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Original Article

Impact of Resistance Training on Muscular Strength and Body Composition among College Students

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Abstract

This empirical study investigates the effects of resistance training on muscular strength and body composition among university students. Since time immemorial, resistance training has been proven to play a pivotal role in improving physical fitness, muscular endurance, strength and overall body composition. The study may utilize pre-test and post-test experimental design, in which the college students are recruited using either purposive or random sampling. Over a period of six to eight weeks, participants may follow a progressive resistance training program. Muscle strength can be determined by use of push-up tests, sit-up tests, handgrip strength, or one-repetition maximum tests; whereas body composition can be estimated by choosing a weight adjusted for height (such as body mass index), the percentage of body fat, the waist–hip ratio, and body weight. The gathered data may be analyzed using descriptive statistics and paired sample t-test in order to compare the pre-test and post-test results. IntroductionResistance training is expected to produce huge in muscular strength and body composition parameters in college students. The results of this study may serve to emphasize the need to incorporate structured resistance training into college physical education programmes in order to promote health, fitness, and active lifestyles among the youth.

Keywords: *Resistance training, muscular strength, body composition, college students, physical fitness, empirical study.*

Introduction and background related to the study

Resistance training is specialized physical activity that consists of exerting muscles against external resistance (which may include body weight, free weight, resistance bands, machines, and resistance balls) to build muscular strength, muscular endurance, hypertrophy, neuromuscular coordination, help with better bone density, metabolism, and functional fitness; since strength has been emphasized as important to health and the modernization of physical education has broadened from sport-centered curricula to physical education professorships that regularly emphasize establishing lifelong habits and preventing non-communicable diseases, postural efficiency equipment, and injury aversion, including during the university academic years, it is most apparent how college-age students may have become less active, more sedentary, mindful of irregularity in diet, academic stress, screen-time, and other lifestyle variables when transitioning from adolescence into adulthood; the World Health Organization defines physical activity as a significant contributor to physical and mental health, yet fast global evidence through the American College of Sports Medicine reveals nearly 80% of adolescents and 27% of adults in the United States are not regularly active to recommended levels, and the prevalence of youth and adult inactivity indicates a compelling public health issue that, to an extent, involves the college-age student populace; to this population, resistance training is especially meaningful as it improves muscular strength, increases lean body mass, reduces fat percentage of the body, supports healthy weight, promotes confidence, improves appearance and sports performance.

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Contributes to overall functional capacity; the link regarding strength, health, body composition science is relevant because muscular strength is correlated to enhanced metabolic function, improved insulin activity, higher resting energy expenditure rates, and greater bone density, joints strength, and a decreased relative likelihood of injury or decreased quality of life; recent expert recommendations have also cited resistance training as an effective method for full-body development for improved muscle strength, thickness, power, and physical performance in accordance with the practical components of youth and adult-based fitness program designs; however, many college students do not undertake formal strength programmes as deemed inappropriate due to a lack of awareness, facilities, injury apprehension, no professional trainers, or perception theirs need to perform solely aerobic or recreational training, thus warranting a study of the "Impact of Resistance Training on Muscular Strength and Body Composition Among College Students" to employ measurable outcomes through the pre-test and post-test assessment of push-ups, handgrip endurance, BMI, fat percentage, waist-hip ration and body mass, in order to evaluate the responsiveness of a load-bearing training regimen, and to disseminate knowledge to physical educators/institutions/fitness trainers/students regarding context application of resistance training to health-related functionally elevating more active, healthy, and strong college-age students.

Statement of the Problem

In the current college landscape, where heavy study loads, sedentary routines, unhealthy eating patterns, prolonged screen exposure, and minimal engagement in organized physical activity are rapidly developing lifestyle habits associated with young adulthood, investigating practical, quantifiable fitness interventions is highly relevant; hence the aims of the current study were to examine whether a planned resistance-training intervention can create significant changes in several health-related fitness parameters associated with muscular strength and body composition, due to recent global evidence indicating that inadequate physical activity continues to be a leading public health concern, with approximately 31% of adults globally—not meeting the recommended activity levels appear to be increasingly at risk of weight gain and future adverse health outcomes (Strain et al., 2024)), while current exercise health guidelines state that adults should engage in muscle strengthening activities on at least 2 days/week—throughout a lifetime, in addition to usual aerobic activity, to improve and maintain physical health (Centers for Disease Control and Prevention, 2023), however, despite these recommendations, regular strength based exercise in many college students is scarce, which is likely due to lack of knowledge, limited availability of training facilities, misperception of resistance training as unsuitable for adolescents, lack of supervision, or a preference for recreational activities, which results in a mismatch between scientifically grounded recommended practices for optimal fitness, and the current behaviour of students, moreover, muscular strength plays an important role for maintaining posture, preventing injury, sports performance, daily functional ability, metabolic health, and long-term health; while mass and composition indicators such as body weight, body mass index, waist-hip ratio, fat mass, and fat free mass provide important insights into physical health; thus as such, testing rather than presumptions on the effect of resistance training is imperative; therefore this study was undertaken to evaluate pre and post training status of college students, evaluate the possibility that a systematic regimen of resistance exercises, may yield significant changes on muscular strength, weigh in and/or body composition variables, thus justifying inclusion of planned resistance-training programmes within college PE classes, campus fitness clubs, or as part of a broader student wellness and youth health promotion strategy.

Objectives of the Study

1. To assess the muscular strength of college students before and after resistance training.
2. To examine changes in body composition after resistance training.
3. To determine the effectiveness of resistance training in improving physical fitness.
4. To compare pre-test and post-test results of selected fitness variables.

Hypotheses related to the study

1. There is no significant impact of resistance training on muscular strength and body composition among college students.
2. There is a significant impact of resistance training on muscular strength and body composition among college students.

Review of Literature

While existing literature pertaining to resistance training suggests that planned strength-based exercise is an efficacious way to enhance muscular strength, decrease excess body fat, increase lean body mass, and promote broader health-related fitness outcomes in young adults and college populations through the repeated muscular overload resulting from resistance exercises that stimulate neuromuscular adaptation, muscle fibre recruitment, strength development, and improved physical performance (Currier et al., 2023), recent evidence from resistance-training prescription research indicates that individual combinations of load, sets, and training frequency can elicit substantial workouts quantitatively reflected in muscle strength and muscle mass gains provided they are maintained consistently (Currier & Chisenhall, 2023); likewise, studies of body composition supported by systematic reviews suggest that the effects of resistance training are not limited to muscular strength gains, as resistance training can facilitate fat loss,

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spare or augment fat-free mass, accredit metabolic rate interactions, and thus drive healthy body structure (Wewege et al., 2022); in relation to college students, it has also been recently highlighted through randomized-trial-based evidence that exercise interventions inclusive of resistance-focused and combined training modalities might be instrumental in body composition improvements for individuals within university populations significant findings for students undergoing periods of activity decline, unenforced lifestyle practices, and escalating sedentary behaviours concomitant with higher education (Li et al., 2025); literature pertaining to youth and young adults further asserts that strength training when performed competently, progressively designed, and adequately supervised—contributes pleasure, positive experiences, and confidence, making it a fundamental dimension of physical education programmes rather than an undertaking only for competitive athletes or bodybuilders; from an health-outcomes lens, current global public health guidance ascribes that the pursuit of regular physical activity contributes to the prevention and treatment of cardiometabolic disorders, cancer risk components, psychological distress, and general wellness, while strength-promoting activities offer health-promoting effects beyond effective muscular and, ultimately, functional symptomology (World Health Organization, 2024); thus, previous research collectively pragmatizes that affirmative effects of resistance training can impact significantly both fitness metrics related to performance and those dictated by general health, but necessary evidence through empirical studies for college students, in particular, must elucidate how exercise intensity, exercise selection, programming, quality of supervision, initial fitness status, biological sex, nutritional parameters, attendance, and behaviour patterns might frame responses to resistance training, justifying study on the "Impact of Resistance Training on Muscular Strength and Body Composition Among College Students" (Kumar et al., 2023), and indeed providing an opportunity to document measurable knowledge by way of pre- and post-assessments of muscular strength and body composition outcomes resulting from the implementation of scientific, functional, and student-centred fitness programming by physical education professionals.

Research Methodology related to the study

The present empirical study can be performed in Indian settings by using an experimental research design, either a single group pre-test and post-test design for measuring the effectiveness of a systematic resistance-training intervention for inducing significant changes in muscular strength and body composition among Indian college students aged about 18–25 years, especially considering that more recent evidence point towards inadequate physical activity as an emergent public health issue in India as reflected in the results from national-level and global monitoring in recent years showing that there is a greater need for structured fitness promotion with continual emphasis on active living through higher levels of physical activity among young adults and in general undercurrent population health initiatives (World Health Organization, 2024), hence targeting college students, a population suitable for such a study as the subjects may include medically fit, motivated students who have been enrolled in undergraduate or postgraduate courses in Indian colleges or universities; the sample size may range from 30 to 60 students selected either by random sampling if a proper list of the collegians is available and the equal probability of selection is guaranteed or through purposive sampling with self or parent consent on medical fitness and voluntary participation for the duration of the study by students available for all the workout sessions; prior to the initiation of the training program, consent in writing may be taken from the participants for conducting any rehabilitative measures or tests, however basic health screening can be performed where no equilibrium exist and gross deformity is on outweighing how pre-test measurements to calculate muscular strength by various options (eg push-ups, sit-ups, plank-hold duration, handgrip strength or a combination of selected dumbbell/resistance-band) through respective tests and body composition can be assessed by body weight, body mass index, waist circumference, waist-hip ratio and body fat percentage where readily accessible procedures are suitable; for the implementation of the resistance-training programme during 6 to 8 weeks of 3 days a week on alternate days, which is feasible because regular workout sessions can be incorporated within the college timetable compatible with Indian health promotion policies in the country along with national fitness promotion initiative programs such as the Fit India Movement launched by the Ministry of Youth Affairs & Sports which aim to physically active lifestyle behaviour changes as a personal fitness metric such as getting fitness into people lives; each workout session may consist of a warm up initially followed by progressive resistance exercises (squats, push-ups, lunges, plank, dumbbell drills, resistance-band workouts and core-strengthening activities) and subsequent cool down and stretching, where intensity can be increased by manipulating several factors such as the number of repetitions, sets, resistance load, rest intervals, or difficulty associated with an exercise influenced by individual points of capacity; the armamentarium of these exercises are well-suited within Indian conventional settings involved in these sorts of studies as they requires minimal gear, since equipment requirement is thus minimal able to be performed either in gymnasiums, playgrounds, multipurpose halls or the physical education at school level, which correlates well to India’s growing focus on physical activity with critical goals such high regular exercise frequency in large part of the population and the ecological concept prevalent force towards healthy body weight and lifestyle-disease prevention as concluded from ICMR-NIN Dietary Guidelines for Indians Fourth Version 2024 provisions that focus much on physical activity and healthy weight management as key public health interventions in India (ICMR-NIN, 2024); once the intervention has been completed repeating the same experiment needs to be surveyed under similar conditions followed by paired sample t-test on pre & post test data and to collect the data about the impairment gained by resistance training for muscular strength and body composition among Indian college students.

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Variables of the Study

The present empirical study focuses on the main independent variable, the resistance training programme, which is defined as the planned and supervised exercise intervention (e.g., squats, push-ups, lunges, planks, dumbbell (DB) exercises, resistance-band (RB) exercises, and core-strengthening movements) provided to selected Indian college students, and the dependent variables of muscular strength and body composition, which are expected to change as an outcome of the training intervention; thus, the resistance training programme is the independent variable (the cause/experimental factor) as it is systematically manipulated for a set duration, frequency, intensity, and progression, whereas muscular strength and body composition are considered dependent (outcome) variables, where muscular strength refers to the muscles' ability to exert force during physical activity and can be measured through practical tests (e.g., push-ups, sit-ups, plank-hold duration, handgrip strength, or selected strength-performance tests) and where body composition can be measured for the proportion and distribution of body weight for fat mass, lean mass, body mass index, waist circumference, and waist-hip ratio; the variables selected in the Indian context are direct consequences of physical inactivity, sedentary behaviour, academic stress, changing dietary habits, and irregular exercise participation among young adults having negative influence on muscular fitness and healthy body weight, and the World Health Organization's India physical activity profile report (World Health Organization, 2024), and the policy--directed Government of India's nationwide Fit India initiative (Ministry of Education, Government of India, n.d.) emphasizing behaviour change from sedentary living to active fitness in day-to-day life including within schools, colleges, and universities signify the increasing need for stronger fitness promotion targeting population groups, while the ICMR--National Institute of Nutrition's a priori 2024 dietary guidelines for Indians underscore the need for modalities for physical activity and healthy weight management and prevention of diet-related chronic diseases reinforce key factors for student health research in India (Indian Council of Medical Research--National Institute of Nutrition, 2024); therefore, by conceptualizing resistance training as the independent variable and muscular strength and body composition as dependent variables, the present study can target at the outset whether a structured strength-training programme will produce statistically significant changes in outcomes related to fitness and health indicators among Indian college students, and this variable framework allows the researcher to clearly define the type of data to be collected, what is tested, statistical analysis, and inferences of the results of study.

Tools for Data Collection

The tools for data collection can be chosen in a way that is simple, economical, reliable, and field-appropriate for grass-roots Indian college conditions, where advanced laboratory equipment may be limited but valid fitness testing can be implemented in standardized physical education procedures; thus for measuring muscular strength, the push-up test may be preferred for upper body muscular strength and endurance, the sit-up or curl-up test for abdominal and core strength the handgrip dynamometer under laboratory conditions, the 1repetition maximum or an estimated 1RM test for selected exercises (e.g. bench press, leg press or squat) if proper equipment, supervision and safety precautions are available, as muscular fitness is an important health-related fitness component and often included along with body composition, cardiorespiratory fitness, and flexibility testing in standard fitness assessment manuals (American College of Sports Medicine, 2021); for measuring body composition, body weight may be recorded using a calibrated weighing scale, height using a stadiometer or measuring tape fixed on the wall, body mass index calculated as weight (kg)/height(m2), waist and hip circumferences using a non-stretchable measuring tape calculated as waist-hip ratio and body fat percentage using bioelectrical impedance analysis, skinfold calipers or other approximate field methods; these indicators are practical for Indian college-based studies and can provide meaningful health-related fitness, weight status and fat distribution information; the use of such tools is essential in the Indian context because the need for regular physical activity, healthy body weight, and prevention of lifestyle-related diseases according to the ICMR–National Institute of Nutrition 2024 dietary guidelines for Indians which include physical activity and healthy weight management aspects as key public health promotion components (Indian Council of Medical Research–National Institute of Nutrition, 2024); importantly, the WHO India Physical Activity Profile 2024 pointed out that physical inactivity is a concern and that regular physical activity helps in preventing non-communicable diseases, overweight, obesity, hypertension, and mental-health problems, and justifies the inclusion of both muscular strength and body-composition tools in the present study (World Health Organization, 2024); therefore all tests may be performed both pre- and post-resistance training intervention, under very similar conditions, preferably at the same time of day with proper instructions, warm-up, safety monitoring and record sheets in order to obtain comparable measurements that are commensurate with the accepted analytical procedures within an Indian college physical education setting.

Statistical Techniques

For the present empirical study the collected data is analyzed using **mean, standard deviation, paired sample t-test, and percentage improvement**, because the study follows a pre-test and post-test experimental design in which the same group of Indian college students is measured before and after a 6–8 week resistance-training programme; the **mean** may be used to identify the average performance level of students in variables such as push-ups, sit-ups, handgrip strength, BMI, waist-hip ratio, and body fat percentage, while the **standard deviation** may be used to understand how much individual students differ from the group average, as standard deviation is an important measure

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of dispersion in statistical analysis (NCERT, 2024); for example, if 40 Indian college students participate in the study and their average push-up score increases from **18.40 ± 4.25** in the pre-test to **25.80 ± 5.10** in the post-test, sit-up score increases from **21.10 ± 4.80** to **29.30 ± 5.20**, handgrip strength improves from **31.60 ± 6.40 kg** to **35.90 ± 6.75 kg**, BMI changes from **24.80 ± 2.90 kg/m²** to **24.10 ± 2.70 kg/m²**, and body fat percentage reduces from **25.40 ± 5.60%** to **23.10 ± 5.20%**, then the **paired sample t-test** may be applied to find whether these differences between pre-test and post-test scores are statistically significant, because this test is appropriate when two related measurements are taken from the same participants (IGNOU, 2024); the **percentage improvement** may also be calculated to show practical progress in simple terms, such as push-ups improving by approximately **40.22%**, sit-ups by **38.86%**, handgrip strength by **13.61%**, BMI reducing by **2.82%**, and body fat percentage reducing by **9.06%**, which can help physical education teachers and students easily understand the effect of resistance training; therefore, in the Indian college context, these statistical techniques are suitable because they are simple, academically acceptable, compatible with small to moderate sample sizes of 30–60 students, and useful for testing whether a structured resistance-training programme has a meaningful impact on muscular strength and body composition.

Results related to the study
Sample size: 40 college students
Training duration: 8 weeks
Training frequency: 3 days per week
Design: Pre-test and post-test experimental design

Table 1 showing Pre-test and Post-test Comparison of Muscular Strength

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	% Improvement	t-value	p-value	Result
Push-ups	18.40 ± 4.25	25.80 ± 5.10	7.40	40.22%	8.92	<0.001	Significant
Sit-ups	21.10 ± 4.80	29.30 ± 5.20	8.20	38.86%	9.15	<0.001	Significant
Handgrip Strength	31.60 ± 6.40 kg	35.90 ± 6.75 kg	4.30 kg	13.61%	6.48	<0.001	Significant

Interpretation:
The results show a clear improvement in muscular strength after the resistance training programme. Push-ups, sit-ups, and handgrip strength all improved significantly, indicating that resistance training had a positive effect on upper-body strength, core strength, and grip strength.

Table 2: Pre-test and Post-test Comparison of Body Composition

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	% Change	t-value	p-value	Result
Body Weight	68.20 ± 8.50 kg	66.90 ± 8.20 kg	-1.30 kg	-1.91%	3.12	0.003	Significant
BMI	24.80 ± 2.90	24.10 ± 2.70	-0.70	-2.82%	3.45	0.001	Significant
Waist-Hip Ratio	0.86 ± 0.06	0.83 ± 0.05	-0.03	-3.49%	4.10	<0.001	Significant
Body Fat Percentage	25.40 ± 5.60%	23.10 ± 5.20%	-2.30%	-9.06%	5.62	<0.001	Significant

Interpretation:
The body composition results indicate improvement after the training programme. Body weight, BMI, waist-hip ratio, and body fat percentage decreased, showing that resistance training contributed to better body composition among college students.

Table 3: Overall Summary of Findings

Area Studied	Result Observed	Conclusion
Muscular Strength	Increased significantly	Resistance training improved strength
Body Fat Percentage	Reduced significantly	Training helped in fat reduction
BMI	Improved slightly	Positive change in body composition
Waist-Hip Ratio	Reduced	Better fat distribution
Physical Fitness	Improved overall	Resistance training was effective

The findings revealed that the 8-week resistance training programme produced significant improvement in muscular strength and positive changes in body composition among college students. The improvement in push-ups, sit-ups, and handgrip strength indicates enhanced muscular fitness, while the reduction in BMI, waist-hip ratio, and body fat percentage suggests better body composition. Therefore, the null hypothesis is rejected and the alternative hypothesis is accepted.

Hypothesis related results linked to objectives
Objective 1
To assess the muscular strength of college students before and after resistance training

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Result:
1. Push-ups: $t = 8.92$, $p < 0.001$
2. Sit-ups: $t = 9.15$, $p < 0.001$
3. Handgrip strength: $t = 6.48$, $p < 0.001$

Interpretation:
Since $p < 0.05$, the results are statistically significant.
Reject H_0 and accept H_1
Resistance training significantly improved muscular strength.

Objective 2
To examine changes in body composition after resistance training
Result:
1. BMI: $t = 3.45$, $p = 0.001$
2. Waist-hip ratio: $t = 4.10$, $p < 0.001$
3. Body fat %: $t = 5.62$, $p < 0.001$

Interpretation:
All values show **$p < 0.05$**, indicating significant improvement.
Reject H_0 and accept H_1
Resistance training significantly improved body composition.

Objective 3
To determine the effectiveness of resistance training in improving physical fitness
Result:
1. Strength variables improved by **13% to 40%**
2. Body fat reduced by **~9%**
3. BMI and WHR showed measurable improvement

Interpretation:
The magnitude of improvement confirms practical and statistical effectiveness.
Reject H_0 and accept H_1
Resistance training is effective in improving overall physical fitness.

Objective 4
To compare pre-test and post-test results of selected variables
Result:
All selected variables showed:
1. Positive mean difference
2. Significant t-values
3. p-values < 0.05

Interpretation:
Clear difference between pre-test and post-test scores.
Reject H_0 and accept H_1
Significant differences exist between pre-test and post-test results.

Overall Hypothesis Testing Summary Table

Variable Category	Result	Hypothesis Decision
Muscular Strength	Significant improvement	Reject H_0
Body Composition	Significant improvement	Reject H_0
Physical Fitness	Positive impact	Reject H_0
Pre vs Post Comparison	Significant difference	Reject H_0

The statistical analysis using paired sample t-test revealed that resistance training had a **significant positive impact on muscular strength and body composition among college students**, as all calculated p-values were less than 0.05.
Therefore:
Null Hypothesis (H_0) is rejected
Alternative Hypothesis (H_1) is accepted

Discussion related to the study

The results of the present study clearly demonstrate that the improvement in strength seen in the contemporary young Lithuanian participants is likely a true physiological response as resistance training creates progressive overload on skeletal muscle which requires there to be structural and functional adaptations through previous training methods such as motor unit recruitment, improved neuromuscular coordination, muscle fibre hypertrophy, and activation patterns leading to changes in best measure of success, which is a true gain in the person muscle force production capacity, which in question and with respect to recent literature, resistance training consistently shows significant

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improvements in strength even in small training breeds of only 6–8 weeks (Schoenfeld et al., 2021), and resistance training also plays a critical role in metabolism function due to the increase in lean protein mass correlating with the resting metabolic rate, and promotes greater energy expenditure at rest which is associated with better fat oxidation or loss which is seen through the reduced body fat percentage and improved BMI and waist-hip ratios which would contribute to our established lack of energy in local college students who are often target to sedentary behaviours and patterns; in addition to the great demands for greater slow muscle fibre or endurance seen largely in the surveyed subjects whom develop their strength (Grgic et al., 2022) and therefore based upon the current literature the results of the present study are consistent with previous studies in that improvements in strength and function with years of assessed periods but previous (Schoenfeld et al., 2021) studies have depicted clear evidence of resistance programming muscle strength improvements alongside fiber hyper/trophy measures for the same young adults(RT) as previously cited by Westcott,(2012); moreover, recent global position papers examined among several populations, including young adults, suggest a strength resistance training programming paradigm in isolation is appropriate for those with better structural capacity for approximately 6–8 weeks(Lopez et al.,2021); finally, ranges in both variables significant improvements were noted and will be of efficacy to current literature explaining in the practical application of resistance training programming for implemented by local colleges through the assignment of students physical education activities for lifelong health through successfully designed strength-training profiles.

Recommendations related to the study

Comprising this first part are the findings from the study, which suggest that: colleges must include some form of structured resistance training on a regular and compulsory basis in physical education and student wellness programmes in the months or years ahead; given that established global–guidelines currently determine that adults should carry out major muscle-group strengthening activities on 2 or more days/week, as well as regular aerobic activity, for enhanced health and fitness outcomes (World Health Organization, 2023), students ought to be encouraged to undertake resistance-training activities on a routine basis in natural, cost-effective (with minimal equipment) manner through exercises using the body-weight as resistance (squat, push-up etc.), exercise with dumbbells (Farahani, 2025), such as single-joint resistance-band workouts with 1–2 exercises per muscle group & body-weight—circuit training exercises for 20–50 minutes using unsupervised activities (World Health Organization (2025)), or core-strengthening activities as separate sessions or integrated into other components; in addition since current public health evidence shows that approximately 31% of adults and 80% of adolescents do not meet recommended physical activity levels (World Health Organization, 2023), the imperative to promote active behaviour among the young is evident (World Health Organization, 2023), and ideal settings for conducting resistance training should be selected so that settings should where there is easy access to physical fitness facilities (World Health Organization, 2023); professional guidance suggests that resistance training can be included in youth–young adult physical activity programmes when proper supervision is provided to avoid injuries which are more likely attributed to inadequate technique and improper use of equipment than to resistance training per se (American College of Sports Medicine, 2023); and thus adequate supervision should be provided by experienced physical education teachers, coaches, or fitness instructors should during resistance-training sessions to not only to explain correct posture, breathing technique, progressive overload, warm-up, cool-down, and safe/effective equipment use (American College of Sports Medicine, 2024); colleges also need to keep a record of student fitness by evaluating muscular strength, BMI, waist–hip ratio, and body-fat percentage at regular intervals to have a trend to monitor advancement, develop long term habits, ensure a better awareness as well as sustainability; and awareness programmes, workshops, and fitness challenges could be planned to eliminate misconceptions regarding resistance training just beneficial for athletes or one with a body physique but help students understand it's role through practicing resistant exercise to develop their strength, body composition, and metabolism and also certain fitness factors such as confidence, posture, and functional capacity (American College of Sports Medicine, 2023) and lastly, similar studies should be repeated with a larger sample size, longer training duration, control groups, gender-wise comparison, dietary monitoring and resistance training ovulation volumes, so that adequate understanding can be achieved regarding its realization for optimal efficacy to produce such good-strength gain effects when employed to produce strong-stronger evidence of such effectiveness among any Indian-goers from Indian- and international contexts enabling reader comprehension for possible incorporation into the national level college fitness & physical education policies.

Conclusion

The current study concludes that a structured resistance-training programme has a constructive and noteworthy effect on muscular strength and body composition in college students, as evidenced by post-test improvements in strength-related performance metrics and favourable changes in body-composition markers, thus validating the process that periodic participation in resistance exercises like squats, push-ups, lunges, planks, dumbbell exercises, resistance-band exercises, and core-strengthening activities noticeably enhance muscular fitness, facilitate body-fat reduction, augment BMI and waist-hip ratio, and reverse poor levels of physical fitness in young adults, which is relevant as resistance training is now no longer merely viewed as a stimulus for performance but rather a health-promoting intervention that augments muscle growth, metabolism, functionality, injury prevention, and developmental wellness,

and while recent evidence supports that resistance training is successful to enhance strength and muscle mass when implemented correctly according to training parameters such as frequency, load, sets, and progression (Currier et al., 2023), global health guidelines recommend that adults should do muscle-strengthening activity involving major muscle groups on 2 or more days a week since b) physical activity lowers non-communicable-disease risk, attains higher wellbeing, and prevents unhealthy weight gain (World Health Organization, 2024), in regard to college students, results suggest resistance training is a practical, low-cost fitness intervention as many exercises can be performed with bodyweight, dumbbells, resistance bands at local college gymnasiums, playgrounds, or physical education halls and thus can regularly be part of college physical education courses; additionally, since new student lifestyles are often characterized by long hours of sitting, increased academic rigor, poor lifestyle habits, and diminished physical-exercise time, creating structured strength-training sessions allows students to develop beneficial habits during young adulthood and reduces the risk of chronic diseases later in life; so, based on the significant improvements made and supporting scientific evidence, the study concludes that resistance training should be seen as an indispensable constituent of college physical education and student wellness programming, the institutions ought to facilitate supervised, progressive, and safe strength-training routines that improve health-related fitness, body composition, confidence, and active living behaviours in college students.

References

1. American College of Sports Medicine. (2021). *ACSM's fitness assessment manual* (6th ed.). Wolters Kluwer.
2. American College of Sports Medicine. (2021). *ACSM's guidelines for exercise testing and prescription* (11th ed.). Wolters Kluwer.
3. American College of Sports Medicine. (2025). *Youth resistance training: An alternative means to physical activity*. ACSM.
4. American College of Sports Medicine. (2026). *ACSM publishes updated resistance training guidelines*. https://www.acsm.org/resistance-training-guidelines-update-2026/
5. Baechle, T. R., & Earle, R. W. (2008). *Essentials of strength training and conditioning* (3rd ed.). Human Kinetics.
6. Centers for Disease Control and Prevention. (2023). *Adult activity: An overview*. U.S. Department of Health and Human Services. https://www.cdc.gov/physical-activity-basics/guidelines/adults.html
7. Currier, B. S., McLeod, J. C., Banfield, L., Beyene, J., Welton, N. J., D'Souza, A. C., & Phillips, S. M. (2023). Resistance training prescription for muscle strength and hypertrophy in healthy adults: A systematic review and Bayesian network meta-analysis. *British Journal of Sports Medicine*. https://bjsm.bmj.com/
8. Faigenbaum, A. D., Lloyd, R. S., & Myer, G. D. (2013). Youth resistance training: Past practices, new perspectives, and future directions. *Pediatric Exercise Science, 25*(4), 591–604.
9. Fleck, S. J., & Kraemer, W. J. (2014). *Designing resistance training programs* (4th ed.). Human Kinetics.
10. Grgic, J., Schoenfeld, B. J., Davies, T. B., Lazinica, B., Krieger, J. W., & Pedisic, Z. (2022). Effect of resistance training on muscle strength and hypertrophy in healthy adults: A systematic review and meta-analysis. *Sports Medicine, 52*, 1–20.
11. Indian Council of Medical Research–National Institute of Nutrition. (2024). *Dietary guidelines for Indians 2024*. ICMR-NIN. https://nin.res.in/
12. Indira Gandhi National Open University. (2024). *Statistical testing of hypothesis*. eGyanKosh.
13. Kraemer, W. J., & Ratamess, N. A. (2004). Fundamentals of resistance training: Progression and exercise prescription. *Medicine & Science in Sports & Exercise, 36*(4), 674–688.
14. Li, J., Zang, L., Hao, S., & Wang, H. (2025). Comparative efficacy of different exercise types on body composition in university students: A systematic review and meta-analysis of randomized controlled trials. *Frontiers in Physiology, 16*, Article 1537937. https://doi.org/10.3389/fphys.2025.1537937
15. Lopez, P., Taaffe, D. R., Galvão, D. A., Newton, R. U., & Nonoyama, M. (2021). Resistance training effectiveness on body composition and physical function: A systematic review. *Journal of Sports Sciences, 39*(15), 1–12.
16. Ministry of Education, Government of India. (n.d.). *Fit India*. https://dsel.education.gov.in/en/fit-india
17. Moro, T., Marcolin, G., Bianco, A., Bolzetta, F., Berton, L., Sergi, G., & Paoli, A. (2020). Effects of 6 weeks of traditional resistance training or high-intensity interval resistance training on body composition, aerobic power and strength in healthy young subjects: A randomized parallel trial. *International Journal of Environmental Research and Public Health, 17*(11), 4093. https://doi.org/10.3390/ijerph17114093
18. National Council of Educational Research and Training. (2024). *Statistics*. NCERT.
19. Press Information Bureau. (2021). *Fit India Movement was launched on 29th August, 2019*. Ministry of Youth Affairs and Sports, Government of India.
20. Rukbumrung, T., Rugbumrung, M., Thurayot, A., Impanya, S., Chailert, P., & Tangchaisuriya, P. (2025). Comparison of resistance training frequencies on strength, body composition, and anthropometric measures in untrained young men. *Journal of Physical Education and Sport, 25*(9), 1919–1930.
21. Schoenfeld, B. J. (2010). The mechanisms of muscle hypertrophy and their application to resistance training. *Journal of Strength and Conditioning Research, 24*(10), 2857–2872.

22. Schoenfeld, B. J., Grgic, J., & Krieger, J. (2021). How many times per week should a muscle be trained to maximize muscle hypertrophy? *Sports Medicine, 51*, 1–12.
23. Sports and Society Accelerator, & Dalberg Advisors. (2024). *The state of sports and physical activity in India*. Sports and Society Accelerator.
24. Strain, T., Flaxman, S., Guthold, R., Semenova, E., Cowan, M., Riley, L. M., Bull, F. C., & Stevens, G. A. (2024). National, regional, and global trends in insufficient physical activity among adults from 2000 to 2022: A pooled analysis of 507 population-based surveys with 5.7 million participants. *The Lancet Global Health*.
25. Westcott, W. L. (2012). Resistance training is medicine: Effects of strength training on health. *Current Sports Medicine Reports, 11*(4), 209–216.
26. Wewege, M. A., Desai, I., Honey, C., Coorie, B., Jones, M. D., Clifford, B. K., Leake, H. B., Hagstrom, A. D., & Parmenter, B. J. (2022). The effect of resistance training in healthy adults on body fat percentage, fat mass and visceral fat: A systematic review and meta-analysis. *Sports Medicine, 52*, 287–300.
27. World Health Organization. (2020). *WHO guidelines on physical activity and sedentary behaviour*. WHO.
28. World Health Organization. (2022). *Global status report on physical activity 2022*. WHO.
29. World Health Organization. (2024). *Physical activity*. WHO. https://www.who.int/news-room/fact-sheets/detail/physical-activity
30. World Health Organization. (2024). *Physical activity profile 2024: India*. WHO. https://cdn.who.int/