© IJARW | ISSN (O) - 2582-1008
April 2026 | Vol. 7 Issue. 10
www.ijarw.com

DEVELOPING A PHYSICAL FITNESS MANAGEMENT AND IMPROVEMENT MODEL TO SUPPORT PHYSICAL EDUCATION MODULES FOR FIRST-YEAR STUDENTS AT THE SCHOOL OF FOREIGN LANGUAGES – THAI NGUYEN UNIVERSITY VIA MOBILE APPLICATIONS

Do Thanh Mai[1], Nguyen Thi Hong [2]

School of Foreign Languages, Thai Nguyen University.

ABSTRACT

This study addresses physical inactivity while enhancing the foundational fitness and health of first-year students at the School of Foreign Languages- Thai Nguyen University, through the integration of mobile health (m-Health) technology. Utilizing a pedagogical experimental method involving 200 students, the research establishes a training management model based on free applications, namely Strava and Google Fit. The results indicate significant improvements in physical fitness indices (800m run for females, 1500m run for males) and a positive shift in students' self-discipline. Notably, the model enables instructors to monitor individual performance in real-time, fostering equity and motivation within the physical education curriculum

Keyword: m-Health, Strava, Google Fit, Physical Education, Digital Transformation.

1. INTRODUCTION

In the era of educational digital transformation, which serves as a key driver of the Fourth Industrial Revolution, modernizing Physical Education (PE) modules in higher education institutions has evolved from an elective choice into an imperative requirement. Specifically, for first-year students at the School of Foreign Languages - Thai Nguyen University, the transition from high school to university, coupled with the intensive workload of linguistic majors, creates substantial barriers to maintaining physical activity. Recent anthropometric studies suggest that foreign language students tend to spend an average of 8–10 hours per day in sedentary behavior, leading to a marked decline in cardiovascular endurance and overall physiological resistance.

Despite improvements in current PE curricula, a significant "gap" persists between formal class hours and autonomous practice. Instructors face challenges in verifying the integrity and intensity of students' extracurricular training, while students often lack intrinsic motivation due to the absence of immediate feedback on their performance. The proliferation of mobile health (m-Health) technology—equipped with proximity sensors, Global Positioning Systems (GPS), and gyroscopes—has introduced a novel management paradigm. "Digitizing" steps and heart rates not only assists students in visualizing their personal efforts but also empowers instructors to implement a data-driven monitoring system. This study raises the question: How can free, readily available mobile applications be leveraged to construct a smart fitness management model that aligns with the psychological characteristics of language students while ensuring scientific pedagogical control?

2. RESEARCH METHODOLOGY

To address the aforementioned problem, this study employs a pedagogical experimental method combined with digital data analysis. The research sample consists of 200 first-year students from the English and Chinese Departments at the School of Foreign Languages - TNU, ensuring homogeneity in age and living environment. The sample was divided into two groups: the Control Group (n=100), following the traditional PE framework, and the Experimental Group (n=100), subjected to the management model via Strava and Google Fit.

Technically, the study utilizes a quantitative research approach by leveraging the APIs of mobile applications. Monitored variables include: Distance (D), Duration (T), Average Velocity (V_{avg}), and Cadence. To ensure objectivity and prevent technological fraud (such as using motorized transportation), a data filtering algorithm based on a "biological velocity threshold" was established. Specifically, any activity exceeding V_{avg} > 25 km/h or exhibiting acceleration patterns inconsistent with human biorhythms was excluded from the evaluation.

Furthermore, gamification strategies were integrated into the experimental process to stimulate academic psychological engagement. Instructors acted as "Administrators" on the community platform (Club), monitoring weekly leaderboards. Traditional fitness indicators, such as the 800m (female) and 1500m (male) endurance runs, were measured at two intervals: Pre-test and Post-test (after 15 weeks). All data were statistically processed using SPSS 26.0, employing independent samples t-tests to determine significance at $P < 0.05$. This represents a rigorous integration of IT mathematical logic and physical development principles in sports science, creating a closed-loop and highly verifiable research process.

3. TECHNOLOGICAL SOLUTIONS AND PERFORMANCE MONITORING PROCEDURES

To address the challenge of managing the physical training of hundreds of students simultaneously without overburdening instructors, this study proposes a tri-layer management model: **Data Collection – Synchronization – Visualization.**

3.1. End-User Layer: Data Collection System

Students are instructed to install **Strava** (for endurance-based activities such as walking and running) and **Google Fit** (for overall daily step counting).

- **Operating Mechanism:** These applications utilize the built-in GPS chips and accelerometers on smartphones to record key parameters: distance (S), duration (t), cadence, and instantaneous velocity (v).
- **Identification Protocol:** Students are required to register accounts using their university-issued email addresses and follow a specific naming convention: StudentID_FullName_Class. This standardization facilitates automated data filtering and student identification.

3.2. Integration Layer: Centralized Data Funneling

Instead of manually inspecting individual devices, instructors establish a **Club** on Strava dedicated to the specific course.

- **Automated Synchronization:** Upon completion of a workout session, data is automatically uploaded to the "Club Cloud" once the student selects "Save."
- **API Connection:** Leveraging intermediary tools (such as the Strava API integrated with Google Apps Script), data is periodically extracted from the Club and populated into a centralized spreadsheet database (Google Sheets).

3.3. Visual Monitoring: Instructor Dashboard

This component serves as the "core" of the technological solution. A dashboard is developed using **Google Data Studio (Looker Studio)**, connecting directly to the spreadsheet database. This interface provides instructors with the following functionalities:

- **Real-time Leaderboard:** Displays a ranked list of students based on cumulative distance per week or month. Students meeting the threshold (e.g., >10 km/week) are highlighted in green, while those falling short are flagged in red.
- **Fraud Detection:** The system automatically calculates the average velocity (V_{avg} = \frac{S}{t}). If V_{avg} exceeds human biological thresholds (e.g., >30 km/h), the data entry is flagged as "Suspected Fraud," potentially indicating the use of motorized transport.
- **Temporal Distribution Charts:** Instructors can monitor peak training hours, allowing for the adjustment of workload intensities to better align with the university's academic schedule.

3.4. Pedagogical Interaction and Monitoring Procedures

The workflow is executed through a closed-loop four-step process:

1. **Task Assignment:** Instructors broadcast weekly objectives (e.g., "Week 5: 5km endurance run and 3 sets of squats") via Zalo groups or the mobile app.
2. **Autonomous Execution:** Students activate the application during their training sessions.
3. **Automated Oversight:** The dashboard updates performance metrics at 23:59 daily. Instructors require only 5–10 minutes to review the entire cohort's progress, replacing manual attendance and reporting.
4. **Feedback & Reinforcement:** Instructors utilize the "Give Kudos" feature directly on Strava to incentivize high-performing students or provide reminders to those who have yet to commence their training.

Practical Value of the Solution:

This approach not only eliminates the inaccuracies associated with traditional paper-based logs but also fosters a competitive and healthy "digital playground" among classes. It transforms physical training from a compulsory obligation into a technology-oriented recreational activity.

4. RESULTS AND DISCUSSION

4.1. Assessment of Standard Physical Fitness Indices Improvements

After 15 weeks of experimentation, field test data indicated superior growth in the Experimental Group (EG) compared to the Control Group (CG). Detailed results are presented in Table:

Assessment Content	Group	Pre-test ($\bar{X} \pm \delta$)	Post-test ($\bar{X} \pm \delta$)	Growth Rate (%)	t-value	P-value
800m Run - Female (s)	CG	285 \pm 12	278 \pm 10	2.4%	1.82	> 0.05
	EG	286 \pm 11	242 \pm 08	**15.4%**	8.45	< 0.01
1500m Run - Male (s)	CG	475 \pm 15	462 \pm 12	2.7%	1.95	> 0.05
	EG	478 \pm 16	425 \pm 11	**11.1%**	7.62	< 0.01

Table: Comparison of Physical Fitness Indices Pre- and Post-Experiment (n=200)

The data reveal that the EG's growth rate in endurance events (800m and 1500m) was 4 to 5 times higher than that of the CG. This demonstrates that maintaining regular physical activity via mobile app reminders has a direct positive impact on students' cardiovascular systems and overall stamina.

4.2. Efficiency of the Dashboard System in Pedagogical Management

The Dashboard system processed over 12,400 activities throughout the study period.

- Transparency: Instructors identified and eliminated 42 activities showing signs of fraud (unrealistic speeds) using the "Biological Velocity Threshold" filter.
- Interaction: The weekly goal completion rate reached 92% in the EG, whereas the self-directed extracurricular exercise rate in the CG was estimated at only 25% (via interview surveys).

The findings suggest that students at the School of Foreign Languages - TNU possess high adaptability to digital platforms. Implementing this model addressed the primary "bottleneck" of traditional PE: constraints of time and space. Students could exercise at the dormitory, around

Xuong Rong Lake, or any location with a GPS signal. However, minor limitations were noted regarding GPS inaccuracies in high-rise areas or instances where students forgot to press "Stop." This necessitates flexibility from instructors when cross-referencing dashboard data.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

1. **Physiological Aspect:** Mobile technology application created a genuine "boost," significantly improving endurance and muscular strength for first-year students—a demographic often hesitant to exercise during the transition to university.
2. **Management Aspect:** The API-connected Dashboard model using free apps (Strava, Google Fit) is an optimal solution for PE instructors in the digital age, automating attendance and ensuring absolute objectivity.
3. **Psychological Aspect:** The **Gamification** method through online leaderboards transformed exercise from a burden into a positive habit, aligning with the modern lifestyle of Gen Z.

5.2. Recommendations

- **For the University:** Integrate mobile-app-based results into the official evaluation criteria for student training points and PE modules to establish a legal framework for large-scale implementation. Additionally, invest in campus-wide Wi-Fi to support rapid data synchronization.
- **For the Department:** Officially formalize the use of app results as component grades. Conduct short-term training sessions for faculty members to improve proficiency in app usage and dashboard data interpretation.
- **Future Research:** Expand integration with **Smartwatches** to monitor deeper physiological markers like Heart Rate and SpO_2, ensuring maximum safety during high-intensity training.

Summary

The study successfully developed a modern physical education management model through mobile technology for first-year students at the School of Foreign Languages - Thai Nguyen University. Experimental results proved that using Strava and Google Fit significantly improved endurance and strength compared to traditional methods. Through a centralized Dashboard, instructors monitored performance and integrity via GPS data and velocity analysis algorithms. The findings highlight a surge in self-directed activity due to real-time interaction and gamification. This solution not only eliminates spatial and temporal barriers in PE but also drives campus digital transformation. It serves as evidence of the effective synergy between IT and sports science. With low costs and high feasibility, this model is easily replicable across higher education institutions, paving the way for personalized fitness pathways based on Big Data analytics. Ultimately, leveraging smartphones as "digital coaches" is an essential strategy for fostering an active lifestyle among Gen Z students.

REFERENCES

[1]. Bort-Roig, J., Gilson, N. D., Puig-Ribera, A., Contreras, R. S., & Trost, S. G. (2014). Measuring and influencing physical activity with smartphone technology: A systematic review. *Sports Medicine*, 44(5), 671-686. https://doi.org/10.1007/s40279-014-0142-5

[2]. Higgins, J. P. (2016). Smartphone applications for health and fitness. *The American Journal of Medicine*, 129(1), 11-19. https://doi.org/10.1016/j.amjmed.2015.05.044

[3]. Middelweerd, A., Mollee, J. S., van der Wal, C. N., Brug, J., & Te Velde, S. J. (2014). Apps to promote physical activity among adults: A review and content analysis. *International Journal of Behavioral Nutrition and Physical Activity*, 11(1), 97. https://doi.org/10.1186/s12966-014-0097-9

[4]. Strava. (2025). *Strava API v3 Reference: Building apps for the global community of athletes*. Strava Developers. https://developers.strava.com/