Enhancing selective functional fitness among sedentary college students through functional loop resistance band training

Mejora de la aptitud funcional selectiva en estudiantes universitarios sedentarios mediante entrenamiento funcional con bandas de resistencia

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Abstract

Background: Sedentary college students require functional fitness. Functional fitness refers to the capacity to carry out activities of daily living independently and efficiently, including muscular strength, flexibility, aerobic endurance and balance. Physical exercise is a key factor in preserving and improving functional fitness.
Materials and Methods: The present controlled pre-post pilot study involved a cohort of 43 allied health sciences students attending an allied health sciences college in Puducherry, India. Participants were allocated randomly into two individual groups: group A (n = 22), which was exposed to a comprehensive program comprising functional loop resistance band strengthening exercise, aerobic exercise, and stretching exercises and group B (n = 21), which was subjected to training in stretching and aerobic exercise alone. Each group received three sessions per week for six weeks. Functional fitness abilities were measured through the Sit-to-Stand Test (SST), Sit-and-Reach Test (SRT), and Back Scratch Test (BST) with baseline and post-intervention measurements.
Results: Statistical analysis was carried out using paired t-tests for within-group comparisons and unpaired t-tests for between-group comparisons. Group A demonstrated significantly greater improvements than group B, $p < 0.001$, suggesting that including functional loop resistance band training led to superior outcomes.
Conclusion: The study indicates that incorporating functional loop resistance band strength training alongside aerobic exercises and stretching significantly enhances physical fitness levels in sedentary college students, outperforming the effects of traditional aerobic and stretching routines alone.

Keywords

Aerobic exercise; back scratch test; functional loop resistance training; physical fitness; stretching exercise.

Resumen

Antecedentes: Los estudiantes universitarios sedentarios requieren aptitud física funcional. La aptitud física funcional se refiere a la capacidad de realizar actividades de la vida diaria de forma independiente y eficiente, incluyendo fuerza muscular, flexibilidad, resistencia aeróbica y equilibrio. El ejercicio físico es un factor clave para preservar y mejorar la aptitud física funcional.
Materiales y métodos: El presente estudio piloto controlado, pre-post, involucró a una cohorte de 43 estudiantes de ciencias de la salud afines que asistían a una universidad de ciencias de la salud afines en Puducherry, India. Los participantes fueron asignados aleatoriamente a dos grupos: el grupo A (n = 22), que recibió un programa integral que incluía ejercicios de fortalecimiento con banda de resistencia funcional, ejercicios aeróbicos y ejercicios de estiramiento, y el grupo B (n = 21), que recibió entrenamiento únicamente en estiramientos y ejercicios aeróbicos. Cada grupo recibió tres sesiones semanales durante seis semanas. Las capacidades de aptitud física funcional se midieron mediante la prueba de sentarse y levantarse (SST), la prueba de sentarse y alcanzar (SRT) y la prueba de rascado de espalda (BST), con mediciones iniciales y posteriores a la intervención.
Resultados: Se realizó un análisis estadístico mediante pruebas t pareadas para comparaciones intragrupales y pruebas t no pareadas para comparaciones intergrupales. El grupo A mostró mejoras significativamente mayores que el grupo B ($p < 0,001$), lo que sugiere que la inclusión del entrenamiento de fuerza con banda de resistencia funcional condujo a resultados superiores.
Conclusión: El estudio indica que la incorporación del entrenamiento de fuerza con banda de resistencia funcional junto con ejercicios aeróbicos y estiramientos mejora significativamente la condición física en estudiantes universitarios sedentarios, superando los efectos de las rutinas tradicionales de aeróbicos y estiramientos por separado.

Palabras clave

Ejercicio aeróbico; prueba de rascado de espalda; entrenamiento de resistencia de bucle funcional; aptitud física; ejercicio de estiramiento.

Introduction

A sedentary lifestyle is a key risk factor among university students. The last few decades have seen an alarming increase in people, especially young adults and college students, adopting a sedentary lifestyle. This behavior identified as one of the strongest predictors of elevating long-term cardiovascular risks in this young population (Abdul Hussein, 2025). According to the World Health Organization (WHO), "Sedentary lifestyle is a lifestyle where an individual does not receive adequate physical activity and exercise." Fitness is essential when it comes to one's health as well as quality of life (Lee et al., 2017). A sedentary lifestyle can accelerate age-related decreases in body composition and functional capacity, particularly with chronic disease, whereas regular physical activity prevents or postpones pre-frailty and frailty and fosters overall health (Battista et al., 2025). Functional fitness is a category of physical fitness that measures the ability to perform activities of daily living in a self-sufficient and effective way, seamlessly and unnoticeably. It has several factors: strength, muscle flexibility, balance, and endurance (Lee et al., 2017; van der Ploeg & Hillsdon, 2017). Flexibility is inversely correlated with BMI and is positively correlated with physical activity highlighting the importance of school based intervention towards increasing fitness and health among young population (De Castro-Maqueda et al., 2025).

The benefits of physical activity are well known; however, inactivity, especially among students in higher education, is on the rise. This is partly due to the prolonged academic workloads, screen time, and sedentary recreation. Globally, the WHO reports that over 80% of adolescents and teenagers do not engage in physical exercise at a healthy level (Guthold et al., 2020). This sedentary lifestyle during emerging adulthood is perilous as it places the individual at greater risk for developing non-communicable illnesses such as cardiovascular disease, diabetes, hypertension, and obesity (Lopes et al., 2019; Qi et al., 2019). Sedentary behavior, defined as any waking activity with low energy expenditure not exceeding 1.5 metabolic equivalent (MET) task while seated or reclined (Quartiroli & Maeda, 2014), is a unique risk factor related to poor spinal and musculoskeletal health, inadequate posture, flexibility and diminished cardiovascular output (Kang et al., 2016; Sands et al., 2013). The MET is a measure that approximates the amount of energy expended by the body when it performs an activity compared to resting metabolic rate. One MET is the oxygen consumed while seated at rest and is equal to 3.5 mL O2 per kilogram body weight per minute. The MET level is a simple means of defining the tolerance for physical activity in a individual (Leal-Martín et al., 2024).

Students studying healthcare or other demanding disciplines are particularly vulnerable due to prolonged sedentary study and screen-based activities. This has been made worse by a recent shift in lifestyle due to the COVID-19 pandemic (Park et al., 2020), which resulted in greater reliance on virtual learning, less active engagement in physical activities, and less routine exercise among students (Barkoukis et al., 2010). Therefore, this group must be targeted for functional fitness promotion through specifically designed programs.

Loop functional resistance band training offers a viable option for exercising in cramped spaces, as it does not require cumbersome gym equipment. These bands utilize external resistance, engaging primary muscle groups, enhancing strength, joint stability, and muscular endurance (Barr-Anderson et al., 2008) Other studies have shown that populations who have limited access to conventional exercise facilities or those at risk of musculoskeletal deconditioning could greatly benefit from incorporating resistance band training into their routine (Biddle et al., 2003; Muñoz-Bermejo et al., 2021). Furthermore, aerobic exercises are known to enhance cardiovascular endurance, oxygen consumption, and activity of the parasympathetic nervous system, while stretching increases the range of motion of joints, reduces muscle stiffness and helps prevent injuries (Ayala et al., 2012; Lohne-Seiler et al., 2016).

When combined, stretching, aerobic exercises and functional resistance training offer a comprehensive strategy for addressing the essential aspects of functional fitness: strength, flexibility, and endurance (Quartiroli & Maeda, 2014). Nevertheless, the integrated impact of these three modalities has not been studied in a sedentary Indian college student population.

Therefore, this study seeks to evaluate the impact of functional loop resistance band training integrated with stretching and aerobic exercises on the functional fitness of sedentary college students. The research aims to validate more efficient exercise prescriptions within academic environments that primarily cater to students leading sedentary lifestyles by examining this comprehensive approach compared to the conventional stretching and aerobic exercise routine.

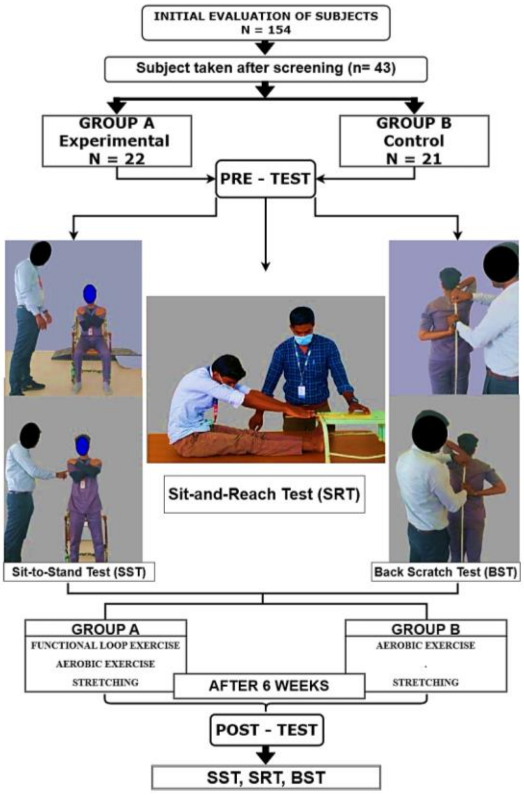
Method

This study was implemented as a controlled pre-post pilot trial over six weeks. The objective was to assess the impact of amalgamating functional loop resistance band strength training with stretching and aerobic exercises on the functional fitness of sedentary college students. The research was conducted at the College of Allied Health Sciences in Puducherry, India. The Institutional Review Board granted ethical approval before initiating the study, and all participants provided written informed consent.

Students demonstrating lower levels of physical activity, such as those who earned MET scores between 100 and 400 on the International Physical Activity Questionnaire (IPAQ), were classified as "physically inactive" for purposes of this intervention (Quartiroli & Maeda, 2014). Therefore, the participants were male and female students between 18 and 25 years old at the college level.

As for students actively participating in musculoskeletal injury, any surgical procedure in the preceding six months, or any medical condition affecting physical exercise (e.g., cardiovascular, neurological, or orthopaedic disorders), these factors would result in exclusion. This selection method gives adequate group allocation because the criteria were processed via simple random sampling. All tests were performed in a well-ventilated, indoor environment within the College of Allied Health Sciences. The physical setting was maintained constant over the course of the study, testing occurring within the same hour window each day to reduce variability due to circadian effects. Outcome measures were performed by two trained examiners with a background in physiotherapy. Before the initiation of data collection, both raters received a standardized training session for uniformity in test administration and data recording. Inter-rater reliability was ensured through pilot testing, and both raters followed a rigorous assessment protocol for the course of the study.

Figure 1. Flowchart of participant selection and graphical overview of the study methodology



Participants

From a study population of 154 participants, 43 were selected through defined inclusion and exclusion criteria and then randomly assigned into two equal groups. Group A (experimental group, n = 22): received a combined intervention of stretching, functional loop resistance band strength training, and aerobic exercises. Group B (control group, n = 21): received a more traditional approach and only incorporated stretching and aerobic exercises (Figure 1). All members in both groups were required to partake in supervised exercise sessions scheduled for thrice a week over the six weeks, maintaining around 55 minutes per session (Stavres et al., 2018).

Procedure

Stretching Exercises: A specific set of stretching exercises was integrated into each one of the warm-up sessions. They aimed to improve the flexibility and the range of motion of various joints in the body's upper and lower limbs. Upper limb stretches: Triceps stretch, triceps and internal rotation stretch, biceps and anterior capsule stretch, complete upper limb stretch, upper back and posterior shoulder stretch, wrist flexion and extension flexor stretch. Lower limb stretches: Hamstring stretch, quadriceps stretch, hip flexor stretch, gluteal stretch, piriformis stretch, and adductor stretch. Each stretch was held for 15–30 seconds and was repeated in 2 sets of 3 repetitions. Overall stretching time amounted to 15 minutes.

Functional Loop Resistance Band Strength Training (only for Group A): Participants in Group A fought under functional strength training conditions using loop resistance bands. The objectives included implementing cardio training, strengthening upper and lower body muscle groups, and training muscle endurance. Their functional movement patterns consist of exercises including Loop band step press, step-ups, lateral walks, squats, forward walks, lat pulldowns, lunges, and bent-over rows. Participants had to complete two sets of 8 to 10 repetitions for each exercise listed. This part lasted 25 minutes of each session (Paluch et al., 2024).

Aerobic Exercises: Both cohorts engaged in aerobic exercises designed to enhance cardiovascular and aerobic fitness. Stationary bicycle aerobic workouts were conducted for a minimum of 150 minutes per week as per the WHO PA guidelines (Bull et al., 2020). Each participant was instructed to attend each exercise session for no less than half an hour, comprising a 3-minute warm-up and a 3-minute cool-down. The exercise program lasted for 6 weeks. During this period, exercise intensity was adjusted on a weekly basis using the calculated Heart Rate (HR) derived from the Karvonen formula (Fletcher et al., 2001). Heart Rate Reserve (HRR) refers to the difference between maximum and resting heart rate and is applied to assess fitness and establish target exercise heart rates (Bishnoi & Hernandez, 2025). The study participants started the program with an intensity of resting HR+50% of HRR in the first week and progressed to the following intensity levels: second week, resting HR+60% of HRR; third week, resting HR+65% of HRR; fourth week, resting HR+70% of HRR; fifth week, resting HR+75% of HRR. By the sixth week, participants were exercising at resting HR+80% of HRR. Heart rate (HR) was monitored in real-time and displayed on a screen.

Functional fitness was evaluated with three performance tests that are standardized and validated as accurate measures of functional fitness capabilities: Sit-to-Stand Test (SST): Assesses the endurance and strength of the lower body. Participants had to repeat a sit-to-standing movement for a set period. (Test reliability: ICC (The Intraclass Correlation Coefficient is a statistical tool that measures the reliability or consistency of measurements) = 0.937) (Muñoz-Bermejo et al., 2021). Sit-and-Reach Test (SRT): Assesses the flexibility of the lower back and hamstring muscles. The participant sat on the ground with legs extended and reached forward along a measuring tape. (Test reliability: ICC = 0.95) (Ayala et al., 2012). Back Scratch Test (BST): Measures the range of total shoulder movement through hand overlap or gap when reaching over the shoulder and behind the back with hands. (Test reliability: ICC = 0.96) (Lohne-Seiler et al., 2016). Every evaluation was done before the intervention (pre-test) and after 6 weeks (post-test). Each test was evaluated by trained assessors under standardized conditions to maintain uniformity.

Data analysis

Data was processed using IBM SPSS software (version 29.0.1.0). Each baseline and outcome variable were assessed with descriptive statistics. Changes within each group's performance from pre-tests to post-test measures were evaluated using paired t-tests. Post-test results of Group A and Group B were compared using unpaired t-tests to assess the impact of the additional resistance training on the group's outcomes. A significance level of $p<0.05$ was used for all tests to determine statistical significance. Effect sizes were also calculated to assess the clinical relevance of the findings, where relevant.

Results

All participants completed the six-week trial, and 43 participants (mean age 21.5 ± 2 years) adhered to greater than 90% of the scheduled sessions; no adverse effects were reported. At baseline, both groups were statistically equal in terms of age, level of physical activity and all functional fitness measures. This is advantageous for the exercise study design as it increases the validity of outcome comparisons due to differing exercise protocols.

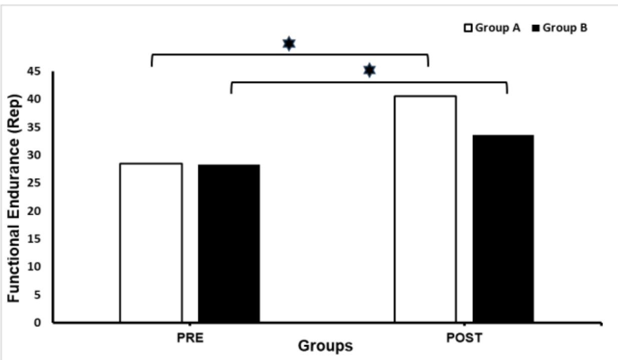
Using within-group analysis with paired t-tests, both groups A (experimental group) and B (control group) showed significant changes post-intervention at six weeks for all three outcomes: SST, SRT and BST (Table 1). In group A, lower limb strength improvement was observed in the result of the SST: $t = 32.92$, $p < 0.001$ (95% CI [11.32, 12.78]; Cohen's $d \approx 2.72$, indicating a very large effect size) (Figure 2). Such an increase is interpreted as a change of magnitude that is almost impossible to attribute to chance. Flexibility as measured by SRT was also significantly enhanced, demonstrating a t-value of 26.93 ($p < 0.001$; 95% CI [7.46, 9.04]; Cohen's $d \approx 1.91$) (Figure 3). Moreover, upper limb flexibility measured by the BST also significantly improved to the right ($t = 22.80$, $p < 0.001$; 95% CI [3.52, 4.18]) and the left ($t = 27.30$, $p < 0.001$; 95% CI [3.42, 4.10]) (Figures 4 & 5). Both results correspond to large effect sizes, reinforcing the meaningful clinical significance of improvements.

Table 1. Within-group comparison of functional fitness performance test scores

Outcome tools	Groups	Pre-test		Post-test		T -value	P -value
		Mean	Sd	Mean	Sd		
Sst	GROUP A	28.50	4.43	40.55	4.56	32.92	<0.001*
	GROUP B	28.35	3.66	33.65	4.08	15.87	<0.001*
SRT	GROUP A	31.90	7.75	40.15	7.25	26.93	<0.001*
	GROUP B	31.05	4.98	36.35	4.61	10.51	<0.001*
BST (Right)	GROUP A	5.80	1.19	1.95	0.54	22.80	<0.001*
	GROUP B	5.35	0.69	2.99	0.92	14.76	<0.001*
BST (Left)	GROUP A	5.62	1.15	2.36	0.73	27.30	<0.001*
	GROUP B	5.65	0.96	3.16	0.76	21.95	<0.001*

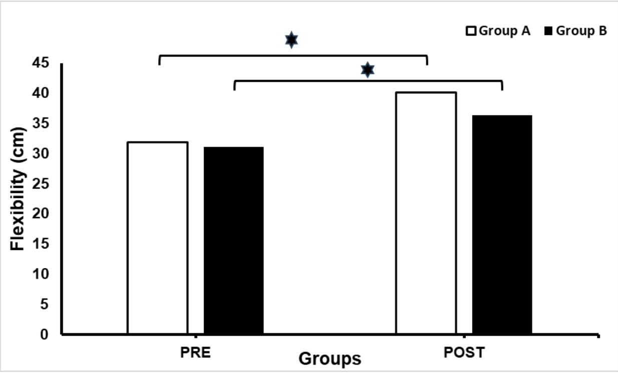
*P<0.001
Note: SST = Sit-to-Stand Test; SRT = Sit-and-Reach Test; BST = Back Scratch Test

Figure 2. Pre and post-test SST scores for group A and group B.



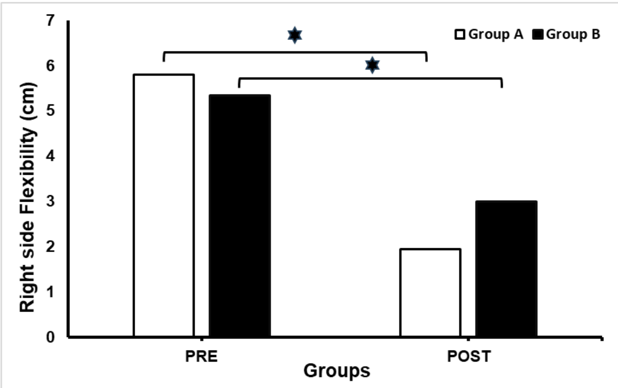
Note: *p<0.001, group A = Experimental group; group B = Control group; SST = Sit-to-Stand Test. Rep= No of repetition

Figure 3. Pre and post-test SRT scores for group A and group B.



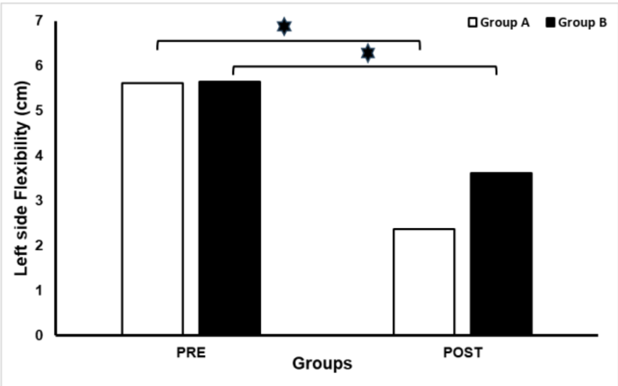
Note: *p<0.001, group A = Experimental group; group B = Control group; SRT = Sit-and-Reach Test.

Figure 4. Pre and post-test BST scores (right side) for group A and group B.



Note: *p<0.001, group A = Experimental group; group B = Control group; BST = Back Scratch Test.

Figure 5. Pre and post-test Back Scratch test scores (left side) for group A and group B.



Note: *p<0.001, group A = Experimental group; group B = Control group; BST = Back Scratch Test.

A parallel case, group B, which participated exclusively in stretching and aerobic exercises, also recorded positive gains, although to a lesser degree. The SST results in group B were impressive, with the t-value of 15.87 (p < 0.001; 95% CI [4.57, 6.03]; Cohen's d ≈ 1.47) demonstrating a significant improvement in lower body endurance. The SST recorded a moderate improvement in flexibility at a t-value of 10.51 (SRT: t = 10.51, p < 0.001; 95% CI [4.34, 5.66]). In BST, both right (t = 14.76, p < 0.001; CI [2.00, 2.72]) and left (t = 21.95, p < 0.001; CI [2.37, 2.95]), confirming significant improvements in shoulder and upper back mobility.

Regarding the change of post-test scores in each group, the between-group comparison analysis was done by unpaired t-tests (Table 2). Group A produced significantly higher improvement than group B on all measures of outcome (Figures 2,3,4 and 5). For SST, group A's mean improvement (12.05 ± 1.19) was significantly greater compared with group B's (5.3 ± 1.49), t = 15.82, p < 0.001; 95% CI [5.95, 7.58]. For SRT, group A got better by 8.25 ± 1.37 compared to 5.0 ± 1.12 in group B (t = 7.43, p < 0.001; CI [2.42, 4.13]). BST (right and left) also demonstrated greater improvement in group A: difference on the right 3.85 ± 0.75 vs. 2.36 ± 0.71 (t = 6.41, p < 0.001; CI [0.99, 1.88]) and on the left 3.76 ± 0.61 vs. 2.03 ± 0.41 (t = 10.70, p < 0.001; CI [1.37, 2.06]). These CIs as well as the large effect sizes (Cohen's d > 1 for most outcomes) indicate clinically significant improvements.

Table 2. Between-group comparison of functional fitness performance test scores

Outcome tools	Groups	Mean	Sd	T -value	P -value
Sst	Group a	12.05	1.19	15.82	<0.001*
	GROUP B	5.3	1.49		
SRT	GROUP A	8.25	1.37	7.43	<0.001*
	GROUP B	5.0	1.12		
BST (Right)	GROUP A	3.85	0.75	6.41	<0.001*
	GROUP B	2.36	0.71		
BST (Left)	GROUP A	3.76	0.61	10.70	<0.001*
	GROUP B	2.03	0.41		

*P<0.001

As noted, functional fitness showed improvement in all sedentary college students because of both interventions. However, the effect of combined stretching, aerobic exercise, and functional loop resistance band training on Group A was progressively greater in all three measures, strength, flexibility and upper body mobility, than in the conventional program used in Group B. The magnitude of the t-values and the severity of the p-values suggest with growing certainty that including resistance training in a comprehensive fitness regimen is most beneficial for sedentary individuals.

Discussion

From the study's findings, it was possible to determine the impact of loop functional resistance band strength training on the operational fitness of sedentary college students compared to the control group. This study highlights the increase in physically inactive and sedentary individuals, especially among college students. We all understand how the COVID-19 pandemic negatively impacted students' level of physical activity by confining them to their homes, subsequently leading to increased sedentary time. In a regional context, studies conducted among allied healthcare students in Puducherry unveiled astonishingly high levels of sedentary behavior and reduced mobility. According to Manickavelu et al. (2022), students with limited physical activity exhibited high levels of restricted daytime mobility, which reflects a growing sedentary lifestyle that can exacerbate relative health and wellness concerns later in life, as well as physically active life and functional health (Manickavelu, S, et al., 2022).

Building upon this, a prior study conducted by Manickavelu et al. noted the association of decreased daily physical activity with impairment of respiratory functions, flexibility and body composition among students within the same age group (Manickavelu, Subbiah, et al., 2022). This data enhances understanding about the impacts of sedentary behavior in students by highlighting the necessity of physical activity not only for musculoskeletal health, but also useful to other physiological systems and functions (Quartiroli & Maeda, 2014). Responding to this gap, the present study examines the effects of a simple, scalable intervention on physical fitness within this high-risk population.

One of the previous literatures (Mougios et al., 2005) showed that there was no change in body weight, proportion of body fat (PBF), fat-free mass, and fat mass over a span of twelve weeks in either the low or high intensity exercise groups for the class of overweight women studied. This reinforces the predominance of caloric expenditure over the intensity of the exercise performed. In another study which consisted of high intensity functional training for twelve weeks, both low and moderate resistance groups that had equal total volume load showed comparable increases in lean body mass. Moreover, both groups had reductions in fat mass over the twelve-week period (Kapsis et al., 2022). Another study of postmenopausal women sought to investigate the impact of walking speed on body fat and found both slow and fast walkers experienced comparable body fat reduction after thirty weeks of walking, supporting the idea that energy expenditure matters more than exercise intensity (La New & Borer, 2022). Thus, it appears more reasonable to prescribe types of exercise and the total amount to reflect the energy expenditure, rather than time, to maximize changes in body composition.

While the stationary cycling incorporated into this study was an appropriate exercise modality within the context of combined aerobic and resistance training (Nam et al., 2024), the exercise volume and intensity of the exercise, including the total duration of exercise in weeks, may not be enough to meaningfully impact body composition changes. This study also noted that the functional training group performed markedly better in the sit and reach test, while the traditional training and control groups demonstrated comparatively less marked improvement (Yildiz et al., 2019). Weiss et al. reported that a 7-week functional training program dramatically increased flexibility in a group of college non-athletes (Weiss et al., 2010), which aligned with this study's participants.

In particular, the current research determined that integrating resistance band strength training into aerobic exercise and stretching maximized levels of physical fitness among previously sedentary college students. These findings corroborate past evidence indicating that resistance band programs enhance body composition and muscular strength, especially in obese individuals (Liu et al., 2022). Consistent with the literature, long-term resistance training has previously been linked to notable gains in weight regulation, posture, and body composition in obese middle-aged individuals. Surprisingly, resistance training has been shown to be more beneficial than maximal fat oxidation training and high-intensity aerobic interval training in certain situations(Hang et al., 2025). While this study targeted a younger population, the physical fitness gains support the generalizability of resistance-based interventions to multiple ages.

In addition, previous studies have indicated that resistance training can strengthen muscles and increase flexibility, even surpassing stretching by itself in certain situations (Alizadeh et al., 2023). Although certain studies indicate that no differences were found in resistance and stretch training when directly compared to each other, the present study indicates that using all three modalities of resistance, aerobic, and flexibility training may provide the greatest advantage in enhancing overall physical fitness in sedentary persons.

Both intervention groups showed improvement in the Sit-to-Stand, Sit-and-Reach, and Back Scratch Tests. Group A, which participated in stretching, aerobic exercise and resistance band training, and group B, which only performed stretching and aerobic exercise, demonstrated the same results. Because Group A achieved better results than Group B in all the outcome measurements, it can be concluded that resistance band training offers additional benefits when incorporated into aerobic and flexibility exercises. Functional training incorporating resistance exercises appears to be more effective in mitigating the negative impacts of a sedentary lifestyle on college students (Quartiroli & Maeda, 2014).

These findings are consistent with the research of (Smith et al., 2017), who noted that sedentary older adults have improved vascular health and functional capacity with resistance band training (Ozaki et al., 2020). Their study confirms the applicability and impact of resistance training on low-active populations, reinforcing this study’s result of measurable fitness improvements in young adults after a six-week resistance loop band intervention.

The current findings simultaneously corroborate (Rubini et al., 2007) observations, who emphasized the need for strength and flexibility training to be part of a fitness program. Stretching was reported to help enhance the range of motion of joints, decrease stiffness, and help prevent injuries. The current study also reported these improvements, especially regarding both groups' SRT and BST changes.

Alongside other studies, however, Puetz's focused on the mental and emotional effects of moderately intense exercise on an individual. This study also noted that even with minimal changes to aerobic capacity, energy perception and reduced fatigue significantly improved with low- to moderate-intensity workouts over six weeks (Puetz et al., 2008). In corroboration of what we observed in our study, these conclusions imply that moderate-intensity resistance and aerobic exercise are integral in enhancing physical functioning and energy levels throughout the day. Practical applications of this research indicate that universities can implement analogous programs by providing group sessions two to three times a week utilizing minimal equipment like resistance bands. The sessions can be conducted in multipurpose rooms and facilitated by trained leaders or peer facilitators. Due to the low expense, ease of adoption, and scalability, this model can be widely adopted to increase physical activity and student health. Long-term compliance, psychological advantages, and the effects of varying levels of training intensity or format also should be examined in future studies.

Conclusions

This pre-post-controlled pilot study demonstrates that incorporating functional loop resistance band strength training into a routine of stretching and aerobic exercise significantly enhances functional fitness among sedentary college students. While both groups showed notable improvements, the addition of resistance band exercises led to greater gains in lower limb strength, flexibility, and upper limb mobility, as reflected in Sit-to-Stand, Sit-and-Reach, and Back Scratch test outcomes. Given the high prevalence of sedentary behavior and associated health risks among college students, these findings highlight the potential of functional loop resistance band training as a cost-effective, scalable, and practical addition to conventional fitness programs, particularly in resource-limited or time-constrained settings like college campuses. However, the small study population and short follow-up period highlight the need for future studies involving larger populations, longer follow-up and a more extensive array of outcome measures, e.g., psychosocial and metabolic markers of health, to definitively establish the long-term effectiveness and feasibility of these interventions in reducing sedentary behaviour in young adults.

Limitations and Future Direction

This study presents several limitations that should be acknowledged. First, the relatively small sample size, drawn from a single academic institution, limits the generalizability of the findings. Second, key lifestyle factors such as stress, sleep quality, dietary habits, and physical activity outside the intervention were self-reported and not objectively controlled, potentially influencing the results. Third, the absence of longitudinal follow-up data restricts the ability to assess the sustainability of the improvement observed. Fourth, the functional outcomes did not account for subjective factors such as fatigue and motivation, which could have enriched the interpretation of performance data.

Future research should consider larger and more diverse samples, longer intervention durations, and follow-up assessments within randomized controlled trial designs. Additionally, incorporating qualitative measures of participant wellness, adherence, and motivation, along with cost-effectiveness evaluations, will provide a more comprehensive understanding of functional resistance training interventions feasibility and long-term impact among sedentary college students in institutional settings.

Conflict of interest

The authors declared no conflict of interest.

Financing

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