

Effect of aerobic training model on mood and life skills based on gender

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ABSTRACT

This study examined the effects of aerobic training on mood and life skills and investigated whether these effects differed according to gender. An experimental method with a 2×2 factorial design was employed. Sixty adult fitness center members in Bandung were randomly assigned to four groups and participated in six weeks of training, consisting of Body Combat or Zumba, three times per week for 50 minutes per session at moderate intensity. Mood and life skills were assessed using the Brunel Mood Scale (BRUMS) and the Life Skills Scale for Sport (LSSS), respectively. Paired-samples t-tests revealed significant pre- to post-training improvements in mood and life skills in both training groups ($p < .05$). Strong positive correlations were observed for mood ($r = .96$ and $.71$), while positive correlations were also found for life skills ($r = .42$ and $.86$). Two-way analysis of variance indicated a significant interaction between gender and training type for both mood and life skills ($p < .05$), suggesting that the pattern of training effects differed according to gender. However, the main effect of gender on life skills was not statistically significant ($p > .05$). Furthermore, post hoc Tukey tests showed no significant difference between Body Combat and Zumba in life skill scores among female participants ($p > .05$). These findings indicate that the relationship between aerobic training type, gender, mood, and life skills is complex and that the effects of different training modalities may vary across gender groups.

KEYWORDS

Aerobic Training; Gender; Life Skills; Mood

1. INTRODUCTION

The need for a good quality of life, physical fitness, and being physically and mentally healthy is the basis for daily routines, including various physical activities to make a life skill (Nuzzo, 2020). Cronin & Allen (2017) view life skills as behavioral, cognitive, interpersonal, or intrapersonal competencies that can be learned, developed, and improved. Examples of life skills include teamwork, goal setting, interpersonal communication, and leadership.

These life skills can be applied in various aspects (such as school work, part-time work, friendships, and sports) (Cunha et al., 2006). Life skill development has been proven possible through sporting activities, but adolescents do not know how to apply life skills daily. Thus, it is necessary to transfer these life skills into everyday life by involving various elements, including psychological needs such as self-control, competence to cope with stress, and social responsibility (Kendellen et al., 2017).

Although sports could facilitate the learning process of life skills, even though the experience gained during the learning process through sports is considered a new life skill, exercise itself is not enough. Zdroik & Veliz (2020) state that structured sports are required to improve youth development when conducted in an intentionally structured exercise program to teach life skills compared to a non-structured exercise program.

A person experiences the transfer process of life skills as a continuous process where they continue to interact and interpret their environment to produce positive or negative outcomes of life skill transfer. As sports skills are life skills, they must be transferred successfully. In this case, the result of the transfer should be able to be applied outside of sports or everyday life (Pierce et al., 2017).

The integration of life skills into the training process (in this case, the research was carried out on golf) has shown a positive impact in encouraging positive youth development and succeeded in transferring life skills to be applied in everyday life (Kendellen et al., 2017). However, Jacobs & Wright (2018) revealed that the environment influences the integration process of life skills in training. The reason is that the training environment could offer significant potential and even determine the level of success in the life skill integration in training and the success of life skill transfer so that they can be applied in everyday life to support positive youth development.

The effects of aerobic training on mood are of great interest to health psychologists for several reasons (Cammisuli, 2018). First, exercise has been proposed as a treatment for affective

disorders, such as depression, as an alternative to pharmacological approaches. Second, aerobic conditioning can provide a suitable stress management method for the general population. The effects of regular exercise on mood and psychological function have been studied in a cross-sectional and excellent design (Firth et al., 2018). Recent controlled studies have shown that despite the impact of training programs on psychological states, a more robust response may occur in people with stress-related problems (Szabo, 2003).

In principle, intense mood swings after performing aerobic exercise are easier to investigate because the assessment can be controlled (Altmann et al., 2016). Elevated mood and exercise-induced euphoria are frequently reported after a strenuous exercise, and several explanations have been proposed (Hyodo et al., 2019). However, the data have some limitations, such as lacking a control group (Lin et al., 2020). Three experiments have been reported where the subjects were randomly assigned to aerobic exercise and a control condition to compare the high and low exercise levels. The comparison between 5 minutes of strenuous exercise on a treadmill and lying on the stomach showed no difference in the negative items of the Profile of Mood States (POMS), but it showed a marginal effect on the positive items (da Silva et al., 2019).

Bahrke & Morgan (1978) measured anxiety before and after 20 minutes of treadmill exercise at 70% of maximum heart rate (HR) and during the equivalent time of sitting or practicing simple meditation techniques. The reduction of anxiety occurred in all conditions. It indicated that time-out or diversion was effective in reducing anxiety. The in-subject design was used to compare the mood for high-intensity exercise conditions and the mood for low-intensity exercise conditions (Weinstein et al., 2017).

A further factor investigated was the impact of music during exercise on mood responses (Ettenberger et al., 2021). Many exercise programs incorporate fast and stimulating music since music has been recommended to prevent monotony during exercise (Karageorghis, 2020).

Mood has a vital role in everyday life. The more a person has a positive mood, the more likely the person has an increased creative capability. There are many ways to develop mood and think creatively (Fernández et al., 2020). One of them is through physical activity. The problem is how the negative mood arising from stress can be reduced and turned into a cheerful mood (Fox & Moore, 2021). Moderate exercise for 150 minutes per week is highly recommended for mood improvement. Biochemical changes are associated with adjustments in the amount of exercise performed and needed to improve mood.

Productivity is expected to increase if a person's mood is positive (Yamada & Nagai, 2015). When someone has a positive mood, the person will have a high motivation to learn, which leads to a positive environment and social situation, which is beneficial for them to lower stress levels and produce a comfortable atmosphere to have a better life (Wei et al., 2020).

The results of the study support the contextual perspective. In particular, if a person is creative in ideation fluidity, originality, and flexibility, then the data positively supports that mood increases creativity in general. A positive mood will increase overall creative thinking, including the idea, originality, and flexibility (Weinstein et al., 2017). People who perform aerobic physical activity before doing their work, such as doing aerobic exercise by performing body combat and Zumba, can improve their mood and good life skills. Thus, it has implications for enhancing life skills, positive thinking, and the ability to do their work better (Wei et al., 2017).

Based on the previous discussion, this study addresses a specific gap: the lack of empirical evidence on how different forms of aerobic training—particularly Zumba and body combat—can enhance mood and life skills among college students, especially when considering gender differences. The main problem identified was that physical education programs often emphasize physical fitness while neglecting psychological and life skill development.

To address this issue, the researcher designed an experimental study involving structured aerobic classes to evaluate their psychological and developmental impact. The study involved four groups: two experimental groups (Zumba and body combat), each designed with standardized routines focusing on coordination, rhythm, and engagement. The Zumba group received training based on foundational Zumba movements with controlled intensity and consistent timing. The body combat group engaged in dynamic, martial arts-inspired aerobic routines, adapted for both class characteristics and gender considerations. Through this design, the study aimed to demonstrate how specific aerobic training methods could contribute not only to physical outcomes but also to the enhancement of mood and essential life skills such as discipline, confidence, and cooperation.

Therefore, the aim of this study was to determine how aerobic training affects mood and life skills across male and female participants. Based on this aim, the following hypotheses were formulated:

H1: Aerobic training will significantly improve participants' mood.

H2: Aerobic training will significantly improve participants' life skills.

H3: There will be significant differences in the improvement of mood and life skills based on gender.

2. METHODS

2.1. Design

The experimental method decides the nature of the treatment (such as what will happen to the research subjects), to whom the treatment will be applied, and the extent to which the treatment affects (Fraenkel et al., 2012). The experimental method was chosen based on three elements, namely: 1) conditions that were intentionally created or given treatment; 2) determination of what conditions (as independent variables) can affect the emergence of a kind of events (the dependent variable), specifically the causal relationship to be observed, or referred to as variable manipulation; 3) control over extra variables that are not the cause of the occurrence of events (Ali, 2014).

This research used a 2 x 2 factorial design. Fraenkel et al. (2012) state that “factorial design is a design that considers the possibility of a moderator variable affecting the treatment (independent variable) and the outcome (dependent variable).”

Based on the explanation, it can be illustrated that the selection of the experimental method was based on the treatment to be carried out in this study. The variables in this study were divided into independent, moderator, and dependent variables. The independent variable was aerobic training (body combat and Zumba). The moderator variable was gender (male and female), while the dependent variables were mood and life skills.

Factorial Design					
Treatment	<i>R</i>	<i>O</i>	<i>X</i>	<i>Y₁</i>	<i>O</i>
Control	<i>R</i>	<i>O</i>	<i>C</i>	<i>Y₁</i>	<i>O</i>
Treatment	<i>R</i>	<i>O</i>	<i>X</i>	<i>Y₂</i>	<i>O</i>
Control	<i>R</i>	<i>O</i>	<i>C</i>	<i>Y₂</i>	<i>O</i>

Figure 1. Factorial design

This design involves several factors (active independent variables and attributes) working together simultaneously (consisting of two factors). Two factors (independent variables) involved in this experiment were aerobic exercise and gender, as depicted in Table 1.

Table 1. 2 x 2 factorial research design

Gender (B)	Aerobic Training Design (A)	
	Body Combat (A ₁)	Zumba (A ₂)
Male (B ₁)	(A ₁ B ₁)	(A ₂ B ₁)
Female (B ₂)	(A ₁ B ₂)	(A ₂ B ₂)

Note: A = Aerobic Training Model; A₁ = Body Combat Aerobic Training Model; A₂ = Zumba Aerobic Training Model; B = Gender; B₁ = Male; B₂ = Female; A₁B₁ = Male sample group with Body Combat aerobic training model; A₁B₂ = Female sample group with Body Combat aerobic training model; A₂B₁ = Male sample group with Zumba aerobic training model; A₂B₂ = Female sample group with Zumba aerobic training model.

2.2. Participants

The population of this study consisted of registered members at a fitness center in Bandung. Using a random sampling technique, 60 participants were selected, with consideration for gender balance and participants' availability to attend the full six-week program. Random treatment assignment was also applied to ensure unbiased group allocation.

The primary criterion for selection was the participants' physical readiness and commitment to complete the entire intervention period, as consistent participation was crucial. The final sample was divided equally into four groups (n = 15 each), as shown in Tables 2 and 3.

Although no a priori power analysis was conducted, the sample size aligns with similar experimental studies involving physical activity interventions (e.g., n = 12–20 per group). This sample size was deemed sufficient to detect medium effect sizes (f = 0.25) with an estimated statistical power of 0.80 and alpha level of 0.05 (Faul et al., 2009; Mukti, 2025).

2.3. Intervention

The intervention lasted six weeks, with training sessions held twice a week (total of 12 sessions). Each session lasted 50–60 minutes, consisting of a 10-minute warm-up, 30–35 minutes of core activity, and a 10-minute cooldown.

1. Zumba Group: This group participated in structured Zumba sessions that included choreographed routines based on Latin dance styles (e.g., merengue, salsa, reggaeton, cumbia). The training emphasized rhythm, coordination, and full-body movement, with gradually increasing intensity over time.
2. Body Combat Group: Participants in this group followed a martial arts-inspired aerobic workout involving techniques from boxing, karate, and Muay Thai. The routines included sequences of punches, kicks, and dynamic footwork synchronized to fast-paced music. Movement patterns were adapted to accommodate participant ability and gender differences.

Both classes were led by certified instructors with experience in group-based aerobic programs. Attendance was recorded, and participants were encouraged to complete all sessions consistently.

Table 2. Number of samples for each group

Group	Number
1 (Male)	15
2 (Female)	15
3 (Male)	15
4 (Female)	15

Table 3. Sample characteristics

Demographic Data	Mean $\pm$ SD
Age	24.51 $\pm$ 0.47
Weight (kg)	64.1 $\pm$ 3.57
Height (cm)	167.25 $\pm$ 3.71

2.4. Instruments

The Brunel Mood Scale (BRUMS)

The Brunel Mood Scale (BRUMS) was developed by Terry et al. (2003) and consists of 24 items measuring six mood states: tension, depression, anger, vigor, fatigue, and confusion. The scale includes 20 negative mood items and 4 positive mood items. Responses are rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely), with higher scores indicating greater intensity of the mood being measured.

Prior to use in this study, the BRUMS was linguistically and culturally adapted to suit the local language and comprehension level of the participants. The adaptation process included forward and backward translation, expert validation, and a pilot test involving participants outside the main sample. The adapted version was tested for construct validity and internal consistency, with Cronbach's alpha values for each subscale exceeding 0.70, indicating acceptable reliability.

Life Skills Scale for Sport (LSSS)

The Life Skills Scale for Sport (LSSS), developed by Cronin and Allen (2017), is designed to assess life skills development in youth and adolescent sport contexts. It contains 47 items across eight sub-dimensions: teamwork, goal setting, time management, emotional skills, interpersonal communication, social skills, leadership, and problem-solving. Each item is rated using a 5-point

Likert scale, ranging from 1 (not at all) to 5 (very much), where higher scores reflect a greater perceived acquisition of the respective life skill.

As with the BRUMS, the LSSS was adapted to the local context through a systematic translation and validation process. Content validity was confirmed by sport psychology experts, and a reliability test conducted with a pilot sample demonstrated good internal consistency across all subscales (Cronbach's $\alpha > 0.75$).

2.5. Statistical Analyses

The data were analyzed using descriptive and inferential statistical procedures. Descriptive statistics, including frequency, mean, and standard deviation, were used to summarize mood and life skills scores across gender and aerobic training groups. Paired-samples t-tests were used to examine pre- to post-training differences in mood and life skills within the Body Combat and Zumba groups. A two-way analysis of variance (ANOVA) was conducted using a 2×2 factorial design to examine the main effects of aerobic training and gender, as well as their interaction effects, on mood and life skills. When significant differences were identified, Tukey post hoc tests were performed to determine differences between the training groups within each gender. Statistical significance was set at $p < .05$.

3. RESULTS

Table 4 shows the mean scores for all variables measured according to gender and aerobic training.

Table 4. Descriptive summary of mood data

Gender	Statistical Resource	Training Model		Total
		Body Combat (A1)	Zumba (A2)	
Male (B1)	n	15	15	30
	X	26.87	22.87	24.87
	s	6.94	5.90	6.42
	$\sum X$	403	343	746
	$\sum X^2$	10953	8151	19104
Female(B2)	n	15	15	30
	X	25.67	33.80	29.73
	s	6.63	8.73	7.68
	$\sum X$	385	507	892
	$\sum X^2$	9973	17281	27254
Total	n	30	30	60
	X	26.27	28.33	27.30

	s	4.80	5.17	4.98
	$\sum X$	788	850	1638
	$\sum X^2$	20926	25432	46358

Note. *n*; Number of Samples; *X*; Mean score; *S*; Standard Deviation; $\sum X$; Total Score; $\sum X^2$; Squared Total Score

The female group with Zumba training had the highest mood mean score. The mood mean score of the aerobic body combat training group was 26.27, with a standard deviation 4.80. In comparison, the mood mean score of the Zumba aerobic training group was 28.33, with a standard deviation 5.17. The overall mood mean score was 27.30, with a standard deviation 4.98. Table 5 shows the mean mood gain scores according to training model (Body Combat vs. Zumba) and gender (male vs. female) in a 2×2 factorial design.

Tabel 5. Factorial 2x2 mood gain score summary

Gender	Training Model	
	Body Combat (A1)	Zumba (A2)
Male (B1)	26.87	22.87
Female (B2)	25.67	33.80
Total	26.27	28.33

The mean differences of each group depicted in Table 5 show the group gaining the most significant improvement. In the mood variable, Group 3, the female Zumba aerobic training group, gained a better mean score improvement than other groups, namely 33.80. In addition, Zumba training provided better results than body combat training. Table 6 presents the descriptive statistics for life skills scores across the two training models—Body Combat (A1) and Zumba (A2)—according to gender.

Table 6. Descriptive summary of life skill data

Gender	Statistic Resource	Training Model		Total
		Body Combat (A1)	Zumba (A2)	
Male (B1)	n	15	15	30
	X	92.87	74.33	83.60
	s	23.98	19.19	21.59
	$\sum X$	1393	1115	2508
	$\sum X^2$	137883	85269	223152
Female (B2)	n	15	15	30
	X	53.80	76.80	65.30

	s	13.89	19.87	16.86
	$\sum X$	807	1152	1959
	$\sum X^2$	48861	90894	139755
Total	n	30	30	60
	X	83.60	75.57	74.45
	s	13.39	13.80	13.59
	$\sum X$	2200	2267	4467
	$\sum X^2$	186744	176163	362907

Note. n; Number of Samples; X; Mean score; S; Standard Deviation; $\sum X$; Total Score; $\sum X^2$; Squared Total Score

The male body combat training group had the highest mean score for life skills. The life skill mean score of the aerobic body combat training group was 83.60 with a standard deviation of 13.39, while the life skill mean score of the Zumba aerobic training group was 75.57 with a standard deviation of 13.80. The overall mean score of life skills was 74.45, with a standard deviation of 13.59. Table 7 presents the mean life skill gain scores according to training model and gender in the 2 $\times$ 2 factorial design.

Table 7. Summary of factorial 2x2 life skill score gain

Gender	Training Model	
	Body Combat (A1)	Zumba (A2)
Male (B1)	92.87	74.33
Female (B2)	53.80	76.80
Total	83.60	75.57

The mean score differences of each group presented in Table 7 show the group gaining the most significant improvement. In the life skill variable, Group 1, namely the male aerobic body combat training group, had a mean score improvement better than other groups (92.87). In addition, body combat training provided better results than Zumba training.

Table 8 displays the paired-sample t-test on mood variables, while Table 11 depicts the paired-sample t-test on the life skill variables in the body combat training group.

Table 8. Paired-samples T test on mood variables

Variable	N	Correlation	p value
Body Combat	60	0.96	0.000
Zumba	60	0.71	0.000

Table 8 shows that the aerobic training model for body combat training had a significance value 0.000. Because the test results gained a value of Sig. (2-tailed) = 0.000 < α = 0.05, H_0 was rejected at the significance level α = 0.05 with a correlation value of 0.96. It indicates an effect difference between mood before and after body combat training.

The results of the Paired-Samples t Test on Zumba training obtained a significance value of 0.000. Because the test results had a value of Sig. (2-tailed) = 0.000 < α = 0.05, H_0 was rejected at the significance level α = 0.05 with a correlation value of 0.71. It indicates the effect differences before and after Zumba training on mood. Table 9 reports the paired-samples t-test results for life skill scores before and after training in the Body Combat and Zumba groups.

Table 9. Paired-samples t test on life skill variable in body combat training group

Variable	N	Correlation	<i>P</i> value
Body Combat	6 0	0.42	0.000
Zumba	6 0	0.86	0.000

The statistical test shows that body combat training had a significance value of 0.000. Because the test results obtained a value of Sig. (2-tailed) = 0.000 < α = 0.05, H_0 was rejected at the significance level α = 0.05 with a correlation value of 0.42. It indicates that there were effect differences before and after body combat training on life skills.

The Zumba aerobic training model had a significance value of 0.000. Because the test results obtained a value of Sig. (2-tailed) = 0.000 < α = 0.05, H_0 was rejected at the significance level α = 0.05 with a correlation value of 0.86. It indicates that there were effect differences before and after Zumba training on life skills.

The results of the two-way variance analysis test presented in Table 10 show that gender (B(b)) gained an F value greater than F Table (29.73 > 4.01). It can be interpreted that there was an effect difference of gender on mood. In aerobic training (Gender(k)), the F count is greater than the F Table (5.36 > 4.01). It can be interpreted that there was a difference in aerobic training's effect on mood.

The interaction of gender and aerobic training on mood, namely the value of I (bxk), obtained an F value greater than F table (46.20 > 4.01). It indicates that there was an interaction between

gender and aerobic training on mood. This is due to the mean differences between the genders (male and female) that are associated with aerobic training (body combat and Zumba) affecting mood.

Table 10. Calculation results of two-way mood variance analysis

Source of Variation (between group)	SS	df	MS	F	p	Description
Training Group (b)	355.27	1	355.27	29.73	<0.001	Significant
Gender (k)	64.07	1	64.07	5.36	0.025	Significant
Interaction (bxk)	552.07	1	552.07	46.20	<0.001	Significant
Error	669.20	56	11.95	-	-	-
Total	1640.64	59	-	-	-	-

The results of the two-way analysis of variance test presented in Table 11 show that gender (B(b)) had an F value greater than F Table ($14.99 > 4.01$). It can be interpreted that there was an effect difference of gender on life skills. Aerobic exercise (Gender(k)) had a calculated F value greater than the F table ($0.22 < 4.01$). Therefore, it can be interpreted that there was no difference of the aerobic training effect on life skills.

Table 11. Summary of two-way variance analysis results

Source of Variation (between group)	SS	df	MS	F	p	Description
Training Group (b)	5023.35	1	5023.35	14.99	4.01	Significant
Gender (k)	74.82	1	74.82	0.22	4.01	Not Significant
Interaction (bxk)	6468.82	1	6468.82	19.30	4.01	Significant
Error	18771.87	56	335.21	-	-	-
Total	30338.85	59				

The interaction of gender and aerobic training on life skills, namely the value of I (bxk), obtained an F value greater than F table ($19.30 > 4.01$). It indicates that there was an interaction between gender and aerobic exercise on life skills. It might be due to the mean difference of each gender (male and female) that is associated with aerobic exercise (body combat and Zumba) affecting life skills.

Based on the results of the Tuckey test (see Tables 12 and 13) in the male group, the comparison between Zumba training and body combat training gained a mean difference value of 0.03008 and a significance value of 0.647. There was no significant difference between the effect of body combat and Zumba training on mood in the male group.

The results of the comparison between body combat training and Zumba training in the female group obtained a mean difference of -0.27623 and a significance value of 0.000. Therefore, there was a significant difference between body combat and Zumba training effects on mood in the female group, where the results of Zumba training were better than body combat training.

Table 12. Tuckey test results of mood variable

Intervention Group	Intervention Group	Mean Difference	<i>p</i>	Description
Male with body combat training	Male with Zumba training	0.03008	0.647	Not Significant
Female with body combat training	Female with Zumba training	-0.27623	0.000	Significant

Table 13. Tuckey test results of life skill variable

Intervention Group	Intervention Group	Mean Difference	<i>p</i>	Description
Male with Body Combat Training	Male with Zumba Training	0.23988	0.000	Significant
Female with Body Combat Training	Female with Zumba Training	-0.00207	1.000	Not Significant

According to the results of the Tuckey test in the male group, the comparison between Zumba and body combat training obtained a mean difference of 0.23988 and a significance value of 0.000. There was a significant difference between body combat and Zumba training effects on life skills in the male group. A positive value in the mean difference indicates that the use of body combat training had a better effect on life skills than the use of Zumba training.

The results of the comparison between body combat training and Zumba training in the female group gained a mean difference of -0.00207 and a significance value of 1,000. Therefore, there was no significant difference between body combat and Zumba training effects on life skills in female groups.

4. DISCUSSION

Effects of Aerobic Training on Mood and Life Skills

This study investigated the profound impact of structured aerobic exercise, specifically Body Combat and Zumba, on participants' mood and life skills. Consistent with our initial hypothesis, paired-sample t-tests revealed significant improvements ($p < 0.05$) in both mood and life skills

variables across all training groups. These findings align with a growing body of literature highlighting the multifaceted benefits of physical activity.

The observed enhancements in life skills resonate with the concept that the sports environment serves as an effective platform for fostering such attributes, given the intrinsic parallels between sports and life skills application (Papacharisis et al., 2005). Sports offer a unique setting for developing skills beyond the physical, extending to critical life competencies. Previous research consistently supports sport as a potent medium for the development and transfer of life skills, viewing it as a meaningful social activity that incorporates various motion components (Lubans et al., 2012). This perspective underscores the innovative potential of leveraging sports to enhance educational quality and youth programs (Sandford, 2008). Within a structured sports environment, participants are inherently required to cultivate teamwork, courage, self-development, self-control, respect for rules, sportsmanship, integrity, competitiveness, leadership, and environmental respect (Allender et al., 2006). Aerobic exercises, in particular, embody these values, fostering components such as persistence, goal setting, social skills, problem-solving, and cooperation (Aghdasi, 2014; Kar & Bhukar, 2013; Kohn, 2016; Stewart et al., 2018; Zhang & Chu).

Beyond life skills, our findings also corroborate the well-documented mood-enhancing effects of exercise. Regular engagement in sporting activities has been shown to alleviate pain, elevate mood, and positively influence mental health, even in populations with chronic conditions like Fibromyalgia (Wright et al., 2003). Similar to the observed benefits of aerobic dance in our study, belly dancing has also been found to significantly reduce pain, depressive symptoms, and anxiety, while improving physical function, quality of life, and self-image (Norouzi et al., 2019). The positive shift in mood is typically characterized by increased passion and a reduction in negative emotional states such as anger, confusion, depression, fatigue, and tension (Donahue et al., 2012; Zito et al., 2022). Current research often focuses on specific exercise modalities like running, yoga, swimming, and various forms of aerobic dance (Berger & Owen, 1988), and the intensity of the activity (Berger & Motl, 2000; Leunes & Berger, 2000), further validating the general positive impact observed in our study.

The Interaction between Aerobic Training and Gender-related to Different Effects on Mood and Life Skills

Our study uniquely contributes by illuminating the significant interaction between gender and aerobic exercise type on both mood and life skills, with a partial eta squared of 0.111 (11%) for the

interaction term. This indicates that the effect of aerobic training on these variables is not uniform across genders, necessitating a more granular interpretation beyond overall group improvements. The substantial partial eta squared values for gender (0.566, indicating 56.6% variance explained for mood and life skills by gender) and aerobic exercise (0.613, indicating 61.3% variance explained) further underscore the critical role these factors play.

This gender-specific interaction is supported by existing literature, which often highlights different motivations and responses to physical activity based on sex (Indiana & Sagone, 2022). While men and women may both seek skill development, social connection, and enjoyment from sports, differences in activity levels and goals are prevalent. For instance, boys are often reported to be more physically active than girls (Anand et al., 2014). Conversely, women often report higher exercise levels and quality of life, with distinct motivations such as weight loss and toning, whereas men more frequently cite pleasure as a primary motivator (Craft et al., 2014). These established gender-based differences provide a robust framework for understanding the interaction effects observed in our study.

Beyond gender, the inherent characteristics of the aerobic exercises themselves contribute to their respective effects. Zumba, frequently described as a "fun" activity (Nieri & Hughes, 2021), integrates physical, psychosocial, and behavioral elements to promote health (Hita & Kumar, 2017; Vendramin et al., 2016). Similarly, Body Combat, particularly when accompanied by music, has been shown to enhance sensations of happiness, joy, and spiritual well-being, while reducing feelings of sadness, tension, and fear (Kommers et al., 2019). While Mao et al. (2020) found no significant gender difference in overall exercise frequency in their study, they did identify significant gender differences in preferred exercise types and influencing factors for regular engagement, such as age, education, and social support. This supports our finding that specific types of aerobic activity might resonate differently with each gender.

It's well-established that exercise is linked to improved mood, with a more pronounced effect in individuals experiencing depressive symptoms before exercise (Lane & Lovejoy, 2001). Furthermore, regular physical activity has been associated with enhanced creative thinking and cognitive flexibility (Colzalo et al., 2013). The positive impact of life skills training, including cooperation, assertiveness, and self-control, on social skills has also been consistently demonstrated (Behroz-Sarcheshmeh et al., 2017). Together, these reinforce the general benefits of physical activity on personal development and mood enhancement (Lane & Lovejoy, 2001; Petitpas et al., 2004).

Gender-Specific Responses to Aerobic Training

Our in-depth analysis revealed distinct gender-specific responses to the two aerobic training programs, particularly in the male and female groups.

In the male group, paired-sample t-tests showed significant improvements in both mood and life skills ($p < 0.05$) post-intervention. However, the Tukey post-hoc test on mood revealed no significant difference between Body Combat and Zumba's effects on mood in males ($p = 0.647$). This suggests that while both exercises effectively uplift male mood, neither offers a superior advantage over the other. Conversely, for life skills, a significant difference was observed ($p = 0.000$) with Body Combat yielding a higher mean difference (0.23) compared to Zumba in the male group. This suggests that Body Combat may be more effective in enhancing life skills for males.

This differentiated effect might stem from the nature of Body Combat, which, as a high-intensity, structured martial arts-inspired workout, emphasizes discipline, focus, and strategic thinking – qualities directly transferable to life skills. Its vigorous nature is known to improve quality of life and respiratory health (Neha & Priyanka, 2016) and evoke feelings of happiness and energy (Kommers et al., 2019). While Zumba is also beneficial, its emphasis on fluid dance movements and less structured combat elements might appeal differently to males, explaining the comparatively lower impact on life skills in this cohort. Our findings echo existing research indicating that physical activity generally improves health-related quality of life, although methodological limitations can exist across studies (Bize et al., 2007). The observation that light-intensity group exercise can improve overall quality of life, while moderate-intensity exercise yields greater physical quality of life benefits (Gillison et al., 2009), provides a broader context for the varying effects of different exercise types.

For the female group, paired-sample t-tests also showed significant improvements in mood ($p < 0.05$) and life skills ($p < 0.05$). Crucially, Tukey post-hoc tests indicated that Zumba had a significantly higher effect on mood compared to Body Combat in the female group ($p = 0.000$, mean difference = -0.27). This is a key unique finding of our study. The greater mood-enhancing effect of Zumba in women could be attributed to its engaging, fun, and less intimidating nature, which is often cited as a reason for women's higher participation and positive experiences compared to other fitness programs (Nieri & Hughes, 2016, 2021). Zumba's combination of upbeat rhythm and easy-to-follow choreography creates an enjoyable and energizing full-body workout (Toscano et al., 2014), fostering

a sense of happiness and reducing stress, which resonates strongly with women's exercise motivations (Donath et al., 2014).

However, in contrast to the male group, the Tukey post-hoc test revealed no significant difference between Body Combat and Zumba effects on life skills in the female group ($p = 1.00$, mean difference = -0.002). While both activities contributed to life skill improvements from baseline (as shown by paired t-tests), neither offered a distinct advantage over the other for women. This suggests that the type of aerobic exercise may be less influential than participation itself for life skill development in females, or that different mechanisms are at play. This nuanced finding is vital for tailoring exercise recommendations. The benefits of Zumba for women extend to improving well-being, aerobic fitness, and neuromuscular function (Donath et al., 2014), and it has even been recommended as an addition to standard care for improving working memory and reducing depressive symptoms in female Fibromyalgia patients (Norouzi et al., 2019). Its effectiveness in improving cardiovascular endurance, cardiorespiratory function, and overall health across age groups, including maintaining bone density in postmenopausal women (Suri et al., 2017), reinforces its broad appeal and physiological benefits.

The physiological and psychological benefits of Zumba are well-documented, from improving physical function (Cugusi et al., 2015; Donath et al., 2014) to enhancing mental health (Bize et al., 2007) and performance in daily activities (Hanson & Jones, 2015). Systematic reviews further confirm Zumba's efficacy in increasing aerobic capacity and positively influencing weight loss, body composition, and psychological/social aspects of quality of life (Vendramin et al., 2016). Our results, particularly the superior mood enhancement of Zumba in women, align with and expand upon this understanding, emphasizing the importance of exercise enjoyment and perceived ease for female participants (Delextrat et al., 2016).

4.1. Limitations and Future Research Directions

Despite the valuable insights gained, this study is not without limitations. First, no a priori power analysis was conducted; however, our sample size aligns with similar experimental physical activity interventions (e.g., $n=12-20$ per group) and was deemed sufficient to detect medium effect sizes ($f=0.25$) with an estimated statistical power of 0.80 and an alpha level of 0.05 (Cohen, 1992; Faul et al., 2009). Future studies would benefit from a formal a priori power analysis to confirm sample adequacy. Second, the reliance on self-reported measures for mood and life skills, while common, may introduce subjectivity. Future research could incorporate objective measures where

feasible to complement self-report data. Third, the study duration was limited, and longer-term interventions could provide more robust insights into the sustained effects of these training programs.

Future research should expand upon these findings by:

- a. Investigating the underlying mechanisms that explain the gender-specific differential effects, particularly why Zumba might enhance mood more in women and Body Combat might be more effective for male life skills. This could involve qualitative approaches or psychophysiological measures.
- b. Exploring diverse populations and age groups to assess the generalizability of these findings.
- c. Conducting follow-up studies to determine the long-term sustainability of the observed improvements and whether these effects persist after the intervention ceases.
- d. Comparing different intensities or formats within Body Combat and Zumba to identify optimal program designs for specific outcomes across genders.
- e. Integrating a control group receiving no intervention to more rigorously isolate the specific effects of the aerobic training.

5. CONCLUSIONS

This study provides compelling evidence that both Body Combat and Zumba training significantly improve mood and life skills. Crucially, our findings highlight a significant interaction between gender and the type of aerobic exercise, revealing nuanced, gender-specific responses. Specifically, while both activities benefit both genders, Zumba demonstrated a superior mood-enhancing effect in women compared to Body Combat. In contrast, for men, Body Combat showed a greater impact on life skills than Zumba, while both activities improved mood equally. These results underscore the importance of considering gender and specific exercise characteristics when designing physical activity interventions to optimize psychological and life skill outcomes. The findings contribute valuable insights for practitioners and policymakers aiming to tailor exercise programs to meet the distinct needs and maximize benefits for diverse populations.

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All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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