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The impact of diaphragmatic breathing on the endurance of contemporary dancers at the Institut Seni Budaya Indonesia Aceh: model-based experimental design

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ABSTRACT

Managing dance movement elements is crucial for maintaining endurance and movement quality. The purpose of this study was to investigate the effects of applying diaphragmatic breathing on dancer endurance. The study employed a mixed-methods approach with an exploratory sequential design. The first phase, qualitative in nature, aimed to formulate hypotheses concerning the endurance issues faced by dancers in choreography courses. The second phase tested these hypotheses through experiments, incorporating control variables between two groups: Group 1, trained in dance movements using diaphragmatic breathing, and Group 2, solely trained in movements. The experiment took place at the Indonesian Institute of Cultural Arts in Aceh, with six female dancers enrolled in choreography classes randomly divided into two groups. None of the participants had prior experience with diaphragmatic breathing techniques while dancing. The study utilized a sphygmomanometer and oximetry for measurement. The endurance test involved dancing to a metronome for 5 minutes at tempos of 100, 110, and 120 without interruption. The results indicated that the respiratory frequency of dancers using diaphragmatic breathing was more stable compared to the group that did not employ this technique. These findings suggest that incorporating diaphragmatic breathing alternately while dancing can serve as a recommendation for maintaining dancers' endurance, particularly for students at the Indonesian Institute of Cultural Arts in Aceh.

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1. Introduction

Extracurricular practical work is gradually becoming an important method for colleges and universities to cultivate versatile talents. In the process of integrating production and education, students' comprehensive ability, communication skills, hands-on proficiency, and problem-solving capabilities are cultivated, trained, and improved [1]. This integration should take place in educational activities and creative processes beyond the classroom. Moreover, Raheb suggested that universities should leverage human resources advantages and actively engage in research, development, and application of new technologies [2]. As a new arts college in Indonesia, The Indonesian Institute of Cultural Arts in Aceh is committed to continuing this integration process. In this context, the researcher endeavors to integrate the dancer's body and the creative process of crafting contemporary dance within the choreography course. The art of dance, in all its forms, is evolving. Techniques and teaching styles are undergoing metamorphosis, and modern choreography is propelling dancers into new realms of physical articulation and stamina [3].

The formal dance class has long been considered the cornerstone of training, providing all the technical, physical, and aesthetic requirements of dance [4]. As Matthew stated, the physiological demands of dance are considered high-intensity, intermittent, or interval in nature, involving both aerobic and anaerobic energy production systems [5]. Therefore, a dancer must be able to execute movements perfectly and possess solid endurance. Consequently, dancers must continuously train themselves. As interpreters, dancers must get closer and even immerse themselves in interpreting the concept of content, meaning, or ideas from a choreographer. Researchers observed the role of dancers in the 2022 Art Festival creation dance competition in Banda Aceh. This festival took the form of an innovative dance competition throughout the province of Aceh. Subsequently, they observed the choreography exam performance of students from the Dance Study Program at the Indonesian Institute of Cultural Arts in Aceh, featuring a type of contemporary dance rooted in tradition. Both performances shared a similar presentation format, focusing on the content of the work. In both instances, the observation involved students from the Indonesian Institute of Cultural Arts in Aceh.

Observations focused on the aspect of the dancer's power of movement. The problem arising from this focus is the dancer's unstable body resistance. Some dancers appear to tire quickly and struggle to control their breath, resulting in expressions that convey fatigue. This issue is closely linked to endurance during dance performances. According to Bisri, endurance is the organism's ability to endure for an extended period to combat fatigue arising from various activities [6]. One contributing factor to the aforementioned problems is dancers' insufficient mastery of breathing techniques, leading to inadequate oxygen intake during movement. This condition is often observed among novice dancers, particularly at the Indonesian Institute of Cultural Arts in Aceh. Diaphragmatic breathing exercises are employed to enhance diaphragmatic descent during inhalation and ascent during expiration [7].

The goal of diaphragmatic breathing is to facilitate proper diaphragm utilization during exhalation, which is valuable for strengthening the diaphragm and reducing the effort required for breathing. Diaphragmatic breathing helps in utilizing the diaphragm effectively during exhalation and is beneficial for maintaining diaphragmatic function and facilitating the respiratory process. The discussion of diaphragmatic breathing above highlights the importance of awareness regarding the breathing patterns dancers should adopt. The way dancers breathe differs between their daily activities and dance performances. Daily activities typically emphasize lung breathing to circulate air with a relatively limited volume. In contrast, dancing requires efficient energy distribution during movement. Dancers must effectively manage air or oxygen (O2) in their bodies to avoid quick fatigue. In line with Bisri's statement, 'A dancer must consistently maintain endurance when dancing, especially in longer-duration dances, as it directly affects the quality of movement and presentation of the work [6].

The study of choreography has never explicitly addressed the diaphragmatic breathing technique, particularly its relation to medical science. Diaphragmatic breathing tends to be employed solely as a technique for managing elements of dance movements, with its implementation lacking consistency and measurable quantitative data. This study refers to the findings of previous research published in national journals. Firstly, the article titled 'Improving Creativity in the Management of Dance Movement Elements in Aceh Besar' was published in 2019. This study addresses the issue of invention in creating motion motifs within choreography, focusing on form. It utilizes qualitative methods (action research) to identify specific issues and proposes actions as problem solutions in the form of training in the management of dance movement elements.

The research partners include the Culture Sector and the Aceh Besar Education and Culture. Secondly, an article titled 'Elements of Motion and Its Application in Seudati Dance: The Creative Process at Aneuk Metuah Studio, Aceh Besar,' was published in 2021. This research leads to training activities aimed at addressing issues in Aneuk Metuah Studio. The problem identified is the dancers' body resistance during Seudati dance, leading to quick fatigue and impacting the

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quality of the dance movement. The program is oriented towards enhancing creativity in managing the energy element when performing the Seudati traditional dance. This type of research is qualitative, using action research methods.

The research conducted thus far has focused on training actions in the management of dance movement elements as a means of enhancing artistic creativity. Evaluation of the two studies above reveals the inconsistency in energy management by dancers, resulting in quick fatigue. Throughout this process, breathing techniques are trained for participants but are not explicitly addressed. Therefore, this research specifically explores the application of diaphragmatic breathing in dance movements as an effort to enhance dancers' body endurance, a topic not covered in previous research. This study is also expected to complement prior research on training in managing dance movement elements as a process of increasing creativity in movement management [8].

Based on the presented background, the focus of this research problem is how dancers' breathing patterns affect body endurance in students taking choreography classes at the Indonesian Cultural Arts Institute of Aceh. The formulation of the research problem includes: (1) Conducting a study on the relationship between dance diaphragmatic breathing techniques and medical science; (2) Conducting experiments on the application of diaphragmatic breathing in dance movements as a solution to dancer endurance problems at the Indonesian Cultural Arts Institute of Aceh; and (3) Measuring the impact of applying diaphragmatic breathing techniques through body endurance tests while dancing using variable control with a sphygmomanometer and oximetry.

The expected results of this study are as follows: (1) Producing cross-disciplinary research that connects the fields of dance and medicine as a reference for future research; (2) Finding a design model for diaphragmatic breathing experiments as a solution to endurance problems and the creative process of dance creation, especially at the Indonesian Institute of Cultural Arts of Aceh; and (3) Obtaining measurable results on the impact of applying diaphragmatic breathing techniques, which will be used as an alternative to increasing dancers' endurance, especially at the Indonesian Cultural Arts Institute of Aceh. The study combines qualitative and quantitative research using a sequential exploratory design to describe the experimental results of applying diaphragmatic breathing to dance moves as an alternative to dancers' endurance.

This study aims to describe the experimental results of applying diaphragmatic breathing in dance movements as an alternative to the dancer's endurance, involving six dancers as research subjects who were divided into two groups. All the dancers are students of the Dance Study Program at the Indonesian Cultural Arts Institute of Aceh who have never applied the diaphragmatic breathing technique. The research subjects, six dancers, were randomly divided into two groups. All dancers are students of the Indonesian Institute of Cultural Arts in Aceh Dance Study Program who took choreography classes and have never used diaphragmatic breathing techniques. This research is important to provide concrete examples of the positive impact of applying diaphragmatic breathing techniques for dancers. It is hoped that this research can contribute to choreographers and dancers in the creative process of contemporary dance.

2. Method

The research employed a mixed methods approach with an exploratory sequential design. Integrating two methods is considered advantageous over using a single method, as it is likely to yield rich insights into the research phenomenon that cannot be fully understood through solely qualitative or quantitative methods [9]. A mixed-methods design can effectively integrate and synergize multiple data sources to study complex problems [10]. esearchers chose the sequential exploratory design model to complement or refine research in dance and medical disciplines, focusing on endurance in contemporary dancers at the Indonesian Institute of Cultural Arts in Aceh. This design initiates with the collection and analysis of qualitative data. Based on the qualitative findings, researchers then develop quantitative

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measures or instruments [11], and, finally, quantitatively test the identified variable, interpreting how the quantitative data generalizes and extends the qualitative findings [12]. Data collection for this research involved observation, interviews, experiments (testing hypotheses), documentation, and literature study. Data analysis techniques encompassed stages of reduction, data presentation, univariate analysis, verification, and conclusion.

Beginning with a qualitative approach to formulating hypotheses about endurance problems in dancers during choreography courses, researchers randomly interviewed six dancers participating in the performance, posing several questions. These included: (1) whether they had consumed food and drink before dancing, (2) whether they understood diaphragmatic breathing; and (3) their satisfaction with the results. All interviewed dancers reported having eaten and drunk enough before dancing and admitted a lack of understanding of diaphragmatic breathing. Regarding performance results, four individuals expressed dissatisfaction, feeling their movements were suboptimal.

Two individuals were satisfied, having done their best despite feeling physically exhausted. In the second stage, a quantitative approach was employed to test the hypothesis using an experimental model with variables: (1) dancer, (2) diaphragmatic breathing, (3) body endurance, and (4) increase in oxygen saturation. A difference test was conducted to determine whether there was a significant distinction between the treatment group (Group 1, trained in dance movements using diaphragmatic breathing) and the control group (Group 2, trained only in dance movements). The body condition of both groups was examined in stages using oximetry and a sphygmomanometer (blood pressure and pulse measuring instrument). Subsequently, data analysis was performed to draw conclusions.

3. Results and Discussion

3.1. Body Dance

Cheney, as cited in Triana, describes the process of dance creation as choreography. It involves the selection and creation of movements for a dance, as well as the planning of movements to fulfill a specific purpose [13]. Motion management is one of the processes involved in producing these works, with dancers playing a crucial role as interpreters of ideas and choreographers' concepts. Dance movement constitutes one of the most fundamental elements of dance, realized through the movement of various parts of the human body, regardless of the dance type. Simultaneously, during the dance process, emotions conveyed differ due to variations in directions, speeds, and strengths [14].

The body, as the primary medium of dance, serves as the foundation for creativity. Dancers, acting as conduits for generating ideas, must be capable of conveying the choreographer's intentions through their movements. Emphasizing the significance of the body as a medium for expressing dance that evolves through movement, the observational focus centers on the dancer's physical resilience in the process of enhancing motor skills in dance. According to Newell, dance falls within the embedded categorization of human motor skills based on function and context, necessitating an assessment of basic motor development skills [15]. In this context, observations of the dancer's body will be conducted at the Indonesian Institute of Cultural Arts in Aceh, particularly focusing on contemporary dance.

The choreography course in the Dance Study Program at The Indonesian Institute of Cultural Arts in Aceh requires students to create and perform contemporary dance. During the performance, researchers identified several instances that were not well presented. According to Sunarto, this indicates that the science of art creation is a collection of facts and various integral propositions, the application of which brings theoretical knowledge into the practical realm of art creation skill. The skill of art creation encompasses practical skill, productive skill, and theoretical thinking skill [16]. These abilities are also essential for contemporary dancers. As Legrand mentioned, the body appears to be framed as an object, to be trained and reworked,

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handled as a specific material with which to form and compose movement according to the ideal [17].

A textual analysis of dance was conducted to refine the research problem, specifically focusing on the aspects of dancers and movement as dance elements. In general, the condition of the dancers and the movements in the three observed performances showed poor quality, impacting the imperfection of movement and the achievement of motion motifs. This is primarily due to dancers getting tired quickly. Based on data obtained by R. Billones et al., in 26 of the 49 articles (55%), fatigue was defined as multidimensional. The most common keywords and phrases used to define fatigue included: "disruptive," "subjective," "distressing," "debilitating," "exhaustion," "persistent," "overwhelming," "lack of energy," and "not relieved by rest or sleep" [18]. In this study, the dimension of fatigue referred to is physical fatigue. Using the definition from two articles, physical fatigue was described as "debilitating physical exhaustion or a distressing lack of energy not relieved by sleep or rest" [19]. Physical fatigue was also "characterized by muscle fatigue, defined as difficulty initiating or sustaining muscle activities" [20]. The physical fatigue referred to in this research occurs when a dancer's body experiences a loss of efficiency and a decrease in work capacity while dancing.

The physical fatigue observed in dancers during performances at The Indonesian Institute of Cultural Arts in Aceh manifests as reduced intensity and quality of movement. The characteristics of this fatigue include: (1) difficulty in closing the dancer's mouth (often opening the mouth), (2) rapid rising and falling of the chest and shoulders, (3) an unstable foot pedestal position, (4) a slowdown in the intensity of movement, and (5) a loss of focus. Based on these characteristics, dancers exhibit signs of oxygen deficiency, leading them to breathe quickly through their mouths. One contributing factor is the irregular breathing pattern of the dancers. According to Verges, Inspiratory Muscle Fatigue (IMF) can develop during exhaustive exercise and result in tachypnea or rapid shallow breathing [21]. This rapid shallow breathing can adversely affect the dancer's endurance. Based on observations and interviews, the preliminary conclusion is that dancers do not employ the correct breathing pattern while dancing and fail to distinguish the breathing pattern during daily activities from that during dancing. The consequence is a decreased endurance during dance performances.

3.2. Application Model of Diaphragm Breathing

The researchers devised an experimental application model to address the hypothesis regarding dancers' endurance, especially at the Indonesian Institute of Arts and Culture Aceh. Control variables for conducting experiments included dancers, diaphragmatic breathing, increased oxygen saturation, and body resistance. The procedure for diaphragmatic breathing was exclusively applied to group 1 (the treatment group). A separate meeting was conducted with group 1 to instruct them on applying diaphragmatic breathing to the previously assigned movements. Dancers were taught inspiration techniques with a slow duration of 5-7 seconds and a fast duration of less than 1 second. Additionally, group 1 dancers were required to perform diaphragmatic breathing exercises for 5-10 minutes before dancing, aiming to familiarize the body with a regular breathing pattern during dance. The endurance test was conducted four times for dancers in groups 1 and 2, with individual measurements for each dancer.

These measurements occurred on 7, 15, 22, and 28 August 2022, both before and after dancing. The dancers moved for a duration of 5 minutes at metronome tempos of 100, 110, and 120. Therefore, for each measurement, the dancer moved for a total of 15 minutes. The instruments used were oximeters and sphygmomanometers, and the measurements were carried out by medical personnel from Pratama Clinic, Syiah Kuala University, Banda Aceh. The experimental model involved variables: (1) dancers, (2) diaphragmatic breathing, (3) increased oxygen saturation, and (4) body resistance. Potential limitations or challenges that could affect the validity and reliability of this experimental model include the small number of dancers (6 people) serving as subjects and the use of only oximeters and sphygmomanometers as medical

measuring instruments. Consequently, the findings obtained can only be recommended on a small scale, specifically for dance students at The Indonesian Institute of Cultural Arts in Aceh.

3.2.1. Dancer

A dancer's body was an instrument for media of expression in dance performances, which meant that the body becomes a vehicle for expressing values or meanings shown in dance [22]. According to Lambangsari, the body, in terms of the soul, also demanded intellectual, emotional, and spiritual intelligence [23]. In this research, the dancers used as the subject are female dancers, totalling six people with age, height, and weight classifications. All subjects have confirmed that they have never applied diaphragmatic breathing when dancing and are in the same adult age group with an average age of 20 years, a height of 155 cm and a weight of 46 kg. The dancers were randomly divided into two groups: the first group was a treatment group that was taught dance movements using diaphragmatic breathing (treatment group) while the second group was a control group that was only taught dance movements (control group).

3.2.2. Diaphragmatic breathing

The breathing technique applied in this experiment is diaphragmatic breathing. Diaphragmatic breathing aims to assist in using the diaphragm correctly during breathing and is beneficial for strengthening the diaphragm and reducing the work of breathing when dancing. Consistent with Wellen, diaphragmatic breathing, or slow abdominal breathing, is also a technique of deep breathing, constituting a form of chest physical therapy program designed to enhance ventilation efficiency, decrease the work of breathing, increase diaphragm excursion, and improve gas exchange and oxygenation [24]. Its application facilitates the distribution of energy to body parts during movement for dancers. The diaphragm, a respiratory muscle located in the chest cavity, plays a crucial role in working with the lungs during breathing. It can be likened to a balloon, expanding during inhalation and deflating during exhalation. To enhance dancers' sensitivity in using diaphragmatic breathing, researchers applied the method used by Subbalakshmi, where participants were taught to breathe at six breaths per minute: 5 seconds for each inhalation and 5 seconds for each exhalation.

The examiner signaled the start of each inhalation by raising his hand and lowered his hand to indicate the start of each exhalation [25]. Practicing this breathing technique helps dancers become familiar with the breathing patterns in dancing, allowing their bodies to adapt to the demands of dancing activities. An example of implementing diaphragmatic breathing can be viewed on the link https://youtu.be/R-b4cE5RM1Q [26]. The technique is then modified during dancing, allowing the dancer to inhale longer or shorter based on the needs of the movement, as well as during exhalation. Dancers are advised to avoid raising their chest and shoulders during inhalation, as this method can lead to fatigue quickly due to limited air distribution in the body.

3.2.3. Increased oxygen saturation.

Data items for the variable of increasing oxygen saturation will be measured using oximetry and a sphygmomanometer. Previously on the dancer variable data item, it was determined that the experimental subject was a female dancer in the adult age group, with the average age of the subject being 20 years. Oxygen saturation variable data items, namely: systolic/diastolic blood pressure, saturation level 95-100 (normal) and pulse rate.

3.2.4. Body resistance

The indicator to get the results of measuring the dancers' endurance is to use motion presentation techniques. The endurance test was carried out by moving using a metronome at tempos of 100, 110 and 120 for 15 minutes. Data items for the dancer's endurance variables: respiratory frequency, pulse rate and quality of motion (stable/decreased).

3.3. Experiment and Data Presentation

The experiment was conducted from July 31 to August 28, 2022. The experimental timeline encompassed the transfer of movement materials and diaphragmatic breathing techniques. The endurance test was measured four times. Before measuring endurance, all subjects received

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dance movement material for 5 minutes. The movement presentation was carried out with a metronome tempo of 100, 110, and 120 by applying different movement intensities, namely slow, medium, and fast movements according to the metronome tempo, with a total presentation duration of 15 minutes.

Fig. 1 illustrates the process of transferring movement material to dancers, applicable to both the treatment group and the control group. In the picture, only movement transfer is depicted, while the treatment group will undergo separate exercises by applying diaphragmatic breathing to the given movements. In the dancer variable, the data items were classified before the experiment. Researchers have determined six subjects in one adult age group with a mean age of 20 years, a height of 155 cm, and a weight of 46 kg.

Breathing techniques that include long and short duration of inspiration (inhalation) have been trained before the endurance test measurement, so another data item that needs to be measured is the respiratory frequency of the subject or dancer. Blood pressure, saturation level, and pulse rate will be measured in the variable of increasing oxygen saturation. Finally, respiratory frequency, pulse rate, and quality of movement will be calculated for the endurance variable. At the same time, the duration of the dance has been determined before the measurement is made, namely 15 minutes at 100, 110, and 120 metronome tempos.

The quality of motion refers to the observation of the elements of dance movement energy, namely the consistency of the dancers in using and channeling energy, such as starting the movement, controlling it, and ending it. Measuring indicators through direct observation and viewing video replays with stable or declining rating criteria. Based on the four variables above, five parameter data items were determined to measure the achievement of the experimental results of implementing diaphragmatic breathing on the dancer's endurance, including blood pressure (systolic/diastolic), oxygen saturation level, respiratory frequency, pulse rate, and quality of movement.

Fig 1. Transfer of motion material to the subject

3.4. Diaphragm Breathing Experiment Analysis

3.4.1. Blood pressure

The tool used to measure the systolic and diastolic blood pressure of the participants is a sphygmomanometer, with the unit of measurement being mmHg. Blood pressure is measured before and after dancing to determine the dancer's fitness level. If the dancer's blood pressure is below normal (systolic ≤95 and diastolic ≤60), the body endurance test cannot be conducted. The analysis results from measurements one to four showed that the lowest systolic blood pressure before dancing was 100 mmHg, and the highest was 130 mmHg, with an average value of 112.2083 mmHg. The lowest diastolic blood pressure measurement before dancing was 65 mmHg, and the highest was 81 mmHg, with a mean value of 73.0833 mmHg.

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The results of the lowest diastolic blood pressure after dancing were 71 mmHg, and the highest was 90 mmHg, with an average value of 78.8333 mmHg. According to Manansang's research, blood pressure is usually described as systolic pressure to diastolic pressure, with adult blood pressure values ranging from 100/60 mmHg to 140/90 mmHg. The average normal blood pressure is 120/80 mmHg [27]. Fig. 2 illustrates blood pressure measurements indicating an increase in the subject's blood pressure, both Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP). All subjects experienced an elevation in blood pressure before and after dancing. This condition is normal for the human body, which undergoes changes in activity from its normal state to work activities such as dancing.

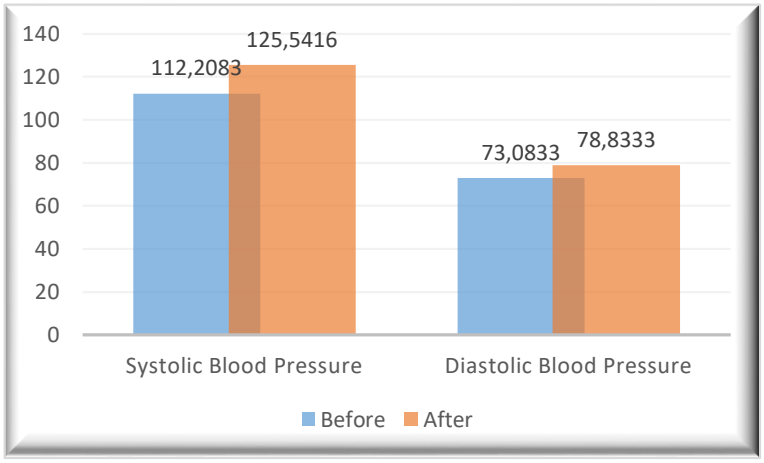

Fig 2. Increase in SBP and DBP before and after dancing

3.4.2. Oxygen Saturation Level

The average pre-test oxygen saturation in the first group (applying diaphragmatic breathing) was 98.25%, and the post-test was 99.16%, resulting in a saturation increase of 0.916%. Meanwhile, the average pre-test for the second group (not applying diaphragmatic breathing) was 98.16%, and the post-test was 98.75%, with a saturation increase difference of 0.583%. According to Perry, the normal level of oxygen saturation is >90% [28]. Table 1 presents average data from 4 oxygen saturation measurements for groups 1 and 2, before and after dancing. Although there was no significant difference, the data showed a greater increase in oxygen saturation before and after dancing in group 1 (the treatment group).

Tabel 1. The average increase in oxygen saturation

Parameter	Average					
	Group 1			Group 2		
	Before	***After***	***Average Deviation***	***Before***	***After***	***Average Deviation***
Oxygen Saturation (%)	98,25	99,16	0,916	98,16	98,75	0,583

3.4.3. Breathing Frequency

The respiratory system plays a crucial role in the human body, a process known as respiration. Despite its apparent simplicity, this process can reflect the state of the human body. Pangestuti explained that diaphragmatic breathing exercises can enhance peak expiratory flow (APE) and reduce respiration rate (RR) [29]. The results of measurements 1 to 4 indicate an increase in the subject's respiratory frequency before and after dancing. The average respiratory frequency of group 1 (applying diaphragmatic breathing) was 18 times per minute before dancing and 20.25 times per minute after dancing, resulting in an increase of 2.25 times per minute. In contrast, the average respiratory frequency of group 2 (not applying diaphragmatic breathing) was 18.25 times per minute before dancing and 23 times per minute after dancing, showing a difference of 4.75 times per minute increase. Therefore, the exertion on the body is more pronounced in group 2, indicating a potential for faster fatigue. Table 2

presents the average respiratory frequency before and after dancing, with the data being a combination of 4 measurements. The data reveals that group 2 (control group) experienced a higher increase in respiratory frequency than group 1 (treatment group).

Tabel 2. The average increase in respiratory rate (x/I)

Parameter	Average					
	Group 1			Group 2		
	Before	*After*	*Average Deviation*	*Before*	*After*	*Average Deviation*
The average increase in respiratory rate (x/I)	18	20,25	2,25	18,25	23	4,75

3.4.4. Pulse

The human heart beats in a healthy individual in a pattern that is neither absolutely regular nor completely random. This subtle fluctuation in sinus rhythm is known as heart rate variability (HRV). Measures of HRV in response to cyclic deep breathing at six respiratory cycles per minute are among the simplest to record and the most sensitive indicators of parasympathetic function [27]. Pulse measurements were conducted before and after dancing. The average pulse rate of group 1 (applying diaphragmatic breathing) before dancing was 88 times per minute, and after dancing, it was 108.75 times per minute, with a difference of 20.75 times per minute. In group 2 (not applying diaphragmatic breathing), the pulse before dancing was 94 times per minute, and after dancing, it was 118.91 times per minute, with an increased difference of 24.91 times per minute. Based on the measurement data, there was an increase in pulse rate before and after dancing in both groups, with a difference of 20.75 times per minute for group 1 and 24.91 times per minute for group 2. Therefore, the data indicate that group 2 experienced a greater increase in heart rate when they finished dancing. The increase in pulse frequency or heart rate and lung activity is in accordance with the intensity of the exercise. The higher the pulling intensity, the faster the pulse or heart rate will be. In line with Conconi's principle in Cebo, to determine the anaerobic threshold in runners by analyzing the relationship between heart rate, running, and velocity, during continuous, incremental exercise, heart rate increases at a linear rate up to a specific point (the point of deflection). At which the heart rate deviates from linearity, the so-called point of deflection was shown to be related to the lactate anaerobic threshold [30]. Table 3 presents the average increase in pulse rate for dancers in groups 1 and 2; measurements were taken 4 times before and after dancing.

Tabel 3. The average increase in pulse rate (x/I)

Parameter	Average					
	Group 1			Group 2		
	Before	*After*	*Average Deviation*	*Before*	*After*	*Average Deviation*
Pulse times/minute (x/I)	88	108,75	20,75	94	118,91	25

3.4.5. Motion quality

Motion quality is the final parameter for measuring the dancer's endurance test. This parameter refers to the observation of the energy element in dance movements, specifically the consistency of the dancers in using and channeling energy when dancing. This includes how the dancer initiates, controls, and concludes movements. Dancing skill is a quality possessed by a dancer in performing dance works. As stated by Lambangsari, a person's dancing ability is derived from how each dancer achieves the quality of dancing and aesthetic experience [23], and according to Herman's statement, a good artist (dancer) should be able to master physical and non-physical abilities, which will eventually bring out the "spirit" of dance [31]. Measuring indicators involves viewing the presentation of each subject for 15 minutes. This parameter is only calculated during dancing because the observation focuses on the body's condition when dancing. Indicators are measured through direct observation of the subject for 15 minutes and

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reviewing video recordings. Criteria for assessing the quality of motion are stability and consistency. The results of comments and measurements four times showed that the consistency of the dancers in group 1 was in the stable category, but one dancer experienced a decrease in energy character in the second measurement. As for group 2, the consistency of the dancers' power decreased across all measures. Table 4 presents data from measuring the movement quality of dancers in groups 1 and 2.

Tabel 4. Average movement quality of groups 1 and 2

Parameter Motion quality	**Dancer**	**Measurement stable/ decrease (S/D)**							
		Measurement 1		***Measurement 2***		***Measurement 3***		***Measurement 4***	
		S	***D***	***S***	***D***	***S***	***D***	***S***	***D***
Group 1 (treatment group)	1	√		√		√		√	
	2	√		√		√		√	
	3	√			√	√		√	
Total		***3***	***0***	***2***	***1***	***3***	***0***	***3***	***0***
Group2 (control group)	4		√		√		√		√
	5		√		√		√		√
	6		√		√		√		√
Total		***0***	***3***	***0***	***3***	***0***	***3***	***0***	***3***

The results of measurements before and after dancing showed that all participants experienced an increase in blood pressure (systolic/diastolic), oxygen saturation, respiratory rate, and pulse. However, on the quality of movement parameters, the condition of the first group participants (the group applying diaphragmatic breathing) is more stable than group 2 dancers who experience a decrease in body endurance. Table 5 is a display of data from the endurance test results of group 1 and 2 dancers before and after the test. The data is the average from the 1st measurement to the 4th measurement.

Tabel 5. Pre and post-test data for initial and final measurements

group	**dancer subject**	**Pre Test**									
		Blood pressure systolic/diastolic (mmHg)		***oxygen saturation 95-100 (normal)***		***breathing frequency time/minute (x/I)***		***pulse time/minute (x/I)***		***motion quality (stabil/ decreasing)***	
		beginning	***end***	***beginning***	***end***	***beginning***	***end***	***beginning***	***end***	***beginning***	***end***
1	1	126/77	104/68	98	98	18	18	89	87	-	-
	2	110/69	114/66	99	98	18	18	90	99	-	-
	3	110/76	113/67	98	99	18	18	92	80	-	-
2	4	112/73	105/76	98	98	18	19	91	103	-	-
	5	110/82	113/87	98	99	18	18	90	91	-	-
	6	117/81	117/91	98	99	18	18	89	91	-	-
group	**dancer subject**	***Post Test***									
		blood pressure systolik/ diastolic(mmHg)		***oxygen saturation 95-100 (normal)***		***breathing frequency time/minute (x/I)***		***pulse time/minute (x/I)***		***motion quality (stable/ decreasing)***	
		beginning	***end***	***beginning***	***end***	***beginning***	***end***	***beginning***	***end***	***beginning***	***end***
1	1	130/79	121/71	100	99	20	20	112	123	Stable	Stable
	2	127/73	126/74	99	99	20	20	104	105	Stable	Stable
	3	114/80	123/76	99	100	20	20	112	111	Stable	Stable
2	4	125/81	116/72	99	98	23	22	124	123	decrease	decrease
	5	140/90	116/76	99	99	22	22	125	133	decrease	decrease
	6	131/85	127/78	99	100	23	22	127	121	decrease	decrease

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4. Conclusion

This research demonstrates that the application of diaphragmatic breathing can impact the dancers' body endurance during dance and enhance the process of creating contemporary dance at the Indonesian Institute of Cultural Arts in Aceh. The data results reveal that the body endurance of dancers in group 1 (using diaphragmatic breathing) is superior to that of dancers in group 2 (not using diaphragmatic breathing). Specifically, the endurance of the first group, who applied diaphragmatic breathing, is better than that of the second group. The increase in oxygen saturation is higher by 1%, and the increase in respiratory frequency and pulse is less. This suggests that dancers in group 1 are more adept at distributing energy by balancing their breathing patterns while dancing, as evidenced by a pulse increase of only 20.75 times/minute and a respiratory frequency increase from 18 times/minute before dancing to 20.25 times/minute after dancing, with a difference of only 2.25 times/minute. In contrast, dancers in group 2 experienced a smaller increase in oxygen saturation (0.5%) and a greater increase in pulse rate (25 times/minute) and respiratory frequency (from 18.25 times/minute before dancing to 23 times/minute after dancing, with a difference of 4.75 times/minute). Based on these results, researchers recommend that students at the Indonesian Institute of Cultural Arts in Aceh practice diaphragmatic breathing and apply it during dancing, contributing to the creation of contemporary dance performances at the institute. However, this research has some weaknesses, including the limited number of subjects and the use of only two medical measuring instruments (oximeter and sphygmomanometer). Therefore, further exploration is necessary to provide more comprehensive coverage and findings. These limitations may not significantly represent the broader population of dancers, but the findings can still contribute valuable insights for dancers at the Indonesian Institute of Cultural Arts in Aceh.

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Declarations

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