Validation of Expert

Dear Experts:

Thank you kindly for giving your time in your busy schedule to support my research, my name is Ai Mengqi, I am a PhD student at Universiti Putra Malaysia, major in Physical Education, my research is under the supervision of Prof. Soh Kim Geok, my dissertation is titled “Effect of plyometric training on lower limbs explosive strength and skill performance among university student Latin dancer in China”. I'm working on my protocol right now , with your comments and feedback being very important to me. You are a scholar with rich theoretical knowledge and practical experience, I cordially invite you to make suggestions for my protocol, and I will refine and improve my protocol according to your suggestions, which can make my experiments more reliable and can help me to continue the next step of my research. What you fill in will be used as research material only and I will keep it absolutely confidential and will not divulge it to anyone else. So please feel free to fill in the details.

Thank you very much for your help and cooperation ！

Universiti Putra Malaysia

Supervisor committee: Prof. Dr. Soh Kim Geok

Dr. Borhannudin Bin Abdullah

Expert Name: _____ Discipline：_____

Degree: _____ Work Unit：_____

1 Study Overview

1.1 Brief Summary

Physical fitness training improves the physical fitness level of dancers and increases their explosive power(Angioi et al., 2012; de la Cruz-Torres et al., 2019; Dowse et al., 2020; Hutt & Redding, 2014; Karim et al., 2019; Kim et al., 2017; Ko et al., 2020; Kolokythas et al., 2022; Koutedakis et al., 2007; Koutedakis & Sharp, 2004; Liu & Wang, 2024; Marshall & Wyon, 2012). In the past, traditional training methods were generally used to improve the strength of dancers, but there are drawbacks to this training method, which cannot fully develop physical fitness and may lead to athletic injuries or limitations in improving skills(Moro et al., 2020). Plyometric training is a high-intensity training method that has been shown to have significant benefits in terms of increasing explosive power (Huang et al., 2023; Ramírez-Campillo et al., 2014; Ramírez-Campillo et al., 2013). However, there is little research on the effects of plyometric training on explosive power and skill in dance programs. Exercise improves physical fitness, plyometric training improves explosive power, and plyometric training should also improve explosive power and specialized performance in Latin dancers. Therefore, the research on improving the explosive power of Latin dancers' lower limbs through plyometric training is of great theoretical and practical significance, which can find suitable means of explosive power training for Latin dance programs, provide reference for coaches in training, and increase the theoretical research on the effect of plyometric training on explosive power.

1.2 Detailed Description

The Intervention Protocol of this research used part of the research protocol of Chinese scholar Du Min (Du, 2020). This research utilized augmentative training as an intervention, with the dependent variables being the subject's lower limb explosive power and Latin dance skill performance. Through extensive literature review, countermovement jumps, standing long jump, and 20m-sprint were identified as measures of lower limb explosive power(Chen et al., 2023). The experimental and control groups will be tested on the same Cha Cha Dance Gold Medal solo routine and recorded with a video camera. Score athletic performance according to ‘the Latin Dance Technical Quality Elements of the World DanceSport Federation（WDSF） 2.1 Evaluation System’. Lower limb explosive power is closely related to the skill performance of cha-cha dance, and the review of the relevant literature was

determined to be posture, balance, footwork, preparation-movement-reduction, spinning and rotation, dynamic performance, and line extension as the test indicators of elementary skill (pei, 2023). In order to make the experiment more rigorous and scientific , to reduce the interference of uncontrollable factors , this research is Cluster Randomized Controlled Trial (CRCT) design , the students come from different areas . This experiment lasted for 8 weeks, 1.5 hours each time (Du, 2020), including one hour of physical fitness training and half an hour of specialized technical training. The sample was a population of university students who had been studying Latin dance for one year as well as more than one year, from Guangxi Normal University (Guilin) and Guilin University of Electronic Technology (Beihai), a total of 48 people. Dancers were randomly assigned to two different training locations and divided into experimental and control groups. Both groups will be trained in the Cha Cha Dance Single Gold Medal Moves. The experimental group will undergo plyometric training and the control group will undergo general training. This study measured the dependent variable three times throughout the intervention: baseline before the experimental intervention, post-test 1 after 4 weeks, and post-test 2 after 8 weeks. Finally, statistical analysis was conducted on the three test results.

2 Protocol Design

The experiment will last a total of 8 weeks in order to familiarize the experimenter with the plyometric training protocol and to make the whole process more fluid. It is necessary to ensure correct technique during the jumping exercises to minimize the occurrence of injuries. This research will monitor heart rate to ensure that the training load is the same for the experimental group (plyometric training) and the control group (general training). Both groups will have the same heart rate for each session of training load from the preparation phase - training phase - stretching and relaxation phase during the intervention. The experimental and control groups will undergo 3 interventions a week, with one session lasting 90 minutes. The experimental group will perform 15 minutes of dynamic stretching, 30 minutes of Latin dance-specific technique training, 30 minutes of plyometric training, and 15 minutes of relaxation stretching. The control group will perform 15 minutes of dynamic stretching, 30 minutes of Latin dance-specific technique training, 30 minutes of general training, and 15 minutes of relaxation stretching.

Table 1 Training Intervention Information

Week	Frequency	Types	Duration (min)	Warm -up /min	Physical training /min	Specialized Training	Cool-down /min	Intensity	Suggestions
1-3	3times/week	Plyometric Training	90min	15min	30min	30min	15	(40%-50%) HRmax	
		General Training						(60%-70%) HRmax	
4-5	3times/week	Plyometric Training	90min	15min	30min	30min	15	(60%-70%) HRmax	
		Standard Training						(60%-70%) HRmax	
6-8	3times/week	Plyometric Training	90min	15min	30min	30min	15	(80%-90%) HRmax	
		Standard Training						(70%-85%) HRmax	

Table 2 Plyometric Training Protocol for Experimental Group

Week	Movements	Sets/reps	Rest (sets/reps)	Intensity	Warm up	Cool down
1-3	Standing Vertical Jump	10sets / 3reps	60-120s	(40%-50%) HRmax	Move the wrist, shoulder, hip, knee, and ankle.	Muscle stretching— arm cross stretch, low lunge stretch, half split, ankle to knee
	Consecutive leapfrog	8sets / 2reps				
	Squat jump	6sets / 3reps				
	Rocket jump	6sets / 3reps				
	High knee	10sets / 3reps				
	Jumping jacks followed by lateral quick run	10sets / 2reps				
4-5	Jump on the jump box	10sets / 3reps	60-120s	(60%-70%) HRmax	Move the wrist, shoulder, hip, knee, and ankle.	Muscle stretching— arm cross stretch, low lunge stretch, half split, ankle to knee
	Frontal consecutive jumping obstacle	8sets / 3reps				
	Rocket jump	10sets / 3reps				
	Star jump	6sets / 3reps				
	Squat jump	10sets / 3reps				
	Consecutive leapfrog	6sets / 3reps				
6-8	Tuck jump	10sets / 3reps	60-120s	(80%-90%) HRmax	Move the wrist, shoulder, hip, knee, and ankle.	Muscle stretching— arm cross stretch, low lunge stretch, half split, ankle to knee
	Weighted leapfrog followed by vertical jump	10sets / 3reps				
	Jump on the jump box	10sets / 3reps				
	Depth jump followed by jump on the jump box	8sets / 3reps				
	Depth jump over obstacle	10sets / 3reps				
	Side lunge	10sets / 3reps				

Table 3 General Training Protocol for Control Group

Week	Movements	Sets/reps	Rest (sets/reps)	Intensity	Warm up	Cool down
1-3	Jumping Jacks	15sets / 3reps	60-120s	(60%-70%) HRmax	Move the wrist, shoulder, hip, knee, and ankle.	Muscle stretching— arm cross stretch, low lunge stretch, half split, ankle to knee
	Split-legged left-right jump	10sets / 3reps				
	50%1RM squat	10sets / 3reps				
	Single-leg squat	10sets / 3reps				
	Supine leg raise	10sets / 3reps				
	Horizontal skip	10sets / 3reps				
4-5	20%1RM Calf raises	10sets / 3reps	60-120s	(60%-70%) HRmax	Move the wrist, shoulder, hip, knee, and ankle.	Muscle stretching— arm cross stretch, low lunge stretch, half split, ankle to knee
	60%1RM Squat	10sets / 3reps				
	50%1RM Deadlift	10sets / 3reps				
	Split-legged left-right jump	10sets / 3reps				
	Horizontal skip	10sets / 3reps				
	Lunge squat	10sets / 3reps				
6-8	30%1RM Calf raises	10sets / 3reps	60-120s	(70%-85%) HRmax	Move the wrist, shoulder, hip, knee, and ankle.	Muscle stretching— arm cross stretch, low lunge stretch, half split, ankle to knee
	60%1RM squat	10sets / 3reps				
	50%1RM Deadlift	10sets / 3reps				
	Lunge squat	10sets / 3reps				
	Standing leg lift	15sets / 3reps				
	Prone sprint	30sets / 3reps				

3 Questionnaire information

The questionnaire adopts a 4-point ordinal scale to evaluate intervention, with 1- 4 representing increasing support (1=not relevant, 2=somewhat relevant, 3=quite relevant, 4=highly relevant). Please score the plyometric training intervention. If there are other content, you can add them and indicate the name. After reading the questionnaire, please rate the following aspects and tick "√"on the corresponding rating scale.

Table 4 Expert Evaluation Form

Type	Relevance				Clarity				Improvement suggestions
	4	3	2	1	4	3	2	1	
Overall evaluation of the program									
Duration									
Frequency									
Intensity									
Time									
Content of warm- up									
Content of physical training									
Content of cool down									
Sets and reps									
Rest time									

4 Outcome Measures

4.1 Lower limb explosive power:

Countermovement jumps: experimenters test using either arm swing or crossed hips (without any arm swing) while performing vertical longitudinal jumps on a smart jumping mat. The experimenter in this research uses a cross-legged waist when performing both the pre-test and post-test. The Smart Jump Pad in this research has been performed to measure the performance of the CMJ by providing signals from the platform in an iPad 7,5 IOS 12.1.1). When the test equipment is ready, under the direction of the test administrator, the experimenter stands on the Smart Jump Mat and performs a vertical longitudinal jump. The experimenter jumps to the best of their ability and each jump was automatically recorded on the iPad. Each participant jumped three times, and the best jump results are selected for data analysis in this research.(Meszler et al., 2019)

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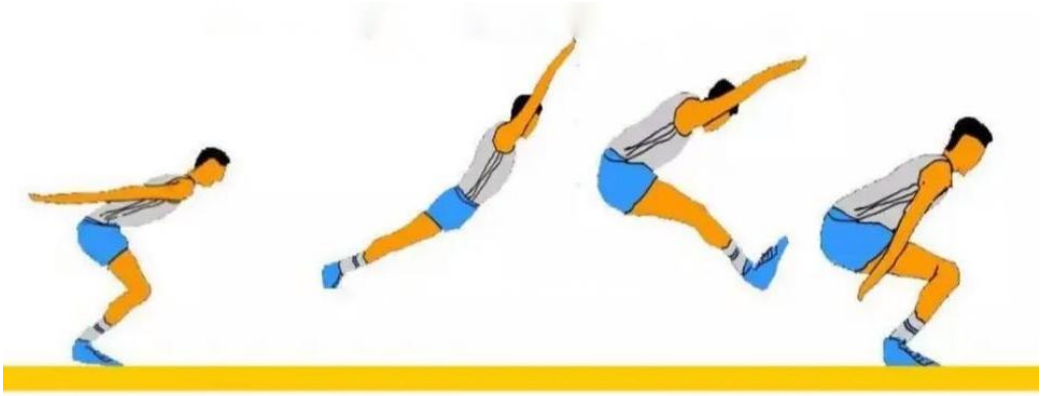
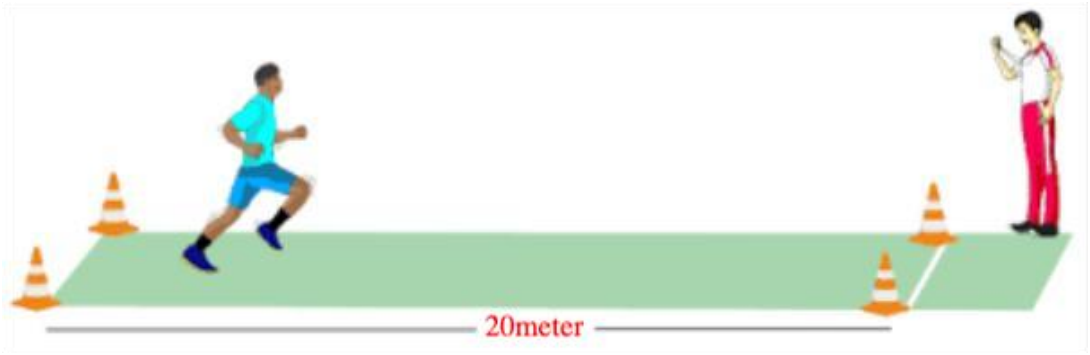
Stangding long jumps： Measure the distance of the standing long jump with a measuring tape.

Participants stand slightly apart in front of the jump line, bend their knees, and move their arms backwards, then swing their arms and jump as far as possible; Stand on both feet while maintaining an upright position; Conduct two tests. Record the best score from two tests with an accuracy of 1 centimeter (Ambroży et al., 2022).



20m-sprint : Use a stopwatch to record the duration of the participants' 30 m sprint.

Set cones at 0 and 20 meters along a straight line. Participants place their toes on the starting line or behind the starting line, start from a stationary position, and sprint at maximum speed over the cone at a distance of 20 meters before safely slowing down (Fischetti et al., 2018).



4.2 Latin Dance Performance

Using a video camera, a recorded video of the Cha Cha Gold Medal solo routine is send to the 6 judges, and the pre- and post-tests need to be rated using the same criteria ‘the Latin Dance Technical Quality Elements of WDSF2.1 Evaluation System’ Objectively assess posture, balance, footwork, preparation-movement-reduction, spinning and rotation, dynamic performance, and line extension (pei, 2023).

Table 5 Scoring Standards for the Qualities of Cha-cha-cha Dancing Skills

Indictors	Very excellent. (10 points)	excellent (8 points)	Above average (6 points)
Posture	Requires the ability to adopt and maintain correct posture during dynamic movement and, with minimal effort, to consciously demonstrate spatial transition postures.	It can drive the entire body to be integrated into the pose, so that the gesture blends with the posture.	The body, in static or dynamic motion, has a well-balanced body structure that includes the head, shoulders, chest, hips, legs, and feet.
Balance	Static: the line of gravity can be reconstructed after dynamic balance movement; Dynamic: can be used naturally and smoothly to generate three-dimensional movement effects, to realize the balance and effect of dance.	Static: can keep its own gravity in the extension line; Dynamic: the use of correct force to achieve dance balance, producing three-dimensional effects	Static: maintains the line of gravity from head to toe; Dynamic: maintaining balance while moving.
Footwork	Control of the spine through the flow of the steps and the transition between centers of gravity to complete the footwork.	Ability to properly utilize foot technique, connecting the necessary foot pressures and hip and body movements.	Ability to properly utilize foot technique.
Preparation-movement-reduction	The ability to perform the full range of motion with a natural and smooth transition from one movement to the next.	It is possible to make the transition from one movement to another during the performance of a complete movement.	Most of the articulated pre-reduction from movement to movement can be accomplished when performing full movements.
Spinning and rotation	Maximize the use of centripetal and centrifugal forces in rotating and turning motions.	It is possible to combine the sagittal plane with the coronal plane when accomplishing rotational and turning. movements.	Ability to combine the sagittal and coronal planes most of the time when completing rotational and turning maneuvers
Dynamic performance	Precise use and maximization of power generation in dance movements.	Precise use of power in dance movements	Precise application of power in most dance movements
Line extension	Maintains the lines and extensions of all body parts in both static and dynamic situations.	Maintains most body lines and extensions in both static and dynamic situations.	Maintains a portion of the body line and extends the line in both static and dynamic situations.

Table 6 Outcome Measurement Information

Test Name	Outcome Measure	Measure Method	Instrument	Unit	Suggestions
Explosive power	Countermovement jumps	Recorded maximum altitude	Smart jump mats, iPad	Centimeters (cm)	
	Stangding long jumps	Measure the distance of the standing long jump with a measuring tape.	Measuring tape	Centimeters (cm)	
	20m-sprint	Use a stopwatch to record the duration of the participants' 20 m sprint.	Stopwatch	Seconds	
Posture	6 Experts	Recording cha-cha-cha solo gold medal moves, expert scoring	M120 high-speed camera	scores	
Balance	6 Experts	Recording cha-cha-cha solo gold medal moves, expert scoring	M120 high-speed camera	scores	
Footwork	6 Experts	Recording cha-cha-cha solo gold medal moves, expert scoring	M120 high-speed camera	scores	
Preparation-movement -reduction	6 Experts	Recording cha-cha-cha solo gold medal moves, expert scoring	M120 high-speed camera	scores	
Spinning and rotation	6 Experts	Recording cha-cha-cha solo gold medal moves, expert scoring	M120 high-speed camera	scores	
Dynamic performance	6 Experts	Recording cha-cha-cha solo gold medal moves, expert scoring	M120 high-speed camera	scores	
Line extension	6 Experts	Recording cha-cha-cha solo gold medal moves, expert scoring	M120 high-speed camera	scores	

5 Questionnaire information

This questionnaire adopts a 5-point Likert scale, with 1-5 representing increasing support (1=strongly disagree; 2=disagree; 3=not necessarily; 4=agree; 5=strongly agree). Please score the intervention program. If there is other content, you can add them and indicate the name. After reading the questionnaire, please rate the following aspects and tick "√" on the corresponding rating scale.

Table 7 Expert Evaluation Form for Outcome Measurement

Type	Measurement Method	Relevance				Clarity				Improvement suggestions
		4	3	2	1	4	3	2	1	
Explosive power	Countermovement jumps									
	Stangding long jumps									
	20m-sprint									
Latin dance performance	Posture									
	Balance									
	Footwork									
	Preparation-movement-reduction									
	Spinning and rotation									
	Dynamic performance									
	Line extension									

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