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Comparing three ways of organising rest during weighted jump squats in resistance-trained men

Submission date 29/06/2026	**Recruitment status** No longer recruiting	[_] Prospectively registered [_] Protocol [_] Statistical analysis plan [X] Results [_] Individual participant data
Registration date 06/07/2026	**Overall study status** Completed	
Last Edited 16/11/2026	**Condition category** Other	

Plain English summary of protocol

Background and study aims

Weighted jump squats are commonly used by athletes and coaches to improve jumping and explosive performance. However, completing many repetitions without enough rest may cause temporary fatigue and reduce the expected performance benefits. This study aimed to compare three different ways of organising repetitions and rest periods during weighted jump squats in resistance-trained men.

Who can participate?

Healthy resistance-trained men aged 18-24 years who had at least 2 years of resistance-training experience, regularly trained their lower body, and could perform a back squat with a load of at least 1.5 times their body mass.

What does the study involve?

Participants first attended a familiarisation session. They then completed three experimental sessions in a randomly assigned order, with 72 hours between sessions.

During each session, participants performed 30 weighted jump squats using a load equal to 30% of their back-squat one-repetition maximum. The repetitions and rest periods were organised in one of three ways:

1. Three sets of 10 repetitions with 120 seconds of rest between sets.
2. Six sets of five repetitions with 48 seconds of rest between sets.
3. Three sets of five repetitions, followed by 40 seconds of rest and another five repetitions, with 60 seconds of rest between sets.

Jump performance, blood lactate concentration, and perceived exertion were assessed before and/or during the 12 minutes after each exercise session.

What are the possible benefits and risks of participating?

Participants were not guaranteed to receive a direct personal benefit. The findings may help coaches and athletes organise rest periods during weighted jump-squat exercise more effectively.

Possible risks included temporary muscle fatigue, muscle soreness, discomfort from the earlobe blood sample, and a small risk of muscle or joint strain during exercise. All exercise and testing procedures were supervised by trained researchers.

Where is the study run from?
Fuzhou University (China)

When did the study start and how long did it run for?
January 2026 to March 2026

Who is funding the study?
Investigator initiated and funded

Who is the main contact?
Dr Jiehong Wu, sky946@fzu.edu.cn

Contact information

Type(s)
Public, Scientific, Principal investigator

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Study information

Scientific Title
Effects of weighted jump-squat set configuration on acute explosive performance and fatigue responses in resistance-trained men: a randomized crossover study

Study objectives
The primary objective was to compare the acute effects of traditional-set, cluster-set, and rest-redistribution weighted jump-squat configurations on vertical jump height in resistance-trained men. The secondary objectives were to compare the magnitude and time course of relative peak power output, reactive strength index-modified, blood lactate concentration, and rating of perceived exertion during the 12-minute postexercise recovery period.

It was hypothesized that the cluster-set and rest-redistribution configurations would produce smaller immediate reductions and greater subsequent improvements in countermovement-jump performance than the traditional-set configuration, and that the cluster-set configuration would produce the lowest blood lactate concentration and perceived exertion.

Ethics approval required
Ethics approval required

Ethics approval(s)
Approved 05/01/2026, Fuzhou University Review Board for Human Participants (Fuzhou University, No. 2 Wulongjiang North Avenue, Fuzhou, 350108, China; +86 (0)13763898963; 7005477@qq.com), ref: 2026001

Primary study design
Interventional

Allocation
Randomized controlled trial

Masking
Open (masking not used)

Control
Active

Assignment
Crossover

Purpose
Exercise performance enhancement and investigation of acute physiological and perceptual responses to different weighted jump-squat set configurations

Study type(s)

Health condition(s) or problem(s) studied
Acute explosive performance and fatigue-related responses to weighted jump-squat exercise in healthy resistance-trained men

Interventions
This was a randomized, counterbalanced, three-condition crossover study. Participants first completed one familiarization session and subsequently completed three experimental trials separated by 72 hours. All trials were conducted at approximately the same time of day (±1 hour). The order of the three experimental conditions was determined using a computer-generated counterbalanced sequence. The sequence was generated by a researcher who was not involved in data collection, and the allocated condition was concealed from participants until the beginning of each experimental visit.

At each experimental visit, baseline blood lactate concentration was measured before participants completed a standardized 10-minute warm-up consisting of 5 minutes of cycling followed by 5 minutes of dynamic and plyometric exercises. After 5 minutes of seated rest, baseline countermovement-jump testing was performed.

Participants then completed one of three weighted jump-squat protocols on a Smith machine, with the bar positioned across the upper back. The external load was equivalent to 30% of the participant’s back-squat one-repetition maximum.

1. Traditional-set condition: 3 sets of 10 repetitions, with 120 seconds of inter-set rest.
2. Cluster-set condition: 6 sets of 5 repetitions, with 48 seconds of inter-set rest.

3. Rest-redistribution condition: 3 sets of 5 + 5 repetitions, with 40 seconds of intra-set rest and 60 seconds of inter-set rest.

All conditions included 30 repetitions at 30% of back-squat one-repetition maximum and 240 seconds of total programmed rest.

Blood lactate concentration and rating of perceived exertion were assessed immediately after exercise and at 4, 8, and 12 minutes after each protocol. At each assessment time point, blood lactate concentration and rating of perceived exertion were obtained before countermovement-jump testing. Participants then performed three countermovement jumps separated by 30 seconds, and the mean of the three trials was used for analysis.

Intervention Type
Behavioural

Primary outcome(s)
1. Vertical jump height measured using flight time during countermovement jumps performed on a Kistler 9286BA force platform sampling at 1000 Hz, at baseline, immediately after each weighted jump-squat protocol (0 minutes), and 4, 8, and 12 minutes post-exercise

Key secondary outcome(s)
1. Relative peak power output measured using the Kistler 9286BA force platform during countermovement jumps and normalized to body mass, at baseline, immediately after each weighted jump-squat protocol (0 minutes), and 4, 8, and 12 minutes post-exercise

2. Reactive strength index-modified measured using vertical jump height divided by time to take-off during countermovement jumps at baseline, immediately after each weighted jump-squat protocol (0 minutes), and 4, 8, and 12 minutes post-exercise

3. Capillary blood lactate concentration, expressed in $mmol \cdot L^{1}$, measured using a 0.7-µL earlobe blood sample using a Lactate Plus analyzer at baseline, immediately after each weighted jump-squat protocol (0 minutes), and 4, 8, and 12 minutes post-exercise

4. Rating of perceived exertion measured using the Borg category-ratio 10 scale at immediately after each weighted jump-squat protocol (0 minutes), and 4, 8, and 12 minutes post-exercise

Updated 14/07/2026, previous version:
4. Rating of perceived exertion measured using the Borg category-ratio 10 scale at baseline, immediately after each weighted jump-squat protocol (0 minutes), and 4, 8, and 12 minutes post-exercise

Completion date
04/03/2026

Eligibility

Key inclusion criteria
1. Healthy male participants within the specified age range
2. At least 2 years of resistance-training experience
3. Participation in resistance training at least twice per week
4. Regular lower-limb resistance training during the previous 6 months

5. A back-squat one-repetition maximum of at least 1.5 times body mass
6. Willingness to provide written informed consent and complete the study procedures

Healthy volunteers allowed
Yes

Age group
Adult

Lower age limit
18 Years

Upper age limit
25 Years

Sex
Male

Total final enrolment
24

Key exclusion criteria
1. Lower-limb injury or pain during the previous 6 months
2. Neurological, cardiovascular, or metabolic disorders
3. Recent interruption of regular resistance training
4. Current use of supplements or medications that could affect exercise performance or fatigue-related responses

Date of first enrolment
15/01/2026

Date of final enrolment
16/01/2026

Locations

Countries of recruitment
China

Study participating centre
Fuzhou University
Department of Physical Education, Fuzhou University, No. 2 Xueyuan Road, University Town, Fujian Province
Fuzhou
China

Sponsor information

Organisation
Fuzhou University

ROR
https://ror.org/011xvna82

Funder(s)

Funder type

Funder Name
Investigator initiated and funded

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		18/08/2026	16/11/2026	Yes	No