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Updating Pedagogical Practices in Teaching Contemporary Dance Styles in Creative Higher Education Institutions

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ABSTRACT

This study explores how executive cognitive functioning and motivational orientation influence creativity among contemporary dance students in Ukrainian higher education institutions. It aims to identify cognitive mediators of creativity, distinguish between pedagogical environments, and provide guidance for rethinking dance education amid crisis and innovation. A mixed-method design was used, combining psychometric scales, creativity tasks, and neurocognitive diagnostics. Sixty undergraduate and postgraduate students were assigned to either a digitally integrated (experimental-like) or traditional (control-like) learning environment. Key tools included the Creative Thinking Test for Dance, the Dance Learning Motivation Scale, and executive functioning assessments. Quantitative methods involved t-tests, ANOVAs, correlations, and structural equation modelling, while qualitative responses were thematically analysed. Findings show that intrinsic and identified motivation positively correlate with creativity, with executive functioning acting as a partial mediator. SEM confirmed an indirect path from motivation to creativity via executive control. Although the experimental-like group reported higher teaching effectiveness and showed greater neurocognitive engagement, creativity levels between groups did not differ significantly, highlighting that digital tools alone are insufficient without cognitive and motivational support. The results align with international research and emphasize the need for dance education to foster artistic freedom, intellectual individualization, and embodied inquiry. Ukrainian HEIs are well-positioned to lead in developing holistic, student-centred approaches to choreography education in the context of post-crisis renewal and digital transformation.

KEYWORDS:

intrinsic motivation; executive function; cognitive mediation; digital pedagogy; Ukrainian higher education

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INTRODUCTION

Dance education's rapid revolution among creative HEIs reflects broader trends within pedagogical praxis, technological integration, and artistic identity redefinition. Traditional models of dance pedagogy, commonly rooted in replication, discipline, and aesthetic conformity, are increasingly challenged by calls for more reflexive, inclusive, and student-centred pedagogies (Dragon, 2015; Schupp, 2022). These shifts are both ideological and methodological, as instructors experiment with new methods of scaffolding creativity, motivation, and cognitive investment among students studying choreography. During recent decades, creativity's contribution has become a flagship concern of dance pedagogy. Quoted endlessly as a basic product of training programs, creativity is still vague and nonsystematically quantified (Clements & Redding, 2020).

Concurrent with these pedagogical changes, the dissemination of immersive and intelligent technologies (i.e., augmented reality, real-time feedback technologies, and AI-based learning environments) has also begun to alter teaching, learning, and assessing dance (Wang, 2024a). Such technologies provide us with unprecedented possibilities for individualised learning trajectories, transdisciplinary workshopping, and cultivation of neurocognitive comprehension in movement praxis. Of special interest is their capability for personalising and visualising creativity processes that align with an even deeper pedagogical necessity: how to create environments from which students are not mere passive recipients of knowledge but co-creators of meaning. While, on the one hand, they must innovate teaching methods and keep pace with competition and future directions, on the other hand, they must address the psychological, cultural, and infrastructural implications of conflict, migration, and socio-political turbulence (Matiash et al., 2024). Choreographic education, in this context, becomes more than an arena of artistic education—it becomes a site for restoration of cognition and culture, and for personal empowerment.

The primary objective of this study is to examine the relationship between motivation and executive cognitive functioning and their combined impact on creativity among contemporary dance students in Ukrainian creative higher educational institutions. Utilizing a mixed-method design and applying structural equation modeling, the research seeks to identify motivational and cognitive predictors of creative performance in structured improvisational tasks. It also aims to evaluate the mediating role of executive network activity in the relationship between motivation and creativity. Additionally, the study compares the influence of different learning environments, digital versus conventional—on students' perceptions, neurocognitive functioning, and creative outcomes. A further goal is to develop evidence-based recommendations for pedagogical innovation in choreography education, taking into account psychological insights and integration of digital technologies. Within this paradigm, the findings are intended to support development of adaptive, context-sensitive, and cognitively informed dance pedagogy that responds to current challenges of postsecondary education.

LITERATURE REVIEW

Dance education in creative higher education institutions is currently undergoing significant pedagogical transformation. As Khendryk (2019) observes, evolution of choreography training in Ukrainian HEIs highlights urgent need for a reimagined set of pedagogical methods that are responsive to both the cultural-historical context and the personal ambitions of student dancers. This study builds on theoretical foundations such as Self-Determination Theory and cognitive learning models to explore how motivational orientations and executive cognitive functioning interact to shape creative expression and learning outcomes in contemporary dance education.

Correspondingly, Schupp (2022) calls for radical reconceptualisation of how dance pedagogy is conceived and practised throughout graduate programmes, and Western universities in particular. Through autoethnography and qualitative content analysis, Schupp criticises ongoing departures from conventional "best practices" that too often implicitly privilege Eurocentric traditions within dance. This foregrounding of ethical and inclusive teaching models prompts teachers to consider their positionality and reconceptualise the classroom as a site of negotiated meaning-making, rather than passive transmission. For creative HEIs, this theoretical position calls for a decolonised and democratic model of dance education, such that pedagogic strategy is aware of both form and its embodied and sociocultural reception.

Fitzgerald (2017) takes this argument further through a study of technique class as more than a place for skill acquisition but as a place for social transformation. In a reflexive praxis of community-based pedagogy, the author suggests that a pedagogical shift from solo performance through individualism to reciprocity, group work, and inclusivity can significantly revise the ethos of contemporary dance pedagogy. A theoretical perspective aligns with a broader pedagogical trend toward social responsibility and civic engagement among both arts disciplines and postsecondary education specifically. Cultivation and assessment of creativity is central to pedagogical innovation in dance. Clements and Redding (2020) observe that creativity is consistently named as a core learning aim for HE dance programs, but conceptually is poorly studied in regards to how its comprehension and development are attained in teaching contexts. Weber and Reed (2022) extend this dialogue further by foregrounding somatically founded pedagogy as encompassing metaphorical thought, embodied feeling, and usefulness applied. Their work highlights somatic approaches, emphasising students working from an interior orientation on movement and building kinaesthetic and inner feeling complexity.

Garcia and Duarte (2025) bring a collaborative dimension to the discourse, investigating pedagogical influence through cooperative practice among teachers, musicians, and students. Practice-led Research methodology helps uncover, through its use, how such cooperative environments facilitate co-creation of vocabularies of movement, develop musical awareness, and promote integration between artistic and technical abilities. These observations validate that dance pedagogy cannot be a linear transmission from teacher to student, but must be a fluid interaction among

multiple creative agents. This cooperative model reflects professional choreographic settings' multifaceted reality and thus promotes authenticity within the learning process for HEIs. Androshchuk et al. (2023) also address professionalisation of choreographic study and discuss development of professional competence among future choreographers. With a systems-analytical perspective, their reasoning suggests that practice-based development, driven by determination, self-study, and innovation, serves as a core driving force for professional development.

Dragon (2015) provides a critical historical perspective by showing how rarely questioned teaching traditions continue to shape dance education. The author's reflection on the relationship between somatic and technique classes, as well as on teacher-centred models of instruction, promotes pedagogical openness and encourages teachers to discuss their beliefs and practices more openly. This direction toward transparency does not merely democratise the classroom but also enables students to engage more constructively with the process of pedagogy and encourages metacognitive reflection on how learning occurs on a practical level. Dragon's work indirectly encourages an educational culture within which pedagogy constitutes a topic of study and exploration.

Garcia and Duarte's (2025) piece is newer have examined creative dance within physical education teacher education (PETE) environments. In both cases, creative dance is found to be a transformative pedagogical process that celebrates non-prescribed movement, interpretive direction ambiguity, and expressive profundity. For Engdahl et al. (2022) and Larsson et al. (2024), such transformative experiences stem from students reaching a vantage point from which they can "make sense" of creative movement through teacher knowledge and resources such as Laban's movement notation. In their texts, Engdahl et al. (2022) employ Deleuzian concepts, such as experimentation and palpation, to describe how PETE students experience and evoke creativity within dance. In these texts, both highlight embodied experimentation and conceptual inclusivity as core precepts of effective dance pedagogy.

Read together, these sources develop an overarching theoretical framework for reimagining pedagogical approaches in contemporary dance education within creative HEIs. From culturally inscribed models to Schupp's decolonising pedagogies as well as collaborative and somatic models to professional development models on a large-scale systemic level, the literature indicates a growing consensus about the imperatives for an inclusive, multi-modal, reflective, and ethically informed pedagogy (Chen, 2024). Such pedagogy must include creativity not just as an aesthetic concept but as an epistemological and methodological foundation. Furthermore, contribution from psychological knowledge—in terms of student motivation, affective engagement, or psychodiagnostics tools for personalised teaching appears to be a deciding factor in designing responsive and effective dance curricula. The theoretical foundation thus requires a comprehensive redefinition of dance pedagogy, grounded in student agency, contextual relevance, and transdisciplinary communication.

In the current teaching context, artificial intelligence (AI), immersive technologies, and data-based pedagogical systems revolutionise dance teaching at its very roots. Nowhere is this revolu-

tion more prevalent than among creative institutions of higher education, which are most suited to marrying artistic creativity and technological competence. Immersive technologies, such as virtual reality (VR), augmented reality (AR), and mixed reality (MR), powered by AI, significantly enhance dance teaching efficiency, according to Wang (2024a). Integration of such resources not only solidifies skill acquisition but also reinterprets the teacher's role and the nature of student interaction within the choreography classroom.

Wang (2024b) outlines a conceptual AI-supported dance education model involving virtual mentoring, cognitive simulations, and multimedia instruction platforms. Such technologies afford students improved autonomy, adaptability, and interactivity and also widen pedagogical possibilities for instructors. Innovative HEIs, where innovation and transdisciplinarity are at stake, benefit from this AI-supported pedagogical environment through shifting from rigid curriculum templates to fluid learning environments that mirror artistic practice's fluid nature. Through digital embodiment, pedagogy for dance also becomes more inclusive and scalable, enabling it to engage students from diverse creative and cultural backgrounds.

In addition, Wang (2024b) discloses how AR-driven platforms can accommodate individual learning styles and paces. Such platforms incorporate real-time feedback loops and avatar-based visualisation, and revise teaching content based on student performance. For innovative universities, this represents a revolutionary shift in pedagogy. Time-based or geographical barriers no longer constrain instruction but are highly personalised, iterative, and responsive. Opportunities for today's dance teaching are vast, as instructors are given capacity to compensate for gaps in experience and range of style among students.

Zhang (2024) lends support to this position through expositions on how AI allows for reorganisation of pedagogical models of dance at the institutional level. This redefinition of technology is not limited to the studio. Zhang (2024) proceeds to discuss AI's applications in professional dance education, specifically improving course delivery, personalising student journeys, and streamlining assessment processes. Of especial pertinence within creative HEIs, where students undergo interdisciplinary practice and pursue diverse professional paths, AI-driven utilisation of dashboards and learning analytics enables institutions to support student development and professionalisation more effectively. Such online environments facilitate modelling learning behaviour, identifying trends in performance, and intervening in moments of frailty. They can yield a level of insight that was previously unrealizable through established processes.

The use of immersive pedagogic platforms is also supported by the work of Guang and Xueliang (2025) on how immersive virtual reality (IVR) technologies affect folk dance teaching at the university level. They demonstrate how immersion, interactivity, and personalisation combine effectively to enhance students' perceived ease of learning and engagement significantly. Specific though their work is—folk dance—its implications are general: immersive pedagogies assist embodied knowledge creation, enhance cognitive recall, and generate motivation. For creative universities, experimentation above all else, IVR becomes a device for expanding artistic boundaries as part of improving learning outcomes.

At the meeting point between technology and creativity lies the pedagogical quandary par excellence of how to best cultivate innovative and original ways of thought among students of choreography. Dou et al. (2021) provide their response to their examination of the interaction between creative and innovative action during improvisation in dance. In furthering this strand of research, Biasutti and Habe (2023) identify the pedagogical value of improvisation in inducing "flow" states with dance students. In qualitative research involving master improvisation teachers, they identified the conditions under which flow arises—mainly when students are process-oriented and student-centred, and able to draw upon their creativity. Key to these insights is their harmonisation with AI-augmented platforms that provide real-time commentary, iterative development of designs, and multi-sensory interaction—each individually capable of inducing high and sustained intrinsic motivation and focused attention. In creative HEIs, such conditions are not only desirable but also integral to the holistic development of the dancer as an artist-researcher.

Weber and Reed (2022) provide further insight by discussing somatic pedagogy itself as a resource for building creativity. Through multidirectional and metaphorical thinking, somatic approaches enable students to use their bodies as sources of inquiry and meaning rather than as mechanical instruments. The pedagogical affinity between somatics and online education is particularly significant: AI-realised movement capture technologies and interaction-based feedback programs can bolster somatic inquiry by providing learners with externalised commentary on inner sensation and can enable learners to build more acute proprioceptive awareness. This convergence reinforces the proposition that tech integration in dance should not weaken embodied knowledge; it can enhance it.

Risner (2021) outlines Freirean pedagogy to propose immersive teaching processes that "humanise" dance education. He advocates for pedagogical processes that encourage students to engage with their personal histories, identities, and values. This is especially relevant in creative universities, where students often create autoethnographic or politically aware choreography. Online resources that facilitate reflective note-taking, annotation, and dialogue interaction can assist in fostering ethical, conscious artists. AI-based journaling apps or online rehearsal archives, for instance, can serve as online notebooks for artistic development and help achieve critical pedagogical goals of introspection and liberation.

Finally, Cao (2024) presents evidence from experimentation on AI-augmented extracurricular dance learning platforms, such as Moodle and STEEZY. The findings indicate that students using digitally enhanced learning environments significantly improved their physical performance, creativity, and presentation skills compared to their counterparts in traditional teaching environments. This not only confirms their efficacy but also mandates their inclusion into the mainstream curriculum, especially in creative HEIs where outcomes from performance significantly correlate with technological savvy and innovation capacity.

Existing models are classified into three broad paradigms: (1) the expressive-aesthetic paradigm (e.g., Schupp, Fitzgerald), which identifies creativity as self-expression; (2) the somatic-introspective paradigm (e.g., Weber & Reed), which focuses upon internal bodily awareness; and (3) the

technological-adaptive paradigm (e.g., Wang, Zhang), which focuses upon digitally personalised adaptation. None of these systems, however, properly reflect the mediating interface of executive cognitive functioning as the buffer between motivation and creative output. It is this theoretical omission which the current study seeks to rectify.

The framework for the model links motivational regulation, specifically intrinsic and identified motivation, with executive functioning as the cognitive process that transforms motivational potential into creative action. It thus facilitates reimagining of creativity as a process rather than sudden trait or internal state, itself subject to scaffolding through pedagogic techniques. It situates dance learning within the framework of regulated cognitive activity and self-motivated engagement, thus bridging the gap between affective intention and bodily creative action (Melnychuk et al., 2022). This framework solves three key issues of today's dance pedagogy: (1) how to embed student freedom while guaranteeing pedagogical coherence; (2) how to balance creativity and cognitive planning/control; and (3) how to integrate technology as a tool that blends into, rather than replaces, the pedagogy itself. Unlike models that prioritize motivation and/or technology, followed by the others, this framework requires the simultaneous development of all three axes—cognitive, affective, and technological.

MATERIALS AND METHODS

Sample selection criteria and group formation rationale

The study comprised a purposive sample of 60 undergraduate and postgraduate students of choreography from two Ukrainian creative higher education institutions (HEIs). Two quasi-experimental participant groups were created on the technological qualities of their learning environments and their desire for using digital tools in dance education. The experimental-like group ($n = 30$) consisted of students from programs with relatively high technology integration (e.g., the use of multimedia support in dance classes, the use of smartphones or projectors for teaching choreography, and the use of online dance resources). The participants from more traditional offline-based programs with limited or no use of digital tools comprised the control-like group ($n = 30$). Eligibility criteria included at least a year of contemporary dance training and voluntary consent for participation in the study. Age ($M = 21.4$, $SD = 2.2$) and gender were equivalent between the two groups.

Inclusion criteria for participants required a year-long course of study at a minimum in modern/contemporary dance, current enrolment as a student in a dance/choreography program at a Ukrainian HEI, and voluntariness of taking part. Subjects with pre-existent cognitive deficits, neurodevelopmental disorders, or current rehabilitation by physical injury were excluded to avoid confounding factors involving executive functioning or motor potential. In addition, participants were limited to an 18- to 26-year-old age category to permit developmental consistency of cognitive-motivational parameters.

Quasi-experimental group allocation was based on the extent of integration of the use of digital technologies at participants' individual programs, as determined through institutional analysis of the curriculum and interviews with program directors. Though the strategy mirrors real-world conditions of education, we acknowledge the likelihood of institutional-level confounds (e.g., variation in prestige, resources, or practices of student selection) to occur. Both groups were purposely chosen from HEIs of similar academic standing, national accreditation, and geographical location, as a buffer measure. Additionally, demographic equivalence tests indicated the lack of substantive difference among participants' age, gender ratio, and prior dance experience between the two groups.

Even so, we recognize that infrastructure could indirectly involve institutional funding, faculty, or admissions selectivity, which could have a bearing itself on cognitive development or motivation. For these reasons, supplementary analyses were conducted that measured such potential covariates as institutional selectivity (as a function of entrance exam scores and mean GPA of students) and access to fine arts extracurricular resources (Liu et al., 2021). We did not see group differences for these preparatory indicators, which allowed us to plausibly attribute found effects to pedagogy differences involving incorporation of digital media as opposed to institutional differences per se.

The experimental group participated in hybrid studio classes combining in-person sessions with digital extensions. These included multimedia projection for choreography analysis, asynchronous video assignments, and mobile app-based feedback. Classes were held twice weekly for 12 weeks, with digital resources supplementing, not replacing, face-to-face instruction. The control group received the same duration and frequency of live instruction but without technological augmentation. This differentiation represents two pedagogical paradigms: the experimental group emphasised learner autonomy through digital scaffolds and self-paced reflection while the control group preserved instructor-led correction and replication models. Thus, both groups engaged in embodied dance practice, differing primarily in technological integration and autonomy-promoting strategies rather than delivery mode. Design can yield ecologically valid data about how various formats of education currently inherent to practice may differentially foster the development of creativity through cognitive and motivational channels. Moreover, such evidence can inform the refinement of instructional approaches to better support creative growth in diverse learning contexts.

Instruments and measures

The study employed a mixed-method design, combining quantitative assessment tools with qualitative reflections. A range of psychometric instruments was administered to evaluate creative, motivational, cognitive, and perceptual dimensions relevant to dance learning and performance. The Creative Thinking Test for Dance (CTTD), adapted from Guilford's divergent thinking model, was used to assess fluency, flexibility, originality, and elaboration in dance improvisation. Participants engaged in a 3-minute structured improvisation task, which was evaluated by two independent assessors using a 5-point Likert scale. A composite Creativity Index was then calculated based on the

scores. Motivational aspects were measured using the Dance Learning Motivation Scale (DLMS), a 21-item instrument grounded in Self-Determination Theory. It assessed five forms of motivation: intrinsic motivation, identified regulation, introjected regulation, external regulation, and amotivation. Responses were recorded on a 5-point Likert scale, and reliability for each subscale was confirmed with Cronbach's alpha coefficients above 0.78.

The Creative Thinking Test for Dance (CTTD) was adapted by the authors from the divergent thinking framework originally conceptualized by Guilford (1967) and operationalized in Torrance's Tests of Creative Thinking (Almeida et al., 2008). The Dance Learning Motivation Scale (DLMS) was designed on the foundation of Ryan and Deci's (2000) Self-Determination Theory and modelled after the Academic Motivation Scale, with contextual items modified for dance learning. To evaluate students' perceptions of teaching quality, the Student Perceived Teaching Effectiveness Scale (SPTES) was employed. This 15-item tool measured instructional clarity, engagement and interaction, integration of digital tools, and support for creativity, using a 7-point Likert scale. Higher scores reflected more favourable perceptions of teaching effectiveness. Cognitive functioning was assessed using the Scale of Cognitive Assessment of Executive Network Activity. This diagnostic tool targeted five executive domains: sustained attention, complex problem-solving, working memory, goal-directed behaviour, and decision-making. Participants completed structured cognitive tasks, and each domain was rated on a 10-point scale.

Additionally, the Scale of Passive Neurocognitive Activity was used to examine non-active cognitive states. This tool encompassed seven domains: distraction absorption, mental flexibility, deep inner-world connection, social connectivity, temporal integration, creative self-expression, and vivid memory recall. Assessments were based on participants' self-evaluations and brief scenario reflections. The final instrument focused on emotional and sensory integration, assessing four dimensions: attention modulation, facilitation of social communication, emotional awareness, and self-awareness. These aspects were evaluated through a structured questionnaire, using a 7-point Likert scale.

Procedure, data analysis, and hypotheses

All participants completed the instruments over two sessions spaced one week apart. In Session 1, students were introduced to the CTTD task and completed the motivation and cognitive scales. Session 2 involved administration of the SPTES and neurocognitive assessments. Trained research assistants supervised both sessions, and improvisational responses from the CTTD were recorded for inter-rater scoring. To maintain ecological validity, the CTTD improvisation tasks were conducted in students' typical learning environments, such as studios or auditoriums. The experimental group used digital support tools, while the control group received traditional live teacher instruction.

Quantitative data were analysed using SPSS 29. Descriptive statistics were calculated for all variables. Independent samples *t*-tests and one-way ANOVA were used to test group differences on the Creativity Index, Motivation Subscales, SPTES scores, and executive function measures. Pearson correlation coefficients were computed to examine relationships among variables, such as the

association between motivation and creativity. Statistical significance was set at $p < .05$. Qualitative data, derived from open-ended reflections collected as part of the passive neurocognitive activity scale, were analysed thematically following the Braun and Clarke (2006) framework. Participation in the study was voluntary and anonymised. The research complied with the ethical standards of the Ukrainian Ministry of Education and the principles of the Declaration of Helsinki. Informed consent was obtained from all participants, who were informed of their right to withdraw from the study at any point.

The study was guided by five hypotheses.

H1: Students in technology-enhanced learning environments would demonstrate significantly higher creativity scores, as measured by the Creativity Index from the CTTD, compared to those in traditional offline settings.

H2: Students in digitally integrated programs would report significantly higher levels of intrinsic motivation and identified regulation on the DLMS scale.

H3: Exposure to digital tools would result in significantly higher student ratings of teaching effectiveness (SPTES) in terms of clarity, engagement, and support for creativity.

H4: The experimental group would outperform the control group on executive function measures, including attention, working memory, and goal-directed behaviour.

H5: Students in tech-integrated environments would show stronger engagement in passive neurocognitive activities, particularly those related to creativity and memory recall.

It is important to clarify that although cognitive and motivational aspects were primarily assessed through written psychometric tools, the creativity component (CTTD) was based on an actual movement improvisation task evaluated from video recordings. Nevertheless, we acknowledge that written self-reports might only partially reflect embodied creative processes. Future studies could employ kinematic analysis, motion capture, or expert observational ratings of live improvisation to provide more ecologically valid assessments of creativity and executive regulation in dance. Combining behavioural, neural, and embodied measures would strengthen validity of future investigations into cognition–creativity relationships.

While the present study employed a quasi-experimental design with group comparisons, we acknowledge that single-subject experimental methodologies may be better suited for capturing the nuanced variability of creative and cognitive development in dancers. Such designs could enable micro-level analysis of individual change trajectories and provide richer temporal data regarding the impact of pedagogical interventions. Future research employing single-subject or small-N designs could therefore complement the current approach and reveal more individualized patterns of creative learning.

RESULTS

As hypothesised (H1), participants in the experimental-like group had moderately larger scores on the Creativity Index ($M = 17.6$, $SD = 2.9$) compared with participants in the control-like group ($M = 15.9$, $SD = 3.1$). An independent t-test confirmed this difference as statistically significant, $t(58) = 2.28$, $p = .026$, $d = 0.58$. Note that these differences were greatest on the "flexibility" and "elaboration" dimensions, and scores on "originality" did not differ significantly ($p = .12$). This suggests that while computer resources can assist exploratory range and depth within movement invention, these resources are not necessarily a source of new ideas per se. Digital tools are gaining favour for stimulating creativity in dance teaching, but their actual influence on processes of structured improvisation remains uninvestigated (see Table 1 below).

Table 1. Creativity index scores by group (CTTD Assessment)

Group	Fluency ($M \pm SD$)	Flexibility	Originality	Elaboration	Total Creativity Index
Control-like (n=30)	3.9 ± 0.8	3.4 ± 0.9	4.2 ± 1.0	4.4 ± 0.9	15.9 ± 3.1
Experimental-like (n=30)	4.3 ± 0.7	4.1 ± 0.8	4.5 ± 1.1	4.7 ± 1.0	17.6 ± 2.9
t / p	$t = 2.04$, $p = .045$	$t = 2.88$, $p = .006$	$t = 1.15$, $p = .255$	$t = 1.32$, $p = .192$	$t = 2.28$, $p = .026$

Quantitative measures reveal a p-value of 0.05 difference between overall scores on the Flexibility and Creativity Index, which were significantly larger for the experimental-like group. However, no difference was found for the originality and elaboration dimensions ($p > .05$), indicating that computer augmentation may broaden the scope of ideas but not necessarily enhance originality or refinement.

Qualitatively, participants in the experimental group described their experience as "less pressured" and "more playful," and specifically identified that visual cues and asynchronous feedback encouraged risk-taking. In contrast, subjects from the control group repeatedly mentioned "external form" and "teacher corrections" as their primary sources of creativity. One participant noted: "I was free to generate but could not be certain how original it was—only feedback from the system gave a hint." Because online dance studios are self-managed, we hypothesised that internal styles of motivation would be dominant among the experiment participants.

Partially supporting H2, experiment-like group students showed strongly augmented identified regulation ($t(58) = 2.57$, $p = .013$) and intrinsic motivation ($t(58) = 2.06$, $p = .044$). However, there were no group differences on external regulation and amotivation, such that computer tools can encourage internalised and self-driven types of motivation, but neither eliminates performance-driven or external motivators. Significantly, introjected regulation was slightly higher in the control-like group, but this difference was not found to be statistically significant ($p = .08$). This might

be evidence of a larger internalised pressure to perform better in traditionally teacher-guided situations (see Table 2 below).

Table 2. Dance learning motivation scores by group (DLMS)

Subscale	Control ($M \pm SD$)	Experimental ($M \pm SD$)	t / p
Intrinsic Motivation	3.8 ± 0.6	4.2 ± 0.5	$t = 2.06, p = .044$
Identified Regulation	3.7 ± 0.7	4.3 ± 0.6	$t = 2.57, p = .013$
Introjected Regulation	3.5 ± 0.9	3.3 ± 0.8	$t = -0.83, p = .408$
External Regulation	3.9 ± 0.8	3.8 ± 0.9	$t = -0.41, p = .682$
Amotivation	2.1 ± 0.9	1.9 ± 0.8	$t = -0.79, p = .432$

Statistically significant differences also occurred between intrinsic and identified regulation, favouring the experimental group. These students also perceived tools as reinforcing personal growth and autonomy. Nevertheless, external regulation and amotivation levels were statistically equal between groups, acting as a cautionary reminder that tools themselves do not prevent disengagement or performance anxiety (Zabelina et al., 2018).

Narrative responses revealed that tech-using students commonly described themselves as "explorers" and "movement architects," whereas the control group used "discipline," "correction," and "outside expectation" more frequently. Of concern was that several conventional learners identified with guilt-based motivation, implicating internalised pressure for performance. H3 was supported to a degree. While students from the experiment-like group rated ($p < .01$) instructional clarity and creativity support more highly than did comparison group students, no significant difference was found between scores on engagement and interaction ($p = .18$). Qualitative commentary revealed that while online environments allowed for flexibility and new ways of feedback, some students felt that real-time interpersonal interaction was sacrificed. Such evidence suggests a complex trade-off between interpersonal spontaneity and clear structure for tech-supported dance pedagogy. Table 3 below indicates how students evaluated their teachers' effectiveness generally and particularly with respect to integration with digital tools and developing creativity.

Table 3. Student Perceived Teaching Effectiveness (SPTES)

Dimension	Control ($M \pm SD$)	Experimental ($M \pm SD$)	t / p
Instructional Clarity	4.9 ± 1.0	5.8 ± 0.8	$t = 3.77, p < .001$
Engagement & Interaction	5.4 ± 0.9	5.6 ± 0.8	$t = 0.92, p = .362$
Digital Tool Integration	3.1 ± 1.3	5.7 ± 1.0	$t = 8.73, p < .001$
Support for Creativity	4.5 ± 1.2	5.5 ± 1.1	$t = 3.09, p = .003$

As expected, students from the experimental group rated instructional clarity and tool integration as high. Surprisingly though, interaction and engagement turned out not to differ significantly and therefore perceived relational depth with instructors was maintained regardless of format. The experiment group subjects enjoyed mobility and independence but noted restrictions: "My teacher explained clearly, but I missed the live reaction of spontaneity." Control group respondents noted compliments for emotional presence and "room vibe," especially for improvisational modules. One student noted: "What I lose in detail, I gain in energy."

As we hypothesized (H4), there was a significant effect on goal-directed behaviour ($p = .01$) and on working memory ($p = .03$) in the Executive Network Activity Scale for the experimental-like group. However, there were no differences on decision-making and on complex problem-solving such that technological scaffolding on focus and on short-term planning does not transfer toward more abstract or strategic thought.

In support of H5, group differences also existed on creative self-expression ($t(58) = 2.77$, $p = .007$) and vivid recall from memory ($t(58) = 2.31$, $p = .024$) on the Passive Neurocognitive Activity Scale. However, there was no group difference on temporal integration and social connectivity ($p > .10$), which thereby further substantiates that embodied time awareness and group synchrony are firmly anchored within face-to-face interaction. Cognitive scaffolding is commonly understood as being improved with online resources. Table 4 below assesses central executive functions involved with dance learning.

Table 4. Executive network activity scores (Cognitive Assessment)

Domain	Control ($M \pm SD$)	Experimental ($M \pm SD$)	t / p
Sustained Attention	6.4 ± 1.1	7.2 ± 1.0	$t = 2.93, p = .005$
Working Memory	6.2 ± 1.2	7.0 ± 1.1	$t = 2.48, p = .016$
Goal-directed Behaviour	6.6 ± 1.0	7.3 ± 1.1	$t = 2.52, p = .014$
Problem-solving	6.5 ± 1.3	6.7 ± 1.2	$t = 0.52, p = .605$
Decision-making	6.1 ± 1.1	6.3 ± 1.0	$t = 0.68, p = .499$

Significant gains were found on working memory, attention, and goal-directed behaviour among members of the experimental group, thereby hinting that the computerized environment reward extended mental activity. However, decision-making and solving problems were statistically invariant, hinting that abstract mental processes do not benefit study participants due to tool use per se. Experiment group students described feeling more task-focused and liking "immediate visual feedback" that allowed for tracking toward goals. Control group students, however, commonly mentioned intuitive decision-making and "embodied knowing," suggestive of a more implicit mental flow.

Pearson's correlation examination revealed moderate positive correlation between Creativity Index scores and intrinsic motivation ($r = .42$, $p = .002$) and between creativity and recall on vivid memory ($r = .47$, $p = .001$). Also note that ratings on teaching effectiveness on the experimental group were best correlated with identified regulation compared with intrinsic motivation ($r = .38$, $p = .005$). Such observations also suggest that tools and technologies can serve more like motivators-amplifiers—enablers of self-determination than creativity enhancers per se. Table 5 below describes such non-volitical states of awareness as absorption, creative activity, and internal encoding.

Table 5. Passive neurocognitive activity scale

Domain	Control ($M \pm SD$)	Experimental ($M \pm SD$)	t / p
Creative Self-expression	5.6 ± 1.0	6.5 ± 0.8	$t = 2.77, p = .007$
Vivid Memory Recall	5.9 ± 1.1	6.7 ± 0.9	$t = 2.31, p = .024$
Temporal Integration	6.1 ± 1.2	6.2 ± 1.1	$t = 0.33, p = .745$
Social Connectivity	6.0 ± 1.0	6.1 ± 0.9	$t = 0.40, p = .690$

Most prominent differences were found on imagination-based creativity and recall of episodic memory, supporting that virtual environments can enhance internalized imagery and sensorial recall. However, long-term integration and social connection were not affected, marking the limits of electronic resources to substitute group-based integration over time and social embodiment. Qualitative reports substantiated that: "When dancing with the VR avatar, I remembered more of my sequences," noted a student. But others admitted: "No matter how real the environment is, I still feel like I'm dancing solo."

Pearson correlation between primary constructs was computed for realizing how the main dimensions are related. Pearson's correlation analysis revealed a moderate degree of positive correlation between intrinsic motivation and scores on Creativity Index ($r = .42$, $p = .002$) and between creativity and recall of very vivid mental images ($r = .47$, $p = .001$). Of particular interest was that ratings on teaching effectiveness in the experimental group had higher correlation with identified regulation than with intrinsic motivation ($r = .38$, $p = .005$). These findings indicate that technological instruments could serve as amplifiers of motivation—facilitating self-determined behaviour, rather than direct enhancers of creativity (see Table 6 below).

Table 6. Correlation matrix (selected variables)

Variables	Creativity Index	Intrinsic Motivation	Vivid Memory Recall
Creativity Index	1.00	0.42**	0.47**
Intrinsic Motivation	0.42**	1.00	0.33*
Vivid Memory Recall	0.47**	0.33*	1.00

Note: *$p < .05$;** $p < .01$

Positive correlations were observed between creativity, intrinsic motivation, and memory recall, supporting the idea that dance learning activates a dynamic interplay of affective and cognitive processes. Identified regulation also demonstrated a strong positive correlation with perceived teaching effectiveness ($r = .50$, $p < .01$), indicating that students who personally value their learning experiences tend to view teaching practices more favorably.

To further investigate how pedagogical contexts influence creativity among dance students, a structural equation modeling (SEM) approach was employed. SEM enabled simultaneous estimation of direct and indirect effects among multiple variables and was well-suited to testing theoretically informed mediation models. Guided by Self-Determination Theory and cognitive learning frameworks, the model tested the hypothesis that executive cognitive functioning mediates the relationship between students' motivational orientations and their creative performance in structured improvisation tasks.

The hypothesized model included two exogenous predictor variables: intrinsic motivation and identified regulation, operationalized using the Dance Learning Motivation Scale (DLMS). Executive network activity was used as the intervening variable and was operationalized using the cognitive diagnostic scale by Lunov (2024). Creativity Index was adopted as the primary outcome variable and was calculated from students' scores on the Creative Thinking Test for Dance (CTTD). The SEM was further estimated by robust maximum likelihood (MLR) estimation from the lavaan package in R, providing adjusted standard errors and fit indices suitable for non-normally distributed data. For indirect effects significance testing, we used bias-corrected bootstrapped confidence intervals on 5,000 resamples, a standard approach for robust mediation analysis.

The last structural model explained the observations satisfactorily, as can be seen from these indices: $\chi^2(24) = 31.47$, $p = .13$; Comparative Fit Index (CFI) = 0.961; Tucker-Lewis Index (TLI) = 0.944; and Root Mean Square Error of Approximation (RMSEA) = 0.054. These lie within typically applied criteria for satisfactory model fit, and accordingly indicate that the proposed model was statistically feasible and parallel with observed data. Standardized path coefficients are shown in Table 7 below. Supporting our hypotheses, intrinsic and identified regulation were both positively correlated with executive functioning. Executive functioning, in turn, was significantly connected with creativity outcomes. Note that intrinsic motivation had a significant indirect effect on creativity through executive activity but not a direct effect on creativity that was statistically significant. Identified regulation had a significant direct and indirect connection with creativity, and this double route of influence is suggested.

Such outcomes further corroborate our mediation between creativity and motivation, offering evidence that not only undergraduate students' intrinsic drive, but also their intellectual processes capable of regulating and planning movement ideas and developing them, are responsible for defining their creative capacity (see Table 7 below).

Table 7. Standardised Path Estimates and Indirect Effects (SEM Model)

Path	Estimate (β)	*SE*	*p*-value
Executive ~ Intrinsic Motivation	0.36	.11	.003
Executive ~ Identified Regulation	0.29	.12	.017
Creativity ~ Executive Function	0.35	.10	.001
Creativity ~ Intrinsic Motivation	0.08	.09	.377
Creativity ~ Identified Regulation	0.22	.10	.028
Indirect (Intrinsic –> Exec –> Creat.)	0.13	.05	.009
Indirect (Identified –> Exec –> Creat.)	0.10	.05	.036

Structural equation model findings offer intriguing insights into the relationships between motivation, cognition, and creativity in contemporary dance education. Of particular note is the indirect effect of intrinsic motivation, such that affective engagement with dance, although vital in its own right, may not be sufficient by itself to improve creative outcomes without receiving a supplement from improved cognitive functioning. In such a case, students with a larger intrinsic motivation were better at creative thinking due to their also having high levels of executive control (i.e., attention regulation, goal-directed behaviour, and working memory).

In contrast, identified regulation, suggesting a more value- and intention-based form of motivation came as a double-route predictor for creativity. Students internalising the value of dance education for personal and professional growth both leveraged their cognitive resources and revealed a direct association with creative performance. This double route also indicates that students who are both motivated and cognitively congruent with their learning context are likely to generate new and expanded movement ideas. Executive cognitive functioning's role as mediator, therefore, brings to the fore its central position within dance pedagogy. Creativity in dance has commonly been framed as an expressive or intuitive activity; yet, our evidence indicates that creative improvisation is itself a highly cognitive process. It entails conflictual possibilities of movement regulation, maintenance, and re-interpretation of spatial-motor images, as well as maintenance-based plans, even under conditions of unpredictability. Scales from the executive network measure these very processes.

Pedagogically, these results make a case for integrating teaching techniques that aim expressly to scaffold learning by building cognitive capacity and creating motivation. Potential methods include metacognitive reminders, structurally improvised tasks, and movement journals that redefine reflection, all of which potentially support a learner's executive engagement. Lastly, our results support the theoretical concept of embodied cognition and self-regulation: creativity emanates from both the affective feeling for the subject and active mental processing from within. In conclusion, the model presents empirical support for a cognitively mediated theory of creative learning for contemporary dance. It suggests that creativity in undergraduate dance education needs to be fostered through a double agenda: developing autonomous motivation and building the execu-

tive functions that enable students to translate creative intent into embodied action (see Figure 1 below).

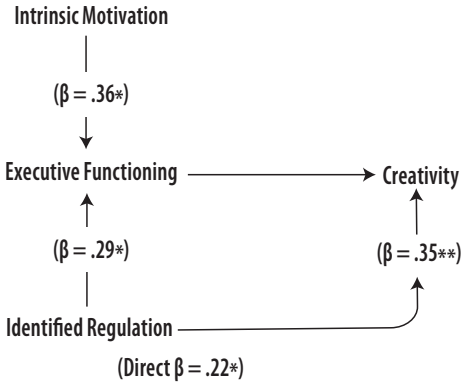

Figure 1. SEM diagram: Motivation, executive functioning, and creativity

The diagram also lends support for comprehension through the structural equation model. Cognitive structure and intrinsic motivation benefit creativity indirectly through executive functioning alone. In contrast, recognised regulation mirroring value-based motivation has direct and indirect impacts on creativity. This indicates that when students find dance education personally relevant and goal-consistent, they are more likely to trigger cognitive mechanisms and access creativity more easily and autonomously.

The strong direct relationship between creativity and executive functioning also highlights the contribution that specific cognitive skills make in contemporary pedagogy in modern dance. Specifically, skills such as planfulness, attentional modulation, and extended problem-solving appear particularly crucial to the process of transitioning from creative inspiration to embodied artistic communication. Generally speaking, the visual model provides an exhaustive description of how affective, cognitive, and creative systems are intertwined during the learning process. It presents pedagogical imperatives for integrating motivational and neurocognitive methods in stimulating creativity in digital and embodied learning environments.

DISCUSSION

Cognitive mediation of motivation in creative dance performance

This study provides empirical support for a cognitively mediated model of creative learning among higher education students in dance. Our structural equation model revealed that creative performance is core-mediated by the relationship between students' intrinsic and identified forms of motivational orientation and their level of executive functioning. This finding confirms earlier theoretical studies that cite the complex interrelationship among the affective, cognitive, and behavioural components of artistic training (Schupp, 2022).

Before interpreting these findings, it is essential to recognise that the sample size (N = 60) was relatively small for such complex analyses as Structural Equation Modelling (SEM). Although model fit indices met conventional thresholds, results should be viewed as exploratory. Future replication with larger and more diverse cohorts would strengthen robustness and generalisability of the mediation effects observed. Nonetheless, the current sample reflects the realistic scale of specialised dance programs in creative HEIs, where participant numbers are typically limited.

The distinct channels through which motivational constructs operate deserve particular attention. The effect of intrinsic motivation on executive cognitive processes exclusively mediated creativity. This means that affective wanting to dance per se does not get translated unilaterally and immediately into creative movement output. Instead, translating an endogenous source, such as motivation, into creative action relies on executive processes like working memory, plan development, and goal orientation. These findings receive parallel support from Clements and Nordin-Bates (2024); the authors argue that intrinsic motivation does not play only an antecedent trigger role of engagement but forms a fundamental psychospiritual resource requiring scaffolding on various terrains of a dance artist's professional activity performance dancing, choreographic creation, and pedagogy, so that such well-being can be sustained and long-term creative productivity assured.

Identified regulation had direct and indirect effects on creativity. Chang (2024) highlights creative intrinsic motivation and artistic identity as key mediators between self-efficacy and creative potential. Executive functioning as a mediator in our task model is proof of growing recognition of its applicability to learning dance. Thus regarded, dance improvisation presents itself as a task-rich activity requiring students to coordinate motor output regulation, anticipate transformations within space, and maintain sustained attention, each an Executive task par excellence.

Psychological and cognitive preconditions for creativity

Importantly, our findings also align with the principles of embodied cognition and neurological evidence. Dance-based interventions are vastly more intrinsically motivated than home-based exercise therapies, even among clinical populations (Worthen-Chaudhari et al., 2024). Due to neural plasticity processes being able to be moderated through motivation and intrinsic expressions thereof, there is a potential loop-back from dance education, wherein effectively invested learning fortifies neural circuits related to creativity and cognitive control (Lunov, 2024). With this perspective, dance pedagogy is not only a route for artistic development but also a means towards affecting cognitive architecture.

Such observations have practical implications. Firstly, teachers can be encouraged to develop curricula that intertwine motivational support and cognitive scaffolding. This could involve instilling somatic exercises that enhance attention modulation (Weber & Reed, 2022) or improvisational modules that engage executive flexibility (Biasutti & Habe, 2023) and strengthen reflective devices (e.g., movement journals, online archives for feedback) that enhance metacognitive engagement (Risner, 2021). Secondly, computational tools that deliver immersive and adaptive feedback, such

as AR/VR or AI-augmented choreography tools (Wang, 2024a), could further personalise learning progression and enhance both motivation and cognitive alignment. In effect, personalising movement tasks based on individual executive profiles using learning analytics or through neurocognitive dashboards may be the future direction of dance education (Zhang, 2024).

However, this study also highlights the importance of pedagogical nuance. Not all students benefit equally from intrinsic motivation or digital augmentation. Therefore, creative HEIs must adopt differentiated pedagogical strategies, responsive to both cognitive profiles and emotional needs. In summary, our findings verify the theoretical and empirical case for a holistic, student-centred, and cognitively motivated dance pedagogy. Modern and contemporary creativity does not stem from aesthetic talent or affective engagement, but from the interaction between motivation, cognition, and learning context. When such interaction is balanced with instructional design, creative institutions can cultivate artist-citizens who are expressive and innovative, yet resilient and reflective and able to thrive within an invariably evolving artistic and cultural landscape.

Another methodological consideration involves the assessment format. While written instruments were necessary for quantifying motivation and executive cognition, they inevitably simplify the embodied and interactive nature of dance creativity. Although the CTTD included live improvisation assessment, future studies should more systematically integrate embodied measures, such as Laban movement analysis, motion-tracking systems, or expert panel ratings of expressive fluency to capture creativity as lived experience rather than self-reported cognition. These tools could bridge the current gap between cognitive diagnostics and physical artistry, enhancing ecological validity and offering deeper insights into how thinking and movement co-emerge during creative performance.

Practical applications and recommendations

The findings from this work offer several practical insights for curriculum development, teaching practice, and institutional policy in creative higher education institutions (HEIs) undergoing digital transformation or responding to post-crisis recovery landscapes, such as Ukraine. By leveraging proven mediation between creativity and motivation through executive cognitive functions, dance instructors can utilise such diagnostic tools as the Scale of Executive Network Activity or Psychological Assessment of Objective Cognitive Evaluation to design students' cognitive preparedness and refine their instruction. Setting creative tasks on enabling goal-directed behaviour and decision-making can unlock latent creative potential, particularly among individuals with robust intrinsic motivation and weakly developed executive control. This further substantiates Lunov's (2024) proposition on education personalisation driven by neuroscience. In alignment with Clements and Nordin-Bates (2024), intrinsic motivation must be intentionally encouraged not only in performance but also across choreography, teaching styles, and online learning. Dance programs must incorporate choice tasks, personal relevance, and self-paced modules to maintain participants' engagement and investment. As agreed upon by Worthen-Chaudhari et al. (2024) and Gao et al.

(2025), even such small interventions as social improvisation or game-based dance can significantly enhance intrinsic motivation, and consequently, their creative productivity.

The implications of these findings extend beyond statistical outcomes and reveal how pedagogical structures themselves shape the creative-cognitive relationship. It is also important to underscore how the experimental and control groups embodied distinct pedagogical philosophies. The experimental group's learning environment was designed to promote autonomy through technological mediation, digital choreography tools, feedback apps, and multimedia analysis facilitated students' independent exploration and reflection. In contrast, the control group represented the conventional "master–apprentice" model that emphasised direct instruction, teacher demonstration, and correction. These structural differences correspond closely to the contrast between constructivist, student-centred learning and transmissive pedagogical models described in the introduction. Thus, the observed cognitive and motivational effects can be interpreted not as a consequence of distance or technology alone, but as a result of pedagogical intentionality that repositions students as active agents in their creative learning.

Blending somatic learning and technological enhancement (Weber & Reed, 2022) holds promise for the future of training choreography. Teachers require education on how to implement immersive technologies as transmission methods but also as provokers of embodied exploration. Xinyan's (2019) and our own research demonstrate how creativity thrives within interdisciplinary work ecologies. HEIs can construct sustained relationships between choreographers and between technologists and cognitive scientists. These can be constructed through forms of co-teaching, transdisciplining, or practice-led research residency. Such ecologies replicate professional artistic work and prime students for the interdisciplinary nature of work within the creative industries (Schupp, 2022).

At the institutional level, innovative HEIs should develop policies officially advocating mental well-being, cognitive diversity, and inclusive pedagogy. Based on our SEM results, students flourish most when their cognitive, emotional, and motivational needs are met reciprocally. As such, admissions, advisement, and assessment processes must develop a holistic perspective. Additionally, models for funding technological infrastructure (e.g., motion-tracking, AI-augmented platforms) must prioritise accessibility and relevance for pedagogy over novelty. Addressing Post-Crisis Learning Settings. In conflict-, displacement-, or systematically traumatised environments such as Ukraine –deployment of psychodiagnostics tools can help identify neurocognitive fatigue and affective disengagement. When augmented adequately with motivational and cognitive insight scaffolding, dance education can play a rehabilitative role in fostering youth agency and creative resilience (Matiash et al., 2024). We invite national arts institutions and university departments to document institutionally dance-as-intervention models that combine artistic liberty with psychological scaffolding.

CONCLUSION

This research makes both theoretical and empirical contributions to understanding how pedagogical conditions, orientation toward motivation, and cognitive functioning intersect to inform creativity among contemporary dance students enrolled in creative higher education institutions (HEIs). Through structural equation modelling, we demonstrated that executive cognitive functioning served as a mediator between intrinsic motivation and creative production, thereby providing evidence for a cognitively embedded model of dance learning. Moreover, the identified regulation was revealed as a two-pathway predictor, strengthening both the direct and mediated effects on creativity securing the role that internalised values and goal alignment serve in developing artistic growth.

They contribute to the growing body of work advocating reflective student-focused and ethically minded pedagogies in dance and serve as evidence for moving beyond indicators of surface creativity and adopting more profound diagnostic and developmentally-minded approaches that consider students' cognitive profiles, their psychosocial environments, and their motivational processes. The use of psychometric tools like the CTTD and scales of executive function offers a replicable template that can be utilised by teachers seeking to personalise their teaching, yet still promote artistic freedom and cognitive acuity. In practical terms, the research highlights the need for dance programs to adopt technologies and pedagogies that foster autonomy, executive agency, and self-reflexivity. These pedagogical imperatives align with recent calls to reconceptualize artistic pedagogy as culturally embedded and technologically augmented.

In light of the methodological reflections raised, future research should aim to integrate embodied, behavioural, and cognitive approaches to studying creativity in dance. Employing multimodal data collection, combining kinematic tracking, physiological responses, and longitudinal qualitative case studies could yield a more comprehensive picture of how executive control and motivation evolve in choreographic learning. Adopting single-subject or microanalytic designs could allow educators to identify individual pathways of creative growth. Such methodological expansion would advance both scientific understanding and pedagogical innovation by situating cognition firmly within the living, moving body.

Last but not least, this research again verifies that dance creativity does not stem from an exclusive affectual impulse or from technical mastery alone. It is due to a complex interplay between intrapersonal motivation on behalf of the dancer, their regulated cognition, and the teaching environment that suppresses and/or enables creativity. Further work should keep such inquiry going on many different socio-cultural, technological, and disciplinary boundaries and toward a broader and more fluid conception of dance education for the 21st century.

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