THE EFFECT OF CORE MUSCLE TRAINING ON THE BODY BALANCE OF 7 TO 12-YEAR-OLD CHILDREN DANCERS IN THE EMBODIMENT OF DANCE TECHNICAL SKILLS

YUAN RUI

UNIVERSITI SAINS MALAYSIA

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by

YUAN RUI

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LIST OF ABBREVIATIONS

CFA	Chinese Ethnic Folk Dancers Association
E	Expert
ICC	Intra-group correlation coefficients
I-CVI	Item-Level Content Validity Index
M	Mean
M1-M12	Movement 1- Movement 12
RM-ANOVA	Repeated measures analysis of variance
S-CVI/Ave	Scale-level Content Validity Index, Average
SD	Standard deviation
SEBT	Star Excursion Balance Test
SPSS	Statistical Package for Social Sciences
ST	Student

LIST OF APPENDICES

KESAN LATIHAN OTOT TERAS KE ATAS KESEIMBANGAN BADAN PENARI KANAK-KANAK BERUMUR 7 HINGGA 12 TAHUN DALAM PENGUASAAN KEMAHIRAN TARIAN

ABSTRAK

Kajian ini meneliti kesan latihan intervensi otot teras terhadap kestabilan teras, keseimbangan badan, dan kemahiran teknikal tarian dalam kalangan penari kanak-kanak berumur 7 hingga 12 tahun. Sebanyak 22 peserta dari "Beijing Seven Colors Flower Dance School," Beijing, China, dipilih menggunakan kaedah persampelan berfokus. Persetujuan bertulis diperoleh daripada ibu bapa dan penjaga peserta sebelum program dijalankan. Kajian ini menggunakan reka bentuk penyelidikan campuran, dengan program latihan selama lapan minggu yang merangkumi 16 sesi, menggabungkan prinsip peningkatan beban progresif yang disesuaikan dengan keperluan perkembangan fizikal kanak-kanak. Data kuantitatif diperoleh melalui penilaian sebelum dan selepas latihan, mengukur kekuatan otot teras, daya tahan, keseimbangan badan, dan kemahiran teknikal tarian. Data kualitatif pula diperoleh melalui sesi temubual dengan pakar. Hasil kajian menunjukkan peningkatan signifikan dalam kestabilan otot teras, seperti yang dibuktikan dengan prestasi yang lebih baik dalam ujian curl-ups, plank, dan side plank. Metrik keseimbangan badan, dinilai menggunakan Star Excursion Balance Test (SEBT), menunjukkan kemajuan khususnya dalam arah posterior dan medial. Selain itu, kemahiran teknikal tarian seperti lompatan, pusingan, dan regangan turut menunjukkan peningkatan yang jelas. Kerangka penilaian berdasarkan Gagné's Nine Events of Instruction dibangunkan untuk memastikan penyesuaian progresif dan pemerolehan kemahiran yang efektif. Kajian masa depan disarankan untuk menggunakan kumpulan kawalan dan meneroka

tempoh latihan yang lebih panjang bagi menilai kesan jangka panjang terhadap kecergasan fizikal dan prestasi teknikal. Kesimpulannya, latihan intervensi otot teras secara signifikan meningkatkan keseimbangan badan dan prestasi teknikal dalam kalangan penari kanak-kanak, serta memberi panduan praktikal untuk pendidikan tarian.

THE EFFECT OF CORE MUSCLE TRAINING ON THE BODY BALANCE OF 7 TO 12-YEAR-OLD CHILDREN DANCERS IN THE EMBODIMENT OF DANCE TECHNICAL SKILLS

ABSTRACT

This study examines the impact of core muscle intervention training on core stability, body balance, and dance technical skills in child dancers aged 7 to 12 years. A total of 22 participants from the "Beijing Seven Colors Flower Dance School," Beijing, China, were selected using purposive sampling. Written consent was obtained from the parents and guardians of the participants before the program began. The study employed a mixed-methods research design, with an eight-week training program consisting of 16 sessions, incorporating progressive overload principles tailored to the physical development needs of children. Quantitative data were collected through pre- and post-training assessments measuring core strength, endurance, body balance, and dance technical skills. Qualitative data were gathered through expert interviews. The results indicated significant improvements in core stability, as evidenced by better performance in curl-ups, planks, and side planks. Body balance metrics, assessed using the Star Excursion Balance Test (SEBT), showed marked progress, particularly in the posterior and medial directions. Additionally, dance technical skills, including jumping, turning, and extension, demonstrated clear improvement. An evaluation framework based on Gagné's Nine Events of Instruction was developed to ensure progressive adaptation and effective skill acquisition. Future research is recommended to use a control group and explore the effects of extended training durations to assess long-term physical fitness and technical performance outcomes. In conclusion, core

muscle intervention training significantly enhances body balance and technical performance in young dancers, providing valuable practical guidance for dance education.

CHAPTER 1

INTRODUCTION

1.1 Introduction

The history of dance can be traced back to early civilizations, described as an ancient and rich art form, it was intricately associated with religious ceremonies, social celebrations and warfare (Dissanayake, 2015; Vatsyayan, 2022). In ancient Egyptian civilization, dance was looked upon as a sacred symbol and was mainly utilized in rituals for sacrifices and celebrations (Garfinkel, 2018). Within the context of Egyptian religious beliefs, dance was used as a vital form of communication with the divine, expressing devotion as they worship their deities. Moreover, during the prayers for blessings, the people would carry out the dance whereby they mimic deity movements or symbolized narratives of faith to facilitate divine communion (Mohammed, 2022). Furthermore, this form of art would also be employed during harvest seasons, national celebrations, and other significant occasions as it enhanced the festive ambiance and fostered social unity. This tradition was continued by Ancient Greece, as dance was promoted in theatrical, social as well as religious contexts. This helped establish dance as a leading art form linked to social interaction, influence, and self-expression (Rocconi, 2015).

As civilizations advanced, the prominence of dance further evolved, particularly during the European Renaissance in the 14th century, which marked a transformative period for dance. In Renaissance Italy, dance became pivotal especially in terms of identity expression, social engagement as well as elevating one's artistic status. In this regard, dance evolved into a form of formal stage performance which was well appreciated by the aristocracy as well as literary and artistic circles, becoming

an integral part of cultural life (Rocconi, 2015). Meanwhile, French ballet attained prominence in the 17th century under the patronage of Louis XIV, where the first specialized dance school was established at court, refining the steps, techniques, and norms of classical ballet. Furthermore, Pierre Beauchamp, an influential figure in the world of classical ballet during that period, had created a coding system for five basic steps still used in our world today, contributing significantly to classical ballet's development. The world-famous Paris Opera House (formerly the French Classical Ballet Theater), established at the end of the 17th century, remains one of the world's most important theaters (Homans, 2013).

According to Cholij and Burden (1993), the 18th century marked a very crucial shift in the history of dance, particularly with ballet as this dance form became increasingly professionalised. Within this context, the dance pedagogy and choreography techniques made big advancements, hence evolving classical ballet into a more distinct art form that comes with its own style and techniques.As Smith (2010) discusses, the cultural and artistic exchange among European dancers further contributed to the development and the prosperity of dance. By the 19th century, the evolution of dance was prominent, becoming a rich and diverse art form, giving rise to seminal works such as "Giselle," "Swan Lake," and "The Sleeping Beauty," which remain ballet classics today (Homans, 2013).

Moving on to the 20th century, the modern dance movement had taken place as dancers sought to break free from the conventional dance tradition to explore more individualised forms of expression. As a result, dance became more diverse and exhibited openness, paving the way to greater innovation (Sööt & Viskus, 2014). That being said, modern dance was particular with the physical expression and emotional resonance of its art form. By the mid-20th century, modern dance had become an

international art form as well as becoming a very important and political medium, reflecting contemporary issues and the spirit of the times (Franko, 2023).

Furthermore, the diversity of modern dance in terms of its content and style which covers social, cultural, emotional, and abstract themes provides children with rich learning materials and expressive forms, offering more choices and developmental opportunities (Berger-Estilita & Greif, 2020). That being said, Samuelsson et al. (2009) highlighted that based on the history of dance evaluation, it is not possible to disregard children's dance education as it is not supposed to be merely a scaled-down version of adult dance. In fact, children's dance education required special designed courses and teaching methods based on children's physical and mental characteristics as well as developmental patterns (Mattsson & Lundvall, 2015).

With properly designed courses and teaching methods numerous researchers emphasized that dance could also improve children's physical agility, flexibility, endurance, posture, and spatial awareness (Verstraete, 2006; Gilbert, 2015; Temple et al., 2020). Furthermore, Germina et al. (2016) found out in their research that this value extends beyond physical benefits, but it also helps develop social and emotional growth, cultural exploration, and the interpretation of inner experiences among the children (Germina et al., 2016). Hence, nowadays, many schools and organizations worldwide have already begun to provide programs that not only cater to young dancers'interests but also focusing more on comprehensive development of these young dancers.

Simultaneously, aside from the course design and teaching methods, another issue that escalates concern is the health of dancers, especially among child dancers. Roberts et al (2013) identified a total of 113,084 dance-related injuries for individuals

aged 3 to 19 during the span of the study. Meanwhile another scholar, Allen et al (2012) recorded 355 injuries in 52 dancers, or a mean of nearly seven injuries per dancer in that single year in which 64% of injuries in females and 68% in males. Hence, considering the impact of injury in dance, there is a need to introduce interventions to reduce injury risk such as physical training of dancers, apart from their technical training in dance, with special attention to the core and to the musculature specific to the demands of their genre(s) (Allen et al., 2012; Russell, 2013).

Although several studies have shown that focus training such as core muscles among the athletes'reduces injury risk and improves performance, a deficiency remains in age-appropriate core muscle training programs tailored specifically for young dancers (Trajković & Bogataj, 2020; Robles-Palazón et al., 2024; Silva et al., 2024). Conventional dance training methodologies often emphasize technique and artistic expression while neglecting systematic cultivation of the core muscles that can enhance these aspects (Rosenthal et al., 2021). Hence, this oversight is particularly significant considering the distinct physical developmental phases of children aged 7 to 12.

While many studies have investigated the importance of including the core training in adult dancers and athletes, little research has addressed its specific applications and efficacy in children's dance education. By acknowledging this gap, the present study examines the specific core muscle training methods and their measurable effects on young dancers'performance. It also validates the training's efficacy from a pedagogical perspective through expert opinions, highlighting practical approaches to skill enhancement in child dancers.

1.2 Background of the Study

In every movement we make in our daily life, our body muscles work in a synchronized manner to carry out specific tasks. When these muscles are being put to work, it enhances the ability of the muscle to be more efficient and stronger over time. While having muscular arms make it easier for one to pull, push or lift things, it is more beneficial when one has strong core muscles. For instance, according to Brill and Couzens (2008), well-developed core muscles could increase both athletic performance and enhance overall body balance by providing essential stability to the spine and trunk, boosting smoother and more efficient movement. Furthermore, strong core muscles could also help prevent excessive strain on the spine and significantly reduce the risk of injury through ensuring appropriate load distribution across the spine, pelvis, and kinetic chain (Huxel Bliven & Anderson, 2013). Thus, the general function of the human body will benefit from having core muscle strength as it ensures long-term musculoskeletal health especially when performing high impact activities in daily life.

In order to develop core muscle strength, Oliver and Adams-Blair (2010) suggested that by engaging in activities that challenge and strengthen core muscles, one will improve both overall strength and enhancing balance which will also help to prevent injuries. Hence, Ni et al. (2014) proposed exercises such as yoga and pilates, both of which could be beneficial as these forms of exercise rely heavily on core strength for balance, control, and continuous muscle activation. These exercises contribute to reinforcing controlled movements and also promote proper alignment which requires continuous engagement of core muscles, thereby enhancing stability and functional strength. Furthermore, it is also proven that these exercises can improve back extensor strength and posture, to counter the expected neuromuscular changes

linked to weaker, less fatigue-resistant, muscles, combined with deficits due to spinal pathology that exacerbate back muscle weakness and postural deformity in people (Brooke-Wavell.et al., 2022),

Similarly, in sports, having a strong core also plays a crucial part as it also depends on core stability for strength and balance during rapid, intense movements in activities such as running and swimming (Hung et al., 2019). By having good stability in core muscles, athletic performance can be enhanced and at the same time preventing injury by minimizing strain on joints and muscles during these high-impact activities. Another example would be activities such as weightlifting, which further highlights the importance of core stability in distributing force evenly throughout the body, enabling athletes to maintain proper posture and reduce stress on the spine (Bi et al., 2023). Thus, the interconnected role of the core across various physical disciplines underscores its centrality in optimizing performance, promoting longevity in physical activity, minimizing the risk of injury, and enhancing recovery.

Dance, on the other hand, is a complex form of movement that is made up of seamless coordination among various body parts (Chang et al., 2020). When executing dance techniques, core muscles contribute significantly (Peng, 2023) as core strength is needed to guarantee precise control over complex movements, hence improving agility, coordination, and power output. In regards to this, the core muscles which are centrally located in the body also enable dancers to perform intricate movements with accuracy and fluidity as they provide essential spinal support and ensure proper pelvic alignment, thereby facilitating precise movement control (Kibler et al., 2006). Therefore, it is evident that strong core stability is important as dancers do rely heavily on it in order to execute complex movement techniques such as jumps, turns or extensions with precision.

In this context, having good core stability which supports the spine and improves posture also contributes towards refining the movement control, enabling dancers to execute complex routines with greater form and accuracy while effectively expressing their technical skills (Watson et al., 2017). This underlines the crucial role of core strength in stabilising dancers'body while enhancing both the aesthetic and technical aspects of dance which are essential for achieving fluidity in performance. As such, in order to achieve a harmonious balance between the technical skills and artistic expression in dance, it is fundamental for the dancers to have a strong core muscle which will enable them to perform at their highest potential.

Having said that, previous research indicates a strong link between dancers'core muscle performance and their risk of lower body injuries, which suggests that strong core muscles do play an important role in keeping these risks at their minimum (Dang et al., 2022). Malkogeorgos et al (2011) highlights that, to minimise or to guarantee the prevention of dance injuries among dancers, training programmes should include muscular training such as muscular strength, power, and endurance; plyometrics; agility; balance; joint stability; and dance-specific technique. For example, Rafferty (2010) had discovered that the implementation of these areas of strengthening the muscular muscle is lacking in the current ballet dance training programs resulting in injuries among the dancers. As a result, the injuries rate among the ballet dancers is relatively high and these injuries most commonly involve the lower extremity, followed by the trunk (16%), head and neck (3%) and upper extremity (3%) (Ekegren et al., 2014).

Similarly to ballet, the majority of dance injuries cases in other dance forms are also closely related to poor dance techniques and musculoskeletal imbalance in flexibility and strength resulting from the minimal level of fitness among the dancers

(Hincapié et al., 2008). However, study also showed that even though improvements in fitness affect the quality in the dance techniques, it also suggests that the impact of fitness training on overall performance, particularly in terms of aesthetic aptitude and technical skills, remains limited (Twitchett et al., 2011). Hence, it is essential to implement the core muscles training programme as a fundamental dance component as it helps in preventing injuries as well as boosting the performance qualities as a whole.

Having said that, despite numerous studies on the effect of core muscle training towards body balance and technical skills among the dancers, with most of it mainly focusing on the professional or adult dancers, creating a gap in understanding its impact towards children specifically those aged 7 to 12 years old (Willardson & Association (U.S.), 2024). Therefore, Kellis et al. (2020) acknowledged this gap and suggested that the core stability training might be beneficial in improving core stability among children dancers. Apart from that, recent studies by Han (2014) and Zhang (2022) also suggest that the implementation of core muscle training can begin as early as the age 7 or 8 provided that the children are mature enough to follow instructions given and be able to execute proper techniques. Therefore, in order to hone their skill development during their growth phase, it is crucial to understand the impact of core muscle training on young dancers as this will lay a solid foundation for future dance performance (Cabrejas et al., 2022).

1.3 Definition

This study delves into several keywords that are pivotal to the research, namely core muscles, body balance and dance technical skills, focusing on their relevance to child dancers aged 7 to 12 years. Within the framework of chapter one, this section

aims to present a concise yet comprehensive explanation of these terms and its significance in this study. By exploring these key terms in-depth, a solid foundation of understanding in regards of the relevance to the study. Furthermore, this exploration of these key components will not only shed light on the contextual framework of the study but also clarify the specific ways on how it had been employed within their respective contexts.

1.3.1 Core Muscles

According to Willardson and Association (U.S.) (2024), the core, when defined anatomically, is a part of the human body muscle that covers the central region of the body that includes the pelvis, spine, shoulders, as well as associated soft tissues such as joints, cartilage, ligaments, tendons, muscles, and fascia. With these interconnected structures working cohesively, it facilitates body mobility as well as providing body stability that ensures physical support that enables the body to perform dynamic and static movements (Behm et al., 2010; Oliva-Lozano & Muyor, 2020). Figure 1.1 illustrates the three primary muscle groups that comprise the core: the abdominal muscles, back and hip muscles, and pelvic muscles, with each of these muscles playing a specific role in maintaining posture, balance, and movement efficiency.

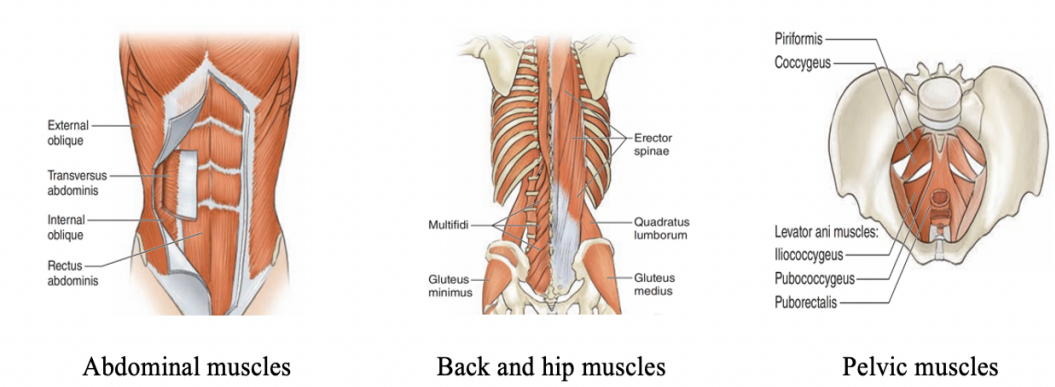

Figure 1.1 Core Muscles Group

Note: Adapted from Haas, J. G. (2010). Dance anatomy. Champaign, IL: Human kinetics.

As shown in Figure 1, the anterior wall of the core is made up of the abdominal muscle that is important in controlling body posture, forward flexion, and rotation. Meanwhile, the key muscles such as the *rectus abdominis*, commonly known as the "six-pack," leans more towards the workings of the forward flexion and stabilization, while the internal and external obliques oversees the rotational movement and lateral flexion of the trunk (Martuscello et al., 2013). Additionally, the deepest abdominal muscle layer or in scientific terms known as *transversus abdomini*s, surrounds the spine to provide stabilization as well as to protect it during movements by increasing the intra-abdominal pressure (McGill, 2002; Hodges, 2003). Together, all these parts of the abdominal muscles form an interconnected system in providing movement efficiency and proper alignment of the spine to enhance body structure stability.

Meanwhile, the group muscle that is portrayed in the image of the back and hip provide crucial posterior support for the core which helps significantly with spinal alignment and lower limb coordination of the body. For instance, the *erector spinae*, a group of muscles located running vertically along the spine, function as structural support and also allows the extension of the spinal cord during movements. While the

quadratus lumborum, an important muscle that is located on the lower back, ensures body stability as it prevents excessive lateral bending (Martuscello et al., 2013). Additionally, the *multifidus,* a muscle that is located beneath other superficial muscles acts as spinal stabilizers that helps the body to carry out well executed vertebral movements and stabilization during dynamic activities.

On the other hand, the *gluteus maximus*, *gluteus medius*, and *gluteus minimus* located at the hip muscles, have two roles: stabilizing the pelvis and supporting lower limb motion. According to Benichou and Lord (2016), these muscles play a vital role in ensuring minimal risks of injuries as they contribute to maintaining balance during complex movements. Furthermore, they point out that activities consisting of movements like running or jumping, require force generation and rely on these muscles for better stability as well as efficiency.

The third image shows the pelvic muscles, a foundation of the lower core that stabilises the trunk and supports the pelvic organs in the body. The pelvic muscles including *levator ani, pubococcygeus, and iliococcygeus* coordinate in function with the *transversus abdominis* and *multifidus* to control intra-abdominal pressure while maintaining pelvic alignment (Hodges, 2003). Thus, these particular groups of muscles function as one to facilitate a more efficient or optimised force transfer between the upper and the lower body.

As demonstrated in Figure 1.1, the core muscle groups—abdominal, back, hip, and pelvic—form a cohesive system that contributes to physical performance. For instance, abdominal muscles play a part in ensuring postural control and stabilization, while back and hip muscles provide structural alignment and force transfer. Simultaneously, pelvic muscles stabilize the lower trunk, creating an integrated

network that gives support to efficient, injury-free movement. Therefore, effective training programs must address all these muscle groups as a whole to improve core stability, reduce injury risk, and optimize functional performance (Carpes et al., 2008; Lehman, 2006).

Based on the illustrated figure 1.1, the core functionality of the body is fully dependent on abdominal strength, promoting freedom of movement and proper body posture (Akuthota & Nadler, 2004; Cook, 2003). Similarly, the back, hip, and pelvic muscles groups enhance body balance and overall stability which gives an impact towards movement efficiency as well as minimizing compensatory adjustments (Waldhelm & Li, 2012). Hence, a well-developed core promotes optimal alignment, effective force transmission and minimising risk of injury, highlighting its integral role in physical performance and daily functional tasks. These interconnected systems highlight the necessity for comprehensive core training programs that target all muscle groups for balanced strength and endurance development.

1.3.2 Body Balance

Body balance, also referred to as postural control, is a primary motor skill that serves to be pivotal in our abilities to carry out tasks in daily life, sports performance as well as reducing the risks of injuries. According to Pollock et al. (2000), it serves to maintain the body's ability to sustain equilibrium during static and dynamic movements. In this context, there are different factors that affect body balance; sensory, motor and cognitive components. Together, this integrated system works towards boosting physical function of the human body and enhancing the quality of life.

Winter (1995) defined balance as the ability to maintain the body's center of gravity (CoG) within the base of support (BoS) which is an important requirement to achieve postural stability. Hence, corrective measures need to be put in place whenever the line of gravity extends beyond the BoS as it automatically causes instability. As stated by Horak (1987) and Nashner (1982), human balance is very much different when compared to inanimate objects because it involves body sensory and motor systems that enables active regulation of the CoG (Horak, 1987; Nashner, 1982). As a result, in order to ensure stability, these systems will work cohesively to coordinate muscular activity in order to balance or oppose gravitational forces and external disturbances (Maki & McIlroy, 1997).

There are three areas that postural control can be classified into; maintaining a static posture, transitioning between postures, and responding to external disturbances such as slips or pushes (Berg et al., 1989). However, these actions rely on two primary strategies: anticipatory (predictive) and reactive (compensatory) mechanisms. According to Horak et al. (1997) predictive strategies involve voluntary muscle activation in anticipation of a disturbance, while reactive strategies respond to unexpected challenges to balance. Nevertheless, both strategies operate through fixed-support mechanisms such as by utilising the ankle and hip strategies, or using the change-in-support mechanisms such as stepping or grasping in order to retain the postural control (Maki & McIlroy, 1997).

There are three sensory systems that are highly important in maintaining the postural control which are visual, vestibular, and proprioceptive. Based on Dietz (2003), visual input plays a vital role in providing spatial orientation, meanwhile vestibular input will inform the brain about head position relative to gravity, and proprioceptive feedback delivers information about body segment positioning. For

instance, by having visual acuity reduced hearing loss, and proprioceptive decline could impact the body's ability to process external stimuli, resulting in delayed or inadequate corrective actions (Haskell et al., 2007). Thus, any impairments of these systems will lead to increased body sway and reduced postural control, requiring greater muscular effort to maintain equilibrium (Schieppati et al., 1996).

Researchers also recognized the vital importance of balance for specialized motor skills, such as dance and sports activities (Krasnow & Wilmerding, 2015). This is due to the fact that these activities not only depend on balance for precise execution of movements but also emphasises studying balance in the training process (Clippinger, 2007). Specifically, during the dance training and performance — whether static poses (e.g., standing, leg extensions) or dynamic movements (e.g., jumps, turns) — balance serves as the foundation for complex techniques and artistic expression. Therefore, it is essential to incorporate balance training into skill development in order to master these activities and ensure achieving optimal performance in executing daily activities is achieved.

1.3.3 Dance Technical Skills

The foundation of dance training and performance are formed from specialised and challenging movements known as dance technical skills. As such, these skills which require high levels of physical fitness, flexibility and precision give the dancers the ability to execute complex and dynamic movements that exceed the requirements of common physical activities (Zhang, 2022). As Tang Mancheng aptly highlights in "Dance Skills Must Go Their Own Way," dance technical skills can consist of highly professional, difficult, and ornamental movements such as jumps, aerial control, rotations, somersaults, and rapid directional changes. These elements not only

demonstrate the dancer's technical proficiency but also significantly enhance the aesthetic quality of a performance.

Furthermore, dance technical skills are also important in enhancing artistic effects and providing space for the emotional aspects of a performance. For instance, technical skills like jumping and turning require dancers'strength and fluidity, at the same time serving as a medium to express emotion and vitality that enriches the performance's visual and spatial impact (Liu, 2022). Moreover, the overall quality of a performance will be elevated as a technically proficient dancer can effectively execute complex movements while being able to manage spatial control, adding structural depth and artistic tension (Liu, 2022). This seamless cohesion of technical skills underlines the importance of understanding the fundamentals of technical skills that comes with artistic intent.

Similarly, in children's dance, technical skills often showcase or reflect natural expressions of joy and energy, highlighting childrens'enthusiasm when it comes to executing these movements. According to Poggini et al. (1997), jumping ability, a movement that is fundamental to childrens'dance, particularly in classical ballet expresses exuberance and serves as a foundation in this dance form. Meanwhile, fast movements or better known in their technical term, as allegro movements, classify jumps into small and large categories based on height and complexity (Poggini et al., 1997).

Likewise, as stated by Laws (1978), various turn techniques in dance which includes posture turns, require a more exquisite control of body posture, speed and balance which ensures proper execution. Therefore, a dancer's physical and artistic capabilities are represented by dance technical skills, giving life and emotion to a

dance performance. It encompasses a wide range of movements, seamlessly elevating quality and complexity of a performance. Thus, it can be said that dance technical skills not only reflect the dancer's level of professionalism but also greatly enhances the expressive power of the art form, making them indispensable to both training and performance.

1.3.4 Child dancers

Child dancers are young individuals, typically aged 7 to 12, who engage in structured dance training that promotes physical development, emotional expression, and social skill enhancement (Little & Hall, 2017; Tao et al., 2022). At this stage, children are introduced to fundamental dance movements alongside progressively challenging technical skills, such as jumping, turning, and extensions, which foster their coordination, flexibility, and musicality. The curriculum for child dancers incorporates elements like music, games, and narratives, designed to stimulate creativity and artistic imagination while keeping the learning process engaging and developmentally appropriate (Rani et al., 2023).

The training of child dancers is programmed according to their physical attributes and developmental needs. Based on research, it is indicated that when child dancers training is being drafted, it must consider their bodily development as well as ensuring all exercises are tailored to their age, contributing to their physical development with the prevention of any form of strain or injury in mind (Lloyd et al., 2016). For instance, stretching and flexibility exercises are essential in improving joint mobility as well as limb flexibility whereas dance sequences focus on fluidity, stability and accuracy when executing movements (Tao et al., 2022). Naturally, as their skills advance, more complex techniques will be taught to the child dancers such as complex

jumps and turns and this would contribute to their expressive ability in dance. Thus, Liu (2022) states that with all these experiences at hand, child dancers would be more confident, team-oriented and achieve a well rounded growth in terms of physical, mental and emotional.

1.4 Problem Statement

According to Ellis & Levy, (2008), a research problem is an important component of any research project as it serves as the foundation of the research framework, identifying the specific issue that needs to be investigated. While the role of core muscle stability is widely recognised in the medical field, sports and dance, its impact on child dancers remains inadequate. McGill (2001) has extensively examined core strength in adults, specifically on rehabilitation and injury prevention. However, there is a lack of research regarding the role of core stability in supporting the development of technical dance skills in children, particularly those aged 7-12. This specific age group represents an important development stage whereby fundamental motor skills are established which are foundational to executing proper dance techniques.

Furthermore, Han (2014) suggests that the abdominal muscles and waist muscles are better developed between the ages of 7 and 12, underlining the importance of core muscle training during this period. Despite this, the current studies on the impact of core stability among young dancers is lacking, focusing on general physical development and athletic performance instead. As such, this research gap limits the understanding of how core strength supports the technical development of young dancers, hindering the development of age appropriate training practices. Thus, it is

crucial to investigate how core muscle training effect body balance, postural stability and movement control among young dancers.

1.5 Research Objectives

This study presents the teaching plan, method, process and outcomes of the 16-training sessions of 12 core training movements being taught to children aged 7-12 years old. The two objectives that have been planned to help this study are as follows:

1. **To identify training exercises that enhance core stability among child dancers.**

The objective of this study is to identify effective training exercises that specifically target the core muscles to enhance core stability in children dancers. Thus, the research will focus on selecting exercises that engage various core muscle groups and progressively build strength and stability. Based on that, a training plan will be developed and implemented in three phases, with data and results being evaluated after each phase. The ultimate goal is to assess the effectiveness of 12 core training movements over the course of 16 sessions to determine their impact on core stability and overall muscle development. This objective will provide a structured approach to understanding the key movements that improve core muscle quality, specifically for young dancers.

2. **To assess the effects of core stability training on body balance and basic technical skills (jumping, turning, and extension) among child dancers.**

The study employed a dual-faceted approach to thoroughly examine the impact of improved core stability on body balance and the execution of technical skills. First,

participants'core stability, balance, and technical aptitude were measured through a comparative analysis of pre- and post-training data. Second, professional dance evaluators provided expert assessments of any changes in the participants'dance techniques observed before and after the intervention. By integrating quantitative measurements with expert evaluations, the study effectively validated the benefits of the core stability training program and its associated pedagogical strategies.

1.6 Research Questions

1. What are the core muscle training exercises that enhance core stability among child dancers?

Selecting suitable core muscle training exercises is essential to ensure the effectiveness of the 16-session training plan in improving participants'body balance. The study takes into account the participants'existing physical fitness levels, ensuring the exercises are neither too challenging nor insufficiently stimulating for their developmental needs. By analyzing the outcomes, the research aims to provide insights into designing effective core training strategies for future dance classes, with the goal of enhancing overall core muscle quality and improving body balance.

2. How does core muscle stability improve balance and technical skills (jumping, turning, and extension) among child dancers?

This research question aims to explore the influence of core stability training on participants'learning outcomes. The study evaluates the implementation of specific teaching plans and assesses participants'mastery of the training movements. To achieve this, it compares pre- and post-training measurement data and involves dance experts to evaluate changes in the participants'technical skills. In conclusion, the

purpose is to comprehend teh influence of core muscle training towards core stability, body balance and the general technical performance in young dancers.

1.7 Research Scope

This study is centered on student dancers ranging from the ages 7 to 12 years old from the Seven Colours Dance School in Beijing, China. This school was chosen as the research site due to the syllabus that is more focused in children's dance education on top of offering its expertise in Chinese folk dances while providing an environment that is professional and appropriate for academic studies. Moreover, Beijing, the location that the school is in not only serves as the capital of the city but is also an educational hub in terms of culture. Therefore, with this location in mind, it is fairly easier to gain access to much more comprehensive dance education resources and a more supportive environment that promotes creativity, creating an ideal setting to carry out the study (Xue et al., 2010).

There were a total of 22 child dancers (male and female), all of whom were research participants who have had experience in dance. The scope of the study was to assess how a structured core muscle training program can affect core stability, body balance and dance technical skills which consists of jumping,turning and extension. The training program was designed to target all regions of the core and consisted of 12 specific core muscle exercises. This programme was conducted over eight weeks, a total of 16 sessions, with each session running for 60 minutes with proper guidelines to ensure effectiveness of the programme based on prior research (Rodríguez-Perea et al., 2023). Hence, by targeting this specific age group and its training guideline, the study aims to offer a better understanding on how young dancers'physical and

technical development can be affected by core muscle training with hopes of also contributing to a comprehensive view on dance education and performance efficiency.

1.8 Significance of the Study

Core muscle training is essential to a dancer's technique and health as it enhances body posture, body balance as well as movement efficiency while ensuring that any risks of injuries can be minimised. Hence, the significance of this study is to expand the knowledge of how core muscle training brings an impact towards young dancers'all of whom are aged between 7 to 12 years old which is the most critical stage for physical and technical development. Although there have been previous researches that have brought about some very positive feedback regarding core muscle training on various athletic abilities, the lack of programmes that is catered to child dancers is still very prominent. Therefore, by taking this gap into account, the study provides significant insights into the functionality of core muscle training and its effects on improving core stability, body balance and necessary dance technical skills among child dancers.

In addition to that, this research also employs a very diverse approach in assessing the results as it consists of the combination of quantitative and qualitative methods to add more depth in the findings. To evaluate the level of effectiveness of the training programme, quantitative tests are employed and it offers measurable evidence. Meanwhile, qualitative tests consist of semi-structured interviews with specific dance experts, providing personal perspectives and views regarding the changes noted in participants during the course of the physical fitness and skill development. Not only does this methodological component enhance the clarity of the

results but it also sets up a practical framework for reference in future researches in dance education.

Furthermore, this study also introduces a distinctive teaching method by incorporating “Gagné’s Nine Events of Instruction” into the training program and this framework aligns well with understanding children’s psychological development stages. With this approach in place, it effectively boosts the children’s motivation to learn and engage as this teaching method begins with capturing the learner's attention. Hence, this study offers new insight in theoretical foundations as it becomes a very beneficial tool for improving training methods.

From an educational point of view, this research also ensures that dance educators are equipped with a very structured methodology that will optimise the training outcomes, promoting optimised coordination, flexibility as well as postural control in young dancers. Ultimately, the study fills this critical research gap and advances any academic inquiry within this area while making certain that the contribution towards children’s dance education is more impactful. Thus, with both theoretical insights and practical applications being employed, it sets as a cornerstone for future innovations in dance pedagogy and training methods.

1.9 Limitations of the Study

Although this study provides valuable insights into the impact of the core muscles training towards child dancers’balance and technical skills, there are several limitations that must be critically addressed. By highlighting these limitations, future research could underscore the possibilities for improvement and situate the findings within methodological limits.

The first limitation lies in the study's geographic scope, which was restricted to only one particular dance school located in Beijing, China. While the location of the research site provides a specialized curriculum that is relevant to the study, its research is limited to a particular setting which affects the external validity as the specific dance education practice and cultural training methodology differs across regions, leading to different outcomes (McCarthy-Brown, 2017). For instance, in other regions the syllabus taught may comprise of different techniques which will then cause change in their feedback towards core muscle training, hence the findings of this study may not be applied universally.

The second limitation of the study is the reliance on a single-group design without a control group, which restricts the ability to establish causality making it difficult to determine whether the observed improvements in core stability, body balance, and dance technical skills are solely attributable to the intervention. According to Marsden and Torgerson (2012), the absence of a control group could affect the results in determining whether or not the observed improvements were solely attributable to the intervention even though the single-group approach allowed for an in-depth analysis of training effects. For instance, natural external factors such as individual developmental growth and personal circumstances could be part of contributing towards the outcomes. Thus, having a control group in future research would enable stronger causal inferences and a clearer comparison of training efficacy.

Another limitation would be the small sample size of 22 participants, which makes it challenging to measure how the study can be applied to a larger population and statistical power of the findings. While the sample size provided was sufficient for this study, a larger sample size would have made it possible to explore further in terms of group variations such as variations that are based on gender which might have given

more insight towards the differences in physical development or individual responsiveness to training, all of which would have contributed to a deeper understanding of its impact (Delice, 2010). Therefore, by having a larger sample size that is diverse, it would have made sure that the findings were better generalized across different contexts.

The age range of participants, 7 to 12 years, also sets another limitation involving a period characterized as at this stage of age rapid and uneven physical development happened differently between childrens. Furthermore, as Faigenbaum et al. (2009) underscore that this age group encompasses significant variability in fitness levels, motor skills, and dance foundations, which could influence training outcomes. Compared to older participants the results may have shown consistency in improvements due to advanced coordination and strength compared to younger children. Such variability necessitates age-specific analyses to better understand how developmental differences affect training effectiveness.

Lastly, the study did not examine the long-term retention of improvements in balance and technical skills following the eight-week program. While immediate benefits were observed, understanding whether these gains are sustained over time is critical for developing effective, long-lasting training protocols as without this knowledge, the study's findings are restricted to only short-term outcomes, leaving the long-term implications unexplored. In summation, these limitations underscore the need for future studies to address geographic diversity, incorporate control groups, expand sample sizes, and investigate long-term outcomes. Nevertheless, despite all these constraints, this study offers a significant contribution in building a strong foundation for exploring core muscle training's benefits specifically for child dancers,