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Article

Enhanced Nondual Awareness and Creativity Through a Paired Eastern Martial-Arts Exercise: A Randomized Controlled Trial

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Abstract

Mind–body practices such as meditation, yoga, and martial arts have been shown to foster psychological well-being and flexible self-experience. However, few studies have examined meditative bodywork rooted in martial traditions or addressed short-term psychological effects related to shifts in self–other boundaries. The present study examined the short-term psychological effects of the Wakame Exercise, a paired body–mind practice derived from Japanese martial arts. Seventy undergraduates were randomly assigned to one of three conditions: the Wakame Exercise, a meditative pair movement emphasizing softness and fluidity; a control practice, Push-Hand Sumo, involving structured physical interaction; or rest. Psychological outcomes included nondual awareness, perception of body boundaries, creativity, decentering, and mood. Compared with controls, the Wakame Exercise group reported significantly greater nondual awareness and reduced salience of body boundaries. Within the Wakame Exercise group, higher nondual awareness was positively correlated with creative attitudes, which in turn were linked to greater decentering. Notably, increases in nondual awareness occurred independently of baseline boundary thinness. These findings suggest that brief paired practices rooted in Eastern martial arts can promote nondual awareness and temporary boundary dissolution, potentially enhancing creativity. Such practices may provide an empirical basis for integrating traditional Eastern methods into contemporary psychology.

Keywords: martial arts; Wakame Exercise; nondual awareness; self-other boundary; creative regression

1. Introduction

Traditional Eastern body-mind practices, including martial arts, zazen meditation, qigong, tai chi, and yoga, have gained academic attention for their potential to transform both mental and physical status. These practices are suggested to involve not merely physical exercises but also incorporate meditative elements and self-cultivation, often framed as a “Way” (dō), in which mind and body are developed in an integrated manner (Yuasa, 1990). A central feature is the cultivation of a state in which the body is experienced as being continuous with others and the surrounding world, i.e., a state referred to as a “pre-subject-object” mode of bodily awareness (Yuasa, 1990). For example, in aikido, a form of martial arts, practitioners seek to harmonize with an opponent’s movements rather than resist them forcefully, to transcend the dichotomy between self and other (Kudo & Shishida, 2010).

Empirical studies have suggested that both tai chi and qigong can enhance parasympathetic activity, reduce heart rate and blood pressure, improve respiratory functions, and potentially reduce oxidative stress (Wang et al, 2013; Goon, 2009). Tai chi practice has also been found to alleviate

depression and anxiety as well as to increase psychological well-being, self-esteem, and life satisfaction (Priddy, 2018; Wang, 2013; Wang et al, 2010). Mindfulness-enhanced tai chi programs have shown greater improvements in mindful awareness and stress reduction compared with traditional forms of tai chi (Qu et al., 2024). In Japan, martial arts have historically been practiced both as techniques of combat and as disciplines for holistic self-development, and training has been associated with emotion regulation, self-esteem, and positive personality traits (Burke, 2007; Moore, Dudley, & Woodcock, 2020). For example, Aikido practice emphasizes breathing, balance, centering, and connection with a partner (Kudo & Shishida, 2010), which is deemed to cultivate non-judgmental awareness comparable to mindfulness (Lothes, 2013).

From a philosophical perspective, many Eastern traditions have offered different positions from the Western conception of a fixed, autonomous self. In fact, Buddhist thoughts typically deny the existence of a permanent, independent self, and instead encourages realization of the state of consciousness without a subject-object distinction (Kelly, 2008; Zoran, 2019). In the context of psychological studies, such state of consciousness is referred to as nondual awareness (NDA). NDA involves an experiential dissolution of self-other boundaries, often described in meditative contexts as expansion into space, merging with the environment, or a sense of formless awareness (Zoran, 2019; Hanley, Nakamura, & Garland, 2018; Gyamtso, 1994; Nguyen et al., 2020). In Western psychiatry, such fluidity of self-other boundaries is often considered to reflect psychopathological status (Federn, 1952) such as depersonalization (Nave et al., 2021). However, thinness of self-other boundaries has also been positively linked to heightened sensitivity and creativity (Hartmann, 1991). Psychoanalytic theorists have coined the term “creative regression” to denote a temporary loosening of ego boundaries that can enable intuitive insight, so long as self-regulatory capacities are well maintained (Kris, 1952; Schafer, 1954). In addition, previous studies suggest that boundary-dissolving experiences are not limited to advanced practitioners of meditation or martial arts (Nave et al., 2021). Even novices can undergo temporary shifts in self–other boundaries. According to the theory of creative regression (Schafer, 1954), when the loosening of self–other boundaries occurs while basic self-functions remain intact, it can enhance psychological flexibility and creativity. Under such conditions, decentering—the metacognitive ability to observe one’s thoughts and emotions as transient mental events without over-identifying with them (Fresco et al., 2007)—may support creativity and positive psychological states in the context of blurred boundaries.

2. Purpose of the Present Study

Building on these theoretical and empirical insights, the present randomized controlled trial aimed to examine whether the “Wakame Exercise,” a basic paired practice derived from a contemporary school of martial arts based on Japanese traditions, can induce changes in psychological status including perception of self-other boundary, creative attitude, mood states, etc. Based on the practical implications of Wakame Exercise to dissolve self-other boundaries, we formulated the following hypotheses: (1) Wakame Exercise would enhance nondual awareness and reduce perception of bodily boundaries compared to the control groups; (2) Within the Wakame Exercise group, nondual awareness would be positively associated with creative attitudes; (3) Within the Wakame Exercise group, creative attitudes would show positive associations with decentering and positive mood. (4) Within the Wakame Exercise group, high JBQ scores, indicating thinner psychological boundaries, would be positively associated with experience of nondual awareness and negatively associated with salience of body boundaries after the practice.

3. Materials and Methods

3.1. Participant

A total of 70 undergraduate students (52 females, 18 males; age range = 18–23 years, $M = 19.5$ years, $SD = 1.00$) who belonged to a private university located in Tokyo, Japan, participated in the study. There were no participants who did not report their sex. All participants were enrolled in one

of the three undergraduate seminars on psychology held by the third author and participated as part of the course activities. For the randomized controlled trial (RCT), participants were randomly assigned to one of the three groups using a stratified randomization procedure to ensure an approximately balanced distribution of sex across groups: (1) the Wakame Exercise group as an experimental group ($N = 25$; 20 females, 5 males; age range = 19–21 years, $M = 19.4$ years, $SD = 0.64$), (2) the Push-Hand Sumo group as an active control ($N = 25$; 15 females, 10 males; age range = 19–23 years, $M = 19.5$ years, $SD = 1.20$), and (3) the Rest group as a passive control ($N = 20$; 17 females, 3 males; age range = 18–23 years, $M = 19.4$ years, $SD = 1.09$). There was no duplication of participants in the three data collection sessions. Participants were not compensated for cooperation in the study.

3.2. General Procedure

Data collection was conducted during three separate sessions on different dates (12 May 2023, 19 October 2023, and 14 June 2024). Data collection was conducted during one class of the seminar course for undergraduate students. At the beginning of each class, the researchers (first and third authors) distributed the paper-based, pre-survey questionnaire sheet to the participants and orally explained the content of the study, including the overview of the study as well as information on the protection of personal information. Participants were also clarified that both participation in the assigned activities and cooperation in the survey were voluntary and that they will not affect the grading of the course. In addition to the demographic information, the pre-survey questionnaire asked about whether the participant engaged in daily practice of Eastern tradition-based mind-body practices such as mindfulness, meditation, martial arts, yoga, etc. The survey also included the Japanese Boundary Questionnaire (JBQ) (Kodama, 2013) and the state questionnaires. After the researchers (first and third authors) explained the content of the study, participants completed the pre-practice questionnaire. They were then informed of their group assignment and directed to separate locations on campus according to their assigned group. Participants in the Wakame Exercise group were guided by the second author, those in the Push-Hand Sumo group were similarly guided by the first author, and participants in the Rest group were instructed to move to the library located within the university campus. The practical session for each group lasted for 45 minutes, and the total session duration, including instructions and completion of the pre- and post-session questionnaire surveys, was approximately 100 minutes. Immediately after the practice session ended, all participants returned to their original room and were instructed to complete the post-practice questionnaire. The post-practice questionnaire included the same psychological state measures as those administered before the practice.

3.3. Intervention for Each Group

3.3.1. Wakame Exercise Group

The “Wakame (seaweed) Exercise” is one of the basic practice methods of *Tenshintaido*, which is a school of martial arts founded by Hiroyuki Aoki based on Japanese traditions. The wakame exercise is also called a meditative *kumite* (sparring practice), because of its contemplative nature to emphasize acceptance of the present moment and promotes a natural state of being (Aoki, 1997). According to Aoki (1997), the Wakame Exercise, as a basic practice focusing on the cultivation of soft and flexible bodily movements, facilitates mental unification and allows practitioners to experience the essential aspects of martial arts. The exercise can be safely performed by individuals regardless of prior experience with Eastern mind-body practices. In the wakame exercise, practitioners are assigned to one of two roles: the wave-player or the wakame-player. The wave-player gently applies pressure to the wakame-player’s shoulders and back, while the wakame-player moves their body softly, surrendering to the sensations and movements generated by the wave-player (Figure1). As the practitioners repeatedly engage in such interactions while switching roles, the distinction between self and other is assumed to fade gradually, evoking a meditative sense of fusion. In the present study, the wakame exercise was instructed by the second author, an experienced martial arts

practitioner who has trained in the Kenbu Tenshin-Ryu school, primarily focused on swordsmanship. He served as a certified Shihan at the Kenbu Tenshin-Ryu headquarters until 2023 and has held the rank of Shihan (4th Dan) since 2024.



Figure 1. A photo during a practical session of Wakame Exercise. The photo was taken by the first author in May 2023.

The instructor first gave a brief explanation of traditional martial arts including background of the establishment of wakame exercise. Participants then engaged in simple warm-up activities to relax their bodies (i.e., bending and stretching, body shaking, and body scanning) and then engaged in the wakame exercise in pairs of the same sex. After each pair of participants experienced the wave-player and wakame-player roles alternately, the pairs were rearranged, and the same exercise was repeated multiple times within the timeframe. Because the Wakame Exercise consists of simple, guided movements and emphasizes interpersonal attunement rather than technical expertise, it can be safely performed even by individuals without prior experience in martial arts or other Eastern mind-body practices.

3.3.2. Push-Hand Sumo Group

To control for the physical and motor components of wakame exercise, the Push-Hand Sumo Group was introduced as an active control. The Push-Hand Sumo is a paired physical activity in which participants face each other and use their hands to unbalance their opponent. While similar in terms of low-intensity physical activity and paired execution, this activity focuses on a win-lose competition and does not include the meditative or Eastern philosophical components inherent in wakame exercise. Prior to the Push-Hand Sumo activity, participants were briefly explained about potential benefits of Push-Hand Sumo for physical conditioning, particularly core strength (Koba, 2021). Warm-up exercises included trunk-focused breathing and balance exercises (e.g., standing on one leg with eyes closed). Participants then engaged in Push-Hand Sumo in same-sex pairs and repeated the matches within the timeframe.

3.3.3. Rest Group

The Rest Group was introduced as another, passive control. Participants assigned to the Rest Group were instructed to spend their time quietly in the library as they normally would. Participants

visited the library located within the same campus, stayed there during the same period as the other groups, and returned to the original classroom at the end of the session.

3.4. Psychological Scales

3.4.1. Japanese Boundary Questionnaire (JBQ) (Kodama, 2013)

The JBQ, adapted from Hartmann's (1991) Boundary Questionnaire, was developed by Kodama (2013) to be culturally appropriate for Japanese populations. The questionnaire assesses various aspects of psychological boundaries experienced in daily life, such as the permeability of external stimuli, relationship between dreams and wakefulness, body image boundaries, interpersonal distance, environmental preferences, etc. The JBQ evaluates the thinness or thickness of boundaries as a personality trait. The JBQ consists of 52 items each rated on a 5-point Likert scale from 0 (does not apply at all) to 4 (applies very much), and a total score is calculated. Higher scores indicate thinner, more permeable psychological boundaries in daily life, whereas lower scores indicate thicker, less permeable boundaries. Internal consistency score (Cronbach's α) in the present sample was .79.

3.4.2. Nondual Awareness Dimensional Assessment-State (NADA-S) (Hanley, Nakamura, & Garland, 2018)

The NADA-S is a state scale for evaluating "Nondual Awareness (NDA)." NDA denotes views of the world and the self as fundamentally one, without separating the subject from the object, a concept that has been explored in both Eastern and Western mystical traditions. Because a Japanese version of the scale was not available at the time of the study, the first author independently translated the items into Japanese for administration. The items included: *"I experienced the boundaries of myself dissolving," "I experienced my mind expanding into space," "I experienced all things seeming to unify into a single whole," "I experienced all sense of self and identity dissolve away."* and *"I felt surrounded and filled with a blissful warmth or energy."* These items assess the extent to which the boundaries between self and other are being blurred and integrated. Responses to each item were rated on a 10-point Likert scale from 1 (not at all) to 10 (very much), with higher scores indicating stronger experiences of nondual awareness and a greater tendency to perceive self and other as unified, and lower scores indicating weaker experiences of nondual awareness. Although the original NADA-S comprises two factors (self-transcendence, bliss), this was deemed theoretically consistent with the unidimensional construct of nondual awareness, which this study conceptualizes as a coherent experiential state rather than separable dimensions. A confirmatory factor analysis (CFA) was conducted to examine the factor structure. Therefore, the present study adopted the one-factor model and calculated the total score for all five items. Cronbach's α for the pre-session measurement was .74, post-session measurement was .90.

3.4.3. Perceived Body Boundary Scale (based on (Dambrun, 2016))

To measure the salience of bodily boundaries, a single-item, visualized scale for perceived body boundary was used (Figure 2). Ataria et al. (2015) proposed that the sense of bodily boundaries is a dynamic experience that exist on a spectrum, ranging from highly salient bodily boundaries to scarcely perceptible ones. The Perceived Body Boundary Scale is based on such views and emphasizes that bodily boundaries are conceived more flexibly rather than being limited to the physical contour of the body. In the present study, to facilitate participants' understanding of the scale, we provided the following instruction in Japanese: *"A clearly perceived bodily boundary refers to the sensation that one's body is surrounded by a distinct contour, clearly separated from others' bodies, and demarcated from the external environment. In contrast, an unperceived bodily boundary refers to the sensation that one's body is strongly connected to the surrounding environment, without a distinct separation from it, as if integrated with the environment. Which of the following statements 1 through 7 best describes you right now? If you feel your body's boundaries very distinctly, select 7."*

If you feel your body's boundaries barely at all, select 1." Responses were rated on a 7-point Likert scale from 1 (I can hardly feel the boundaries of my body) to 7 (I can clearly feel the boundaries of my body), with higher scores indicating that participants perceived their bodily boundaries as more distinct and salient, and lower scores indicating that participants experienced their bodily boundaries as thinner or less clearly defined.

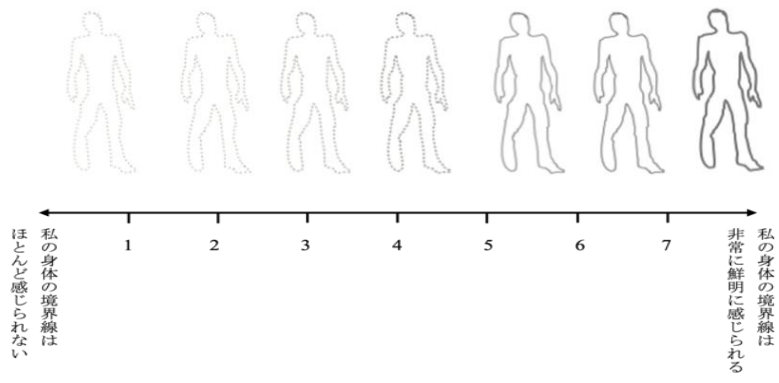


Figure 2. Visual analogue scale assessing perceived body boundary. The phrase on the left and right ends read “My body boundaries are almost imperceptible” and “My body boundary are extremely salient,” respectively (in Japanese).

3.4.4. Creative Attitude Questionnaire

Creative attitudes associated with meditative experiences were assessed using a brief questionnaire originally developed by the authors based on Onda (1995). Question items were designed to assess creativity-related psychological traits that are characteristic of meditative states as denoted by Onda (1995), such as tolerance for ambiguity, openness to change, and prioritization of intuition over conventional values. Based on these concepts, the following 4 items were used: “I do not stick to the existing way of doing things, and I am not afraid to change my behavior according to the situation,” “I am eager to learn more about new knowledge and the unknown,” “I can accept uncertainty and contradiction even if confronted with them,” and “I prefer to value how I intuitively feel rather than existing values or general evaluations.” Responses to each item were rated on a 10-point Likert scale from 1 (I do not agree at all) to 10 (I agree very much) , with higher scores indicating greater creativity associated with meditative states. A confirmatory factor analysis (CFA) was conducted to examine the factor structure, and a total score across all four items was calculated for each participant. Cronbach’s α for the pre-session measurement was .82 and for the post-session measurement was .75. Because this scale was developed as a provisional measure to capture creativity in a meditative context, its reliability is limited, and results should be interpreted with caution.

3.4.5. Japanese Version of the Experiences Questionnaire (J-EQ) (Kurihara, Hasegawa & Nedate, 2010)

The J-EQ was used to assess decentering during the practical session of wakame exercise. The J-EQ consists of two subscales: Decentering (10 items) and Rumination (5 items). Items that fall into the Decentering subscale assess the capacity to accept experiences from an objective perspective, such as “I can detach myself from my thoughts and feelings.” and “I have a sense of being fully aware of what is happening around me and inside myself.” Responses to each item are rated on a 5-point Likert scale ranging from 1 (not applicable) to 5 (applicable). All items of the original scale, including the Decentering and Rumination subscale, were administered. For the present study, scores from the Rumination subscale were excluded from analyses because they were not relevant to the study’s aims, and only the total scores of the Decentering subscale were used. Higher scores on the Decentering subscale indicate a greater tendency to distance oneself from one’s experiences and emotions and to observe them, whereas lower scores indicate a greater likelihood of being absorbed

in experiences and emotions, with a reduced tendency for objective observation. Cronbach's α for the Decentering subscale was .81 at the pre-session measurement and .87 at the post-session measurement.

3.4.6. Positive and Negative Affect Schedule (PANAS) (Sato & Yasuda, 2001)

The PANAS (Watson et al., 1988) is a brief, widely used mood rating scale. The Japanese version of the PANAS (Sato & Yasuda, 2001) was used. The PANAS is a 16-item scale comprising two subscales: 8 items for Positive Affect (e.g., "Active," "Excited," etc.) and 8 items for Negative Affect (e.g., "Afraid," "Irritable," etc.). In the present study, the PANAS was used as a state scale and participants were instructed to report their current mood states. Participants rated each item on a 6-point Likert scale ranging from 1 (not at all) to 6 (very much). In the present sample, Cronbach's α s for the subscales were .86 for Positive Affect and .88 for Negative Affect.

3.5. Data Analysis Methods

All statistical analyses were performed using the free statistical software HAD Version 17 (Shimizu, 2016). For the NADA-S and Creative Attitude Questionnaire, confirmatory factor analyses (CFA) were conducted to examine the factor structure of each scale. For all scales on psychological states (i.e., all scales except for the JBQ), total scores were calculated separately for pre- and post-session assessments and means and standard deviations (SDs) were subsequently computed for each group. To assess potential baseline differences, three participants who reported regular practice of Eastern mind-body disciplines (e.g., meditation or martial arts) were compared with the remaining participants using independent samples t-tests for each psychological measure. Next, to evaluate changes in psychological states from pre- to post-session assessments, a mixed-factor two-way analysis of variance (ANOVA) with group (3 levels: Wakame Exercise, Push-Hand Sumo, Rest) as a between-participants factor and measurement period (2 levels: pre- and post-session) as a within-participants factor was conducted for scores from all state scales. Where an interaction between group and measurement period was statistically significant, multiple comparisons were further conducted. Finally, Pearson's correlation coefficients (r) were calculated to examine the associations among the psychological state scales at the post-session assessment within the Wakame Exercise group, and correlations between JBQ scores and each psychological scale were computed for both pre- and post-session assessments in each group.

3.6. Use of Generative AI

Generative artificial intelligence (GenAI) was employed to assist in the preparation of this manuscript. Specifically, AI tools (ChatGPT, OpenAI) were used to support English editing, refinement of structure and flow, and formatting adjustments. The content, analyses, and interpretations remain the responsibility of the authors, and all AI-assisted text was carefully reviewed and revised to ensure accuracy and appropriateness.

4. Results

4.1. Result of Confirmatory Factor Analyses for Psychological Scales

Nondual Awareness Dimensional Assessment-State (NADA-S): Confirmatory factor analysis (CFA) was conducted to examine the factor structure of the NADA-S. Both the one-factor and two-factor models showed comparable fit indices (χ^2 (4) = 10.7, p = .058; CFI = .946; TLI = .891; RMSEA = .127; AIC = 1432; BIC = 1466). While the χ^2 test was not statistically significant and the CFI approached acceptable levels, the TLI and RMSEA suggested less satisfactory fit. As there was no clear statistical advantage for the two-factor model, the one-factor model was retained, consistent with the theoretical conceptualization of nondual awareness as a unidimensional experiential state.

Creative Attitude Questionnaire: A CFA was conducted to examine the unidimensionality of the Creative Attitude Questionnaire. The one-factor model showed limited fit (χ^2 (2) = 7.27, p = .026; CFI

= .949; TLI = .846; RMSEA = .194; AIC = 1110; BIC = 1137) , but all factor loadings were positive and of reasonable magnitude (range: 0.868–1.338), indicating that the items coherently reflected a single underlying construct. Accordingly, the scale was treated as unidimensional, and a total score across the four items was calculated for subsequent analyses.

4.2. Participant Characteristics and Baseline Comparisons

Three participants reported that they regularly practiced Eastern mind-body practices such as meditation and martial arts. To assess potential baseline differences, their pre-session scores were compared with those of the rest of the sample using independent samples t-tests. A statistically significant difference was observed for NADA-S ($p < .007$, Bonferroni-corrected). and perceived body boundary ($t(68) = .002, p < .007$, Bonferroni-corrected). Therefore, these participants’ data were excluded from the analyses of NADA-S and perceived body boundary scores. No statistically significant differences were found for other psychological measures ($t = .029-.899$, all $p > .007$, Bonferroni-corrected).

4.3. Changes in Psychological States Before and After Practice Across Groups

Table 1 shows the mean and standard deviation for each psychological measure before and after the practice, and **Table 2** presents the results of the two-way ANOVA. Post hoc multiple comparisons are summarized in **Table 3**.

Table 1. Mean (SD) Scores of Psychological Measures and Their Correlations with JBQ Before and After Practice.

		Score		Correlation with JBQ	
Psychological Scale	Group	Pre	Post	Pre	Post
NADA-S	Wakame	17.64 (5.42)	30.46 (5.27)	.467 *	.054
	Push-Hand	17.68 (9.02)	20.84 (9.83)	.530 **	.418 *
	Rest	16.70 (4.68)	16.10 (6.44)	.122	.038
Body Boundary	Wakame	5.64 (0.22)	4.00 (0.25)	.030	-.057
	Push-Hand	5.68 (1.18)	5.52 (1.56)	-.238	-.153
	Rest	5.70 (1.46)	5.85 (1.18)	-.056	-.058
Creative Attitude	Wakame	27.00 (5.54)	29.56 (4.70)	.213	.209
	Push-Hand	26.12 (4.89)	28.36 (6.24)	.157	-.047
	Rest	27.15 (3.98)	28.55 (4.25)	.220	.127
Decentering	Wakame	29.88 (6.39)	38.68 (6.88)	.056	-.102
	Push-Hand	28.84 (6.47)	39.08 (8.31)	.226	.135
	Rest	31.05 (6.93)	36.30 (7.45)	-.233	-.466 *
PANAS: PA	Wakame	20.50 (6.33)	16.96 (5.56)	.063	.005
	Push-Hand	21.48 (7.58)	26.88 (8.47)	-.054	.426 *
	Rest	19.90 (7.29)	16.65 (7.85)	-.219	-.158
PANAS: NA	Wakame	16.56 (6.36)	10.00 (3.49)	.026	.257
	Push-Hand	19.00 (7.50)	11.72 (4.17)	.265	.093
	Rest	14.50 (6.76)	10.90 (4.45)	-.165	-.093

For NADA-S scores, The Wakame Exercise group showed increases in nondual awareness after practice, whereas the Push-Hand Sumo group showed a smaller increase, and the Rest group showed

no notable change. Regarding perceived body boundaries, Only the Wakame Exercise group exhibited a decrease in perceived bodily boundaries, suggesting a thinning of self-other boundaries post-practice. The other groups showed minimal changes. For creative attitudes, both the Wakame Exercise and Push-Hand Sumo groups showed increases in creative attitudes, while the Rest group showed no notable change. For decentering, all groups showed increases in decentering, indicating enhanced capacity to observe one’s thoughts and emotions objectively. Regarding mood, for positive affect, the Push-Hand Sumo group showed an increase, whereas the Wakame Exercise and Rest groups showed slight decreases. For negative affect, decreases were observed across all groups after the session.

Table 2. Results of the two-way ANOVAs for each psychological scale.

Psychologi cal Scale	Main Effect: Group			Main Effect: Measurement Period			Interaction: Group x Measurement Period		
	<i>F</i> _{2, 67}	<i>p</i>	Partia l η^2	<i>F</i> _{1, 67}	<i>p</i>	Partial η^2	<i>F</i> _{2, 67}	<i>p</i>	Partial η^2
NADA-S	7.46 8	.001 **	.19	44.633	<.001 ***	.41	26.251	<.001 ***	.45
Body Boundary	4.42 0	.016 *	.12	13.203	<.001 ***	.17	13.053	<.001 ***	.29
Creative Attitude	0.31 3	.732	.01	19.664	<.001 ***	.23	0.518	.598	.02
Decenterin g	0.04 6	.955	.00	189.77 5	<.001 ***	.74	5.988	.004 **	.15
PANAS: PA	6.02 2	.004 **	.15	0.259	.613	.00	18.212	<.001 ***	.35
PANAS: NA	1.81 3	.171	.05	88.264	<.001 ***	.57	3.092	.052	.09

* *p*<.05; ** *p*<.01; *** *p*<.001.

Table 3. Results of post-hoc comparisons (Holm correction) between pre- and post-measurements.

Psychological Scale	Group	<i>t</i> (<i>p</i>)	<i>d</i>
NADA-S	Wakame Exercise	−9.613 (<.001) ***	−1.74
	Push-Hand Sumo	−2.526 (.014) *	−.55
	Rest	.429 (<i>n.s.</i>)	.082
Body Boundary	Wakame Exercise	6.234 (<.001) ***	1.25
	Push-Hand Sumo	.650 (<i>n.s.</i>)	.17
	Rest	−.545 (<i>n.s.</i>)	−.12
Creative Attitude	Wakame Exercise	−3.301 (.002) **	−.50
	Push-Hand Sumo	−2.888(.005) **	−.59
	Rest	−1.615 (<i>n.s.</i>)	−.27
Decentering	Wakame Exercise	−8.997 (<.001) ***	−1.22
	Push-Hand Sumo	−10.470 (<.001) ***	−1.92
	Rest	−4.801 (<.001) ***	−.73
PANAS: PA	Wakame Exercise	2.794 (.007) **	.43
	Push-Hand Sumo	−4.714 (<.001) ***	−.99

PANAS: NA	Rest	2.538 (.013) *	.44
	Wakame Exercise	6.371 (<.001) ***	1.14
	Push-Hand Sumo	7.070 (<.001) ***	1.72
	Rest	3.127(.003) **	.63

4.4. Correlation Analyses Within the Wakame Exercise Group After Practice

Table 4 presents the correlation coefficients among psychological measures post-practice in the Wakame Exercise groups. Correlation analyses indicated that nondual awareness (NADA–S) was positively associated with creative attitudes. Creative attitudes were also positively associated with decentering. In addition, positive affect and negative affect showed a significant strong positive correlation.

4.5. Correlations Between JBQ and Psychological Measures

Table 1 presents correlations between JBQ scores and psychological measures for pre- and post-session assessments in all groups. JBQ scores were associated with nondual awareness (NADA–S) before the practice, but not after, and showed no association with perceived bodily boundaries at either time point. This suggests that the Wakame Exercise influenced nondual awareness independently of participants’ baseline trait boundary tendencies.

Table 4. Correlation matrices of psychological scales at post-practice in wakame exercise group.

Psychological Scale	1. NADA-S	2. Body Boundary	3. Creativity	4. Decentering	5. PANAS: PA
1. NADA-S					
2. Body Boundary	–.200	–			
3. Creativity	.533 *	–.017	–		
4. Decentering	.394	–.286	.472 *		
5. PANAS: PA	.492 *	.176	.132	.188	–
6. PANAS: NA	.184	–.162	–.056	.042	.582 **

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

5. Discussion

The present study examined the short-term psychological effects of a meditative martial arts-based paired practice (i.e., Wakame Exercise) on nondual awareness, perceived body boundaries, decentering, creativity and mood. As hypothesized (Hypothesis 1), Wakame Exercise significantly increased nondual awareness and decreased the salience of perceived body boundaries compared with both active and passive control conditions. In addition, creative attitude improved following Wakame Exercise, with stronger associations between nondual awareness, creative attitude, and decentering observed in this group. Notably, the effect on nondual awareness appeared independent of baseline trait boundary tendencies (JBQ scores).

5.1. Enhancement of Nondual Awareness

The observed increase in nondual awareness is consistent with theoretical accounts of Eastern body–mind practices as methods for dissolving subject–object distinctions (Gyamtso, 1994; Nguyen et al., 2020). The Wakame Exercise is a “moving meditation” based on coordinated interaction with a partner, and this characteristic may have facilitated nondual awareness by fostering a sense of unity without strict self–other differentiation. Similar effects have been documented in mindfulness-based

interventions (Hanley, 2020), suggesting that even brief paired exercises can elicit nondual states. These results support Hypothesis 1.

5.2. *Thinning of Perceived Body Boundaries*

Participants in the Wakame Exercise group reported decreased salience of bodily boundaries, indicating a reduction in the perceived separation between self and environment. While in Western psychiatry such boundary attenuation is sometimes linked to pathological states such as depersonalization disorders or complex post-traumatic stress (Nave et al, 2021), in the present study, the observed thinning of perceived bodily boundaries was accompanied by increases in decentering, reflecting a metacognitive attitude of observing experiences, as well as enhancements in creativity. These findings are consistent with Hartmann's (1991) notion that boundary thinness can function as an adaptive trait when core self-functions are maintained, and psychological safety is ensured, further supporting Hypothesis 1.

5.3. *Nondual Awareness, Creativity, and the Role of Trait Boundaries in Wakame Exercise*

In the Wakame Exercise group, positive correlations were observed post-practice between nondual awareness and creative attitude, as well as between creative attitude and decentering, supporting the psychoanalytic concept of "creative regression" (Kris, 1952; Schafer, 1954), in which a temporary loosening of ego boundaries facilitates novel associations and creative insights. These results support Hypothesis 2. In contrast, no significant association was observed between creative attitude and positive affect, indicating only partial support for Hypothesis 3.

Push-Hand Sumo, although involving paired physical interaction, is characterized by intentional resistance and competitive engagement and lacks meditative elements. This may explain why it enhanced creativity and mood while having little effect on nondual awareness or perceived bodily boundaries. These findings suggest that the qualitative nature of the practice—cooperative versus competitive engagement with others—may differentially influence psychological outcomes, highlighting the distinctiveness of the Wakame Exercise as a martial art – based meditative practice.

Regarding trait boundary thinness, as measured by the JBQ, correlations with psychological measures were observed at pre-practice but not post-practice in the Wakame Exercise group. This indicates that nondual awareness after the practice was not preferentially experienced by individuals with thinner trait boundaries; rather, the Wakame Exercise facilitated nondual awareness regardless of baseline trait boundary tendencies. Therefore, Hypothesis 4 was not supported.

5.4. *Limitations and Future Perspectives*

Despite the novel findings and suggested as mentioned above, the present study has several limitations. First, the intervention consisted of a single 40-minute session, limiting conclusions about long-term effects. Future studies should employ repeated or longitudinal interventions to examine whether changes in nondual awareness, perceived body boundaries, and creative attitudes are sustained over time. Second, the sample included only Japanese university students, which may restrict generalizability. Future research should recruit participants from more diverse cultural and age backgrounds to assess whether the observed effects generalize beyond this population. Third, the results relied on self-reports of the participants, and causal interpretations should be made with caution due to the single-session design and correlational analyses. Future research may employ longitudinal designs and incorporate physiological indices (e.g., heart rate variability) to better assess causal mechanisms. Fourth, measurement limitations should be noted. The NADA-S (Hanley, Nakamura, & Garland, 2018) used to assess state nondual awareness lacks an official Japanese version and was administered in a provisional translation. Creative attitude items were researcher-developed based on Onda (1995) and are not fully validated. Future studies should develop and standardize culturally appropriate measures for nondual awareness and creative attitudes within Eastern mind-body practice contexts. Fifth, while this study focused on Wakame Exercise, other Eastern mind-body

practices (e.g., meditation, qigong, yoga, tai chi) may differently affect self-other boundaries and related psychological outcomes. Comparative studies are needed to examine how specific practices influence boundary perception and psychological states.

6. Conclusions

A single practical session of Wakame Exercise, a contemplative paired practice based on Japanese traditional martial arts, significantly increased nondual awareness, reduced the salience of perceived self-other boundaries, and enhanced creative attitudes. In the Wakame Exercise group, nondual awareness was positively associated with creative attitudes, and creative attitudes were associated with decentering, suggesting that temporary boundary transformation may function as a psychological mechanism linking Eastern body-mind practices to creativity enhancement. Importantly, increases in nondual awareness occurred independently of baseline trait boundary tendencies, indicating that the practice can facilitate boundary-related experiential shifts regardless of trait boundary thinness. These findings may contribute to a growing empirical basis for integrating Eastern tradition-based practices into modern psychological contexts.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/doi/s1>, Dataset S1: Raw questionnaire data (.xlsx), including group codes (A = Push-Hand Sumo; B = Rest; C = Wakame Exercise).

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