Interval Circuit Training and the Cardiovascular Fitness of Grade 8 Learners

An Action Research

[Copy for blind review: the researchers' names, positions, and school are removed. The final copy lists them here.]

Conducted June to November 2025

Abstract

This action research tested whether a 15-minute interval circuit in Physical Education (PE) and Health periods would improve the cardiovascular endurance of Grade 8 learners, measured with the Department of Education's (DepEd) Physical Fitness Test (PFT). Two Grade 8 sections of one teacher in a public secondary school took part in School Year 2025–2026; a coin toss gave one section the circuit and the other the usual warm-up for the same 15 minutes. The circuit ran twice a week from July 1 to October 21, 2025: ten 30-second bouts of body-weight exercise, each followed by 30 seconds of rest. All 83 learners with parental consent took the PFT at the start of Quarter 1, and 81 at the start of Quarter 3, as DepEd schedules it; 79 had both step tests. The primary outcome, chosen before the study, was the heart rate after the 3-minute step test; the other eleven PFT items were secondary, with Holm's correction. Each posttest was analyzed by analysis of covariance (ANCOVA) with its pretest and sex as covariates. The circuit section's heart rate after the step test was 9.7 beats per minute lower than the comparison section's, 95% CI [−14.2, −5.2], $p < .001$, Hedges' $g = -0.64$. After Holm's correction, the circuit section also did 2.9 more push-ups, held the plank 9.4 s longer, and jumped 5.6 cm farther. A stork balance difference, $p = .024$, did not survive the correction, and the other seven items showed no significant difference. The step test's test-retest reliability was .81, so one learner's change had to exceed 14.8 beats per minute to be told from measurement error. The circuit ran 30 of its 32 planned sessions, with no injury beyond first aid. The circuit is recommended for Grade 8 PE and Health, with the

comparison section taking it from November and a study across more sections to follow.

Keywords: physical fitness test, high-intensity interval training, cardiovascular endurance, analysis of covariance, physical education

Acknowledgment

The researchers thank the school head, who approved the study and kept both sections' PE and Health periods on Tuesdays and Thursdays for two quarters; the two MAPEH teachers of other grades who gave both rounds of the Physical Fitness Test; the school's clinic focal, who reviewed the health questionnaires and arranged the referrals; the Grade 8 advisers, who sent the consent forms home and collected them; the parents, who answered the health questions with their children; and the 83 learners, who stepped, jumped, and planked through two rounds of testing four months apart. The study was funded by the researchers.

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Context and Rationale

DepEd counts on learners being active every day. Its national calisthenics routine, *Galaw Pilipinas*, takes four minutes and is meant to "contribute to the 60 minutes of moderate to vigorous physical activity (MVPA) prescribed daily for children 5-17 years of age" (Department of Education [DepEd], 2021, Sec. I). Overweight and obesity among Filipino adolescents rose "from 4.9% in 2003 to 9.2% in 2015 and 11.6% in 2018" (Platon-Desnacido et al., 2022). The Philippines' 2022 report card on physical activity gave physical fitness an incomplete grade because "public schools conducted regular physical fitness testing, but no publicly available reports had been produced" (Cagas et al., 2022).

Our own sections showed the need. On the Physical Fitness Test (PFT) at the start of Quarter 1, the learners' heart rate after the 3-minute step test averaged 130.1 beats per minute in Section A and 128.2 in Section B. Only 4 of 42 learners of Section A did enough push-ups to reach "Good" in DepEd's table, and 2 of 42 reached it on the stork balance stand. The PFT is DepEd's own measure of fitness, given "at the beginning of the first quarter and of the third quarter, to monitor improvement/progress" (DepEd, 2019, para. 5).

The MATATAG curriculum asks Grade 8 learners in the first quarter to "execute appropriate skills of sports and the required fitness abilities of chosen striking/fielding games in responding to tactical problems" (DepEd,

2023, p. 36). It does not say how that fitness is to be built in the two PE and Health periods a week, and it does not name the PFT.

High-intensity interval training (HIIT), short bouts of hard exercise separated by rest, fits a PE period with no gym and no equipment. A review of 42 school-based HIIT programs found a large average effect on cardiorespiratory fitness in the 25 studies that measured it against a control group, a standardized mean difference of 1.0, 95% CI [0.7, 1.3]. The effect was only 0.41, 95% CI [0.12, 0.70], in the five studies with a low risk of bias from deviations from the intended intervention (Duncombe et al., 2022). Against control groups, most of which did no exercise, HIIT improved adolescents' cardiorespiratory fitness by $g = 0.86$, 95% CI [0.52, 1.11], and longer or larger programs did no better than short ones (Martin-Smith et al., 2020). A review of HIIT in school against active control conditions found that "neither form of HIIT was more beneficial for parameters related to cardiorespiratory fitness than the control interventions" (Bauer et al., 2022).

Two school programs come close to a Philippine PE period. In a pilot with 65 Australian adolescents, 8 to 10 minutes of 30-second bouts with little equipment, three times a week, gave a gain in cardiorespiratory fitness after eight weeks that was small and not significant (Costigan et al., 2015). In a trial with Grade 11 students in 20 schools, teacher-led sessions of 8 to 20 minutes in academic lessons, with heart rate monitors, improved fitness at six months, mostly by stopping a decline, and not at twelve (Lubans et al., 2021).

The evidence supports trying HIIT in PE and does not promise a result. Whether a twice-weekly interval circuit raises the cardiovascular endurance of Grade 8 learners in a Philippine public school, measured with DepEd's own test, is a question for our own classes. The study addresses the Teaching and Learning theme of the Basic Education Research Agenda (DepEd, 2016).

Innovation, Intervention, and Strategy

The innovation was an interval circuit in the first 15 minutes of each PE and Health period of one Grade 8 section, from July 1 to October 21, 2025. The school's class program gave PE and Health two of the five 45-minute MAPEH periods a week, on Tuesdays and Thursdays, in both sections. Everything else stayed the same: the teacher, the quarter's competencies and lessons, and the *Galaw Pilipinas* routine both sections did at the flag ceremony.

The Circuit

Each session had three parts. A 3-minute dynamic warm-up (marching, arm circles, leg swings, and easy skipping) came first. Then came the intervals: ten bouts of 30 seconds of work, each followed by 30 seconds of rest, at five stations taken twice: jumping jacks, high knees in place, squat jumps, mountain climbers, and 5-meter shuttle runs between taped lines. Two minutes of walking and slow breathing ended the session. In the first two weeks, the intervals lasted 8 and then 9 minutes while the learners learned the stations; from the third week they lasted 10 minutes, as in the pilot of Costigan et al. (2015). The learners worked in pairs on the covered court, one counting the partner's repetitions. A learner who could not keep the pace

could march instead of jump or step instead of run, and a learner advised by a physician worked at his own pace.

From the fifth week, the squat jumps and mountain climbers alternated with push-ups (from the knees or the toes, as each learner chose) and a forearm plank hold, so that the circuit trained the upper body and trunk as well. The PFT tests push-ups and the plank, so gains on those two items partly reflect practice of the test's own movements, and the results are read that way.

The Intensity

The school had no heart rate monitors. After each interval block, every learner rated how hard it had felt on a scale from 0 (rest) to 10 (the hardest effort they could make), and the teacher recorded the class's mean. The target was "hard," 7 or more. During the bouts, the teacher watched for learners who could still talk easily and urged them on.

The Comparison Section

The comparison section spent the same 15 minutes on the warm-up it had always done: two laps of jogging around the court, calisthenics, and static stretching, before the lesson. It received the circuit from the start of Quarter 3, after the posttest.

Strategy and Evaluation Plan

A coin toss on June 13, 2025, witnessed by the school's research coordinator, decided which of the teacher's two Grade 8 sections would have the circuit. Both sections took the full PFT at the start of Quarter 1 and again

at the start of Quarter 3, as DepEd schedules it (DepEd, 2019, para. 5). Three criteria for success were set in advance:

1. At least 90% of the planned sessions held, with a class mean rating of effort of 7 or more in at least three of every four sessions held.
2. A lower adjusted heart rate after the step test in the circuit section than in the comparison section, significant at the .05 level.
3. No injury in the circuit that needed more than first aid.

Action Research Questions

Main question: Does a 15-minute interval circuit in PE and Health periods improve the cardiovascular endurance of Grade 8 learners, as measured by DepEd's Physical Fitness Test?

1. What were the two sections' results on each PFT item at the start of Quarter 1 and of Quarter 3?
2. Is there a significant difference between the two sections' heart rates after the 3-minute step test at the start of Quarter 3, adjusting for the pretest and sex?
3. Is there a significant difference between the two sections on each of the other eleven PFT items, adjusting for the pretest and sex, after correcting for the number of items tested?
4. How reliable were the step test and the counting of push-ups and plank times, and how many learners changed by more than the step test's measurement error?
5. How did the two sections' results compare with DepEd's PFT tables?

Two null hypotheses were tested:

$H_0$1: There is no significant difference between the two sections' adjusted heart rates after the 3-minute step test at the start of Quarter 3 (a = .05).

$H_0$2: On each of the other eleven PFT items, there is no significant difference between the two sections' adjusted posttest results (family-wise a = .05, Holm's procedure).

Action Research Methods

Research Design

The study used a quasi-experimental pretest–posttest design with a nonequivalent comparison group. Learners could not be assigned to conditions one by one, because a PE class is taught as a section, so a coin toss decided which of the two intact sections had the circuit. With one section in each condition, the circuit's effect cannot be separated from everything else that differs between the two sections, which the What Works Clearinghouse calls an "N = 1 confounding factor" (What Works Clearinghouse [WWC], 2022, p. 14). The pretest showed how similar the sections were, and the analysis adjusted for the difference that remained. The pretest and posttest were the school's own PFT rounds at the start of Quarters 1 and 3, so the study added no test that DepEd does not already require.

Participants and Other Sources of Data and Information

The participants were the learners of the teacher's two Grade 8 sections in a public secondary school in School Year 2025–2026, the first year of the MATATAG curriculum in Grade 8 (DepEd, 2024). Of the 89 learners enrolled, 45 in Section A and 44 in Section B, the parents of 83 gave consent: 42 in

Section A, the circuit section, and 41 in Section B, the comparison section. They were 37 girls and 46 boys; at the pretest, 74 were 13 years old, 8 were 14, and 1 was 15. All learners took the PFT as part of PE; only the results of learners with consent were used.

Three learners answered yes to a question of the health questionnaire. One, in Section A, had asthma; a physician advised him to join the circuit at his own pace and to skip maximal tests, so he took neither the step test nor the sprint. One, in Section B, had a knee injury from basketball and was advised not to jump, sprint, or step up in Quarter 1; he took the step test, sprint, long jump, and hexagon test at the posttest only, so he was left out of their analyses. One, in Section A, had felt dizzy once in May and was cleared by the school physician before the pretest. One learner of Section A missed the posttest and its make-up day through illness, and one of Section B transferred out after September 19, 2025. The analyses therefore counted 40 and 39 learners on the step test and 41 and 40 on most other items.

Other sources of data were the session log (the date, the minutes of intervals, the class's mean rating of effort, and attendance), the incident log, a retest of the step test, and a second scorer's counts for a subset of learners.

Sample Size and Power

With two intact sections, the number of learners was fixed, so the question was the smallest effect the study could detect. With 42 and 41 learners, a two-tailed t test at $\alpha = .05$ and power of .80 detects $d = 0.62$. An ANCOVA reduces the error variance by the share the pretest explains. With the correlation of .70 between June and November step test results in the

school's PFT records of the previous year, the detectable effect falls to 0.44, about 5.8 beats per minute at that year's standard deviation of 13. Without the pretest, a difference of 0.50 standard deviation would need 64 learners per section.

Data Gathering Methods

The Physical Fitness Test

The PFT followed DepEd's Revised Physical Fitness Test Manual (DepEd, 2019, Encl. No. 1) and its suggested sequence: body mass index (BMI) and the 3-minute step test on the first day; the basic plank, 40-meter sprint, push-up, stick drop, and sit-and-reach on the second; and the hexagon agility test, juggling, standing long jump, stork balance stand, and zipper test on the third. The pretest ran on June 24 to 26, 2025, and the posttest on November 4 to 6, 2025, in the first week of Quarter 3, which began on November 3 (DepEd, 2025a, Encl. No. 2). Both rounds were given in the same covered court, in the morning periods, with the same equipment: a 12-inch wooden step box and a metronome at 96 beats per minute for the step test, a tape measure fixed to the wall with an L-square for height, the school clinic's calibrated beam balance for weight, mats, stopwatches, a 12-inch ruler, and a sipa made of a washer and straw. Learners wore their PE uniforms, and the same clothes at both weighings. Each result was written on DepEd's PFT score card (DepEd, 2019, Encl. No. 2) and then entered in an Excel file under the learner's code.

The manual leaves some choices open, and the study fixed them in advance:

1. The step test's heart rate was counted by the learner, as the manual directs: the pulse found within 5 seconds of stopping, counted for 10 seconds, and multiplied by 6. Every recorded rate is therefore a multiple of 6. The learners practiced finding and counting their pulse in two PE periods before the pretest, on June 17 and 19, 2025, when they also went through every test "with minimal effort exerted to familiarize themselves with testing procedures" (DepEd, 2019, Encl. No. 1).
2. The zipper test was recorded for each shoulder, an overlap as a positive and a gap as a negative number of centimeters, and analyzed as the mean of the two.
3. The score card's own rules gave one result for each test: the better of two sit-and-reach and long jump trials, the best of three juggling trials, the mean of the two hexagon revolutions and of the two feet on the stork stand, and the middle of three stick drops.
4. BMI was computed as weight in kilograms over the square of height in meters, from weight to the nearest 0.5 kilogram and height to the nearest 0.1 centimeter (DepEd, 2019, Encl. No. 1).

Testers and Reliability

Two MAPEH teachers who taught other grades gave both rounds. They studied the manual together and rehearsed each station with a Grade 9 class before the pretest. They were not told which section had the circuit, though a learner could have told them.

Two checks were planned. First, 30 learners, 15 from each section, drawn by lot from those with no health concern, took the step test again on

June 27, three days after the pretest, to estimate its test-retest reliability. Second, both testers counted the push-ups and timed the plank of 40 learners at the pretest, 20 from each section, to estimate the agreement between scorers. Reliability was estimated as the intraclass correlation for absolute agreement of single measurements, ICC(A,1), and read against the bands of Koo and Li (2016): below .50 poor, .50 to .75 moderate, .75 to .90 good, and above .90 excellent. The standard error of measurement (SEM) was the standard deviation of all the retest results, both days together, times the square root of 1 minus the ICC, and the minimal difference at 95% confidence (Weir's MD, often called the minimal detectable change) was 1.96 times the square root of 2 times the SEM (Weir, 2005).

The Session and Incident Logs

For every PE and Health period of both sections, the teacher recorded whether it was held, the minutes of intervals, the class's mean rating of effort, the number of learners present, and any injury or complaint with what was done about it.

Ethical Considerations

The school head approved the study in May 2025. At the Grade 8 parents' orientation on June 13, 2025, the parents received a letter in English and Filipino, gave written consent for the use of their children's PFT results in the study, and completed with their children the Physical Activity Readiness Questionnaire for Everyone (PAR-Q+; Warburton et al., 2011), which a parent signs for a minor. The one learner aged 15 also answered the PAR-Q & YOU questionnaire that the PFT manual requires of learners 15

years old and above (DepEd, 2019, para. 7). The school's clinic focal reviewed every yes answer and arranged the physicians' advice described above. Each learner gave assent in the first PE period.

The learners' health answers, and the height and weight taken to assess their nutritional status, are information about their health, which the Data Privacy Act of 2012 treats as sensitive personal information (Republic Act No. 10173, Sec. 3(l)(2)). Learners were weighed and measured one at a time behind a screen, and no BMI was read aloud, posted, or compared in class. Each learner kept their own score card, the data file used codes, and the key linking codes to names stayed in a locked cabinet in the school office. The study followed the Research Management Guidelines (DepEd, 2017) and the Child Protection Policy (DepEd, 2012). PFT results did not count toward grades. The comparison section received the circuit after the posttest, so no learner was denied it for the study's sake. The researchers' use of an artificial intelligence (AI) tool is declared in Appendix D (DepEd, 2026a).

Data Analysis

For the first question, each PFT item was described by section and occasion. For the second and third, each posttest was analyzed by ANCOVA: an ordinary least squares regression of the posttest on the section (1 = circuit), sex (1 = boy), and the pretest. ANCOVA is preferred to comparing gain scores because it adjusts for a baseline difference between groups and has more power (Vickers & Altman, 2001). Sex was included because DepEd's push-up protocol differs by sex and because boys and girls differed on several items. The section's coefficient is the adjusted difference: how much the circuit

section's posttest differed from the comparison section's for learners with the same pretest and sex.

The effect size, Hedges' g, was the adjusted difference divided by the pooled within-section standard deviation of the posttest, with the small-sample correction $1 - 3/(4N - 9)$, as the What Works Clearinghouse computes it: from a covariate-adjusted difference and the unadjusted standard deviations of the outcome (WWC, 2022, pp. 137, 162–163). Baseline equivalence was the same statistic on the pretest: a difference between 0.05 and 0.25 standard deviation requires statistical adjustment, and a larger one fails the What Works Clearinghouse's standard (WWC, 2022, pp. 53–54).

The step test was the primary outcome, named before the study and tested alone at $\alpha = .05$. The other eleven items were secondary and were tested as one family with Holm's (1979) procedure: the p values were sorted from smallest to largest, the smallest was compared with .05/11, the next with .05/10, and so on, and the procedure stopped at the first item that missed its threshold.

For the primary outcome, the homogeneity of regression slopes was checked by adding the interaction of section and pretest, the normality of residuals by the Shapiro–Wilk test, and the equality of residual variances by Levene's test, centered on the median. Four checks followed: the ANCOVA without sex, with heteroskedasticity-consistent (HC3) standard errors, and without the learners who had answered yes on the health questionnaire, and a Welch t test on the gain scores. For the fourth question, the ICCs, SEM, and minimal detectable change were computed as described above. For the fifth,

the results were read against DepEd's tables (DepEd, 2019, Encl. No. 1), and the session and incident logs were summarized against the criteria for success.

All analyses were run in Python 3.12 with pandas, statsmodels (Seabold & Perktold, 2010), and pingouin. The Excel data set computes every ANCOVA, Holm's correction, and the ICCs as formulas, and the notebook reproduces them in Python (Appendix A).

Discussion of Results and Reflection

Implementation

The circuit section held 30 of its 32 planned sessions (93.8%); two were lost to the school's intramurals on September 23 and 25, 2025, and August 21 was a holiday. The intervals lasted 9.8 minutes on average. The class's mean rating of effort averaged 7.2, from 6.4 to 7.9, and reached 7 or more in 24 of the 30 sessions held. An average of 40.1 of the 42 learners took part in each session. The first criterion for success was met.

One learner twisted an ankle at the shuttle station on July 3 and returned the next week after first aid, and several learners reported sore legs in the first week. The comparison section's only incident was a bruised knee in a kickball game. No injury needed more than first aid, so the third criterion was met.

Question 1: The Two Sections' PFT Results

Table 1 gives every PFT item for both sections in June and November. At the pretest, the circuit section's heart rate after the step test averaged 130.1 beats per minute and the comparison section's 128.2, a difference of

0.13 standard deviation. That is between 0.05 and 0.25, so the analysis had to adjust for it (WWC, 2022, p. 53). No item differed between the sections at the pretest by more than 0.25 standard deviation. By November, the circuit section's rate had changed by −12.0 beats per minute on average and the comparison section's by −2.2.

Table 1

PFT Results at the Start of Quarter 1 (June) and of Quarter 3 (November), by Section

PFT item	Circuit, June	Circuit, November	Comparison, June	Comparison, November
Step test, heart rate after (bpm)	130.1 (15.5)	118.1 (15.8)	128.2 (12.4)	126.0 (14.5)
Push-ups (number)	10.4 (5.5)	14.1 (6.6)	11.2 (6.0)	12.1 (6.1)
Basic plank (s)	43.9 (15.1)	56.1 (16.3)	47.5 (14.9)	49.9 (18.8)
Zipper test, both shoulders (cm)	0.2 (4.3)	0.6 (4.2)	−0.7 (4.3)	−0.7 (4.3)
Sit-and-reach (cm)	31.8 (7.1)	33.5 (8.2)	32.1 (7.7)	32.7 (8.1)
Body mass index (kg/m²)	19.00 (2.78)	18.99 (2.85)	18.71 (2.55)	18.80 (2.58)
Juggling (hits)	26.2 (16.2)	28.5 (16.2)	27.6 (15.0)	29.8 (17.1)
Hexagon agility test (s)	12.57 (1.94)	12.15 (1.90)	12.81 (2.05)	12.50 (2.47)
40-meter sprint (s)	7.80 (0.66)	7.59 (0.68)	7.67 (0.76)	7.55 (0.77)
Standing long jump (cm)	153.7 (25.6)	161.5 (26.7)	156.3 (18.2)	158.7 (17.3)
Stork balance stand (s)	13.2 (8.8)	17.2 (12.5)	12.7 (10.5)	13.5 (10.8)
Stick drop (cm)	15.5 (3.6)	15.1 (4.8)	15.2 (4.1)	14.4 (5.1)

Note. Values are *M* (*SD*). Circuit and comparison sections: 40 and 39 learners on the step test, 40 and 39 on the sprint, 41 and 39 on the hexagon test, 41 and 39 on the standing long jump, and 41 and 40 on the other items. Lower is fitter for the step test, hexagon, sprint, and stick drop. Boys did push-ups from the toes and girls from the knees, as DepEd's manual directs. bpm = beats per minute.

Question 2: The Step Test

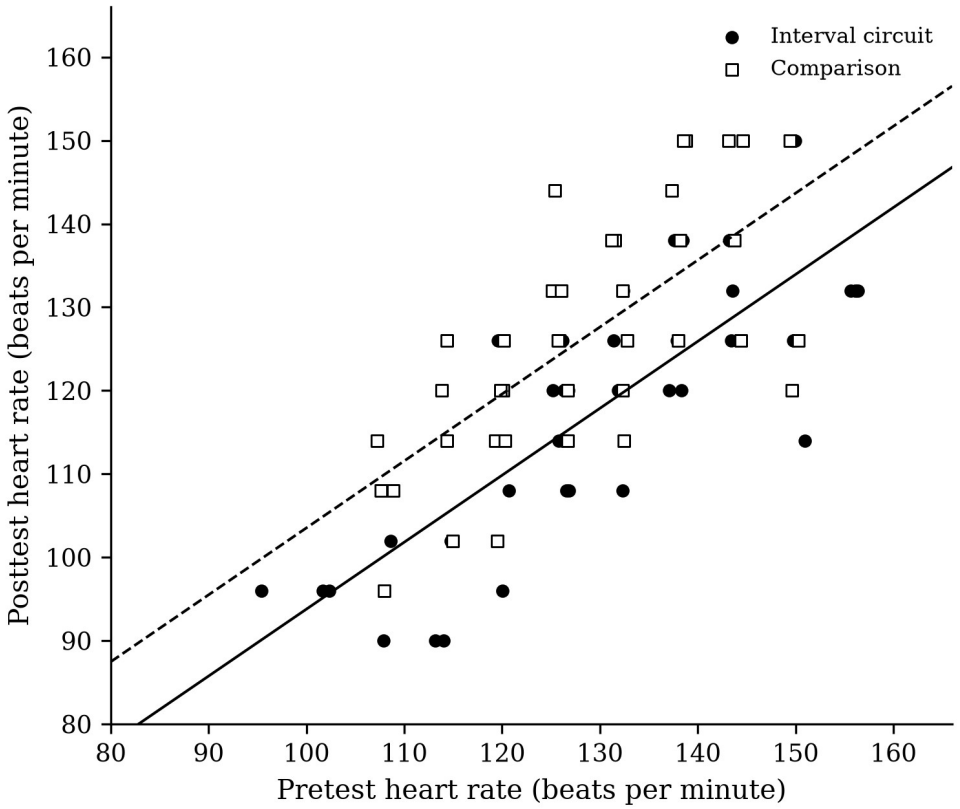
Adjusting for the pretest and sex, the circuit section's heart rate after the step test was 9.7 beats per minute lower than the comparison section's:

adjusted means 117.2 and 126.9, difference −9.7, 95% CI [−14.2, −5.2], $t(75) = -4.31$, $p < .001$, partial $\eta^2 = .20$, Hedges' $g = -0.64$, 95% CI [−0.93, −0.34] (Table 2 and Figure 1). $H_0 1$ is rejected, and the second criterion for success was met.

The checks agreed. The slopes of the posttest on the pretest did not differ between the sections, $F(1, 74) = 0.00$, $p = .977$. The residuals did not depart from normality, $W = .985$, $p = .484$, or differ in variance between the sections, Levene's test (median-centered) $F(1, 77) = 0.57$, $p = .452$. Without sex in the model, the difference was −9.51, 95% CI [−13.94, −5.08]. With HC3 standard errors, the interval was [−14.27, −5.22]. Without the three learners who had answered yes on the health questionnaire, the difference was −9.56, 95% CI [−14.12, −5.00]. Compared by their gains, the sections differed by −9.85 beats per minute, Welch's $t(75.81) = -4.32$, $p < .001$.

Figure 1

Heart Rate After the 3-Minute Step Test in June and November, by Section



Note. Each point is a learner, spread slightly so that learners with the same rates show. The lines are the ANCOVA's fit for each section; the vertical distance between them is the adjusted difference. Lower is fitter.

Question 3: The Other Eleven PFT Items

Before correction, four of the eleven secondary items differed at the .05 level: the push-ups, the plank, the standing long jump, and the stork balance stand (Table 2). Holm's procedure kept three. The plank, with the smallest p, passed its threshold of .0045, the push-ups passed .0050, and the long jump passed .0056. The stork balance stand, $p = .024$, missed its threshold of .0063, and the procedure stopped there. $H_0 2$ is rejected for the push-ups, the plank, and the standing long jump, and retained for the other eight items.

The three items that passed are the ones the circuit trained most directly. The circuit section did 2.9 more push-ups, 95% CI [1.4, 4.4], g = 0.45; held the plank 9.4 seconds longer, 95% CI [5.0, 13.8], g = 0.53; and jumped 5.6 centimeters farther, 95% CI [1.7, 9.4], g = 0.24. On the flexibility items, BMI, and the skill items (juggling, hexagon agility, sprint, and stick drop), no difference could be told from chance. The stork balance stand's difference of 3.7 seconds, 95% CI [0.5, 6.9], is uncertain: among eleven items, a p below .05 can turn up by chance, which is what Holm's correction guards against.

Table 2

ANCOVA of Each PFT Item at the Start of Quarter 3, Adjusted for the Pretest and Sex

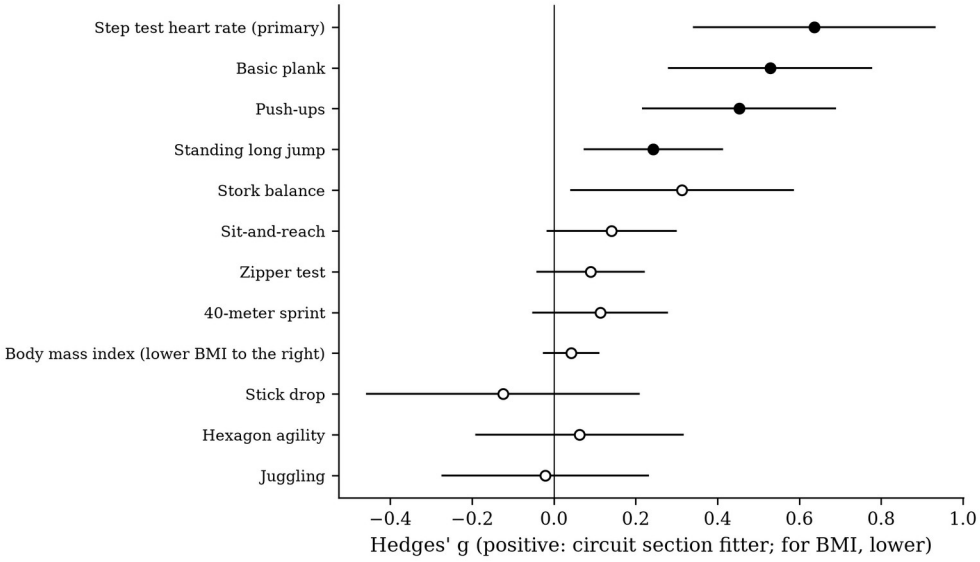
PFT item	Adjusted difference [95% CI]	t	p	Holm p	Hedges' g	Baseline g
Step test, heart rate after (bpm)	−9.7 [−14.2, −5.2]	−4.31	< .001		−0.64	0.13
Push-ups (number)	2.9 [1.4, 4.4]	3.83	< .001	.003	0.45	−0.13
Basic plank (s)	9.4 [5.0, 13.8]	4.26	< .001	< .001	0.53	−0.24
Zipper test, both shoulders (cm)	0.4 [−0.2, 0.9]	1.38	.172	1.000	0.09	0.22
Sit-and-reach (cm)	1.2 [−0.1, 2.5]	1.80	.076	.535	0.14	−0.04
Body mass index (kg/m²)	−0.12 [−0.30, 0.07]	−1.27	.209	1.000	−0.04	0.11
Juggling (hits)	−0.4 [−4.6, 3.9]	−0.17	.867	1.000	−0.02	−0.09
Hexagon agility test (s)	−0.14 [−0.70, 0.42]	−0.49	.624	1.000	−0.06	−0.12
40-meter sprint (s)	−0.08 [−0.20, 0.04]	−1.38	.173	1.000	−0.11	0.17
Standing long jump (cm)	5.6 [1.7, 9.4]	2.88	.005	.046	0.24	−0.12
Stork balance stand (s)	3.7 [0.5, 6.9]	2.30	.024	.191	0.31	0.05
Stick drop (cm)	0.6 [−1.0, 2.3]	0.75	.458	1.000	0.12	0.06

Note. Adjusted difference = circuit section minus comparison section, in the item's units. Negative differences on the step test, hexagon, sprint, and stick drop favor the circuit section, since lower is fitter there. The step test is the primary outcome, tested alone; Holm's correction applies to the other eleven items. Hedges' g uses the pooled posttest

standard deviation; baseline *g* is the pretest difference in pooled standard deviations. Residual degrees of freedom: 75 for the step test, 75 for the sprint, 76 for the hexagon and long jump tests, and 77 for the other items.

Figure 2

Effect of the Circuit on Each PFT Item, in Standard Deviations



Note. Hedges' *g* with its 95% confidence interval, signed so that a positive value means the circuit section was fitter (for the step test, hexagon, sprint, and stick drop, the sign is reversed); for BMI, a positive value means a lower BMI, which is not in itself fitter. Filled points are significant after Holm's correction or, for the step test, at .05.

Question 4: How Far the Measures Can Be Trusted

The step test's test-retest reliability was ICC(A,1) = .81, 95% CI [.65, .91], for 30 learners tested three days apart: good by its point estimate, and moderate to excellent across its interval (Koo & Li, 2016). The two days differed by −0.8 beats per minute on average, and 22 of the 30 learners' two results were within 6 beats per minute, one counted beat, of each other. The SEM was 5.3 beats per minute and the minimal detectable change 14.8. The scorers agreed almost perfectly: ICC(A,1) = .99, 95% CI [.97, .99], for the push-ups, with 25 of 40 counts identical, and 1.00, 95% CI [.99, 1.00], for the plank time (Table 3).

Table 3

Reliability of the Step Test and of the Push-Up and Plank Scores

Check	Learners	ICC(A,1) [95% CI]	Other results
Step test, two days, three days apart	30	.81 [.65, .91]	SEM 5.3 bpm; minimal detectable change 14.8 bpm
Push-ups, two scorers at once	40	.99 [.97, .99]	Identical counts: 25; largest difference: 2
Plank, two scorers at once	40	1.00 [.99, 1.00]	Within 2 seconds: 39; largest difference: 3 s

Note. ICC(A,1) is the two-way intraclass correlation for absolute agreement of single measurements. SEM = standard error of measurement. bpm = beats per minute.

A group's mean is far more precise than one learner's change. In the circuit section, the heart rates of 15 of 40 learners fell by more than the minimal detectable change of 14.8 beats per minute; in the comparison section, 5 of 39 did. A learner whose rate fell by less may still have improved, so one learner's result should not be used to judge that learner.

Question 5: DepEd's Tables

Table 4 gives the share of learners whose results DepEd's tables place at "Good" or better. DepEd sets no norms for the step test's heart rate, and its BMI table is the adult one, so neither appears. On the push-ups, the circuit section rose from 9.5% to 36.6%, and the comparison section went from 22.0% to 20.0%.

Table 4

Share of Learners at "Good" or Better in DepEd's PFT Tables

PFT item	Circuit, June	Circuit, November	Comparison, June	Comparison, November
Push-ups	9.5%	36.6%	22.0%	20.0%
Basic plank	76.2%	95.1%	85.4%	82.5%
Zipper test, both shoulders	21.4%	26.8%	14.6%	25.0%
Sit-and-reach	50.0%	63.4%	53.7%	55.0%

PFT item	Circuit, June	Circuit, November	Comparison, June	Comparison, November
Juggling	59.5%	61.0%	61.0%	65.0%
Hexagon agility test	92.9%	97.6%	92.5%	87.5%
40-meter sprint	92.7%	87.5%	82.5%	82.5%
Standing long jump	83.3%	87.8%	100.0%	97.5%
Stork balance stand	4.8%	9.8%	4.9%	2.5%
Stick drop	76.2%	70.7%	78.0%	75.0%

Note. DepEd, 2019, Encl. No. 1. For the zipper test, both shoulders had to reach "Good." A result was first rounded to the precision of DepEd's bands, and one still between two printed bands was placed in the lower band; 27 of the 83 stick drop results at the pretest fell in such a gap. The sprint and stork tables were read at each learner's age on the test day.

The tables are not percentiles. Almost every learner reached "Good" on the hexagon test, and almost none on the stork balance stand, whose "Good" band for ages 13 and 14 starts at 41 seconds. DepEd's push-up table for secondary learners is the same for boys and girls, though girls do push-ups from the knees and stop at 25 (DepEd, 2019, Encl. No. 1), so a girl can reach "Very Good" at most. Shares like these show where a class stands against DepEd's bands, but they move little when a learner improves within a band, which is why the analysis used the raw results.

The manual classifies BMI with adult cut-offs, below 18.5 for underweight. By that table, 35 of the 83 learners were underweight at the pretest. DepEd's nutritional assessment of Kindergarten to Grade 6 learners follows World Health Organization (WHO) standards, which compare a learner's BMI with others of the same age and sex (DepEd, 2025b, Encl. No. 3). Its feeding program, which also reaches learners beyond Grade 6, calls a learner whose BMI-for-age falls between −2 and −3 z-scores "wasted" (DepEd, 2026b, Sec. III, item 22). Against WHO's growth reference for ages 5 to 19 (de Onis et al., 2007), 7 learners had a BMI-for-age below −2 standard deviations,

and 28 of the 35 learners the adult table called underweight were within the normal range for their age. The study therefore reported BMI only as a number.

Reflection

What We Found

The interval circuit lowered the Grade 8 learners' heart rate after the step test by 9.7 beats per minute, adjusted for the pretest and sex, an effect of 0.64 standard deviation. The circuit section also did 2.9 more push-ups, held the plank 9.4 seconds longer, and jumped 5.6 centimeters farther. On flexibility, BMI, and the skill items, the sections showed no difference that could be told from chance.

How It Compares With the Research

An effect of g = 0.64 lies between the pooled effect of school HIIT on cardiorespiratory fitness in the five studies with a low risk of bias from deviations from the intended intervention, 0.41, and the pooled effect across 25 studies, 1.0 (Duncombe et al., 2022). It is larger than the small, nonsignificant gain in the Australian pilot with a similar dose (Costigan et al., 2015). The comparison section's warm-up was an active condition, though a light one. No change in BMI is what the research leads one to expect from 16 weeks of 10-minute sessions twice a week; the reviews find effects on body composition mainly in longer programs with more volume (Duncombe et al., 2022).

What Else Could Explain the Gains

Four rival explanations remain. First, the two sections differed in more than the circuit: their adviser, their timetable, and their mix of learners. With one section in each condition, nothing in the data can rule these out (WWC, 2022, p. 14). Second, the learners counted their own pulse, as DepEd's manual directs. A hand-counted pulse after exercise tends to read low (John et al., 2007), and learners who knew they had trained for four months may have counted differently from those who had not. Third, push-ups and the plank were stations of the circuit from the fifth week, so part of those gains is practice of the test's own movements. Fourth, the testers were not told which section had the circuit, but the learners could have told them. The retest and the two scorers' agreement show that the measures were consistent; they do not show that the measures were free of these biases.

Limits

With one section in each condition, the study can show what happened in these two sections, not that the circuit would do the same elsewhere. The step test's heart rate moves in steps of 6 beats per minute, and with a minimal detectable change of 14.8 beats per minute, most single learners' changes cannot be told from measurement error. The last circuit session was on October 21 and the posttest on November 4, after the Quarter 2 examination and the Mid-School Year Wellness Break, so the posttest measured fitness two weeks after training stopped. Room temperature changes the step test's heart rate (Chen et al., 2006); both rounds were given in the same covered

court in the morning, but June and November weather differ. The learners rated their own effort; no heart rate monitor measured it.

What We Would Change

We would study four or more sections, with the circuit assigned to half of them by lot; have a trained scorer count the pulse or use a fingertip pulse oximeter; keep push-ups and the plank out of the circuit, or add an endurance measure the circuit does not practice; and give the posttest within a week of the last session.

Conclusion

A 15-minute interval circuit twice a week, inside the regular PE and Health periods and with no equipment, lowered Grade 8 learners' heart rate after DepEd's step test and raised their push-up, plank, and long jump results more than the usual warm-up did, with no injury beyond first aid. The circuit will continue in both sections, and a study with more sections would show whether the effect holds beyond one teacher's classes.

Action Plan

Table 5

Action Plan

Objective	Audience	Activity and channel	Persons responsible	Timeline	Budget (PhP)	Evidence of success
Give the comparison section the circuit	Grade 8 learners, Section B	The circuit in the first 15 minutes of each PE and Health period, with the same logs	PE teacher	November 2025 to March 2026	0	90% of sessions held; mean rating of effort of 7 or more
Share the circuit and the PFT findings with the MAPEH department	MAPEH teachers, Grades 7 to 10	LAC session with the station cards, a demonstration circuit, and the step test results	Researchers	January 2026	300 (printing)	Two more teachers use the circuit
Report each PFT round as DepEd asks	School head, clinic focal	Class summaries of both rounds from the score cards, without names	PE teacher	After each round	0	Summaries filed for Quarters 1 and 3
Measure the pulse more accurately	PE teachers	Two fingertip pulse oximeters for the step test; a trained scorer counts beside the learner	Researchers, school head	Before the June 2026 PFT	1,200	Retest reliability of .90 or more
Test the circuit in more sections	School research committee	Proposal for a study with four or more Grade 8 sections, the circuit assigned by lot	Researchers, school head	Next call for proposals	Up to 30,000 (BERF)	Proposal submitted and scored

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Financial Report

Table 6

Statement of Expenses

Date	Particulars	Receipt no.	Amount (PhP)	Category
June 10, 2025	Printing of consent letters, assent scripts, and PAR-Q+ forms, 95 sets	OR 3118	380	Reproduction
June 11, 2025	Two 12-inch step boxes of plywood, built by the school's utility worker	OR 3127	1,150	Supplies and materials
June 11, 2025	Two stopwatches, two tape measures, two 12-inch rulers, masking tape	OR 3127	920	Supplies and materials
June 16, 2025	Printing of DepEd's PFT score cards, 180 copies	OR 3164	270	Reproduction
June 30, 2025	Laminated station cards, 10 cards	OR 3201	250	Supplies and materials
October 30, 2025	Printing of the session and incident logs	OR 3655	200	Reproduction
Total			**3,170**	

Note. Fund source: the researchers' own funds. The beam balance was the school clinic's; the metronome was a free phone application. The receipts are kept with the school's copy of the report.

Appendices

Appendix A. Data, Notebook, and Class Record

The Excel data set (the learners, both PFT rounds in the score card's fields with its derived values as formulas, every ANCOVA, Holm's correction, the ICCs, and the session log), the Jupyter notebook that reproduces the analysis, and the class record used to read results against DepEd's tables, all linked above.

Appendix B. Consent Letter, Assent Script, and Health Questionnaire

Kept with the school, not in the archived report. The health questionnaire was the PAR-Q+ (Warburton et al., 2011); the learner aged 15 also answered DepEd's PAR-Q & YOU (DepEd, 2019, Encl. No. 3).

Appendix C. Station Cards and the Session Log

The five stations and their substitutes, the warm-up and cool-down, the 0-to-10 rating of effort, and the session and incident logs.

Appendix D. Declaration of AI Use

We, the researchers, declare that we used [name of the AI tool] only to check the grammar of the English text of this report, for the purpose of finalizing the research study. The prompt used was: "Check the grammar of this paragraph. Do not change its meaning or add content." We have reviewed, edited, and understood all the content, and we take full accountability for it. No names, scores, health information, or other personal or sensitive information were entered into the AI tool (adapted from Annex A of DepEd Order No. 003, s. 2026).