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Art, Play, and Neuroplasticity: Advancing Dementia Care Through Art-Enriched Environments

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Abstract: Dementia represents a global public health crisis, characterized not only by progressive memory loss but by a pervasive decline in cognitive flexibility, social functioning, and overall quality of life. Traditional therapeutic modalities, often limited to pharmacological management and cognitive training, have yielded only modest gains in symptom mitigation and patient well-being. Recent advances in neuroscience have illuminated the brain's capacity for neuroplasticity—its inherent ability to adapt, reorganize, and form new neural connections even in advanced age and the presence of neurodegenerative conditions. This emerging understanding invites a critical re-evaluation of dementia care strategies, highlighting the potential of non-pharmacological interventions to target underlying neural mechanisms. Within this context, art-enriched environments and playful, multisensory engagement have gained empirical support as vehicles for fostering neuroplasticity, enhancing mood, and strengthening social bonds among individuals with dementia. The need for innovative approaches is underscored by the multidimensional and progressive nature of dementia, which demands holistic interventions addressing cognitive, emotional, and social domains simultaneously. The significance of this study lies in its synthesis of interdisciplinary research from neuroscience, psychology, and the arts, proposing a comprehensive framework for integrating structured artistic and play-based activities into dementia care. Through advancing methodologies that leverage art to stimulate neuroplasticity, this research seeks not only to inform clinical practice but also to inspire further inquiry into scalable, person-centered interventions that may slow cognitive decline, improve quality of life, and transform the therapeutic landscape for dementia patients and their caregivers.

Keywords: *Dementia, neuroplasticity, art-enriched environments, play-based intervention, cognitive rehabilitation.*

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Introduction

Scope of Dementia and Contemporary Challenges

Dementia represents one of the most formidable and multifaceted challenges confronting global health systems in the twenty-first century (Morris, 2024). Characterized by progressive deterioration in memory, executive function, language, and social cognition, dementia significantly impairs the autonomy and quality of life of affected individuals. Globally, over 55 million people are living with dementia, with projections estimating a doubling of this figure by 2050 due to increased life expectancy and demographic shifts (World Health Organization, 2021). While memory decline is often foregrounded, the broader implications include emotional dysregulation, impaired social interaction, and increased caregiver burden, all of which complicate care delivery and exacerbate health inequities (Bell, O'Connor, & Moo, 2025; Lou et al., 2024). This complex clinical profile necessitates, as Costa, Adduono, and Jones-Bonofiglio (2024) argue, an interdisciplinary response that moves beyond pharmacological containment to embrace comprehensive psychosocial models. However, Dowlen et al. (2024) note that conventional care paradigms often fail to address the totality of lived experience for individuals with dementia, particularly in domains related to self-expression, creativity, and social connectivity. The fragmentation of biomedical, psychological, and environmental aspects of care remains a critical barrier to holistic intervention. As such, innovative and integrative therapeutic frameworks are required—approaches that prioritize both neural function and human dignity through multimodal engagement.

The burden of dementia is not confined to the individual but radiates through families, communities, and public health infrastructures. The socio-economic costs are staggering, with global expenditures exceeding $1.3 trillion annually and expected to rise dramatically in the coming decades (Alzheimer's Disease International, 2022). Informal caregivers, often family members, face escalating emotional, financial, and physical strain, which in turn contributes to increased rates of caregiver burnout and depression. Health systems struggle to maintain adequate support structures, especially as populations age and the prevalence of dementia accelerates (Parthasarathy, 2024). Moreover, disparities in access to care persist across socio-economic and cultural contexts, disproportionately affecting underserved communities

(Stanley, 2025). Consequently, dementia care requires a paradigmatic shift—away from symptom suppression and toward strategies that facilitate engagement, meaning-making, and cognitive stimulation. Given the progressive nature of neurodegeneration, interventions aimed at early engagement and preservation of remaining capacities are particularly crucial. Such approaches must account for the heterogeneity of the disease, accommodating variable trajectories, preferences, and cultural contexts (Alanzi, 2024). The present inquiry into art-enriched and play-based interventions addresses this imperative, proposing a model that is at once evidence-informed and profoundly humane.

Limitations of Traditional Therapeutic Approaches

The prevailing therapeutic landscape for dementia is predominantly defined by pharmacological interventions targeting neurotransmitter imbalances and symptom management. Agents such as cholinesterase inhibitors and NMDA receptor antagonists offer limited and transient cognitive benefits, often accompanied by adverse side effects that further diminish patient well-being (Egunlusi & Joubert, 2024). Despite decades of investment in drug development, no pharmacological treatment currently exists that can halt or reverse the neurodegenerative processes characteristic of Alzheimer's disease and related dementias (Colavitta & Barrantes, 2023). As a result, clinical and research communities have increasingly recognized the necessity of supplementing pharmacological regimens with psychosocial interventions (Watt et al., 2024). Yet, these non-drug modalities, including cognitive training and reality orientation therapy, are frequently underutilized or implemented in a fragmented manner, failing to exploit their full potential (Gräsel, Wiltfang, & Kornhuber, 2003). Moreover, they often rely on repetitive, didactic methods that lack the affective and experiential richness necessary to sustain engagement in individuals with advanced cognitive decline.

Psychosocial interventions, when narrowly construed, risk marginalizing the affective and embodied dimensions of dementia care. For example, cognitive stimulation therapies (CST) have demonstrated effectiveness in improving global cognition and quality of life (Behfar et al., 2023; Carbone et al., 2021), yet their efficacy is often constrained by rigid programmatic structures and insufficient integration of sensory, emotional, and social dimensions. Furthermore, implementation barriers such as inadequate training, staffing shortages, and a lack of institutional support impede the scalability of CST and similar models (Kelly et al., 2025). These constraints underscore a broader limitation of traditional therapies: their failure to address the holistic needs of individuals living with dementia. What is needed is a model of care that embraces the complexity of human experience, accommodates diverse pathways to engagement, and situates neurocognitive function within the broader context of emotion, embodiment, and community. The exploration of art-enriched environments and play-based modalities arises from this recognition, offering a platform for individualized expression and neural stimulation that transcends the limitations of conventional care frameworks.

Emergence of Neuroplasticity as a Therapeutic Target

In recent decades, the concept of neuroplasticity has redefined neuroscientific understanding of the aging brain, offering renewed hope for therapeutic interventions in neurodegenerative disorders such as dementia (Marzola et al., 2023). Neuroplasticity refers to the central nervous system's inherent ability to reorganize, adapt, and form new synaptic connections in response to internal or external stimuli across the lifespan (Innocenti, 2022). Contrary to earlier beliefs that adult brains were relatively fixed and impervious to structural change, converging research has demonstrated that even in later life stages—and within the context of pathology—plasticity can be mobilized under the right conditions (Park & Reuter-Lorenz, 2009; Shah et al., 2024). This recognition has catalyzed a paradigm shift in dementia research, moving from models of inevitable decline to those emphasizing cognitive reserve, compensatory scaffolding, and functional adaptation. The implications are profound: if interventions can effectively stimulate and support these adaptive mechanisms, it may be possible to delay symptom progression, enhance function, and improve the lived experience of individuals with dementia.

Neuroplasticity-based interventions are gaining empirical legitimacy through neuroimaging studies that reveal structural and functional changes in response to cognitive and sensory stimulation. Functional MRI studies have indicated that targeted activities—ranging from cognitive training to music therapy—can increase connectivity in regions associated with memory and executive function, even among individuals with mild to moderate Alzheimer's disease (Behfar et al., 2023; Herholz et al., 2013). Such findings underscore the viability of plasticity as a clinical target and establish a rationale for developing non-invasive, experiential therapies that capitalize on this capacity. Importantly, neuroplasticity is not monolithic; it is modulated by emotional valence, social interaction, sensory input, and motivational states. Therefore, interventions must engage individuals holistically, activating multiple domains of experience to maximize neural impact. The emergence of neuroplasticity as a therapeutic lens does not merely complement pharmacological models—it reorients dementia care toward growth, adaptability, and continued engagement with the world.

Rationale for Art-Enriched and Play-Based Interventions

Given the multifactorial nature of neuroplasticity, interventions that simultaneously activate cognitive, emotional, social, and sensory domains are particularly well-positioned to foster adaptive neural responses. Art-enriched and play-based environments offer such multimodal stimulation, engaging participants through color, texture, rhythm, narrative, and movement. These activities facilitate positive affect, stimulate memory recall, and promote embodied cognition, creating conditions that are conducive to synaptic reorganization and enhanced connectivity (Kempermann, 2019; Stein, 2012). The theoretical rationale is reinforced by empirical findings: art therapy, music engagement, and dance have been linked to improved cognitive outcomes, enhanced mood, and greater social participation among individuals with dementia (Emblad & Mukaetova-Ladinska, 2021; Stuckey & Nobel, 2010). These benefits are not ancillary but integral to the activation of neuroplastic processes; emotional arousal, for instance, has been shown to modulate dopamine release, a neurotransmitter critical to learning and memory consolidation (Salimpoor et al., 2011).

Artistic play, in this context, is not mere diversion but a structured and intentional method of neural engagement that aligns with the demands of dementia care. Unlike traditional cognitive training, which often emphasizes rote learning and abstraction, art-based activities are inherently meaningful and personalized, fostering intrinsic motivation and self-efficacy. They also lower barriers to participation, particularly among individuals who may resist more clinical or didactic approaches. Playful interactions

enable improvisation and experimentation—qualities that encourage flexibility in cognitive processing and promote resilience in the face of cognitive decline. As dementia affects each individual differently, the adaptability and inclusivity of art-based interventions offer a customizable and human-centered approach to care. The integration of these modalities into therapeutic contexts is not only supported by evidence but responds to a broader ethical imperative: to treat individuals with dementia not merely as patients, but as persons capable of growth, expression, and connection through creative engagement

Theoretical Framework

Defining Neuroplasticity in the Aging Brain

Neuroplasticity, broadly defined as the capacity of the brain to structurally and functionally reorganize itself in response to environmental stimuli and experiential learning, is a foundational concept in contemporary neuroscience. Initially believed to diminish irreversibly with age, plasticity is now recognized as an enduring property of the human brain, albeit one that may attenuate in intensity and responsiveness over time. In the context of aging, neuroplasticity manifests as the attempt of the brain to preserve cognitive integrity by recruiting alternative neural pathways and compensatory mechanisms—a process often referred to as "scaffolding" (Park & Reuter-Lorenz, 2009; Toricelli et al., 2021). This compensatory remodeling is not merely reactive but can be deliberately cultivated through enriched experiences, challenging cognitive engagement, and meaningful social interaction. Although the aging brain exhibits reduced synaptogenesis and a decline in neurotrophic factors, studies have shown that it retains the capacity for dendritic branching, synaptic strengthening, and even limited neurogenesis under conducive conditions (Kempermann, 2019). Such findings underscore the therapeutic relevance of neuroplasticity for neurodegenerative diseases, especially dementia, wherein cognitive networks progressively deteriorate.

The application of neuroplasticity theory to dementia care involves understanding how targeted interventions can arrest or decelerate neural decline by enhancing connectivity, facilitating cognitive reserve, and promoting functional adaptation **(Figure 1)**. In Alzheimer's disease, for example, early intervention programs that stimulate cognitive, sensory, and motor functions have been shown to increase cortical thickness and bolster hippocampal activity—markers of preserved or restored plastic potential (Behfar et al., 2023). Importantly, the plasticity of the aging brain is highly sensitive to emotional salience, novelty, and social relevance, suggesting that therapeutic strategies must transcend mechanistic cognitive tasks to incorporate multidimensional engagement. Interventions that are personally meaningful and emotionally resonant are more likely to produce enduring neural changes, aligning therapeutic outcomes with lived experience (Golland et al., 2025). This premise challenges the traditional deficit-focused models of dementia care by advancing a vision of the aging brain as responsive, adaptive, and capable of growth under the right conditions (Pomorska & Ockene, 2017).

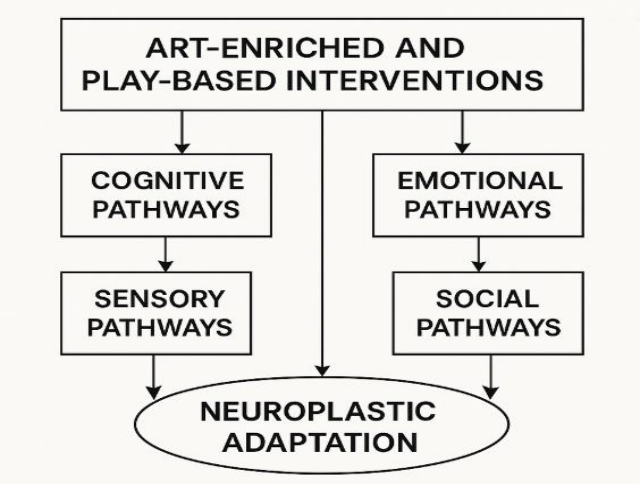


Figure 1. Conceptual Model of Neuroplasticity in Dementia Care

Mechanisms Underlying Neural Adaptation

Neural adaptation in aging and neurodegenerative contexts is mediated by several interlocking mechanisms, including synaptic plasticity, neurogenesis, functional reorganization, and the modulation of neurotransmitter systems. Synaptic plasticity—the strengthening or weakening of synaptic connections in response to activity—is fundamental to learning and memory and can be enhanced through repeated, meaningful stimulation (Kolb & Whishaw, 1998; Tran et al., 2021). At the cellular level, long-term potentiation (LTP) supports the encoding of new information, while long-term depression (LTD) prunes unnecessary connections, maintaining network efficiency. These synaptic changes are regulated by neurotrophins such as brain-derived neurotrophic factor (BDNF), which are upregulated in response to sensory and cognitive stimulation (Asuku et al., 2025). Aging, and particularly dementia, is associated with a decline in these neurochemical facilitators; however, environmental enrichment has been shown to reverse some of these deficits by promoting BDNF expression and enhancing synaptic efficacy (Kempermann, 2019).

In parallel with synaptic adjustments, neurogenesis—especially in the hippocampus—provides a substrate for memory and learning, albeit at a reduced rate in the aging brain. Evidence from animal models and human neuroimaging suggests that activities involving novelty, challenge, and reward can stimulate the birth and integration of new neurons into existing circuits (Herholz et al., 2013). Moreover, functional reorganization, whereby different or adjacent brain regions compensate for the deterioration of primary areas, is a critical adaptive process in neurodegeneration. This reorganization is not haphazard; it is shaped by the type, frequency, and quality of stimuli encountered. Multisensory experiences, social interaction, and emotionally engaging tasks appear particularly potent in modulating this dynamic (Salimpoor et al., 2011). Thus, understanding the mechanisms underlying neural adaptation reinforces the imperative to design interventions that are not only cognitively demanding but emotionally and socially immersive—conditions well supported by art-enriched and play-based therapeutic frameworks.

Conceptualizing Art-Enriched Environments

Art-enriched environments represent intentional, multisensory therapeutic settings that incorporate visual, auditory, kinesthetic, and emotional elements to stimulate cognitive engagement and foster psychological well-being. These environments are predicated on the understanding that human cognition is not confined to abstract reasoning but is deeply

embodied, affectively driven, and socially constructed (Cardillo & Chatterjee, 2025). The use of visual arts, music, dance, and narrative-based forms provides an entry point for activating diverse neural networks, including those related to memory, attention, motor planning, and emotional regulation (Stein, 2012). Crucially, these environments emphasize process over product, encouraging individuals to engage with materials, sensations, and others in ways that are exploratory and expressive rather than outcome-oriented. By doing so, they accommodate varying levels of cognitive and motor ability, making them especially suited for individuals across the dementia spectrum.

Empirical research supports the efficacy of art-enriched environments in improving neurocognitive outcomes and enhancing mood among individuals with dementia. For instance, structured art sessions have been associated with increased self-expression, reduced agitation, and greater engagement, particularly in populations resistant to more traditional forms of cognitive rehabilitation (Beard, 2012; Hogarty et al., 2004; Stuckey & Nobel, 2010). These settings also foster a sense of autonomy and competence, which are critical for maintaining identity and psychological resilience in the face of progressive cognitive decline. The integrative and personalized nature of artistic engagement makes it uniquely capable of tapping into residual strengths and latent capacities. Moreover, art-based environments function as communal spaces, catalyzing social interaction and reducing feelings of isolation—factors that further enhance neural responsiveness and overall quality of life. In conceptualizing such environments, the therapeutic objective shifts from remediation to reconnection: restoring the individual's relationship with self, others, and the surrounding world through aesthetic and sensory experience.

The Role of Play in Cognitive and Emotional Stimulation

Play, broadly defined as voluntary, imaginative, and intrinsically motivated activity, serves as a powerful catalyst for cognitive flexibility, emotional resilience, and social connectivity. Within dementia care, play is re-envisioned not as frivolous entertainment but as a structured modality for stimulating adaptive neural activity through creativity, improvisation, and embodied engagement. Artistic play—encompassing painting, storytelling, music-making, and dance—elicits spontaneous joy and engagement, which are strongly correlated with dopaminergic activation and enhanced cognitive processing (Salimpoor et al., 2011; Shaffer, 2022). Importantly, play provides a low-risk, non-evaluative context in which individuals can explore new roles, rehearse cognitive strategies, and express affective states without fear of failure. This environment of psychological safety is particularly critical for individuals with dementia, for whom conventional cognitive tasks may elicit frustration, anxiety, or withdrawal.

The therapeutic efficacy of play-based interventions lies in their capacity to integrate sensory, emotional, and social dimensions into cohesive experiences that stimulate neuroplasticity. Studies have shown that play-based cognitive stimulation enhances attention, verbal fluency, and social interaction while concurrently reducing stress and depressive symptoms (Kim & Yoo, 2019; Li et al., 2021). Moreover, the repetitive and rhythmic nature of many playful activities—such as drumming or movement-based games—can reinforce procedural memory systems that remain relatively intact in the earlier stages of dementia. By embedding cognitive challenges within pleasurable and socially meaningful contexts, play-based interventions circumvent resistance and build engagement in ways that traditional therapies cannot. As such, the role of play in dementia care transcends entertainment; it becomes a strategic, evidence-based tool for activating latent neurocognitive potentials, sustaining personhood, and fostering therapeutic alliance.

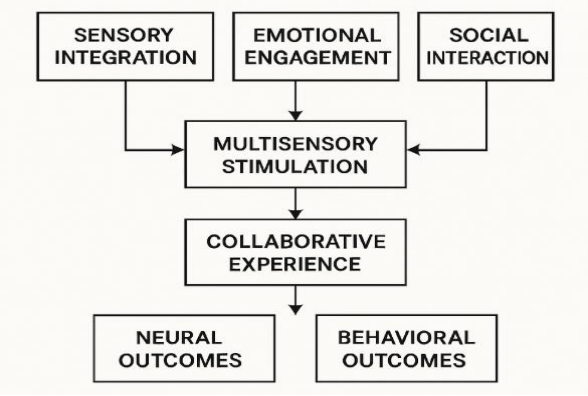
Mechanisms of Action

Sensory Integration and Multisensory Stimulation

Sensory integration refers to the central nervous system's capacity to organize and interpret multisensory input to produce coherent perceptions and appropriate motor and behavioral responses. In individuals with dementia, sensory processing deficits are prevalent and often exacerbate cognitive disorientation, emotional dysregulation, and reduced functional independence. Contemporary interventions increasingly target sensory integration through structured sensory diets—customized sequences of visual, auditory, tactile, olfactory, and vestibular stimuli designed to stimulate neuroplasticity and cognitive engagement. Studies have shown that integrating multisensory stimuli, such as music combined with tactile experiences or visual art activities, can enhance attention, memory recall, and orientation in older adults with dementia (Maneemai et al., 2024). Multisensory environments, including "Snoezelen" rooms and virtual reality platforms, have demonstrated positive effects in reducing agitation, promoting relaxation, and elevating overall well-being.

Empirical findings further reveal that multisensory stimulation not only improves behavioral outcomes but also initiates changes at the neurobiological level. Neuroimaging data suggest enhanced connectivity between sensory cortices and associative brain regions in response to combined sensory inputs. For example, multisensory stimulation has been linked to increased neural oscillation synchronization and improved cerebral blood flow in areas associated with memory and executive function (Yang et al., 2021). Systematic reviews support these findings, indicating that interventions like Sonas therapy, Cognitive Stimulation Therapy (CST), and immersive environments improve language function and cognitive fluency when delivered through rich, multi-modal channels (Calderone et al., 2025). These approaches leverage the principle of inverse effectiveness, whereby degraded unisensory signals in aging brains become more potent when reinforced through multisensory redundancy (Schneeberger et al., 2024). Thus, integrating multisensory strategies into dementia care not only aligns with emerging neuroscientific evidence but enhances clinical efficacy through holistic engagement **(Figure 2).**

Figure 2. Mechanisms of Action in Multisensory Therapeutic Intervensions



Emotional Engagement and Neuromodulation

Emotionally salient experiences are potent modulators of brain plasticity, influencing synaptic strength, neurochemical release, and the consolidation of long-term memory. Emotional engagement—elicited through music, storytelling, painting, or dance—triggers dopaminergic and serotonergic pathways that facilitate neurogenesis and cognitive reorganization. In individuals with dementia, emotional activation remains relatively intact even in advanced stages of cognitive decline, rendering it a valuable entry point for therapeutic intervention. Recent clinical studies demonstrate that emotionally charged multisensory experiences—such as digital storytelling, music therapy, or virtual reality reminiscence—can evoke autobiographical memory, reduce apathy, and increase cooperation during care routines (Chierichetti & Tombolini, 2023). These interventions align with neuroaffective research showing that reward-related neuromodulation amplifies synaptic efficacy in memory and attention networks, particularly the hippocampus and prefrontal cortex.

Neuromodulation via affectively rich stimuli also supports regulation of the autonomic nervous system, contributing to reduced stress and improved emotional stability. For instance, Bonanno et al. (2025) report that tactile-emotional multisensory stimulation significantly improved cognitive processing speed (as measured by P300 latency), heart rate regulation, and mood in patients with disorders of consciousness. In dementia populations, similar benefits have been observed in interventions involving art therapy and music-based engagement, where emotional arousal corresponds with enhanced attentional focus and social interaction. Emotional valence, especially when personalized and culturally resonant, increases the motivational salience of the activity, thereby reinforcing neural commitment and encoding efficiency. This neurobiological interplay underscores the necessity of designing interventions that are not only cognitively stimulating but emotionally evocative—strategies that align with the principles of embodied cognition and lived experience. Emotional engagement thus operates not merely as an affective by-product but as a central mechanism of therapeutic efficacy in dementia care.

Social Interaction and Collaborative Problem Solving

Social interaction is a key driver of neurocognitive vitality, particularly in the aging brain where isolation and loneliness are significant risk factors for cognitive decline. The neuroplastic benefits of social engagement are mediated by increased activity in fronto-parietal networks and the release of oxytocin and dopamine, which facilitate trust, bonding, and attention. In dementia care, group-based interventions that incorporate collaborative artistic or playful tasks foster peer interaction, co-regulation, and turn-taking—all of which are cognitively demanding and socially reinforcing. Recent studies underscore the impact of socially enriched environments on cognitive resilience, showing that collective participation in structured art or music sessions leads to improved language function, affective expression, and behavioral regulation (Chrysostomou et al., 2024).

The problem-solving demands embedded in social play—such as improvisational storytelling, cooperative drawing, or dance choreography—engage executive functions, including planning, inhibition, and working memory. Calderone et al. (2025) note that dual-task interventions combining social dialogue with physical or cognitive exercises enhance both cognitive flexibility and motor coordination. These multimodal engagements tap into distributed neural circuits, particularly in the dorsolateral prefrontal cortex and anterior cingulate cortex, which are critical for higher-order reasoning and error monitoring. Social participation also reduces perceived stigma, strengthens identity continuity, and reaffirms agency, thereby contributing to psychological resilience. Furthermore, the feedback loop of social validation in group settings amplifies motivation and fosters sustained involvement in therapeutic activities. Consequently, embedding collaborative dynamics within art-based interventions does not merely augment cognitive stimulation—it recontextualizes dementia care as a relational, co-creative process grounded in mutual engagement and shared meaning-making.

Motor Coordination and Neurogenesis

Motor coordination tasks—particularly those involving rhythmic, patterned movement—have demonstrated significant neuroplastic effects in aging populations. Activities such as dance, sculpting, or gestural painting recruit sensorimotor networks, cerebellar regions, and the basal ganglia, areas integral to both movement and procedural learning. In dementia care, these motorically embedded interventions can stimulate neurogenesis, particularly in the hippocampus and subventricular zones, as evidenced in animal and human studies. Zhou et al. (2025) report that combined Tai Chi and multisensory stimulation interventions significantly improved motor performance, cognitive function, and functional connectivity in patients with mild cognitive impairment, suggesting that motor-based engagement may act as a vector for cognitive enhancement.

Motor activity also interacts with neurovascular mechanisms that support brain health. Aerobic and resistance-based movement increase cerebral blood flow, enhance mitochondrial efficiency, and promote the expression of growth factors such as BDNF and IGF-1. Furthermore, rhythmic coordination in group settings—e.g., circle dance or percussion-based play—engages entrainment processes that synchronize neural activity and strengthen interpersonal attunement. These embodied practices capitalize on procedural memory systems, which remain relatively preserved in dementia, thus offering an accessible platform for engagement even in advanced stages of decline (Calderone et al., 2025). Critically, motor-enriched interventions also foster a sense of bodily agency and proprioceptive awareness, countering the disembodiment and passivity often associated with institutional dementia care. In integrating motor coordination into therapeutic environments, clinicians can leverage a biologically grounded pathway to neuroregeneration while enriching the experiential texture of care.

Review of Empirical Evidence

Art Therapy in Dementia Care

Outcomes from Controlled Clinical Trials

Controlled clinical trials have substantiated the efficacy of art therapy as a non-pharmacological intervention in dementia care, particularly for its impact on behavioral symptoms, emotional regulation, and quality of life. Systematic reviews indicate that visual art modalities—such as painting, sculpting, and drawing—produce statistically significant improvements in emotional well-being and reduce agitation and apathy in older adults with dementia (Souza et al., 2022) **(Table 1)**. In a review of 17 trials encompassing over 650 individuals with dementia, Emblad and Mukaetova-Ladinska (2021) reported that 88% of studies yielded

positive outcomes in at least one domain, with the most consistent findings observed in enhanced social interaction and decreased behavioral and psychological symptoms of dementia (BPSD). These benefits extended to caregivers, who reported improved relational quality and reduced stress when art therapy was integrated into daily routines.

Table 1. Summary of Controlled Clinical Trials on Art and Play-Based Interventions (2021–2025)

Study	Sample Size	Intervention Type	Primary Outcomes	Secondary Outcomes	Duration	Major Findings
Emblad & Mukaetova-Ladinska (2021)	N=657 (PWD)	Visual Art Therapy	Emotional well-being, BPSD	Caregiver relationship quality	4–12 weeks	88% of studies reported significant improvements in at least one domain
Souza et al. (2022)	N=280	Painting, Drawing, Sculpture	Quality of Life, Cognition	Emotional function	6–8 weeks	Significant improvements across cognitive and emotional functions
Guzman et al. (2025)	N=125	Spoken-Word Poetry	Self-expression, Social Interaction	Identity preservation	Variable	Enhanced social connection and expressive capacity
Karkou et al. (2023)	N=204	Dance Movement Therapy	Depression, Neuropsychiatric Symptoms	Cognitive function	12 weeks	Modest improvements in depression; limited cognitive change
Jornkokgoud et al. (2025)	N=30	Tablet-Based Multicomponent CST	Cognition, Depression, Anxiety	Quality of Life	10 sessions	Significant gains in cognition, reduced depression and anxiety

The growing interest in visual and narrative-based arts has led to the exploration of poetry and creative writing as therapeutic tools. A 2025 scoping review by Paniagua Guzman et al. demonstrated that poetry interventions fostered personhood, improved self-expression, and elevated social connectedness, although methodological heterogeneity limited the generalizability of results. Nonetheless, such interventions exemplify how creative expression can reinforce identity and promote emotional resilience. The adaptability of art therapy formats—ranging from group sessions to individualized approaches—supports its implementation across various care settings. While limitations remain concerning sample sizes and methodological rigor, the preponderance of evidence suggests that art therapy offers a viable and person-centered alternative to more didactic therapeutic formats.

Neuroimaging Evidence of Functional Connectivity

Although neuroimaging studies of art therapy in dementia are still emerging, preliminary findings suggest that creative engagement fosters neural connectivity in regions associated with executive functioning, affect regulation, and memory consolidation. Research reviewed by Strang (2024) highlights that visual and motoric artistic activities engage distributed neural networks, including the default mode network and salience network—both of which are known to deteriorate in Alzheimer's disease. Though few studies have directly linked artistic interventions to longitudinal changes in neuroanatomy, indirect measures using fMRI and EEG indicate that sustained engagement with multimodal artistic tasks correlates with increased cortical activation and preserved connectivity between frontal and temporal lobes.

Furthermore, telehealth adaptations of art therapy, such as those reviewed by Reitere et al. (2024), have shown potential for evoking neuroplastic responses even in remote formats. These interventions were associated with increased emotional and cognitive engagement, demonstrating the feasibility of leveraging digital platforms to stimulate similar neural pathways as in-person sessions. As neuroimaging methodologies become more integrated into dementia intervention studies, future trials will be better positioned to quantify the mechanisms through which art therapy modulates functional connectivity. For now, the converging evidence from behavioral outcomes and preliminary neurobiological data affirms the central role of artistic engagement in preserving cognitive networks in dementia populations.

Play-Based Cognitive Stimulation

Impact on Attention and Stress Reduction

Play-based cognitive interventions—defined as structured, yet imaginative and socially embedded activities—have consistently demonstrated benefits in attention regulation and stress mitigation among individuals with dementia. Recent trials of music therapy and tablet-assisted play reveal that such interventions promote attentional focus and reduce physiological stress markers, including cortisol levels and heart rate variability (Jornkokgoud et al., 2025). In particular, rhythmic and interactive elements of music and drama therapies support dual-task performance and enhance executive functioning, highlighting their alignment with procedural memory systems that are relatively preserved in the early stages of dementia. These findings are echoed by Karkou et al. (2023), who report modest, yet persistent improvements in emotional regulation and attentional engagement following group-based dance movement therapy interventions.

Moreover, play modalities that emphasize narrative construction—such as improvisational storytelling and role-play—demonstrate positive effects on verbal fluency and emotional responsiveness. These interventions activate overlapping cognitive and affective systems, reinforcing neural integration across domains often dissociated in traditional therapies. Importantly, such activities are perceived as non-threatening and enjoyable, thus

improving compliance and therapeutic alliance. As a result, play-based cognitive stimulation not only supports measurable neurocognitive outcomes but enhances the subjective experience of care, rendering it a potent vehicle for holistic dementia intervention.

Overcoming Barriers to Engagement

Despite the demonstrated efficacy of play-based interventions, several barriers to participation persist, including sensory limitations, motivational decline, and caregiver misconceptions regarding the utility of "play" in adult populations. Nonetheless, emerging evidence suggests that these barriers can be mitigated through thoughtful design and facilitation strategies. For instance, integrating culturally familiar materials, simplifying task instructions, and adjusting sensory input levels can significantly enhance accessibility (Vicente et al., 2024). Interventions such as group singing, reminiscence games, and guided improvisation have been particularly successful in overcoming resistance by fostering a sense of belonging and personal relevance (Moye, 2023).

Moreover, caregiver involvement is increasingly recognized as a facilitator rather than a hindrance to play-based engagement. Involving caregivers in co-participation or facilitation of activities not only reduces apprehension but reinforces the therapeutic alliance and augments relational bonding. Ali et al. (2023) report that cognitive stimulation therapy programs incorporating caregiver training achieved higher retention and greater subjective improvement in both cognitive and emotional domains. These findings affirm the importance of aligning therapeutic frameworks with individual capacities and environmental constraints. By positioning play not as leisure, but as cognitively enriched interaction, these interventions dismantle stigma and expand the therapeutic possibilities for dementia care.

Integration of Multisensory Stimuli

Effects on Synaptic Density and Cognitive Outcomes

The integration of multisensory stimuli in therapeutic environments has been shown to produce measurable enhancements in synaptic density and cognitive performance in dementia populations. This approach, exemplified by interventions combining music, visual art, tactile input, and movement, engages multiple cortical regions simultaneously, fostering more robust neural signaling and memory consolidation. A systematic review by Calderone et al. (2025) concluded that multisensory therapies such as Cognitive Stimulation Therapy (CST) and Sonas therapy significantly improved language fluency and executive functioning. These outcomes are hypothesized to result from enhanced sensory-motor integration and increased activation of the hippocampus and prefrontal cortex.

The neurophysiological basis of these effects is supported by studies showing increased production of brain-derived neurotrophic factor (BDNF) and improved functional connectivity in participants exposed to enriched sensory environments. Jornkokgoud et al. (2025) further demonstrated that multisensory interventions combined with cognitive tasks yield greater neurocognitive benefits than unimodal interventions, particularly in enhancing attention, immediate recall, and emotion regulation. These data support a growing consensus that multisensory therapies operate not through isolated stimulus effects, but through the synergistic activation of distributed neural networks that underpin cognitive resilience in aging.

Case Examples and Pilot Programs

Pilot programs provide valuable insights into the feasibility, adaptability, and scalability of multisensory interventions in real-world settings. For instance, Chrysostomou et al. (2024) reported on an eight-month multisensory remediation program that included tactile puzzles, auditory stimuli, and reminiscence-based dialogue. Participants exhibited qualitative improvements in social interaction, language use, and participation in communal activities—outcomes corroborated by MMSE scores and caregiver observations. Similarly, Machado and Castro (2022) found that institutionalized older adults exposed to structured sensory stimulation programs demonstrated reductions in agitation and enhancements in sustained attention.

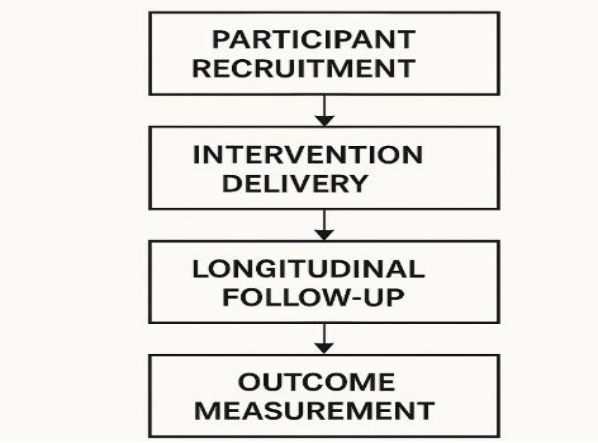
Such programs exemplify the practical implementation of multisensory theory, often utilizing spaces like Snoezelen rooms or integrating emerging technologies like virtual reality to deliver customizable therapeutic experiences. These environments can be tailored to accommodate sensory preferences and cultural contexts, optimizing engagement and efficacy. The evidence suggests that these interventions not only enhance individual cognitive performance but also foster a therapeutic culture within care settings that prioritizes interaction, stimulation, and dignity. Thus, multisensory integration emerges as both a mechanistic and an ethical framework for improving dementia care.

Methodological Considerations for Future Research

Study Design and Longitudinal Assessment

The evolving landscape of art- and play-based interventions for individuals with dementia necessitates methodologically rigorous research designs that can capture both short-term efficacy and long-term therapeutic impact **(Figure 3)**. While randomized controlled trials (RCTs) remain the gold standard for evaluating intervention efficacy, many existing studies in the domain of creative and multisensory therapies suffer from small sample sizes, limited follow-up periods, and insufficient control conditions. Future investigations must adopt longitudinal RCT frameworks capable of tracing cognitive, emotional, and neural trajectories over extended durations—ideally six to twelve months post-intervention. This approach would allow researchers to distinguish between transient improvements and durable neurocognitive benefits, and to understand how different intervention intensities and frequencies influence outcomes over time (Calderone et al., 2025).

Figure 3. Methodological Framework for Future Research



Equally crucial is the inclusion of appropriate comparator groups, such as standard cognitive training, pharmacological treatment, or social activity controls. Such comparisons are essential to isolate the unique contributions of art-enriched or play-based modalities. To maximize ecological validity, future trials should recruit participants from diverse care settings, including home-based care, assisted living facilities, and memory clinics, reflecting the heterogeneity of real-world dementia populations. Integrating caregiver perspectives and behavioral observations as secondary outcomes can further enrich the data and provide a more holistic view of intervention impact. Mixed-methods designs, which combine quantitative assessments with qualitative insights, are especially valuable in capturing the nuanced effects of person-centered interventions in cognitively impaired populations.

Neuroimaging and Quantitative Outcome Measures

Neuroimaging technologies offer powerful tools for quantifying the neurobiological effects of creative interventions, yet their application in dementia care remains underutilized. Functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and diffusion tensor imaging (DTI) are particularly well-suited for detecting changes in functional connectivity, neural oscillations, and white matter integrity—parameters that may reflect neuroplastic adaptation in response to intervention. For example, tablet-based Cognitive Stimulation Therapy (CST) studies utilizing EEG have revealed modulation of alpha and theta rhythms, correlating with improvements in memory and attention (Jornkokgoud et al., 2025). However, more comprehensive integration of such tools is needed to establish causal pathways between intervention exposure and neural changes.

Beyond imaging, standardized cognitive and behavioral assessments are essential for triangulating evidence. Instruments such as the Mini-Mental State Examination (MMSE), Montreal Cognitive Assessment (MoCA), and Alzheimer's Disease Assessment Scale-Cognitive (ADAS-Cog) are widely accepted but must be complemented by affective and quality-of-life measures, including the Geriatric Depression Scale (GDS), Neuropsychiatric Inventory (NPI), and Quality of Life in Alzheimer's Disease (QoL-AD). Combining subjective reports with physiological indices—such as heart rate variability or cortisol assays—can yield richer multidimensional data. Additionally, the use of wearable biosensors and digital tracking tools holds promise for continuous monitoring of engagement and affective responses during interventions. Collectively, these approaches can provide a more granular and mechanistic understanding of therapeutic efficacy in neurodegenerative contexts.

5.3. Standardized Protocols for Intervention Delivery

The proliferation of diverse art and play-based therapeutic modalities necessitates the development of standardized intervention protocols to ensure replicability, scalability, and comparative analysis **(Table 2)**. At present, variability in session length, facilitator training, intervention content, and delivery mode complicates meta-analytic synthesis and weakens the generalizability of findings. Future research must work toward the articulation of structured intervention manuals that delineate session goals, activity sequencing, materials required, and facilitation strategies. Initiatives such as DementiaCare's intercultural art therapy training program exemplify efforts to professionalize practice through competency-based frameworks and interculturally informed guidelines (Giusti et al., 2024).

Table 2. Recommendations for Standardized Protocols in Art and Play-Based Interventions

Protocol Component	Recommendation
Facilitator Training	Facilitators must complete structured training with certification in dementia care and creative modality (e.g., art therapy, music therapy).
Session Structure	Each session should follow a consistent template: warm-up, core activity, reflection/discussion, and closure.
Activity Modality Definition	Clearly define the specific art or play modality used (e.g., painting, improvisational movement), including tools and intended outcomes.
Cultural and Cognitive Adaptability	Adapt activities for sensory, motor, and cognitive accessibility; include culturally resonant content and language.
Dosage and Frequency Guidelines	Minimum of 1–2 sessions per week for at least 6–8 weeks; specify duration and pacing in advance.
Participant Engagement Strategies	Incorporate personalization and autonomy, use reminiscence triggers, and foster peer interaction to sustain motivation.
Fidelity Assessment Procedures	Include fidelity checklists, session logs, and inter-rater observations to ensure consistent delivery.
Outcome Alignment	Ensure activities map directly onto pre-defined cognitive, emotional, or behavioral outcome measures.
Documentation Standards	Maintain standardized reporting logs detailing attendance, responsiveness, and observed changes.
Feedback and Iterative Revision	Integrate facilitator and participant feedback into ongoing protocol refinement through structured review cycles.

Furthermore, fidelity assessments must be embedded into study designs to verify that facilitators adhere to the core components of interventions while allowing room for culturally sensitive adaptation. This requires rigorous training and certification pathways for facilitators, as well as continuous supervision and quality control mechanisms. Establishing shared definitions and taxonomies across intervention types—e.g., distinguishing narrative art therapy from expressive or cognitive-

based variants—will also enhance conceptual clarity and support rigorous testing. Ultimately, the formalization of these protocols will strengthen the field's evidentiary base and enable more effective integration into health policy and clinical practice.

Ensuring Accessibility and Inclusivity in Practice

As art-based and play-based therapies gain traction, ensuring their accessibility and inclusivity across diverse populations is both an ethical and methodological imperative. Dementia disproportionately affects individuals in lower socioeconomic strata and ethnic minority communities, yet these populations are often underrepresented in research and underserved in intervention access. To address these disparities, future studies must adopt inclusive recruitment strategies, culturally tailored content, and flexible delivery formats—such as telehealth platforms and mobile interventions—that can overcome logistical and geographic barriers (Reitere et al., 2024). The integration of locally meaningful artistic forms, languages, and traditions into intervention design can enhance cultural resonance and increase participant engagement.

Additionally, special attention must be paid to individuals with advanced dementia, limited literacy, or sensory impairments. Designing interventions that utilize non-verbal communication, multisensory engagement, and simplified instructions can ensure that even those with severe impairments are not excluded from therapeutic opportunities. Furthermore, caregiver input should be systematically incorporated during intervention planning to ensure activities align with the practical and emotional needs of both patients and families. Universal design principles—emphasizing flexibility, simplicity, and intuitive use—should underpin all therapeutic environments and tools. By prioritizing inclusivity, the field can move toward a truly person-centered model of dementia care that recognizes and accommodates the diversity of cognitive, cultural, and social realities across aging populations.

Discussion

Synthesis of Findings and Transformative Potential

The collective body of evidence reviewed affirms the potential of art-enriched and play-based interventions to function as viable, non-pharmacological modalities for enhancing neuroplasticity in dementia care. Across controlled trials, case studies, and systematic reviews, these interventions have demonstrated positive outcomes on cognitive performance, emotional well-being, and social interaction. Interventions such as visual art therapy, music-based stimulation, and cognitively engaging play have repeatedly been linked to improvements in memory, mood regulation, and executive functioning (Emblad & Mukaetova-Ladinska, 2021; Souza et al., 2022). Notably, when such interventions incorporate multisensory stimuli—engaging auditory, tactile, visual, and kinesthetic modalities—they appear to facilitate enhanced neural activation and behavioral responsiveness (Calderone et al., 2025).

What emerges is not merely a collection of complementary techniques, but the scaffolding of a transformative paradigm in dementia care—one that shifts the therapeutic focus from remediation of loss to reinforcement of retained capacities. Creative engagement functions as both cognitive exercise and expressive outlet, activating neural circuits involved in memory consolidation, emotional modulation, and motor coordination. The evidence indicates that these interventions not only address symptoms but potentially rewire aspects of functional connectivity through emotionally salient and socially embedded stimuli (Strang, 2024). This reconceptualization of therapeutic efficacy—centered on experiential richness and relational engagement—heralds a new frontier in neurorehabilitation for individuals with neurodegenerative diseases.

Addressing Multidimensional Symptomatology

Dementia's symptomatology is profoundly multifaceted, encompassing cognitive decline, emotional dysregulation, social withdrawal, and behavioral disturbances. Conventional therapies, often siloed by disciplinary origin, fail to address this complexity in an integrated manner. By contrast, the inherent multidimensionality of art- and play-based interventions uniquely positions them to respond to this polyphonic clinical reality. Music and dance therapies, for example, provide simultaneous engagement of motor, emotional, and mnemonic systems, while narrative art and poetry promote language function alongside self-expression and identity preservation (Paniagua Guzman et al., 2025; Karkou et al., 2023). These modalities deliver parallel cognitive and affective benefits, challenging reductionist frameworks that isolate symptom domains.

Moreover, the flexible structure of creative interventions allows for real-time adaptation to individual fluctuations in capacity and interest, which are hallmarks of the dementia experience. Activities can be scaled in complexity, personalized in content, and modulated in sensory intensity, enabling continuous recalibration to the individual's current state. Importantly, such interventions often operate below the threshold of explicit memory or verbal fluency, leveraging procedural memory and embodied cognition to elicit engagement even in late-stage dementia (Jornkokgoud et al., 2025). In this way, art-based therapies transcend categorical symptom management, offering instead a constellation of interlinked supports that attend to the whole person—cognitively, emotionally, socially, and spiritually.

Implications for Holistic, Person-Centered Care

The integration of art-enriched environments into dementia care aligns seamlessly with the core tenets of person-centered care: respect for individual autonomy, preservation of identity, and recognition of the person beyond their diagnosis. These interventions honor the lived experience of individuals with dementia, providing platforms for agency, creativity, and relational reciprocity. By creating spaces where patients are not passive recipients of care but active co-participants, these therapies rehumanize clinical settings and restore narrative continuity in the face of cognitive fragmentation (Moye, 2023). Care settings that embed creative practices into their routines report not only enhanced patient outcomes but improved staff morale and caregiver satisfaction, as the relational tone of care becomes more compassionate and collaborative.

Furthermore, person-centered care requires therapeutic flexibility—an attribute intrinsic to arts-based modalities. Whether delivered through individualized sessions, group formats, or remote platforms, these interventions are adaptable to cultural, linguistic, and sensory needs, making them accessible across diverse demographic and clinical contexts (Reitere et al., 2024). As such, they offer a pathway to equity in dementia care, especially when integrated into community-based models that address barriers related to geography, socioeconomic status, or mobility. The operationalization of these interventions through standardized protocols and inclusive delivery mechanisms will be critical for

their institutional sustainability and policy adoption.

Remaining Gaps and Directions for Future Research

Despite promising evidence, several gaps remain that constrain the broader implementation and scientific validation of these approaches. First, the field suffers from heterogeneity in outcome measures, intervention protocols, and assessment timelines, which complicates meta-analytic synthesis and limits cross-study comparability. Standardizing evaluation frameworks—particularly around neurobiological metrics such as functional connectivity and biomarkers of neuroplasticity—would enhance the precision of future research. Longitudinal studies are especially needed to determine the durability of benefits and identify optimal dosing regimens over time (Calderone et al., 2025).

Second, demographic inclusivity must be improved. Marginalized populations, including racial and ethnic minorities, individuals with lower socioeconomic status, and those with limited language proficiency, are underrepresented in current research. Studies must address these disparities by employing culturally sensitive designs and community-partnered methodologies. Additionally, mechanistic research is needed to elucidate how various modalities—e.g., music versus visual arts—engage different neural substrates and to what extent these effects are mediated by emotional, social, or sensory mechanisms (Strang, 2024).

Finally, translational frameworks should be developed to facilitate the implementation of evidence-based creative therapies in clinical and residential care settings. This will require not only clinical validation but workforce development, policy support, and infrastructural investment. By addressing these gaps, the field can move toward a robust, interdisciplinary model of dementia care in which art and play are not peripheral diversions but central instruments of therapeutic change.

Conclusion

The evidence surveyed compels a fundamental reframing of dementia care—one that positions art-enriched and play-based interventions not as peripheral adjuncts, but as central, evidence-based strategies for fostering neuroplasticity, emotional well-being, and social connectivity in individuals living with dementia. Where traditional biomedical models foreground loss, decline, and management of deficits, the creative and experiential paradigm emphasizes preserved capacities, residual agency, and the transformative possibilities of engagement. Through visual arts, music, movement, and narrative expression, these modalities activate latent neural pathways, cultivate affective resilience, and restore avenues for self-expression and interpersonal connection (Emblad & Mukaetova-Ladinska, 2021; Strang, 2024). This approach not only improves symptomatology but reaffirms the personhood and dignity of individuals navigating the challenges of neurodegenerative disease.

Despite the persuasive body of preliminary and observational evidence, the field now demands rigorously designed clinical trials and robust implementation science to guide the next phase of integration. Future research must prioritize randomized controlled trials with sufficient power, long-term follow-up, and ecologically valid control conditions to isolate the specific effects of art and play-based modalities. Neuroimaging, wearable technologies, and multidimensional assessment batteries should be leveraged to triangulate behavioral and neurobiological outcomes. Concurrently, research in implementation science must address questions of scalability, cost-effectiveness, and workforce training, ensuring that evidence-based protocols are not only validated in research settings but translated effectively into routine care (Calderone et al., 2025; Giusti et al., 2024). The articulation of clear guidelines, facilitator competencies, and culturally responsive practices will be essential for achieving consistency and equity across therapeutic environments.

The prospects for broad adoption of art- and play-based interventions in dementia care are increasingly auspicious, provided that institutional, regulatory, and educational infrastructures align to support this evolution. Person-centered models, already ascendant in gerontological policy, offer a fertile context for embedding creative therapies into multidisciplinary care pathways, day programs, and residential facilities. Digital and telehealth platforms further expand the reach of these modalities, reducing barriers related to geography and mobility (Reitere et al., 2024). As the demographic burden of dementia intensifies, the scalable integration of creative, multisensory, and relational approaches stands as both a pragmatic and ethical imperative. Realizing this potential will require sustained investment in research, cross-sector collaboration, and an unwavering commitment to honoring the full humanity of those living with dementia. In so doing, the field may finally achieve not only symptomatic management, but a genuine enrichment of life in the face of cognitive decline.

Data Availability

Data available upon request.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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