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The Effects of Exercise on College of Physical Therapy and Occupational Therapy Students S.Y. 2025–2026: University of Bohol

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ABSTRACT: Aerobic exercises play a significant role in promoting overall fitness and health by enhancing cardiovascular, respiratory, and mental well-being. The study was conducted to establish the theoretical advantage in health-related fitness of two prescribed exercises, the High-Intensity, Short-Duration Circuit Training Program (HI-SDCTP) and the Moderate-Intensity, Long-Duration Circuit Training Program (MI-LDCTP), among students in Physical Therapy and Occupational Therapy at the University of Bohol. This population group was selected because students tend to adopt a sedentary lifestyle, which normally restricts physical activity. A single-blinded, quasi-experimental pretest–posttest design was conducted over a four-week intervention period. Thirty-eight (38) students were randomly assigned to either the MI-LDCTP or HI-SDCTP group using an online randomizer and participated in supervised circuit training sessions twice weekly for 4 weeks, with differences in exercise intensity, duration, and rest periods. Analysis of the HI-SDCTP cohort revealed significant improvements in the mental fitness scores. However, physiological parameters, such as VO2max and resting heart rate, did not reach statistical significance. Conversely, the MI-LDCTP intervention elicited highly significant physiological adaptations, including a robust increase in VO2max and a significant reduction in resting heart rate. Comparative posttest analysis confirmed that the MI-LDCTP group achieved statistically superior improvements in aerobic capacity compared with the HI-SDCTP group, and the homogeneity of variance across all metrics was supported. While both modalities are effective for enhancing psychological well-being, these results suggest that a moderate-intensity, longer-duration approach is more efficacious for inducing rapid cardiorespiratory and autonomic adaptations within a short-term framework.

KEY WORDS: Aerobic exercise, High-Intensity, Short-Duration Circuit Training Program (HI-SDCTP), Moderate-Intensity, Long-Duration Circuit Training Program (MI-LDCTP), Cardiovascular Fitness, Respiratory Efficiency, Mental Fitness.

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INTRODUCTION

Physical inactivity is a major annual worldwide problem and a major risk factor for non-communicable diseases (NCDs), such as cardiovascular disease, obesity, diabetes, and mental health disorders (World Health Organization, 2020). Lack of activity has also been linked to poor body composition, including low body mass index (BMI) and increased waist circumference.

On the other hand, exercise has great health benefits. It involves a methodical engagement in physical exercise to increase cardiovascular capacity, muscle power, elasticity, body composition, and overall fitness (Chen et al., 2022). The exercise routines tend to combine aerobic, resistance, and flexibility exercises with personal goals and fitness requirements. M. D. Pratiwi and R. Sepriani (2023) divide physical exercise into aerobic, which requires oxygen to produce energy, and anaerobic, which does not. Exercise may be categorized by duration: moderate-intensity exercise lasts up to 30 minutes, and high-intensity exercise lasts at least 30 minutes (Cantrell et al., 2020). When the body is physically active, it uses large amounts of oxygen to sustain energy production; oxygen enters the body through the lungs and is delivered to haemoglobin in the blood (Tarver et al., 2022). A significant decrease in the availability of oxygen in the blood can pose serious health risks, such as syncope or even death.

One of the most crucial physiological benefits of exercise is the improvement in maximum oxygen uptake (VO2 max), the ultimate measure of cardiorespiratory fitness. High VO2max is a sign of better functional capacity of the cardiorespiratory system and is strongly linked with a reduced risk of cardiovascular disease and early death, despite the presence of other predisposing factors, such as ageing, hypertension, diabetes, smoking, and obesity (Crowley et al., 2022).

The intensity needs to be tailored to the patient's goals and health status. The increase in ventilation can also be explained by increases in tidal volume and respiratory rate, in line with increases in oxygen intake and carbon dioxide excretion, and by haemoglobin being generally fully saturated with oxygen, and by individuals with normal respiratory capacity (Armstrong, N. 2019).

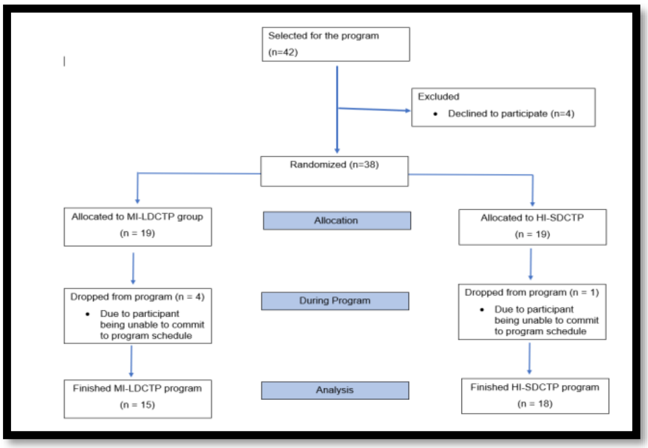
According to Z. Guo et al. (2023), there are High-Intensity Exercise Program (HIEP) and Moderate-Intensity Exercise Program (MIEP), which demonstrate divergent results regarding the influence on body composition and cardiorespiratory fitness in adults of 18-45 years of age, where HIEP has been shown to be superior in its ability to reduce waist circumference, body fat percentage and peak oxygen uptake (VO 2 peak), suggesting that HIEP is a better method of reducing fat accumulation in the abdomen To reinforce this observation, J. De Revere et al. (2021) describe HIEP as a training protocol made up of intermittent cycles of high-intensity exercise followed by active recovery cycles, which are an effective way to stimulate VO 2max and fat oxidation. On the other hand, MIEP includes physical activities that increase heart rate to 50-70 percent of its maximum, which contribute to increased respiration and sweating rates, without the ability to sing but able to talk (MacIntosh, B. et al., 2021).

MATERIALS AND METHODS

Design

The study used a 4-week, 2 sessions per week, single-blinded, quantitative quasi-experimental design with a pretest and a series of posttests. Some of the exercises were adopted from the study by Ballesta-García et al. (2019), and others were developed by the researcher with guidance from a licensed Physical Therapist. Exercises was pilot tested with the researchers and some volunteers who were willing to join the pilot.

The participants were randomly assigned to 2 exercise programs (MI-LDCTP and HI-SDCTP). The session length, exercise intensity, and work-rest interval ratios were varied according to the assigned exercise program. The experiment was carried out over 4 weeks, with 2 sessions per week. The health-related fitness parameters measured included V02max, Oxygen saturation (SpO2), respiratory rate (RR), pulse rate (PR), Mental fitness (MF), and Body Mass Index (BMI) before the commencement of each week's first session to establish the presence of significant effects on the parameters. One (1) set of pretest data and four (4) sets of posttest data were available for each training program.Participants in this study were adults aged 18 years and above. From the total population (N = 154), the required sample size was determined using the Taro Yamane Formula with a significance level of 0.05, yielding a target sample of 111 participants. Eligibility for inclusion required participants to be at least 18 years old and physically fit as assessed through the Physical Activity Readiness Questionnaire (PAR-Q)**.** Individuals were excluded if they had regularly engaged in exercise or physical activity within the previous six months or had acute musculoskeletal injuries prior to the exercise program. The flow diagram shows the participant recruitment, allocation, and completion of the study. A total of 42 individuals were initially selected; four declined to participate, leaving 38 participants randomized into two groups: MI-LDCTP (n = 19) and HI-SDCTP (n = 19). During the program, four participants from the MI-LDCTP group and one from the HI-SDCTP group dropped out due to



their inability to commit to the schedule. Consequently, 15 participants completed the MI-LDCTP program and 18 completed the HI-SDCTP program**,** resulting in 33 participants included in the final analysis**.**

The final data were analyzed using IBM SPSS Statistics. An exploratory analysis was first conducted to examine the frequency, range, variability, and distribution of each variable to determine the most appropriate statistical tests. Normality of the data was assessed using the Kolmogorov–Smirnov and Shapiro–Wilk Tests, with the latter used for interpretation due to the sample size ($n = 33$). Results showed that VO_2max, mental fitness, BMI, and final heart rate were normally distributed, whereas SpO_2, respiratory rate, and initial heart rate were not. Consequently, parametric tests such as the Paired Samples t-test and Independent Samples t-test were used for normally distributed variables. In contrast, nonparametric tests, including the Wilcoxon Signed-Rank Test and the Mann–Whitney U Test, were applied to variables that did not meet the normality assumption, with a significance level set at $p = 0.05$.

Procedure

A pretest was conducted prior to the first training session to establish baseline measurements of VO_2max**,** SpO_2, RR, HR, BMI, and mental fitness. VO_2max was estimated using an online VO_2max calculator, while mental fitness was assessed using a two-minute online self-assessment questionnaire from Bujoo Education. The questionnaire evaluates aspects of mental fitness such as resilience, focus, stress management, and confidence when facing challenges, and provides feedback on individual mental strengths along with suggestions for improvement. Posttest measurements of all variables were conducted at the end of each week to monitor changes throughout the intervention period. Participants follow a video presentation of the exercises, and all sessions were supervised to ensure correct exercise technique and adherence to prescribed intensity levels**.**

Table 1. Exercise Intervention Protocol

Phase	HI-SDCTP	MI-LDCTP
Warm-up	Dynamic warm-up: 30 s each of arm circles, arm swings, hamstring sweeps, quadriceps stretch, and downward dog (**2.5 min total**).	Same dynamic warm-up protocol (**2.5 min total**).
Exercise Circuit	50 s work: 10 s rest per exercise 1. Jumping Jacks 2. High Knees 3. In-Out Steps 4. Shuffle Woodchop 5. Alternating High Kick Touch 6. Crossover + Knee-to-Elbow 7. Scissor Jumps 8. Plyometric Side Squat 9. Burpees 10. Plyometric Squat + Twist	50 s work: 20 s rest per exercise 1. Jumping Jacks 2. High Knees 3. In-Out Steps 4. Shuffle Woodchop 5. Alternating High Kick Touch 6. Crossover + Knee-to-Elbow 7. Scissor Jumps 8. Plyometric Side Squat 9. Burpees 10. Plyometric Squat + Twist
Sets	Circuit repeated 3 sets with 1-min rest between sets.	Circuit repeated 6 sets with 2-min rest between sets.
Cool-down	Static stretching: 30 s each of supine snow angels, active hamstring stretch, forearm stretch, T-spine opener, and downward dog (**2.5 min total**).	Same cool-down protocol (**2.5 min total**).
Estimated Session Duration	**~30 minutes per session**	**~40 minutes per session**

RESULTS AND DISCUSSION

Profile of the Participants. The majority of participants were young adults, with most aged 18–19 years (39.39% aged 18 and 24.24% aged 19), while the remaining respondents ranged from 20 to 26 years old and comprised a smaller proportion of the sample. Regarding sex distribution, the respondents were nearly evenly split, with 51.51% female and 48.48% male participants, indicating no substantial gender imbalance in the study population.

Effect of HI-SDCTP on Health-Related Fitness. Analysis of the eight-session exercise intervention reveals that the most noticeable effect occurred in the psychological domain, where mental fitness scores increased significantly from 69.17 to 79.39 ($p = 0.001$). In contrast, physiological parameters, including VO2max, resting HR, and SpO_2, showed directional trends toward improvement, such as a reduction in mean resting HR from 82.94 to 78.61 bpm, but did not reach statistical significance ($p > 0.05$).

The RR approached statistical significance ($p = 0.059$), suggesting a promising trend toward enhanced ventilatory efficiency that could be strengthened with a larger sample or more sessions. Furthermore, the negligible shift in BMI ($p = 0.572$) aligns with the existing literature, suggesting that short-term physical activity often prioritizes neurological and psychological enhancements over systemic morphological or metabolic transformations.

Effects of MI-LDCTP on Health-Related Fitness. The 8-session exercise intervention yielded a highly significant increase in aerobic capacity, with mean VO_2max improving from 35.93 to 42.46ml/kg/min ($p < 0.001$), suggesting rapid cardiovascular adaptation and enhanced metabolic efficiency. This physical progression was mirrored by significant improvements in mental fitness scores ($p = 0.001$) and a reduction in resting heart rate ($p = 0.001$), indicating psychological benefits and improved autonomic nervous system regulation. While a statistically significant SpO_2 was observed ($p = 0.010$), changes in respiratory rate and Body Mass Index (BMI) did not reach statistical significance ($p = 0.072$ and $p = 0.285$, respectively), suggesting that while functional capacity and psychological well-being respond rapidly to short-term training, structural morphological changes and resting ventilatory steady-states may require a more prolonged intervention.

Significant Degree of Difference in Health-Related Fitness between HI-SDCTP and MI-LDCTP. The comparative analysis of post-intervention outcomes between the HI-SDCTP and the MI-LDCTP reveals that the MI-LDCTP group achieved a statistically superior enhancement in aerobic capacity, as evidenced by significantly higher VO_2max values ($t(31) = 2.71$, $p = 0.011$; Mean Difference = 5.41). While other physiological and psychological parameters, including Resting HR ($p = 0.069$), RR ($p = 0.864$), SpO_2 ($p = 0.104$), and Mental Fitness ($p = 0.770$), showed a directional trend favoring the MI-LDCTP cohort, these differences did not reach the conventional threshold for statistical significance. Notably, the resting heart rate approached marginal significance, suggesting a potential trend toward greater autonomic efficiency in the moderate-intensity group that may warrant further longitudinal investigation. Collectively, these data suggest that while both modalities may confer health benefits, a moderate-intensity, longer-duration approach may be more efficacious for specific gains in cardiorespiratory power (VO_2max) within this experimental framework.

Significant Degree of Variance between HI-SDCTP and MI-LDCTP. To ensure the robust application of parametric inferential statistics, Levene's Test for Equality of Variances was used to assess differences in post-intervention health-related fitness variables between the HI-SDCTP and MI-LDCTP groups. The analysis confirmed that the assumption of homogeneity of variance was met across all primary metrics, as indicated by non-significant F-statistics ($p > .05$). Specifically, high levels of variance consistency were observed for VO_2max ($F = .002$, $p = .968$), RR($F = .028$, $p = .868$), and Resting HR ($F = .041$, $p = .841$. Additionally, Mental Fitness scores demonstrated a stable distribution across groups ($F = .170$, $p = .683$), further validating the use of the equal-variance assumed model for subsequent t-test comparisons. These results provide the necessary statistical foundation to conclude that any observed differences in fitness outcomes are attributable to the intervention modalities rather than underlying disparities in group distribution or data dispersion.

CONCLUSION

The results of the proposed work indicate that both High-Intensity Short-Duration (HI-SDCTP) and Moderate-Intensity Long-Duration (MI-LDCTP) circuit training regimens result in substantial psychological changes. Still, the MI-LDCTP training mode is significantly more efficient in promoting rapid cardiorespiratory adaptation. The two interventions provided strong responses in terms of mental fitness ($p = 0.001$), indicating that psychological well-being is incredibly sensitive to exercise, irrespective of its intensity and duration, over an eight-session period. Nevertheless, the MI-LDCTP group achieved statistically higher aerobic capacity (VO2max) than the HI-SDCTP cohort ($p = 0.011$) and showed significant changes in resting heart rate and oxygen saturation. The statistical consistency established by the Levene Test is a valid indication that these performance differences are attributable to the training modalities rather than to data variability. Finally, although mental health improves with any form of short-term training, a moderate-intensity, longer-duration training program seems more effective at producing immediate physiological changes in cardiorespiratory power and autonomic regulation.

To strengthen the clinical and practical usefulness of these findings, longitudinal studies involving more than 8 sessions should be undertaken in the future to identify which temporal thresholds for marginal trends in respiratory rate and BMI must be crossed before they become statistically significant. It is necessary to examine the underlying physiological mechanisms that may explain the high VO2max gains in the MI-LDCTP cohort, e.g., stroke volume and mitochondrial biogenesis. Moreover, the long-term effects of these mental fitness benefits after the intervention should be assessed in studies, as the psychological gains were highly significant in both groups. Including diverse age groups and clinical populations in the participant demographic will enhance generalizability. In contrast, increased sample sizes will allow nascent trends in autonomic regulation and ventilatory efficiency to be validated. Lastly, scrutiny of SpO2 oscillations should be considered to determine whether the identified changes are attributable to a transitory post-exercise condition or to a sustained respiratory acclimatization.

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