

The Effect of Resistance Band Training Methods on Shot Put Throwing Performance

Nana Suhendi¹, Andi Taufan Bayu² Rukmantara³
^{1,2,3}The Sport Education Study Program, STKIP Kusuma Negara, Indonesia
nana.suhendi@gmail.com

Abstract

The purpose of this study is to examine the difference in shot put performance among eleventh-grade students at SMA PGRI 4 East Jakarta who were trained using a resistance band exercise method and those who were not. The research employed an experimental method, a procedure designed to reveal causal relationships between an intentionally introduced variable and other variables outside the researcher's control. The intentionally introduced variable is referred to as the treatment or experimental variable and functions as the independent variable. The treatment was deliberately administered to the research subjects to observe its effects, which in turn served as the dependent variable. The findings of this study indicate a significant difference in shot put performance between students who used the resistance band training method and those who did not. This conclusion is supported by the results of the t-test, which showed that the calculated t-value exceeded the table value ($t_{hitung} = 5.63 > t_{tabel} = 2.0063$) at a significance level of $\alpha = 0.05$. The mean score of students who participated in the resistance band training was 69.61, whereas the mean score of those who did not receive the training was 65.5. Thus, a difference of 4.11 points was observed between Variable X1 and Variable X2.

Keywords: Training Methods, Resistance Bands, Shot Put Performance

1 INTRODUCTION

The functions and objectives of national education, as stated in the Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System, affirm that national education serves to develop capabilities and to shape the character and civilization of a dignified nation in order to educate the life of the nation. It aims to cultivate learners' potential so that they become individuals who are faithful and devoted to God Almighty, possess noble character, are healthy, knowledgeable, capable, creative, independent, and become democratic and responsible citizens (Nurhayati, 2020).

Ramadhan et al. (2023) emphasize that physical education, sports, and health constitute an integral part of the overall education system, prioritizing physical activities and the cultivation of healthy living to support physical, mental, social, and emotional development. Physical education specifically aims to develop physical fitness, motor skills, critical thinking abilities, social competence, reasoning, emotional stability, moral conduct, healthy lifestyle patterns, and environmental awareness through physical activities.

Furthermore, Law of the Republic of Indonesia Number 3 of 2005, Chapter II Article 4 concerning the National Sports System, states that national sports aim to maintain and improve health, fitness, sports performance, human quality, as well as promote moral values, discipline, sportsmanship, unity, and national resilience, while enhancing the dignity and honor of the nation (Prianto, 2021). Training is defined as a systematic and planned process conducted repeatedly to improve ability, physical condition, and mental readiness, and must adhere to specific principles to ensure effectiveness and efficiency (Rizky, 2025).

Resistance band training is considered a viable alternative to enhance physical readiness in shot put. This training method utilizes elastic resistance to improve muscular power, particularly in the lower and upper limbs, and contributes to improved balance, flexibility, and full-body mobility. Essentially, the core purpose of resistance band exercises is to build muscular strength (Ahmad et al., 2024).

This study aims to describe the effect of resistance band training on the shot put performance of eleventh-grade students at SMA PGRI 4 East Jakarta. The study seeks to determine how resistance band exercises influence strength, coordination, and shot put technique in comparison to conventional training methods. Through an experimental approach, this research is expected to provide scientific insight into the effectiveness of resistance band training in enhancing optimal shot put outcomes.

Supporting literature includes research by Siti Hasnawati (2021), which developed a resistance band training manual to improve athletic strength. The manual received “excellent” ratings across material expert validation (83.07%), media expert validation (85.71%), small-group testing (87.50%), and large-group testing (87.18%). This indicates that the training manual is both feasible and effective as a reference for coaches and athletes in strength and acceleration training programs.

2 RESEARCH METHODS

This study utilized an experimental method to examine the causal effect of resistance band training on students’ shot put performance. The treatment functioned as the independent variable, while its outcomes served as the dependent variable. The procedure involved selecting 28 eleventh-grade students, providing them with research instructions, demonstrating proper shot put techniques, having them execute the techniques, and recording their performance results for analysis.

3 RESULTS AND DISCUSSION

3.1 Data Description

3.1.1 Shot Put Performance of Students Using the Resistance Band Training Method

Table 2 Frequency Distribution of Variable X1

Score	f_i	%
61 – 63	3	10,71
64 – 66	4	14,29
67 – 69	6	21,43
70 – 72	8	28,57
73 – 75	5	17,86
76 – 78	2	7,14
Total	28	100,00

Based on the table above, the mean value of Variable X1 can be calculated using the following formula:

$$\begin{aligned}\text{Mean} &= \frac{\sum x_i}{n} \\ &= \frac{1949}{28} \\ &= 69,61\end{aligned}$$

Thus, the mean value of Variable X1 is 69.61. According to the assessment scale, this mean falls within the range of 66–80, which is categorized as “good.” This indicates that the shot put performance of eleventh-grade students at SMA PGRI 4 East Jakarta who used the resistance band training method is classified as good. The data presented in the table above, when illustrated in a graph, appear as follows:

3.1.2 Shot Put Performance of Students Who Did Not Use the Resistance Band Training Method

Table 2. Distribution Frequency of Variabel X₂

Score	f _i	%
60 – 61	3	10,71
62 – 63	5	17,86
64 – 65	6	21,43
66 – 67	7	25,00
68 – 69	3	10,71
70 – 71	4	14,29
Total	28	100,00

Based on the table above, the mean value of Variable X₂ can be calculated using the following formula:

$$\begin{aligned}\text{Mean} &= \frac{\sum x_2}{n} \\ &= \frac{1834}{28} \\ &= 65,5\end{aligned}$$

Thus, the mean value of Variable X₂ is 65.5. According to the assessment scale, this mean falls within the range of 66–80, which is classified as “good.” This indicates that the shot put performance of eleventh-grade students at SMA PGRI 4 East Jakarta who did not use the resistance band training method is categorized as good.

3.2 Analysis Requirement Tests

3.2.1 Normality Test

Table 3. Normality Test Calculation for Group X₁

No	X ₁	Z _i	Z _t	F(i)	S(i)	F(i) - S(i)
1	61	-1,97	0,4756	0,0244	0,0357	0,0113
2	62	-1,74	0,4591	0,0409	0,0714	0,0305
3	63	-1,51	0,4345	0,0655	0,1071	0,0416
4	64	-1,28	0,3997	0,1003	0,1429	0,0426
5	65	-1,05	0,3531	0,1469	0,1786	0,0317
6	66	-0,83	0,2967	0,2033	0,2143	0,11
7	66	-0,83	0,2967	0,2033	0,25	0,467
8	67	-0,59	0,2224	0,2776	0,2857	0,0081
9	67	-0,59	0,2224	0,2776	0,3214	0,0438
10	68	-0,37	0,1443	0,3557	0,3571	0,0014
11	68	-0,37	0,1443	0,3557	0,3929	0,0372
12	69	-0,14	0,0557	0,4443	0,4286	0,0157
13	69	-0,14	0,0557	0,4443	0,4643	0,02
14	70	0,09	0,0359	0,5359	0,5	0,0359
15	70	0,09	0,0359	0,5359	0,5357	0,0002
16	71	0,32	0,1255	0,6255	0,5714	0,0541
17	71	0,32	0,1255	0,6255	0,6071	0,0184
18	71	0,32	0,1255	0,6255	0,6429	0,0174
19	72	0,55	0,2088	0,7088	0,6786	0,0302
20	72	0,55	0,2088	0,7088	0,7143	0,0055
21	72	0,55	0,2088	0,7088	0,75	0,0412
22	73	0,78	0,2823	0,7823	0,7857	0,0034
23	74	1,00	0,3413	0,8413	0,8214	0,0199
24	72	0,55	0,2088	0,7088	0,8571	0,0158

25	75	1,23	0,3907	0,8907	0,8929	0,0022
26	75	1,23	0,3907	0,8907	0,9286	0,0379
27	76	1,46	0,4279	0,9279	0,9643	0,0364
28	78	1,92	0,4726	0,9726	1	0,0274

Based on the results of the normality test calculation above, it is known that L_o ($L_{\text{calculated}}$) is 0.0541. Meanwhile, the L_{table} value (L_t) for a sample size of $n = 28$ at a significance level of $\alpha = 0.05$ is 0.1658. Therefore, it can be concluded that the shot put performance data of students who used the resistance band training method are normally distributed because $L_{\text{calculated}}$ is smaller than L_{table} .

a. The calculations for the mean, variance (S^2), and standard deviation (S) of Variable X_2 are as follows:

$$\begin{aligned}
 \text{Mean} &= \frac{\sum x_2}{n} \\
 &= \frac{1834}{28} \\
 &= 65,5 \\
 \text{Varians } (S^2) &= \frac{n \sum x_2^2 - (\sum x_2)^2}{n(n-1)} \\
 &= \frac{28(120376) - (1834)^2}{28(28-1)} \\
 &= \frac{3370528 - 3363556}{28(27)} \\
 &= \frac{6972}{756} \\
 &= 9,22 \\
 \text{Deviation Standard } (S) &= \sqrt{S^2} \\
 &= \sqrt{9,22} \\
 &= 3,04
 \end{aligned}$$

Table 4. Normality Test Calculation for Group X_2

No	X_1	Z_i	Z_t	$F(i)$	$S(i)$	$F(i) - S(i)$
1	60	-1,81	0,4649	0,0351	0,0357	0,0006
2	61	-1,48	0,4306	0,0694	0,0714	0,002
3	61	-1,48	0,4306	0,0694	0,1071	0,0377
4	62	-1,15	0,3749	0,1251	0,1429	0,0178
5	62	-1,15	0,3749	0,1251	0,1786	0,0535
6	63	-0,82	0,2939	0,2061	0,2143	0,0082
7	63	-0,82	0,2939	0,2061	0,25	0,0439
8	63	-0,82	0,2939	0,2061	0,2857	0,0796
9	64	-0,49	0,1879	0,3121	0,3214	0,0093
10	64	-0,49	0,1879	0,3121	0,3571	0,045
11	64	-0,49	0,1879	0,3121	0,3929	0,0808
12	65	0,16	0,0636	0,4364	0,4286	0,0078
13	65	0,16	0,0636	0,4364	0,4643	0,0279
14	65	0,16	0,0636	0,4364	0,5	0,0636
15	66	0,16	0,0636	0,5636	0,5357	0,0279
16	66	0,16	0,0636	0,5636	0,5714	0,0078
17	66	0,16	0,0636	0,5636	0,6071	0,0435
18	67	0,49	0,1879	0,6879	0,6429	0,045
19	67	0,49	0,1879	0,6879	0,6786	0,0093
20	67	0,49	0,1879	0,6879	0,7143	0,0264
21	67	0,49	0,1879	0,6879	0,75	0,0621
22	68	0,82	0,2939	0,7939	0,7857	0,0082

23	68	0,82	0,2939	0,7939	0,8214	0,0275
24	69	1,15	0,3749	0,8749	0,8571	0,0178
25	69	1,15	0,3749	0,8749	0,8929	0,018
26	70	1,48	0,4306	0,9306	0,9286	0,002
27	71	1,81	0,4649	0,9649	0,9643	0,0006
28	71	1,81	0,4649	0,9649	1	0,0351

ased on the results of the normality test calculation above, it is found that L_o ($L_{\text{calculated}}$) is 0.0796. Meanwhile, the L_{table} value (L_t) for a sample size of $n = 28$ at a significance level of $\alpha = 0.05$ is 0.1658. Therefore, it can be concluded that the shot put performance data of students who did not use the resistance band training method are normally distributed because $L_{\text{calculated}}$ is smaller than L_{table} .

a. Homogeneity Test

Determining F_{hitung} :

$$F_{\text{hitung}} = \frac{s_2^2}{s_1^2} = \frac{19,14}{9,22} = 2,08$$

$$\begin{aligned} \text{b. } F_{\text{tabel}} &= F_{\frac{1}{2} \alpha} (n_1 - 1, n_2 - 1) \\ &= 0,05 (28 - 1, 28 - 1) \\ &= 0,05 (27, 27) \\ &= 1,91 \end{aligned}$$

c. Statistical Hypotheses

$H_0: \sigma_1^2 = \sigma_2^2$ (the variance of group 1 is equal to the variance of group 2, or the data are homogeneous).

$H_1: \sigma_1^2 \neq \sigma_2^2$ (the variance of group 1 is not equal to the variance of group 2, or the data are not homogeneous).

d. Testing Criteria

Accept H_0 , jika $F_{\text{hitung}} < F_{\text{tabel}}$.

Reject H_0 , jika $F_{\text{hitung}} > F_{\text{tabel}}$.

e. Conclusion

$F_{\text{hitung}} = 2,08$ dan $F_{\text{tabel}} = 1,91$

Since $F_{\text{hitung}} > F_{\text{tabel}}$

F_{table} , H_1 is accepted, indicating that the data are not homogeneous.

3.3 The results of hypothesis testing

Hypothesis testing was carried out using a two-mean difference test (t-test) (Waluyo, 2024). The t-test was employed to determine whether there is a significant difference in shot put performance between students who used the resistance band training method and those who did not in the eleventh grade of SMA PGRI 4 East Jakarta. The steps undertaken are as follows:

Determining t_{hitung} :

$$\begin{aligned} t_{\text{hitung}} &= \frac{\bar{X}_A - \bar{X}_B}{\sqrt{S \left(\frac{1}{n_A} + \frac{1}{n_B} \right)}} \\ &= \frac{69,91 - 65,5}{\sqrt{7,41 \left(\frac{1}{28} + \frac{1}{28} \right)}} \\ &= \frac{4,41}{\sqrt{7,41 (0,072)}} \\ &= \frac{4,41}{\sqrt{0,5335}} \\ &= \frac{4,41}{0,73} \\ &= 5,63 \end{aligned}$$

- a. Determining the degrees of freedom (df) using the following formula:db =

$$(n_1 + n_2) - 2$$

$$= (28 + 28) - 2$$

$$= 56 - 2$$

$$= 54$$
- b. Determining t_{tabel}
 The researcher used a confidence level or significance level of 5% ($\alpha = 0.05$) with 54 degrees of freedom, resulting in a t-table value of 2.0063. Thus, the t-table value is 2.0063. This value was obtained through interpolation because it was not directly available in the table. The next step is to compare the t_{hitung} with the t_{tabel} according to the following hypothesis testing criteria:
 Accept H_0 , if t_{hitung} less than t_{tabel} .
 Accept H_1 , if t_{hitung} more than t_{tabel} .
 Referring to the hypothesis testing criteria above, the Null Hypothesis H_0 rejected because $t_{\text{hitung}} = 5,63$ more than $t_{\text{tabel}} = 2,0063$.
 This indicates that the Working Hypothesis (H_1) is accepted, meaning that there is a positive and significant difference in shot put performance between students who used the resistance band training method and those who did not in the eleventh grade of SMA PGRI 4 East Jakarta.

3.4 The Result of Discussion

The analysis indicates that the resistance band training method is both practically and theoretically effective in improving students' shot put performance. These findings support the acceptance of the research hypothesis, demonstrating a significant difference between students who used the resistance band method and those who did not. This is confirmed by the t-test results at a 5% significance level, where the t-calculated value (5.63) exceeds the t-table value (2.0063).

4 CONCLUSION

The study demonstrates that the resistance band training method has a significant effect on improving the shot put performance of eleventh-grade students at SMA PGRI 4 East Jakarta. The t-calculated value (5.63), which exceeds the t-table value (2.0063), confirms the effectiveness of this method. Students who trained with resistance bands achieved a mean score of 69.61, compared to 65.5 in the group that did not use resistance bands. The 4.11-point difference indicates that resistance band exercises provide a more optimal training stimulus and enhance student motivation, making this method appropriate for implementation in physical education (PJKE) learning.

5. ACKNOWLEDGEMENT

Hereby declare that the article included in my undergraduate skripsi is entirely my own original work. This article was written independently without any form of plagiarism, fabrication, or unauthorized assistance, and all sources of information used have been properly cited in accordance with academic standards. I fully acknowledge that if, at any time, this statement is proven to be false, I am willing to accept any academic sanctions imposed by the university in accordance with the applicable regulations.

6. REFERENCES

- Ahmad, N., Muhammad, M., Dyah, A. I., Bahaiddin, M. A., & Ismawati, N. (2024). Gerakan Tubuh Manusia: Biomekanika Dalam Olahraga.
 Arfanda, P. E. (2024). Dasar-Dasar Atletik Jalan dan Lari. Penerbit NEM.

- Bloom, Benjamin S. (2017). *Industrial Psychology: It's Theoretical and Social Foundation*. New York: Harper & Row.
- Cahyono, I. F., & Kuncoro, B. (2024). PERBEDAAN PENGARUH LATIHAN TOLAK PELURU GAYA OÂ€™ BRIEN MENGGUNAKAN METODE LATIHAN EXPLOSIVE SQUAT THROW DAN LATIHAN PLYOMETRICS SINGEL-ARM PUSH PASS TERHADAP PENINGKATAN HASIL PRESTASI PADA ATLET PUTRA CLUB ADIOS TRACK AND FIELD SURAKARTA TAHUN 2023. *JURNAL KREATIF OLAHRAGA*, 1(2), 1-18.
- Dermawan, H., & Hasibuan, A. (2024). Metode Penelitian Eksperimen: Prinsip, Prosedur, dan Aplikasi dalam Penelitian Ilmiah. *Factory Jurnal Industri, Manajemen dan Rekayasa Sistem Industri*, 3(2), 47-50.
- Elpna Rosa, E. L. P. N. A. (2023). *Hubungan Kekuatan Otot Lengan Terhadap Hasil Tolak Peluru Gaya Obrain Siswa Kelas Ix Smpn 3 Seluma* (Doctoral Dissertation, Universitas Dehasen Bengkulu).
- Gardner, Howard. (2016). *Multiple Intelligence*. United States: Basic Books.
- Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional.
- Nurhayati, R. (2020). Pendidikan Anak Usia Dini Menurut Undang-Undang No, 20 Tahun 2003 Dan Sistem Pendidikan Islam. *Al-Afkar, Journal For Islamic Studies*, 57-87.
- Lafendry, F. (2023). Teori Pendidikan Tuntas Mastery Learning Benyamin S. Bloom . *Tarbawi: Jurnal Pemikiran Dan Pendidikan Islam*, 6(1), 1-12.
- Prianto, D. A. (2021). Olahraga Pendidikan Dan Olahraga Prestasi. *Kajian Ilmu Keolahragaan Ditinjau Dari Filsafat Ilmu*, 135.
- Rizky, M. R., Hafidzh, A., Wulandari, F. Y., & Sidik, R. M. (2025). *Buku Panduan Pengembangan dan Penerapan Model Program Latihan untuk Meningkatkan Kondisi Fisik Daya Tahan, Kelincahan, dan Kecepatan dalam Cabor Futsal*. Penerbit NEM.
- Ramadhan, Ziko Fajar dkk. (2023). "Pengaruh Latihan Resistance Band dan Latihan Beban (Barbel 1 Kg) Terhadap Power Otot Lengan Pada Atlet Taekwondo Pesawaran Provinsi Lampung". *Jurnal Penjaskesrek*, Volume 10, Nomor 1, Mei 2023. Universitas Aisyah Pringsewu. Lampung.
- Siti Hasnawati. (2021). *Pengembangan Panduan Latihan Resistance Band dalam Upaya Peningkatan Kekuatan Cabang Olahraga Atletik*. Yogyakarta: Skripsi, Program Studi Pendidikan Kepelatihan Olahraga, Fakultas Ilmu Keolahragaan, Universitas Negeri Yogyakarta.
- Suryahardaputra, A. J. (2022). Penerapan Resistance Band Dan Dumbell Terhadap Peningkatan Hasil Belajar Pukulan Depan Pencak Silat Pada Siswa Kelas VIII F SMP N 26 Surakarta Tahun Ajaran 2022/2023.
- Waluyo, E., Septian, A., Jerilian, E., Hidayat, I. N., Prahadi, M. A., Prasetyo, T., & Sabilah, A. I. (2024). Analisis data sample menggunakan uji hipotesis penelitian perbandingan menggunakan uji anova dan uji t. *Jurnal Ekonomi Dan Bisnis*, 2(6), 775-785.