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## MODIFIED SHOT-PUT EQUIPMENT AND STUDENTS' INTEREST IN PHYSICAL EDUCATION

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### Abstract

This study examined changes in students' interest in physical education after two lessons using modified shot-put equipment. A one-group pretest–posttest design involved all 21 students in class X A at SMK As-Shofwah NWDI Renco. A 20-item, five-point Likert questionnaire assessed enjoyment, attention, attraction, and active involvement before and after the lessons. Paired scores were compared using a paired-samples t test. Mean interest increased from 56.71 (range 39–73) to 85.62 (range 76–93). The mean increase was 28.90 points (95% CI 23.37–34.44),  $t(20)=10.899$ ,  $p<.001$ , with a large within-participant effect ( $d_n=2.38$ ). Students reported substantially greater interest after the modified-equipment lessons. Because the study had no control group and included only one class, the increase cannot be attributed exclusively to the equipment modification.

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A - Conception and design of the study; B - Acquisition of data; C - Analysis and interpretation of data; D - Manuscript preparation; E - Obtaining funding

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## INTRODUCTION

Physical education can support motor competence, social participation, and lifelong engagement in physical activity, but these benefits depend on students being willing to attend to and participate in lessons. Interest is especially relevant because it directs attention, sustains effort, and can develop from a short-lived response to a learning situation into a more enduring preference (Hidi & Renninger, 2006). In physical education, supportive environments that help students feel competent, autonomous, and connected are consistently associated with more self-determined forms of motivation (Saugy et al., 2020; Vasconcellos et al., 2020).

Shot put presents a practical challenge in schools. Regulation implements may be unavailable, too heavy for novice learners, or perceived as intimidating. When equipment is scarce or poorly matched to students' capabilities, waiting time and



reluctance to practise can reduce active participation. Adapting an implement's size, mass, material, or appearance may lower the initial task constraint and provide more successful trials while teachers preserve the essential movement pattern and safety rules.

Research in Indonesian school settings generally supports modified implements for teaching shot put, although most studies have focused on skill or completion of learning criteria. Tampubolon and Hamonangan (2020) reported improved learning outcomes in vocational-school students, Sulistianta et al. (2022) developed modified implements for the orthodox and O'Brien techniques, and Marsianus and Maksum (2024) documented improvement during classroom action research. Maulana et al. (2023) more directly reported higher participation and interest among primary pupils. Sajiwo et al. (2025) likewise found that modified shot-put equipment supported learning outcomes. These studies suggest promise, but differences in age group, design, and outcome measurement limit direct generalization.

Evidence is particularly limited for vocational-school students when learning interest is measured before and after a brief intervention. The present study therefore examined whether interest scores changed after two physical-education lessons using modified shot-put equipment in class X A at SMK As-Shofwah NWDI Renco. We expected posttest scores to exceed pretest scores. Because the design did not include a comparison group, the analysis was intended to quantify within-class change rather than establish definitive causality.

## **METHOD**

### **Design, Setting, and Participants**

This quantitative study used a one-group pretest–posttest design. All 21 students enrolled in class X A at SMK As-Shofwah NWDI Renco participated through total sampling. The study ran from 23 April to 21 May 2026 within the regular physical-education timetable. The source manuscript did not report students' age, sex distribution, prior shot-put experience, eligibility criteria, consent procedures, or ethics approval; these details should be supplied before submission.

### **Intervention and Procedure**

Students completed the pretest on 23 April 2026, received modified shot-put lessons on 30 April and 7 May, and completed the posttest on 21 May. The intervention was intended to make introductory shot-put practice safer and more approachable than practice with a standard implement. However, the source record does not specify the modified implement's material, diameter, mass, construction, lesson duration, teaching sequence, number of trials, instructor, safety procedures, or implementation fidelity. Those details are necessary for replication and should be recovered from field notes rather than inferred.

### **Measure**

Learning interest was assessed with the same 20-item questionnaire at both time points. Items represented enjoyment, attention, attraction, and active involvement and used a five-point response scale from 1 (strongly disagree) to 5 (strongly agree), giving a possible total score of 20–100. In the study sample, item–total correlations ranged from .516 to .883 and Cronbach’s alpha was .973. These values indicate strong internal consistency, although validation in the same small sample used for outcome testing may overstate precision, and an alpha this high can also reflect item redundancy (Cronbach, 1951).

### Statistical Analysis

Pretest and posttest scores were summarized by means and ranges. A paired-samples *t* test compared the two measurements at  $\alpha=.05$ . From the reported mean difference and *t* statistic, the standard error, standard deviation of paired differences, 95% confidence interval, and within-participant effect size ( $d_n=t/\sqrt{n}$ ) were reconstructed (Lakens, 2013). The source record did not report a normality assessment of paired differences or participant-level data, so distributional assumptions and influential observations could not be independently examined.

## RESULTS

All 21 students contributed pretest and posttest scores. Mean interest rose by 28.90 points, equivalent to 51.0% of the pretest mean. The paired-difference standard deviation reconstructed from the reported statistics was 12.15 points. Descriptive results are shown in Table 1.

Table 1.

Learning-interest scores before and after the modified-equipment lessons

| Measurement | n  | Mean  | Minimum | Maximum |
|-------------|----|-------|---------|---------|
| Pretest     | 21 | 56.71 | 39      | 73      |
| Posttest    | 21 | 85.62 | 76      | 93      |

The paired comparison was statistically significant,  $t(20)=10.899$ ,  $p<.001$ . The estimated mean increase was 28.90 points (95% CI 23.37–34.44), and the standardized within-participant effect was large,  $d_n=2.38$  (Table 2). The direction is reported as a positive increase; the original software output used pretest minus posttest and therefore displayed negative signs.

Table 2. Paired comparison of learning-interest scores

| Contrast         | Mean increase | 95% CI      | SD of change | t (df)      | p     | $d_n$ |
|------------------|---------------|-------------|--------------|-------------|-------|-------|
| Posttest–pretest | 28.90         | 23.37–34.44 | 12.15        | 10.899 (20) | <.001 | 2.38  |

## **DISCUSSION**

Students reported markedly greater interest after two lessons using modified shot-put equipment. The 28.90-point mean increase was statistically clear and large relative to the variability of individual changes. Scores also moved from the middle portion of the questionnaire scale toward its upper end. This pattern is consistent with the idea that an implement better matched to novice learners can make practice less threatening, increase the number of attainable attempts, and make the lesson feel more inviting.

The finding aligns with school-based shot-put research. Maulana et al. (2023) reported improved interest and participation after introducing modified equipment, while Tampubolon and Hamonangan (2020), Sulistianta et al. (2022), Marsianus and Maksum (2024), and Sajiwo et al. (2025) found gains in skill-related or learning outcomes. The present study adds a vocational-school sample and a questionnaire-based affective outcome. It does not, however, show that affective responses improve more quickly than motor learning because no motor outcome was measured and the cited studies used different designs.

A plausible explanation comes from self-determination theory. Equipment that permits early success may support perceived competence; repeated access may provide meaningful choice and agency; and shared practice can foster relatedness. These experiences can strengthen autonomous motivation and engagement (Ryan & Deci, 2020). Reviews in physical education generally connect need-supportive teaching with more adaptive motivation, although effects vary by context and study quality (Saugy et al., 2020; Vasconcellos et al., 2020; White et al., 2021). Modified equipment is therefore best understood as one element of a broader teaching climate, not as a motivational mechanism on its own.

The very large effect warrants caution. With no control class, change may reflect novelty, repeated questionnaire exposure, teacher attention, expectancy, ordinary instruction, or events occurring during the four-week period. The posttest range of 76–93 was high and relatively compressed, suggesting a possible ceiling effect. In addition, the same 21 students appear to have been used for item validation, reliability estimation, and outcome testing. Internal consistency was high, but this does not establish content validity, temporal stability, or sensitivity to change.

For practice, teachers may use lighter, softer, and appropriately sized implements during initial learning, while progressively restoring task demands as control and confidence improve. The implement must still allow the intended pushing action rather than encourage throwing, and lesson plans should specify safety zones, turn-taking, feedback, and progression. Equipment details and students' exposure should be documented so other teachers can reproduce the approach.

Future research should compare modified and standard-equipment groups, randomly allocate classes where feasible, and include follow-up measurements after novelty has diminished. Larger multisite samples should report age, sex, prior experience, attendance, lesson dosage, and adverse events. Pre-registered analyses, validated interest measures, participant-level plots, and both affective and motor outcomes would clarify whether greater interest accompanies better technique and sustained participation.

## CONCLUSION

Basic running-skill scores increased among 15 third-grade pupils during a 16-lesson Bentengan program. Mean improvement was 15.13 points (95% CI 12.32–17.95),  $t(14)=11.542$ ,  $p<.001$ ,  $d_n=2.98$ . Bentengan is a promising culturally relevant option for elementary physical education, but the uncontrolled design and incompletely documented measure prevent a definitive causal conclusion.

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