functions like a crystal: the actual moment of movement, the contact with the ground, and the rhythm of the music form the transparent surface, while the sensory past (bodily memories, experienced movements, emotional patterns) forms the reflective facets that are mirrored in the same instant.

In Biodanza, time is not measured "externally" but flows within the dancer. The movement of time is, in fact, the gap and reflection between the "experience of the now" and the "body's memory." For example, when a person

experiences a "return to childhood" or recalls a past love during emotional dance, this is not a mental flashback but a manifestation of the Time-Crystal in the body: present and past dance together simultaneously.

These concepts can be better understood through Biodanza exercises. For example, when a dancer is asked to repeat a simple movement multiple times, each time with a different intensity or emotional quality, it demonstrates how the past continues in the present. Mirror movements provide another example: a dancer reflects another's movement, like a virtual reflection in a mirror. Pauses between movements, which condense the present moment and allow the past to sediment in the body, offer another experience of the Time-Crystal. Memory-based movements, which invite dancers to bring a movement from their bodily or emotional memory to the stage and combine it with ongoing music, are also examples of a distinct experience of time in Biodanza.

Thus, by examining several key concepts from Deleuze's philosophy within the framework of Biodanza, we realize that Biodanza provides a suitable ground for the experience of becoming as a living, creative, and continuous process. It fosters the emergence of the Body without Organs—a free, open, and dynamic body of energy—and creates a rhizomatic structure for group movements and interactions, based on coexistence, polycentrism, and nonlinearity. The dancer's body is present in the actual moment of movement, yet simultaneously reflects the virtual layers of sensory and emotional past. In this sense, dance is not a representation of linear time but an embodiment of the gap and coexistence between present and past.

### *The Application of Deleuze's Philosophy in the Experience of AI-Based Dance*

With the advancement of machine learning and robotics technologies, research has increasingly focused on the use of artificial intelligence in the creation of dance movements and the performing arts. Recent studies have shown that AI-generated dances can be effective in fostering multisensory interactions, stimulating cognition, and generating innovative experiences. Recent research involving digital somatosensory dance games has demonstrated significant neurostructural and functional enhancements in brain regions

associated with multisensory integration, motor control, and attention, alongside improvements in cognitive performance and overall well-being[26].

Moreover, applications of robotics and virtual reality in motor rehabilitation and art therapy are rapidly expanding. Digital dance programs at home can provide cognitive, emotional, and motor benefits for older adults and people with Parkinson's disease, supporting engagement and well-being[27]. Acknowledging that social robots and thus therapeutic robots, as embodiments of movable sculptures, can be considered as art objects, as any other artifacts within the field of media arts field, can be crucial to understanding their purpose and functionality.[28]

By "AI-based dance," we mean a form of dance in which movements or choreographic structures are generated, guided, or analyzed by algorithms and AI systems. Instead of relying solely on human improvisation or pre-designed choreography, AI functions as a tool or collaborator in the creation of movement and choreographic structures. Examples include: algorithms that generate dance movements by analyzing existing motion data; machine learning systems that can produce new movements or interactively follow and respond to a dancer's motions; and performances in which robots or virtual avatars move under AI control. This form of dance, as a synthesis of digital technology, artificial intelligence, and the art of dance, offers novel and transformative experiences. Interactive digital dance experiences can have significant cognitive and emotional stimulation effects, although they do not replace embodied human presence.

Some specific examples of AI-based dance:

*1. Dancing robots with artificial intelligence*

Robots that can learn and perform dance movements autonomously using machine learning algorithms, such as NAO robots or Boston Dynamics

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[26] Tung, H.-H., C.-Y. Kuo, P.-L. Lee, C.-W. Chang, K.-H. Chou, C.-P. Lin, and L.-K. Chen. "Efficacy of Digital Dance on Brain Imagery, Cognition, and Health: Randomized Controlled Trial." *Journal of Medical Internet Research* 26 (2024): e57694. https://doi.org/10.2196/57694.

[27] Beck, J., J. W. L. Keogh, R. M. Daly, and B. Goss. "Moving Online: Experiences and Potential Benefits of Digital Dance for Older Adults and People with Parkinson's Disease." *Frontiers in Psychology* 13 (2022): 865097. https://doi.org/10.3389/fpsyg.2022.865097.

[28] Vardanyan, G. *Therapeutic Robots in Media Arts Context* (page: n/a, from Abstract). https://www.researchgate.net/publication/336312417_Therapeutic_Robots_in_Media_Arts_Context.

robots programmed to execute complex dance routines. "In industry, dance has been used as a marketing tool by the well-known robotics company Boston Dynamics. Their dance videos demonstrate their robots' control abilities, even resulting in the development of a Choreographer software development kit."[29] Xia et al demonstrate "the feasibility of algorithms on the NAO humanoid robot to show that the robot is capable of using the mappings defined to autonomously dance to any music"[30].

2. *Interactive dance using sensors and AI*

Dancers wear motion sensors on stage, and an AI system analyzes their movements in real time, adjusting lighting, music, or robot movements accordingly; for example, in Interactive Dance Performance projects[31].

3. *Creation of dance movements by AI algorithms*

Deep learning algorithms analyze thousands of hours of dance footage to generate new movements and innovative combinations. For instance, projects that automatically produce dance sequences in different genres[32].

4. *Virtual dancing avatars in the metaverse*

Virtual characters controlled by AI perform dance in digital environments, such as metaverse or virtual reality performances designed and guided by AI[33].

These examples illustrate the integration of dance and AI, going beyond mere human movement to create novel spaces for choreography, performance, and interactive motion.

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[29] Wallace, Benedikte, Kyrre Glette, and Alex Szorkovszky. 2025. "How can we make robot dance expressive and responsive? A survey of methods and future directions." *Frontiers in Computer Science* 7 (June 3, 2025): 1, article 1575667. https://doi.org/10.3389/fcomp.2025.1575667.

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[32] Li, J., Y. Yin, H. Chu, Y. Zhou, T. Wang, S. Fidler, and H. Li. "Learning to Generate Diverse Dance Motions with Transformer." *arXiv*, 2020.

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For comparison with Biodanza, the best examples are those that emphasize embodied experience, the human body, and interpersonal interaction, moving beyond algorithmic motion generation toward "living body" engagement and human connection.

Among the examples mentioned, the following two are the most suitable:

*1. Interactive dance using sensors and AI*

In this model, a direct and live interaction occurs between the human body and the AI system. The human body is present in real time, and the AI system responds to their movements or modifies the performance environment accordingly. This is the closest scenario to the embodied experience and bodily presence emphasized in Biodanza, though extended in an algorithmic and data-driven way.

*2. Creation of dance movements by AI algorithms*

This can be compared to improvisation in Biodanza, as both involve the generation of movement. However, one is based on the living body and human experience, while the other relies on data analysis and algorithmic production.

Robotic and virtual avatar-based examples are primarily digital and non-embodied, and thus are further from the philosophy of improvisation and living-body experience in Biodanza, making comparisons less tangible.

*1. Becoming*

According to Deleuze's philosophy, "becoming" means a continuous movement from one state to another without ever reaching a fixed identity. Becoming is an "in-between": it has no beginning and no end, only flow. In interactive dance with AI, the dancer's body, in interaction with digital reflections (image, sound, light), is constantly transforming. Each movement is immediately re-created and takes on a new form. The dancer is no longer merely "human"; in relation to the machine, they enter into becoming-digital, becoming-light, or becoming-sound. For example, a small hand movement may be transformed by AI into vast waves of light projected on the screen. The dancer is no longer just a "human body," but part of a "wave of light." This is the very experience of becoming.

*2. Body without Organs*

Deleuze and Guattari describe the Body without Organs as a body freed from the rigid organization of organs, becoming instead a field of flows and forces. That is, the body is not understood as a collection of organs, but as pure capacity for connection and production. In interactive dance with AI, sensors translate the body into data. A movement of the hand or foot is not necessarily confined to the hand or foot; it can be transformed into light, sound, or image. The dancer's body, within the digital space, becomes detached from its organs and turns into a network of flows and signals. For example, the dancer bends a knee, but on stage this does not appear as a knee: instead, it emerges as the sound of an explosion or the image of a tree growing. In this moment, the body is no longer an organized body of organs; it has become a "Body without Organs."

*3. Rhizome*

In interactive dance with AI, the relationship between body, light, sound, image, and audience is neither linear nor hierarchical. Each movement can simultaneously connect to sound, image, and light—and these, in turn, can act back upon the body. This continuous, decentered network is precisely a living rhizome. For example, one dancer's foot movement changes the light; that light affects another dancer and prompts a new movement, which then alters the sound… an endless, non-linear cycle.

The rhizome is also reflected in data structures, neural networks, and algorithmic movement-composition processes. AI dances may draw simultaneously from multiple data sources and algorithms, generating a complex, networked structure. Multi-layered algorithms that merge diverse data streams create a rhizomatic architecture, where much of the interaction occurs not through direct human exchange but between algorithms and data themselves.

Thus, in interactive dance with AI, body and machine are in constant linkage, producing new identities (becoming-machine, becoming-sound, becoming-light). The body exits the mold of biological organs and turns into a field of flows and energies. The interactive network of bodies, technologies, and reflections is non-hierarchical and multi-directional; there is no single center or "absolute controller." In this sense, it is rhizomatic.

*4. Crystal of Time*

In *Cinema 2: The Time-Image,* Deleuze describes "the crystal of time"[34] as the point where "the actual and the virtual," "the past and the present," "memory and perception" are intertwined simultaneously and reflectively. It is like a mirror that shows both the present image and a reflection of the past, without being able to privilege one over the other. In interactive dance with AI, the dancer's body moves in the moment of performance. The AI generates a reflection, repetition, or transformation of that movement (for example, through projection, sound, or kinetic feedback), and the dancer then responds again to this reflection. A perception/reflection cycle emerges here, exactly as Deleuze describes in the crystal of time: the present and the past coexist in a simultaneous audiovisual field. The dancer's body is "real," but the algorithmic reflection produced by AI is a "virtual" one that immediately enters the perceptual field. This coexistence of the "physical body" and the "data body" creates a crystal of time. AI often learns from movement data collected just moments before and transforms it. Each feedback loop is therefore always a past that becomes present—a process between "recollection" and "perception." The crystal of time here can have infinite layers, since AI can produce multiple reflections, varying delays, or even predictions of future movement. Thus, the dancer is no longer dancing only their own body, but is experiencing a "body-in-crystal": a body dispersed and multiplied across different times. Interactive AI-based dance, in effect, materializes what Deleuze saw in cinema at the bodily/sensory level. It transfers the "crystal of time" from the cinematic image to the plane of body-movement, where the human body and the digital body are united in a multilayered mirror of present and past, actual and virtual.

## *A Comparative Study of Biodanza and Interactive Dance with Artificial Intelligence from the Perspective of Deleuzian Concepts*

A comparative analysis of Deleuzian concepts in Biodanza and AI-based dance reveals that while both approaches redefine bodily and movement experiences, they differ fundamentally in the nature and quality of these

[34] Gilles Deleuze, *Cinema 2: The Time-Image*, 79–82.

experiences. Biodanza, with its emphasis on lived experience, improvisation, and human presence, is a genuine embodiment of becoming and the Body without Organs, arising from human interaction and collective energy. In this context, the body functions as a field of free energy and as a rhizomatic network of multi-centered relations, carrying profound therapeutic effects such as stress reduction, enhancement of psychological well-being, and the strengthening of social connections.

In contrast, AI-based dance emerges from algorithms and the processing of movement data, capable of generating complex and non-linear movement structures, yet lacking the dimension of human consciousness. Although this form of dance can provide new cognitive and sensory stimuli and create innovative, multisensory spaces within interactive performances, its limitations in achieving therapeutic functions rooted in lived bodily experience are significant. Nevertheless, the adaptability, accessibility, and spatial control enabled by technology open new opportunities for applying AI-based dance in complementary therapeutic and educational domains.

By examining several key concepts of Deleuze's philosophy in this comparison, we find that both forms of dance display the process of continuous transformation and change (Deleuzian becoming). The difference, however, is that in Biodanza, becoming is a lived and conscious experience, whereas in AI-based dance, becoming is an automated, algorithmic process lacking direct consciousness.

From the perspective of the Body without Organs, both dance practices liberate the body from traditional frameworks and transform it into new, freer forms. In Biodanza, the body remains biological, and its liberation is tangibly experienced and felt; in AI dance, the body appears in abstract, computational, and non-biological ways.

From a rhizomatic perspective, both systems exhibit multi-centered, non-linear, and dynamic structures, in which multiple flows and connections emerge. The rhizome of Biodanza is grounded in human interaction and physical presence, while the rhizome of AI is based on data networks and non-human processes.

The comparative analysis shows that both Biodanza and AI-based dances can, in different ways, represent Deleuzian concepts, yet they diverge fundamentally on experiential and philosophical levels. Biodanza is grounded

in lived experiences, human presence, and bodily liberation, whereas AI dance is more representative of automated, computational, and structural processes.

Nevertheless, combining these two domains may open new horizons—for example, using AI to amplify the capacity for becoming in Biodanza, or merging the biological body with the digital body in dance performances. Such a synthesis could give rise to hybrid dances that are both alive and intelligent.

Table 1 presents a comparison of Deleuzian concepts in Biodanza and interactive AI dance.

**Table 1:** Comparison of Deleuzian concepts in Biodanza and interactive AI dance

| **Deleuzian Concepts** | **AI-Interactive Dance** | **Biodanza** |
|---|---|---|
| (Becoming) | The body, in interaction with AI, generates new identities (becoming-digital, becoming-light, becoming-sound). Human movement is re-created in a different form. | Becoming has a more biological and emotional dimension: becoming-child, becoming-nature, becoming-other. The body moves along a path of liberation from social roles and a return to the pure flow of life. |
| (Body without Organs) | The body is transformed into data and flows of energy; a hand movement can become light or sound. The body is no longer confined to biological organs but functions as a field of forces. | The body is freed from social conventions and judgment. Organs are experienced not as functional instruments but as flows of life. The dancer experiences the body in a sensory-emotional unity. |
| (Rhizome) | A non-linear network of connections emerges between body, light, sound, image, and other dancers. There is no center or hierarchy. | An emotional and human network is formed among the participants—horizontal relations of coexistence and empathy. Each individual can connect with any other individual, without centrality or a fixed leader. |

## *The Therapeutic Function of Biodanza and AI-Based Dance: Comparative Analysis and Opportunities*

### *1. Biodanza and Its Therapeutic Functions*

Biodanza, as a movement-based therapeutic approach, is grounded in bodily awareness, improvisation, and human connection. Numerous studies have shown that participation in Biodanza sessions reduces anxiety, improves mood, and strengthens social bonds The living bodily presence, eye contact, and mutual touch play a key role in fostering a sense of safety and psychological restoration. Biodanza enables individuals to reach new and healing experiences through becoming, the body without organs, and the rhizome.

In Biodanza, the body—understood as a living field of energy—is actively present in the moment, and through improvisation and conscious awareness, it experiences the process of becoming in a rich and multidimensional way. This embodied presence and human interaction make possible the creation of unique, interactive movements that simultaneously carry psychophysical and therapeutic functions.

### *2. AI-Based Dance and Therapeutic Potentials*

AI-generated dances, through the use of deep learning algorithms and the creation of innovative movements, enable the production of unusual and stimulating movement experiences. In interactive performances, these dances can analyze participants' movement responses and provide them with feedback, thereby fostering cognitive and emotional stimulation. At the Venice Dance Biennale, works like *Waves* by Cloud Gate Dance Theatre and Nicole Seiler's *Human in the Loop* demonstrated how AI can generate projections and instructions that stimulate perception and affect[35]. Similarly, Wayne McGregor's collaboration with Google Arts & Culture led to the development of AISOMA, an AI tool capable of providing real-time choreographic suggestions, functioning almost like a feedback partner during improvisation[36].

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[35] May, Emily. "Venice Dance Biennale Puts AI and Humanity at Its Heart." *Financial Times*, July 30, 2024. https://www.ft.com/content/8d705fab-1664-4988-9028-a06866466120

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In addition, AI-based dance can adapt to the needs of individuals with motor limitations and be utilized in the form of movement games or digital rehabilitation programs, such as digital somatosensory dance games[37].For instance in "Promoting Social Engagement With a Multi-Role Dancing Robot for In-Home Autism Care" experiment uses AI to act as both dance leader (generating moves) and the follower(mirroring the child's own movements), therby tailoring its behavior to the child;s activity level. by" combined the largely unexplored paradigm of learning-by-teaching by incorporating multiple robot roles that allow the child to both learn from and teach the robot", the system adapts its intraction to meet individual's social and physical needs[38].

If we want to unfold the concept of the time crystal in interactive dance with AI from a therapeutic perspective (art therapy/dance therapy), we must address aspects such as breaking the linearity of time and confronting memory, the linkage of body and virtuality (actual/virtual), and the transformation of one's relation to time and anxiety. In psychotherapy, much suffering is rooted in the past, which manifests in the "now" of body and mind. When a dancer makes a movement on stage and the AI reflects it back in an altered, delayed, or transformed form, the body perceives itself both in the "present" and in the "reflection of the past." This coexistence of past and present creates the possibility of re-reading and re-processing memories, similar to psychotherapeutic techniques based on representation.

On the other hand, since the body is always a carrier of internal pressures and tensions, when AI projects the "virtual layer" of bodily movements (for example, turning a small gesture into a vast image or expansive music), the dancer feels that their inner world has been seen and heard. This is where the connection between the virtual and the actual occurs, and this process can generate a sense of release and bodily self-awareness—like a reflection that reveals, "I am more than this silent body." In a sense, anxiety often arises from being trapped in linear time: the past repeats, and the future remains uncertain.

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[37] Tung, et al. 2024: 5.

[38] Javed, Hifza, and Chung Hyuk Park. 2022. "Promoting Social Engagement with a Multi-Role Dancing Robot for In-Home Autism Care." *Frontiers in Robotics and AI* 9:1. https://doi.org/10.3389/frobt.2022.880691.

In interactive dance grounded in the concept of the time crystal, the individual encounters time as multilayered, non-linear, and flexible. Such an experience can contribute to the reduction of anxiety, since it enables the realization that within the immediacy of the present moment, both past and future can be reshaped and reimagined. Within this framework, AI functions as a form of the "Other"—a counterpart that responds and mirrors without judgment. The dancer thus engages in a non-verbal dialogue with this Other, establishing a safe, non-threatening relational field. This dynamic can serve a reparative function and foster trust, particularly for individuals with communicative difficulties or histories of social trauma.

Central to this process is the Therapeutic Moment. The notion of the time crystal corresponds to a moment in which "time discloses itself." In therapeutic practice, such a moment may manifest as catharsis (emotional release), as the emergence of a renewed sense of self, or as a reconciliation with memory. Interactive dance with AI creates the conditions for the dancer to embody a simultaneity of past and present, while remaining within a protected and creatively generative environment.Therefore,the therapeutic effect of interactive dance with AI, in light of the time crystal, lies in its capacity to generate multilayered reflections of the body and memory, to transform the lived experience of time, and to establish a creative relationship with a non-judgmental Other.Nevertheless, despite these potentials, the absence of human bodily presence and face-to-face interaction in AI-based dance introduces limitations in the therapeutic domain. The therapeutic impact of Biodanza, for instance, largely emerges from the live presence of bodies, collective energy, and physical interactions—dimensions that are far less reproducible within digital frameworks.

## *Conclusion*

Gilles Deleuze, through concepts such as becoming, the Body without Organs, and the rhizome, provides an important theoretical framework for understanding the body and movement—one that has had a profound impact on the performing arts. Biodanza, rooted in principles of mental well-being, heightened bodily awareness, and the enhancement of social connections,

embodies these concepts through lived bodily experience, improvisation, and human interaction. Recognized as both a therapeutic and educational method, Biodanza promotes overall well-being by activating the body's energetic field and strengthening social bonds.

In contrast, AI-based dance—constructed through machine learning algorithms and automated movement generation—has increasingly established its place within contemporary performing arts. While this form of dance possesses the capacity to create complex and interactive movement structures, its lack of biological presence and lived human bodily experience raises important questions regarding its therapeutic potential.

Both forms of dance, particularly within the field of contemporary performing arts, can provide platforms for sensory stimulation, creative exploration, and the enhancement of motor and cognitive flexibility. Biodanza, with its emphasis on bodily presence and improvisation, directly contributes to the promotion of mental well-being, the reduction of stress, and the strengthening of social connections. This form of dance helps participants achieve greater self-awareness and engage in psychological and physical restoration through movement.

Both forms of dance can generate novel motor and cognitive experiences, contributing to the expansion of the bodily and movement world of artists or audiences. In addition, AI-based dance, by creating an interactive environment and stimulating the senses, can indirectly influence psychological and emotional processes.

AI-based dances also hold several positive therapeutic potentials. These include movement diversity and innovation, multisensory interaction, adaptability, and the creation of a safe and controlled environment. Algorithms are capable of generating diverse and unexpected movements, which can serve as new stimuli for the body and mind, encouraging the discovery of fresh movement patterns.

In interactive performances where AI is involved in producing music, lighting, or responding to participants' movements, it becomes possible to create stimulating multisensory experiences that may enhance mood and motivation. AI dance can also provide customized and guided practices for individuals with physical limitations or without access to a human instructor.

Moreover, the digital and interactive environments offered by AI dance allow for the regulation of difficulty levels, intensity of stimulation, and real-time feedback—factors that, in certain contexts, can be highly beneficial for therapeutic processes.

Nevertheless, the absence of direct biological presence, human interaction, and lived bodily experience in AI-based dances creates limitations in fully reproducing the therapeutic functions of Biodanza. Many of the psychotherapeutic effects of Biodanza emerge through bodily contact, eye contact, collective energy, and the live presence of the group—elements that are either diminished or mediated in virtual and indirect forms within AI dance.

Biodanza and AI-based interactive dance can both be examined through the philosophical concepts of Gilles Deleuze; however, at the level of lived experience, function, and nature, they differ in fundamental ways.

The therapeutic function of Biodanza is grounded in direct bodily presence, moment-to-moment awareness, and human interaction—factors widely recognized as key contributors to psychological and physical well-being. In contrast, AI-based dance, due to the absence of biological presence and lived bodily experience, cannot fully reproduce these therapeutic dimensions. Nevertheless, it retains value in complementary domains, such as cognitive stimulation and aesthetic experience.

In AI-based interactive dance, although the dancer's body is physically present in space, movements are shaped within the framework of algorithms and data processing. This approach reproduces the structure of the rhizome in a data-driven and digital form, yet it lacks the depth of lived experience and conscious human presence. For this reason, certain limitations emerge regarding its therapeutic function and human experiential depth. At the same time, however, this data-oriented space enables the creation of novel interactions and innovative artistic experiences, which can serve as a complement to the embodied practices of Biodanza.

This tension and simultaneity suggest that integrating the two approaches—the live, conscious presence of the human body alongside the capacities of artificial intelligence in processing and generating movement—can lead to the development of new forms of performing arts and movement-based therapies. Although AI-based dance cannot fully replace the therapeutic experience of human-centered Biodanza, it can, by providing a creative

space, novel stimuli, and interactive possibilities, serve as a complementary or supportive tool within therapeutic processes. The fusion of AI with improvisation and human presence thus holds the potential to foster innovative therapeutic methodologies in the performing arts.

Ultimately, this study suggests that the future of performing arts and movement-based therapies lies in the synergy and integration of human biological presence with intelligent technologies. The creation of hybrid interactive spaces—combining elements of Biodanza with AI-based dance—has the potential to generate richer, more accessible, and multisensory bodily experiences that can respond to the diverse needs of contemporary society.

Biodanza, with its emphasis on human presence and movement improvisation, provides a rich ground for therapeutic processes—something that AI-based dance, due to its inherent limitations, cannot fully replace. Nevertheless, the capacities of artificial intelligence in generating innovative and interactive movement experiences open the possibility of expanding therapeutic and artistic applications within hybrid environments. Future research is encouraged not only to advance interactive AI technologies but also to examine more closely the psychological and physiological effects of such integrations, in order to develop new, practical, and evidence-based methods for movement-based art therapy.

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