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SELECTION AND APPLICATION OF SEVERAL SPEED-STRENGTH EXERCISES TO ENHANCE HANG-STYLE LONG JUMP PERFORMANCE IN FEMALE TRACK AND FIELD ATHLETES AT LE HONG PHONG HIGH SCHOOL, BIM SON, THANH HOA PROVINCE

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ABSTRACT

Using commonly applied scientific research methods in sports science, the study selected seven exercises aimed at developing speed-strength to improve the performance of the hang-style long jump among female athletes of the track and field team at Le Hong Phong High School, Bim Son, Thanh Hoa Province. The initial application of these exercises produced positive effects in the experimental group. The results of the assessment tests indicated that the experimental group achieved better performance than the control group

Keywords: Exercises, Speed-strength, Enhance athletic performance, Hang-style long jump, Female track and field athletes

1.0 INTRODUCTION

Physical education and sports play an important role in improving physical fitness, promoting comprehensive human development, and contributing to the achievement of the country's socio-economic development goals. The Party and the State have consistently paid attention to physical education in schools with the aim of fostering the younger generation's holistic development in terms of physical strength, intellectual capacity, and moral character. Among various sports, athletics is considered a fundamental discipline and occupies an important position in physical education curricula and school sports activities.

The long jump is an athletics event that requires close coordination between technical skills and physical fitness components, particularly speed-strength. Long jump performance largely depends on the effectiveness of the approach run, take-off, and the ability to generate force through the lower limb muscle groups. Therefore, the selection and application of speed-strength development exercises are of significant importance in improving long jump performance.

At Le Hong Phong High School, Bim Son Town, Thanh Hoa Province, sports activities have developed strongly and achieved considerable success in student sports competitions. However, the performance of female athletes in the long jump event of the school's track and field team remains limited and has not yet achieved high competitive results. This situation highlights the need to investigate appropriate training measures to improve both training effectiveness and athletic performance.

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Based on the above theoretical and practical considerations, the study entitled "Selection and Application of Several Speed-Strength Development Exercises to Improve Hang-Style Long Jump Performance among Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son, Thanh Hoa Province" is considered necessary. The study is expected to contribute to improving the quality of training and competitive performance of the school's track and field team.

2.0 RESEARCH METHODOLOGY

2.1 Research Participants

- Survey participants: 20 experts, lecturers, and athletics coaches from universities and sports training institutions in Northern Vietnam.
- Inclusion criteria: Experts, lecturers, and athletics coaches from Hanoi University of Physical Education and Sports, Hanoi Sports Training Center, Military Sports Training Center, and Hong Duc University (Thanh Hoa Province).
- Exclusion criteria: Experts, lecturers, and coaches who did not agree to participate in the survey.

2.2 Research Methods

- Study design: Cross-sectional descriptive study.
- Study period: From October 2024 to May 2025.
- Sampling method: Convenience sampling.
- Research content: A questionnaire was developed to select speed-strength development exercises aimed at improving hang-style long jump performance among members of the high school track and field team. The questionnaire included the following contents:
  - Participants' information: year of birth, gender, workplace, position, and educational qualification.
  - Investigation of the current use of speed-strength training exercises: number of exercises used and frequency of use.
- Data collection method: Data were collected by the researcher using a survey questionnaire administered through Google Forms, combining both online and face-to-face data collection methods. Respondents were asked to answer questions covering the following main areas: general information about the respondents and evaluation of the selected exercises using a five-point Likert scale (Strongly Agree, Agree, Neutral, Disagree, and Strongly Disagree).
- Data analysis: Data were presented as percentages, mean scores, and frequencies. The collected data were processed and analyzed using EpiData and SPSS version 22.0.

3.0 RESEARCH RESULTS

3.1 Selection of Speed-Strength Development Exercises to Improve Hang-Style Long Jump Performance among Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son, Thanh Hoa Province

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Through an analysis of relevant literature and an investigation into the current use of speed-strength development exercises for members of the school track and field team, a total of 16 exercises were identified as being used to develop speed-strength for long jump athletes.

To select the exercises most appropriate for the research participants, a survey was conducted involving experts, lecturers, and athletics coaches using structured questionnaires. A total of 20 questionnaires were distributed and all 20 were returned.

The survey employed a three-point rating scale: Strongly Agree (3 points), Agree (2 points), and Disagree (1 point). The results of the survey are presented in Table 3.2.

Table 1. Results of the Expert Survey on the Selection of Speed-Strength Development Exercises to Improve Hang-Style Long Jump Performance among Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son, Thanh Hoa Province (n = 20)

No	Test	Survey Results							
		Strongly Agree		Agree		Disagree		Total Score	%
		n	đ	n	đ	n	đ		
1	**40-m sprint at maximum speed, 2 repetitions × 3 sets, with 5 minutes of rest between sets.**	**12**	**36**	**6**	**12**	**2**	**2**	**50**	**83,33**
2	**Standing long jump, 5 repetitions × 3 sets, with 3 minutes of rest between sets.**	**12**	**36**	**4**	**8**	**4**	**4**	**62**	**80**
3	**Tuck jumps on sand, 10 repetitions × 3 sets, with 3 minutes of rest between sets.**	**15**	**45**	**2**	**4**	**3**	**3**	**52**	**86,66**
4	Single-leg squats, 20 repetitions per leg × 3 sets, with 3 minutes of rest between sets.	7	21	5	10	8	8	39	65
5	Lateral jumps over a 50-cm hurdle, 20 repetitions × 2 sets, with 5 minutes of rest between sets.	9	27	3	6	8	8	41	68,33
6	Single-leg hopping for 30 m, 3 repetitions × 2 sets, with 4 minutes of rest between sets.	7	21	6	12	7	7	40	66,66
7	**Alternating-leg jumps onto a 30-cm platform, 10 repetitions × 3 sets, with 3 minutes of rest between sets.**	**10**	**30**	**9**	**18**	**1**	**1**	**49**	**81,66**
8	**Continuous jumps over 90-cm hurdles, 3 sets, with 3 minutes of rest between sets.**	**9**	**27**	**8**	**16**	**3**	**3**	**46**	**76,67**
9	100-m sprint, 2 repetitions × 2 sets, with 4 minutes of rest between sets.	5	15	6	12	9	9	36	60

10	**Frog jumps for 50 m, 2 repetitions × 2 sets, with 4 minutes of rest between sets.**	**8**	**24**	**7**	**14**	**5**	**5**	**43**	**71,67**
11	30-m sprint from a standing start, 2 repetitions × 3 sets, with 4 minutes of rest between sets.	8	24	4	8	8	8	42	66,67
12	20-m uphill sprint, 3 repetitions × 2 sets, with 3 minutes of rest between sets.	4	12	5	10	11	11	33	55
13	Medium-approach run followed by take-off and flight-step execution into the sandpit, 5 repetitions × 2 sets, with 3 minutes of rest between sets.	6	18	6	12	8	8	38	63,33
14	High-knee running in place on sand, 15 seconds × 3 sets, with 2 minutes of rest between sets.	8	24	4	8	8	8	40	66,67
15	60-m sprint at maximum speed, 2 repetitions × 2 sets, with 3 minutes of rest between sets.	6	18	7	14	7	7	39	65
16	**Standing triple jump (three consecutive bounds from a stationary position), 5 repetitions × 2 sets, with 5 minutes of rest between sets.**	**11**	**33**	**6**	**12**	**3**	**3**	**48**	**80**

As shown in Table 3.2, the study selected seven exercises that were evaluated by experts, lecturers, and athletics coaches as receiving a “Strongly Agree” rating (accounting for more than 70% of the total score). These exercises were subsequently chosen for inclusion in the experimental phase of the study:

1. 40-m sprint at maximum speed, 2 repetitions × 3 sets, with 5 minutes of rest between sets.
2. Standing long jump, 5 repetitions × 3 sets, with 3 minutes of rest between sets.
3. Tuck jumps on sand, 10 repetitions × 3 sets, with 3 minutes of rest between sets.
4. Alternating-leg jumps onto a 30-cm platform, 10 repetitions × 3 sets, with 3 minutes of rest between sets.
5. Continuous jumps over 90-cm hurdles, 3 sets, with 3 minutes of rest between sets.
6. Frog jumps for 50 m, 2 repetitions × 2 sets, with 4 minutes of rest between sets.
7. Standing triple jump (three consecutive bounds from a stationary position), 5 repetitions × 2 sets, with 5 minutes of rest between sets.

3.2. Application and Evaluation of the Effectiveness of Speed-Strength Development Exercises for Improving Hang-Style Long Jump Performance among Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son, Thanh Hoa Province

3.2.1. Pedagogical Experiment

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Experimental participants: 20 female athletes from the track and field team of Le Hong Phong High School, Bim Son, Thanh Hoa Province.

- Group A (Experimental Group): Consisted of 10 students who trained using the exercises selected and proposed by the researchers.
- Group B (Control Group): Consisted of 10 students who trained using the exercises prescribed by the school's physical education teachers.

Experimental period: From February to April 2025.

Experimental location: Le Hong Phong High School, Bim Son, Thanh Hoa Province.

Experimental content: The speed-strength development exercises selected by the study and presented in Section 3.1.

3.2.2. Evaluation of the Effectiveness of the Exercise Program

3.2.2.1. Selection of Speed-Strength Assessment Tests for Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son, Thanh Hoa Province

To identify appropriate tests for assessing speed-strength among female athletes of the track and field team at Le Hong Phong High School, the study reviewed relevant literature and consulted with experts. Based on this process, three assessment tests were selected:

- Test 1: 30-m sprint from a standing start (s).
- Test 2: Standing long jump (cm).
- Test 3: Long jump with full approach run (cm).

To determine the suitability of these tests for the research participants, the study conducted a survey of experts, lecturers, and athletics coaches. A total of 20 questionnaires were distributed and all 20 were returned. The characteristics of the survey participants are presented in Figure 1.

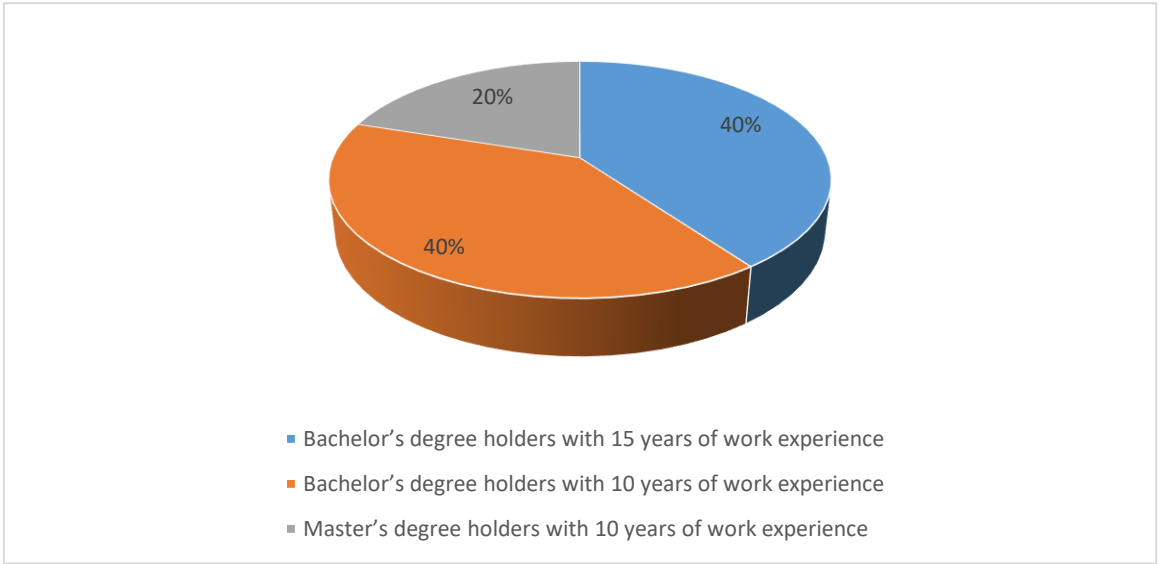

Figure 1. Demographic Characteristics of the Survey Participants

The survey results are presented in Table 2.

Table 2. Results of the Expert Survey on the Selection of Speed-Strength Assessment Tests for Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son, Thanh Hoa Province (n = 20)

No	Test	Survey Results							
		Very Important (3 points)		Important (2 points)		Not Important (1 point)		Total Score	%
		n	Đ	n	Đ	N	Đ		
1	30-m Sprint from a Standing Start (s)	10	30	7	14	3	3	47	78
2	Standing Long Jump (cm)	15	45	3	6	2	2	53	88
3	Long Jump with Full Approach Run (cm)	20	60	0	0	0	0	60	100

The results presented in the table indicate that all three assessment tests were selected by the experts, lecturers, and athletics coaches, with total scores ranging from 47 to 60 points, corresponding to agreement rates of 78% to 100%.

Determination of Validity

To ensure the reliability and validity of the selected assessment tests, the study examined their validity by determining the correlation between the test results and hang-style long jump performance. The results are presented in Table 3.

Table 3. Correlations between the Assessment Tests and Hang-Style Long Jump Performance (n = 20)

No	Tests	r	p
1	30-m Sprint from a Standing Start (s)	0,81	< 0,05
2	Standing Long Jump (cm)	0,83	< 0,05
3	Long Jump with Full Approach Run (cm)	0,85	<0,05

The results presented in the table show that all three tests exhibited a strong correlation between the test scores and the hang-style long jump performance of the female athletes on the track and field team. Therefore, these tests were considered to possess satisfactory validity.

Determination of Reliability

To ensure a more accurate and appropriate selection of assessment tests for the research participants, the study further employed the test–retest method to determine the reliability of the tests by examining the correlation between the results obtained from two testing occasions. The results are presented in Table 4.

Table 4. Reliability of the Speed-Strength Assessment Tests for Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son

TT	Test	Test Results ($\bar{x} \pm \delta$)		r	p
		Trial 1	Trial 2		
1	30-m Sprint from a Standing Start (s)	4.85±0.30	4.82±0.31	**0.83**	<0.05
2	Standing Long Jump (cm)	2.15±0.69	2.17±0.7	**0.85**	<0.05
3	Long Jump with Full Approach Run (cm)	4.52±0.02	4.50±0.08	**0.86**	<0.05

The results presented in Table 4 indicate that all three selected tests demonstrated relatively high correlation coefficients between the two testing occasions, with r values greater than 0.80. This finding confirms that all three tests possess satisfactory reliability.

Based on the results of both the reliability and validity analyses, the study selected these three tests for use in assessing speed-strength among female athletes of the track and field team at Le Hong Phong High School, Bim Son, Thanh Hoa Province.

3.2.2.2. Evaluation of the Effectiveness of Speed-Strength Development Exercises for Improving Hang-Style Long Jump Performance among Female Athletes of the Track and Field Team at Le Hong Phong High School, Bim Son, Thanh Hoa Province

a) Pre-Experimental Test Results

Before implementing and evaluating the effectiveness of the selected speed-strength development exercises for the research participants, the researchers conducted assessments using the selected speed-strength tests for female students in both the experimental and control groups. The results are presented in Table 5.

Table 5. Comparison of Test Results between the Experimental and Control Groups before the Experiment (nA = nB = 10)

Test	30-m Sprint from a Standing Start (s)		Standing Long Jump (cm)		Long Jump with Full Approach Run (cm)	
Group Variables	Control	Experimental	Control	Experimental	Control	Experimental
Means	4,86	4,82	2,16	2,14	4,50	4,55
± SD	0,042	0,046	0,085	0,125	0,135	0,097
t-value (calculated)	2,065		2,065		1,718	
t-value (critical)	2,228					
P	> 0,05					

As shown in Table 5, there were no significant differences between the performances of the experimental and control groups prior to the experiment.

Specifically, the mean long jump performance of the control group was 3.86 m, while that of the experimental group was 3.82 m. The calculated t-value was tcal = 2.065, which was lower than the critical t-value (ttab = 2.228). Therefore, the difference between the two groups was not statistically significant at the probability level of $p > 0.05$.

Similarly, for the standing long jump and 30-m sprint from a standing start, no statistically significant differences were found between the control and experimental groups, as indicated by tcal < ttab, with a significance level of $p > 0.05$.

Based on these results, it can be concluded that prior to the experiment, the two groups were equivalent in terms of their sport-specific physical fitness levels.

b) Post-Experimental Test Results

Following a 7-week intervention period, during which the participants trained twice per week for 45 minutes per session using the selected speed-strength development exercises, a second round of testing was conducted. The collected data were processed and analyzed using statistical methods. The results are presented in Table 6.

Table 6. Comparison of the Post-Test Results of the Experimental and Control Groups (nA = nB = 10)

Tests	30-m Sprint from a Standing Start (s)		Standing Long Jump (cm)		Long Jump with Full Approach Run (cm)	
Group Variables	Control	Experimental	Control	Experimental	Control	Experimental
Means	3,64	3,56	2,21	2,32	4,71	4,90
± SD	0,076	0,041	0,055	0,068	0,058	0,178
t-value (calculated)	2,882		2,882		3,017	
t-value (critical)	2,228					
P	< 0,05					

As shown in Table 6, the improvement in performance of the experimental group was clearly greater than that of the control group.

Specifically, the mean long jump performance of the control group was 4.60 m, whereas the mean performance of the experimental group reached 4.90 m. The calculated t-value (tcal = 3.017) was higher than the critical t-value (ttab = 2.228), indicating a statistically significant difference between the two groups.

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Similarly, the experimental group achieved significantly better results in the standing long jump and 30-m sprint from a standing start test compared with the control group, as evidenced by tcal > ttab, with statistical significance at the $p < 0.05$ level.

These findings demonstrate that the application of the selected speed-strength development exercises produced a significant training effect and contributed to improving long jump performance among the research participants.

4.0 CONCLUSION

The study identified and selected seven speed-strength development exercises aimed at improving hang-style long jump performance among female athletes of the track and field team at Le Hong Phong High School, Bim Son, Thanh Hoa Province. In addition, the study selected three assessment tests for evaluating speed-strength in long jump performance for this group of athletes.

Following the experimental period, the test results indicated that the experimental group outperformed the control group in all three assessment tests. The calculated t-values (tcal) were greater than the critical t-values (ttab) at the significance level of $p < 0.05$, demonstrating statistically significant differences between the two groups.

These findings confirm that the selected exercises were effective in developing speed-strength and contributed to improving hang-style long jump performance among female athletes of the track and field team at Le Hong Phong High School, Bim Son, Thanh Hoa Province.

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