The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of Students University

KE KUANG

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR MASTER DEGREE OF SCIENCE
IN EXERCISE AND SPORTS SCIENCE
FACULTY OF SPORT SCIENCE
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2024

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KE KUANG

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The Thesis of Ke Kuang has been approved by the examining committee to be partial fulfillment of the requirements for the Master Degree of Science in Exercise and Sports Science of Burapha University

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KE KUANG : THE EFFECT OF AEROBIC DANCE PROGRAM ON SUSTAINED ATTENTION AND PHYSICAL FITNESS OF STUDENTS UNIVERSITY. ADVISORY COMMITTEE: TANIDA JULVANICHPONG, CHATKAMON SINGHNOY KANOK PANTHONG 2024.

This study examines whether an 8-week aerobic dance program improves sustained attention and physical fitness in university students and whether significant differences exist between the experimental and control groups. Sixty female students from Huanghuai University in China were randomly assigned to either an experimental group (aerobic dance intervention) or a control group (maintaining regular activities). The experimental group participated in an 8-week, moderate-intensity aerobic dance program, with sessions held three times per week, each lasting 60 minutes. The experimental data will be collected for both the experimental and control groups through the Attention Network Test (ANT) and physical fitness tests at three time points: pre-intervention (Week 0), mid-intervention (Week 4), and post-intervention (Week 8). Sustained attention will be measured using the Attention Network Test (ANT), while physical fitness will be assessed according to the standards of the American College of Sports Medicine (ACSM, 2021), encompassing cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. The collected data will be analyzed using paired t-tests, independent t-tests, and one-way repeated measures MANOVA to evaluate differences between the groups.

The research results found significant improvements in both attention and fitness levels in the experimental group, particularly in reaction time and alertness ($p < 0.01$). Additionally, the experimental group showed notable improvements in the 800-meter run, 1-minute push-up count, and sit-and-reach flexibility ($p < 0.01$). This study demonstrates that an aerobic dance program positively impacts sustained attention and physical fitness, highlighting its potential as a valuable intervention for

enhancing sustained attention and physical fitness in university students.

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Ke kuang

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CHAPTER 1
INTRODUCTION

1.1 Background of the Study

University students are often at the cutting edge of societal advancement, and their mental capabilities are vital for future growth across numerous disciplines (Peng, 2018). Within the spectrum of cognitive functions, the capacity for sustained attention is especially significant. This refers to keeping focus and interest in a task over an extended period, even when the task might be inherently less stimulating due to its repetitive or monotonous nature (Unsworth & Robison, 2020). Students need to be able to concentrate for lengthy durations and digest intricate information, which makes this aspect of cognition essential for handling the demands of academic life. As a result, preserving and improving one's sustained attention is a pivotal element in the educational achievements of university students.

In the modern learning environment, university students face numerous challenges that may impact their cognitive and physical well-being. The increase in academic stress and anxiety, coupled with the widespread consumption of short-form video content, has led to a growing prominence of attention deficits among college students. Moreover, lifestyle factors such as excessive screen time, irregular sleep patterns, and a lack of physical activity exacerbate these attention issues. A landmark study revealing the profound impact of sleep quality and emotional state on cognitive processes (Mehta, 2022) underscores the significant role of these factors in determining learning efficiency and academic performance. This highlights the complex interplay between students' physical, psychological, and academic domains, emphasizing the importance of adopting a holistic approach to student health.

In this study, research has indicated that Chinese university students often exhibit deficits in sustained attention during mobile learning. One study found that approximately 60% of college students reported being distracted while engaging in m-

learning, resulting in a decrease in learning efficiency of over 30% (Zhang, 2022). Furthermore, deficits in sustained attention not only adversely affect learning outcomes but may also trigger mental health issues such as anxiety and depression (Li &Wang, 2023). Consequently, educators must implement effective strategies to address attention issues among college students to enhance learning outcomes and optimize the learning environment, thereby fostering the overall development of students (Zhou, 2021).

Recent studies conducted between 2017 and 2019 in Ningxia and Hubei showed a downward trend in the physical fitness of Chinese university students, characterized by rising obesity rates and deteriorating overall health (Hou, 2017; Zhou, 2019). This trend reflects the negative impact of prioritizing academic achievement over physical fitness and highlights the importance of achieving a balance between academic pursuits and physical activity. To maintain and enhance the overall health of college students, it is important to emphasize the significance of physical activity in balancing academic and physical health.

With this in mind, aerobic dance programs have emerged as an effective intervention that has shown its potential to improve cognitive functioning (particularly sustained attention) and physical health among college students. By combining the physiological benefits of aerobic exercise with the interactive and social aspects of dance, these programs offer a multifaceted approach to addressing the cognitive and physical challenges faced by students. Aerobic exercise has been shown to improve cardiovascular fitness, stimulate neurogenesis, and enhance mood, resulting in improved cognitive performance and learning outcomes (Ratey & Loehr, 2011; Smith et al., 2010). Therefore, incorporating regular aerobic dance activities into students' daily lives can promote their overall health, academic success, and quality of life.

In conclusion, the complex relationship between sustained attention, physical fitness, and academic success among college students underscores the need for

comprehensive interventions that simultaneously address cognitive and physical health. Aerobic dance classes, which uniquely combine physical activity with engaging activities, provide an effective way to improve students' sustained attention and physical fitness while contributing to their academic and future career success.

1.2 Problem Statement and Significance

The advent of the digital age has ushered in significant changes in the learning environment and social habits of university students, raising concerns about the potential exacerbation of attention deficits. This phenomenon is particularly alarming given the crucial role of sustained attention and cognitive control in academic success. The increased engagement in media multitasking, characterized by simultaneous interaction with multiple streams of digital information, has been linked to reduced attentional capacities (Ophir, Nass, & Wagner, 2009). Furthermore, the sedentary lifestyle encouraged by prolonged screen time poses additional risks to physical health, underscoring a need for interventions that can address both cognitive and physical well-being in this population.

Amidst these challenges, physical activity emerges as a promising countermeasure, with aerobic dance programs, in particular, offering a unique blend of cardiovascular exercise and engaging group activity that may appeal to young adults. Previous research by de Greeff et al. (2017) has illuminated the positive impacts of physical activity on executive functions and academic performance, suggesting that structured exercise programs can significantly enhance cognitive functions crucial for learning and academic achievement. However, the specific effects of aerobic dance on the attention spans and physical fitness of university students remain underexplored, representing a gap in the existing literature that this study aims to fill.

This study's significance is manifold, offering contributions to cognitive

psychology, physical education, and higher education policy. By examining the impact of an 8-week moderate-intensity aerobic dance program on university students' attention and physical fitness, this research addresses a critical gap in understanding how specific types of physical activity can enhance cognitive performance and well-being among young adults. Utilizing a comprehensive fitness assessment framework recommended by the American College of Sports Medicine (ACSM), this investigation will provide robust data on the efficacy of aerobic dance in improving key components of physical fitness, such as cardiovascular endurance, muscular strength, flexibility, and body composition.

Moreover, this study responds to growing concerns about the cognitive effects of digital media overuse among university students. Findings on the diminished cognitive control in heavy media multitaskers highlight the urgency of developing interventions that can bolster attentional capacities in this demographic (Ophir, Nass, & Wagner, 2009). By exploring the relationship between aerobic dance and cognitive functions, this research offers valuable insights that could guide the development of holistic health and wellness programs within academic institutions, encouraging a more balanced approach to student life that integrates physical activity for cognitive and physical health enhancement.

In short, the purpose of this study is to not only add to knowledge about physical activity and cognitive functions within an academic setting but also provide practical ways of promoting health in students for better educational outcomes. Consequently, the aerobic dance program trial that was implemented in this study could pose significant implications for educational strategies and policies beyond enhancing attentional deficits and fitness levels among university students by targeting health culture to be positioned as an inherent element of academic success.

1.3 Research Questions

1. Does an 8-week aerobic dance program affect sustained attention and physical fitness in both the experimental and control groups?

2. Does the sustained attention and physical fitness test results reveal differences between the experimental and control groups following the 8-week aerobic dance program?

3. Do the sustained attention and physical fitness test results exhibit variations between the experimental and control groups across the pre-, mid-, and post-8 week assessments of the aerobic dance program?

1.4 Research Purposes

1. To investigate the effect of an 8-week aerobic dance program on sustained attention and physical fitness in both the experimental and control groups.

2. To compare the results of the sustained attention and physical fitness tests following the 8-week aerobic dance program within both groups.

3. To compare sustained attention and physical fitness test results among the pre-, mid-, and post-8 weeks of the aerobic dance program between the experimental and control groups.

1.5 Research hypotheses

1. Participation in the 8-week aerobic dance program will lead to a significant improvement in sustained attention and physical fitness in the experimental group, while the control group will show no significant changes in these measures.

2. There will be significant differences in the sustained attention and physical fitness test results between the experimental and control groups following the 8-week aerobic dance program, with the experimental group demonstrating greater improvements than the control group.

3. The sustained attention and physical fitness test results will exhibit significant variations among the pre-, mid-, and post-8 week assessments, with the experimental group showing notable improvements compared to the control group.

1.6 Conceptual framework

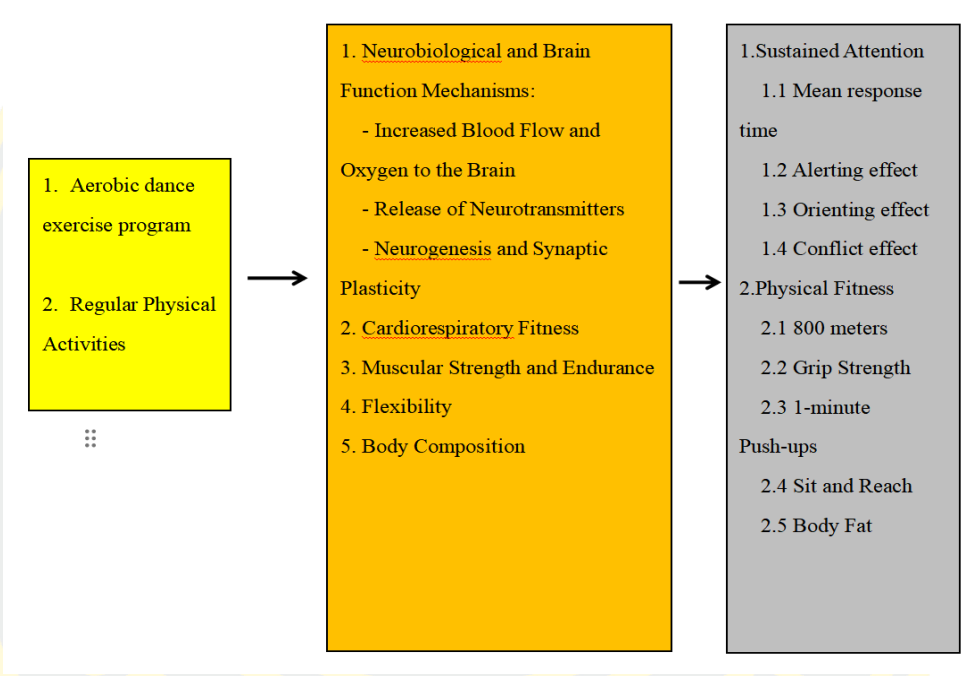

Figure 1 Conceptual framework

The purpose of this study was to investigate the effects of an aerobic dance exercise program on sustained attention and physical fitness in university students, combined with a more detailed assessment schedule to capture dynamic changes throughout the program. This structured program of 60-minute sessions three times a week for eight weeks was designed to investigate the benefits of aerobic exercise on neurobiological function and physical fitness parameters.

Participants in this study are college students between the ages of 18 and 25 who will be randomly assigned to either the intervention group (participating in aerobic dance classes) or the control group (maintaining their usual lifestyle without any additional exercise). To fully assess the effects of the aerobic dance program on

sustained attention and physical fitness, measurements will be taken at three key moments: before the start of the program (pre-test), during the middle period (4 weeks), and after completion (8 weeks).

Sustained attention will be assessed by the Attention Network Test (ANT), which will provide an understanding of participants' attention span before, during, and after the intervention. Participants' fitness levels will also be assessed according to the American College of Sports Medicine (ACSM) criteria, which consists of four main components: cardiovascular endurance, muscular strength, muscular endurance, and flexibility. In addition, body composition measurements, such as subcutaneous fat, using skinfold calipers are included to assess fitness and fitness levels. This assessment strategy was designed to capture the direct and cumulative effects of aerobic dance exercise on both cognitive and physical fitness.

The rationale for this study is that aerobic exercise significantly enhances brain function. It is hypothesized that increased blood flow and oxygenation of the brain, coupled with the release of key neurotransmitters and the promotion of neurogenesis and synaptic plasticity, will lead to significant improvements in sustained attention. Additionally, the aerobic dance program is expected to result in a full range of physical benefits including enhanced cardiorespiratory fitness, increased muscle strength, improved flexibility, and a healthier body composition.

The study will use quantitative data analysis methods to compare ANT and physical fitness test results between the two groups of participants at three assessment points. The study is expected to demonstrate not only the direct benefits of aerobic dance exercise but also the potential for sustained improvements in cognitive function and physical fitness over time. By providing concrete evidence of these benefits, the study aims to highlight the importance of incorporating regular aerobic exercise, such as a dance program, into the lifestyles of university students to improve their physical and mental health.

1.7 Contribution to Knowledge

The implications of this study span the fields of cognitive psychology, physical education, and higher education policy. By providing an in-depth study of the effects of an 8-week moderate-intensity aerobic dance class on college students' attention and physical fitness, this study fills an important gap in the current understanding of how different types of physical activity can improve young people's cognitive abilities and overall health. This study will provide comprehensive data on the effectiveness of aerobic dance in improving key fitness components such as cardiovascular endurance, muscular strength, flexibility, and body composition, using fitness assessment methods recommended by the American College of Sports Medicine (ACSM).

The particular significance of this study is that it aims to elucidate the direct impact of an aerobic dance program on students' attention and physical performance an area that has not been fully explored despite its recognized importance. Previous research has highlighted the positive effects of aerobic dance on cognitive function and physical performance in diverse populations, particularly in improving memory and balance in older age groups (Wang et al., 2023). These findings suggest that aerobic dance may also benefit younger populations, including college students. Furthermore, a systematic review confirmed the efficacy of dance interventions, including aerobic dance, in improving physical health outcomes (Fong Yan et al., 2018).

This context of the existing literature highlights the novelty of this study: specifically examining the effects of aerobic dance on college students' attention and physical health. Not only does this study aim to validate the prevalence of the benefits of aerobic dance across age groups, but it also fills an important research gap by focusing on improvements in attention in an academic setting. The anticipated findings may provide valuable insights for the development of a comprehensive health and wellness program to support a more integrated student lifestyle that

prioritizes cognitive function and physical health.

1.8 Scope of Study

This study aims to investigate the effects of an 8-week moderate-intensity aerobic dance intervention on sustained attention and physical fitness among female undergraduate students at Huanghuai University, aged 18 and above, and in their first year of study. Participants were selected based on strict inclusion and exclusion criteria to ensure they had no prior experience with aerobic dance and no health conditions that could affect their ability to participate. The intervention lasted 8 weeks, with participants engaging in 60-minute sessions three times per week. The duration was chosen to allow sufficient time to observe significant changes in cognitive and physical health indicators.

The main dependent variables in this study include sustained attention and physical fitness. Sustained attention was measured using the Attention Network Test (ANT) at three time points: before the intervention (baseline, week 0), mid-intervention (week 4), and post-intervention (week 8), aiming to capture both immediate and long-term effects of the intervention. Physical fitness indicators were measured using the standards recommended by the American College of Sports Medicine (ACSM), including cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. The independent variable in this study is whether the participants engaged in the aerobic dance intervention.

The study design includes a control group that maintained regular activities without additional exercise intervention. By comparing the experimental group with the control group, the study aims to evaluate the impact of the aerobic dance intervention on sustained attention and physical fitness. A repeated measures design was employed, with data collected at baseline (week 0), mid-intervention (week 4), and post-intervention (week 8), to capture the progressive and cumulative effects of

the intervention. The research data will be analyzed using Analysis of Variance (ANOVA) and Multivariate Analysis of Variance (MANOVA) to compare the performance differences between the experimental and control groups at different time points, thereby providing a comprehensive assessment of the impact of the aerobic dance intervention on sustained attention and physical fitness.

1.9 Limitation of Study

This study has several limitations. Firstly, the study sample is restricted to first-year female undergraduate students from a single university in China, which may limit the generalizability of the findings. Secondly, the study did not control for external factors such as diet, sleep patterns, and academic stress, which could influence the interpretation of the results. Additionally, the relatively short duration of the study did not allow for the observation of long-term effects. Lastly, the study focused solely on the effects of moderate-intensity aerobic dance, which may not be applicable to other forms of physical exercise.

1.10 Definition of Terms

To ensure a clear understanding of terms in this study, a list of definitions of terms applying to this research follows:

***Sustained Attention*:** For the purposes of this study, sustained attention is defined as the ability to maintain focus and concentration over an extended period, which is essential for effective cognitive functioning and daily activities. The Attention Network Test (ANT) was used to assess sustained attention, with all data obtained from its results throughout the testing process. This construct is assessed using several key metrics:

- ***Mean Response Time:*** The average duration it takes for an individual to respond to a stimulus. This measure is vital for evaluating attentional capacity and processing speed. Variations in mean response time can indicate the efficiency and concentration of sustained attention.

- ***Alerting Effect*****:** The ability of an individual to anticipate and prepare for upcoming stimuli. This measure reflects the capacity to maintain vigilance and responsiveness to potential changes in the environment.

- ***Orienting Effect*****:** The ability to direct attention to specific spatial locations. This metric evaluates how well an individual can allocate and sustain attention to particular areas, indicating attentional flexibility and persistence.

- ***Conflict Effect*****:** The capacity to manage attention amidst conflicting information. This measure assesses how well an individual can control their focus and maintain concentration when faced with conflicting or distracting stimuli.

Physical Fitness: In this study, physical fitness is defined as a comprehensive assessment of an individual's overall health. According to the guidelines set forth by the American College of Sports Medicine (ACSM) in 2021, the evaluation of physical fitness encompasses aspects such as strength, endurance, and overall wellness,The assessment includes:

- ***800 Meters*****:** This measure evaluates cardiovascular endurance by recording the time (minute) taken to complete an 800-meter run using a stopwatch, reflecting the efficiency of the cardiovascular system.

- ***Grip Strength*****:** This measure assesses muscular strength by determining the maximum force an individual can exert with their hand using a Hand Grip

Dynamometer, with the unit of measure expressed in kilograms relative to body weight (kg/body weight), providing insight into upper body strength.

- ***1-Minute Push-Ups*:** This measure gauges upper body and core muscular endurance by counting the number of push-ups performed in one minute using a stop watch, indicating muscular stamina.

- ***Sit and Reach*:** This flexibility test measures the distance an individual can reach (Centimeters) forward while seated using sit and reach box, evaluating the flexibility of the lower back and hamstrings.

- ***Body Fat*:** This measure indicates body composition by calculating the percentage of body fat relative to total body weight, providing insight into overall body health and composition. More specifically, the measurement method employed is Skinfold thickness measurement at the thigh, triceps, and suprailiac sites.

Aerobic dance program, For the purposes of this study, the Aerobic Dance Program was designed by the researcher which as a structured, moderate-intensity exercise program (scientific guide of intensity, 50-70% of Maximum Heart Rate) that combines rhythmic dance movements with aerobic exercise, including, but not limited to, a combination of in-place jogging, high kicks, jumping jacks. The 60-minute program is offered three times a week to university students and is designed to build cardiovascular endurance, muscular strength and overall fitness while incorporating elements of creativity and rhythmic expression. Participants perform choreographed dance movements to music that emphasizes sustained and continuous movements to increase heart rate and promote aerobic conditioning. The aerobic dance program used in this study is an energizing and engaging way to exercise university students while also improving their concentration and providing a holistic approach to their physical and mental health.

Students, For the purposes of this study, a "student" is defined as a female undergraduate first-year student enrolled at Huanghuai University, not majoring in physical education and with no prior experience in aerobics or dance. Their participation in aerobic dance classes and related assessments forms the core focus of this investigation.

CHAPTER 2
LITERATURE REVIEW

This chapter systematically focuses on the literature on attention, physical fitness, and aerobic dance effects, focusing on basic theories, practical applications, and empirical research results. This chapter first explores the concept of attention, defines the theoretical basis, different types, and the role of attention in cognitive processes, and traces the development of theoretical models from early simple models to more detailed modern concepts. This foundation gives way to more in-depth research on sustained attention, including its definition, evaluation methods, neural basis, and its significant impact on academic achievements and daily life.

Next, this chapter will discuss how aerobic dance affects physical health by improving physical and cognitive function. It includes the historical evolution, definition, physiological and psychological advantages of this art form. The chapter also evaluates current levels of sustained attention and physical activity amongst the university student population . This chapter develops a theoretical basis for the examination of the outcome of an 8-week aerobic dancing program on sustained attention and physical fitness in university students by synthesizing the literature of a diversity of disciplines.

2.1 Attention

2.1.1 Introduction to Attention

Attention is a core element of cognitive processes, determining how people perceive, interpret, and interact with their environment. The human cognitive system relies on this complex structure, which can select relevant stimuli while blocking other distracting or irrelevant stimuli. It provides the foundation for many cognitive operations such as perception, memory, learning, and decision-making, which play

important roles in people's daily work and learning.

Some studies have found that mindfulness meditation, cognitive training exercises, and engaging in activities that require focused attention are effective means of enhancing attention. A study investigated the impact of mindfulness meditation on attention and found that the attention performance of the experimental group improved compared to the control group after mindfulness training (Sumantry, 2021). Meditation also enhanced some attention processes, but not all; In addition, cognitive training has been shown to improve attention, memory, and daily cognitive function in patients with moderate or severe traumatic brain injury (Le ś niak et al., 2020); Participating in activities that involve focused attention can also effectively improve attention, and a study found that regular chess training has a positive impact on attention control and cognitive flexibility (Sala et al., 2017). Similarly, another study suggests that action video game training can improve attention control and visual attention skills (Bavelier&Green, 2019).These findings emphasize the importance of incorporating mindfulness meditation, cognitive training tasks, and attention demanding activities as part of daily life to maintain cognitive health and strengthen attention control.

Previous studies have generally believed that creativity is related to attentional distraction. This viewpoint contradicts recent experimental evidence, which suggests that distraction is a variable state rather than a stable feature in creative individuals (Vartanian, 2009). In specific terms, a group of people with a high spirit of innovation will adjust their attention according to task requirements. The ambiguous task definition and increased ambiguity provide a distracting environment, slowing down processing speed. On the other hand, clear and concise task definitions promote concentration and thus accelerate processing speed. The flexibility in this problem-solving process should give significant advantages to those with strong innovation drive; Because when facing structural changes in problems, it is necessary to re-

strategize and adjust solutions.

The study of attention essentially encompasses multiple disciplines, gaining insights from psychology, neuroscience, cognitive science, and education. For psychology, improving understanding of how individuals concentrate and process information has become a core topic, and exploring the correlation between these processes and broader cognitive functions (Eysenck and Keane, 2020). In exploring the neural substrates and pathways involved in attention control, the attention process behind complex brain mechanisms has been revealed (Petersen&Posner, 2012). In the context of education, understanding the learning process and setting strategies to improve educational outcomes are closely dependent on grasping attention (Rueda et al., 2010). The attention from a comprehensive perspective stems from the integration of these disciplines. Its complexity and importance are emphasized. Interdisciplinary approach is a rich factor in understanding attention, creating possibilities for us to describe the multifaceted and cognitive functions, key role models and theories in daily life. (Bosna&Rothbart, 2007).

2.1.2Theoretical Frameworks and Models of Attention

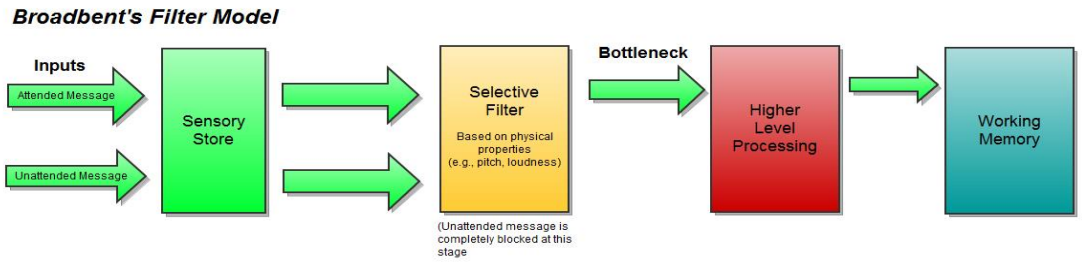

Figure 2 Broadbent's Filter Model

The progression of attention theories demonstrates an increasingly nuanced understanding of this complex cognitive function. Early theories approached attention with relatively straightforward models, like Broadbent's filter model, which was among the first to address how attention operates. Broadbent suggested that attention functions as a filter, selectively allowing sensory inputs into consciousness based on

certain physical traits, such as the volume or frequency of a sound, or where a visual cue is located (Broadbent, 1958). This pioneering model underscored the selectivity inherent in attention, providing a foundation for later, more elaborate theories.

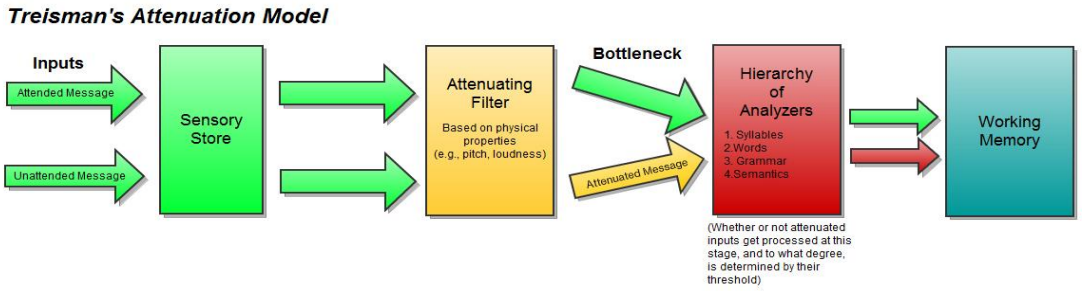

Figure 3 Treisman's Attenuation Model

As research advanced, attention theories evolved toward more sophisticated models that captured the dynamic and adaptable aspects of attention. Treisman's Attenuation Theory, for example, proposed that rather than functioning as a strict filter, attention resembles a volume control, permitting unattended information to undergo processing at reduced strength (Treisman, 1964). This theory introduced the concept that attention is not an all-or-nothing mechanism but involves varying levels of information processing.

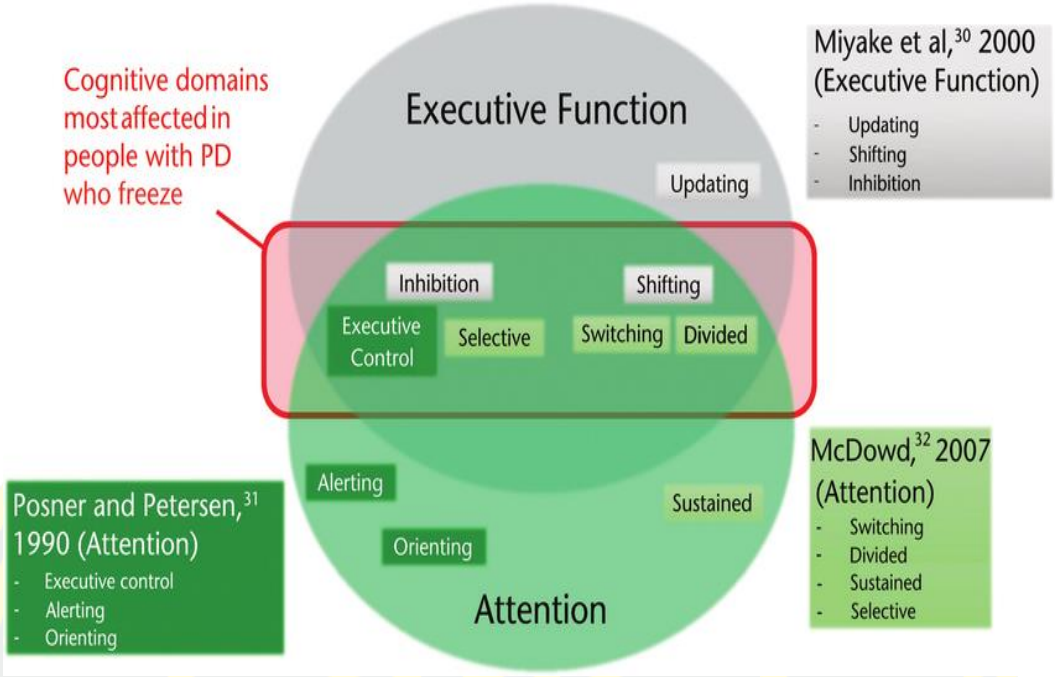

Figure 4 Attenion Network

The modern view of attention is significantly shaped by network theories. Among these, the executive control model is particularly influential, emphasizing attention's role in organizing and guiding cognitive functions, especially in tasks that involve resolving conflicts or correcting errors (Eysenck & Keane, 2020).

A key development in attention theory is the model by Posner and Petersen, which proposes that attention consists of multiple systems rather than a single unified process. According to this theory, attention includes three main networks: alerting, orienting, and executive control. The alerting network helps establish and sustain a heightened state of awareness, the orienting network manages the selection of sensory information, and the executive network oversees the monitoring and resolution of conflicting responses (Posner & Petersen, 1990). Each network connects to specific neural circuits and brain regions, such as the frontal and parietal lobes, which are particularly involved in executive control (Petersen & Posner, 2012).

The information processing theory has provided a clearer view of attention, particularly in terms of how it helps manage and prioritize incoming information. This

theory underscores the limitations of cognitive resources, pointing to the need for careful allocation when handling extensive data. Within this framework, the working memory model by Baddeley and Hitch (1974) marked a key development. This model goes beyond simple short-term memory storage, emphasizing how attention aids in encoding, storing, and retrieving information. It also introduces a “central executive” – a system that directs other storage units and integrates information from multiple sources (Baddeley & Hitch, 1974). In this view, attention acts not only as a filter but as a flexible system that actively organizes and allocates resources.

Studies about multitasking have shown the hurdles that people face when they try to handle multiple activities at the same time. Earlier investigations often suggested that doing several things at once could negatively impact how well individuals perform each task because their attention has to be divided (Pashler, 1994).As research deepens, experts begin to explore how to help people reduce the negative impact of multitasking by optimizing strategies. For example, a theory proposed by Meyer and Kieras (1997) suggests that individuals can reduce distraction and improve performance in multitasking situations by planning ahead and effectively switching tasks (Meyer&Kieras, 1997). This study suggests that although multitasking may lead to some performance decline, effective management and allocation of attention can still improve work efficiency in such environments.

Recent research has changed how we think about attention by mixing ideas from information processing and multitasking. For instance, studies using brain imaging have shown how attention is managed when people try to perform multiple tasks at the same time. This research reveals how various parts of the brain cooperate to enhance the way information is processed (Dux & Marois, 2009). Moreover, the rise of technology and the increasing need for multitasking in everyday life have led researchers to explore new methods and difficulties in handling attention in online environments.

These investigations have deepened people understanding of attention and led to practical methods that can be used in everyday life, such as in schools, for boosting productivity, and in promoting safer driving. The evolution of attention theories reveals not just a better grasp of this complex mental function but also emphasizes how valuable it is to draw from various disciplines when addressing challenging psychological issues.

2.1.3 Sustained Attention

Attention is an important cognitive function, a multifaceted concept that plays a crucial role in how we process information and interact with our environment. Attention is commonly categorized into several different types - sustained attention, selective attention, distracted attention, and executive attention - each of which contributes uniquely to our cognitive abilities, and this paper focuses on sustained attention.

In the study of sustained attention, alertness, and vigilance are often used as synonyms for sustained attention. The confusing use of these terms is indicative of differences in the way sustained attention is interpreted and quantified in different scientific fields. Before attempting to give a precise definition of sustained attention, it is crucial to think about the relationship between alertness, vigilance, and sustained attention.

The Attention Network Model hypothesizes that attention consists of three components: first, the orienting function of attention; second, executive control; and third, the ability to prepare for and maintain vigilance in processing high-priority signals (Posner et al., 2000). The latter is referred to by some as sustained attention and is used interchangeably with vigilance. Sustained attention is defined as "the maintenance of attention on a target stimulus or activity over a period of time, also known as attentional stability" (Peng, 2018), which has been summarized as the ability to maintain goal-directed focus in a repetitive, inactive environment with little

external stimulation (Robertson et al., 2010). Sustained attention is a form of executive control that involves monitoring the activation of task-relevant brain regions, reactivating regions when activation is low, and inhibiting irrelevant brain regions when they are inappropriately selected.

As research has progressed, there has been increasing evidence that sustained attention is not a single component, but rather a result of multiple brain regions working together. This can also be seen in the changing definition of sustained attention, which was initially conflated with vigilance, where only the maintenance function existed, to a gradual expansion to encompass inhibition, and then attentional control, which has been conceptually enriched. Of course, alertness and vigilance are also included as components of sustained attention. Thus, sustained attention not only adds a temporal component to the definition of attention but also includes the ability to allocate attentional resources, which is the core of attentional control. At the present time when sustained attention research has been developed so far, the definition is then mixed with vigilance which brings many problems.

A summary of past literature indicates that all methods of defining persistent attention emphasize "temporality," "purposefulness," "persistence," and "resistance. Therefore, the ability to maintain a high level of focus on task stimuli over a period of time without being distracted by other stimuli has become the definition of sustained attention in this article, although the definition varies.

This study delves into the mechanisms underlying differences in attention and individual efficiency from the perspective of cognitive neuroscience (Rueda et al., 2015). While emphasizing the close connection between sustained attention and the prefrontal cortex, as well as related neurotransmitter systems, it highlights the critical role of the prefrontal cortex in sustained attention tasks, including planning, execution, and maintaining focus. In addition, it is also pointed out that neural transmitter systems such as dopamine and noradrenaline systems play a key role in adjusting

attention levels. At the same time, they have a higher level of precision in observing the naturally occurring different responses between levels of sustained attention, and have identified individualized differences that are closely related to brain structure and function (Rueda et al., 2015) The new discovery has deepened our understanding of long-term concentration and can be connected to further exploration of the direction of attention dispersion programs in the future.

Cognitive neuroscience techniques have been applied in a study aimed at exploring the critical role of the brain in attention. The prefrontal cortex and its neurotransmitter system have a significant impact on the maintenance of sustained attention; They are particularly crucial when planning, executing, and maintaining focused tasks. In terms of regulating attention levels, neurotransmitters such as dopamine and norepinephrine play an indispensable role. Even more surprising to researchers is the existence of sustained attention differences between individuals, which are closely linked to changes in brain structure and function. These findings enrich people's understanding of the depth of persistent attention and point out new avenues for exploration (Oken et al., 2006; Rueda et al., 2015). To truly and effectively evaluate a person's sustained attention level and explore the mechanisms and individual gaps involved, and to find reference basis in this study.

2.1.4 Sustained Attention Measurement Techniques and Instruments

A period of focus and attention maintenance is known as a person's sustained attention. This ability is related to daily life and cognitive function, and is irreplaceable. The technological tools used to measure this characteristic play an indispensable role in research and clinical practice, providing objective and highly repetitive indicators for the evaluation process.

A very common method for measuring sustained and focused attention is to use high-tech neuroimaging techniques such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and magnetoencephalography (MEG), as

well as analyze various neurophysiological indicators. Especially, functional magnetic resonance imaging technology can meticulously measure changes in brain blood oxygen levels during the execution of specific tasks. By having participants perform tasks that require sustained attention during this complex and precise fMRI scan, researchers can cleverly identify brain activity patterns associated with those persistent and focused attention. The electrical activity in the brain is measured through EEG and magnetoencephalography techniques. During the execution of sustained attention tasks, the synchronicity, consistency, spatial and temporal characteristics of neural activity, as well as neural oscillations, can be inferred from analyzing EEG and MEG signals. With the help of event-related potential technology, the neural responses of different stimuli to the brain can also be measured. By combining these methods, it is possible to comprehensively understand the neurophysiological basis of sustained attention.

To evaluate sustained attention, we use a thorough tool: Continuous Performance Task (CPT). During the execution of this test, participants are required to respond in a chain reaction to sequential stimuli in order to assess their attention status in the context of lengthy tasks. Target stimuli and non target stimuli constitute two types of excitation sources for CPT. When faced with the presentation of target stimuli, participants need to initiate a response; For situations where non target stimuli are constantly emerging, it is necessary to remain silent. By conducting analysis on reaction time, accuracy, and other attention level indices, CPT has become an important basis for evaluation focus competition.

The application of CPT in their study was utilized to evaluate patients' sustained attention function (Oken et al., 2006). This discovery reveals the importance of CPT in effectively distinguishing sustained attention differences between patients and healthy control groups, and provides an important experimental tool for clinical neurophysiological research.

Another commonly used tool for measuring sustained attention is the Continuous Attention Task (SAT), which involves presenting continuous stimuli and requiring participants to maintain stimulus attention over a period of time. In design, SAT is similar to CPT, but imagine it to be more complex and have a greater cognitive load. Multiple tasks and paradigms of different levels are included, such as continuous directed response tasks (continuous performance testing, CPT).

Rueda et al. (2015) evaluated the attention levels of participants in the study using tools such as SAT. Individual attention differences are effectively captured by SAT, providing rich clues for a deeper understanding and study of attention mechanisms and individual differences.

The following is a comprehensive evaluation of attention network functionality - Attention Network Test (ANT), achieved through simultaneous measurement and differentiation of three attention networks: alertness, orientation, and executive control. ANT (Posner&Petersen, 1990) was designed based on attention network models widely used in cognitive neuroscience research and clinical practice in this field. When performing ANT tasks, arrow targets require participants to respond accurately and quickly.This task involves four conditions: invalid orientation, valid orientation, no orientation, and no target orientation. When performing the 'invalid targeting' task, the position of the target stimulus does not match the arrow indication; On the contrary, 'effective targeting' requires strict consistency. By weighing and comparing the duration of anti application in these contexts, evaluation results are formed for different levels of attention network functionality.

Through the ANT task, individual attention differences in alertness, orientation, and executive control were effectively captured (Rueda, Checa,&C ó mbita, 2012). Participants have different age groups and reflect corresponding attention patterns in ANT tasks - a phenomenon closely related to their cognitive development level. Then Katz and Kain (2020) conducted a deeper exploration of the effectiveness of ANT and

emphasized its wide applicability to diverse cultural and age backgrounds. From their research results, it can be seen that there is a correlation between ANT tasks and various cognitive performance indicators, which is relatively robust in evaluating attention function. This study mainly uses this tool to evaluate the participants' sustained attention function. All efforts are aimed at finding theoretical and practical basis for the aerobics dance project that affects the sustained attention of college students.

2.2 Physical Fitness

A healthy body encompasses the vitality and alertness in one's daily activities, without excessive fatigue, providing ample energy to enjoy leisure time and respond to sudden emergencies. This concept is diverse and originated from the assessment of soldiers' physical condition. After years of evolution, it has now expanded to a broader theme - the healthcare background and overall well-being of the general public (Caspersen, Powell,&Christensen, 1985).

2.2.1 Components of Physical Fitness

The main factors that make up a healthy body are cardiovascular endurance, muscle strength, muscle endurance, flexibility, and body composition. The following text will answer questions and provide a detailed explanation of these elements:

We call cardiovascular endurance the ability of the heart and lungs to provide oxygen to muscles during continuous physical activity. This element is one of the key indicators of health and exercise performance, and helps to reduce the risk of chronic diseases.

The maximum force exerted by muscles during a specific activity is muscle strength. Strong muscles, less stress in completing daily tasks, and increased metabolic rate can help with weight management.

Long term exercise maintenance ability characterizes muscle endurance. This

endurance in good condition enhances the efficiency of daily activities and reduces fatigue.

The range of motion around joints refers to flexibility. After increasing flexibility, the risk of injury may be reduced and athletic performance may also be improved.

The core concept of body composition focuses on the ratio of body fat to fat free mass, which is a crucial health indicator that affects the suppression of obesity and related disease risks.

2.2.2 Physical Fitness Testing Tools

In the context of higher education, various standardized assessment tools are commonly used to comprehensively evaluate students' physical fitness. Digital insights not only reflect students' current health status, but also serve as basic data for developing personal fitness plans. The following content will showcase popular physical fitness assessment tools and protocols arranged in typical application order:

FitnessGram (1992), developed by the Institute of Health Sciences at California State University in Long Beach, is a commonly used tool for assessing the physical health status of schools. Many tests, such as cardiovascular endurance, muscle strength, muscle endurance, flexibility, and body composition, can be measured here. Typical tests include PACER (Progressive Aerobic Cardiovascular Endurance Run), sit ups, etc., and also include push ups, sitting and stretching, and skin fold measurements. This tool focuses primarily on health-related fitness areas to help students clearly understand the appropriate standards for their age and gender.

In 1973, the National Collegiate Athletic Association (NCAA) regularly monitored the physical fitness of participating athletes. The comprehensive physical fitness level of the school's competitions is not only a goal, but also a manifestation of its responsibility to its member institutions. The assessment of speed, strength, endurance, and flexibility is included in the rigorous NCAA physical fitness testing program, presented in the form of sprinting tests, weightlifting assessments, long-

distance running tests, and sitting and stretching tests. Through this approach, athletes' performance and readiness can be directly observed, and the path to improvement can be outlined for coaches and trainers. At the same time, the exercise plan required to optimize athletes' performance can be clearly documented.

The guidelines for physical activity (2008) were developed by multiple health organizations such as the Centers for Disease Control and Prevention (CDC) and the American Heart Association (AHA). Specific physical activity levels are recommended for people of different age groups, and clear standards should be established for fitness testing to screen whether a person has reached the corresponding level of exercise - this is an important aspect that must be considered to maintain health and prevent the development of chronic diseases.

Innovative and practical, the Functional Movement Screening (FMS) (2010) tool plays a crucial role in evaluating movement patterns and identifying functional limitations or unevenness in each individual. Completed based on seven tests for flexibility, stability, and overall athletic quality. FMS tools can greatly benefit participants in various competitive events: early identification of potential injury areas and enabling trainers to adopt corrective exercise plans to improve performance while reducing injury risks.

The comprehensive framework for providers of exercise testing and prescriptions is completed by guidelines from the American College of Sports Medicine (ACSM). In these guidelines, a wide range of assessment content is covered, including cardiovascular health testing, muscle strength assessment, flexibility testing, and body composition analysis. For each standardized protocol evaluated, these guidelines provide a detailed overview to ensure consistency and reliability. As one of the outstanding resources for fitness professionals, the ACSM guide develops personalized exercise plans based on individual needs of participants.

Physical fitness testing tools and guidelines have achieved dual benefits in

education and sports, one of which is to reveal key information about the health status of students and athletes, while also applying evidence support to the promotion of sports education and training. Through these assessments, the analysis of individual physical abilities and areas for improvement is particularly detailed and clear. With the help of such knowledge insights, trainers and educators may be able to implement clear strategic routes and directly target directions such as promoting health, optimizing exercise performance, and encouraging long-term fitness habits.

2.2.3 Impact of Aerobic Dance Programs on Physical Fitness

Based on a series of fitness assessment methods recommended by the American College of Sports Medicine (ACSM, 2021), participants' performance in key health areas such as cardiovascular endurance, muscle strength, muscle endurance, flexibility, and body composition will be comprehensively examined. This study aims to explore the potential impact of an 8-week moderate intensity aerobic dance program on improving participants' health levels.

The assessment of cardiovascular endurance is carried out through an 800 meter running test, with the requirement of completing the running distance as soon as possible. The short completion time reflects good cardiovascular endurance and efficient oxygen delivery capacity of the cardiopulmonary system.

For the assessment of muscle strength, grip strength devices will be used. This device detects the maximum grip strength of participants' hands and forearms. A high grip strength reading indicates strong overall muscle strength.

The assessment of muscle endurance is based on the number of push ups completed within one minute. It is a reliable indicator for testing the endurance of the upper body, especially the chest, shoulders, and the third part of the head.

The sitting posture squat test is used for flexibility assessment. Through this test, we can understand the participants' proficiency in extending their legs as far forward as possible, even beyond the toe boundary, which indirectly demonstrates their precise

ability to extend in multiple important areas such as the lower back, buttocks, and hamstring - that is, how impressive their attitude towards flexibility and comfort is.

To evaluate body composition, it is necessary to measure the subcutaneous fat thickness of specific body parts in order to calculate the percentage of body fat. This process plays a crucial role in understanding an individual's health status, fat distribution, and developing targeted health and fitness plans.

Conduct research based on the evaluation method recommended by ACSM to accurately quantify the impact of moderate intensity aerobic dance projects on various physical parameters of college students. This move provides scientific support for improving the physical fitness level of college students.

2.3 Training principles

The design and implementation of sports training programs need to follow basic guidelines, namely training principles. Through these principles, athletes can be assisted in achieving the optimal level of physical fitness and athletic performance. The principle of efficiency can improve athletic performance, reduce the risk of injury, and help shape participants' long-term development of good exercise habits. The so-called key training reasons include:

In the entire training program, the gradually increasing training load that the body needs, such as weight, intensity, or duration, is referred to as "progressive overload". This approach is beneficial for promoting physical adaptation and improving performance (Haff&Triplett, 2016). The closely related principle is "specificity", which means that the type and method of exercise performed are closely related to the training effect. In an ideal situation, it is necessary to ensure that the training conducted is consistent with the athlete's goals in order to achieve maximum effectiveness (Ratames, 2012). 'Recovery'. Extremely important for the body; Because each training session requires a certain amount of time to repair damaged tissues and

promote muscle growth, making them stronger. Incorporating rest and recovery periods into the plan is extremely crucial - this is the guest principle! Thompson (2018) acknowledges that "personalization" means that each person has their own unique qualities and adaptability. The training plan should meet the requirements and abilities of each individual to achieve the best results (Earle&Bailey, 2009).

The FITT principle, which means frequency, intensity, time, and type, provides a key framework for designing effective training programs. Frequency refers to the number of times one exercises per week, which is a necessary condition for the body to gradually adapt to the intensity of training and maintain a healthy level. For aerobic exercise, the recommended three to five times a week (McArdle, Katch,&Katch, 2010) is the ideal choice. As for intensity, it is reflected in the difficulty or load level of exercise, and needs to be adjusted according to the participant's health level. Aiming to seek a "challenging and not overly intense" exercise balance point, moderate intensity exercise based on this will significantly improve cardiovascular and muscle strength (Rhea, 2004).

The concept of time refers to the duration of each exercise activity. To achieve the best and most ideal health benefits, we recommend that each aerobic exercise should last for at least 30 minutes, including warm-up phase, main exercise section, and relaxation phase (American College of Sports Medicine, 2013). The type is related to the specific type of exercise being performed. In this in-depth and detailed study, aerobic dance was chosen as the main and representative form of exercise because it is highly participatory and interactive, and can effectively enhance participants' valuable coordination, flexibility, and social skills (Willoughby&Wilkins, 2008).

In this comprehensive and systematic study, a detailed, comprehensive, and orderly aerobic dance program was developed strictly and conscientiously in accordance with the FITT principle. This carefully designed and planned plan

includes three 60 minute, moderate intensity large classes per week. The series of exercises in this plan aim to gradually transition from simple to complex, ensuring that all participants can gradually increase the intensity of their exercise during the adaptation process, thereby significantly enhancing their physical adaptability and improving their mental health.

2.4 University Students

2.4.1 The Current Situation of university students' Attention

One of the areas that is receiving increasing attention is the attention span of college students, especially in an environment where digital interference is increasing. A landmark study published in the Journal of Social and Clinical Psychology in 2017 (Wilmer, Sherman, and Chein) revealed that heavy media multitasking processors performed worse than other populations in sustained attention tasks, implying that digital media exposure has a significant impact on attention retention duration. One of the key factors is that mental health also determines whether student members can maintain focus for a long time. According to a survey report released by the American College Health Association (ACHA) in 2018, the prevalence of anxiety and depression on campus, at known unprecedented levels, will gradually erode our cognitive function and the energy needed for concentration.

The COVID-19 led to the change from offline learning to online learning in 2019, which affected college students' attention. A study conducted by EDUCAUSE Review focused on the challenges in online classroom environments, which make it more difficult for students to maintain participation and focus compared to traditional classrooms (Means and Neisler, 2020). Mindfulness and meditation practices are seen as strategies to improve attention. A study published in Psychological Science showed this effect: after mindfulness training, GRE reading comprehension scores and working memory abilities were significantly improved (Mrazek et al., 2013).

There are many strategies, such as mindfulness and meditation, aimed at improving attention. However, most studies focus on static intervention methods and have not fully addressed the enormous potential of dynamic aerobic activity. This study selected a moderate intensity, 8-week aerobic dance program as the experimental subjects, which perfectly combines music and exercise. In this way, not only does it enhance the physical fitness of students who have been exercised through rhythmic body movements, but it also makes them more focused and difficult to maintain alertness during the participation process Compared to simple static intervention, aerobic dance can be said to be a more energetic and enjoyable interactive method, which is easily accepted and persevered among college students. Therefore, it not only enhances concentration, but also strengthens comprehensive physical and mental health, effectively supporting students' all-round development

2.4.2 Physical Fitness Status of university students

Recent research findings indicate that the physical fitness of college students has declined. According to a 2019 report by the American University of Sports Medicine, less than half of college students are able to reach physical activity guidelines, leading to increased concerns about obesity and related health issues. The choice of lifestyle - diet and exercise habits - will directly affect the physical and mental health of this population. Subsequent research findings revealed that there may be a significant correlation between unhealthy eating habits and a decrease in physical fitness among college students (Huffman, 2018). Having good physical fitness is linked to excellent grades. An observation published in the American Journal of College Health suggests that maintaining close frequency of physical exercise is beneficial for improving GPA (Trockel, Barnes, and Egget, 2010).

Universities have invested in various health promotion strategies with varying effects. A study in the Journal of College Student Development shows that comprehensive health plans provide students with strong physical activity abilities

and good overall health effects (Keating, Guan, Pi ñ ero,&Bridges, 2010). Despite limitations, the intervention methods found in current literature mainly focus on single exercise or lifestyle changes. For the goal of encouraging college students to participate in sports for a long time and cultivating their healthy habits, these methods appear inadequate in conducting long-term effectiveness evaluations.

In comparison, the dynamic, joyful, and interactive characteristics of aerobic dance not only improve the physical fitness of participants, but also attract long-term investment from students due to its diverse movements and rhythm changes. This situation drives their overall health condition to be maintained and improved in reverse. As for the future, attaching importance to intervention methods such as aerobic dance, which have many advantages, and investigating their long-term effects on college students will be the research direction, striving to find more effective strategies to solve the health problems of modern college students through these efforts.

2.5 Aerobic Dance

2.5.1 Definition of Aerobic Dance

Aerobic dance, a vibrant and dynamic form of physical activity, cleverly combines the unique rhythm and expressive elements of dance with the endurance training properties of aerobic exercise. This unique blend not only adds more fun, but also significantly improves the physical and mental health and overall fitness level of participants.

The core goal of aerobic dance is to improve cardiovascular health through continuous, rhythmic body movements that challenge and stimulate heart and lung function, thereby enhancing endurance and cardiovascular efficiency. The American Council on Exercise (ACE) praises this comprehensive exercise approach, which not only focuses on enhancing cardiovascular function, but also helps burn calories and

improve overall physical fitness (ACE). This diverse and flexible form of exercise is particularly popular because it adapts to different fitness levels, and individuals can actively participate and benefit from it regardless of their initial fitness status.

While maintaining good physical health, aerobic dance is also widely recognized for its positive impact on mental health. Combining music, group dynamics, and sports activities has become one of the excellent ways to relieve stress, improve emotions, and promote overall mental health. Rhythmic dance and physically demanding aerobic exercise release "feel good" endorphins, a biochemical reaction that plays an important role in reducing stress and anxiety and actively promoting mental health.

Moreover, aerobic dance has flexibility and adaptability, and occupies a dominant position in inclusive activities. Tailored charming and unique exercise forms based on different cultural preferences, age groups, and fitness levels. Whether it's an aerobic exercise filled with Latin rhythms, high-energy Zumba courses, or a more traditional form infused with jazz and hip-hop elements, it is composed of various styles that keep participants enthusiastic and determined to continue.

The various exercise methods presented in the summary - aerobic dance, have immeasurable benefits for physical and mental health. The joy of dancing and the rigor of aerobic exercise blend together, becoming an effective and enjoyable exercise choice. The American Sports Commission emphasizes that aerobic dance is a dynamic, effective, and enjoyable way to improve overall health and fitness.

2.5.2 Origins of Aerobic Dance

The story of oxygen dance, a fascinating journey through time. In the late 1960s, there was a crucial transformation in the field of fitness. Thanks to the pioneering work of Dr. Kenneth H. Cooper, a former Air Force colonel and exercise physiologist, the concept of aerobic exercise was introduced in his groundbreaking work "Aerobic Exercise" in 1968. The book proposes a plan for preventing coronary artery disease

and a series of revolutionary ideas, laying the foundation for subsequent aerobic dance.

In the 1970s, Dr. Cooper's concept of aerobic exercise evolved into a more structured and enjoyable form - aerobic dance. This transformation was initiated by enthusiasts such as Judi Sheppard Missett, who founded jazz dance in 1969. As a professional jazz dancer, Missett realized that integrating dance and movement would open up a new way of exercise that was both beneficial and enjoyable. At first, it was just a small jazz dance class in Evanston, Illinois, but it quickly developed into a global phenomenon and introduced elements of resistance training, Pilates, yoga, and taekwondo. Through the innovation brought by Mistet, exercise methods are not only easy to implement but also have a wide appeal; This is especially true for women, especially those who expect to maintain a healthy or weight loss pattern in a fun and engaging way.

Driven by its widespread appeal and effectiveness, millions of people worldwide actively participate in various forms of aerobic dance, as recorded in the 2021 IHRSA report. The rise of this trend is not only due to the pleasure brought by exercise itself, but also because of its proven benefits to health (IHRSA, 2021).

In the 1980s and 1990s, the cultural influence of aerobic dance was further demonstrated: as a frequent appearance on popular media, highly praised by celebrities, and a major content in family exercise videos, it witnessed its symbol of health and fitness, enriching life like Jane Fonda and attracting public attention through its multifunctional features, becoming a major event that aroused universal imagination in this era. Nowadays, it is deeply rooted in people's hearts and exists as a norm in the fitness industry, and its influence still cannot be stopped.

Dr. Kenneth H. Cooper's innovative work on aerobic dance originated, and Judi Sheppard Missett propelled his jazz dance to mainstream development. This fitness revolution not only responds to the growing awareness of health, but also

demonstrates humanity's desire for enjoyable and engaging sports activities. The IHRSA report and various academic studies have established the key role of aerobic dance in the fitness industry and documented its effectiveness and popularity.

2.5.3 Characteristics of Aerobic Dance

Aerobic dance, a dynamic and attractive exercise mode, has unique characteristics that make it an effective exercise and enjoyable activity. Its characteristic is to widely popularize fitness programs and improve their effectiveness.

The exciting performance highlights the relationship between energy and rhythm in aerobic dance, which is one of the most decisive aspects. The participants demonstrated each carefully arranged step in joyful and fast-paced music. This experience, which is full of muscle tension and artistic expression intertwined with five flavors, truly embodies different style elements. And exercising with music enhances overall coordination and rhythm sensation; Make exercise more stimulating and physically challenging. Domene et al. (2015) confirmed in the journal "Physical Activity and Health" that aerobic dance improves cardiovascular function and enhances cognitive abilities due to the symmetrical and coherent combination of high-efficiency energy elements

The adaptability of aerobic dance intensity and speed enables it to cover low impact training to high-intensity training, compatible with various fitness levels from beginners to experienced fitness enthusiasts.

The perfect combination of upper and lower body movements is a characteristic of aerobic dance, achieving all-round exercise. This not only balances the development of muscle strength, but also enhances overall coordination and balance. According to Vazou et al. (2016), the combination of upper and lower movements in aerobic dance can significantly improve muscle strength and endurance.

Physical and mental health benefits: The advantages of aerobic dance are not only reflected in the body, but also bring significant psychological health benefits.

Combining music, sports activities, and social classes can effectively relieve stress and enhance emotions. A study tells us that dance can positively affect our psychological state and internal stress (refer to Koch et al.'s 2019 study).

Cultural Diversity and Evolution: Aerobic dance styles vary and continue to evolve, reflecting current cultural trends and integrating a diverse range of dance styles from Latin samba to hip-hop. This wide and diverse approach keeps exercise lively and fresh, attracting a large audience to come and learn.

High energy and rhythmic movements, variability in intensity, whole-body integration, and physical and mental health benefits shape aerobic dance as a unique and effective form of exercise. Many studies have shown that aerobic exercise has rich and comprehensive exercise effects that are unparalleled in supporting overall health and enjoyment. Compared to other methods, this approach is more popular among those seeking fun and effective exercise.

2.5.4 Aerobic or Anaerobic: The Nature of Aerobic Dance

When exploring aerobic dance, it was found that there is a distinction between aerobic and anaerobic energy systems, and various forms of aerobic dance that combine with these systems were studied. While using aerobic energy systems as the main focus of activity, anaerobic system elements are also incorporated, especially in more drastic changes.

Aerobic Energy System Engagement: Aerobic dance routines are primarily aerobic, relying on the body's oxygen use to meet energy demands. These routines, characterized by extended moderate to vigorous activities, are known for enhancing cardiovascular endurance and aiding in fat burning. A study found that dance interventions may increase VO2peak compared to non-exercising controls, demonstrating its effectiveness in improving the aerobic capacity of the elderly (Rodrigues-Krause et al., 2016). Additionally, a cohort study revealed that moderate-intensity dancing is inversely associated with cardiovascular disease mortality, thus

underscoring the cardiovascular benefits of aerobic dance (Merom et al., 2016).

Anaerobic Components in High-Intensity Variants: High-intensity variants of aerobic dance engage the anaerobic energy system, essential for short, intense bursts of activity under limited oxygen availability. Fong Yan et al. (2018) in "Sports Medicine" conducted a systematic review and meta-analysis showing that structured dance interventions significantly improve musculoskeletal function and body composition, suggesting the engagement of anaerobic pathways along with aerobic benefits.

Comparative Analysis with Other Exercises: Aerobic dance, featuring a blend of sustained aerobic activity and potential anaerobic bursts, offers a comprehensive workout that improves both aerobic and anaerobic fitness levels. The systematic review by Fong Yan et al. (2018) also highlighted that dance is as effective, and sometimes more so, than other types of structured exercise for improving various health outcomes, thereby positioning it as a comprehensive and beneficial exercise option.

In conclusion, aerobic dance primarily operates within the aerobic energy system, contributing to improved cardiovascular health and endurance. However, its adaptability for the inclusion of anaerobic elements in high-intensity formats further enhances its effectiveness in improving overall fitness, including muscular strength and anaerobic capacity. This dual nature, as evidenced by various academic studies, establishes aerobic dance as a versatile and comprehensive exercise option suitable for a broad spectrum of fitness goals.

2.5.5 Aerobic Exercise and Physical Fitness

Aerobic, as a regular and sustained aerobic exercise, produces multiple positive effects in terms of physical fitness. First, it improves aerobic endurance and promotes cardiorespiratory fitness, thanks to the process of heart rate elevation that participants experience during the activity (Annadurai et al., 2021). Secondly, aerobics contributes

to weight management and fat burning, supporting weight loss and weight control by promoting calorie burning and fat metabolism (Krishnamoorthi et al., 2021). Aerobic exercise also greatly enhances flexibility, which is an important component of physical fitness. Regular aerobics classes often include stretching exercises that improve joint range of motion and muscle flexibility, helping to improve the body's overall flexibility and reduce the risk of injury. Improved flexibility also further improves aerobic efficiency, making exercise more effective and enjoyable(Vijayalakshmi，2021).

In addition, this aerobic exercise positively affects cardiovascular health, including improving cardiovascular system function and regulating blood lipids and blood pressure (Arfanda et al., 2022). Also, aerobics enhances mental health, helping to improve cognitive function, reduce stress, and improve mood states (Fausto, 2022). These studies support the idea that aerobics has a comprehensive and beneficial effect on physical fitness in several ways.

In this study, the 8-week moderate-intensity aerobic dance program employed represents an aerobic exercise form that possesses the aforementioned multiple benefits. Compared to other forms of exercise, aerobic dance classes offer distinct advantages in terms of dynamism, enjoyment, and interactivity, enabling participants to achieve significant physical and psychological benefits within a relatively short period. For university students, this short-term and easily accessible intervention is particularly suitable, as it aids in enhancing their physical fitness and fostering positive lifestyle habits within a limited timeframe.

2.5.6 Aerobic Dance and Attention

Aerobics, as a comprehensive physical activity, not only provides significant health benefits to the body but also positively impacts brain and cognitive function. Research in recent years has shown that regular participation in aerobic exercise, such as aerobics, can enhance the structure and function of the brain, especially those brain

regions associated with attention management, memory, and executive function. For example, aerobic exercise has been found to increase the volume of the hippocampus, a key region of the brain directly related to learning and memory (Firth et al.,2018). Furthermore, exercise promotes the release of brain-derived neurotrophic factor (BDNF), a protein that plays a central role in neurogenesis and brain plasticity (Szuhany et al., 2015).

Regarding the association between attention and the brain, studies have pointed out that attention is modulated by the prefrontal cortex and the parietal lobe, two regions that play a key role in regulating focus and distraction of attention (Posner & Petersen, 1990). Research has shown that improvements in frontal and parietal lobe function in the brain can be promoted through aerobic exercise, specifically aerobics, which further enhances the execution of attention and cognitive control (Qi, 2019).

In this study, the designed 8-week moderate-intensity aerobic dance program serves as an intervention aimed at rapidly and effectively improving sustained attention. Compared to other forms of exercise or intervention methods, aerobic dance offers a high degree of enjoyment and social interaction, not only stimulating university students' motivation to participate but also significantly enhancing their attention levels within a relatively short timeframe. This multidimensional benefit makes it an ideal choice for addressing the issue of sustained attention among university students.

2.6 In summary

In summary, the effects of aerobic dance programs on attention are multifaceted, involving intricate connections between mind-body coordination, emotional well-being, and long-term neuroplastic changes. The next chapters of this dissertation will delve into the methodology used to study the effects of an 8-week aerobic dance program on cognitive attention and physical fitness. Through this study, we expect to

gain valuable insights that will contribute to the growing knowledge of university students regarding the interrelationships between physical activity, cognitive function, and overall health.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides a detailed overview of how an 8-week aerobic dance course affects the sustained attention and physical health of college students. The research method involves repeated measurement experimental design and ensures objectivity by randomly dividing participants into experimental or control groups. The key points include: research design, participant selection, intervention procedures, and data collection techniques. The psychological measurement tools and physical fitness assessments used to measure key variables, as well as statistical methods for data analysis, are also discussed here. Finally, this chapter aims to provide an organized and easily replicable framework for accurately evaluating the effectiveness of aerobic dance programs in improving sustained attention and physical health among students.

3.2 Research Design

The quasi experimental design was chosen for this study to investigate in depth the effects of sustained attention and physical health on college students in an eight week aerobic dance course. By combining repeated measurements and paired groups, objectivity is ensured and bias is minimized as much as possible. The computer-generated randomization process is responsible for the random allocation of participants to the experimental or control group.

Multiple measurements are distributed at three key time points: the beginning stage (i.e. week 0), the middle stage (i.e. week 4), and the end stage (i.e. week 8). And these assessments cover attention network testing (ANT) and various physical fitness assessments. The fluctuation of the same test object data over time can also be observed through repeated measurement symbols, effectively improving the reliability and effectiveness of the results displayed in aerobic dance projects.

This study used an 8-week aerobic dance program as the independent variable, with sustained attention and physical fitness as the dependent variables. The assessment of cardiovascular health, muscle strength, endurance, flexibility, and body composition is the latter method of measurement. Conduct in-depth behavioral investigations to control for potential confounding variables such as sleep patterns, stress levels, prescription drug use, and even frequency of participation in other non study related physical activities, in order to ensure consistency of results.

3.3Participants

3.3.1 Sample Size Determination

Before recruiting participants, the research team calculated the appropriate sample size necessary to achieve sufficient statistical power. Given the lack of prior studies for setting effect sizes in this context, the researchers followed recommendations and used data from other relevant studies to determine the required effect sizes (Kang, 2021). For attention-related effects, research indicated an effect size of approximately 0.9 (Zhang, 2021), while findings suggested an effect size of about 0.8 for physical fitness improvements (Bulca et al., 2022).

To ensure the study's effectiveness, the effect size was set at 0.8. Using G*Power 3 software, the study aimed to ensure statistical validity by setting an alpha level of 0.05, a power of 0.80, and an anticipated effect size of 0.8 (Faul et al., 2007). The minimum calculated sample size was 52 participants. However, to account for potential dropouts and to strengthen the study's robustness, the study successfully recruited 60 volunteers who met the experimental conditions.

3.3.2 Sample Characteristics

The research involves 60 female freshmen over the age of 18 who are studying non sports majors at Huanghuai University in Zhumadian, China. These physically robust participants have no prior experience in sports or dance training to ensure that

the research focus is on the general college student population and there are no other influencing factors for intervention. The use of demographic data to represent the typical group of college students has increased the generalizability of research results.

3.3.3 Inclusion Criteria

Participants were selected based on the following inclusion criteria:

University Enrollment: Participants had to be current first-year female students at Huanghuai University.

Age: Participants were required to be 18 years of age or older.

The consideration is limited to individuals who are physically healthy and have no potential obstacles to aerobic dance or physical fitness assessment. Participants must meet specific health standards: blood pressure should be maintained at 90-120mmHg for systolic blood pressure and 60-80mmHg for diastolic blood pressure; Reaching a height specification of 150-175 centimeters, with a resting heart rate of 60 to 100 beats per minute.

No Prior Aerobic Dance Experience: To avoid bias from previous training, participants with little to no experience in aerobic dance were selected.

3.3.4 Exclusion Criteria

The following exclusion criteria are all to ensure the focus and effectiveness of the research:

Medical conditions: For those with cardiovascular disease, musculoskeletal problems, or other health conditions that may limit participation in aerobic dance or fitness activities, it is necessary to decide to exclude them;

Regular physical exercise: Without affecting the principle of ensuring that the observed effects are fully generated by the intervention measures, individuals who continue to engage in regular aerobic exercise or high-intensity sports outside of the experiment cannot be included in the scope of this experiment;

There is a significant difference in attendance rate: at least 80% of aerobic dance

learners who promise not to participate 100% must also be able to choose to be placed on file due to the long-term impact of intervention measures.

Participants who had previous experience in cognitive training programs were removed from the research list due to confusion about the results caused by potential impact on attention ability.

The precisely calculated sample size and detailed inclusion and exclusion criteria ensure the rigor and scientific rationality of the participant selection process in the study, thereby enhancing the credibility and effectiveness of the research results.

3.4 Indicators of Content Effectiveness (IOC)

The purpose of this study is to evaluate the effectiveness of aerobic dance programs, and five experts were invited to serve as evaluators. After comprehensive training and discussions among all parties, assign responsibilities to each expert and conduct detailed scoring for the plan. Five experienced experts in related fields brought their professional perspectives and suggestions. The following three points will be used as the scoring criteria for this round:

-1: when the question was determined to be inconsistent with the purpose

0: when it is uncertain whether the problem is consistent with the purpose

+1: When the problem is determined to be consistent with the purpose

The following aspects provide guidance for experts' ratings: the fun and attractiveness of aerobic exercise programs, the appropriateness of exercise intensity, posture, and frequency, and the rationality of 8-week plans; The warm-up phase includes key steps such as muscle activation, stretching, consistency, and duration; The weekly exercise intensity, duration, and appropriateness of movements and rhythms are combined with the exercise phase; The relaxation phase focuses on the effectiveness, consistency, and duration of muscle relaxation.

After each expert completes the scoring, the average score of each project

mentioned above is calculated to measure the overall efficiency of the plan. Statistical analysis tells us that IOC received an average score of 0.8, indicating that experts believe that the aerobic dance course content is targeted and effective. The appendix section will store specific scoring items and detailed scoring results from various experts for reference. And all data will serve as an important basis for implementation in curriculum design, and also become valuable references for future related research.

3.5 Measurement tools

3.5.1 ANT Test

This study used the Attention Network Test (ANT) to evaluate the impact of aerobic dance programs on participants' sustained attention (Fan et al., 2002). One mature tool is ANT testing, whose Cronbach's alpha value typically ranges from 0.70 to 0.90, reflecting the level of internal consistency. Enter a few key indicators for evaluation:

Alarm network effect: The difference in reaction time between correct experiments under no prompting and prompting conditions provides a measure of an individual's ability to achieve and maintain an alarm state.

Directional network effect: By comparing the reaction time of correct attempts under effective and ineffective cue conditions, we can evaluate an individual's ability to drive their attention to specific spatial locations.

The implementation of network effect control includes the ability to evaluate, manage, and resolve conflicts between information, and its quantitative method mainly measures the difference in correct experimental response time under consistent and inconsistent conditions.

For the average accuracy, it includes the function of evaluating the accuracy of participants in identifying the direction of the target arrow, and displays it in percentage form. This index can also be used to examine the accuracy of attention

control.

As for the average reaction time, it is measured by measuring the participants' response speed to stimuli, which serves as the basis for measuring attention processing efficiency.

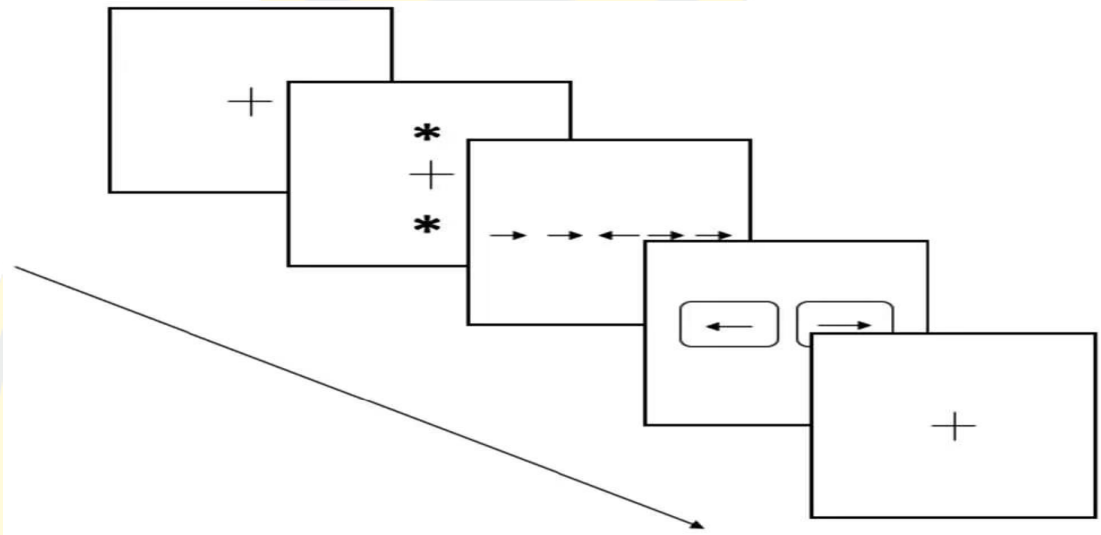

Figure 5 Attention Network Test Task Flowchart

During the test, Participants' eyes were 60 cm from the screen, with a "+" at the center of the screen as the focus of attention, and stimulus signals could appear above or below the center of the screen, either as distractors (cues) such as "*" or as targets such as "→" or. Interference "*" appeared in four states: did not appear, appeared in the center, appeared at the same time above and below the center (double cue), appeared separately above and below the center (spatial cue).

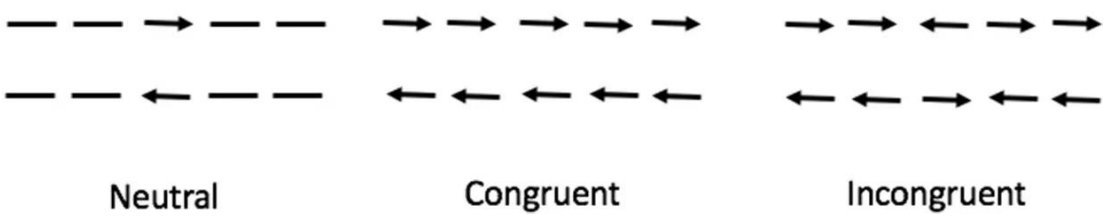

Figure 6 Neutral, Congruent, and Incongruent Conditions in the ANT Task

One state is when a single arrow appears. The second state, with five arrows arranged in the same direction, occupies a central position among the eight possible options. The third state is that one of the five arrows in a row is located in the opposite direction and at the center position of the target row (asymmetrical). The subjects use the left and right keyboards to determine the direction of one of the five arrows (pointing left or right) displayed on the screen, and request a fast speed. The time difference between each reaction is used as an index to measure the effectiveness of attention network function.

Visual representations of the five parts of the trial in ANT: a) gaze dots appeared on the screen for random durations between 400-1600 ms; b) there was a cueing cue that lasted for 100 ms; c) 400 ms after the cueing cue, the target and distractor dots appeared; d) the subjects had to respond; e) after the response, the target and distractor disappeared.

To accurately track the course's effect on sustained attention, we planned to take measurements before the experiment, during the experiment, and after the experiment: Before the aerobic dance project begins, measure the pre experiment data: all participants have completed the ANT test, and the baseline data is used for initial comparison of sustained attention. Evaluate subsequent changes through this preliminary measure. During the course, data from the experiment was measured: participants used ANT for retesting to capture the direct effect of the course on sustained attention, while also evaluating their current attention status. At the end of the course, another ANT test was conducted to obtain data after the measurement experiment, and the information collected before and during the experiment was compared to gain insight into the long-term impact of aerobic dance classes on participants' ability to sustain attention.

The Attention Network Test (ANT) in PEBL2 (Psychological Experiment Construction Language 2) was applied in this study. This open-source psychological experiment software platform is designed to help researchers build various types of psychological experiments, which are flexible and user-friendly. Each participant will receive a detailed manual before starting the experiment to fully understand the testing objectives, process, and precautions, which will be gradually elaborated by the researchers.

In the face of any problems encountered by participants during the experiment, researchers are always willing to provide guidance and assistance - ensuring that participants can successfully complete the test. In order to make participants more familiar with the testing environment and reduce the anxiety or confusion that may arise from it, it is crucial to introduce and demonstrate how to respond and use the keyboard before the full start.

The ANT test has ended, and participants are guided to submit their results in compressed file format according to the prescribed steps. Before submission, researchers need to confirm the completeness and accuracy of each participant's data to ensure its reliability and validity. After everything is ready, participants can leave, and the collected data becomes the object that researchers need to analyze in the next stage.

The purpose of this experiment is to provide participants with a positive experience in a meticulous manner and rigorously verify all the information collected, in order to gain a deeper understanding of how aerobic dance classes affect sustained attention.

To understand and analyze how aerobic dance gradually shapes and improves people's focus on controlling strength during long-term tasks, different time point patrol measurement methods were tested at various stages. We prefer to use this hierarchical evaluation strategy to delve deeper into sports activities, especially when

it comes to aerobic dance. The key to assisting is to help physical and mental players improve their mental and sexual abilities in handling long-term tasks, and to enhance their understanding of the cumulative benefits.

3.5.2 Physical Fitness Measurement

To ensure the reliability and validity of the study examining the impact of an 8-week moderate-intensity aerobic dance program on physical fitness, a comprehensive set of physical fitness assessment methods, as recommended by the American College of Sports Medicine (ACSM) in the 2021 edition of the "Guidelines for Exercise Testing and Prescription," was employed. The reliability of these methods has been reported, with Cronbach's alpha values ranging from 0.75 to 0.90. These methods are specifically designed to evaluate key components of physical fitness, including cardiovascular endurance, muscular strength, muscular endurance, flexibility, and body composition. Each test was selected for its established reliability and validity in measuring specific fitness attributes, thereby providing a holistic view of the participants' physical fitness improvements.

Cardiovascular Endurance: This was assessed through the 800-meter run test, requiring participants to complete the 800-meter distance as quickly as possible. with the time measured using an AnyTime XL-012 stopwatch. The shorter the time taken to complete this distance, the greater the participant's cardiovascular endurance, serving as a good indicator of the efficiency of the cardiorespiratory system in oxygen delivery and endurance.

Muscle Strength: This was evaluated using a Xiangshan Hand Grip EH101 device. This test assesses hand and forearm muscle strength by measuring the participant's maximum grip strength. Higher grip strength measurements indicate greater muscle strength.

Muscular Endurance: This was assessed based on the number of push-ups completed within one minute, measured using a stopwatch (model: AnyTime XL-012). This test measures the endurance of the upper body muscles, particularly the chest, shoulders, and triceps.

Flexibility: This was measured by the seated forward bend test using a Baseline 12-1085 sit and reach box. Participants were asked to sit on the floor with their legs straight and extend their arms forward as far as possible, aiming to touch or exceed their toes. This test measures the flexibility of the legs and trunk, with a particular focus on the ability to extend the muscles of the lower back, buttocks, and the backs of the legs.

Body Composition: *The subcutaneous fat thickness of specific body parts can be measured using a skin folding caliper (Lara Star, model: 0050). Through this method, the percentage of body fat can be estimated. Understanding the key information required for personal health status and body fat distribution, this assessment can provide important insights in designing personalized health and fitness plans.*

By using the assessments recommended by the ACSM, this study was able to accurately quantify the effects of a moderate-intensity aerobic dance program on various aspects of university students' physical fitness, thus providing a scientific basis for improving university students' fitness levels.

3.6 Procedures

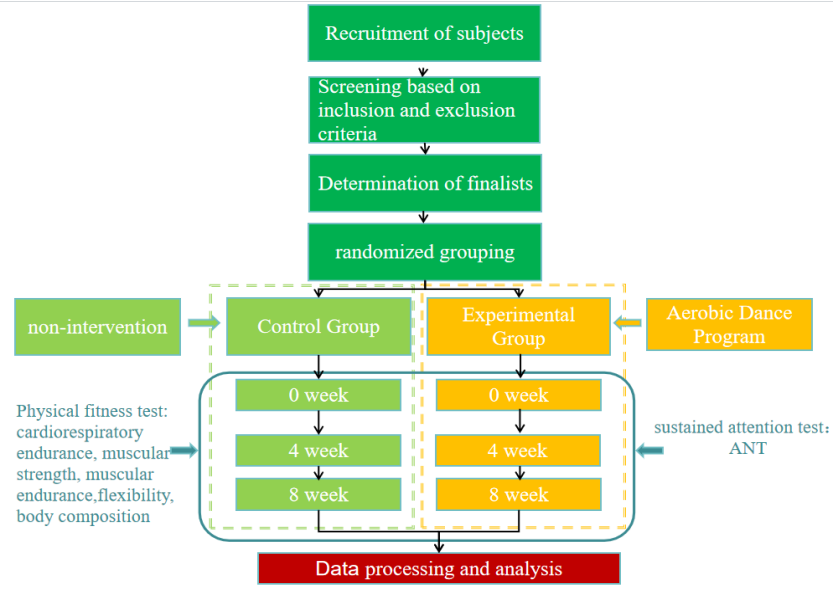

Figure 7 Research Experimental Procedure and Grouping

3.6.1 Sample Selection

After approval by the ethics committee, the recruitment process begins. Full time first-year female students at Huanghuai University are the target population, with an age limit of 18 years old or above, not majoring in sports, and must be in good physical condition, without any major diseases or contraindications to sports activities. The main goal of this program is to focus on the general group of college students who have not yet received sports or professional dance training. This ensures that the research conducted always focuses on universal physical and mental development, and does not change with individual individuals who excel in physical fitness and dance.

Initially, 69 students expressed interest in participating. A preliminary screening was conducted to confirm that participants met the study's inclusion criteria and could commit to the entire 8-week period. This screening resulted in the exclusion of 9 students, leaving a final sample of 60 participants who met all criteria.

3.6.2 Random Assignment

To ensure the scientific rigor and fairness of the experiment, 60 eligible participants will be randomly assigned to either the experimental group or the control group. This is a randomization process accomplished through the use of computer-generated random number programs. Each person will receive a unique number between 1 and 60 and generate a random value for it using the Excel function=RAND(). Then, based on the generated random values, the participants are sorted in ascending order, with the top 30 entering the experimental group and the remaining 30 entering the control group. This method can minimize all potential deviations in team allocation and achieve complete isolation.

3.6.3 Experimental Procedure

Under the guidance of two qualified aerobic dance teachers, the experimental group began an 8-week moderate intensity aerobic dance program. On the contrary, the control group maintained normal daily activities and did not have structured sports activities added to their schedule.

As for the training frequency and duration, it can be seen that the aerobic dance class of 60 minutes three times a week accurately depicts the efforts of the experimental group participants. To ensure consistency in training, these courses are held at fixed times.

Content of the Classes:

In the first two weeks, warm-up and simple aerobic exercise will be the main focus, covering all areas from the head to the ankles; Maintain a speed of 90-95BPM for 10 minutes. In the course, there are activities such as stationary walking, brisk walking, and stationary jogging. After demonstrating at speeds of 94-100BPM, students will practice at 105BPM. During the relaxation period, it consists of slow steps and 80-85BPM stretching.

The next two weeks will be characterized by deep warm-up exercises such as

raising knees, circling arms, and shaking legs, set at 95-100 BPM and maintained for ten minutes. The training session opened in this issue is even more challenging: complex combinations such as strides and side hits are included in the dance, and practical operations are required to be performed in 115 time units, i.e. beat per minute. The final stage emphasizes the vigorous exhalation accompanied by a ten minute extension time of 85-90 BPM.

Within the next five to six weeks, a level chart similar to jumping platform and deep and graceful drumming was added to the tutorial; Its model is expected to be calibrated with 125 directional markers to ensure that others can conceal the imitation approach; At the end of the session, the focus is on training the triceps and hamstring muscles and doing moderate stretching according to the predetermined 90-95 BPM benchmark.

In the last two weeks, advanced aerobic exercises were performed, including lateral jumps and body movements, lasting for up to ten minutes at a sharp speed of 105-110 BPM. The featured courses during this period include well-known styles, complex and challenging low-level works: a perfect match with the shape, a sudden but precise slow turn, and the ideal effect of blind men touching elephants and stealing the sky to imitate the sun by hanging their knees high in the sky.

The final scene is set inside and outside the sports field of Huanghuai University Park, preparing a wide area for dancers, with other electric winds coming from all directions to infiltrate and balance, which has a participatory and ornamental nature. Attentive to creating a safe drop supply situation for normals and guiding us smoothly along the way, this experience was quite good

3.6.4 Control Group Activities

In addition to normal daily activities, participants in the control group did not engage in any additional physical activities. Their daily activities include regular learning and socializing, as well as some light sports activities such as walking after work. To maintain the original state after distinguishing between the experimental group and the control group, and further ensure that participants in the control group are not subjected to any additional exercise or examination.

3.6.5 Data Collection Timeline

The data collection process was conducted through close collaboration between the aerobic dance instructors and the researchers. One aerobic dance instructor's primary responsibility was to maintain order during the testing procedures, ensuring that all participants could smoothly follow the established protocols. Concurrently, another instructor collaborated with the researchers to conduct measurements and record experimental data. Throughout the measurement process, both parties worked in tandem to ensure the accuracy and reliability of the data collected. To ensure consistency in measurements, the researchers provided detailed guidance to participants prior to data collection and supervised the entire testing process. This division of responsibilities not only enhanced the efficiency of data collection but also ensured the scientific rigor and integrity of the study.

The experiment was conducted at the athletic field of Huanghuai University in Zhumadian, Henan Province, China, from June to August. Data collection was conducted at three key points: before the first class, immediately after the fourth week of classes, and immediately after the last class (weeks 0, 4, and 8). These measurements included an Attention Network Test (ANT) and a series of physical fitness assessments, providing a comprehensive evaluation of the effects of the aerobic dance program on sustained attention and physical fitness over time.

3.7 Data Analysis

Data analysis was carried out to rigorously evaluate the effects of an 8-week aerobic dance intervention on sustained attention and physical fitness among university students.The Shapiro-Wilk test was first employed to assess the normality of all continuous variables. Paired t-tests were utilized to assess within-group differences between Weeks 0 and 8, while independent t-tests were conducted to evaluate between-group differences at Week 8. To further investigate temporal changes and interaction effects between the experimental and control groups, a one-way repeated measures MANOVA was applied to analyze data across Weeks 0, 4, and 8. All statistical analyses were performed with a significance level set at $p < 0.05$ to ensure the precision and robustness of the findings.

CHAPTER 4
RESULTS

4.1 Introduction

To ensure the scientific rigor and reliability of the study results, a method using computer-generated random numbers was employed to randomly assign participants to either the experimental or control group. The specific steps were as follows: first, each participant was assigned a unique number (1 to 60). Then, the =RAND() function in Excel was used to generate random numbers for each number. Next, the participants were sorted based on the generated random numbers to achieve random grouping. After sorting, the first 30 participants were assigned to the experimental group, and the last 30 participants to the control group. To ensure a double-blind design, each participant was renumbered after grouping and clearly marked with their respective group. This process strictly followed the principles of random grouping and double-blind design, ensuring the fairness of the experiment and the validity of the data.

This chapter presents the results of the study and discusses their implications. The data collected from the Attention Network Test (ANT) and physical fitness assessments at weeks 0, 4, and 8 are analyzed to determine the impact of an 8-week moderate-intensity aerobic dance program on sustained attention and physical fitness among university students. The results are discussed in the context of existing literature to provide a comprehensive understanding of the findings.

4.2 Participant Characteristics

To ensure the comparability of the experimental and control groups, an analysis of the participants' basic characteristics was conducted. The table below presents the descriptive statistics for age, height, and weight in both groups.

Table 1 Experimental Group (EG)

Category	Value	Count	Percentage
Age Group	18 years	12	40.00%
	19 years	16	53.33%
	20 years	2	6.67%
Height (cm)	154	1	3.33%
	155	3	10.00%
	156	1	3.33%
	162	6	20.00%
	163	1	3.33%
	164	4	13.33%
	165	8	26.67%
	166	1	3.33%
	167	1	3.33%
	169	2	6.67%
	170	1	3.33%
	171	1	3.33%
Weight (kg)	42	1	3.33%
	43.5	1	3.33%
	48.5	2	6.67%
	48.9	1	3.33%
	49	1	3.33%
	51	1	3.33%
	52	1	3.33%
	53.3	1	3.33%
	54	2	6.67%
	55	1	3.33%
	57	2	6.67%
	59	2	6.67%
	62	1	3.33%
	63	1	3.33%
	65	2	6.67%

Table 2 Control Group (CG)

Category	Value	Count	Percentage
Age Group	18 years	7	23.33%
	19 years	18	60.00%
	20 years	5	16.67%
Height (cm)	153	2	6.67%
	155	1	3.33%
	160	6	20.00%
	161	2	6.67%
	162	2	6.67%
	163	2	6.67%
	164	3	10.00%
	165	4	13.33%
	166	4	13.33%
	167	3	10.00%
	171	1	3.33%
Weight (kg)	41.2	1	3.33%
	45	4	13.33%
	46.5	1	3.33%
	47	1	3.33%
	47.5	1	3.33%
	47.7	1	3.33%
	48	1	3.33%
	48.5	1	3.33%
	49.8	1	3.33%
	50	3	10.00%
	52.3	1	3.33%
	53	2	6.67%
	53.5	1	3.33%
	53.6	1	3.33%
	55	3	10.00%
	56	1	3.33%
	60	1	3.33%
	65	2	6.67%
	68	1	3.33%
	82	1	3.33%
	90	1	3.33%

The experimental group's mean age of 18.67 ± 0.61 years, is closely aligned with the control group's mean age of 18.93 ± 0.64 years, suggesting a well-matched cohort in terms of age, which is essential for the validity of the comparative analysis. Similarly, the mean height in the experimental group is 163.27 ± 4.44 cm, nearly identical to the control group's mean of 162.70 ± 4.12 cm, indicating consistency in height distribution. However, while the mean weight is similar between the groups,

with the experimental group at 55.12 ± 9.31 kg and the control group at 54.09 ± 10.79 kg, the control group shows a slightly wider range and higher standard deviation, suggesting greater variability in weight distribution among its participants. This overall similarity in participant characteristics across both groups provides a robust foundation for subsequent analyses, thereby enhancing the credibility and reliability of the experimental outcomes.

4.3 Normality Test

The normality test results for both the control and experimental groups were assessed using the Shapiro-Wilk test across weeks 0, 4, and 8. The results indicate that certain variables deviate from normal distribution at various time points. Despite these deviations, the skewness and kurtosis for most variables remained within the acceptable range (skewness ±3, kurtosis ±10), Specifically, the minimum skewness and kurtosis were 0.642 and 0.240, respectively, while the maximum skewness and kurtosis reached -1.905 and 8.201. suggesting that the majority of the data can be considered approximately normally distributed and suitable for further statistical analysis.

4.4 Data Analysis and Hypothesis Testing

4.4.1 Descriptive Statistics

Table 3 Sustained Attention Measurements at Different Time Points for Experimental and Control Groups

Measure	Group	***Mean*** **(Week 0)**	***Mean*** **(Week 4)**	***Mean*** **(Week 8)**
Mean response time	EG	692.88	657.70	590.55
	CG	619.47	623.22	619.77
Alerting	EG	77.27	85.57	106.65
	CG	62.49	63.30	59.33
Orienting	EG	33.79	33.24	45.12
	CG	28.60	26.12	28.69
Conflict	EG	102.36	84.05	62.14
	CG	88.02	86.76	88.93

Table 3 provides the descriptive statistics for sustained attention measures, including mean response time, alerting, orienting, and conflict effects across the three time points. The experimental group showed noticeable changes over time, particularly between Week 0 and Week 8, while the control group exhibited minimal fluctuations.

Table 4 Physical Fitness Measurements at Different Time Points for Experimental and Control Groups

Measure	Group	*Mean* (Week 0)	*Mean* (Week 4)	*Mean* (Week 8)
800 meters (s)	EG	247.10	234.70	224.40
	CG	254.33	255.27	254.73
Grip Strength (kg)	EG	26.450	27.577	28.313
	CG	26.900	26.823	26.870
1-minute Push-ups	EG	6.37	9.07	11.40
	CG	6.43	5.83	5.97
Sit and Reach (cm)	EG	16.033	17.530	18.520
	CG	13.857	13.823	13.823
Body Fat (%)	EG	22.880	21.173	19.783
	CG	21.883	21.997	21.993

Table 4 provides the descriptive statistics for sustained physical fitness measures, including 800 meters, Grip Strength,1-minute Push-ups, Sit and Reach, Body Fat across the three time points. The experimental group showed noticeable changes over time, particularly between Week 0 and Week 8, while the control group exhibited minimal fluctuations.

4.4.2 Paired T-Test Results for Sustained Attention Metrics and Physical Fitness Metrics Between Weeks 0 and 8

Table 5 To compare the sustained attention test results between Week 0 and Week 8 for experimental group.

	Variable	*n*	*Mean*	*SD*	*df*	*t*	*p*
Pair 1	Post-Mean response time	30	590.55	92.77	29	-4.984	0.000**
	Pre-Mean response time	30	692.88	105.39			
Pair 2	Post-Alerting	30	106.65	43.02	29	3.971	0.000**
	Pre-Alerting	30	77.27	58.73			
Pair 3	Post-Orienting	30	45.12	32.32	29	0.908	0.371
	Pre-Orenting	30	33.79	57.85			
Pair 4	Post-Conflicting	30	62.14	48.83	29	-3.978	0.000**
	Pre-Conflicting	30	102.36	75.39			

**p < 0.05, **p < 0.01*

Table 6 To compare the sustained attention test results between Week 0 and Week 8 for control group.

	Variable	*n*	*Mean*	*SD*	*df*	*t*	*p*
Pair 1	Post-Mean response time	30	619.77	112.68	29	0.086	0.932
	Pre-Mean response time	30	619.47	124.84			
Pair 2	Post-Alerting	30	59.33	41.20	29	-1.260	0.218
	Pre-Alerting	30	62.49	42.56			
Pair 3	Post-Orienting	30	28.69	35.48	29	0.053	0.958
	Pre-Orenting	30	28.60	35.09			
Pair 4	Post-Conflicting	30	88.93	48.92	29	0.262	0.795
	Pre-Conflicting	30	88.02	49.59			

**p < 0.05, **p < 0.01*

The paired T-test results for the experimental group (EG) between Weeks 0 and 8 revealed significant improvements in sustained attention metrics. The mean response time decreased markedly from 692.88 ms (SD = 105.39) at Week 0 to 590.55 ms (SD

= 92.77) at Week 8 (t(29) = -4.984, p < 0.01), indicating a substantial reduction in reaction time. Additionally, the alerting performance showed a significant increase, with the mean rising from 77.27 (SD = 58.73) to 106.65 (SD = 43.02) (t(29) = 3.971, p < 0.01). Although no significant change was observed in the orienting metric, the conflicting task performance improved significantly, as the mean decreased from 102.36 (SD = 75.39) to 62.14 (SD = 48.83) (t(29) = -3.978, p < 0.01), demonstrating enhanced ability to handle conflict conditions; The control group showed no significant changes in any sustained attention metrics over the 8-week period.

Table 7 To compare the physical fitness test results between Week 0 and Week 8 for the experimental group

	Variable	*n*	*Mean*	*SD*	*df*	*t*	*p*
Pair 1	Post-800 meters(s)	30	224.40	16.48	29	-26.017	0.00**
	Pre-800 meters(s)	30	247.10	17.49			
Pair 2	Post-Grip Strength(kg)	30	28.31	3.57	29	29.940	0.00**
	Pre-Grip Strength(kg)	30	26.45	3.60			
Pair 3	Post-1-minute Push-ups(count）	30	11.40	2.95	29	25.107	0.00**
	Pre-1-minute Push-ups(count）	30	6.37	2.95			
Pair 4	Post-Sit and Reach(cm)	30	18.52	6.54	29	23.879	0.00**
	Pre-Sit and Reach(cm)	30	16.03	6.55			
Pair 5	Post-Body Fat (%)	30	19.78	3.65	29	-22.278	0.00**
	Pre-Body Fat (%)	30	22.88	3.87			

**p < 0.05, **p < 0.01*

Table 8 To compare the physical fitness test results between Week 0 and Week 8 for the control group.

	Variable	*n*	*Mean*	*SD*	*df*	*t*	*p*
Pair 1	Post-800 meters(s)	30	254.73	20.18	29	1.161	0.255
	Pre-800 meters(s)	30	254.33	20.30			
Pair 2	Post-Grip Strength(kg)	30	26.87	3.84	29	-1.511	0.142
	Pre-Grip Strength(kg)	30	26.90	3.83			
Pair 3	Post-1-minute Push-ups(count）	30	5.97	2.65	29	-3.751	0.001**
	Pre-1-minute Push-ups(count）	30	6.43	2.79			
Pair 4	Post-Sit and Reach(cm)	30	13.82	6.13	29	-0.469	0.642
	Pre-Sit and Reach(cm)	30	13.86	6.21			
Pair 5	Post-Body Fat (%)	30	21.99	3.33	29	1.930	0.063
	Pre-Body Fat (%)	30	21.88	3.42			

**p < 0.05, **p < 0.01*

The paired T-test results for the experimental group (EG) between Weeks 0 and 8 revealed significant improvements across all physical fitness metrics. The 800-meter run time decreased significantly from 247.10 seconds (SD = 17.49) to 224.40 seconds (SD = 16.48) ($t(29) = -26.017$, $p < 0.01$). Grip strength increased from 26.45 kg (SD = 3.60) to 28.31 kg (SD = 3.57) ($t(29) = 29.940$, $p < 0.01$). The number of 1-minute push-ups improved significantly from 6.37 (SD = 2.95) to 11.40 (SD = 2.95) ($t(29) = 25.107$, $p < 0.01$). Flexibility, as measured by the sit and reach test, increased from 16.03 cm (SD = 6.55) to 18.52 cm (SD = 6.54) ($t(29) = 23.879$, $p < 0.01$). Body fat percentage also saw a significant reduction, decreasing from 22.88% (SD = 3.87) to 19.78% (SD = 3.65) ($t(29) = -22.278$, $p < 0.01$); For the control group (CG), a significant decrease was observed in the number of 1-minute push-ups, from 6.43 (SD = 2.79) to 5.97 (SD = 2.65) ($t(29) = -3.751$, $p < 0.01$).

4.4.3 Comparison of Sustained Attention Test Results Between Experimental and Control Groups at Week 8

Table 9 Independent T-Test Results Comparing Sustained Attention Test Outcomes Between Experimental and Control Groups at Week 8

Group	**Variable**	***n***	***Mean***	***SD***	***df***	***t***	***p***
EG	Mean response time	30	590.55	92.77	58	-1.097	0.277
CG	Mean reponse time	30	619.77	112.68			
EG	Alerting	30	106.65	43.02	58	4.351	0.00**
CG	Alerting	30	59.33	41.20			
EG	Orienting	30	45.12	32.32	58	1.875	0.066
CG	Orenting	30	28.69	35.48			
EG	Conflicting	30	62.14	48.83	58	-2.123	0.038*
CG	Conflicting	30	88.93	48.92			

**p < 0.05, **p < 0.01*

At week 8, an independent samples t-test was conducted to compare the sustained attention test results between the experimental group (EG) and the control group (CG). The results indicated that the experimental group significantly outperformed the control group in alerting performance (EG: M = 106.65, SD = 43.02; CG: M = 59.33, SD = 41.20), t(58) = 4.351, p < 0.01. Additionally, the experimental group also demonstrated significantly better performance in conflicting tasks compared to the control group (EG: M = 62.14, SD = 48.83; CG: M = 88.93, SD = 48.92), t(58) = -2.123, p < 0.05. These results suggest that the experimental group exhibited significantly superior performance in both alerting and conflicting tasks relative to the control group.

Table 10 Independent T-Test Results Comparing Physical Fitness Test Outcomes Between Experimental and Control Groups at Week 8

Group	Variable	*n*	*Mean*	*SD*	*df*	*t*	*p*
EG	800 meters(s)	30	224.4	16.48	58	-6.377	0.00**
CG	800 meters(s)	30	254.73	20.18	58		
EG	Grip Strength(kg)	30	28.31	3.57	58	1.508	0.137
CG	Grip Strength(kg)	30	26.87	3.84	58		
EG	1-minute Push-ups(count）	30	11.4	2.96	58	7.504	0.00**
CG	1-minute Push-ups(count）	30	5.97	2.65	58		
EG	Sit and Reach(cm)	30	18.52	6.54	58	2.871	0.006**
CG	Sit and Reach(cm)	30	13.82	6.13	58		
EG	Body Fat (%)	30	19.78	3.65	58	-2.448	0.017*
CG	Body Fat (%)	30	21.99	3.33	58		

$*p < 0.05$, $**p < 0.01$

In week 8, an independent samples t-test was conducted to compare physical fitness test results between the experimental group (EG) and the control group (CG). The results showed significant differences across several indicators. The experimental group outperformed the control group in the 800-meter run (EG: M = 224.4, SD = 16.48; CG: M = 254.73, SD = 20.18), $t(58) = -6.377$, $p < 0.01$. Additionally, the experimental group achieved a significantly higher number of push-ups in one minute compared to the control group (EG: M = 11.4, SD = 2.96; CG: M = 5.97, SD = 2.65), $t(58) = 7.504$, $p < 0.01$. In the sit-and-reach test, the experimental group demonstrated better flexibility (EG: M = 18.52, SD = 6.54; CG: M = 13.82, SD = 6.13), $t(58) = 2.871$, $p < 0.01$. Furthermore, the experimental group had a significantly lower body fat percentage compared to the control group (EG: M = 19.78%, SD = 3.65; CG: M = 21.99%, SD = 3.33), $t(58) = -2.448$, $p < 0.05$. These results indicate that the experimental group significantly outperformed the control group across all physical fitness tests.

4.4.4 Analysis of one-way Repeated Measures and MANOVA Results for Sustained Attention Measures and Physical Fitness Measures.

This section presents the analysis of sustained attention data from 60 students (30 in the experimental group and 30 in the control group) collected at three-time points: Week 0 (pre-intervention), Week 4 (mid-intervention), and Week 8 (post-intervention). One-way repeated measures MANOVA was conducted to compare the differences in sustained attention and physical fitness performance over time and between groups.

4.4.4.1 Assumptions Check for one-way repeated measures MANOVA on sustained attention

To test the assumption of sphericity for the one-way repeated measures MANOVA, Mauchly's test was performed. The results indicated significant deviations for all sustained attention measures: Response Time ($W = 0.595$, $p < 0.01$), Alerting ($W = 0.723$, $p < 0.01$), Orienting ($W = 0.434$, $p < 0.01$), and Conflicting ($W = 0.620$, $p < 0.01$). Since the sphericity assumption was not met, the Greenhouse-Geisser correction was applied to adjust the degrees of freedom for the subsequent analyses.

4.4.4.2 Results of one-way repeated measures MANOVA and Detailed Analysis of Between-Groups, Time, and Interaction Effects on sustained attention

Table 11 One-way repeated measures MANOVA Results for Intercept, Between-Groups Effect, Time Effect, and Time × Group Interaction Effects

Effect	Wilks' Lambda Statistic	*F*	df_1	df_2	*p*
Between-Group Effect	0.845	2.53	4	55	0.051
Time Effect	0.332	12.841	8	51	0.00**
Time × Group Effect	0.308	14.33	8	51	0.00**

**p < 0.05, **p < 0.01*

The one way repeated measures MANOVA results reveal a marginally significant between-group effect (Wilks' Lambda = 0.845, F(4, 55) = 2.53, p = 0.051), indicating a trend toward differences in sustained attention between the experimental and control groups. A significant time effect (Wilks' Lambda = 0.332, F(8, 51) = 12.841, p < 0.001) was found, showing that sustained attention changed significantly over time. Furthermore, the time × group interaction was significant (Wilks' Lambda = 0.308, F(8, 51) = 14.33, p < 0.001), demonstrating that the patterns of change in sustained attention over time differed significantly between the two groups.

Table 12 Analysis of Between-Groups, Time, and Time × Group Interaction Effects on Various Measures

Measurement	Comparison	*F*	*p*
Between-Group Effect			
Response	EG vs CG	1	0.321
Alerting	EG vs CG	6.57	0.013*
Orienting	EG vs CG	1.25	0.269
Conflicting	EG vs CG	0.16	0.695
Time Effect			
Response	Pre vs. Mid	1.77	0.189
	Mid vs. Post	33.386	0.00**
Alerting	Pre vs. Mid	1.13	0.292
	Mid vs. Post	11.13	0.001**
Orienting	Pre vs. Mid	0.113	0.738
	Mid vs. Post	5.346	0.024*
Conflicting	Pre vs. Mid	2.642	0.109
	Mid vs. Post	9.508	0.003**
Time × Group Effect			
Response	Pre vs. Mid	2.713	0.105
	Mid vs. Post	27.189	0.00**
Alerting	Pre vs. Mid	0.767	0.385
	Mid vs. Post	23.852	0.00**
Orienting	Pre vs. Mid	0.046	0.831
	Mid vs. Post	2.221	0.142
Conflicting	Pre vs. Mid	2.004	0.162
	Mid vs. Post	14.155	0.00**

**p < 0.05, **p < 0.01*

The table presents the F-values and significance levels for between-groups effects, time effects, and time × group interaction effects. The between-groups effect analysis reveals differences between the experimental group (EG) and the control group (CG)

across various measures. Specifically, in the alerting measure, a significant difference was observed between EG and CG ($F = 6.57$, $p < 0.05$), indicating that the intervention had a notable impact on the alerting performance of the experimental group, resulting in a marked difference from the control group.

The main effect analysis indicated significant changes in several measures over time. For the Response measure, a substantial improvement was observed between Mid and Post interventions ($F = 33.386$, $p < 0.01$). Alerting also demonstrated significant changes between Mid and Post ($F = 11.130$, $p <0.01$), while Orienting showed a significant difference between Mid and Post ($F = 5.346$, $p < 0.05$). In contrast, no significant differences were noted between Pre and Mid for these measures, suggesting that the most pronounced changes occurred later in the intervention period. For the Conflicting measure, significant improvements were observed between Mid and Post ($F = 9.508$, $p < 0.01$), indicating enhanced performance in conflict resolution as the intervention progressed.

The interaction effects between time and group reveal differing performance between the experimental and control groups during the intervention period. In the response measure, a significant difference was found between the experimental and control groups from mid-intervention to post-intervention ($F = 27.189$, $p < 0.01$), indicating a more pronounced effect of the intervention on the experimental group compared to the control group. Alerting measures also showed a significant interaction effect between mid-intervention and post-intervention ($F = 23.852$, $p < 0.01$), reflecting a greater improvement in the experimental group. For conflicting measures, the interaction effect between mid-intervention and post-intervention ($F = 14.155$, $p < 0.01$) highlighted a significant enhancement in conflict resolution abilities for the experimental group, whereas the control group showed comparatively smaller improvements. These results underscore the substantial impact of the intervention on the experimental group's sustained attention and conflict resolution abilities, with the

most pronounced effects observed in the later stages of the intervention.

4.4.4.3 Assumptions Check for one-way repeated measures MANOVA on physical fitness

Mauchly's test indicated significant deviations from sphericity for all physical fitness measures ($p < 0.01$). Therefore, the Greenhouse-Geisser correction was applied for 800 meters, Grip Strength, 1-minute Push-ups, and Sit and Reach ($W < 0.75$). For Body Fat ($W > 0.75$), the Huynh-Feldt correction was used.

4.4.4.4 Results of one way repeated measures MANOVA and Detailed Analysis of Between-Groups, Time, and Interaction Effects on physical fitness

Table 13 One way repeated measures MANOVA Results for Intercept, Between-Groups Effect, Time Effect, and Time × Group Interaction Effects

Effect	Wilks' Lambda Statistic	*F*	df_1	df_2	*p*
Between-Group Effect	0.710	4.415	5	54	0.00**
Time Effect	0.024	202.607	10	49	0.00**
Time × Group Effect	0.021	233.326	10	49	0.00**

**p < 0.05, **p < 0.01*

The results of the one-way repeated measures MANOVA indicated significant improvements in all physical fitness measures over time (Wilks' Lambda = 0.024, $F(10, 49) = 202.607$, $p < 0.01$), along with a notable group effect (Wilks' Lambda = 0.710, $F(5, 54) = 4.415$, $p < 0.01$). Additionally, the time × group interaction effect was significant (Wilks' Lambda = 0.021, $F(10, 49) = 233.326$, $p < 0.01$), suggesting that the experimental group experienced greater enhancements in physical fitness over time compared to the control group, thereby highlighting the pronounced impact of the intervention on the experimental group.

Table 14 Analysis of Between-Groups, Time, and Time × Group Interaction Effects on Various Measures

Measurement	Comparison	*F*	*p*
Between-Group Effect			
800 meters (s)	EG vs CG	16.314	0.00**
Grip Strength (kg)	EG vs CG	0.368	0.546
1-minute Push-ups	EG vs CG	15.929	0.00**
Sit and Reach (cm)	EG vs CG	4.617	0.036*
Body Fat (%)	EG vs CG	0.543	0.464
Time Effect			
800 meters (s)	Pre vs. Mid	265.365	
	Mid vs. Post	422.325	0.00**
Grip Strength (kg)	Pre vs. Mid	501.573	
	Mid vs. Post	328.653	0.00**
1-minute Push-ups	Pre vs. Mid	121.800	
	Mid vs. Post	328.107	0.00**
Sit and Reach (cm)	Pre vs. Mid	279.041	
	Mid vs. Post	198.901	0.00**
Body Fat (%)	Pre vs. Mid	224.155	
	Mid vs. Post	148.985	0.00**
Time × Group Effect			
800 meters (s)	Pre vs. Mid	358.800	
	Mid vs. Post	343.254	0.00**
Grip Strength (kg)	Pre vs. Mid	658.761	
	Mid vs. Post	255.001	0.00**
1-minute Push-ups	Pre vs. Mid	300.771	
	Mid vs. Post	261.000	0.00**
Sit and Reach (cm)	Pre vs. Mid	305.045	
	Mid vs. Post	198.901	0.00**
Body Fat (%)	Pre vs. Mid	292.468	
	Mid vs. Post	147.563	0.00**

**p < 0.05, **p < 0.01*

The between-group analysis showed significant differences between the experimental and control groups in the 800 meters run ($F = 16.314$, $p < 0.01$) and 1-minute push-ups ($F = 15.929$, $p < 0.01$), indicating notable performance differences in these measures. Additionally, the sit-and-reach test also showed a significant difference ($F = 4.617$, $p < 0.05$).

The time effect analysis revealed significant changes across all physical fitness measures. Specifically, the 800 meters run showed significant differences between pre-intervention and mid-intervention ($F = 265.365$, $p < 0.01$) and mid-intervention and post-intervention ($F = 422.325$, $p < 0.01$). Similarly, grip strength, 1-minute push-ups, sit-and-reach, and body fat percentage showed significant changes between pre-intervention and mid-intervention as well as mid-intervention and post-intervention, with all p-values less than 0.01.

The time × group interaction effects were also significant for all physical fitness measures. Notably, the 800 meters run (pre vs. mid: $F = 358.800$, $p < 0.01$; mid vs. post: $F = 343.254$, $p < 0.01$), grip strength (pre vs. mid: $F = 658.761$, $p < 0.01$; mid vs. post: $F = 255.001$, $p < 0.01$), 1-minute push-ups (pre vs. mid: $F = 300.771$, $p < 0.01$; mid vs. post: $F = 261.000$, $p < 0.01$), sit-and-reach (pre vs. mid: $F = 305.045$, $p < 0.01$; mid vs. post: $F = 198.901$, $p < 0.01$), and body fat percentage (pre vs. mid: $F = 292.468$, $p < 0.01$; mid vs. post: $F = 147.563$, $p < 0.01$) all showed significant interactions, indicating substantial differences between groups over time.

CHAPTER 5
DISCUSSION

This study aims to evaluate the impact of an 8-week aerobic dance program on sustained attention and physical fitness in university students, using a repeated measures experimental design to ensure the rigor and reliability of the results. The participants were 60 female freshmen aged 18 and above from Huanghuai University in China, randomly assigned to either the experimental group or the control group. The study variables include: independent variable—an 8-week moderate-intensity aerobic dance program; dependent variables—sustained attention and physical fitness. The research tools included the Attention Network Test (ANT) and a series of physical fitness assessments (800-meter run, maximum grip strength, 1-minute push-ups, sit-and-reach, and body fat measurement) for data collection. Changes in sustained attention and physical fitness between the pre- and post-intervention phases were analyzed using paired t-tests; differences between the experimental and control groups post-intervention were compared using independent t-tests; and differences in sustained attention and physical fitness across pre-intervention, mid-intervention, and post-intervention phases were analyzed using one-way repeated measures MANOVA.

5.1 Summary of Findings

During the initial phase of the intervention (Weeks 0-4), the experimental group exhibited minimal changes in the indicators related to sustained attention. However, significant improvements were observed in the later phase (Weeks 4-8). By Week 8, the experimental group demonstrated considerable enhancements in alertness ($p < 0.05$), reaction time ($p < 0.01$), and conflict resolution skills ($p < 0.01$), while the control group displayed only slight changes in these areas. These results indicate that the aerobic dance intervention had a notably positive effect on the attention abilities of the experimental group.

During the intervention period (from week 0 to week 8), the experimental group showed significant changes in physical fitness indicators compared to the control group. The performance of the 800 meter run and 1-minute push up suggests a significant improvement in cardiovascular endurance and muscle endurance in the experimental group (p-value < 0.01). The flexibility under the influence of sitting posture stretching test also showed a significant increase (p-value < 0.05), indicating an enhancement in flexibility ability. No statistically significant differences have been found in grip strength and body fat percentage factor. The observation trend of this series of samples reflects that intervention measures have considerable potential in targeting physical health effects, especially focusing on the dynamic positive aspects of cardiovascular endurance, muscle endurance, and flexibility.

5.2 Discussion of Results

This study aims to explore how aerobic dance programs affect the sustained attention and physical health of college students. The paired t-test results showed that from the beginning (week 0) to the end (week 8) of the intervention, the entire sample showed significant changes, with the experimental group showing more significant improvements in sustained attention and physical health compared to the control group. This observation seems to suggest that participating in aerobic dance may bring benefits to college students' sustained attention and physical health.

5.2.1 To compare the sustained attention and physical fitness test results between Week 0 and Week 8 for both the experimental and control groups.

During the 8-week aerobic dance course, students gradually mastered dance movements from basic to complex, resulting in a significant improvement in sustained attention levels. The rhythm has also increased from 105 BPM to 135 BPM. This intervention method achieved significant optimization effects on multiple indicators such as reaction time ($p<0.01$), alertness performance ($p<0.01$), and conflict

resolution ability ($p<0.01$). In contrast, the control group showed no significant improvement.

The conclusion drawn highlights the significant importance of aerobic exercise for cognitive abilities, particularly in the area of sustained attention tasks. Effective blood supply and adequate oxygen delivery can enhance key brain regions such as the prefrontal cortex through aerobic exercise (advocate Colcombe&Kramer, 2003). The experimental group discovered effective improvement points and speculated that it was caused by aerobic dance programs (Hillman et al., 2009), and seemingly active neurotrophic factors (BDNF) originating from the body also played a major role in efficiently driving their focus direction (Liu et al., 2020)

Similarly, in the 8-week aerobic dance course, students gradually improved from basic movements to complex dances, and their speed increased from 105 BPM to 135 BPM. As a result, their cardiovascular endurance, muscle endurance, flexibility, and physical strength all showed significant improvements. Although all physical fitness indicators were significantly improved within the experimental group, the control group showed relatively weak adjustments. The only significant growth point found was the increase in the number of push ups per minute ($p<0.01$), and there were no other significant optimization investments outside of this. That is to say, there is a significant gap in improving physical fitness compared to the former.

Minor improvements in basic physical fitness or adaptive responses may suggest an increase in the number of push ups in the control group. Even without specific fitness interventions, daily activities or light physical activities may improve upper body muscle endurance. However, due to specific muscle endurance, the degree of improvement in physical fitness indicators is very limited.

The experimental group showed that aerobic dance intervention has an effect on improving physical health in terms of cardiovascular endurance and body composition. Based on the fact that there were fewer changes in the control group, it can be inferred

that the main improvement observed was due to the aerobic dance program, rather than natural progression or external factors. Garber et al. (2011) found that regular aerobic exercise is extremely important for improving physical health parameters.

One of the crucial proofs - in other words, the significant advantage of the experimental group lies in its good long-term maintenance of cardiovascular and muscle endurance, which is closely related to actively participating in and executing aerobic dance programs. In contrast, the control group showed minimal improvement due to daily activities or other non intervention factors.

5.2.2 To compare the sustained attention and physical fitness test results between the experimental group and the control group at week 8.

In the 8-week aerobic dance course, students' attention level significantly improved through the gradual learning of basic to complex dance movements. The increase in rhythm from 105 BPM to 135 BPM is just an example of a time interval. Further analysis showed that the experimental group had a significant advantage over the control group in sustained attention during the 8th week, while the control group showed relatively slow improvement.

Both have made progress But the more obvious impact was that aerobic dance intervention brought changes to the experimental group. Consistent with previous research findings, aerobic exercise practitioners often approach tasks that require long-term focus with a positive attitude (Best, 2010). The results are consistent with this theory, indicating its validity.

The reason for the improvement can be traced back to the increase in cerebral blood flow and the enhancement of neural plasticity, and it is precisely this twin carriage that can endow stronger cognitive abilities!

Eight weeks later The experimental group has made a remarkable leap forward! And it reveals the potential for cultivating cognitive abilities in the hidden aerobic dance, especially among university students.

5.2.3 To compare the sustained attention and physical fitness test results between the experimental and control groups across weeks 0, 4, and 8.

This study explores the differences in sustained attention testing between the experimental group and the control group at weeks 0, 4, and 8. The data shows that after the intervention, the experimental group witnessed a significant improvement in alertness, reaction time, and conflict management ability, with insufficient description during the period of weeks 4 to 8. In contrast, the control group showed slower progress.

Through single factor repeated measures MANOVA analysis, it can also be seen that the time effect and its interaction with the two populations have a significant impact on all indicators ($p<0.01$). The evidence strongly suggests that over time, the experimental group showed a much greater increase in sustained attention compared to others. Especially in the late stage of treatment, the advantages become increasingly prominent. The group effect is also close to significant on certain indicators ($p=0.051$), which indirectly confirms the gap in sustained attention performance among individuals after this intervention.

In the early stages of the experiment, from week 0 to week 4, there was no significant difference in alertness and reaction time between the experimental group and the control group, and the p-value was greater than 0.05. This is a common phenomenon in cognitive intervention research, where participants may not show significant improvement in performance during the initial stages of cognitive training or exercise intervention - it is necessary to allow some time for the nervous system to adapt to new stimuli and activity patterns (Smith et al., 2010). At the beginning of the exercise intervention, participants' cognitive improvement pace is often very slow, and the effect will gradually emerge over time (Northey et al., 2018).

Then entering the stage from week 4 to week 8, the experimental group showed a significant advantage in alertness and showed a significant improvement compared to

the control group. The relevant statistical results showed that p was less than 0.01. The focus here is that aerobic exercise affects participants' cognitive function and accumulates effectiveness over time, especially during a tracking period lasting more than eight weeks, during which improvements can be seen in the attention network (Colcombe&Kramer, 2003). In terms of long-term aerobic exercise, it has been found that it can simultaneously improve participants' concentration and significantly accelerate reaction speed (Hillman et al., 2009). All of these are sufficient to prove that the aerobic dance program has a sustained and cumulative positive impact on the cognitive ability of the experimental group.

Compared to the 8th week, the experimental group significantly surpassed the control group in conflict management ability ($p<0.01$). This result is consistent with the effect of administrative function exercise intervention. Research on long-term aerobic exercise reveals how it enhances the function of the prefrontal cortex and improves individuals' ability to handle conflict affairs through this mechanism (Voss et al., 2011). On the contrary, without external intervention, the control group showed slight improvements throughout the entire experiment, but not significant, indicating that they relied more on time and learning effects to achieve cognitive improvement.

This exploration presents that using aerobic dance as a cognitive intervention tool can highlight the effective improvement of sustained attention in college students, especially in the later stages. As time passed, it was confirmed that the experimental group showed a clear improvement in alertness, reaction time, and conflict resolution skills; However, no synchronous progress was observed in the control group. All these achievements support the positive impact of aerobic exercise on cognitive function and confirm the undeniable advantages of regular and sustained exercise interventions for sleep management.

Single factor repeated measures MANOVA was also applied in this study to analyze the physical health evolution exhibited by the experimental and control

groups at weeks 0, 4, and 8. The results revealed that the group effect, time effect, and their mutual influence were significant ($p<0.01$), indicating that all fitness measures in the experimental group had increasingly optimized changes after intervention. Especially clearly, the experimental group showed strong enhancement compared to the control group in 800 meter running, one minute push ups, and sitting posture stretching flexibility tests, fully demonstrating the prominent advantages of aerobic dance in terms of menstrual endurance, muscle tension, and flexibility skills.

Previous studies indicate that moderate-intensity aerobic exercise can significantly improve muscular endurance over a sustained period, which is consistent with the improvements observed in the push-up test in this study (Gordon, Benson, & Hsu, 2017). Regarding flexibility, Colcombe and Kramer (2003) found that aerobic exercise significantly enhances flexibility and range of motion, aligning with the improvements in the sit-and-reach test observed here. Moreover, the positive impact of aerobic exercise on cardiorespiratory endurance has been supported by other studies, such as a randomized controlled trial on long COVID patients, which demonstrated that aerobic exercise significantly increased VO2 peak and overall cardiorespiratory endurance (Bai et al., 2024).

In contrast, the non-significant group effect on grip strength ($p = 0.546$) suggests that the intervention had limited efficacy in this area, consistent with findings by Timmons et al. (2018), who reported that strength training is more effective in improving metrics like grip strength. Furthermore, although body fat percentage showed a significant time effect ($p < 0.01$), the non-significant group effect ($p = 0.464$) suggests that short-term interventions may have a limited impact on body fat. This is in line with Swift et al. (2014), who found that clinically significant reductions in body weight and fat typically require at least 12 weeks of intervention.

Overall, these results suggest that while aerobic dance interventions are effective in improving endurance, muscular endurance, and flexibility, they have limited short-

term effects on grip strength and body fat percentage.

5.3 Limitations of the Study

Despite the significant findings on the effects of aerobic dance on sustained attention and physical fitness among university students, there are limitations in the study's design and implementation that may affect the interpretation and generalizability of the results. The following discusses these limitations in detail and their potential impact on the findings.

5.3.1 Sample Size and Representativeness

The relatively small sample size and the fact that it was limited to female university students restrict the broader applicability of the study's results. Although significant improvements in sustained attention and physical fitness were observed in this specific population, the limitations in sample size and composition may mean that the results may not be generalizable to other genders, age groups, or cultural backgrounds. The small sample size may also reduce the statistical power of the analysis, limiting the generalizability of the study's conclusions. Future research should consider increasing the sample size and including participants of different genders, age groups, and cultural backgrounds to enhance the representativeness and generalizability of the results.

5.3.2 Duration of the Intervention

The 8-week intervention period, while sufficient to observe initial improvements in sustained attention and physical fitness, may not be long enough to reveal the long-term effects of aerobic dance on these outcomes. Sustained attention and physical fitness improvements may require longer interventions to fully manifest, and short-term interventions may only capture temporary changes in these metrics, without fully assessing their long-term stability and durability. To better understand the long-term effects of aerobic dance on sustained attention and physical fitness, future research

should consider extending the intervention period and conducting long-term follow-up studies after the intervention ends.

5.3.3 Narrow Focus of the Intervention

The investigation of the effects of moderate intensity aerobic dance on sustained attention and physical health is only one of the research areas compared to other forms of physical activity. Although its significant effects are admirable, different types of sports may have varying impacts. In order to uncover the full truth, any intervention focus should not be limited to just one form of exercise. Combining various sports activities not only has known benefits, but also has untapped potential Investigating and evaluating the overall effects of different types of exercise and how they affect our normal attention and physical health will become a novel and in-depth research direction in the future

5.3.4 Influence of External Variables

External variables such as diet, sleep, and academic stress were not controlled for in this study, which affected the results of sustained attention and physical health. Added research results on variability. External variables that have not been systematically recorded or controlled may bring some limitations to the interpretation of research results. Regarding the inclusion of these factors in strict control or recording scope, it will help to minimize their interference with research output in future considerations.

5.3.5 Limitations of Measurement Methods

In this study, objective measurement tools played a leading role in attention network testing (ANT) and physical fitness assessment. Because of its objectivity, it can reduce the influence of subjective bias. However, in some cases, subjective experiences or individual differences of participants may not be fully captured. For example, for sustained attention, ANT does provide objective data about it; However, the aspect of attention changes under different environmental conditions may still

need to be explored. Regarding this issue, future research may consider incorporating subjective assessment tools such as questionnaires or interviews. This approach aims to gain a more comprehensive understanding of participants' experiences and attempt to compare two methods to obtain results, in pursuit of improving the reliability and interpretability of research conclusions.

5.4 Future Research Directions

This study examined the effects of an 8-week moderate-intensity aerobic dance intervention on sustained attention and physical fitness among university students, yielding significant results. However, the limitations encountered during the study suggest several areas for further exploration and investigation in future research to gain a more comprehensive understanding of how aerobic exercise affects cognitive function and physical health. The following are some recommendations and directions for future research.

5.4.1 Expand Sample Size and Diversify Participant Groups

Increasing the sample size may be a measure to be considered in future research, which can enhance statistical capabilities and generalizability of results. This move is more likely to bring us a significant improvement in the accuracy of the impact of aerobic dance on sustained attention and physical health, thereby enhancing the reliability and applicability of research results. Don't forget, it is also important to introduce participants of different genders, age groups, and cultural backgrounds in future research, as these variables may drag the research results in various directions. Through this approach, it is possible to reveal whether the effectiveness of aerobic dance has broad applicability and provide scientific evidence for developing specific intervention measures for different populations.

5.4.2 Explore Different Types of Exercise Interventions

This study focuses on the effects of moderate intensity aerobic dance on physical health and sustained attention, and there is still ample room for future exploration. Various forms of exercise such as strength training, yoga, and high-intensity interval training can joyfully affect cognitive function and physical health through their unique physiological or psychological mechanisms. Comparing multiple exercise methods can help seek the most effective way to enhance sustained attention and physical health. Moreover, in the future, it is possible to conduct in-depth evaluations of the composite effects of various exercises, to see if comprehensive exercise interventions can bring greater cognitive and physical health benefits on a macro level.

5.4.3 Extend the Duration of Intervention and Follow-Up

The intervention period in this study was 8 weeks, which showed initial positive effects, but the long-term effects remain unclear. Future research should consider extending the intervention period to observe the long-term effects of aerobic dance on sustained attention and physical fitness. A longer intervention may reveal more significant and enduring effects. Additionally, conducting long-term follow-up studies after the intervention ends will help to understand whether aerobic dance can bring about lasting improvements in cognitive and physical health. This has important implications for developing long-term health intervention strategies.

5.4.4 Control and Record External Variables

Future research to more accurately evaluate the effectiveness of aerobic dance requires strict control or recording of external variables such as diet, sleep, and academic stress. Considering that these external factors may have a significant impact on the research results, it is particularly important to monitor and adjust them to reduce their level of interference. On the other hand, the system's recording of participants' daily activity levels and lifestyle habits is comprehensive in

understanding the effectiveness of intervention measures, and can provide empirical data on the application of exercise intervention methods in daily life.

5.4.5 Combine Subjective and Objective Measurement Tools

The possibility of combining subjective and objective measurement tools in future research deserves attention, paving the way for a more comprehensive perspective. This study heavily relies on objective measurement tools such as Attention Network Test (ANT) and Physical Health Assessment. It should also emphasize the crucial role of subjective experience data obtained by participants through questionnaires or interviews in gaining a deeper understanding of the psychological and emotional impact of exercise intervention. The integration of subjective and objective data highlights the comprehensive evaluation of the multidimensional effects of aerobic dance on sustained attention and physical health, and this will accumulate a wealth of information for the development of effective mid health intervention strategies.

5.5 Conclusion

The eight week moderate intensity aerobic dance program can have a significant impact on the sustained attention and physical health of college students, and the conclusion is based on a scientifically rigorous experimental design. This study confirms that aerobic dance benefits both sustained attention and physical health greatly among Chinese university students.

From the research results, participants showed significant improvements in reducing average reaction time, enhancing alertness, and improving conflict resolution abilities after receiving aerobic dance classes. Similarly, participating in aerobic dance can also achieve positive results in key physical indicators such as cardiovascular endurance, flexibility, and muscle endurance.

These persuasive results further endow trust to the attention network model and highlight the significant advantages of aerobic dance as a special way to promote cognitive function and enhance physical health. By utilizing rhythm adjustment, coordination techniques, and repetitive stitching movements, its advantages in improving sustained attention are highlighted, and it heralds infinite possibilities for interdisciplinary research in the future.

However, there are also many limitations in the research, such as a small sample size, relatively limited intervention time, and an excessive emphasis on a single intervention content. These shortcomings reveal a roadmap for future progress: expanding the sample size, extending the duration of intervention plans, and combining subjective and objective measurement tools to obtain more scientific and accurate data on external variable control - in order to further explore the longitudinal benefits of aerobic exercise on sustained attention and physical health.

In conclusion, this study not only offers new theoretical insights for cognitive science and exercise science but also provides important empirical evidence for educational and public health practices. By making aerobic dance a mandatory course for university students, educational institutions can more effectively enhance students' physical and sustained attention, thereby promoting their overall development.

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APPENDIX

Appendix A

Aerobic Dance Program

Activity Details and Training Positions

Aerobics Dance Program for university Students

With Essay

Topic:The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of University Students

The Aerobics Dance Program is divided into the following 3 phases:

Warm-up It takes about 10 minutes.

The learning and practicing of aerobics dance takes about 40 minutes.

The relaxation time takes about 10 minutes.

Course Objective:

1-2 weeks:

Improved Attention: Teach basic dance movements such as head, shoulder, chest, waist, leg, knee, wrist, and ankle movements to enhance students' focus and ability to follow sequences. These foundational movements, performed at a rhythm of BPM 105, help students gradually improve their memory and execution of dance steps.

Physical Fitness Improvements: Conduct simple aerobic exercises like marching in place, brisk walking, jogging in place, step touch, and V-step to boost cardiovascular health. These activities aim to enhance overall flexibility and muscle strength, laying the foundation for more intense training in subsequent weeks.

3-4 weeks:

Improved Attention: Challenge students with more complex dance combinations at BPM 115, including cross step box step, six-beat mambo, side cha-cha, and forward-backward mambo, which require increased focus and memory for accurate execution.

Physical Fitness Improvements: Improve endurance and cardiovascular health by incorporating more challenging dance steps like high knee jogging, arm circles, and

leg swings, enhancing coordination, agility, and muscle toning. These movements also promote muscle strength and flexibility through varied rhythms and increased movement complexity.

5-6 weeks:

Improved Attention: At a BPM of 125, develop sustained attention and cognitive function by having students remember and execute complex dance movements including forward and backward steps, side open-close jumps, horse step jumps, and side rope skipping. These require intense concentration and precise memory of each step.

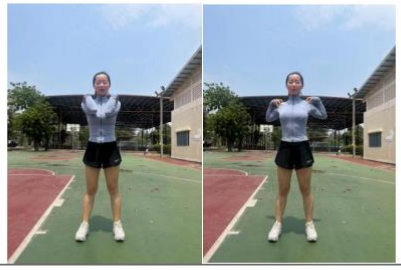
Physical Fitness Improvements: Introduce high-energy exercises like rope skipping, butt kickers, side steps, and four-directional jumps to enhance overall physical condition, focusing on aerobic endurance, flexibility, and muscle strength. These activities also improve students' agility, balance, and coordination, facilitating smoother movements within complex dance sequences.

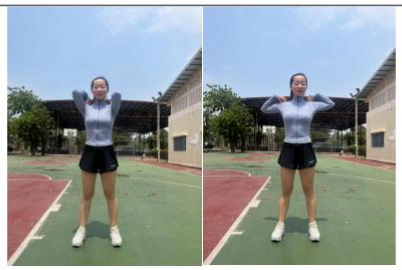
7-8 weeks:

Improved Attention: Maximize sustained attention and cognitive coordination with the most complex and rapid dance sequences at BPM 135. This includes movements like the left foot starting cross step with box turn, left foot double jump cha-cha, left foot mambo with a right 90-degree turn, easy walk steps, and triple side taps with the right foot, demanding high levels of concentration, memory, and cognitive function.

Physical Fitness Improvements: Focus on achieving peak physical health by concentrating on maximal aerobic capacity, strength, flexibility, and endurance. Introduce challenging movements like lateral jumps, dynamic stretching, and knee-high jumps to enhance students' coordination, speed, and power, pushing their physical and sustained attention limits.

WEEK	DAY	CONTENT	RHYTHM	DURATION
1-2	**1**	Warm Up: Head movement	4×8 for each movement	10

		  shoulder movement  		



chest expansion

waist movement

lunge leg press

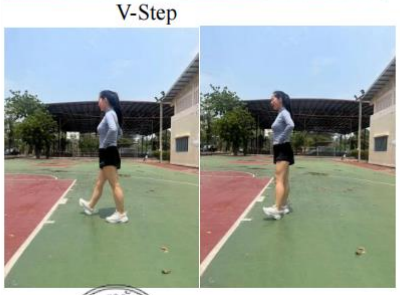
knee movement

		  wrist and ankle exercises 		
		Work out（BPM 105）: March in Place  Brisk Walking	Drill	40

Jogging in place

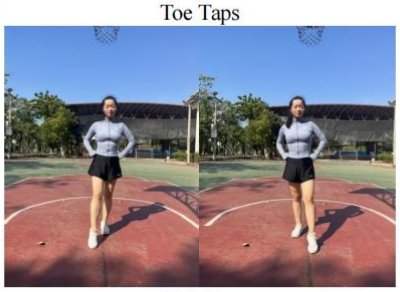
Step Touch

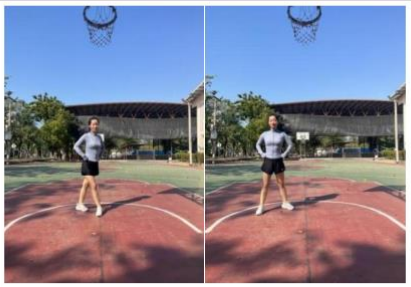
V-Step



				
		Cool Down: Slow marching (2 minutes) Triceps Stretch (1 minute, 30 seconds each side)  Forward Bend (1 minute)  Hamstring stretch (2 minutes, 1 minute each side)		10

		 Quadriceps stretch (2 minutes, 1 minute each side)  Calf stretch (2 minutes, 1 minute each side) 		
	2	Warm Up: Head movement shoulder movement chest expansion waist movement lunge leg press knee movement wrist and ankle exercises	4×8 for each movement	10
		Work out (BPM 105) :	Drill	40

		Toe Taps  Side Step   Grapevine 		



Knees Up

Heel Digs

		Cool Down：Slow marching (2 minutes) Triceps Stretch (1 minute, 30 seconds each side) Forward Bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side) Calf stretch (2minutes, 1 minute each side)		10
	3	Warm Up: Head movement shoulder movement chest expansion waist movement lunge leg press knee movement wrist and ankle exercises	4×8 for each movement	10
		Work out（BPM 105）: Box Step 	Drill	40

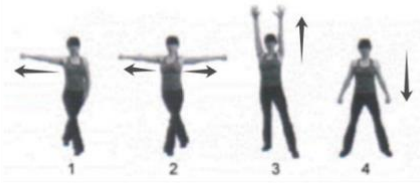
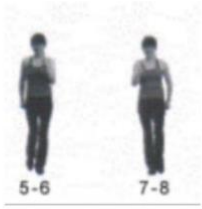
		 Mambo    Quarter Turns		

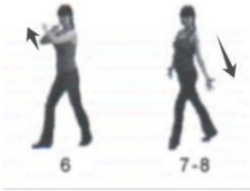
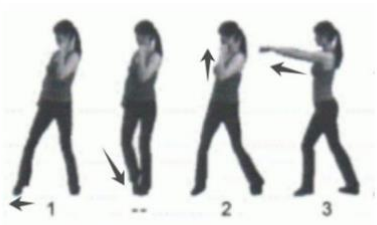
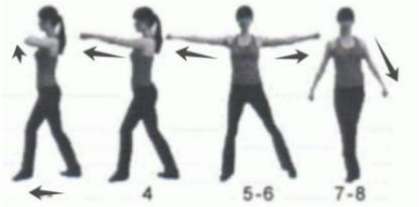
Butt Kickers

Cha Cha Cha

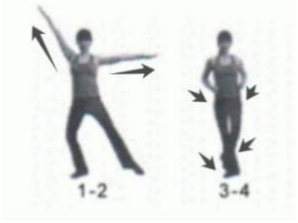
				
		Cool Down: Slow marching (2 minutes) Triceps Stretch (1 minute, 30 seconds each side) Forward Bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side) Calf stretch (2 minutes, 1 minute each side)		10
3-4	**1**	Warm Up: Jogging with high knees  Arm circles 	4×8 for each movement	10

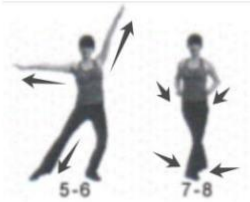
		   Leg swings 		

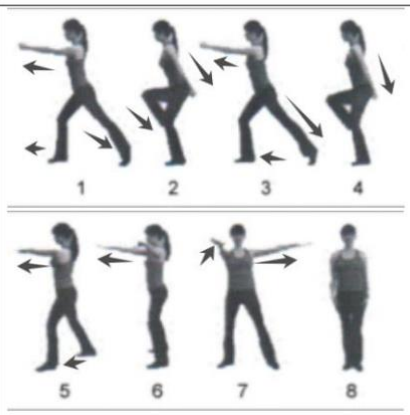
				
		Work Out（BPM 115）：   First 8 beat movements: 1-4: Lower body steps: right foot cross step box step 1; upper body movement: right arm side lift, 2 left arm side lift, 3 double arm lift, 4 lower lift. 5-8: Lower body steps: walk backward 4 steps; upper body movement: flexed arm natural swing, 7-8 same as 5-6. The second eight beats are the same as the first eight beats, but with four steps forward.  	Drill	40

		 Third eight-beat movements: 1-6: Lower body steps: right foot begins 6-beat stroll mambo; upper body movements: 1-2 right hand forward, 3 hands crossed, 4-5 left hand forward, 6 hands crossed in front of chest 7-8: Lower body steps : right foot back 1/2 back mambo ; upper body movement: arms side to side back down.   Fourth eight beat movements: 1-2: Lower body steps: right foot to the right and jump cha cha side; upper body movement: bend the left arm to swing naturally. 3-8 : lower body steps: left foot to the right front to do front, side, back 6 beats front side back mambo; upper body movement: 3-4 front flat lift bouncing 2 times, 5-6 side flat lift, 7-8 back diagonal down lift. （Requirements: The subject should move to the beat and make each movement		

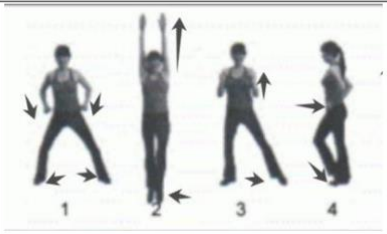
		accurately.)		
		Cool Down：Deep breathing relaxation (2 minutes) Neck stretch (1 minute, 30 seconds each side)  Shoulder Stretch (1 minute, 30 seconds each side)  Upper Body Stretch (1 minute)  Forward bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (1 minute,		10

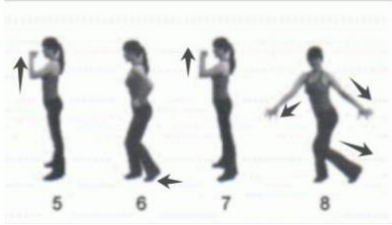
		30 seconds each side) Calf stretch (1 minute, 30 seconds each side)		
	2	Warm Up（BPM 115）: Jogging with high knees arm circles Leg swings	4×8 for each movement	10
		Work Out（BPM 115）: The first eight beats (the same as the fourth eight beats of the First day, oriented to the left): 1-2: Lower body steps: left foot to the left and jump cha cha side; upper body movements: bend the right arm to swing naturally. 3-8 : Lower body steps: right foot to the left front to do front, side, back 6 beats front side back stroll baby mambo; upper body movement: 3-4 front flat lift flick 2 times, 5-6 side flat lift, 7-8 back diagonal down lift.   Second eight-beat movements: 1-2: lower body steps: right foot slide to the right side ; upper body movements: right arm side raise left arm side plank. 3-4: Lower body steps: 1/2 back walk mambo; Upper body movements: back swing with bent arms. 5-6: lower body steps: left foot starts to the	Drill	40

		left front to do side by side step touch; upper body movement: 5-6 high five 3 times, 7-8: lower body steps: right foot starts to the right rear to do side by side step. Upper body movement: cross your arms. 7-8: Lower body steps: 1/2 back walk mambo ; Upper body movement: arms bent arms swing back.   Third eight-beat movements: 1-2 : Lower body steps: Left foot starts to do a side step to the left rear; Upper body Movements: High Five 3 times. 3-4: Lower body step: right foot starts to do side step to the right front; Upper body movement: hands on the waist. 5-6: Lower body steps: slide left foot to the left side; Upper body Movement: left arm side up, right arm side flat lift. 7-8: lower body steps: 1/2 back walk mambo; Upper body movement: arms bent and swinging back.		

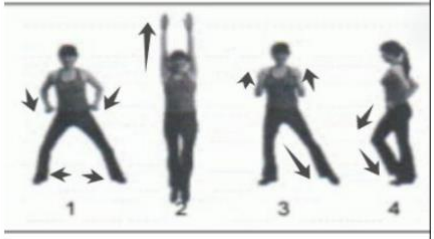
		 Fourth eight beat movement: 1-4: lower body steps : right turn 90 degrees, right foot step up and lift the knee two times; Upper body movements : both arms forward punch, backward down punch 2 times. 5-8: Lower body steps : left foot V step, left turn 90 degrees V step; Upper body movements: arms swing from right to left horizontally. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down：Deep breathing relaxation (2 minutes) Neck stretch (1 minute, 30 seconds each side) Shoulder Stretch (1 minute, 30 seconds each side) Upper Body Stretch (1 minute) Forward bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (1 minute, 30 seconds each side) Calf stretch (1 minute, 30 seconds each side)		10
	3	Warm Up: Jogging with high knees, arm circles	4×8 for each	10

		Leg swings	movement	
		Work Out（BPM 115）:  First eight beat movement: 1-4: Lower body steps : left leg lifts (side tap) 2 times ; Upper body movement: 1 arm chest flat bend, 2 left arm raise, 3 left leg lifts, 4 reduction. 5-8: Lower body steps : right leg lifts (side tap) 2 times ; Upper body movement: 1 arm chest flat bend, 2 right arm raise, 3 left leg lifts, 4 reduction. Second eight beat movement: 1-4: Lower body steps : right leg lifts (side tap) 2 times ; Upper body movement: 1 arm chest flat bend, 2 right arm raise, 3 left leg lifts, 4 Reduction. 5-8: Lower body steps : left leg lifts (side tap) 2 times ; Upper body movement: 1 arm chest flat bend, 2 left arm raise, 3 left leg lifts, 4 Reduction.	Drill	40



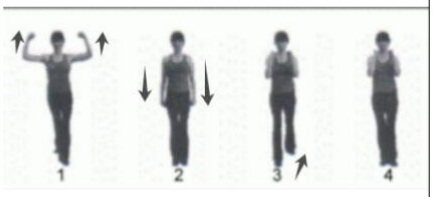


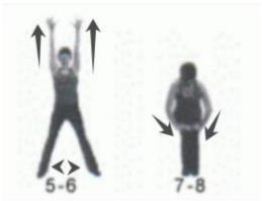
Third eight beat movements:
1-4: Lower body steps: right foot side step jump ; Upper body movements : arms up, pulling down.
5-8: Lower body steps: left foot right turn 90 degrees side cross step ; Upper body movements : arms bend and swing naturally, the 8th beat, arms side down, upper body to the left twist 90 degrees, toward the front.



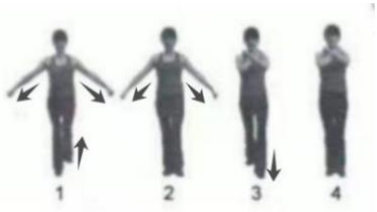
Fourth eight beat movements:

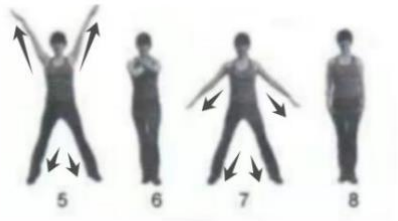
		1-4: Lower body steps: step jump to the right side, turn 90 degrees to the left on the 4th beat ; Upper body movements : arms up, pulling down. 5-8: Lower body steps: turn left 90 degrees and start to step touch with left foot 2 times; Upper body movements : 5-6 right arm front down lift, 7-8 left arm front down lift. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down：Deep breathing relaxation (2 minutes) Neck stretch (1 minute, 30 seconds each side) Shoulder Stretch (1 minute, 30 seconds each side) Upper Body Stretch (1 minute) Forward bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (1 minute, 30 seconds each side) Calf stretch (1 minute, 30 seconds each side)		10
5-6	**1**	Warm Up：Jumping jacks  Butt kickers Arm circles Leg swings	4×8 for each movement	10
		Work Out（BPM 125）:	Drill	40





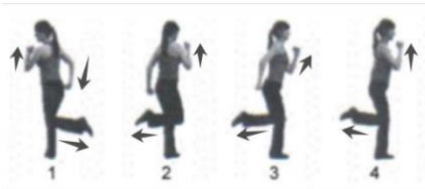
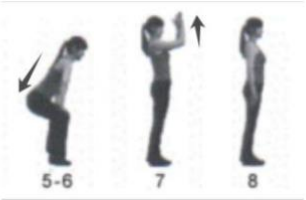
First eight beat movements:
1-4 lower body steps: take a step back and forward ; Upper body movements: 1 arms shoulder side flexion, 2 arms down, 3-4 arms chest flexion.
5-8 lower body steps: left, right in turn and leg 2 times open close; Upper body movements: 5-6 arms up with palms facing forward, 7-8 hands on knees.

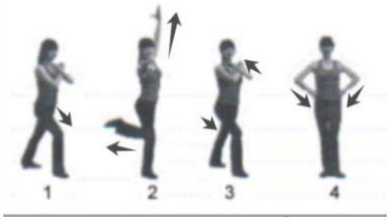




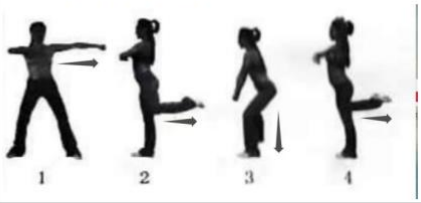
Second eight beat movements:
1-4 Lower Body Steps: take a step back and forward ; Upper body movements:1-2 hand side down, 3-4 chest cross.
5-8 Lower Body Steps: 5 legs open, 6 legs

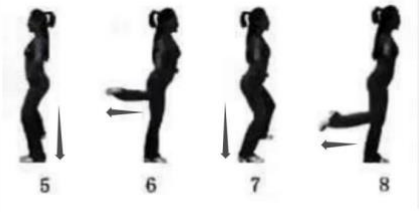
		close, 7 legs open, 8 legs close ; Upper body movements: 5 side lift, 6 chest cross，7 side lower lift , 8.Reduction. Third eight beat movements (same as the second eight beat movements , but step forward.): 1-4 Lower Body Steps: take a step forward and back ; Upper body movements:1-2 hand side down, 3-4 chest cross. 5-8 Lower Body Steps: 5 legs open, 6 legs close, 7 legs open, 8 legs close ; Upper body movements: 5 side lift, 6 chest cross，7 side lower lift , 8.Reduction.  Fourth eight beat movement: 1-8 lower body steps: the right foot began to pony jump 4 times, to the side forward in a trapezoid ; Upper body movements: 1-2 right arm body side inward around the ring, 3-4 for the left arm, 5-8 with 1-4. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down：Walking in place (2 minutes) Triceps Stretch (1 minute, 30 seconds each side) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side) Cat-cow stretch (3 minutes)		10

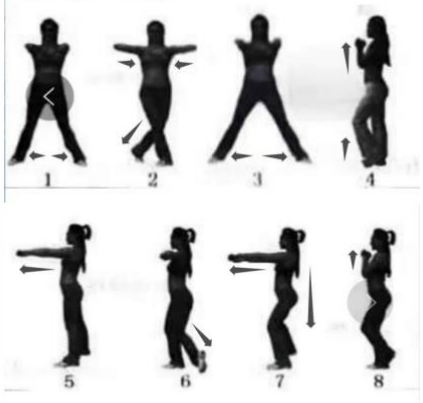
				
	2	Warm Up： Jumping jacks Butt kickers Arm circles Leg swings	4×8 for each movement	10
		Work Out（BPM 125）：   First eight beat movements: 1-4: Lower body steps: right foot to the right back arc run four steps, right turn 270 degrees ; Upper body movements: flexed arm natural swing 5-8: Lower body steps open and close do jump jack1 time; Upper body movements: 5-6 hands on legs, 7 high five, 8 at side of body.	Drill	40

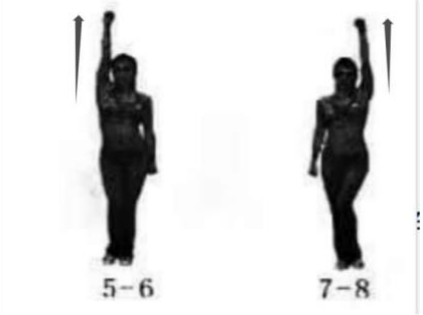


Second eight beat movement:
1-4: lower body steps: the right foot to the right front step forward and then bend leg step curl; Upper body movements: 1 arms crossed in front of the chest, 2 right arm side, left arm up, 3 arms crossed in front of the chest , 4 hands crossed the waist.
5-8: Lower body steps: turn right 90 degrees, left foot step forward and then bend leg step curl; Upper body movements: 1 arms crossed in front of the chest, 2 left arm side, right arm up, 3 arms crossed in front of the chest , 4 hands crossed the waist.

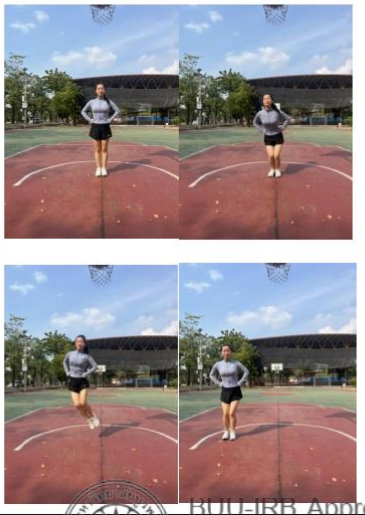


		 Third eight beat movement: 1-4: Lower body steps: 1 right foot starts to step to the side and then bends the leg 2 times in an L-shape, turn right 90 degrees at 2 (4 step curl); Upper Body Movements: 1-2 right arm swings to the side and left arm swings to the chest in a flat flexion, 3-4 left arm swings to the side and right arm swings to the chest in a flat flexion. 5-8: Lower body steps: step back to the left and then bend the leg 2 times, turn 180 degrees at 6 (2 step curl); Upper body movements: hands on the waist.   Fourth eight beat movement: 1-2: Lower body steps: 1/2 V-step; Upper Body Movements: 1 Right Arm Lateral Raise, 2 Left Arm Lateral Raise. 3-8: Lower body steps: 6 beats backward mambo, 8 turn left 90 degrees; Upper body movement: natural swing back and forth with		

		the movement of the foot. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down：Walking in place (2 minutes) Triceps Stretch (1 minute, 30 seconds each side) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side) Cat-cow stretch (3 minutes)		10
	3	Warm Up：Jumping jacks Butt kickers Arm circles Leg swings	4×8 for each movement	10
		Work Out（BPM 125）：  First eight beat movements: 1-8: Lower body steps: right foot starts to cross step 2 times, turn left 90 degrees in L shape 2 grapevine; Upper body movements: 1 arm forward, 2 chest flat flexion, 3 arm forward, 4 palm strike, 5-8 same as 1-4.	Drill	40

		  Second eight beat movements: 1-4: Lower Body Steps: hop with right foot side by side, 1-2 backward mambo ; Upper Body Movements: 1-2 double arm lateral raises, 3-4 right arm swings behind the body, left arm swings in front of the body. 5-8: Lower Body Steps: turn 90 degrees left and start pony jumps on left foot 2 times ; Upper Body Movements: 5-6 right arm lift, 7-8 left arm lift. Third eight beat movements: 1-4: Lower Body Steps: hop with left foot side by side, 1-2 backward mambo ; Upper Body Movements: 1-2 double arm lateral raises, 3-4 left arm swings behind the body, right arm swings in front of the body. 5-8: Lower Body Steps: turn 90 degrees right and start pony jumps on right foot 2 times ; Upper Body Movements: 5-6 left arm lift, 7-8 right arm lift.		

Third eight beat movements:
1-4 Lower body steps: step right foot forward step two knee; Upper body movements: arms swing naturally.
5-6 Lower body step: ball change; Upper body movements: arms swinging naturally with lower body movement.
7-8 Lower body step: right foot step right forward step knee; Upper body movements: arms swing naturally.

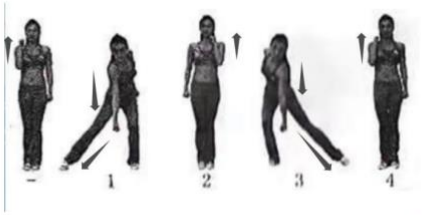
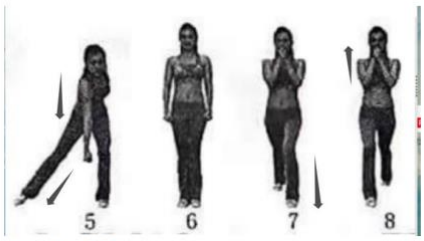
		Fourth eight beat movements: 1-4: Lower body steps: left foot starts to cross to the right side; Upper body movements: arms flex in the opposite direction with the step. 5-8: Lower body steps: turn 45 degrees to the right while mambo with the left foot; Upper body movements: 5 shoulder lateral flexion, 6 crossing in front of the body, 7-8 lateral raises. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down：Walking in place (2 minutes) Triceps Stretch (1 minute, 30 seconds each side) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side) Cat-cow stretch (3 minutes)		10
7-8	**1**	Warm Up：Marching Lateral jumps 	4×8 for each movement	10

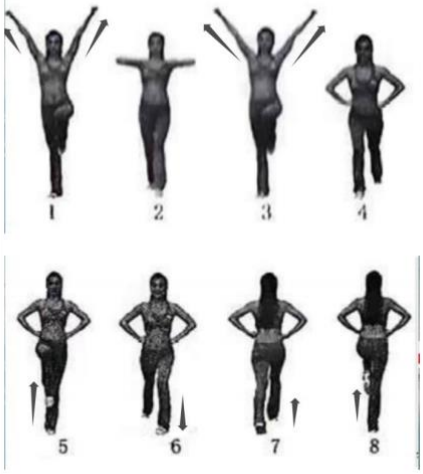
		  Leg swings Arm circles Torso twists 		
		Work Out（BPM 135）:  	Drill	40

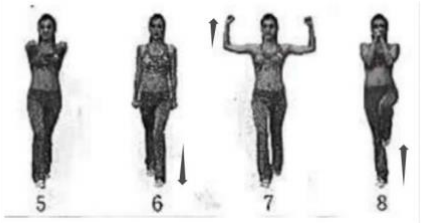
First eight beat movements:
1-4: Lower body steps: left foot start cross step while box step turn 180; Upper body movements: arms swing naturally.
5-8: Lower body steps: left foot start to jump 2 times cha cha; Upper body movement: arms swing naturally.

Second eight beat movements:
1-4: Lower body steps: left foot mambo right turn 90 degrees; Upper body movements: 1-2 arms swing to front raise, 3-4 back swing.
5-8: Lower body steps: easy walk ; Upper body movements: 1-2 arms swing to front lift, 3-4 back swing.

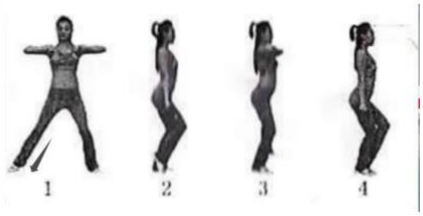
Third eight beat movements:
1-4: Lower body steps: Right foot mambo left turn 90 degrees; Upper body movements: 1-2 arms swing to front raise, 3-4 back swing.
5-8: Lower body steps: easy walk ; Upper body movements: 1-2 arms swing to front lift, 3-4 back swing.

		  Fourth eight beat movements: 1-6: Lower body steps: start with right foot and do 3 tap side; Upper body movements: 1-2 right arm downward flexed arm reach, 3-4 left arm downward flexed arm reach, 5-6 right arm downward flexed arm reach. 7-8: Lower body steps: 2 steps forward starting with left foot; Upper body movements: 2 clap hands. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down： Neck and shoulder stretch (2 minutes, stretching the neck and shoulder muscles, about 30 seconds each) Triceps stretch (1 minute, 30 seconds each side) Forward bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side) Calf Stretch (1 minute, 30 seconds each side) Child's pose (1 minute)		10

				
	2	Warm Up： Marching Lateral jumps Dynamic stretching:Leg swings Arm circles Torso twists	4×8 for each movement	10
		Work Out（BPM 135）：  First eight beat movements: 1-4: Lower body steps: knees up jump 2 times; Upper body movements: 1 side up, 2 arms flat on chest, 3 side up, 4 hands on waist. 5-8: Lower body steps: right knee up and jump, turn 180 degrees; Upper body movement: hands on waist.	Drill	40

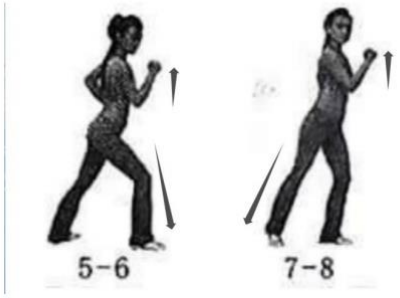


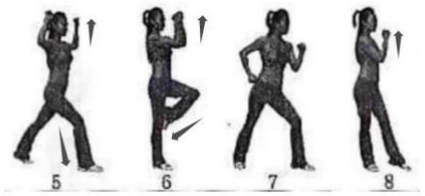
Second eight beat movements:
1-4:Lower body steps: left foot begins to walk forward 3 steps, left knee up and jump while turning left 180 degrees; Upper body movements: 1-3 hands on waist, 4 palms.
5-8: Lower body steps: right foot starts to walk forward 3 steps, lift the right knee; Upper body movements: 5-6 arms swing downward through the front at the same time, 7-8 shoulder lateral flexion to the body in front of the clap hands.



Third eight beat movements:

		1-4: Lower body step: Left foot 4 steptouch in L-shape; Upper body movement: arms in flexed arm lift 4 times. 5-8: Lower body step: Right foot 4 steptouch, L-shape; Upper body movement: Bend arms and lift 4 times.   Fourth eight beat movements: 1-4: Lower body steps: right leg step knee up; Upper body movements: arms do forward punch and pull back 2 times. 5-8: Lower body steps: left leg forward knee up; Upper body movements: arms simultaneously swing downward through the front, 8 palm strikes. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down： Neck and shoulder stretch (2 minutes, stretching the neck and shoulder muscles, about 30 seconds each) Triceps stretch (1 minute, 30 seconds each side) Forward bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side)		10

		Calf Stretch (1 minute, 30 seconds each side) Child's pose (1 minute)		
	3	Warm Up: Marching Lateral jumps Dynamic stretching:Leg swings Arm circles Torso twists	4×8 for each movement	10
		Work Out（BPM 135）:   First eight beat movements: 1-4: Lower body steps: right leg steps to the side, 2-3 right foot mambo forward to the right, 4 left foot steps to the side; Upper body movements: 1 side up, 2-3 swing naturally with the movement of the foot, 4 side up. 5-8: Lower body steps: left foot makes mambo to the left; Upper body movements: arms swing naturally.	Drill	40

		  Second eight beat movements: 1-4: Lower body step: right foot knee up 3 times; Upper body movements: 1 shoulder lateral flexion , 2 palm strike, 3-4 same as 1-2, 5-6 same as 1-2. 7-8: Lower body step: left foot forward mambo; Upper body movement: both arms swing naturally (high five 2 times). Third eight beat movements: 1-4: Lower body step: left foot knee up 3 times; Upper body movement: 1 shoulder lateral flexion , 2 palm striking, 3-4 same as 1-2, 5-6 same as 1-2. 7-8: Lower body step: right foot forward mambo; Upper body movement: arms swing naturally (high five 2 times).  		

		 Fourth eight beat movements: 1-4: Lower body steps: turn left 90 degrees to the left and do a side cross step and turn 180 degrees to a side cross step; Upper body movements: 1-4 arms abduction, adduction, high five. 5-8: Lower body steps: turn right 90 degrees to the right and do a side cross step and turn 180 degrees to a side cross step; Upper body movements: 1-4 arms abducted, adduction, high-five. （Requirements: The subject should move to the beat and make each movement accurately.）		
		Cool Down： Neck and shoulder stretch (2 minutes, stretching the neck and shoulder muscles, about 30 seconds each) Triceps stretch (1 minute, 30 seconds each side) Forward bend (1 minute) Hamstring stretch (2 minutes, 1 minute each side) Quadriceps stretch (2 minutes, 1 minute each side) Calf Stretch (1 minute, 30 seconds each side) Child's pose (1 minute)		10

Physical activity readiness questionnaire-PAR-Q (revised 2002)

(A questionnaire for people aged 15-69)

(Chinese version)

Name: Grade: Times:

Common sense is your best guide when you answer these questions. Please resd the questions carefully and answer each one honestly : Check YES or NO

YES	NO	
		1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
		2. Do you feel pain in your chest when you do physical activity?
		3. In the past month, have you had chest pain when you were not doing physical activity?
		4. Do you lose your balance because of dizziness or do you ever lose consciousness?
		5. Do you have a bone or joint problem（for example , back , Knee or hip) that could be made worse by a change in your physical activity?
		6. Is your doctor currently prescribing drugs (for example , water pills）for your blood pressure or heart condition?
		7. Do you know of any other reason why you should not do physical activity?

Table reference: Canadian society for exercise physiology www.csep.ca/forms

Appendix B

Physical activity readiness questionnaire-PAR-Q

Physical activity readiness questionnaire-PAR-Q (revised 2002)

(A questionnaire for people aged 15-69)

(Chinese version)

Name: Grade: Times:

Common sense is your best guide when you answer these questions. Please resd the questions carefully and answer each one honestly : Check YES or NO

YES	NO	
		1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
		2. Do you feel pain in your chest when you do physical activity?
		3. In the past month, have you had chest pain when you were not doing physical activity?
		4. Do you lose your balance because of dizziness or do you ever lose consciousness?
		5. Do you have a bone or joint problem（for example , back , Knee or hip) that could be made worse by a change in your physical activity?
		6. Is your doctor currently prescribing drugs (for example , water pills）for your blood pressure or heart condition?
		7. Do you know of any other reason why you should not do physical activity?

Table reference: Canadian society for exercise physiology www.csep.ca/forms

Appendix C

Item Objective Congruence (IOC)

LIST OF IOC REVIEW COMMITTEE EXPERTS

Assit.Prof.Dr.Chairat Choosakul,	Mahasarakham Univerisity
Dr.Chirawut Achriyacheevin,	Mahasarakham University
Dr. Amnuay Tanpanich,	Kasetsart University
Dr. Apanchnit Siripet,	Princess Chulabhorn College of Medical Science
Second Lieutenant Anusorn Montri	Kasetsart University

Results of analysis of the accuracy of the instrument (Validity)

Research Topic: The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of University Students

No.	Exercise program components	Experts opinion (person) 1	2	3	4	5	Total	IOC	Result	suggestion
1	**Aerobics Course Program**									
	1.1 Aerobics program is fun and interesting	0	1	0	-1	1	1	0.2	Reject	Increase the interest in courses with language or gestures or music
	1.2 Appropriate intensity of exercise	1	1	0	-1	1	2	0.4	Reject	1-2 weeks 105 BPM 3-4 weeks 115 BPM 5-6 weeks 125 BPM 7-8 weeks 135 BPM
	1.3 Appropriate exercise position	1	1	1	0	1	4	0.8	Accept	
	1.4 Appropriate frequency of exercise	1	1	1	1	1	5	1	Accept	
	1.5 8-week Aerobic Dance program is appropriate	1	1	1	1	0	4	0.8	Accept	8-12weeks
2	**Workout steps**									
	Warm-up phase									
	2.1 Activation of muscles	1	1	1	1	1	5	1	Accept	
	2.2 Stretching muscles and stretching joints	1	1	1	1	1	5	1	Accept	
	2.3 Warm-up movements have continuity	1	1	1	1	1	5	1	Accept	
	2.4 Appropriate length of warm-up	1	1	1	1	1	5	1	Accept	
	Exercise phase									
	2.5 Appropriate intensity of weekly exercise	1	1	0	-1	1	2	0.4	Reject	Add posture
	2.6 Appropriate duration of exercise	1	1	1	1	1	5	1	Accept	

2.7 Appropriate weekly exercise movements	1	1	1	-1	1	3	0.6	Accept	Add posture
2.8 Appropriate number of exercise sessions per week	1	1	1	1	1	5	1	Accept	
2.9 Appropriate of exercise beats	1	1	0	1	1	4	0.8	Accept	
Cool-down phase									
2.10 Good muscle relaxation	1	1	1	0	1	4	0.8	Accept	
2.11 Relaxation of muscles in all parts of the body	1	1	1	0	1	4	0.8	Accept	
2.12 There is a continuity of relaxation movements	1	1	1	0	1	4	0.8	Accept	
2.13 Appropriate duration of relaxation	1	1	1	1	1	5	1	Accept	

Additional suggestions:

1. All pictures are enlarged, and the direction of action is added with arrows.
2. Add suitable BPM to the work out part.
3. Warm-up and relaxation movements with corresponding pictures, no need to add the repetitions.
4. For the same movement, write down which direction is opposite.
5. Week3 Cool Down should not from the stand to sit and stand back . Cool Down should add posture to the muscles that are also used while exercise.
6. The work out part should be more intense.
7. The cool down section should state how long to hold each pose.

Appendix D

Participants Information Sheet

AF 06-02/v2.1

Participant Information Sheet

Research protocol code: G-HS046/2567(C1)
(A research code will be assigned by the Burapha University Institutional Review Board Office upon completing the submission)
Research Title:The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of University Students

Dear all participants ,

I, Mrs KUANG KE Master degree student from the faculty of sport science, Burapha University, would like to invite you to participate in a reach project, entitled "The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of University Students". Before agreeing to participate in this project, the details of the projects are as follows:

This study proposes to use a repeated measures experimental design with paired groups. To ensure objectivity and reduce bias in the study, the experiment will be designed using a double-blind method through the use of computer-generated random numbers. Each volunteer is given a unique participant number and these numbers are then assigned to either the experimental or control group through a randomization process. There are 60 participants, all of which are first -year non -sports female students in Huanghuai university.

Experimental Group: This group consists of university students who participate in the Aerobic Dance Program, training three times a week for 60 minutes each session over an 8-week period. The aim for this group is to observe the effects of the aerobic dance program on their sustained attention and physical fitness. Control Group: Refers to the university students who do

not participate in the Aerobic Dance Program. This group serves as a baseline to compare the effects observed in the experimental group, allowing for an assessment of the program's effectiveness in enhancing sustained attention and physical fitness.

The aerobics dance program lasted 8 weeks, and participants in both groups were measured before the first class, immediately after the fourth week of classes, and immediately after the last class (weeks 0, 4, and 8). Measurements were taken for equal periods of time before and after the intervention; each measurement included an ANT test and a fitness test (Cardiovascular endurance will be assessed through the 800 meters run test, Muscle strength will be assessed through a test using a grip strength device. Muscular endurance is evaluated based on the number of push-ups completed in 1 minute. Flexibility is measured by a seated forward bend test.Body composition will be assessed through Skin Fold Caliper). This design helped to observe the direct effects of short-term aerobics dance instruction practice on attention and physical fitness.

All the tests were completed within two days, the first day was ANT test, start at 9:00, and the next day from 8:00-9: 00 muscle strength test; 9: 00-10: 00 muscle endurance test; 10: 30-11: 30 cardiovascular endurance Test; 13: 30-14: 00 Flexible test; 14: 30-15: 30 body composition test. All university students participating in the study received the same instructions on how to complete the sustained attention test and physical fitness assessment.

In this study on moderate-intensity aerobic dance program ， participants may face physical risks such as muscle strains and sprains from intense activities, and joint injuries from actions like jumping and twisting that stress the knees and

ankles. To minimize these risks, preventive measures include employing professionally certified instructors to lead all classes, ensuring safety and correctness. The training intensity will be adjusted to match the fitness levels of participants, complemented by sufficient warm-up exercises and stretching at both the start and end of each session to reduce injury risks.

In terms of emergency measures, the research venue will be equipped with first aid supplies like ice packs and bandages for immediate care of minor injuries. An emergency contact mechanism with the school hospital will ensure quick professional medical assistance for serious injuries. All injury incidents will be recorded and reported to the research team for necessary risk assessment and procedural adjustments.

Participants in this research project is completely voluntary. You may withdraw from the study at any time without any reason . There are no consequences of withdrawing from the study.

Importantly, there is no potential psychological, social, freedom, and property risks from the data collections. All test results, comments and responses will be treated confidentially with identifying detailed removed. All data obtained from familiarization and testing session will be store for 2 years by the research team and will be used for any other purpose. You also have the right to cancel your permission to use and disclose information collected about you, in writing, at any time, by sending your written request to Ms. KUANG KE , faculty of sport science, Burapha university, telephone number: 0967956028, email:65910129@go.buu.ac.th.

If the researchers do not follow the research protocol as stated in in the Participant Information Sheet, please contact Burapha University Institutional Review Board Office, Burapha University (Division of Research and Innovation), Tel. 038-102620.

参与者信息表

研究协议代码：G-HS046/2567（C1）
（提交完成后，由东方大学机构审查委员会指定研究代码）
研究题目：有氧舞蹈计划对大学生持续注意力和身体健康的影响。
尊敬的所有参与者，

我是泰国东方大学体育科学学院的硕士研究生 KUANG KE 女士，我邀请您参与一个名为“有氧舞蹈项目对大学生持续注意力和身体健康的影响”的研究项目。在您同意参与此项目之前，以下是该项目的细节：

本研究拟采用重复测量实验设计与成对组设计。为了确保研究客观性并减少偏见，实验将使用双盲方法设计，通过使用计算机生成的随机数。每位志愿者将获得一个独特的参与者编号，然后通过随机化程序将这些编号分配给实验组或对照组。共有 60 名参与者，均为黄淮大学一年级非体育专业的女生。

实验组：这一组由参与“有氧舞蹈项目”的大学生组成，每周三次进行为期 8 周的 60 分钟训练。该组的目标是观察有氧舞蹈项目对他们的持续注意力和身体健康的影响。对照组：指不参与有氧舞蹈项目的大学生。该组作为基准，用于比较实验组观察到的效果，以评估该项目在增强持续注意力和身体健康方面的有效性。

有氧舞蹈项目为期 8 周，两组参与者在第一节课前、第四周课程结束后立即和最后一节课结束后立即（第 0 周、第 4 周和第 8 周）进行测量。在干预前后的相同时间段内进行测量；每次测量包括 ANT 测试和健身测试（通过 800 米跑测试评估心血管耐力，通过握力设备测试评估肌肉力量。肌肉耐力根据 1 分钟内完成俯卧撑的数量进行评估。柔韧性通过坐姿前屈测试进行评估，身体成分通过皮褶卡尺进行评估）。该设计有助于观察短期有氧舞蹈训练对注意力和身体健康的直接影响。

所有测试将在两天内完成，第一天进行 ANT 测试，开始时间为早上 9:00，第二天进行肌肉力量测试为 8:00-9:00；肌肉耐力测试为 9:00-10:00；心血管耐力测试为 10:30-11:30；柔韧性测试为

13:30-14:00；身体成分测试为 14:30-15:30。所有参与研究的大学生均接收相同的指导，以完成持续注意力测试和身体健康评估。在这项中等强度有氧舞蹈项目的研究中，参与者可能会面临诸如强化活动导致的肌肉扭伤和拉伤，以及跳跃和扭曲等动作对膝盖和踝关节造成压力的关节损伤等身体风险。为减少这些风险，防范措施包括雇用专业认证的教练员领导所有课程，确保安全和正确性。训练强度将根据参与者的健身水平进行调整，并在每次课程开始和结束时进行充分的热身运动和伸展，以降低受伤风险。

关于应急措施，研究场所将配备急救用品，如冰袋和绷带，以立即处理轻微受伤。与学校医院建立的紧急联系机制将确保对严重受伤提供迅速的专业医疗援助。所有受伤情况将被记录并报告给研究团队，以进行必要的风险评估和程序调整。

本研究项目的参与者完全自愿。您可以随时无需任何原因退出研究。退出研究不会有任何后果。

重要的是，从数据收集中不会面临潜在的心理、社会、自由和财产风险。所有测试结果、意见和回答将被保密处理，移除所有可识别的详细信息。所有熟悉化和测试阶段得到的数据将由研究团队保存两年，并不会用于其他任何目的。您还有权随时书面取消对您提供的信息的使用和披露许可，通过发送书面请求至 KUANG KE 女士，泰国东方大学体育科学学院，电话号码：0967956028，电子邮箱：65910129@go.buu.ac.th.

如果研究人员未按照参与者信息表中规定的研究协议进行行动，请联系泰国东方大学机构审查委员会办公室，泰国东方大学（研究与创新部），电话 038-102620。

Appendix E

Consent Form

AF 06-03.1/v2.1

Consent Form

Research Code: G-HS046/2567(C1)
(Given by the Research Ethics Committee at Research and Innovation Administration Division, Burapha University)
Research Title: The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of University Students

Date ..... Month ..... Year .....

Before signing the consent form for this research participation, I was provided the information about the purposes and the processes of the research in the participant information sheet, which the researcher has given to me. I have fully understood the preceding explanation and the researcher has undertaken to answer my questions willingly and without concealment to my satisfaction.

I voluntarily agree to participate in this research project. I understand I can withdraw from the research project at any time without giving a reason,There are no consequences of withdrawing from the study.

I am not exposed to potential psychological, social, liberty and property risks from data collection. All my test results, comments and responses will be kept strictly confidential with any identifiable details removed. All my data from the familiarization and testing phase will be kept by the research team for 2 years and will not be used for any other purpose. I have the right to revoke permission for the use and disclosure of the information I have provided at any time in writing.

I have read and fully understood the above statements in all respects and have signed this consent document willingly.

In the case that I cannot read or write, the researcher has read the statement in the consent form to me until I fully understand it well. Therefore, I willingly signed or stamped my thumb on this consent form.

Participant's signature .....

(.....)

Researcher's signature .....

(.....)

Note: If the participant gave thumbprint as their consent, witness signature will be needed.

AF 06-03.1/v2.1

同意书

研究编码： G-HS046/2567(C1)
（由东方大学研究与创新管理部研究伦理委员会提供）
研究题目：有氧舞蹈计划对大学生持续注意力和身体健康的影响

日期……月份……年份……

在签署此研究参与同意书之前，我已经收到了研究人员提供给我的参与者信息表，其中包括了关于研究目的和过程的信息。我已经充分理解了上述解释，研究人员也愿意并且诚实地回答我的问题，使我满意。

我自愿同意参与这个研究项目。我明白我可以在任何时候无需给出理由退出研究项目，退出研究不会有任何后果。

在数据收集过程中，我不会受到潜在的心理、社会、自由和财产风险的影响。我的所有测试结果、评论和回答都将严格保密，不会泄露任何可识别的细节。我从熟悉化和测试阶段获得的所有数据将由研究团队保存两年，并且不会用于任何其他目的。我有权随时书面撤销我提供的信息的使用和披露权限。

我已经完全阅读并理解了上述声明，并愿意签署这份同意文件。

如果我无法阅读或书写，研究人员将同意书中的声明读给我，直到我完全理解为止。因此，我自愿在这份同意书上签名或盖上拇指印。

参与者签名……
(……)
研究人员签名……
(……)

注： 如果参与者以拇指印作为他们的同意意向，将需要见证人签名。

Appendix F

Certificate of Ethical Review Approval for Human Research

สำเนา

ที่ IRB3-088/2567

เอกสารรับรองผลการพิจารณาจริยธรรมการวิจัยในมนุษย์

มหาวิทยาลัยบูรพา

คณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา ได้พิจารณาโครงการวิจัย

รหัสโครงการวิจัย : G-HS046/2567

โครงการวิจัยเรื่อง : The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of University Students

หัวหน้าโครงการวิจัย : MISSKE KUANG

หน่วยงานที่สังกัด : คณะวิทยาศาสตร์การกีฬา

อาจารย์ที่ปรึกษาโครงการหลัก (สารนิพนธ์/ งานนิพนธ์/ วิทยานิพนธ์/ ดุษฎีนิพนธ์) : รองศาสตราจารย์ ดร.ธนิดา จุลวนิชย์พงษ์

หน่วยงานที่สังกัด : คณะวิทยาศาสตร์การกีฬา

อาจารย์ที่ปรึกษาโครงการร่วม (สารนิพนธ์/ งานนิพนธ์/ วิทยานิพนธ์/ ดุษฎีนิพนธ์) : ผู้ช่วยศาสตราจารย์ ดร.ฉัตรกมล สิงห์น้อย

หน่วยงานที่สังกัด : คณะวิทยาศาสตร์การกีฬา

วิธีพิจารณา : ☐ Exemption Determination ☐ Expedited Reviews ☑ Full Board

BUU Ethics Committee for Human Research has considered the following research protocol according to the ethical principles of human research in which the researchers respect human's right and honor, do not violate right and safety, and do no harms to the research participants.

Therefore, the research protocol is approved (See attached)

1. Form of Human Research Protocol Submission Version 2: 14 May 2024
2. Research Protocol Version 1: 23 March 2024
3. Participant Information Sheet Version 2: 10 May 2024
4. Informed Consent Form Version 2: 10 May 2024
5. Research Instruments Version 1: 23 March 2024
6. Others (if any)

6.1 Activity Details and Training Positions Aerobics Dance Program for university Students With Essay Version 1: 23 March 2024

6.2 Announcement Version 1: 23 March 2024

สำเนา

วันที่รับรอง : วันที่ 12 เดือน มิถุนายน พ.ศ. 2567
วันที่หมดอายุ : วันที่ 12 เดือน มิถุนายน พ.ศ. 2568

ลงนาม *Assistant. Professor Ramorn Yampratoom*
(Assistant. Professor Ramorn Yampratoom)
Chair of The Burapha University Institutional Review Board
Panel 3 (Clinic / Health Science / Science and Technology)

**** หมายเหตุ การรับรองนี้มีรายละเอียดตามที่ระบุไว้ด้านหลังเอกสารรับรอง ****

สำเนา

ผู้วิจัยทุกท่านที่ผ่านการรับรองจริยธรรมการวิจัยในมนุษย์ ต้องปฏิบัติดังต่อไปนี้

1. ดำเนินการวิจัยตามขั้นตอนต่าง ๆ ที่ระบุไว้ในโครงการวิจัยอย่างเคร่งครัด โดยใช้เอกสารชี้แจงผู้เข้าร่วมโครงการวิจัย (Participant Information Sheet) (AF 06-02), เอกสารแสดงความยินยอมของผู้เข้าร่วมโครงการวิจัย (Consent Form) (AF 06-03), แบบสัมภาษณ์ และ/หรือแบบสอบถาม รวมถึงเอกสารอื่น ๆ เช่น ใบประชาสัมพันธ์ หรือประกาศเชิญชวนเข้าร่วมโครงการ เป็นต้น
ที่ผ่านการรับรองและประทับตราจากคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา แล้วเท่านั้น
2. ผู้วิจัยมีหน้าที่ส่งแบบรายงานความก้าวหน้าของการวิจัย (Progress Report Form) (AF 09-01) ต่อคณะกรรมการฯ ตามเวลาที่กำหนดหรือเมื่อได้รับการร้องขอ
3. การรับรองโครงการวิจัยของคณะกรรมการฯ มีกำหนด 1 ปี หลังจากวันที่คณะกรรมการฯ มีมติให้การรับรอง หากการวิจัยไม่สามารถดำเนินการเสร็จสิ้นภายในระยะเวลาที่กำหนด ผู้วิจัยสามารถยื่นขอต่ออายุการรับรองโครงการวิจัยอย่างน้อย 30 วัน ก่อนวันหมดอายุตามที่กำหนดไว้ในเอกสารับรองผลการพิจารณาจริยธรรมการวิจัยในมนุษย์
4. หากมีการแก้ไขเพิ่มเติมโครงการวิจัย เช่น เปลี่ยนแปลงหัวหน้าโครงการวิจัย/ เพิ่มเติมผู้ร่วมวิจัย การแก้ไขหรือเพิ่มเติมวิธีดำเนินการวิจัย การแก้ไขการสะกดคำ เป็นต้น ผู้วิจัยจะต้องยื่นขอแก้ไขเพิ่มเติมโครงการวิจัย
โดยส่งแบบรายงานการแก้ไขเพิ่มเติมโครงการวิจัย (Amendment Form) (AF 08-01) ต่อคณะกรรมการฯ
โดยอ้างอิงรหัสโครงการวิจัยที่ได้รับไว้ และต้องระบุรายละเอียดให้ชัดเจนว่ามีการเปลี่ยนแปลงอะไร อย่างไร
และเหตุผลที่ต้องมีการเปลี่ยนแปลง ทั้งนี้ ในกรณีการเปลี่ยนแปลงหัวหน้าโครงการวิจัย/
เพิ่มเติมผู้ร่วมวิจัยท่านใหม่ให้แนบประวัติมาด้วย
5. ผู้วิจัยมีหน้าที่รายงานเหตุการณ์ไม่พึงประสงค์ชนิดร้ายแรงที่เกิดขึ้นกับผู้เข้าร่วมโครงการวิจัย
ภายในระยะเวลาที่กำหนดในวิธีดำเนินการมาตรฐาน (Standard Operating Procedures, SOPs) ให้แก่คณะกรรมการฯ
ตามแบบรายงานเหตุการณ์ไม่พึงประสงค์ชนิดร้ายแรง (Serious Adverse Event (SAE) Report Form) (AF 10-01)
6. ผู้วิจัยมีหน้าที่รายงานให้คณะกรรมการฯ ทราบ เมื่อมีการยุติโครงการวิจัยก่อนกำหนด
หรือการระงับโครงการวิจัยโดยผู้วิจัยหรือผู้สนับสนุนทุนวิจัย
พร้อมทั้งคำอธิบายเป็นลายลักษณ์อักษรโดยละเอียดถึงสาเหตุของการยุติหรือระงับโครงการวิจัย
ตามแบบรายงานการยุติโครงการวิจัยก่อนกำหนด (Study Termination Memorandum) (AF 12-01)
7. ผู้วิจัยมีหน้าที่ส่งแบบรายงานการไม่ปฏิบัติตามข้อกำหนด (Non-compliance / Protocol Deviation / Protocol Violation Report) (AF 13-01) ให้คณะกรรมการฯ และผู้สนับสนุนทันทีที่ตรวจพบ
หรือได้รับรายงานว่ามีการปฏิบัติที่ไม่ตรงกับขั้นตอนที่ระบุไว้ในโครงการวิจัย หรือข้อ กำหนดของคณะกรรมการฯ
8. เมื่อสิ้นสุดโครงการวิจัย ผู้วิจัยมีหน้าที่ส่งแบบรายงานสรุปผลการวิจัย (Final Report) (AF 11-01) ให้คณะกรรมการฯ ทราบ ภายใน 30 วัน หลังจากสิ้นสุดการดำเนินการวิจัย

Appendix G

Data Collecting Sheet

Data Collecting Sheet

The Effect of Aerobic Dance Program on Sustained Attention and Physical fitness of University Students

ID..... Age.....

Pre-existing Exercise Duration (minutes/session).....

Pre-existing Exercise Frequency (times/week).....

Physical Fitness Tests

Items	0 week	4 week	8 week
Cardiovascular Endurance (800m run time)			
Muscle Strength (grip strength)			
Muscular Endurance (push-ups count)			
Flexibility (seated forward bend distance)			
Body Composition (Skin Fold Caliper)			

Sustained Attention Test (ANT)

Item	0 week	4 week	8 week
ANT			

Appendix H

Announcement

Announcement

Recruitment of interested persons to join the research program:
The effect of aerobic dance program on sustained attention and physical fitness of university students

Eligible Participants: Female freshmen at Huanghuai University, aged 18 and above, non-sports majors, with no experience in aerobics or dance, physically healthy, without cardiovascular, musculoskeletal diseases, or other contraindications.

Study Format:
Participants will be randomly assigned to either the experimental group, which will attend the Aerobic Dance Program, or a control group. The program will last for 8 weeks. Assessments will be conducted at the beginning, midpoint, and end of the study to monitor changes in sustained attention and physical health.

Place of study: Dance Practice Room, Huanghuai University

How to Participate: Interested individuals please contact Ms. KE KUANG： 18339965006
Email: kuangke1002@163.com

Note: Participation in this research project is completely voluntary, with no compensation provided.

招募公告

征集有兴趣加入研究项目的人员：
舞蹈有氧运动项目对大学生持续注意力和身体健康的影响研究

参与资格：黄淮大学的女性新生，年龄18岁及以上，非体育专业，无舞蹈或有氧运动经验，身体健康，无心血管、肌肉骨骼疾病或其他禁忌症。

研究形式：参与者将随机分配到实验组或对照组。实验组将参加舞蹈有氧运动项目，项目为期8周。研究开始、中期和结束时将进行评估，以监测持续注意力和身体健康的变化。

研究地点：黄淮大学舞蹈练习室

如何参与：有兴趣的个人请联系邝珂小姐：18339965006 电子邮箱：kuangke1002@163.com

注：参加这项研究项目完全自愿，不提供任何补偿。

BIOGRAPHY

NAME	Mrs. KE KUANG
DATE OF BIRTH	2 October 2536
PLACE OF BIRTH	China
PRESENT ADDRESS	No.121 Yanxi Road, Zhumadian, Henan Province, China
EDUCATION	2012-2016 Studied in the Sports Training Department of Zhengzhou University, earn a Bachelor's degree 2022 to 2024 Studied in Faculty of Sport Science of Burapha University, earn a Master's degree