



THE EFFECTS OF ONLINE PHYSICAL ACTIVITY DURING COVID-19 PANDEMIC AMONG UNDERGRADUATE STUDENTS IN THAILAND

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Abstract

Study purpose. The purpose of this study was to develop a physical activity program by using resistance band for students to improve physical activity and monitor improvements in physical performance. The university students' physical activity, which was still low before the pandemic, may be impacted by these. As a result, we want to incorporate physical activity into our course and assess the differences in physical performance before and after taking the course.

Materials and methods. 95 undergraduate college students signed up to take the course. The online course, which included resistance band training for a total of 12 weeks, addressed the principles of resistance band training/exercise. The physical performance of the participants was assessed both before and after training.

Results. According to our study findings, university students at Walailak University can increase their physical performance by using an online resistance band training. The physical fitness statistics for the wall sit test, sit up test, sit and reach test, and shuttle run test were significantly different before and after the online elastic band intervention ($p=0.0463$, $p=0.0050$, and $p=0.0430$, respectively), but not for the shuttle run or YMCA 3-minute step test.

Conclusions. The results of this study provide proof that resistance band training improves strength and encourages physical activity. In order to reduce anxiety and depression, which the COVID-19 has severely touched, as well as to increase the population's level of physical activity or exercise, we must continually promote physical activity or exercise at home.

Keywords: Physical activity, COVID-19 pandemic, Resistance band training, Physical performance.

Introduction

The COVID-19 epidemic, which is causing half of the world's population to be infected, is creating a dire worldwide health crisis (Peters et al., 2020). The virus is consequently aggressively spreading throughout many areas, and we could unwittingly bring it into our houses. Additionally, the COVID-19 pandemic, which was brought on by social exclusion and quarantine, can have a detrimental effect on physical activity, as well as mental health (Park et al., 2022), which has seriously harmed the quality of exercise and physical health. The population's daily physical activity may thus be adversely affected by these measures of social

distance (Woods et al., 2020). Physical distance/isolation policies and the pandemic's ongoing spread are also anticipated to have an impact on the general public's mental health (Pfefferbaum & North, 2020). Excessive information, concerns about one's health and the future, annoyance over project delays, boredom, a decline in family income, and a political or economic crisis can all cause or worsen feelings of melancholy and anxiety (Lu & Lin, 2021). These issues linked to insufficient physical activity may also have a detrimental effect on mental health.

Exercise and sports are examples of physical activity (PA), which is defined as a controlled movement that causes an energy expenditure (Westerterp, 2013). Exercise has also been recognized as a crucial component in preventing future viral diseases and severe respiratory illnesses. According to prior studies, moderate exercise can enhance immunity and have an anti-inflammatory cytokine impact in addition to

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lowering the risk of heart disease, diabetes, hypertension, obesity, and cancer (Booth et al., 2017; Zbinden-Foncea et al., 2020). Exercise can generally be divided into two types: (1) aerobic exercise, which is rhythmic, continuous, uses a lot of large muscle groups, and is typically prescribed to improve endurance; and (2) resistance exercise training, also known as strength training, which is well known to increase muscle size and strength. Simple elastic bands can be used for resistance training; they are inexpensive, user-friendly, and may thus have a greater potential for application in dialysis centers all over the world. According to a previous study, using resistance bands for exercise produces the same strength gains as using conventional gym equipment (Lopes et al., 2019).

To increase muscle strength, strength training is required. One of these is strength training using elastic bands. Elastic bands are recently utilized in physical therapy and rehabilitation to improve people's functional abilities, treat chronic illnesses, and train athletes' functional capacities (Verrill et al., 1992). According to research by Xinhong Liu and colleagues, elastic band training helps overweight people lose body fat more quickly than other types of exercise such as free weights and bodyweight exercises. The review was focused on 18 studies with 669 participants (Liu et al., 2022). Similar findings were made by Sundstrup et al. (2014) using dumbbell, weight machine, and resistance band techniques to increase muscular activation (Sundstrup et al., 2014). In addition, resistance bands are convenient to carry, enabling everyone to exercise everywhere, and there is a proper technique to utilize the bands in order to benefit from their ability to build muscle, which is appropriate in the COVID-19 pandemic situation. From this perspective, the purpose of this study was to create an exercise course for students to increase physical activity and track changes in physical performance. The university students' physical activity, which was still low before the pandemic, may be impacted by these. As a result, we want to incorporate physical activity into our curriculum and assess the differences in physical performance before and after taking the course.

Material and methods

Study participants

The 95 undergraduate students who are enrolled to attend the course in the first semester, from 1 June 2022 to 31 August 2022, in Tha Sala District, Nakhon Si Thammarat Province, Thailand. The design was an experimental study using an online platform. This study was approved by the Human Research Ethic Committee of Walailak University (approval number: WUEC-21-282-01). Participants with previous exposure to a physical fitness enhancement or weight loss program, had a history of being a university athlete or a vigorous exerciser, had musculoskeletal injuries, congenital diseases with exercise contraindications, or had participated in more than three research projects, were excluded. Prior to participation in the study, written informed consent was obtained from each subject. Before the session began, participants were asked to access a link to complete a Google Forms-based questionnaire, in order to compare their exercise behavior or physical activity characteristics both before and during the COVID-19 pandemic.

Study Organization

The online resistance band program Intervention

The resistance band is an elastic device used for strength training. They are commonly used in physical therapy as well, especially by people recovering from muscular injuries and those undergoing cardiac rehab. The fundamentals of resistance band exercise were covered in the online course that featured resistance band training. For a total of 12 weeks, the intervention was conducted three times a week (Mondays, Wednesdays and Fridays) from 5:00 to 6:00 pm via Zoom application platform as 3 sets and 15 repeats. It was changed to be used online that perform 60 minutes a day for three days a week: 15 minutes for warming up, 30 minutes for resistance band training, and 15 minutes for cool-down, as stated in Table 1 and Figure 1.

Table 1. Components of the online resistance band training (three times/week)

Components	Duration
1. Warm up	15 min
2. Resistance band training	30 min
Chest press	
Shoulder side lateral	
Alternative shoulder rise	
Upright row	
Overhead pull apart	
Standing bent row	
Triceps extension	
Biceps curl	
Shoulder press	
Front squat	
3. Cool down	15 min

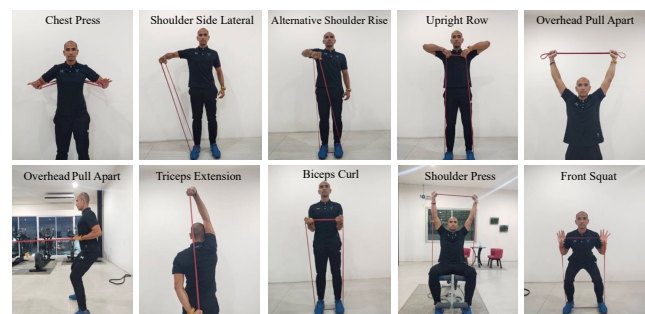


Fig. 1. The online resistance band work for upper body and lower body workouts.

Assessments of anthropometric parameters

Researchers examined the participants' physical performance both before and after training. The anthropometric assessments, including the YMCA 3-minutes step test, shuttle run, wall sit, sit up, sit and reach, and BMI.

Body Mass Index (BMI)

Height was recorded in centimeters (cm) without socks and shoes to the nearest 0.1 cm. The weight in kilograms (kg) was calculated using a digital electronic weighing scale, and it was recorded to the nearest 0.1 kg. Weight in kg divided by the square of height in meter (m) was used to compute BMI.

Shuttle Run Test

Using a shuttle run test, agility is evaluated. At a distance of 10 meters, marking cones are used to indicate the starting and finishing places on the floor. When given the signal “ready,” participants place their front foot behind the starting line. At the “go” signal, competitors run to the other line, pick up an item, run back, and place it on or beyond the starting line. Without pausing, they turn and sprint back to grab the next block, which they then carry across the finishing points. The researcher arrives at the earliest moment possible (Cvejić et al., 2013).

Wall Sit Test

The lower-body muscular endurance is assessed using the wall-sit test. In the Wall-sit test, the subject begins with their backs against a wall and their legs bent at a 90-degree angle. They then have to maintain this sitting-like position for the greatest amount of time. The amount of time a performer can maintain the position is recorded (Morrow et al., 2011).

Sit Up Test

The participant was supine on the floor, elbows pointing forward, hands at the sides of their head, and knees flexed 90 degrees. The shoulders should hit the floor once the elbows have touched the knees correctly execute a sit-up (Ghiarelli et al., 2009). To gauge the level of endurance in each test, the total number of repetitions was recorded.

Sit and Reach Test

Using a sit-and-reach box and a ruler, the sit-and-reach flexibility test measures flexibility. Without shoes, participants sit on the ground. Flat against the box are the feet. The knees are locked and flat against the ground. Participants are told to extend their arms as far forward as they can along the measurement line. When being tested, the correct stances are required, including hands reaching forward at the same level and no jerky movements. Participants in reaches out keep their stance for 1-2 seconds after which the score is recorded (Cvejić et al., 2013).

YMCA 3-minute Step Test

The alternating stepping cadence of the YMCA 3-minute step test is shown to the subject. Step one foot up on the bench to start the beat, then step up with the other foot to start the next beat, then step down with one foot to start the next beat (4th beat.) The metronome cadence is set at 96 beats per minute (4 clicks equals one step cycle), giving the subject the opportunity to practice stepping at a rate of 24 steps per minute. For three minutes, the participant moves up and down on the platform at the prescribed rate. Immediately once the exam is over, the participant stops, sits down, and does not move. The tester’s job is to monitor the participant’s heart rate for one full minute (Kieu et al., 2020).

Statistical analysis

Descriptive statistics; physical characteristics and physical fitness performance were presented as mean and standard error of the mean (Mean ± SEM). A Kolmogorov-Smirnov test was used to test the normal distribution of all data. The before and after online training intervention were compared using unpaired t-test comparison. All statistical analyses were carried out using the statistical program SPSS (SPSS version 26; IBM, Armonk, NY, USA), with statistical significance set at $P < 0.05$.

Results

Demographic characteristics of participants

Ninety-five students were enrolled in this study and further measured the demographic data before the online resistance training intervention. The general characteristics of participants are presented in Table 2. Weight and BMI tend to modestly drop following an online resistance band intervention, but not significantly ($p=0.4552$ and $p=0.4675$, respectively).

Table 2. General demographic characteristics of the participants (n=95). Data of gender represented as percentage in men (n=35) and women (n=60)

Characteristics	Pre-test	Post-test
Gender		
Men	35 (36.84%)	
Women	60 (63.16%)	
Age	19.88 ± 0.12	
Height	162.73 ± 0.87	
Weight	58.02 ± 1.65	56.33 ± 1.55
Men	66.94 ± 3.52	65.23 ± 3.28
Women	52.81 ± 1.22	51.13 ± 1.08
BMI	21.80 ± 0.53	21.16 ± 0.49
Men	23.03 ± 1.18	22.44 ± 1.10
Women	21.08 ± 0.48	20.42 ± 0.42

Note: Data are presented as mean ± SEM in age, height, weight, and BMI, with an unpaired t-test. BMI: body mass index

Physical performance assessment

Table 3 and Figure 2 display the results of physical performance fitness tests before and after an online resistance band intervention. The results for the 10-meter shuttle run and the YMCA 3-minute step test did not differ significantly, but the data for the wall sit, sit up for a minute, and sit and reach did. The physical fitness statistics for the wall sit test, sit up test, sit and reach test, and shuttle run test were significantly different before and after the online resistance band intervention ($p=0.0463$, $p=0.0050$, and $p=0.0430$, respectively), in contrast to the shuttle run and YMCA 3-minute step test, which showed no significant differences ($p=0.5408$ and $p=0.1114$, respectively). However, there was no significant difference between men and women in this study (figure 3).

Discussion

The study’s findings showed that creating a physical education course for students was a good way to increase physical activity and track changes in university students’ physical performance at Walailak University. Before and after elastic band intervention, with BMI in the range of 23-24.9 kg/m², which normal and overweight categories. To classify overweight and obesity, the WHO standard of BMI was applied. The WHO defines normal BMI as being between 18.5 and 24.9 kg/m², overweight as being between 25.0 and 29.9 kg/m², and obese as being more than or equal to 30.0 kg/m² (WHO, 2000). After resistance band intervention, we discovered that the BMI value tends to drop, indicating excellent health. During the COVID-19 epidemic, experts

Table 3. The results of physical performance fitness tests before and after an online resistance band intervention (n=95)

Physical Assessments	Before training intervention	After training intervention	p-value
Shuttle run 10 meters (Second)	11.46 ± 1.33	11.14 ± 5.21	0.5408
Wall sit (Second)	56.31 ± 33.27	69.05 ± 51.36*	0.0463
Sit up 1 min (time)	23.53 ± 7.97	26.88 ± 8.17**	0.0050
Sit and Reach (cm)	5.07 ± 7.48	7.19 ± 6.86*	0.0430
Step test 3 minutes (HR/min)	134.92 ± 40.93	126.57 ± 29.64	0.1114

Note: Data are present as mean ± SEM. *P < 0.05 indicates a significant difference between before- and after- online resistance band program intervention group. **P < 0.01 indicates a significant difference between before- and after- online resistance band program intervention group, with an unpaired t-test. HR: heart rate; cm: centimeter

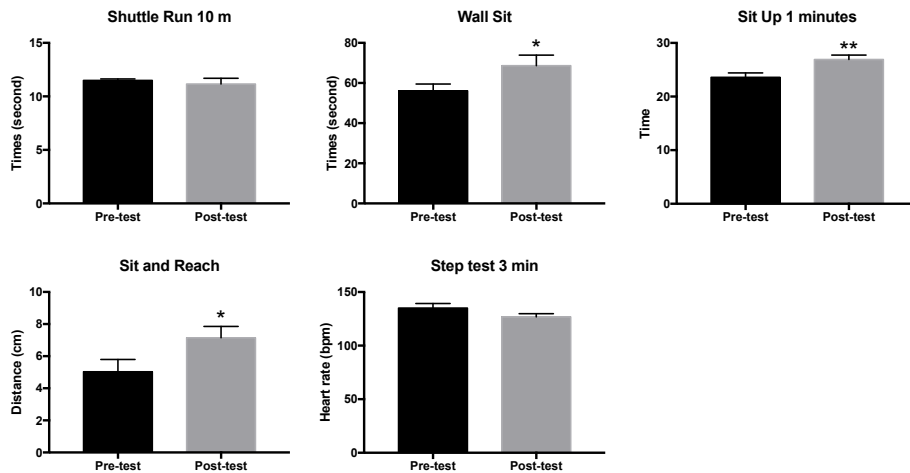


Fig. 2. The results of physical performance fitness tests before and after an online resistance band intervention (n=95)
 Note: Data are present as mean ± SEM. *P < 0.05 indicates a significant difference between before- and after- online resistance band program intervention group. **P < 0.01 indicates a significant difference between before- and after- online resistance band program intervention group, with an unpaired t-test

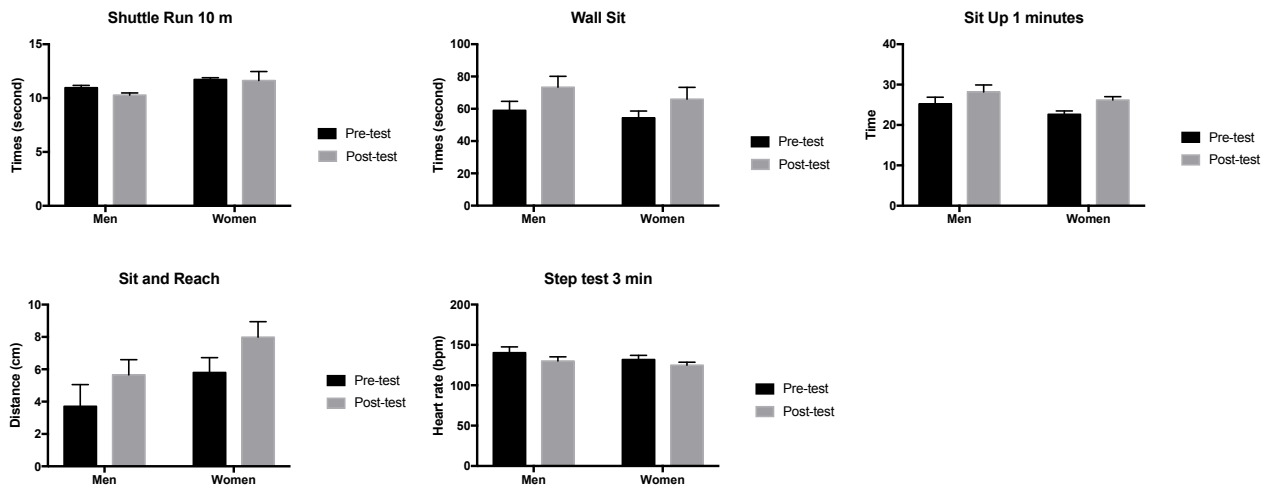


Fig. 3. The differential physical performance assessment between men and women
 Note: Data are present as mean ± SEM

from all across the world have demonstrated significant interest in evaluating people’s lifestyle-related behavior. Our research indicates that while the majority of respondents were able to continue their exercise regimens throughout the COVID-19 pandemic, university students at Walailak University engaged in less physical activity. However, behavior theory predicts that the pandemic would cause an

increase in dread and anxiety in people’s typical emotional reactions (Wattanapisit et al., 2016). Thus, it could be challenging to workout in the current environment. Similar patterns of physical activity, as well as a decline in exercise frequency and duration, were seen before and during the COVID-19 pandemic (Zhong et al., 2020). But they all resulted in physical activity or exercise, and it is possible

to adopt the straightforward strategy of remaining healthy at home. Participants were required to employ body movement as one of the physical activity measures to assess their level of physical activity and sedentary behavior during the COVID-19 pandemic, when team sports were on the decline, as shown in the behavior results.

Resistance exercise such as using a resistance band has been shown to improve muscle quality, physical self-reported functionality, and strength (Johansen et al., 2006; Cheema et al., 2007). Evidence from previous studies is consistent with systematic reviews and meta-analyses that found that using elastic resistance increased muscular strength gains in older adults (Martins et al., 2013), people with osteoarthritis (Lange et al., 2008), and people with fibromyalgia when compared to a control group (Busch et al., 2013). Ghigiarelli and colleagues implemented a 7-week strength training program and examined its impact on upper extremity strength after dividing strength training groups into three categories: resistance bands, weight chains, and conventional weights. They discovered that the elastic band group had the biggest growth (Ghigiarelli et al., 2009). In addition, Anderson and colleagues conducted a 7-week strength training program and compared resistance band and free weight strength training. In their study, they found that the elastic band strength training group considerably increased the squat and bench press movements compared to the free weight group (Anderson et al., 2008). Similarly, Colado and Triplett (2008) showed that the strength and body composition improved as a result of the elastic band strength training program (Colado & Triplett, 2008). Chang et al. (2012) conducted a resistance band training program over an eight-week period and found that lower extremity strength and function metrics significantly increased (Chang et al., 2012). The findings of the researchers previously cited were significant since they are in agreement with those of the current investigation.

Regarding the aforementioned, the online resistance band program would result in an improvement in muscle strength and flexibility as demonstrated by the results of the wall sit, sit up test, and sit and reach, hence extending the types of people who could benefit from the method's emphasized health benefits. Wall sit is a simple test of lower body muscular strength and endurance, particularly the quadriceps muscle group. After the elastic band intervention in our study, the wall sit-in had a higher value than it had previously. Additionally, the 1-minute sit-up test before and after the use of the resistance band revealed differences. The shuttle run test, which gauges an individual's aerobic capacity, did not show any changes. Additionally, there were no differences between the pre- and post-elastic band intervention cardio-respiratory tests such as the YMCA 3-minute step test. Our findings showed that muscle strength and flexibility of volunteers presented a significant positive correlation with the elastic band intervention. One may argue that less research has been done on the effects of resistance training than endurance training on daily energy expenditure. Van Etten and a colleague used doubly labeled water to quantify the daily energy expenditure of young men. After 18 weeks of a resistance training program, they discovered a mean increase in daily energy expenditure that was close to 260 kcal/d, the majority of which was attributable to the resistance training program's direct caloric cost (Van Etten et al., 1997). On the other hand, Hunter and colleagues

discovered that, in addition to the direct energy cost of the resistance training program, 6 months of resistance training considerably increased daily energy expenditure (Hunter et al., 2000). Since we only measured physical fitness tests and our measurements were done after the resistance training programs were over 8 weeks, the results cannot be directly compared to the findings of the current inquiry.

Although this kind of exercise has become more popular recently, studies that employ the resistance band exercise modality note challenges with intensity regulation. In order to regulate intensity and prescription parameters, writers use subjective effort perception measures. Other methods utilized include increasing stress levels by stretching or using elastic devices that are colored differently. Regarding the study's shortcomings, we specifically point out the lack of consistency of the training load conducted with elastic resistance as well as the range of protocols used. According to our study's findings, university students at Walailak University can increase their physical performance by using an online elastic band – workout that build strength and muscle. The necessity of exercise or physical activity as a top priority during the COVID-19 pandemic was also highlighted by the current investigation. The resistance band is a well-known device that can reduce the risk of diabetes and heart disease. It can also reduce age-related decline in muscle mass. Because of this, the online resistance band program may be ideal and effective for enhancing appropriate physical activity among kids, adults, and the elderly in a comfortable setting. Finally, we once again stress the significance of the results for clinical and scientific practice, offering significant proof for a form of physical exercise that is becoming more and more preferred and easily available at a low cost. In the scientific world, research on "home-based workouts" is garnering more and more attention. In this situation, the presented modality enables procedures to be initially carried out under supervision and thereafter at home, satisfying particular demands.

Conclusions

This study's findings give evidence that resistance training with elastic devices increases strength and promotes physical activity. Additionally, we must constantly promote physical activity or exercise at home in order to lower anxiety and depression, which the COVID-19 pandemic has profoundly impacted, as well as to raise the population's level of physical activity or exercise.

Acknowledgments

The study was carried out according to the research plan of the Research Institute for Health Sciences, Walailak University, to this work (registration number: WUEC-21-282-01).

Conflict of interest

The authors declare that there is no conflict of interest.

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ВПЛИВ ФІЗИЧНОЇ АКТИВНОСТІ ОНЛАЙН ПІД ЧАС ПАНДЕМІЇ COVID-19 СЕРЕД СТУДЕНТІВ БАКАЛАВРАТУ В ТАЇЛАНДІ

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; Е – збір коштів

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Мета дослідження. Метою цього дослідження було розробити програму фізичної активності з використанням еспандера для студентів, щоб покращити їхню фізичну активність і контролювати покращення фізичної результативності. Це може вплинути на фізичну активність студентів університету, яка була низькою ще до пандемії. Тому ми хочемо включити фізичну активність у наш курс та оцінити відмінності у фізичній результативності до та після проходження курсу.

Матеріали та методи. На курс записалися 95 студентів бакалаврату коледжу. Онлайн-курс, який включав тренування з еспандером протягом загалом 12 тижнів, стосувався принципів тренувань/вправ з еспандером. Фізичну результативність учасників оцінювали як до, так і після тренувань.

Результати. Відповідно до результатів нашого дослідження, студенти Університету Валайлак можуть підвищити свою фізичну результативність, використовуючи онлайн-тренування з еспандером. Статистичні дані фізичної підготовленості для тесту на присідання з опорою, тесту на присідання, тесту на нахил тулуба вперед із положення сидячи сидячи, а також тесту на човниковий біг статистично значущо різнилися до та після онлайн-тренувань з еспандером ($p=0,0463$, $p=0,0050$ та $p=0,0430$ відповідно), але не для човникового бігу або 3-хвилинного степ-тесту YMCA.

Висновки. Результати цього дослідження є доказом того, що тренування з еспандером підвищують силу та заохочують до фізичної активності. Щоб зменшити тривожність і депресію, на які серйозно вплинув COVID-19, а також підвищити рівень фізичної активності чи вправ серед населення, ми повинні постійно сприяти фізичній активності чи вправам удома.

Ключові слова: фізична активність, пандемія COVID-19, тренування з еспандером, фізична результативність.

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