JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 6, No. 1, June 2026
DOI: 10.53863/mor.v6i1.2255
Universitas Ma'arif Nahdlatul Ulama Kebumen

Original Article Research

The Effect of Box Jump and Barrier Hops on Triple Jump Psychomotor Skills in Grade XII Students of SMA Negeri 6 Semarang

Mochamad Bintang Mahadi[1*], Pandu Kresnapati[1], Fajar Ari Widiyatmoko[1]

[1]*Physical Education, Health and Recreation, Faculty of Social Sciences Education and Sports, Universitas PGRI Semarang, Indonesia*

m.bintang.mahadi@gmail.com[*]

Received: 30/04/2026 *Revised: 23/05/2026* *Accepted: 25/05/2026*

Abstract

Psychomotor competence in Triple Jump demands explosive power, rhythmic coordination, and precise technique, yet empirical comparisons of plyometric approaches targeting Triple Jump outcomes in formal physical education (PE) settings remain scarce. This study examined and compared the effects of Box Jump and Barrier Hops on Triple Jump psychomotor outcomes among senior high school students. A quasi-experimental two-group pretest-posttest design was employed, with three progressive overload sessions (135 minutes/session). Seventy Grade XII students of SMA Negeri 6 Semarang (2025/2026) were selected via simple random sampling into the Box Jump group (Class XII J, n = 35) and Barrier Hops group (Class XII L, n = 35), aged 17–18 years. Assessment used a movement technique rubric (12 descriptors across three indicators, scored SP/12 × 100) and a standardized jump distance conversion table adjusted for student sex. Data were analyzed using descriptive statistics, Shapiro-Wilk normality test, Levene homogeneity test, paired samples t-test, and independent samples t-test ($\alpha = .05$). Both groups showed significant within-group improvements: Box Jump from 51.66 to 75.63 ($t(34) = -7.160$, $p = .000$) and Barrier Hops from 53.91 to 76.11 ($t(34) = -10.741$, $p = .000$). A significant between-group difference was found ($t(68) = -7.243$, $p = .000$), favoring Barrier Hops. Both plyometric approaches significantly enhanced Triple Jump psychomotor competence, with Barrier Hops yielding marginally superior outcomes. This study offers empirical evidence for integrating a structured plyometric program into the PE curriculum, guiding educators in selecting modalities aligned with the biomechanical demands of the Triple Jump.

Keywords: *Barrier Hops, Box Jump, Physical Education, Plyometric Training, Psychomotor Competence, Triple Jump*

How to cite:

Mahadi, M. B., Kresnapati, P., & Widiyatmoko, F. A. (2026). The Effect of Box Jump and Barrier Hops on Triple Jump Psychomotor Skills in Grade XII Students of SMA Negeri 6 Semarang. *Jurnal Moderasi Olahraga, 6*(1), 105–118. https://doi.org/10.53863/mor.v6i1.2255

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 6, No. 1, June 2026
DOI: 10.53863/mor.v6i1.2255
Universitas Ma'arif Nahdlatul Ulama Kebumen

1. INTRODUCTION

Education is a broad and multidimensional concept. According to Al Kahar (2021) education is a normative effort that moves human beings from their present condition toward an ideal state. Physical education (PE) occupies a strategic position in formal schooling, not only enhancing students' physical fitness but also shaping character, discipline, and holistic competence (Arifin, 2017; Saitya, 2022). Evidence consistently demonstrates that PE contributes to students' active lifestyles and long-term health outcomes (Widiyatmoko et al., 2020), reinforcing its central role within the national education framework.

A fundamental dimension of physical education is psychomotor development. According to Bloom in (Salsabila et al., 2023), the psychomotor domain encompasses movement behaviors measurable in terms of distance, speed, technique, and manner of execution. Psychomotor competence is directly correlated with cognitive readiness (Avalos et al., 2022; Shingjergji, 2013) and is significantly associated with academic achievement in adolescents aged 13 to 16 years (Vist Hagen et al., 2022), underscoring its importance within formal PE settings.

Triple Jump performed in the hop-step-jump sequence is an athletic event in the PE curriculum that demands explosive power, rhythmic coordination, and precise movement technique. Its mastery encompasses three sequential phases: initial position, movement execution (take-off, flight, and landing), and final position. Physical components such as leg muscle strength are strongly correlated with jump performance (Yusuf et al., 2022), making their systematic development inseparable from comprehensive Triple Jump instruction.

Plyometric training has proven effective in enhancing students' proficiency in the Triple Jump, a complex athletic skill demanding explosive power, rhythmic coordination, and precise sequencing across three phases. Plyometric training improves muscle strength and speed through rapid, explosive movements that develop muscular explosive power (Dimas Amjad Zukruf et al., 2024; Sudarmanto et al., 2019). Two plyometric approaches particularly relevant to Triple Jump are Box Jump, which involves explosive bilateral jumps from the ground onto a stable box or platform of a specific height (Syaleh et al., 2024) and Barrier Hops, which involves a series of rapid, continuous jumps over low hurdles (Haromain et al., 2024). Both approaches activate the quadriceps, hamstrings, gastrocnemius, and core muscles, the key muscle groups essential for Triple Jump performance (Jaleha, 2022).

Empirical evidence consistently supports the effectiveness of both methods. Utama et al. (2019) found that Box Jump and Barrier Hops training improved lower-limb explosive power, while V Sihombing & Rahman Situmeang (2022) demonstrated that both types of exercises increased leg muscle power in beginner volleyball athletes. Syaleh et al. (2024) found that Box Jump and Barrier Hops training both improved lower limb explosive power, and Haromain et al. (2024) confirmed that Barrier Hops significantly improved strength, power, and speed, including in Triple Jump activities. Furthermore, jump training patterns that share biomechanical characteristics with Triple Jump phases have been shown to effectively improve Triple Jump performance (Kresnapati, 2018).

Despite this body of evidence, a clear research gap remains: no study has directly compared Box Jumps and Barrier Hops, specifically targeting Triple Jump psychomotor outcomes, in formal PE settings at the senior secondary level, particularly using instruments that comprehensively assess both movement technique and jump distance. Effective implementation

of such approaches further requires teachers' readiness to design lesson modules aligned with the applicable curriculum (Creswell, 2023 Saputra, 2020). This study was therefore designed to address that gap and provide empirical evidence toward the development of plyometric-based PE teaching strategies in senior high schools.

2. METHOD

2.1 Participants

The study population comprised all Grade XII students of SMA Negeri 6 Semarang for the 2025/2026 academic year. Using simple random sampling which provides each member of the population with an equal probability of selection (Febriyanti, 2023; Asrulla et al., 2023) two classes were selected as research samples: Class XII J as the Box Jump experimental group and Class XII L as the Barrier Hops experimental group, each consisting of 35 students (N = 35 per group; total N = 70). Participants were senior high school students aged 17–18 years with no prior history of systematic plyometric training.

2.2 Research Design

This study adopted a quantitative approach employing a quasi-experimental design with a two-group pretest-posttest pattern (Creswell, 2023); Syahroni, 2022). The first group received Box Jump treatment (X_1) and the second group received Barrier Hops treatment (X_2). Each group underwent three treatment sessions of 135 minutes each, structured according to progressive overload principles based on scientific recommendations for youth plyometric training, with a work rest ratio of 1:5 to 1:10 and gradual volume increases across sessions (Palma-Muñoz et al., 2021; Ramirez-Campillo et al., 2023). Pre-test was administered once before treatment and post-test once after all treatment sessions were completed.

2.3 Instruments

The research instruments comprised two complementary assessment components: a movement technique assessment (process evaluation) and a jump distance assessment (product evaluation), as described below.

a. Movement Technique Assessment (Process Evaluation)

The movement technique assessment utilized a rubric based on three essential indicators encompassing 12 movement descriptors. The three essential indicators were: (1) Initial Position and Stance, (2) Movement Execution, and (3) Final Position and Stance. Each essential indicator was broken down into four movement descriptors based on body segments: (a) leg movement, (b) body movement, (c) arm and hand movement, and (d) eye focus. This yielded 3 indicators × 4 descriptors = 12 assessment items. Each descriptor was scored dichotomously: score 1 (Yes) if the student performed the movement correctly at a minimum of 80% of required components, and score 0 (No) if below 80%. The score obtained (SP) was then converted to a final score using the formula: Final Score = SP/12 × 100.

b. Jump Distance Assessment (Product Evaluation)

The jump distance assessment was conducted by measuring the Triple Jump distance achieved by each student from the starting position through the approach run to the farthest landing point. The measured distance (in meters) was then converted into achievement categories using a standardized conversion table adjusted for student's sex.

These two assessment components movement technique and jump distance together provide a comprehensive picture of student's psychomotor competence in Triple Jump. Movement technique assessment reflects the quality and precision of movement (process evaluation), while jump distance assessment represents the biomechanical effectiveness of the movement performed (product evaluation). The use of both components is consistent with Bloom's psychomotor taxonomy, which emphasizes that physical skill development encompasses coordination, precision, articulation of movement, and measurable performance (Salsabila et al., 2023). All instruments were validated by experts in physical education and athletics to ensure their validity and reliability (Sarie et al., 2023).

2.4 Procedures

The treatment program was structured according to progressive overload principles across three sessions, drawing on scientific recommendations for youth plyometric training (Palma-Muñoz et al., 2021; Ramirez-Campillo et al., 2023). Session 1 focused on introduction and adaptation (low volume: approximately 50–60 foot contacts). Session 2 increased training volume by 20–30% (approximately 100–120 foot contacts). Session 3 applied optimal volume prior to post-test administration (approximately 90–100 foot contacts).

In Session 1, both groups commenced with learning material delivery (30 minutes), static dynamic warm up (10 minutes), and a snakes and ladders game as a motivational activator (10 minutes). Following the demonstration of Triple Jump technique and administration of the psychomotor pre-test (40 minutes), the core treatment sessions began. The Box Jump group performed ABC drills (2 sets × 10 meters/movement, 2 minutes rest) and single leg box jumps (3 sets × 8 repetitions/leg, 2-minute rest). The Barrier Hops group performed ABC drills with the same volume, along with jump rope activities (3 sets × 25 seconds, 1-minute rest) as an initial reactive strength stimulus.

In Session 2, training volume was progressively increased by 20–30% from Session 1. Both groups commenced with static-dynamic warm-up and a frog jump game as a jump-based transition activity. The Box Jump group performed ABC drills (3 sets), single leg box jumps (4 sets × 10 repetitions/leg), lateral box jumps (3 sets × 10 repetitions, 2–3 minutes rest), and depth box jumps (3 sets × 8 repetitions, 3 minutes rest) forming a progressive sequence from unilateral strengthening to lateral coordination to deep reactive power. The Barrier Hops group performed ABC drills (3 sets), jump rope (4 sets × 35 seconds), cone/hurdle jumps (3 sets × 10 hurdles), and zig-zag cone jumps (3 sets × 8 cones) progressively increasing reactive movement complexity.

In Session 3, the program was designed at optimal volume prior to post-test. The Box Jump group performed ABC drills (2 sets), single leg box jumps (3 sets × 10 repetitions/leg), lateral box jumps (3 sets × 10 repetitions), and depth box jumps (4 sets × 8 repetitions) as the peak of progressive loading, followed by psychomotor post-test (45 minutes). The Barrier Hops group performed ABC drills (2 sets), jump rope (3 sets × 45 seconds), cone/hurdle jumps (4 sets × 10 hurdles), and zig-zag cone jumps (4 sets × 8 cones), followed by psychomotor post-test (45 minutes).

2.5 Data Analysis

Data analysis was performed using SPSS (Statistical Package for the Social Sciences). Descriptive statistics were used to characterize the data, including mean, standard deviation, minimum value, maximum value, and variance (Saptono & Harsoyo, 2022). The Shapiro Wilk

normality test was conducted to examine data distribution, and the Levene test was applied to verify variance homogeneity across groups. Hypothesis testing used paired samples t-test for within group differences (pre-test vs. post-test) and independent samples t-test for between group comparisons. The significance level was set at $\alpha = .05$ (Syahroni, 2022).

3. RESULTS

This section presents the results of data analysis sequentially, covering descriptive statistics, assumption testing (normality and homogeneity), and hypothesis testing (paired samples t-test and independent samples t-test).

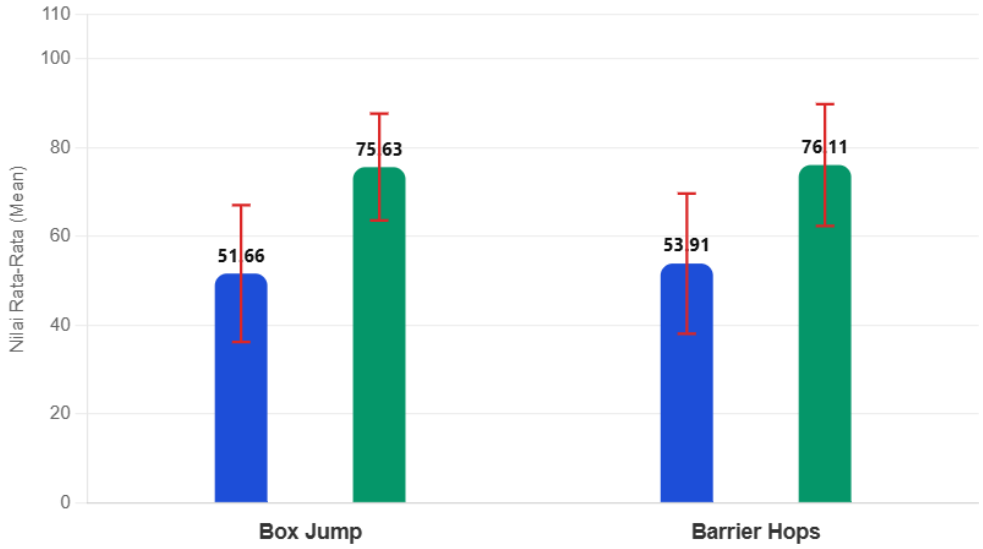
Table 1.

Descriptive Statistics of Pre-Test and Post-Test Scores for Both Groups

Variable	N	Range	Min	Max	Mean	SD	Variance	Improvement
Pre Box Jump	35	55	20	75	51.66	15.442	238.467	-
Post Box Jump	35	50	50	100	75.63	12.037	144.887	+23.97
Pre Barrier Hops	35	55	28	83	53.91	15.777	248.904	-
Post Barrier Hops	35	50	50	100	76.11	13.722	188.281	+22.20

Source: Primary Data (SPSS Output)

Table 1 presents the descriptive statistics of pre-test and post-test scores for both groups, Box Jump group experienced a mean score improvement of 23.97 points, from 51.66 (pre-test) to 75.63 (post-test). The standard deviation decreased from 15.442 to 12.037, indicating that student scores became more homogeneous following treatment. The Barrier Hops group demonstrated a gain of 22.20 points, from 53.91 (pre-test) to 76.11 (post-test), with the standard deviation decreasing from 15.777 to 13.722. Both groups exhibited substantial improvement following plyometric intervention, with the Barrier Hops group achieving a slightly higher post-test mean.



Data are presented as mean (SD). Box Jump performance improved from 51.66 (SD=15.44) to

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 6, No. 1, June 2026
DOI: 10.53863/mor.v6i1.2255
Universitas Ma'arif Nahdlatul Ulama Kebumen

75.63 (SD=12.04), a net increase of +23.97. Barrier Hops performance improved from 53.91 (SD=15.78) to 76.11 (SD=13.72), a net increase of +22.20.

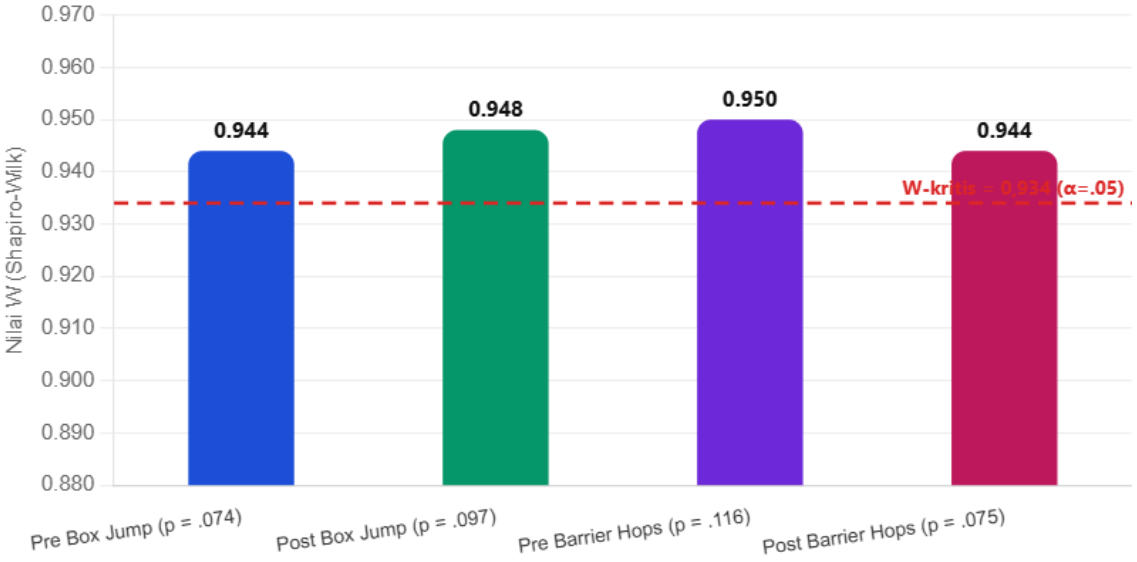
Table 2.

Shapiro-Wilk Normality Test Results

Variable	Shapiro-Wilk Statistic	df	Sig.	Data Distribution	Decision
Pre Box Jump	.944	35	.074	Normal	H_0 Accepted
Post Box Jump	.948	35	.097	Normal	H_0 Accepted
Pre Barrier Hops	.950	35	.116	Normal	H_0 Accepted
Post Barrier Hops	.944	35	.075	Normal	H_0 Accepted

Source: Primary Data (SPSS Output)

Table 2 shows that all variables yielded significance values above .05 — Pre Box Jump (p = .074), Post Box Jump (p = .097), Pre Barrier Hops (p = .116), and Post Barrier Hops (p = .075) confirming that all data were normally distributed and met the prerequisite assumptions for parametric statistical analysis.



All W values exceeded the critical value of 0.934, with p-values of .074, .097, .116, and .075 (all p > .05). Therefore, the assumption of normality was met.

JUMORA: JURNAL MODERASI OLAHRAGA
E-ISSN: 2797-8761
Volume 6, No. 1, June 2026
DOI: 10.53863/mor.v6i1.2255
Universitas Ma'arif Nahdlatul Ulama Kebumen

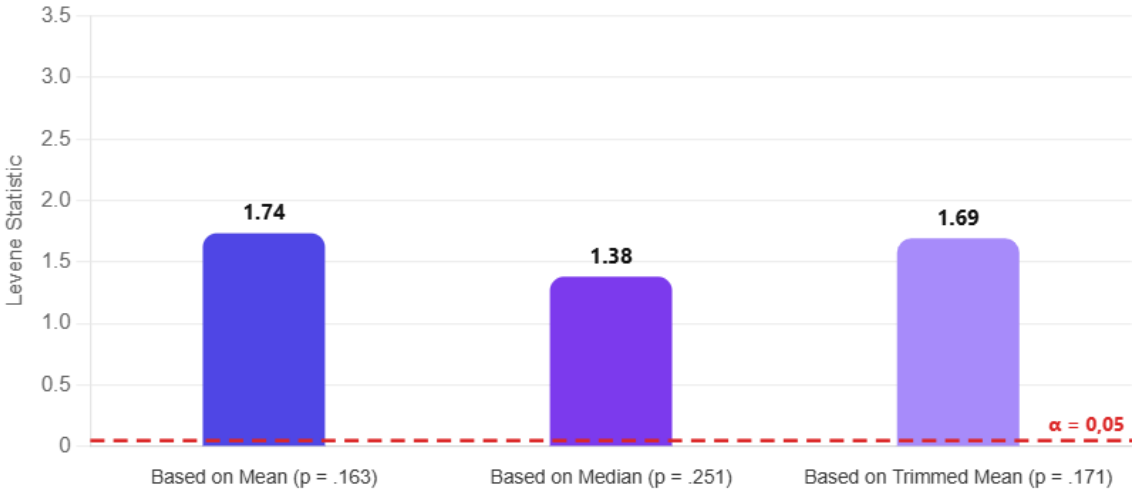
Table 3.

Levene Test of Homogeneity of Variance Results

Testing Method	Levene Statistic	df1	df2	Sig.	Decision
Based on Mean	1.735	3	136	.163	Homogeneous
Based on Median	1.382	3	136	.251	Homogeneous
Based on Trimmed Mean	1.694	3	136	.171	Homogeneous

Source: Primary Data (SPSS Output)

Table 3 displays the results of the Levene test significance values exceeded .05 (Based on Mean: p = .163; Based on Median: p = .251; Based on Trimmed Mean: p = .171), confirming that variance across groups was homogeneous and that the data met the homogeneity assumption required for parametric analysis.



Based on Mean F=1,735 (p=.163), Based on Median F=1,382 (p=.251), Based on Trimmed Mean F=1,694 (p=.171). All p > 0,05 → homogeneous variance.

Table 4.

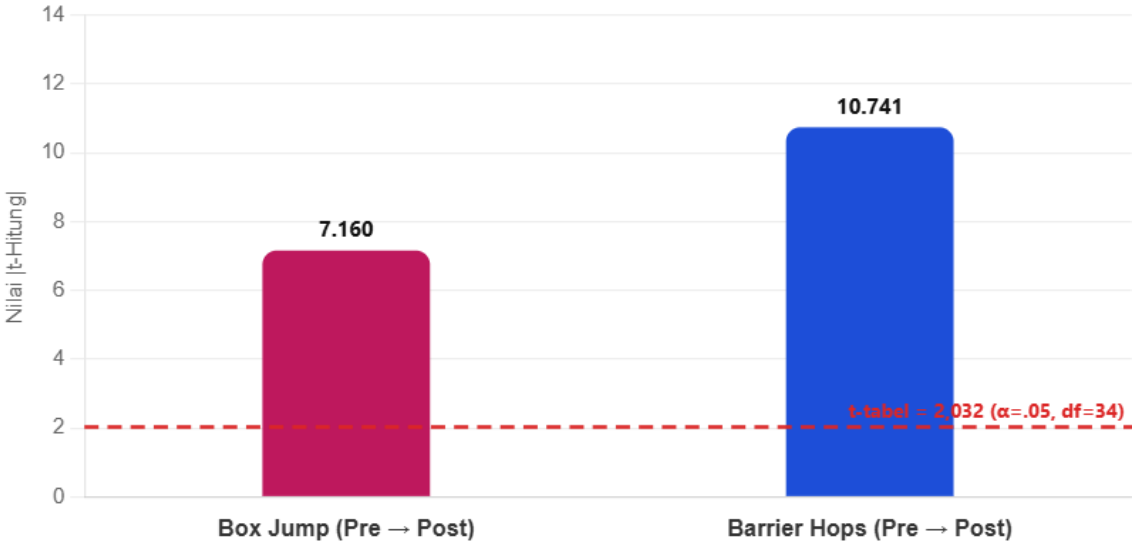
Paired Samples t-Test Results (Within-Group Pre-Test to Post-Test Comparison)

Test Pair	Mean Difference	SD	t-value	df	Sig. (2-tailed)	Decision
Pre Box Jump – Post Box Jump	−25.071	20.717	−7.160	34	.000	Significant
Pre Barrier Hops – Post Barrier Hops	−22.200	12.228	−10.741	34	.000	Significant

Source: Primary Data (SPSS Output)

Table 4 presents the paired samples t-test results. The Box Jump group yielded t(34) = −7.160 with p = .000 (p < .05), indicating a statistically significant within-group improvement. The Barrier Hops group yielded t(34) = −10.741 with p = .000 (p < .05), also confirming a

significant within-group difference. Accordingly, the first alternative hypothesis (Ha_1) and the second alternative hypothesis (Ha_2) are accepted: there is a significant effect of Box Jump on Triple Jump psychomotor outcomes, and a significant effect of Barrier Hops on Triple Jump psychomotor outcomes.



The t-statistic for the Box Jump (7.160) exceeded the critical t-value of 2.032 (p = .000, significant). Similarly, the t-statistic for Barrier Hops (10.741) exceeded the critical t-value of 2.032 (p = .000, significant). The mean differences were -25.071 and -22.200, respectively.

Table 5.

Independent Samples t-Test Results (Between-Group Comparison)

Variance Assumption	F Levene	Sig.	t-value	df	Sig. (2-tailed)	Mean Diff.	Std. Error	95% CI Lower	95% CI Upper
Equal variances assumed	3.149	.080	−7.243	68	.000	−23.971	3.310	−30.575	−17.367
Equal variances not assumed	-	-	−7.243	64.176	.000	−23.971	3.310	−30.583	−17.360

Source: Primary Data (SPSS Output)

Table 5 shows that the Levene test yielded F = 3.149 with p = .080 (p > .05), so the equal variances assumed row was interpreted. The t-test result was t(68) = −7.243, p = .000 (p < .05), with a mean difference of −23.971 and a 95% CI of −30.575 to −17.367. A statistically significant difference was found between the two groups post-test scores, with the Barrier Hops group obtaining a slightly higher mean. Accordingly, the third alternative hypothesis (Ha_3) is accepted: there is a significant difference in effect between the Box Jump and Barrier Hops approaches on Triple Jump psychomotor outcomes.

4. DISCUSSIONS

The findings of this study provide empirical evidence that both plyometric approaches

Box Jump and Barrier Hops produced statistically significant improvements in student's Triple Jump psychomotor competence. This is consistent with the theoretical foundation of plyometric training, which emphasizes rapid and explosive muscle contractions to enhance lower limb explosive power a bio-motor component essential for Triple Jump (Sudarmanto et al., 2019; Dimas Amjad Zukruf et al., 2024). The progressive overload principle applied across three sessions proved effective in maximizing neuromuscular adaptations within a relatively short timeframe, as recommended by Palma-Muñoz et al. (2021) and Ramirez-Campillo et al. (2023), who demonstrated that progressively overloaded plyometric training yields superior adaptations compared to constant-volume training in youth populations.

The significant improvement in the Box Jump group ($t = -7.160$, $p = .000$; mean gain = 23.97 points) is consistent with the findings of Utama et al. (2019), who reported that jump-to-box training effectively increased lower limb explosive power. The exercise sequence applied single leg box jump → lateral box jump → depth box jump — formed a progressive continuum from unilateral strengthening to lateral coordination to deep reactive power, which is biomechanically relevant to the hop and step phases of Triple Jump. Repeated explosive bilateral landings strengthen the quadriceps, hamstrings, and gastrocnemius (Jaleha, 2022), while lateral box jumps improve movement stability and coordination needed in phase transitions. These improvements were reflected across all three essential indicators of the 12 descriptors movement rubric initial position, movement execution, and final position.

The significant improvement in the Barrier Hops group ($t = -10.741$, $p = .000$; mean gain = 22.20 points) is supported by (Haromain et al., 2024), who found that barrier hops significantly improved power, strength, and speed in athletic contexts including Triple Jump. The progressive movement sequence jump rope → cone/hurdle jumps → zig-zag cone jumps reflected a gradual increase in reactive movement complexity. Zig-zag cone jumps particularly develop rapid directional changes relevant to the sequential rhythm of the three Triple Jump phases. The higher t-value in the Barrier Hops group (-10.741 vs. -7.160) suggests more consistent improvement among students, likely because the sequential nature of barrier hops more closely resembles the rhythmic demands of the hop-step-jump sequence, thereby optimizing movement transfer (Syaleh et al., 2024). The effectiveness of specific jump patterns sharing biomechanical characteristics with Triple Jump phases has been previously demonstrated. Kresnapati (2018) showed that a deer leap training pattern biomechanically analogous to the step phase of Triple Jump significantly improved triple jump performance in male PJKR undergraduate students.

The independent samples t-test revealed a significant between-group difference ($t = -7.243$, $p = .000$), with the Barrier Hops group achieving a slightly higher post-test mean (76.11 vs. 75.63). While statistically significant, the relatively small mean difference (-23.971) indicates that both approaches are practically comparable in effectiveness. This finding is partially consistent with (Syaleh et al., 2024), who reported the superiority of barrier hop training in volleyball jump service, but contrasts with (Utama et al., 2019), who found jump-to-box training more effective for basketball differences likely reflecting sport-specific movement characteristics.

The two-component assessment instrument movement technique (12 movement descriptors) and jump distance provided a more comprehensive picture of psychomotor competence than a single-component measure. Score conversion using the formula $SP/12 \times 100$ ensured objective and proportional assessment, assigning equal weight to each descriptor. This approach aligns with Bloom's psychomotor taxonomy, which emphasizes that physical skill

development encompasses coordination, precision, movement articulation, and measurable performance (Salsabila et al., 2023). Sex-differentiated jump distance classification further ensured ecological validity within the PE school context.

From a pedagogical perspective, this structured three-session plyometric program demonstrated that meaningful psychomotor gains are achievable within the constraints of the school timetable, provided the program is systematically designed according to scientific training principles. Motivational games snakes and ladders in Session 1 and frog jump in Session 2 effectively supported student's affective engagement prior to core training, consistent with an integrative learning approach in physical education (Dhuli et al., 2022; Vist Hagen et al., 2022). Physical education has also been recognized as having a significant long-term impact on student's active lifestyles (Widiyatmoko et al., 2020), reinforcing the value of evidence-based plyometric instruction in formal PE curricula.

This study has several limitations. The intervention was limited to three sessions due to curriculum schedule constraints, and therefore cannot characterize long-term effects of either approach. The study did not control for confounding variables such as baseline physical fitness or prior sport experience. Future research is recommended to employ longitudinal designs of greater duration, include a pure control group, control for confounding variables, and examine long-term retention of psychomotor gains along with differential effects by sex or initial fitness level.

5. CONCLUSIONS

This study draws three principal conclusions. First, the Box Jump approach produced a significant effect on Triple Jump psychomotor outcomes among Grade XII students of SMA Negeri 6 Semarang, evidenced by $t(34) = -7.160$, $p = .000$, with a mean score gain of 23.97 points. Second, the Barrier Hops approach similarly produced a significant effect, evidenced by $t(34) = -10.741$, $p = .000$, with a mean score gain of 22.20 points. Third, a significant difference in effect was found between the two approaches ($t(68) = -7.243$, $p = .000$), with the Barrier Hops group achieving a slightly higher post-test mean (76.11 vs. 75.63), likely due to the sequential and rhythmic nature of barrier hops aligning more closely with the biomechanical demands of the hop-step-jump sequence.

Both approaches yielded significant psychomotor gains within three sessions, confirming feasibility within standard school timetables under progressive overload principles. Barrier Hops is preferable when movement specificity to Triple Jump is prioritized; Box Jump is a valid alternative for explosive and reactive power development. PE teachers should select plyometric modalities based on equipment availability, student fitness, and biomechanical relevance to the target skill. The three-session intervention limits assessment of long-term effects and psychomotor retention. Confounding variables baseline fitness, prior sport participation, and sex-differentiated responses were not controlled. Single-school sampling restricts generalizability. This study offers empirical evidence for the comparative effectiveness of Box Jump and Barrier Hops on Triple Jump psychomotor outcomes in formal PE settings, using a dual-component instrument assessing both movement technique and jump distance. A structured three-session progressive overload protocol and a Bloom's psychomotor taxonomy-aligned assessment framework are provided for replication. Future research should adopt longitudinal designs, include a control group, and examine effects by sex and fitness level.

Acknowledgment

The author expresses sincere gratitude to Allah SWT for His blessings and mercy, which have enabled the completion of this scientific article. May peace and blessings always be bestowed upon the Prophet Muhammad SAW. With deepest respect, the author would like to express profound gratitude to the beloved parents, father and mother, for their endless prayers, love, sacrifices, care, and both moral and financial support throughout his educational journey. Their sincerity and perseverance have become the greatest source of motivation for the author in completing this article.

The author would also like to extend his sincere appreciation and gratitude to Mr. Pandu Kresnapati and Mr. Fajar Ari Widiyatmoko as academic supervisors for their valuable guidance, advice, motivation, and support throughout the research and writing process of this article. Appreciation is also addressed to all lecturers of the Physical Education, Health, and Recreation Study Program at Universitas PGRI Semarang, as well as SMA Negeri 6 Semarang, for their knowledge, permission, assistance, and support during the research process.

Special thanks are also dedicated to someone who continuously provided prayers, encouragement, care, and unwavering support throughout the preparation of this article. Their presence and support became a significant source of motivation for the author in facing various challenges during the research process. Finally, the author would like to express gratitude to friends, colleagues, and all parties who contributed directly or indirectly to the completion of this article. The author hopes that this article will provide valuable benefits and positive contributions to the development of knowledge, particularly in the field of physical education and sports science.

REFERENCES

Al Kahar, A. A. D. (2021). Pendidikan Karakter Multidimensi sebagai Aplikasi Konsep Merdeka Belajar dalam Menyambut Bonus Demografi. *AN NUR: Jurnal Studi Islam*, 13(1), 67–89. https://doi.org/10.37252/an-nur.v13i1.99

Arifin, S. (2017). Peran Guru Pendidikan Jasmani Dalam Pembentukan Pendidikan Karakter Peserta Didik. *Multilateral Jurnal Pendidikan Jasmani Dan Olahraga*, *16*(1). https://doi.org/10.20527/multilateral.v16i1.3666

Andriyan, Mahmud Yunus, & Heri Purnama Pribadi. (2023). PENGARUH LATIHAN BOX JUMP, BOX SHUFFLE, DAN SQUAT JUMP TERHADAP KEKUATAN OTOT TUNGKAI PADA ATLET UKM BADMINTON UNIVERSITAS NEGERI MALANG. *Journal Sport Science Indonesia*, 2(2), 201–209. https://doi.org/10.31258/jassi.2.2.201-209

Asrulla, R., Jailani, M. S., & Jeka, F. (2023). Populasi dan sampling (kuantitatif), serta pemilihan informan kunci (kualitatif) dalam pendekatan praktis. *Jurnal Pendidikan Tambusai*, *7*(3), 26320–26332.

Avalos, M. L., Zurita Ortega, F., & Cachón, J. (2022). *Analysis of the psychomotor profile, learning difficulty and emotional level in preschoolers*. https://doi.org/10.14198/jhse.2022.172.14

Creswell, J. W., & Plano Clark, V. L. (2023). *Revisiting Mixed Methods Research Designs Twenty*

Years Later. The Sage Handbook of Mixed Methods Research Design, 21–36. https://doi.org/10.4135/9781529682663.n6

Dhuli, K., Naureen, Z., Medori, M. C., Fioretti, F., Caruso, P., Perrone, M. A., Nodari, S., Manganotti, P., Xhufi, S., & Bushati, M. (2022). Physical activity for health. *Journal of Preventive Medicine and Hygiene*, *63*(2 Suppl 3), E150. https://doi.org/10.15167/2421-4248/jpmh2022.63.2S3.2756

Dimas Amjad Zukruf, Erdy Arista Desti, & Yopi Hutomo Bhakti. (2024). Meningkatkan Kekuatan Tendangan T Atlet Pencak Silat Lampung Utara Melalui Latihan Plyometric. *JIMU:Jurnal Ilmiah Multidisipliner*, *2*(04), 1106–1111. https://doi.org/10.70294/jimu.v2i04.499

Febriyanti, B. N. (2023). Teknik pengambilan sampel. *Universitas Jambi*, *13*(3), 1576–1580.

Haromain, I., Wiriawan, O., Arief, N. A., Hidayat, T., Wibowo, S., Siantoro, G., & Wahyudi, A. R. (2024). Pengaruh Latihan Plyometric Barrier Hops, Front Cone Hops, Jump To Box, dan Depth Jumps terhadap Peningkatan Power, Kekuatan, dan Kecepatan Siswa Ekstrakulikuler. *EduInovasi: Journal of Basic Educational Studies*, 4(1). https://doi.org/10.47467/edui.v4i1.5596

Jaya, I. P. P., Tirtayasa, K., Muliarta, I. M., Sri Handari Adiputra, L. M. I., Purnawati, S., & Griadhi, I. P. A. (2019). PELATIHAN PLIOMETRIK DEPTH JUMP LEBIH MENINGKATKAN DAYA LEDAK OTOT TUNGKAI DARIPADA PELATIHAN PLIOMETRIK BOX JUMP SISWA PESERTA EKSTRAKURIKULER BOLA VOLI SMK NEGERI 1 PETANG. *Sport and Fitness Journal*. https://doi.org/10.24843/spj.2018.v06.i03.p02

Jaleha, B. (2022). Peningkatan Kecepatan Jarak Tempuh dengan Penguatan Tungkai pada Atlet Ikatan Sport Sepeda Indonesia (ISSI) Bali. *Physiotherapy Health Science (PhysioHS)*, 4(2), 85–89. https://doi.org/10.22219/physiohs.v4i2.22639

Kresnapati, P. (2018). PENGARUH POLA LATIHAN LOMPAT KIJANG TERHADAP HASIL LOMPAT JANGKIT MAHASISWA PUTRA PJKR UPGRIS. *Journal of Sport Coaching and Physical Education*, 3(1), 9–15. https://doi.org/10.15294/jscpe.v3i1.31883

Kusuma, I. A., & Nurul Arifin. (2022). PERBEDAAN PENGARUH METODE LATIHAN BARRIER HOPS DAN SIDE HOPS TERHADAP KEMAMPUAN HEADING DALAM SEPAKBOLA PADA ATLET PUTRA CLUB MAHESA SAKTI FC KAB SEMARANG TAHUN 2021. *Jurnal Ilmiah Spirit*, 22(1), 73–85. https://doi.org/10.36728/jis.v22i1.1827

Mubarok, M. R., Widiyatmoko, F. A., & Wiyanto, A. (2026). Pengaruh Kegiatan Pemanasan Berbasis Permainan terhadap Minat Belajar Siswa dalam Pembelajaran Pendidikan Jasmani pada Siswa Siswi SMP. *Jurnal Pendidikan Olahraga*, 16(1).

Palma-Muñoz, I., Ramírez-Campillo, R., Azocar-Gallardo, J., Álvarez, C., Asadi, A., Moran, J., & Chaabene, H. (2021). Effects of Progressed and Nonprogressed Volume-Based Overload Plyometric Training on Components of Physical Fitness and Body Composition Variables in Youth Male Basketball Players. *Journal of Strength &Amp; Conditioning Research*, 35(6), 1642–1649. https://doi.org/10.1519/jsc.0000000000002950

Ramirez-Campillo, R., Sortwell, A., Moran, J., Afonso, J., Clemente, F. M., Lloyd, R. S., Oliver, J. L., Pedley, J., & Granacher, U. (2023). Plyometric-jump training effects on physical fitness and sport-specific performance according to maturity: a systematic review with meta-analysis. *Sports Medicine-Open*, *9*(1), 23. https://doi.org/10.1186/s40798-023-00568-6

Rohendi, A., & Budiman, A. (2020). Pengaruh metode pliometrik barrier hops, pliometrik knee tuck jump, dan daya ledak terhadap hasil lompat jauh gaya jongkok. *Jpoe*, 2(1), 86–96. https://doi.org/10.37742/jpoe.v2i1.27

Saitya, I. (2022). Pentingnya perencanaan pembelajaran pada pelajaran pendidikan jasmani olahraga dan kesehatan. *PIOR: Jurnal Pendidikan Olahraga*, *1*(1), 9–13.

Salsabila, Y., Harahap, A. A. S., Fitria, N., & Harahap, N. D. (2023). Pengaruh Perkembangan Kemampuan Pada Aspek Kognitif, Afektif, dan Psikomotorik Terhadap Hasil Belajar. *ALGEBRA: Jurnal Pendidikan, Sosial, Dan Sains*, *3*(1), 7. https://doi.org/10.58432/algebra.v3i1.741

Saptono, L., & Harsoyo, Y. (2022). *Statistika Deskriptif Untuk Pendidikan Ekonomi*. Sanata Dharma University Press

Saputra, A. S. (2020). Menjaga Imunitas dan Kesehatan Tubuh melalui Olahraga yang Efektif. *Prosiding Seminar Nasional Pendidikan STKIP Kusuma Negara II*, 33–42.

Sarie, F., Sutaguna, I. N. T., Par, S. S. T., Par, M., Suiraoka, I. P., St, S., Damanik, D., Efrina, G., Sari, R., & Nengsi, A. R. (2023). *Metodelogi penelitian*. Cendikia Mulia Mandiri.

Shingjergji, A. (2013). Psychomotor education, an aspect of general formation of pre-school children. *The Journal of Education, Culture, and Society*, *4*(1), 121–132. https://doi.org/10.15503/jecs20131.121.132

Sudarmanto, E. (2019). Perbedaan Pengaruh metode Latihan Plyometric Depth Jump dan Hurdle hopping terhadap Peningkatan Power Otot Tungkai Pada Pesilat Remaja Putri Perguruan Tapak Suci Putera Muhammadiyah Simo Boyolali Tahun 2018. *JOSSAE : Journal of Sport Science and Education*, 3(2), 60. https://doi.org/10.26740/jossae.v3n2.p60-68

Sunaryadi, Y., & Slamet, S. (2024). The Optimum Phase Ratio of Indonesian Triple Jump Athletes as an Index Detector for Triple Jump Performance. *Jurnal Pendidikan Jasmani Dan Olahraga*, 9(1), 89–95. https://doi.org/10.17509/jpjo.v9i1.67933

Suriani, N., Risnita, & Jailani, M. S. (2023). Konsep Populasi dan Sampling Serta Pemilihan Partisipan Ditinjau Dari Penelitian Ilmiah Pendidikan. *Jurnal IHSAN : Jurnal Pendidikan Islam*, 1(2), 24–36. https://doi.org/10.61104/ihsan.v1i2.55

Syafwan, F. r. (2024). KONTRIBUSI DAYA LEDAK OTOT TUNGKAI, DAN KEKUATAN OTOT LENGAN TERHADAP KEMAMPUAN SMASH PADA PERMAINAN BOLA VOLI PUTRA EKSTRAKULIKULER DI SMA NEGERI 3 MANDAU-BENGKALIS. *Jurnal Inovasi Olahraga*, 2(03). https://doi.org/10.53905/jiojurnal.v2i03.48

Syahroni, M. I. (2022). *PROSEDUR PENELITIAN KUANTITATIF*. *2*(3), 43–56.

Syaleh, M., Hendrawan, D., Irwandi, I., & Meliala, F. O. B. R. (2024). Pengaruh Media Latihan (Barrier Hop Dan Box Jump) Dan Tingkat Percaya Diri Terhadap Keterampilan Jump

Service Bola Voli. *Jurnal Penjaskesrek*, *11*(1), 14–29. https://doi.org/10.46244/penjaskesrek.v11i1.2330

TETİK DÜNDAR, S. (2021). Investigation of Ratios and Distances in Triple Jump Hop-Step-Jump PhaseS. Anatolia Sport Research, 3(3), 10–17. https://doi.org/10.29228/anatoliasr.17

Utama, M. B. R., Pangkahila, A., Adiputra, I., Tianing, N., Weta, I., & Adiputra, L. S. H. (2019). Pelatihan Pliometrik Jump to Box Lebih Meningkatkan Daya Ledak Otot Tungkai Dari Pada Pealtihan Pliometrik Barrier Hops Pada Permainan Bola Basket. *Jurnal Pendidikan Kesehatan Rekreasi*, *5*(2), 34–41.

V Sihombing, E., & Rahman Situmeang. (2022). Perbedaan Pengaruh Latihan Plyometric Box Jump Dan Barrier Hopss Terhadap Daya Ledak Otot Tungkai Pada Atlet Pemula Bola Volley Klub Dispora Binjai Tahun 2021. *Journal Physical Health Recreation*, *2*(2), 180–187. https://doi.org/10.55081/jphr.v2i2.651

Vist Hagen, R., Lorås, H., Sigmundsson, H., & Haga, M. (2022). Association between motor competence, physical fitness, and academic achievement in physical education in 13-to 16-year-old school children. *Frontiers in Sports and Active Living*, *3*, 774669 https://doi.org/10.3389/fspor.2021.774669

Widiyatmoko, F. A., Pradipta, G. D., & Fahmi, A. (2020). *Kompetensi yang dibutuhkan untuk dapat bermain olahraga dan berpartisipasi dalam kegiatan lainnya*. *6*(4), 28–37. https://doi.org/10.29407/js_unpgri.v6i4.15217

Yusuf, J., Adi Wijaya, M. R., Kresnapati, P., & Yusuf, Y. (2022). Korelasi Nilai Berat Badan, Kekuatan Otot Tungkai terhadap Hasil Lompatan Lompat Tinggi. *Jurnal Patriot*, 4(1), 12–24. https://doi.org/10.24036/patriot.v4i1.816

Zainuddin, E. (2022). Pengaruh Latihan Depth Jump To Rimp Jump dan Box Jump dan Panjang Tungkai Terhadap Jump Shoot. *Jurnal Porkes*, 5(1), 304–313. https://doi.org/10.29408/porkes.v5i1.5828