



How Dance-Based Somatic Training Shapes Aesthetic Judgment: The Mediating Role of Kinesthetic Empathy

Shiyue Bi*

School of Art, Shandong University, Weihai, Shandong, China

*Email: bishiyue888@163.com

Abstract. The role of dance-based somatic education in changing dancers' perceptions and assessment of movement has been widely considered, although empirical evidence regarding its dimensional specificity and dose-response relationship is still inconclusive. In the present study, we aim to investigate the influence of cumulative dance practice on aesthetic evaluations according to four different standards, using kinesthetic empathy as a possible mediator. In all, 120 right-handed participants were divided evenly between dancers and controls without a dancing background. The subjects were assessed for nine dance videos regarding their level of technicality, expressivity, innovation, and emotional valence. Dancers outperformed the controls on technicality ($d=0.78$) and expressivity ($d=0.65$), while having slight advantages on the other dimensions. There was a saturating quadratic association between aesthetic sensitivity and training experience, at approximately 9.2 years. Kinesthetic empathy accounted for 57.4% of the indirect effects on the variables discussed above.

Keywords: dance-based somatic training, embodied cognition, aesthetic judgment, dancers, kinesthetic empathy

1 Introduction

1.1 Research Background and Questions

Unlike any other art form, dance differs because of the tight connection between its perceiving and doing, which both use the same neurological mechanisms. The perception of dancing done by professionals triggers neurological pathways similar to those engaged in the process of performing dance moves. Indeed, during the last two decades, studies carried out by experts working in the field of neuroaesthetics have shown how prior experience of bodily movement impacts perception ^[1]. Thus, observations and personal experience of dancing led to studies on how physical training shapes aesthetic preferences. There are three central questions in the present study that include the following issues. The first one is concerned with the question whether dancers differ from untrained people in terms of how certain features of dance films affect their aesthetic perceptions. While some features show a low to moderate group effect size, the variability in group effect size between studies has proved to be very high. Question two

aims at determining whether there is any relationship between total training and sensitivity to beauty by taking into account the variable for training as a continuous one because past research reveals that the effect of total training is not likely to be linear and that diminishing returns are normally found in the span of eight to ten years. Question three seeks to determine whether kinesthetic empathy, which refers to the internal representation of observed movement, acts as a mediator for the relationship between training and sensitivity to beauty.

1.2 Research Significance

The importance of this study has three perspectives. To begin with, theoretically speaking, since the application of somatic training is treated as a continuum as opposed to a binary construct in the context of the research background, it is feasible for this study to analyze the theory of embodied aesthetics as a continuous process. Methodologically, the use of an aesthetic evaluation consisting of four factors, expert-based stimulus validation, and a kinesthetic empathy scale addresses one of the key problems within the area by providing the necessary standardization and dose-response examination, which were previously lacking ^[2]. From a practical perspective, the expected findings may have implications in the realms of dance education and choreography, seeing that the link among the impacts of bodily training, perceptual sensitivity, and spectator response has been primarily discussed from an intuitive perspective until now. Establishing which attributes can be trained and at what point sensitivity stabilizes may be useful for dance schools seeking to revise their programs, as well as for choreographers looking to create dance performances for varied audiences.

2 Literature Review and Hypotheses

2.1 Core Tenets of Embodied Aesthetics

In accordance with the theory of embodied aesthetics, beauty is more than contemplation; beauty also entails the actual participation of the body. Rather than being an added part of viewing a piece of art, the participation of the body in perception, simulation, and proprioception forms part of the perceptual experience. In studies performed under conditions of installation/performance art, proprioception, as well as disturbance of body experience, was identified as a predictor of aesthetic transformation, with proprioception emerging as a significant variable in the artistic experience within the museum environment ^[3]. This principle is of relevance in research regarding dance. Insofar as one element of aesthetic experience hinges to some extent on the somatic ability of the perceiver, perceivers whose somatic ability is improved by training will differ from other perceivers who lack such training. Such an assumption could be linked to the simulated embodiment route.

2.2 Cognitive Evidence from Dance Spectatorship

The results of recent behavioral and neuroimaging studies over the past five years have clearly shown that the idea of the effect of dance training on the processing of movements is valid. In an experiment with fNIRS involving a two-stage procedure, dance training by physical experience helped to improve performance in terms of enjoyment, familiarity, and reproduction, along with activation of the inferior frontal gyrus and the right middle temporal gyrus in correlation with competence [4]. The same results were obtained at the group level through experiments done with kinematic stimuli, where it was found that dancers and non-dancers differed in terms of the manner in which they integrated movement amplitude while giving aesthetic ratings to stick figures, thus proving that kinematics influenced aesthetics via sensorimotor experience [5]. The results of such studies indicate that the effect of experts on the aesthetic perception process is much more complicated and includes both recognition and evaluation stages. Furthermore, the ability of such effects to be applied cross-culturally and cross-domain implies that the importance of experts on evaluations depends on the match between trained motor schemas and style being observed. Naive people demonstrate higher levels of ingroup bias, and the degree to which it occurs decreases based on artistic experience [6].

2.3 Research Hypotheses

The three hypotheses below have been derived from the theoretical discussions and research conducted previously. According to Hypothesis H1, the dancers will score higher than the non-dancers in all measures of aesthetic perception, except for those pertaining to the dimensions of novelty and emotional appeal. There will be a positive correlation between training duration and aesthetic sensitivity, but it will not be a linear one and will decrease after eight to ten years of accumulated training. The correlation between the years of training and aesthetic sensitivity is expected to be mediated by kinesthetic empathy, accounting for most of the indirect correlation.

2.4 Theoretical Model

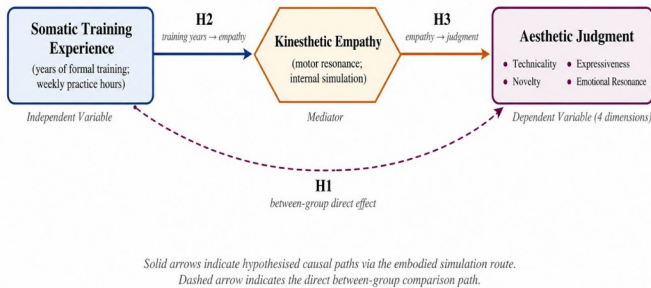


Fig. 1. Theoretical Model of Somatic Training, Kinesthetic Empathy, and Aesthetic Judgment.

The hypothesized association is then consolidated in one mediation model framework, as shown in Fig. 1 below. Somatization training is used as an independent variable, while kinesthetic empathy acts as a mediator, and aesthetic judgment on four separate dimensions is used as the dependent variable. The possible paths that can be taken for the three hypotheses include H1, H2, and H3.

3 Research Method

3.1 Participants

In total, 120 subjects consisting of adults between the ages of 18 and 32 who were all right-handed participated in the experiment. This was divided equally between a dancing group ($n = 60$) and non-dancing control group ($n = 60$). The dancers consisted of those selected from professional institutions and universities located in Beijing and Shanghai with a minimum experience of three years of training. The controls were students from universities who had never undergone any form of dance training. All subjects had normal vision acuity, both in terms of correction and without correction, and all subjects were briefed on the Helsinki declaration criteria. From Table 1, it is evident that age, gender composition, and years of education in groups were not different, but there was a variation in terms of frequency of exposure to art and dancing styles.

Table 1. Participant Demographics and Group Equivalence Tests.

Variable	Dancer group ($n=60$)	Control group ($n=60$)	t / χ^2	p
Age ($M \pm SD$, years)	22.4 $\pm$ 3.2	22.7 $\pm$ 3.5	$t = -0.49$	.624
Gender (F/M)	38/22	36/24	$\chi^2 = 0.14$	.708
Years of education ($M \pm SD$)	15.6 $\pm$ 1.8	15.4 $\pm$ 1.9	$t = 0.59$	.555
Artistic exposure (sessions/month)	18.3 $\pm$ 5.2	4.7 $\pm$ 2.8	$t = 17.84$	<.001
Dance genre (ballet/contemporary/folk)	24/22/14	n/a	n/a	n/a

3.2 Stimuli

A total of nine videos of dancing were selected from previously available databases for stimuli, where dancing was performed by professional dancers in dance groups. These nine selected videos featured dancing of the entire body against a grey background with no sound. Before selecting these videos, three dance experts rated all the videos available based on the aesthetic rating scale that ranged between one and seven, and these nine selected videos possessed a correlation coefficient of .82, as shown in Table 2.

Table 2. Inventory of Experimental Dance Video Stimuli.

Video ID	Genre	Style	Duration (s)	Expert mean	Source
V01	Ballet	Classical	8	5.8	Christensen library
V02	Ballet	Classical	8	5.4	Christensen library
V03	Modern dance	Contemporary	8	5.6	Original recording
V04	Modern dance	Contemporary	8	5.1	Original recording
V05	Chinese classical	Classical	8	5.5	Beijing Dance Academy
V06	Jazz	Contemporary	8	4.9	Original recording
V07	Contemporary	Contemporary	8	5.7	McNorm library
V08	Ballet	Classical	8	5.2	Christensen library
V09	Folk fusion	Contemporary	8	4.8	Original recording

3.3 Measurement Instruments

Aesthetic judgment assessment was performed using four 100-point slider scales involving parameters such as technicality, expressiveness, novelty, and emotional content. The kinesthetic empathy scale comprised 12 self-report items adapted from established scales for measuring motor empathy and bodily awareness skills and had reached Cronbach's alpha value of .87 in the present sample population. Somatic training experience was measured in years of training and hours of training per week during the peak periods of life.

3.4 Experimental Procedure

Each test was about 45 minutes long and carried out in an isolated lab cubicle where participants watched the videos on a 24-inch monitor at a distance of 60 centimeters. Before going into the rating part, the participants were asked to fill out a demographics

and training history questionnaire. The nine video clips were played in a random order through the PsychoPy software version 2023.2, while the four aesthetic ratings were also presented to the participants in a counterbalanced order for each video clip.

3.5 Data Analysis

For the differences among the groups based on the four dimensions of aesthetics concerning the first hypothesis, independent samples t-tests were run. For the second hypothesis on years of training, quadratic regression was performed since the expected pattern is saturation at eight to ten years of experience. For testing the third hypothesis about the mediation, bias-corrected bootstrapping was performed with 5000 resamples through PROCESS macro version 4.2. These statistical procedures were conducted via SPSS 26.0 and R 4.3.1, with an alpha level of .05 two-tailed.

4 Results and Discussion

4.1 Between-Group Differences (H1)

The independent samples t-tests indicated a marked differentiation of effects between groups within the four aesthetics. As indicated in Table 3 below, dancers scored significantly higher than control participants on technicality ($d=0.78$) and expressiveness ($d=0.65$), with effect sizes of these measures being medium to large as per the conventional classification for trained versus untrained comparisons in body movements [7]. The differences between the two groups were less distinct when it came to novelty and emotions and were also not statistically significant. This dissociation of the dimensions supports Hypothesis One, meaning that the advantages gained through the training process are tied more to motor skills than to emotions.

Table 3. Between-Group Comparisons of Aesthetic Ratings Across Four Dimensions.

Dimension	Dancer (M±SD)	Control (M±SD)	t	p	Cohen's d
Technicality	72.4±11.6	63.1±12.3	4.27	<.001	0.78
Expressiveness	70.8±12.1	62.5±13.0	3.62	<.001	0.65
Novelty	64.3±13.5	61.7±13.8	1.04	.299	0.19
Emotional resonance	67.2±12.8	65.4±13.2	0.76	.448	0.14

4.2 Dose-Response Effect (H2)

A quadratic regression analysis run on the subsample of dancers revealed that there is a non-linear correlation between the number of training years and standardized aesthetic sensitivity ($R^2=.41$, $F(2,57)=19.83$, $p<.001$). In the model, the coefficient for the linear variable was positive ($\beta=0.62$, $p<.001$), while that of the quadratic term was negative ($\beta=-0.28$, $p=.012$). It can be seen from the curve fit that the saturation threshold occurred at about 9.2 years of accumulated training, and beyond this, each year of further practice resulted in marginal gains in sensitivity. This is illustrated in the genre-specific curves presented in Fig. 2 below.

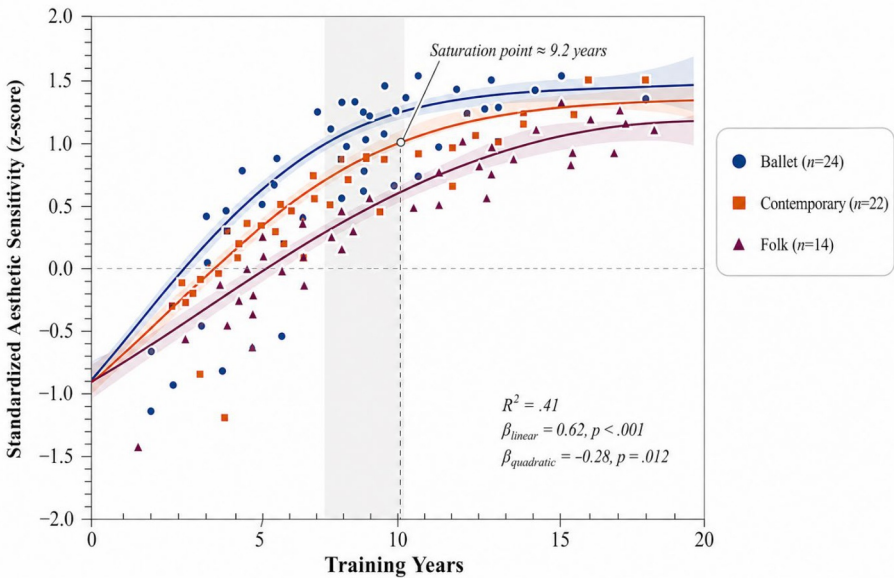


Fig. 2. Dose-Response Curve Between Training Years and Aesthetic Sensitivity.

4.3 Mediation Effect (H3)

Bias-corrected bootstrap mediation analysis showed that the impact of training experience on aesthetic judgment mediated by kinesthetic empathy was statistically significant ($ab=0.31$, 95% CI [0.18, 0.46]). The overall effect ($C = 0.54$; $p < .001$) became small but still significant after controlling for kinesthetic empathy ($C' = 0.23$; $P = .014$); thus, it was only partially mediated. The proportion of the total effect carried by the indirect path reached 57.4%, consistent with theoretical accounts that position internal motor simulation as a substantive intermediate process between cumulative bodily training and evaluative output^[8]. The complete path structure of the standardized coefficients is shown in Fig. 3.

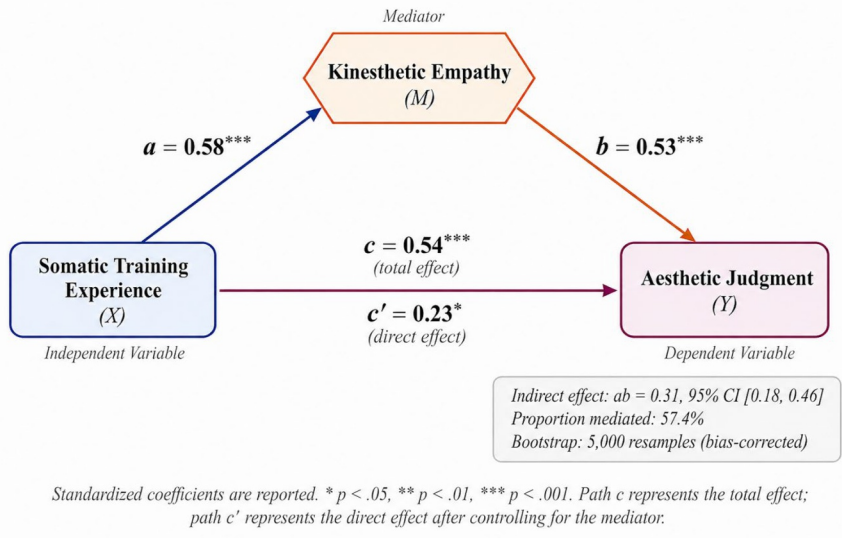


Fig. 3. Mediation Path Diagram of Kinesthetic Empathy.

4.4 Discussion

The dimensional dissociation shown by H1 is consistent with cross-cultural evidence that aesthetic preferences differ according to accumulated body experience under specific channels of trained motor repertoires, which is not equally distributed among several evaluation domains [9]. The nonlinear training curve in H2 corresponds to the most recent qualitative evidence that recognizes narrative elements and movement textures as components with a threshold of perception stabilization, beyond which further refinement is unlikely to occur [10]. Partially mediated H3 suggests that kinesthetic empathy is significant but still cannot cover all the paths of training into judgments; There are other parallel pathways, including knowledge schema, attentional habit, and stylistic similarity. Three boundary conditions require attention. The sample is limited to young Chinese adults; there are no live performances in the stimuli, and self-reports measuring kinesthemic empathy carry certain deficiencies compared with physiological indexes.

5 Conclusion

Somatic training reformed artists' appreciation of art along selected evaluation routes, not for all dimensions of aesthetics equally. Group comparison demonstrated significant performance discrepancies in technology and expression skills compared to novelties and emotions; thus, this embodied-simulation account is considered dimensional-specific according to operation outcomes. The train-year predictor showed that the number of years of practice was around 9.2 for saturated perceptual improvement. Kinesthetic empathy carried 57.4% of the indirect effect from training history to aesthetic

judgment, supporting partial mediation. These findings recommend graded modeling of expertise and dimensional precision in future neuroaesthetic protocols of dance perception.

References

1. Zardi, A., Carlotti, E. G., Pontremoli, A., & Morese, R. (2021). Dancing in your head: An interdisciplinary review. *Frontiers in Psychology*, 12, 649121. <https://doi.org/10.3389/fpsyg.2021.649121>
2. Orlandi, A., Darda, K. M., Calvo-Merino, B., & Cross, E. S. (2025). Editorial: Methods in cognitive neuroscience — dance movement 2023. *Frontiers in Human Neuroscience*, 18, 1542595. <https://doi.org/10.3389/fnhum.2024.1542595>
3. Kühnapfel, C., Fingerhut, J., & Pelowski, M. (2023). The role of the body in the experience of installation art. *Frontiers in Psychology*, 14, 1192689. <https://doi.org/10.3389/fpsyg.2023.1192689>
4. Casale, C. E., Moffat, R., & Cross, E. S. (2024). Aesthetic evaluation of body movements shaped by embodied and arts experience — Insights from behaviour and fNIRS. *Scientific Reports*, 14, 25841. <https://doi.org/10.1038/s41598-024-75427-9>
5. Vinken, P. M., & Heinen, T. (2022). How does the amount of movement and observer expertise shape the perception of motion aesthetics in dance? *Human Movement*, 23(2), 46–55. <https://doi.org/10.5114/hm.2021.106170>
6. Darda, K. M., & Cross, E. S. (2022). The role of expertise and culture in visual art appreciation. *Scientific Reports*, 12, 10666. <https://doi.org/10.1038/s41598-022-14128-7>
7. Christensen, J. F., Bruhn, L., Schmidt, E.-M., Bahmanian, N., Yazdi, S. H. N., Farahi, F., Sancho-Escanero, L., & Menninghaus, W. (2023). A 5-emotions stimuli set for emotion perception research with full-body dance movements. *Scientific Reports*, 13, 8757. <https://doi.org/10.1038/s41598-023-33656-4>
8. Monroy, E., Imada, T., Sagiv, N., & Orgs, G. (2022). Dance across cultures — Joint action aesthetics in Japan and the UK. *Empirical Studies of the Arts*, 40(2), 209–227. <https://doi.org/10.1177/02762374211001800>
9. Stutesman, M. G., & Goldstein, T. R. (2024). Mechanisms for affect communication from dance — A mixed methods study. *The Journal of Creative Behavior*, 58(1), 28–46. <https://doi.org/10.1002/jocb.622>
10. Christensen, J. F., Schmidt, E.-M., Frieler, K., Smith-Chase, R. A., Sancho-Escanero, L., Michalareas, G., Ullén, F., & Cross, E. S. (2025). Aesthetic appeal of dance actions depends on expressivity, liveness and audience characteristics. *Cognition*, 263, 106152. <https://doi.org/10.1016/j.cognition.2025.106152>

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