

# Physical activity intervention program through walking routes in sedentary university students

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## ABSTRACT

**Objective:** Effect of a physical activity program on body composition and physical condition with university teacher students. **Methods:** 51 university students from the Faculty of Education and Sport Sciences, University of Vigo (Spain), participated in the study. Students performed a 6-week protocol, using the walking routes designed in the university's own facilities. Two cohorts, experimental group and control group were analysed, before and after the program. The 6-minute walking test, countermovement jump (CMJ), flexibility through active straight leg raise, rate of perceived exhaustion (RPE) and heart rate (HR) were evaluated, and a bioimpedance measurement was used to evaluate the basal and final metabolism. **Results:** On the 6-minutes walking test, CMJ, and flexibility of the right leg significant differences were found between the experimental and the control group. There were no significant differences in either group for any RPE. In the bioimpedance, there were significant differences in fat and lean mass in the left leg. **Conclusion:** The analysed data indicates an improvement in aerobic endurance, jumping and flexibility capacities at the end of the program. But for body composition, in general there were no significant variations. **Keywords:** Bioimpedance; CMJ; Physical exercise; RPE; Walking towards health; Well-being.

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## INTRODUCTION

The World Health Organization (WHO, 2010) understands physical activity as the daily movements that includes both exercises and sports, as well as work and spare time. To perform it on a regular basis—as any kind of natural or predetermined movement that spends energy with a preventive, rehabilitating, personal care or sport purpose (Cintra Cala and Balboa Navarro, 2011) —has positive effects on both physical and mental well-being (Caracuel and Arbinaga, 2010; Sofi et al., 2008). WHO (2010) suggest distributing 150 minutes of physical activity along the week, i.e. 30 minutes of moderate exercise five times (or more) per week to incorporate it as a daily habit. An average of 150-300 minutes per week will produce supplementary improvements, even though beyond that load is not possible to confirm it (World Health Organization [WHO], 2010).

Several investigations show how physical exercise produces physical, physiological, and above all, psychological beneficial effects (Alfermann and Stoll, 2000; Fox, 2001). From this perspective, studies confirmed that the practice of physical activity have positive results in mental health for increasing the self-esteem (Fox, 2000; Sonstroem and Morgan, 1989; Sonstroem and Potts, 1996). It has effective results in the well-being for the people that exercise, but for sedentary people, on the contrary it is associated with depressive state and health complains (Fox, 2000; Sonstroem and Morgan, 1989; Sonstroem and Potts, 1996).

Even though the practice of planned and systematized physical exercise cause health benefits, currently there is still a predominance of sedentary over active population (Encuesta sobre hábitos deportivos de los españoles, 2005; US Department of Health and Human Services, 1996). Likewise, the medical and scientific field as well as the different media, recommend practicing physical activity and having healthy habits. But, why to do it? Is not enough to have a healthy diet and a controlled weight? The truth is that when people pretend to control their weight and health, they put more focus on the diet than on the energy expenditure because they do not reach the minimum of daily physical activity (Cintra Cala and Balboa Navarro, 2011). One way for the people to reach this minimum is to walk because it is a predictor of lower rates of chronic diseases as well and it is one of the most accessible forms of physical activity (Lee and Buchner, 2008). The recommendation for moderate-intensity activity, was brisk walking at three to four mph (Lee and Buchner, 2008). To produce health benefits, it must be performed with a frequency of at least five days per week and a minimum duration of 30 minutes per day (Lee and Buchner, 2008).

Scientific evidence confirms that it exists a relationship between the well-being and regular physical activity (Myers et al., 1999; O'Sullivan, 2003; Reinboth et al., 2004; Stiggelbout et al., 2004). Which is determinant to improve people's life quality, with impact on the prevention of different diseases and the promotion of greater social contact and well-being among the population (Caracuel Tubío and Arbinaga Ibarzábal, 2010). Therefore, it is vital to encourage the practice of physical activity from the beginning. If the school would encourage children and adolescents to participate in more physical activities, it would be more possibilities that they will continue doing it as adults (Malina, 2001). Considering that the stage at the university is a critical moment regarding the life style and behavioural changes, it is essential that the intervention strategies to promote health have as goal that university students will turn into healthy adults (Katzmarzyk, 2007; Lau et al., 2007; Perusse-Lachance et al., 2010).

With the focus on sedentary university students, it is vital the regular participation in programs of physical activity to can obtain an active and healthy life (Nahas et al., 2003). Furthermore, reduce the possible negative results of young adults in blood sugar, blood pressure, lipid profile, as well as insulin resistance

(Ferrara, 2009). The day-to-day in a faculty favours the constant movement in the building, in consequence it must go further than a plan of active students and go towards a healthy university lifestyle as a goal (Leandro et al., 2013). This goal does not only suggest operational changes to reduce and correct the impacts of the campus (Benayas et al., 2001), it also promotes the development of university lifestyle in a correct environment to achieve social functions in public space. From this perspective, the university students spend a lot of hours at the campus, accordingly healthy university activities should make them participate more (Leandro et al., 2013).

The implementation of walking routes in other studies showed its importance for promoting physical activity through walking (Brownson et al., 2000; Gilson et al., 2007). The implementation of walking at the work place is related with higher work productivity as well as with higher perceptions of health and well-being (Brownson et al., 2000; Gilson et al., 2007; Gilson et al., 2008).

Throughout life, the practice of physical activity is reduced gradually, and the university stage is a critical phase for the increase of sedentary lifestyle among the students. It is important to establish habits of physical activity at the university, considering that is a suitable and daily place for the students. The creation of walking routes to be performed inside the faculty is a new way to increase the physical activity of the students in an easier way such as walking. Therefore, the aim of this study was to analyse the effect of a physical activity program on body composition [body mass index (BMI), fat mass, and lean mass] and physical condition [aerobic endurance, countermovement jump (CMJ), flexibility, heart rate (HR) and rate of perceived exhaustion (RPE)] of university teacher students.

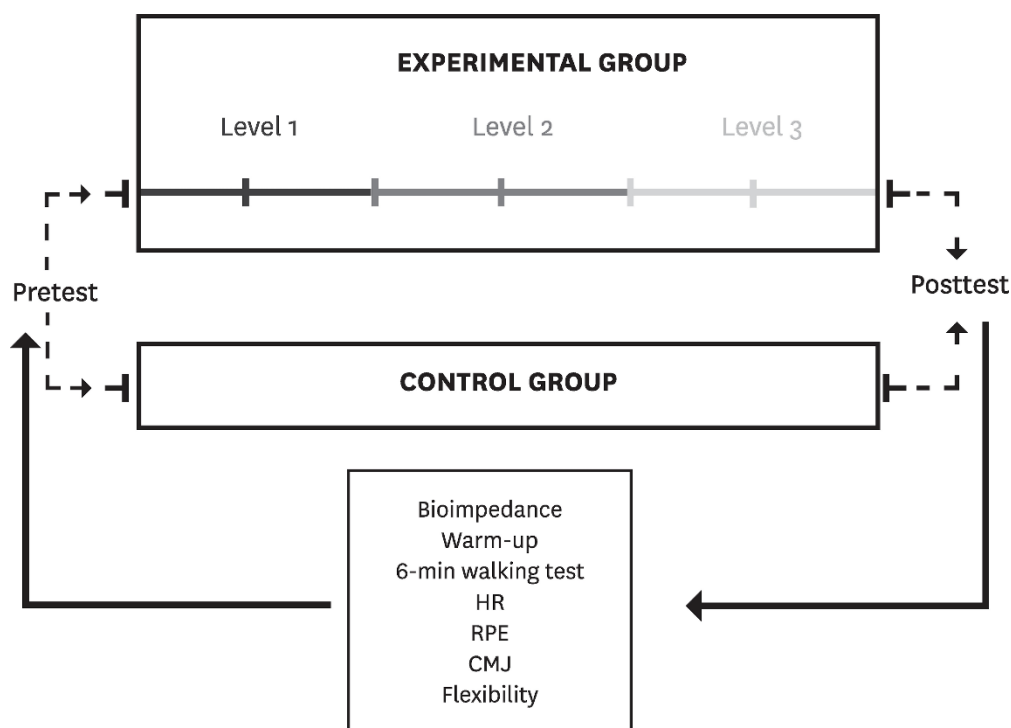


Figure 1. Study design. HR, heart rate; RPE, rate of perceived exhaustion; CMJ, countermovement jump

## METHOD

Pre-treatment and post-treatment with convenience groups (Thomas et al., 2015) design was used to compare the effects of walking routes protocol on the performance of 6-minute walking test (Gibbons et al., 2001) of the participants from the Faculty of Education and Sport Sciences of the University of Vigo (Figure 1). The effect of the program on several body composition parameters was also analysed. The intervention consisted on a pre-test session, 6-week supervised practice program, and a post-test session.

### Participants

The sample was composed by 51 teacher students (age =  $21.8 \pm 2.9$  years; height =  $162.2 \pm 5.8$  cm; weight =  $62.1 \pm 16.0$  kg; BMI =  $23.6 \pm 6.5$  kg/m<sup>2</sup>), from the Faculty of Education and Sport Sciences of the University of Vigo (Spain). Prior to the study, all participants were informed about the purpose and characteristics of the study and gave their written informed consent and the research was approved by the Ethical Committee of the Faculty of Education and Sport Sciences (University of Vigo, Spain), in accordance with the Helsinki declaration. The inclusion criterion was that the participants made the intervention program regularly (minimum of 90% of attendance). Two cohorts, ordered in experimental group (EG; n = 27) and control group (CG; n = 24) were analysed, before and after the program. Anthropometric characteristics of groups are presented on Table 1.

**Table 1. Physical characteristics of the participating students.**

	<b>EG (M ± SD)</b>	<b>CG (M ± SD)</b>
n	27	24
Age	$22.6 \pm 3.2$	$20.8 \pm 2.1$
Height (cm)	$161.1 \pm 6.3$	$163.5 \pm 4.8$
Weight (kg)	$62.2 \pm 13.6$	$62.0 \pm 18.6$
BMI (kg/m <sup>2</sup> )	$23.9 \pm 4.6$	$23.4 \pm 8.3$

BMI, body mass index; CG, control group; EG, experimental group.

### Measures

Body composition variables registered were: age; height; weight; BMI; fat mass percentage of the right leg, left leg, right arm, left arm and trunk; and lean mass percentage of the right leg, left leg, right arm, left arm and trunk.

Physical condition variables registered were: CMJ; flexibility of the right leg and left leg; meters covered during the 6-minute walking test; maximum HR; and RPE overall, central, and local for the lower extremities (LE) and upper extremities (UE). For all RPE measures the CR-10 scale was used.

### Intervention protocol

The intervention protocol using walking routes inside the faculty was carried out during six weeks by the participants of the EG. The specific route was performed three times a week as the WHO recommends for physical activity and well-being<sup>1</sup> and was divided in three levels of intensity (Figure 2, 3 and 4) performing for two weeks each of the levels.

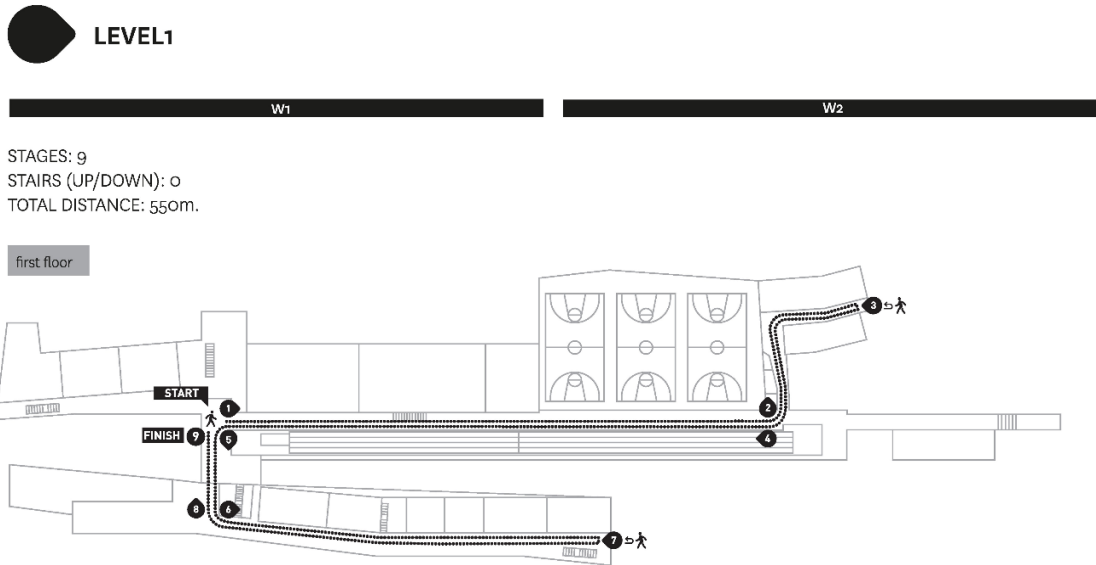


Figure 2. Level 1 of the walking routes performed during weeks 1 (W1) and 2 (W2)

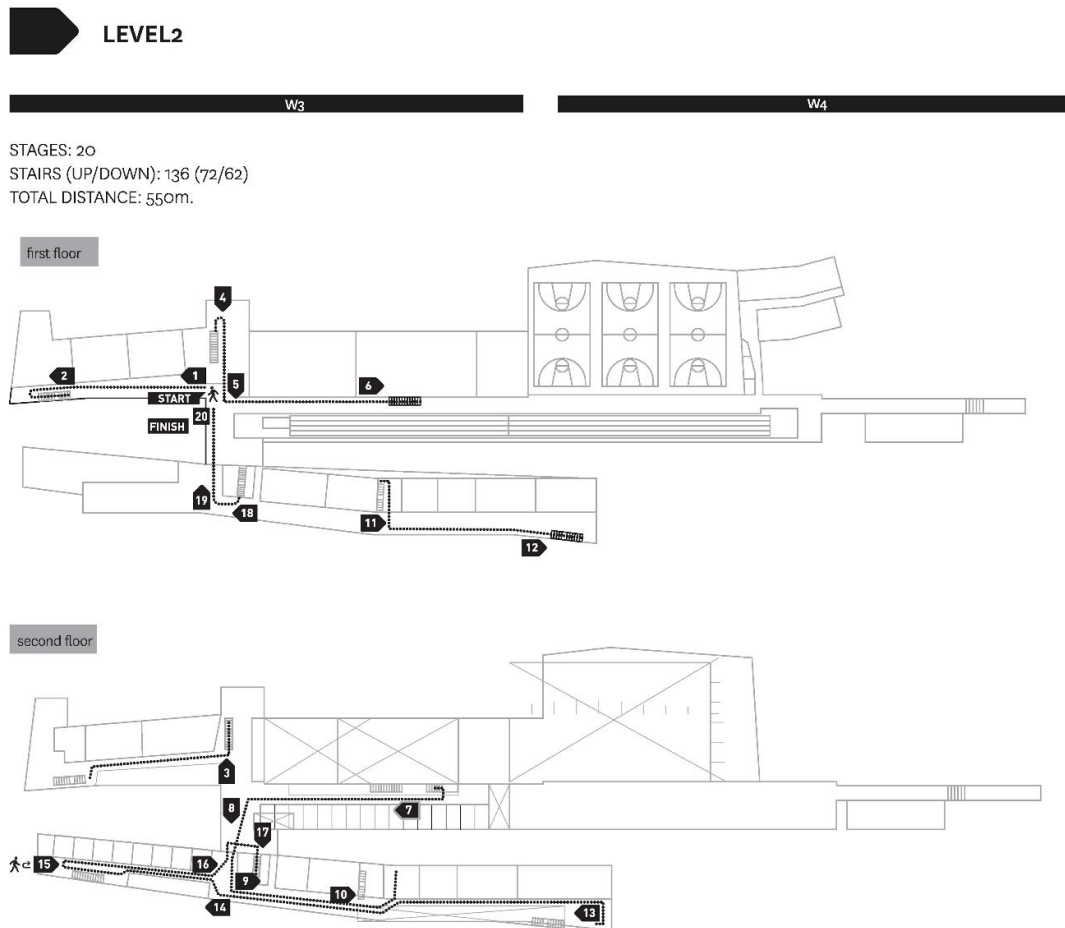


Figure 3. Level 2 of the walking routes performed during weeks 3 (W3) and 4 (W4)

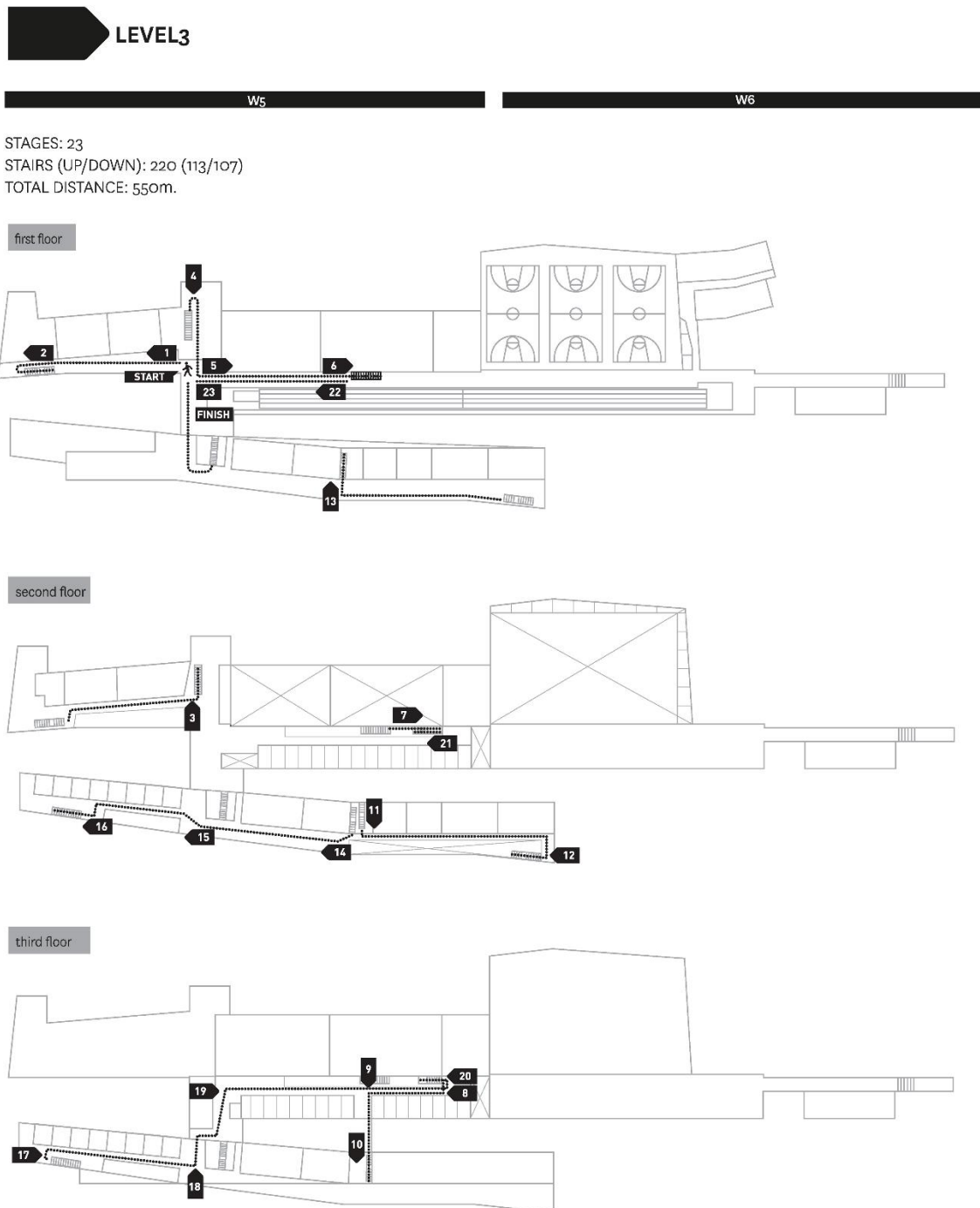


Figure 4. Level 3 of the walking routes performed during weeks 5 (W5) and 6 (W6)

### Procedure

To determine the effects of the practice program for the walking routes, a bioimpedance (Tanita, Tanita Corporation, Tokyo) was made to know the body composition of the participating students. It was carried out in standard conditions, all participants were measured at first time in the morning, fasting, without shoes and with the least amount of clothing possible.

Vertical jump was evaluated with the CMJ test using a contact platform with specific software (Chronojump Boscosystem, Barcelona, Spain) following Bosco's indications (Bosco et al., 1983). Each participant had a total of three tries, with two-minute recovery between repetitions, and it was selected the best score of the three. The following protocol was used: a) Start position: the participants stayed on an upright position, with the hands on the waist, and with the sole of the feet on the platform; b) Execution: after remaining two to three seconds the position described in a), the participants made a preparation movement until 90° of knee flexion approximately followed by a maximal and explosive extension; c) Final position: fall with the feet and knees totally extended (same as when leaving the floor), slightly bouncing.

Active straight leg raise was performed to assess hip's articulation range of movement (ROM) as well as hamstring's flexibility. All participants started on a supine position, upon hearing the "as you go" signal from the tester they performed a hip flexion maintaining the knee extended for a few seconds. The participants were photographed with a NIKON D3100 camera at the maximum point of flexion while keeping the knee extended, and afterwards hip's flexion angle for both legs was analysed with a specific software (Kinovea, Bordeaux, France).

The 6-minute walking test was made to analyse the improvement in aerobic endurance of the participants. This test was carried out in a 40-m distance hallway and the participants were told to try to cover the maximum distance in six minutes. Directly after, the HR was measured and the CR-10 RPE (Foster et al., 2001) was used —when the participants finished the 6-minute walking test— to know their perceived effort. The participants were asked about the scale of the effort performed with the following questions to determine the RPE overall, central and local LE and UE, respectively: How hard was the walk? How hard did the walk feel on your chest, your breathing? How hard did the walk feel on your legs? How hard did the walk feel on your arms?

### **Data analysis**

The statistical analyses were made using the SPSS 20 for Mac (version 21.0, Chicago, IL, USA). Kolmogorov-Smirnov test was made to assess the normality of the data. A 2 (group: EG and CG) × 2 (time: pre-test and post-test) repeated measures analysis of variance (ANOVA) was calculated for each parameter. Partial eta squared ( $\eta_p^2$ ) effect sizes (ES) for the time × group interaction effects were calculated. An effect of  $\eta_p^2 \geq 0.01$  indicates small,  $\geq 0.059$  medium, and  $\geq 0.138$  large effect, respectively [27]. The differences in averages were presented as the percent difference from the pre-test to the post-test ( $\Delta \% = [\text{Post-Pre}/\text{Pre}] \times 100$ ) for both groups. For the ES, Cohen's *d* was calculated (Cohen, 1988) and interpreted as trivial, when  $ES < 0.2$ ; low, when  $ES < 0.5$ ; moderate, when  $ES < 0.8$ ; and large, when  $ES > 0.8$ . Quantitative chances of beneficial/better or detrimental/poorer effects were assessed qualitatively as follows: <1%, almost certainly not; 1% to 5%, very unlikely; 5% to 25%, unlikely; 25% to 75% possible; 75% to 95% likely; 95% to 99%, very likely; and >99%, almost certainly (Hopkins et al., 2009). A substantial effect was set at >75%. If the chances of having beneficial/better and detrimental/poorer were both >5%, the true difference was assessed unclear. A significance level of  $P < 0.05$  was set.

## **RESULTS**

Table 2 shows the averages and standard deviations for the body composition variables on the participants of each group before and after the walking routes. The fat mass and lean mass percentage of the left leg both showed a medium sized difference between the pre- and post-test in both EG and CG. No differences were found in the Time x Group interaction for any variable, noticing an equity of effect between the groups.

**Table 2. Comparison of the body composition variables between the EG and the CG after the intervention program.**

	EG (n = 27)			CG (n = 23)			Time P ( $\eta_p^2$ )	Group P ( $\eta_p^2$ )	Time x Group P ( $\eta_p^2$ )
	Pre (M $\pm$ SD)	Post (M $\pm$ SD)	$\Delta$ (%)	Pre (M $\pm$ SD)	Post (M $\pm$ SD)	$\Delta$ (%)			
Weight (kg)	62.18 $\pm$ 13.63	62.20 $\pm$ 13.38	0.14	61.96 $\pm$ 18.65	59.59 $\pm$ 22.69	-0.05	0.301 (0.022)	0.766 (0.002)	0.292 (0.023)
BMI (kg/m <sup>2</sup> )	23.87 $\pm$ 4.56	23.67 $\pm$ 4.39	-0.70	23.38 $\pm$ 8.31	22.36 $\pm$ 9.65	-0.72	0.147 (0.043)	0.640 (0.005)	0.323 (0.020)
Fat mass (%)	29.54 $\pm$ 9.23	29.63 $\pm$ 8.61	1.43	28.26 $\pm$ 9.27	27.66 $\pm$ 11.13	2.72	0.659 (0.004)	0.538 (0.008)	0.548 (0.007)
Right leg	33.71 $\pm$ 6.57	33.97 $\pm$ 6.04	1.19	32.54 $\pm$ 7.70	32.98 $\pm$ 7.52	-1.32	0.091 (0.058)	0.578 (0.006)	0.613 (0.005)
Left leg	33.54 $\pm$ 6.56	33.97 $\pm$ 5.85	1.90	32.38 $\pm$ 7.53	33.01 $\pm$ 7.31	2.61	0.037 (0.088)	0.596 (0.006)	0.771 (0.002)
Right arm	31.85 $\pm$ 9.44	31.50 $\pm$ 8.98	-0.42	29.56 $\pm$ 10.94	29.31 $\pm$ 11.98	-1.49	0.311 (0.021)	0.456 (0.012)	0.981 (0.001)
Left arm	32.71 $\pm$ 9.39	32.02 $\pm$ 9.05	-1.56	30.39 $\pm$ 11.13	30.53 $\pm$ 11.42	1.84	0.210 (0.032)	0.527 (0.008)	0.171 (0.039)
Trunk	26.16 $\pm$ 11.42	26.20 $\pm$ 10.69	2.82	25.15 $\pm$ 9.90	25.91 $\pm$ 10.73	1.91	0.216 (0.032)	0.845 (0.001)	0.268 (0.026)
Lean mass (%)	42.72 $\pm$ 4.17	42.73 $\pm$ 4.00	-0.83	43.02 $\pm$ 4.22	42.66 $\pm$ 4.12	-0.81	0.223 (0.031)	0.923 (0.001)	0.187 (0.036)
Right leg	7.45 $\pm$ 0.75	7.43 $\pm$ 0.76	-0.033	7.51 $\pm$ 0.91	7.42 $\pm$ 0.84	-2.40	0.062 (0.071)	0.894 (0.001)	0.306 (0.022)
Left leg	7.32 $\pm$ 0.74	7.28 $\pm$ 0.74	-0.52	7.35 $\pm$ 0.90	7.29 $\pm$ 0.87	-1.04	0.035 (0.090)	0.909 (0.001)	0.545 (0.011)
Right arm	1.99 $\pm$ 0.28	2.01 $\pm$ 0.25	1.06	2.03 $\pm$ 0.25	2.00 $\pm$ 0.26	-1.22	0.638 (0.005)	0.816 (0.001)	0.092 (0.058)
Left arm	2.01 $\pm$ 0.32	2.00 $\pm$ 0.36	-0.41	2.03 $\pm$ 0.35	2.03 $\pm$ 0.34	-0.30	0.653 (0.004)	0.783 (0.002)	0.971 (0.001)
Trunk	23.88 $\pm$ 2.16	24.01 $\pm$ 2.06	-0.48	24.06 $\pm$ 1.85	23.91 $\pm$ 1.90	-0.68	0.784 (0.002)	0.934 (0.001)	0.096 (0.057)

BMI, body mass index; CG, control group; EG, experimental group;  $\eta_p^2$ , eta partial square for effect size.

Table 3 shows the averages and standard deviations for the physical condition variables on the participants of each group before and after the walking routes. RPE overall and flexibility—using the active leg raise—of the right leg showed medium sized differences between the pre-test and post-test in both EG and CG (Figure 5). Medium size Group and Time x Group interactions were found for meters covered at the 6-minute walking test in both EG and CG. The percent difference for the EG was an increase of 9.89% and for the CG a -0.18%. Large size Time interactions and Medium size Time x Group interactions were found for CMJ for both EG and CG. Results from the between-group analyses are illustrated in Figure 6.

**Table 3. Comparison of the physical condition variables between the EG and the CG after the intervention program.**

	EG (n = 27)			CG (n = 24)			Time P (d)	Group P (d)	Time x Group P (d)
	Pre (M $\pm$ SD)	Post (M $\pm$ SD)	$\Delta$ (%)	Pre (M $\pm$ SD)	Post (M $\pm$ SD)	$\Delta$ (%)			
CMJ (cm)	16.11 $\pm$ 4.28	18.31 $\pm$ 4.88	16.52	15.22 $\pm$ 3.96	15.77 $\pm$ 3.79	5.23	0.001 (0.200)	0.136 (0.045)	0.042 (0.082)
Flexibility (cm)									
Right leg	76.81 $\pm$ 14.79	79.85 $\pm$ 14.22	4.69	77.33 $\pm$ 13.85	79.37 $\pm$ 11.03	4.34	0.027 (0.096)	0.995 (0.000)	0.657 (0.004)
Left leg	76.78 $\pm$ 14.58	78.78 $\pm$ 11.09	4.20	74.71 $\pm$ 14.88	75.92 $\pm$ 13.08	2.93	0.195 (0.034)	0.494 (0.010)	0.747 (0.002)
6-min walking test (m)	660.37 $\pm$ 65.20	719.26 $\pm$ 70.58	9.89	659.17 $\pm$ 96.60	649.58 $\pm$ 79.09	-0.18	0.073 (0.064)	0.046 (0.079)	0.014 (0.117)
HR	123.11 $\pm$ 25.09	129.11 $\pm$ 23.43	8.02	130.75 $\pm$ 19.6	137.75 $\pm$ 20.51	6.56	0.062 (0.069)	0.130 (0.046)	0.884 (0.001)
RPE									
Overall	3.51 $\pm$ 1.05	3.93 $\pm$ 1.23	18.46	3.67 $\pm$ 1.27	3.96 $\pm$ 1.49	10.42	0.047 (0.078)	0.773 (0.002)	0.738 (0.002)
Central	3.26 $\pm$ 0.98	3.18 $\pm$ 0.13	0.68	3.67 $\pm$ 1.68	3.67 $\pm$ 1.17	7.04	0.823 (0.001)	0.123 (0.048)	0.823 (0.001)
Local LE	4.11 $\pm$ 1.31	4.18 $\pm$ 1.00	8.92	4.08 $\pm$ 1.71	4.29 $\pm$ 1.80	9.28	0.350 (0.018)	0.919 (0.001)	0.656 (0.004)
Local UE	2.11 $\pm$ 1.01	2.15 $\pm$ 1.20	11.23	2.38 $\pm$ 1.01	2.33 $\pm$ 1.13	2.08	0.985 (0.001)	0.430 (0.013)	0.745 (0.002)

CG, control group; CMJ, countermovement jump; EG, experimental group; HR, heart rate; LE, lower extremities; RPE, rate of perceived exhaustion; UE, upper extremities;  $\eta_p^2$ , eta partial square for effect size.



**EXPERIMENTAL GROUP COMPARED TO CONTROL GROUP**

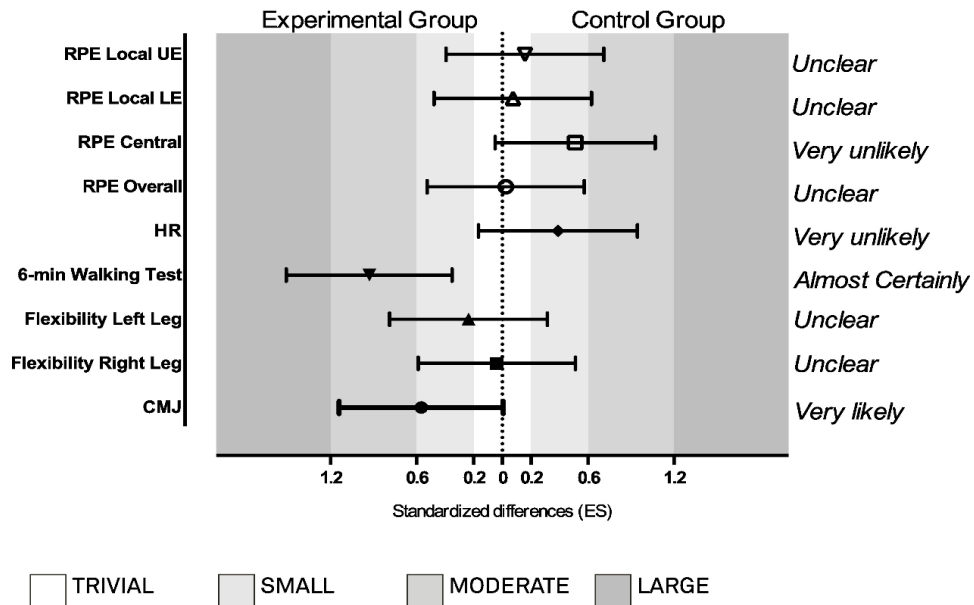


Figure 5. Effectiveness of walking routes in the experimental group in comparison to the control group in the improvement of rate of perceived exhaustion (RPE) local for upper extremities (UE), RPE local for lower extremities (LE), RPE central, RPE overall, heart rate (HR), 6-minute walking test, flexibility of the left leg, flexibility of the right leg, and countermovement jump (CMJ). Bars indicate uncertainty in the true mean changes with 90% confidence limits

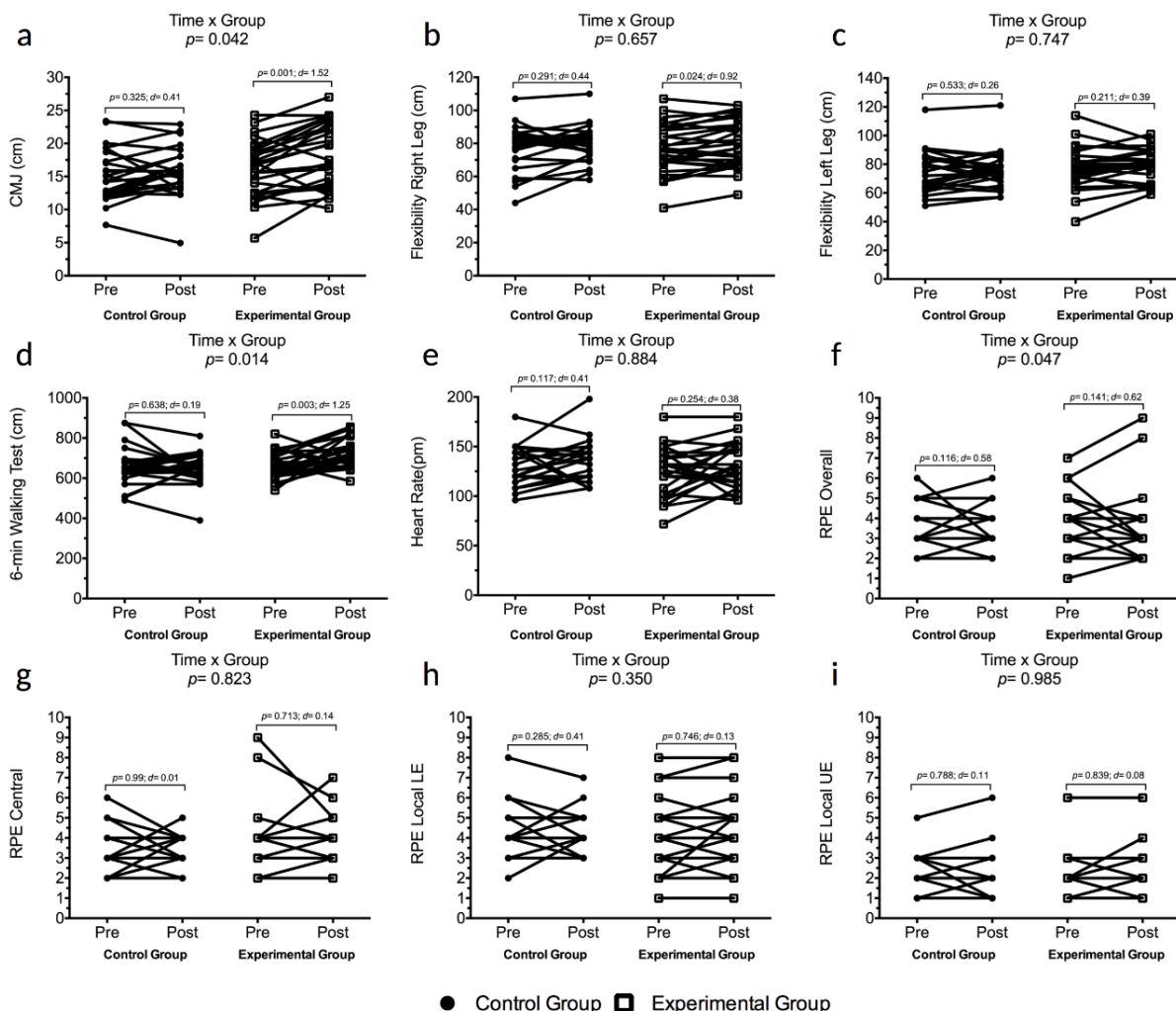


Figure 6. Individual values at pre- and post-test for (a) countermovement jump (CMJ), (b) flexibility of the right leg, (c) flexibility of the left leg, (d) 6-minute walking test, (e) heart rate (HR), (f) rate of perceived exhaustion (RPE) overall, (g) RPE central, (h) RPE local of lower extremities (LE), and (i) RPE local of upper extremities (UE), in the experimental and control group

## DISCUSSION

The aim of this study was to analyse the effect of a physical activity program on body composition and physical condition of university teacher students. The results suggest that there were no improvements in the body composition variables in any of the groups. However, the walking routes improved aspects of physical condition such as aerobic endurance in the students of the experimental group.

In the 6-minute walking test, EG obtain a significant improvement of 9.89% after the intervention, while the CG suffered a decrease compared with the pre-test. This improvement in the endurance capacity was also seen in other investigations with participants between 50 and 85 years-old after an intervention (Troosters et al., 1999). On the other performance tests, significant differences were found in CMJ and in the flexibility of the right leg.

Vertical jump offers the possibility to assess the mechanical power of leg extensor muscles during explosive action (Bosco et al., 1983). Likewise, scientific evidence showed that stair ascending action produces an electromyography activation in extensor leg muscles (Benedetti et al., 2011). During level two and three of walking routes the participants had to ascend stairs and therefore, elicit an activation in extensor leg muscles. Thus, this concentric contraction produced while participants are ascending stairs would produce an increase of power in leg extensor muscles.

Neither the overall, central, or local RPE improved significantly. Different results were found in another study (Joseph et al., 2008), in the first part the authors point out that “when the RPE was compared with the relative distance, there were no significant differences in the growing RPE at proportional distances”. However, in the second part (Joseph et al., 2008) the authors point out that “the decrease in starting power the decrease in power output during the hypoxic segments was sufficient that the growth of RPE was the same at each proportional distance”. In both parts of the study “a five (hard) RPE was accomplished after 20% of the time trial distance, and an eight RPE after 80% of the distance” (Joseph et al., 2008).

An improvement of HR was found for the EG. Previous studies demonstrated a correlation between the increase in RPE with the HR, while the intensity of the exercise increases the correlation between the HR and RPE is accentuated (Arruza Gabilondo et al., 1996).

On the body composition variables measured with the bioimpedance it was only found significant differences in the fat mass and lean mass on the left leg. However, no significant differences were found neither in the right leg, right arm, left arm or trunk. In comparison with these results, a study of the Santo Tomás University (Temuco, Chile), after 12 weeks of physical exercise on participants with obesity, there were significant improvements such as decrease in weight, BMI, as well as waist, and hip contour (Delgado Floody et al., 2015). In a study with walking routes (Gilson et al., 2007), no significant differences were found in body fat % and waist circumference as well.

In the study where the variations in diet of Galician university students from 2011 to 2013 were investigated, they found a decrease in the normal weight students, and an increase in the low weight and obesity (Míguez Bernárdez et al., 2013). The authors pointed out that food pattern was medium-low adequate to the cardioprotective factors of Mediterranean diet between 2011-2013, being further apart in 2013. In consequence, they confirm that 90% of the participants should have a healthy diet (Míguez Bernárdez et al., 2013).

Studies about walking routes found implications for promoting work-based physical activity and the development of walking interventions within the work space (Gilson et al., 2007); as well as the value of walking at work, and the increased working productivity (Gilson et al., 2008).

The need of further research in this area is needed to fully understand the implications and benefits of finding new and more accessible ways of physical activity at the work or study place.

## CONCLUSIONS

This study points out that university students did not improve their body composition after a six-week intervention. But the walking routes in the sphere of work help to improve the performance of the students, in the aerobic, jumping and flexibility capacities. There is a relationship between the HR and the score in RPE, a higher HR, higher RPE; but no significant differences were found.

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## REFERENCES

- Alfermann, D., & Stoll, O. (2000). Effects of physical exercise on self-concept and well-being. *Int J Sport Exerc Psychol*, 30, 47–65.
- Arruza Gabilondo, J., Alzate Sáez de Heredia, R., & Valencia Gárate, J. (1996). Esfuerzo percibido y frecuencia cardiaca: el control de la intensidad de los esfuerzos en el entrenamiento de judo. *Rev Psicol Deporte*, 5(2), 39.
- Benayas, J., Alba, D., & Sánchez, S. (2002). La ambientalización de los campus universitarios: El caso de la Universidad Autónoma de Madrid. *Ecosistemas*, 11(3).
- Benedetti, M. G., Agostini, V., Knaflitz, M., & Bonato, P. (2011). Muscle activation patterns during level walking and stair ambulation. In: C. Steele (Ed.). *Applications of EMG in Clinical and Sports Medicine*, chapter 8 (pp. 117-130). Rijeka, Croatia: InTech.
- Bosco, C., Komi, P. V., Tihanyi, J., Fekete, G., & Apor, P. (1983). Mechanical power test and fiber composition of human leg extensor muscles. *Eur J Appl Physiol Occup Physiol*, 51, 129–135. <https://doi.org/10.1007/BF00952545>
- Brownson, R. C., Housemann, R. A., Brown, D. R., Jackson-Thompson, J., King, A. C., Malone, B. R., & Sallis, J. F. (2000). Promoting physical activity in rural communities. Walking trail Access, use, and effects. *Am J Prev Med*, 18(3), 235–241. [https://doi.org/10.1016/S0749-3797\(99\)00165-8](https://doi.org/10.1016/S0749-3797(99)00165-8)
- Caracuel, J. C., & Arbinaga, F. (2010). Repercusión del ejercicio físico sobre la salud. *Apunt Psicol*, 28(2), 315–328.
- Cintra Cala, O., & Balboa Navarro, Y. (2011). La actividad física: Un aporte para la salud. *Lecturas*, 16(159).
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Delgado Floody, P., Jerez Mayorga, D., Caamaño Navarrete, F., Osorio Poblete, A., Thuillier Lepeley, N., & Alarcón Hormazábal, M. (2015). Doce semanas de ejercicio físico intervalado con sobrecarga mejora las variables antropométricas de obesos mórbidos y obesos con comorbilidades postulantes a cirugía bariátrica. *Nutrición Hospitalaria*, 32(5), 2007–2011.
- Encuesta sobre hábitos deportivos de los españoles 2005. Madrid, España, CIS. Web site: <http://www.csd.gob.es/csd/sociedad/encuesta-de-habitos-deportivos/encuesta-de-habitos-deportivos-2005/encuesta-de-habitos-deportivos> Accessed March 15, 2018.
- Ferrara, C. M. (2009). The college experience: Physical activity, nutrition, and implications for intervention and future research. *J Exerc Physiol Online*, 12(1), 23–35.
- Foster, C., Florhaug, J. A., Franklin, J., Gottschall, L., Hrovatin, L. A., Parker, S., ... Dodge, C. (2001). A new approach to monitoring exercise training. *J Strength Cond Res*, 15(1), 109–115.
- Fox, K. R. (2000). Self-esteem, self-perceptions and exercise. *Int J Sport Psychol*, 31(2), 228–240.
- Fox, K. R. (2001). The effects of exercise on self-perceptions and self-esteem. In: S. J. H. Biddle, K. R. Fox, S. H. Boutcher (Eds.). *Physical Activity and Psychological Well-Being*, 88–117.
- Gibbons, W. J., Fruchter, N., Sloan, S., & Levy, R. D. (2001). Reference values for a multiple repetition 6-minute walk test in healthy adults older than 20 years. *J Cardiopulm Rehabil Prev*, 21(2), 87–93. <https://doi.org/10.1097/00008483-200103000-00005>

- Gilson, N., McKenna, J., & Cooke, C. (2008). Experiences of route and task-based walking in a university community: Qualitative perspectives in a randomized control trial. *J Phys Act Health*, 5(1Suppl), 176–182. <https://doi.org/10.1123/jpah.5.s1.s176>
- Gilson, N., McKenna, J., Cooke, C., & Brown, W. (2007). Walking towards health in a university community: A feasibility study. *Prev Med*, 44, 167–169. <https://doi.org/10.1016/j.ypmed.2006.09.012>
- Hopkins, W. G., Marshall, S. W., Batterham, A. M., & Hanin, J. (2009). Progressive statistics for studies in sports medicine and exercise science. *Med Sci Sports Exerc*, 41, 3–13. <https://doi.org/10.1249/MSS.0b013e31818cb278>
- Joseph, T., Johnson, B., Battista, R. A., Wright, G., Dodge, C., Porcari, J. P., ... Foster, C. (2008). Perception of fatigue during simulated competition. *Med Sci Sports Exerc*, 40(2), 381–386. <https://doi.org/10.1249/mss.0b013e31815a83f6>
- Katzmarzyk, P. T. (2007). 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children. *CMAJ*, 176(8), 17–20.
- Lau, D. C. W., Douketis, J. D., Morrison, K. M., Hrniak, I. M., & Sharma, A. M. (2007). 2006 Canadian clinical practice guidelines on the management and prevention of obesity in adults and children [Summary]. *CMAJ*, 176(8), 1–13. <https://doi.org/10.1503/cmaj.061409>
- Leandro, M., Molina, O., & Riba, L. Intersecciones de la movilidad activa: Construcción interdisciplinar del espacio público en el campus universitario. *On the w@terfront*, (28), 40–56.
- Lee, I-M., & Buchner, D. (2008). The importance of walking to public health. *Med Sci Sports Exerc*, 40(7Suppl), 512–518. <https://doi.org/10.1249/MSS.0b013e31817c65d0>
- Lepeley, N., & Alarcón Hormazábal, M. Doce semanas de ejercicio físico intervalado con sobrecarga mejora las variables antropométricas de obesos mórbidos y obesos con comorbilidades postulantes a cirugía bariátrica. *Nutr Hosp*, 32(5), 2007–2011.
- Malina, R. M. (2001). Adherence to physical activity from childhood to adulthood: a perspective from tracking studies. *Quest*, 53, 346–355. <https://doi.org/10.1080/00336297.2001.10491751>
- Míguez Bernárdez, M., Castro Sobrino, L., Collins Greene, A., & Montaña Miguélez, J. D. L. (2013). Variaciones en la dieta de universitarios gallegos (campus de Ourense) con relación al patrón cardioprotector de la dieta mediterránea. *Nutr Hosp*, 28(6), 2099–2106.
- Myers, A. M., Malott, O. W., Gray, E., Tudor-Locke, C., Ecclestone, N. A., Cousins, S. O., & Petrella, R. (1999). Measuring accumulated health-related benefits of exercise participation for older adults: The Vitality Plus Scale. *J Gerontol A Biol Sci Med Sci*, 54(9), 456–466. <https://doi.org/10.1093/gerona/54.9.M456>
- Nahas, M. V., Goldfine, B., & Collins, M. A. Determinants of physical activity in adolescents and young adults: The basis for high school and college physical education to promote active lifestyles. *Phys Educ*, 60(1), 1–18.
- O'Sullivan, T. L. (2003). A biopsychosocial approach to exercise [Dissertation]. *International Section A: Humanities & Social Sciences*, 63(10-A), 34–89.
- Perusse-Lachance, E., Tremblay, A., & Drapeau, V. (2010). Lifestyle factors and other health measures in a Canadian university community. *Appl Physiol Nutr Metab*, 35(4), 498–506. <https://doi.org/10.1139/H10-035>
- Reinboth, M., Duda, J. L., & Ntoumanis, N. (2004). Dimensions of coaching behavior, need satisfaction, and the psychological and physical welfare of young athletes. *Motiv Emotion*, 28(3), 297–313. <https://doi.org/10.1023/B:MOEM.0000040156.81924.b8>
- Stigebout, M., Popkema, D. Y., Hopman-Rock, M., De Greef, M., & Van Mechelen, W. (2004). Once a week is not enough: effects of a widely implemented group based exercise programme for older adults; a randomized controlled trial. *J Epidemiol Commun H*, 58(2), 83–88. <https://doi.org/10.1136/jech.58.2.83>

- Sofi, F., Capalbo, A., Cesari, F., Abbate, R., & Gensini, G. F. (2008). Physical activity during leisure time and primary prevention of coronary heart disease: an updated meta-analysis of cohort studies. *Eur J Cardiovasc Prev Rehabil*, 15(3), 247–257. <https://doi.org/10.1097/HJR.0b013e3282f232ac>
- Sonstroem, R. J., & Morgan, W. P. (1989). Exercise and self-esteem: Rationale and model. *Med Sci Sport Exer*, 21(3), 329–337. <https://doi.org/10.1249/00005768-198906000-00018>
- Sonstroem, R. J., & Potts, S. A. (1996). Life adjustment correlates of physical self-concepts. *Med Sci Sport Exer*, 28(5), 329–337.
- Thomas, J. R., Silverman, S., & Nelson, J. (2015). *Research Methods in Physical Activity*. 7th ed. Champaign, IL: Human Kinetics.
- Troosters, T., Gosselink, R., & Decramer, M. (1999). Six minute walking distance in healthy elderly subjects. *Eur Respir J*, 14(2), 270–274. <https://doi.org/10.1034/j.1399-3003.1999.14b06.x>
- US Department of Health and Human Services. (1996). *Physical Activity and Health: A Report of the Surgeon General*. Atlanta, GA: US Department of Health and Human services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
- World Health Organization. (2010). *Global Recommendations on Physical Activity for Health*. Geneva, Switzerland: World Health Organization.



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