

Effect of a 4-Week Tele-Physiotherapy Exercise Program on Awareness, Acceptance, and Physical Activity Levels among College Students: A Pre-Post Experimental Study

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Abstract: ***Background:** Physical inactivity is common among university students, and tele-physiotherapy offers a low-cost way to deliver supervised exercise. We examined whether a 4-week live, video-delivered exercise programme changed awareness of tele-physiotherapy, acceptance of it, and self-reported physical activity in college students. **Methods:** Single-group pre-post study using convenience sampling at SVIMS. Participants joined live Google Meet sessions five days a week (30–40 minutes) for four weeks. Physical activity was measured with the IPAQ short form (40 matched pairs); awareness (10 yes/no items) and acceptance (10 five-point Likert items) were measured with study-specific questionnaires (40 matched pairs). Analysis used paired non-parametric tests (Wilcoxon signed-rank, exact McNemar), Holm correction for item-level testing. **Results:** Participants (mean age 22.7 ± 1.2 years; 31 women, 9 men,) weekly physical activity roughly increased six-fold: median total activity rose from 363 (IQR 278–544) to 2249 (1726–3000) MET-min/week (mean difference 2094, 95% CI 1581 to 2607; $p < 0.001$; rank-biserial $r = 1.00$). The share of participants in the low-activity category fell from 77.5% to 2.5%, and 25.0% reached the high category. Awareness scores changed from 8.70 ± 1.87 to 9.20 ± 1.42 out of 10 (Wilcoxon $p = 0.143$), while acceptance scores changed from 39.00 ± 6.42 to 39.58 ± 6.89 out of 50 (Wilcoxon $p = 0.081$). BMI also decreased where the baseline BMI median was 22.00 (IQR 21.00–24.00) and the post was 21.95 (IQR 20.80–23.70); $p < 0.001$. **Conclusion:** A short, supervised tele-physiotherapy programme was followed by a large increase in self-reported physical activity in these students, who were already aware of and receptive to tele-physiotherapy.*

Keywords: tele-physiotherapy; telerehabilitation; physical activity; IPAQ; college students; awareness; technology acceptance

1. Introduction

Physical inactivity among university students is a growing public health concern worldwide. The transition to college life is often associated with reduced physical activity, increased sedentary behaviour, and unhealthy lifestyle habits, which may negatively affect physical and mental health. Previous research has identified university students as a population at risk for insufficient physical activity levels¹. Recent advances in digital health technologies have created new opportunities for promoting healthy behaviours and increasing physical activity participation. Tele-physiotherapy, a branch of telehealth, involves the delivery of physiotherapy services through information and communication technologies, including video consultations, remote exercise supervision, and digital health platforms.² Tele-physiotherapy gained significant importance following the COVID – 19 pandemic, as healthcare providers increasingly utilized remote service delivery methods to ensure continuity of care. Tele-physiotherapy has emerged as a visible alternative to traditional face-to-face consultations, particularly for exercise-based interventions and follow-up care.⁵

The World Health Organization recommends that adults aged 18–64 years do at least 150–300 minutes of moderate-

intensity (or 75–150 minutes of vigorous-intensity) aerobic activity per week, together with muscle-strengthening activities on two or more days¹³. Many students fall short of this. In Indian studies using the IPAQ, 63% of undergraduate physiotherapy students in Delhi NCR were classified as inactive and only 16% as highly active; among 342 MBBS students in Lucknow, 34.2% were insufficiently active and 26.6% reached the health-enhancing category¹⁵; and among 259 medical students in Bangalore, 15.4% showed low, 43.2% moderate and 41.3% high activity, with women less active than men¹⁶. Even students who study health professions therefore do not reliably meet recommended levels, which makes a supervised, low-cost programme worth testing.

Whether students will actually take up such a service depends largely on how useful and how easy they think it is⁴. The acceptance and adoption of tele-physiotherapy services depend largely on user's perceptions of the technology. According to the technology acceptance model proposed by Davis, perceived usefulness and perceived ease of use are key factors influencing an individual's willingness to adopt a new technology⁴. Therefore, understanding student's awareness and acceptance of tele-physiotherapy is important for successful implementation of such programs. Hence this study is designed as a single-group pre-post study in which

college students participated in a 4-week, live, video-delivered exercise programme.

2. Aims and Objectives

Aims

To evaluate the effect of a 4-week tele-physiotherapy exercise program on awareness, acceptance, and physical activity levels among college students.

Objectives

To assess the effect of tele-physiotherapy exercises on awareness among college students, to assess the effect of tele-physiotherapy exercises on acceptance of tele-physiotherapy among college students, to assess the effect of tele-physiotherapy exercises on physical activity levels among college students.

3. Methods

3.1 Design, participants and intervention

The study was conducted after approval from the Institutional Ethics Committee (IEC No.2133), and written informed consent was obtained from all participants. The study used a single-group pre-test-post-test design with convenience

sampling of college students aged between 18–25 years at SVIMS. The study procedure was explained to the participants who met the inclusion criteria of able to understand English, between low and moderately activity levels according to IPAQ-SF, possession of smartphone and internet access, were included in the study after obtaining an informed consent. Exclusion criteria includes a recent musculoskeletal injury limiting exercise, neurological disorders, cardiovascular contraindications, or participation in other structured exercise programmes (>150 minutes/week) were excluded. The demographic data, anthropometric measures (height, weight, BMI), physical activity levels, acceptance, and awareness levels were measured at baseline and at the end of 4 weeks. Participants joined live tele-physiotherapy sessions on Google Meet, five days a week for four weeks, each lasting 30–40 minutes. The programme progressed from warm-up, stretching and comfortable walking in week 1, to aerobic exercise in week 2, to added strengthening in week 3, and a progressive combined programme with attendance tracking in week 4 (Table 1) [9]. Questionnaires were completed online before the programme and again after week 4. The exercise protocol was developed with reference to ACSM exercise-prescription principles and WHO physical-activity recommendations, with progressive aerobic and strengthening exercises adapted to the feasibility and tolerance of apparently healthy college students.

Table 1: Week-wise tele-physiotherapy exercise protocol (as approved by the Institutional Ethics Committee)

Week	Component	Exercises	Dosage	Duration
1	Warm-up	Cervical flexion, extension and rotation; shoulder rolls; ankle pumps; knee flexion–extension; hip abduction–adduction	10 repetitions	10 min
	Stretching	Neck stretch; upper trapezius, shoulder, hamstring, calf and quadriceps stretches	Hold 20–30 s × 3	—
	Walking	Comfortable-paced walking	5 days/week	15–20 min/day
2	Warm-up	Same as week 1	—	10 min
	Aerobic	Brisk walking, spot marching, side-stepping, low-impact jumping jacks	—	20–25 min
	Cool-down	Slow walking and deep-breathing exercises	—	10 min
3	Warm-up	Same as week 1	—	10 min
	Aerobic	Brisk walking, spot marching, step-ups	—	25–35 min
	Strengthening	Wall push-ups, sit-to-stand, mini squats, knee extensions, heel raises	2 sets × 10–15 reps	—
	Cool-down	Stretching and deep-breathing exercises	—	5 min
4	Warm-up	Same as week 1	—	10 min
	Progressive programme	Brisk walking, step-ups, mini squats, wall push-ups, lunges, bridging, heel raises	2 sets × 10 reps	30 min
	Adherence	Attendance tracking	Weekly	—

Delivery: live sessions on Google Meet; 5 days/week; 30–40 minutes/session; 4 weeks. Standard session structure: warm-up (5 min), aerobic exercise (15–20 min), strengthening (10 min), cool-down (5 min).

3.2 Outcome measures and scoring

Physical activity. The International Physical Activity Questionnaire – Short Form (IPAQ-SF) records days per week and minutes per day of vigorous activity, moderate activity and walking over the previous seven days [10,18]. Following the standard processing rules, each domain was converted to MET-minutes per week (vigorous 8.0 METs, moderate 4.0, walking 3.3 × minutes per day × days per week), with daily durations truncated at 180 minutes, and summed to a total. Participants were then classed as low (<600 MET-min/week), moderate (600–2,999) or high (≥3,000) activity. We also used the WHO guideline threshold of at least 150 minutes per week of moderate-to-vigorous activity [13]. The short form has acceptable reliability and

moderate validity against objective measures [18]. Sitting time was not analysed because several free-text entries were in inconsistent units.

A self structured validated questionnaire was used to assess awareness and acceptance

- **Awareness:** Ten yes/no items (Appendix A) were summed to give a total score from 0 to 10; higher scores mean greater awareness.
- **Acceptance:** Ten statements (Appendix A) were rated on a five-point scale (1 = strongly disagree to 5 = strongly agree) and summed to give a total from 10 to 50. Internal consistency was checked with Cronbach's alpha [11]. The data was collected and tabulated in an excel sheet.

3.3 Statistical analysis

The data collected was analysed statistically using Python 3 (pandas, SciPy); the Continuous data are shown as median with interquartile range (IQR) for the skewed activity outcomes and as mean $\pm$ standard deviation (SD) for the awareness and acceptance totals; categorical data as counts and percentages. Normality of the paired differences was checked with the Shapiro–Wilk test. Because the differences departed from normality for all three primary outcomes, the Wilcoxon signed-rank test was the primary test, with the rank-biserial correlation (r) as the effect size (values near 0.1, 0.3 and 0.5 are conventionally read as small, medium and large). The paired t-test is reported as a check. Yes/no awareness items and the change in activity category were tested with the exact McNemar test. Because ten awareness items and ten acceptance items were each tested, p-values within each family were adjusted with the Holm method (12) All tests were two-sided with $\alpha = 0.05$. An exact paired sign test is used to analyse the BMI. The pre/post differences were not normally distributed (Shapiro–Wilk $p < 0.001$), and several participants had no change. The sign test compares the direction of change in the 31 pairs that changed, without relying on normally distributed differences. The decrease was statistically significant ($p < 0.001$; exact two-sided $p = 9.31 \times 10^{-10}$).

4. Results

4.1 Participant characteristics

Table 2: Demographic profile of participants with matched physical-activity data ($n = 40$)

Characteristic	Value
Age, years, mean $\pm$ SD	22.73 $\pm$ 1.24
Female, n (%)	31 (77.5%)
Male, n (%)	9 (22.5%)
Baseline low-to-moderate activity, min/week, median (IQR)	21 (10–40)
BMI at the baseline median (IQR)	22.0(21.0–24.0)
BMI at post median (IQR)	21.95(20.8–23.7)

The analytic group was young and fairly homogeneous: with the mean 22.73 of age. Females made up 78.5% of the group, and men rests 22.5%. At baseline the typical participant reported only about 21 minutes of low-moderate activity a week,

4.2 Physical activity

Physical activity rose sharply on every measure. Total weekly activity increased from a median of 363 MET-min/week to 2249 (Table 3), an average gain of 2094 MET-min/week (95% CI 1581 to 2607). Thirty-seven of the 40 participants improved, 1 declined and 2 were unchanged; the effect size was very large ($r = 1.00$, paired $d_z = 1.30$).

Table 3: Physical activity (MET-min/week) before and after the 4-week programme, by IPAQ domain ($n = 40$)

Domain	Pre median (IQR)	Post median (IQR)	Wilcoxon p	Effect r
Vigorous	0 (0–0)	1400 (1200–1600)	<0.001	1
Moderate	82 (40–160)	310 (160–700)	<0.001	0.84
Walking	214 (165–359)	371 (272–693)	<0.001	0.82
Total	363 (278–544)	2249 (1726–3000)	<0.001	1

Median activity increased in every IPAQ domain: vigorous activity rose from 0 to 1,400 MET-min/week, moderate activity from 82 to 310, walking from 214 to 371, and total activity from 363 to 2,249 MET-min/week. The increases were statistically significant in all domains (Wilcoxon $p < 0.001$). Effect sizes were large, ranging from $r = 0.82$ for walking to 1.00 for vigorous and total activity.

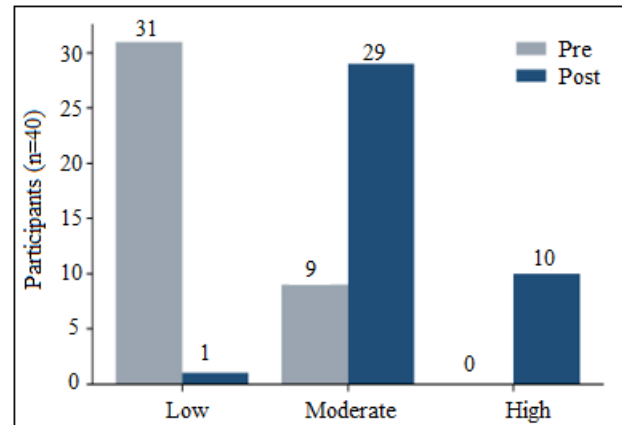


Figure 1: Distribution of IPAQ activity categories before and after the programme. The low category fell from 31 (77.5%) to 1 (2.5%); moderate rose from 9 (22.5%) to 29 (72.5%); and 10 (25.0%) reached the high category from none.

4.3 Awareness of tele-physiotherapy

Awareness was already high before the programme: Where the mean awareness score increased from 8.70 ± 1.87 at baseline to 9.20 ± 1.42 after the programme. The mean increase was 0.50 points (95% CI -0.07 to 1.07), Wilcoxon signed-rank test ($W=53$, $p=.143$; rank-biserial $r=.38$). Scores increased for 12 participants, decreased for 6 and were unchanged for 22. Awareness of a local tele-physiotherapy service increased from 15/40 (37.5%) to 22/40 (55.0%), Cronbach's alpha was 0.83 at baseline and 0.78 after the programme.

4.4 Acceptance of tele-physiotherapy

Complete pre–post acceptance data were available for 40 matched participants. The median was 39 (IQR 38–40) before and 40 (IQR 38–41) after. Scores increased for 20 participants, decreased for 8 and were unchanged for 12. Cronbach's alpha was 0.96 at baseline and 0.98 after the programme.

5. Discussion

This study was conducted to evaluate the effect of a 4-week, live, video-delivered exercise programme on awareness of tele-physiotherapy, acceptance of it, and self-reported physical activity among college students.

Physical activity: The clearest result of this study is the rise in self-reported activity: within four weeks the share of students in the low-activity category dropped from about three in four (77.5%) to almost none (2.5%), and the share reaching the WHO minimum of 150 minutes of moderate-to-vigorous activity a week went from 8% to 95% [13]. Previous

studies in India show that low activity is common in this age group, but at lower rates than our baseline: 63% of Delhi NCR physiotherapy students were inactive [14], 34.2% of Lucknow MBBS students were insufficiently active [15], and 15.4% of Bangalore medical students had low activity [16]. A meta-analysis of eight controlled studies (569 college students) by Bi et al. found that digital health interventions significantly increased step counts (standardised mean difference 0.64), but their effects on light activity, moderate-to-vigorous activity and sedentary time were limited [3]. In contrast, we found large increases in vigorous, moderate and walking activity. The likely reasons are that our programme was a live, supervised exercise class rather than a self-directed app or message-based intervention, and that we used a self-reported measure without a control group, whereas Bi et al. included only controlled studies with objective outcomes. Real-time telerehabilitation has previously been described as a workable way to supervise exercise [2,5], and the near-complete delivery of the prescribed dose in our group is consistent with that.

Awareness: Awareness was so high at baseline that there was little room for improvement: about four in five participants already scored 9 or 10 out of 10, and nine of the ten items were answered “yes” by more than 80% of the sample. Earlier surveys of college students report lower and more variable awareness: in a Nigerian sample of 200 students most had only moderate awareness (43%) and 39% held a positive attitude [7]; in a Turkish sample of 322 college students only 40.4% were aware of telerehabilitation, and the authors linked this to its absence from the curriculum [17]; and a survey of 524 college students from a South Indian college mainly described awareness and future outlook, with 49.4% highly optimistic about sports telerehabilitation [8]. The small increase in the total score (0.56 points) and the rise in awareness of a local service (37.5% to 55%) are plausible, since taking part in a programme makes a service more visible, but the study was not able to confirm them statistically. A more important point may be about the questionnaire rather than the students: yes/no items about whether one “knows” something are easy to agree with, and they cannot measure depth of understanding. Earlier surveys of college students on tele-rehabilitation have concentrated on awareness and attitudes rather than on change after an exercise programme [7,8], so our results add a before-and-after view, but in a population that is arguably more informed than the general student body.

Acceptance: Acceptance was favourable and unchanged, averaging about “agree” on every item. The Technology Acceptance Model suggests that perceived usefulness and ease of use drive adoption [4], and our participants already scored highly on statements about convenience and access. Our finding is more positive than the Nigerian study, in which only 39% of students held a positive attitude and negative attitudes were common, which the authors attributed to local barriers to use [7]. It is, however, in line with the Turkish and Nigerian students' optimism about the future of telerehabilitation (72.4% and 62% respectively expected further development or held high expectations) [7,17]. Two observations stand out. First, the benefits people endorsed most were practical (saving travel time), while the statement about trusting the quality of online care had the lowest

agreement (about two-thirds). Students who are trained to rely on hands-on assessment may reasonably be cautious here, and this is the area where a future programme could work to build confidence, for example through demonstrations of remote movement assessment. Second, a stable score after four weeks of real use is reassuring in its own way: it suggests that the experience did not disappoint people, even if it did not raise their opinion further.

6. Strengths and Limitations

The study used a clear, reproducible analysis plan: matched-pair analysis, exact tests for binary items, multiplicity correction for item-level tests, effect sizes with confidence intervals, and sensitivity analyses that did not change the conclusions. The intervention was standardised and delivered live, with a dose that was easy to document. Limitations of the study

- **No control group.** With a single-group design we cannot separate the effect of the programme from natural change over time, seasonal variation, repeated testing, or regression to the mean.
- **Self-reported, programme-linked outcome.** The IPAQ relies on recall and self-report, which tend to differ from objectively measured activity [19], and may be affected by social desirability, especially when participants know they are being evaluated; and the post-programme scores largely reflect the prescribed sessions.
- **Sample.** A small convenience sample of mostly female college students from one institution limits generalisability. The students are likely to be unusually knowledgeable about, and positive towards, tele-physiotherapy, which produced ceiling effects in both attitudinal outcomes.

7. Future Recommendations

A controlled study with random sampling, objective activity measures, and a longer follow-up will give a deeper impact.

8. Conclusion

A 4-week tele-physiotherapy exercise program study was conducted on physical activity levels, acceptance and awareness among college students which revealed a significant increase in the level of self-reported physical activity in college students who took part in a 4-week, live tele-physiotherapy exercise programme. After the implementation of the programme, there were significant increases in the number of people engaging in vigorous, moderate and walking activities, with a significant decrease in the percentage of people with low physical activity level.

On the other hand, there was no significant change in the level of awareness and acceptance of the tele-physiotherapy; the level of acceptance remained high and constant during the intervention period. The lack of any change in these two variables could be attributed to the fact that their levels were quite high before the intervention started. In summary, a brief, structured and supervised tele-physiotherapy exercise programme is a practical method of promoting physical activity in college students

Declarations

Ethics approval and consent: The study protocol was approved by the Institutional Ethics Committee of Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati Roc.No.AS/11/IEC/SVIMS/2017(IEC No. 2133; approval dated 31-08-2026 August 2026). Data collection commenced after obtaining ethical approval. Written informed consent was obtained from all participants before enrolment. Participants provided consent in English or Telugu.

Data availability: The individual participant data are available from the corresponding author on reasonable request.

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Author contributions: B.Vinyasree contributed to the study conception, participant recruitment, data collection, intervention delivery, data analysis and manuscript drafting. M.Suresh Kumar contributed to the study supervision, clinical guidance and critical revision of the manuscript. N.Kavitha contributed to study supervision, methodological guidance and critical revision of the manuscript. All authors reviewed and approved the final manuscript and agree to be accountable for the work.

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Appendix A. Questionnaire items

Awareness (yes / no): A1 Have you heard about telephysiotherapy? A2 Do you know physiotherapy can be provided through video consultations? A3 Do you know exercises can be supervised online? A4 Are you aware that movement can be assessed through video calls? A5 Do you know tele-physiotherapy can reduce travel time and cost? A6 Are you aware it can be used for follow-up and consultations? A7 Do you know tele-physiotherapy can improve access in rural areas? A8 Are you aware mobile apps can support physiotherapy treatment? A9 Do you know tele-physiotherapy became more common after COVID-19? A10 Are you aware of any tele-physiotherapy service available locally?

Acceptance (5-point Likert, strongly disagree to strongly agree): C1 I would be willing to use tele-physiotherapy if available. C2 I trust physiotherapists to provide quality online care. C3 Tele-physiotherapy would save travel time. C4 It is convenient for follow-up visits. C5 I would feel comfortable communicating online. C6 It improves access to healthcare services. C7 I would follow online exercise instructions. C8 It is suitable for people in remote areas. C9 I would recommend tele-physiotherapy to others. C10 I would like tele-physiotherapy offered routinely.