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ORIGINAL ARTICLE

Sedentary behavior and compensatory mechanisms in response to different doses of exercise—a randomized controlled trial in overweight and obese adults

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BACKGROUND/OBJECTIVES: To examine compensatory changes in sedentary behavior (SB) and light-intensity physical activities (LIPA) in response to a 22-week exercise training program in overweight/obese adults; and to determine if different forms of exercise training and physical activity recommendations interact with these compensatory changes.
SUBJECTS/METHODS: Eighty-nine overweight and obese individuals (body mass index (BMI): 25–34.9 kg/m^2, 48% males), aged 18–50 years, were randomized into four intervention groups (strength, endurance, combined strength + endurance and physical activity recommendations) with a 25–30% caloric restriction of total daily energy expenditure for 22 weeks. Energy expenditure was measured by accelerometry before, during and after the program.
RESULTS: LIPA increased significantly ($P < 0.001$) after three months and at the end of intervention compared to baseline (pre: 281 ± 9 min; 3 months: 303 ± 9 min; post: 312 ± 8 min). SB percentage decreased by 5.3 at the end of the intervention ($P = 0.002$). No interactions were observed between groups or sexes. Significant correlations were found between SB and body weight, fat mass, android fat mass and lean body mass before and after the intervention ($P < 0.05$). LIPA was also significantly correlated with all these body composition variables in the pre-intervention, but only correlated with body weight at the end of intervention.
CONCLUSIONS: There were no compensatory changes after a combined exercise and diet program; where minutes in LIPA increased and %SB decreased after the program, without differences among exercise modes. Greater physical activity levels can contribute to a better percentage and distribution of body tissues.

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INTRODUCTION

Obesity is a serious growing health problem, and as a result, several international organizations are adopting preventive strategies to tackle this disease.[1] Increasing moderate-to-vigorous physical activity (MVPA) has been identified as an effective method in preventing high levels of adiposity;[2] additionally, weight training or aerobic activity interventions to lose and maintain body weight have also been successful.[3]

On the other hand, sedentary behavior (SB) is by far the most prevalent behavior in human's waking day,[4] and new research have found a negative impact of SB on adiposity and cardiovascular risks.[5] It has been recognized that even for those individuals who engage in regular MVPA, the risk of having increased adiposity and cardiovascular diseases is amplified, simply by being more sedentary (sitting, watching television and so on).[6,7]

Obesity occurs when energy intake exceeds energy expenditure.[8] Humans expend energy through purposeful exercise, and through changes in posture and movement that are associated with the routines of daily life (called non-exercise physical activity). Non-exercise physical activity is frequently related to light-intensity physical activities (LIPA).

The health benefits of exercise training, including weight loss, are well-established.[9] However, the amount of weight loss following an exercise training trial is variable; commonly the predicted weight loss (based on the energy expended) is not reached solely through the completion of the prescribed exercise.[10]

King *et al.*[11] suggested that individuals may compensate for higher energy expenditure during exercise training by increasing SB, decreasing non-exercise physical activity and/or increasing caloric consumption during the rest of the day. Few studies have examined the patterns of physical activity, such as time spent sedentary and time spent in different activity intensity categories,[12] and limited data on compensatory behavior in response to exercise training are equivocal.[13–16]

In addition to the inconsistencies found across studies, there seems to be large individual differences in changes in LIPA within studies.[13] For example, Di Blasio *et al.*[16] reported that half of the women who started an exercise training program actually decreased total daily energy expenditure, even with the inclusion of energy expenditure from exercise.[16] The authors concluded that an additional intervention may be necessary to ensure that a decrease in LIPA, and a consequent increase in SB, does not occur.[16]

Besides the controversial findings for the compensatory mechanisms in LIPA and SB, no study has investigated if these behavioral responses to an exercise intervention can be affected by the type of training,[17] and did not consider a long-term exercise training.[18,19] We hypothesized a modest reduction of sedentary time, which would be reallocated to LIPA[20] after the

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participation in an exercise and diet program. We also hypothesized that this reduction could be influenced by types of exercise. Therefore, our aim was to examine compensatory changes in SB and LIPA (objectively assessed by accelerometry), in response to a 6-month exercise training and diet program in overweight/obese adults. In addition, we determined if different forms of exercise training (aerobic, resistance, and combined) and providing physical activity recommendations, interacted with the compensatory mechanisms in SB and LIPA.

MATERIALS AND METHODS

Participants

The present study was part of the randomized clinical trial, Nutrition and Physical Activity Programs for Obesity Treatments (PRONAF according to its Spanish initials); the aim of the trial was to examine the usefulness of different types of physical activity and nutrition programs for the treatment of adult obesity. The inclusion criteria included individuals living in the region of Madrid, aged 18 to 50 years, overweight (body mass index (BMI): 25–29.9 kg/m^2) or obese (BMI: 30–34.9 kg/m^2), inactive ($<$ 30 min MVPA/day), normoglycaemic (fasting blood sugar $\leqslant$ 100 mg/dl) and non-smoker. A total of 180 participants (84 males) completed the study, complying with at least 90% assistance to the training sessions and 80% adherence to the diet. Out of these, 89 subjects (43 males) were included in the analyses according to Figure 1. In agreement with the guidelines of the Declaration of Helsinki, regarding research on human subjects, all participants were carefully informed about the possible risks and benefits of the study and signed an institutionally approved written informed consent. The PRONAF study was approved by the Human Research Review Committee of the University Hospital La Paz (HULP) (PI-643).

Study design

The intervention consisted of a 22-week diet and exercise-based program, with a particular focus on creating a behavioral change. Participants entered the study in two sample waves (overweight and obese); they were then split into four randomly assigned groups, stratified by age and sex. The groups were as follows: strength (S); endurance (E); combined strength and endurance (SE); and the control group (PA); adhering to physical activity recommendations from the American College of Sports Medicine.[21,22] The recommendations consisted at least 150 min (2 h and 30 min) a week of moderate intensity, or 75 min (1 h and 15 min) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity. Physical activity was assessed by accelerometry once a month and all subjects were instructed to continue their habitual daily activities and were provided physical activity diary to log the type, duration, and intensity of any physical activity or exercise undertaken during the intervention. The complete methodology can be found in Zapico *et al.*[23]

Exercise intervention. All exercise training groups followed an individualized training program; which consisted of three exercise sessions per week, for 22 weeks. All exercise sessions were carefully supervised by certified personal trainers. Exercise conducted by the PA group was not supervised, only registered with an accelerometer.

The exercise programs were designed according to the participants' muscle strength and their heart rate (HR) reserve. Muscle strength was measured using the 15-repetition maximum testing method in the S and SE groups. Rest supine HR was calculated as the average HR measured during 10 min in a lying down position, and maximal HR was obtained from the cardiovascular maximal effort test, which was evaluated using a modified Bruce protocol on a computerized treadmill (H/P/COSMOS 3PW 4.0, H/P/Cosmos Sports & Medical, Nussdorf-Traunstein, Germany), with the gas analyzer Jaeger Oxycon Pro (Erich Jaeger; Viasys Healthcare, Höchberg, Germany). The stress test was maintained until exhaustion.

All the exercise programs were performed in circuit. In the S group, the session routine consisted of eight scheduled exercises (that is, shoulder press, squat, barbell row, lateral split, bench press, front split, biceps curl and French press for triceps). For group E, running, cycling or elliptical (self-selected) exercises were the main components of the session routine, while the routine for the SE group consisted of a combination of cycle ergometer, treadmill or elliptical intercalated with squat, row machine, bench press and front split. The S and SE participants performed 15 repetitions for each strength exercise (cadence fixed at 1:2 s, concentric-eccentric phase) or/and 45 s for aerobic exercise (only SE participants) with a rest period of 15 s between them.

Before each training session a 5-min aerobic warm-up routine was performed, followed by the session routine, and concluded with a 5-min cool down and stretching exercises routine. Both volume and intensity of the three training programs increased progressively. During the adaptation period (weeks 1–4) subjects were taught on the exercise technique. Between the 5th and 8th week, exercises were carried out at an intensity of 50% of 15RM and HR reserve, performing two laps to the circuit (51 min and 15 s), then between the 9th and 14th week the intensity was increased up to 60% of 15RM and HR reserve, and finally during the period between the 15th and 24th week the volume increased from two to three laps to

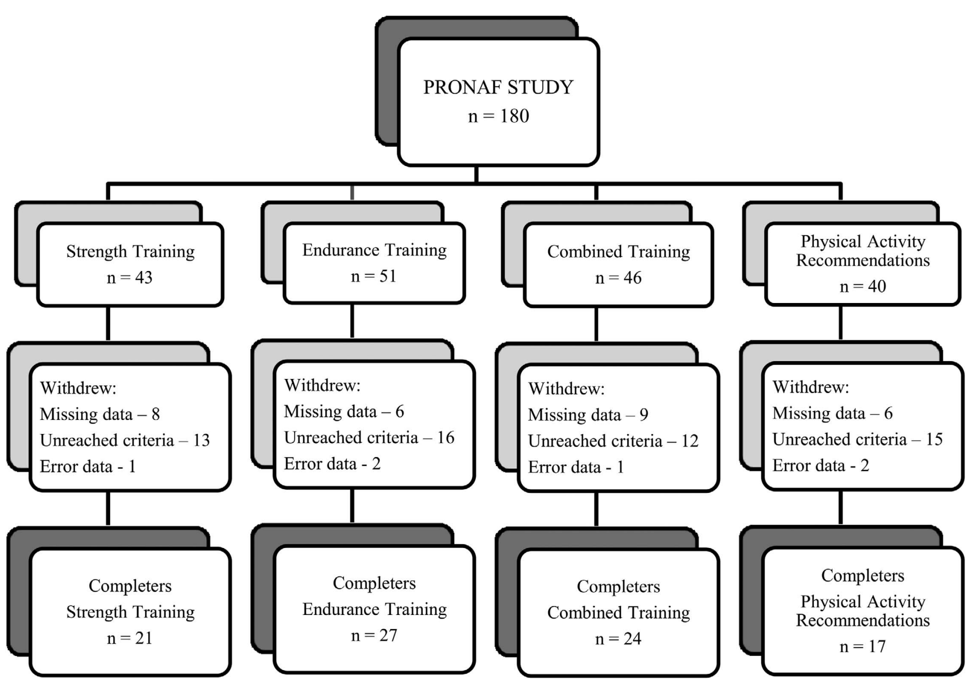

Figure 1. Participant flow diagram.

Table 1. Characteristics before or at beginning of the intervention

	S	*E*	*SE*	*PA*	*Total*
Age	39.2 ± 9.1	40.6 ± 6.6	37.0 ± 7.5	41.1 ± 5.9	39.4 ± 7.4
Body weight (kg)	89.2 ± 13.6	84.5 ± 11.4	82.8 ± 12.3	85.9 ± 10.9	85.4 ± 12.1
Height (cm)	169.9 ± 11.3	166.6 ± 8.9	169.4 ± 9.3	169.2 ± 9.0	168.6 ± 9.6
Body mass index (kg/m^2)	31.0 ± 2.3	31.0 ± 2.9	28.6 ± 2.0*≠	29.8 ± 2.1	30.1 ± 2.6
Fat (%)	41.5 ± 6.0	41.1 ± 6.7	38.0 ± 6.8	40.5 ± 5.5	40.2 ± 6.4
Android fat (%)	48.8 ± 5.4	47.3 ± 8.2	44.1 ± 6.2	48.4 ± 5.8	47.0 ± 5.8
Lean body mass (kg)	56.7 ± 5.7	57.0 ± 6.3	59.9 ± 6.4	57.6 ± 5.3	57.8 ± 6.1
VO_{2peak} (ml/kg/min)	31.1 ± 6.3	30.7 ± 6.5	34.1 ± 6.1	30.8 ± 4.5	31.7 ± 6.1
SB (%)	62.0 ± 7.8	63.5 ± 11.8	61.3 ± 10.6	66.6 ± 9.3	63.2 ± 10.2
LIPA (%)	29.7 ± 7.4	27.4 ± 7.0	29.0 ± 7.3	25.8 ± 9.5	28.1 ± 7.7
MVPA (%)	8.3 ± 3.8	9.1 ± 7.8	9.6 ± 5.0	7.6 ± 2.5	8.7 ± 5.4
Average sleep (hours)	6.9 ± 0.9	6.9 ± 0.9	6.7 ± 0.9	6.8 ± 1.1	6.8 ± 0.9
Total registered time (hours)	23.7 ± 0.2	23.7 ± 0.2	23.7 ± 0.1	23.7 ± 0.2	23.7 ± 0.2
Number of steps	10457 ± 2001	10129 ± 3858	10192 ± 3134	9377 ± 2148	10079 ± 2975

Abbreviations: E, endurance training group; LIPA, light-intensity physical activity; MVPA, moderate-to-vigorous physical activity; PA, physical activity recommendations group; S, strength training group; SB, sedentary behavior; SE, combined strength + endurance training group. Data are presented mean ± s.d. VO_{2peak}: peak oxygen consumption. *$P < 0.05$, difference between SE and S; ≠$P < 0.05$, difference between SE and E.

the circuit (64 min). Then, a 5-min recovery period was set between the circuits. Training loads also were evaluated with the rate of perceived exertion once a month.

Hypocaloric diet. All groups underwent an individualized and hypocaloric diet (between 1200 and 3000 kcal) prescribed by expert dieticians in the Nutrition Department of HULP. The diet implied a 25% reduction from the total daily energy expenditure measured using SenseWear Pro Armband (BodyMedia, Pittsburgh, PA, USA) accelerometer.[24] Energy intake was measured by the '3-day food and drink record', validated for the Spanish population,[25] at baseline and at the end of the intervention. Diet compliance was calculated as the estimated kcal of the diet divided by the real kcal intake ((estimated kcal of diet/real kcal intake) · 100).

Measurements

Physical activity. Energy expenditure was measured by the SenseWear (SWA), a multi-sensor monitor worn on the back of the right upper arm (over the triceps muscle) as per manufacturer orientation. The SWA continuously records physiological data during daily life activities. The SWA has been shown to be valid for assessing energy expenditure in free-living conditions.[26] Data were downloaded into the SWA software (SenseWear Professional software version 6.1; Body Media Inc., Pittsburgh, PA, USA).

Participants were instructed to wear the SWA for 6 consecutive days, 24 h per day on the non-dominant arm. Data of subjects that obtained a minimum of 3 days of 95% 'on-body' time[27–29] (22 h and 48 min) with at least one weekend day included in the analysis and if the individual was of a training group with one day of exercise (reached criteria). Data were measured at beginning (week two), after 3 months (weeks 12) and final (weeks 23) of the intervention. Daily energy expenditure was calculated using the Body Media propriety algorithm (Sense Wear Professional software version 6.1; Body Media Inc.) and computed at one minute intervals.

Participants were instructed to take the SWA off for showering and water activities, as the SWA is not waterproof. From all the participants, only three reported water activities (aerobics) performed in a swimming pool for around 45 min a week. Data about non-wear time was recorded on the log sheet and was verified through inspection of the data downloaded into the SWA software.

SB was estimated as the amount of time accumulated below 1.5 METs. Time spent in $\geqslant 1.5 < 3.0$ METs was classified as LIPA, time spent in $\geqslant 3.0$ METs was classified as MVPA.[27] For the analysis, sleeping time provided by the accelerometer was subtracted from total registered sedentary time. Physical activity level was computed as the average MET value provided by the SWA (MET_{SWA}) during 24 h. Number of steps was also measured by the SWA.

Body composition. Body composition was assessed by dual-energy X-ray absorptiometry (GE Lunar Prodigy; GE Healthcare, Madison, Wisconsin, USA, GE Encore 2002, version 6.10.029 software). Height was measured using a SECA stadiometer (range 80–200 cm, Valencia, Spain). Body mass was measured using a TANITA BC-420MA balance (Bio Lógica Tecnología Médica S.L, Barcelona, Spain). All participants were measured pre- and post-intervention, in week 1 and week 24, respectively. BMI was calculated as (body mass (kg)/(height (m))^2).

Statistical analysis

Data were presented as mean and standard deviation (± s.d.). Data normality was proved by Kolmogorov-Smirnov test. Two-way analysis of covariance repeated measures (analysis of variance) was used to determine any differences among the four groups (S, E, SE and PA) and sex at baseline, during and post-intervention values. Age and BMI were used as covariates. Partial correlations were performed to verify the associations between accelerometry and body composition variables at baseline and in the post-intervention, controlling for age, sex and energy intake. Differences between men and women at baseline were tested using a Student's *t* test. SPSS version 20.0 for Windows was used (SPSS Inc., Chicago, IL, USA). The significance level was set at $\alpha = 0.05$.

RESULTS

The characteristics of participants at baseline are described in Table 1. There are significant differences between men and women for body weight, height, fat percentage, android fat percentage, lean body mass, peak oxygen consumption and MVPA. Men presented greater values than women for all variables except for fat percentage and android fat percentage.

Light-intensity physical activity increased after 3 months and at the end of intervention by 8 and 11%, respectively. No interactions were observed between sex or groups (Table 2).

Despite a change percentage of time in minutes in SB of −3 and − 4%, and in MVPA of 8 and 10% after 3 months and at the end of the intervention respectively, analysis of variance showed no significant differences or interactions for any of these variables (Table 2). However, percentage in SB in relation to the total time of day decreased significantly by 5.3% at the end of the intervention. Total fat percentage and android fat percentage also decreased and lean body mass percentage increased (Figure 2).

Significant correlations were found between accelerometry and body composition variables. Before the intervention body weight, fat and android fat percentages were positively correlated with SB and negatively correlated with LIPA, MVPA and physical activity level. In the same way, negative correlation was found between SB and lean body mass percentage and positives correlations were observed between this last variable and LIPA, MVPA and physical activity level. After the intervention the same correlations were found, except for LIPA that only presented low, but significant correlation with body weight. Number of steps was only

Table 2. Accelerometer data at beginning, during and final of the intervention

	S	E	SE	PA	Total	P	Power
SB (min/day)							
Beginning	624.3 ± 74.6	640.5 ± 116.2	626.2 ± 116.5	672.3 ± 104.1	638.9 ± 105.3	T 0.081	0.50
3 Months	618.7 ± 108.0	622.3 ± 143.2	604.2 ± 98.9	651.6 ± 133.9	622.2 ± 121.6	T × G 0.903	0.15
Final	616.4 ± 82.8	613.7 ± 94.3	603.5 ± 106.7	641.0 ± 113.6	616.0 ± 98.3	T × S 0.580	0.14
						T × G × S 0.380	0.42
LIPA (min/day)							
Beginning	300.4 ± 80.1	277.4 ± 77.9	295.8 ± 75.6	262.2 ± 103.4	284.9 ± 83.0	T < 0.001	0.96
3 Months	312.8 ± 97.5	315.2 ± 85.6	310.3 ± 70.7	285.7 ± 85.8	307.7 ± 84.2*	T × G 0.854	0.18
Final	322.3 ± 98.0	314.6 ± 74.2	328.2 ± 75.9	293.7 ± 70.2	316.1 ± 79.7**	T × S 0.727	0.10
						T × G × S 0.071	0.71
MVPA (min/day)							
Beginning	83.9 ± 39.6	92.4 ± 77.9	98.3 ± 52.0	76.5 ± 23.8	88.9 ± 55.0	T 0.235	0.31
3 Months	84.3 ± 30.2	106.0 ± 66.9	95.6 ± 52.9	98.5 ± 54.7	96.0 ± 53.6	T × G 0.658	0.27
Final	81.0 ± 38.1	99.2 ± 71.0	102.9 ± 57.8	100.8 ± 30.3	98.2 ± 54.2	T × S 0.658	0.12
						T × G × S 0.305	0.47

Abbreviations: CI, 95% confidence interval; E, endurance training group; G, intervention group; LIPA, light-intensity physical activity; MVPA, moderate-to-vigorous physical activity; PA, physical activity recommendations group; S, sex; S, strength training group; SE, combined strength + endurance training group; SB, sedentary behavior; SE, strength and endurance; T, time. *$P < 0.05$, **$P < 0.001$ compared to baseline.

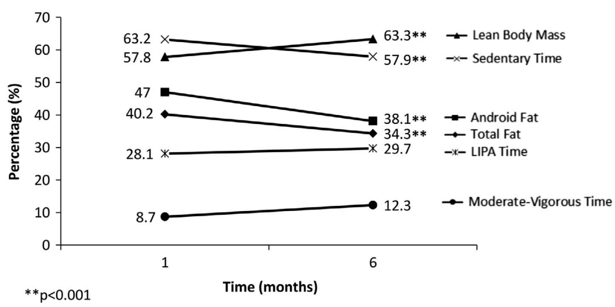

Figure 2. Body composition changes and behavioral responses after the program. LIPA, light-intensity physical activities.

correlated with body weight at beginning of the intervention (Table 3).

DISCUSSION

Our data did not show compensatory changes in SB and LIPA in response to interventions. There was no intervention group effect, but there was effect of time, where LIPA increased and %SB decreased after the program.

Compensatory responses could influence weight loss related to energy deficit.[10,11] In our study, different interventions resulted in similar behavior changes. We monitored thoroughly intensity and volume to ensure the comparison among the different types of training, and the exhaustive control of these parameters may have been responsible for the lack of differences. Unlike previous investigations,[13] our participants did not present a physical activity expenditure compensation regarding the adoption of a more sedentary lifestyle. However, this study utilized the Actigraph and caution must be taken when comparing the two, as they are independent devices placed on different body locations, and results showed that the SWA and the Actigraph provide different estimates for physical activity and sedentary activity.[27] Although, Actigraph and SWA were both valid tools for quantifying energy expenditure during light-intensity stepping in lean young subjects,[30] results of others investigations support than SWA may be a more accurate estimates of energy expenditure during sedentary to vigorous-intensity activities,[31–34] besides provide more precise reliability estimates[35] and to be preferred because easier to wear compared to Actigraph.[36] Di Blasio et al.[16] showed a reduction of spontaneous physical activity after participation in an aerobic exercise program using SWA. On the other hand, similar to our findings and with the use of SWA, a study by Turner et al.[14] in sedentary and overweight men found that the adoption of regular aerobic exercise did not result in a negative compensatory reduction on physical activity without prescription. The programs' duration could be one of the reasons why there were disagreements, since, Turner et al.'s[14] program was performed in 6 months, as was our study, whilst the duration of Di Blasio et al.'s[16] intervention only ran for 3 months. Moreover, participant characteristics could also be used to explain these differences. Turner et al.'s sample[14] presented BMI more similar to our subjects.

LIPA is not supported within physical activity guidelines because there is limited evidence showing its benefits on one's health.[12] Similarly, the direct links between SB and health measures, independent of time spent in MVPA, is a relatively new topic of discussion;[37] and is not yet considered in many health guidelines. Strong associations have been observed between SB and elevated blood pressure[38] and between sedentary time and elevated BMI and waist circumference;[39] suggesting that a reduction in sedentary time could result in a decrease of cardiovascular risk, independent of time spent in MVPA. In this way, there is a physiology hypothesis, where SB is not merely the lack of exercise but has its own physiological consequences that increase cardiovascular and metabolic risks, regardless of the amount of physical activity undertaken.[40] In accordance with Cleland et al.,[41] in which men with low step counts had increased odds of obesity irrespective of time sitting, our data illustrated a negative correlation between LIPA and body weight. Despite the complexity of the relationship between SB and obesity, obese patients could increase their risk for metabolic disease due to an increase in SB.[37] In this line, Larsen et al.[42] verified a linear increase of the intra-thoracic fat with sitting time in overweight subjects, suggesting that SB adoption could affect fat deposition and increase cardiovascular risks.[42]

On the other hand, recent studies support the relationship between MVPA and the decrease in cardiovascular and obesity risk.[2,5,43–46] In accordance with these studies, our data showed bigger correlations between MVPA and body composition; indicating that maintaining a greater physical activity level can contribute to a better distribution of body tissues. Furthermore, accumulating research continues to support that overweight/obese adults who are active have similar/lower odds of suffering

Table 3. Pearson's correlation between accelerometry and body composition at beginning and final weight loss program

	Body weight (kg)		Fat (%)		Android Fat (%)		Lean body mass (%)	
	Beginning	Final	Beginning	Final	Beginning	Final	Beginning	Final
	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)	r (p)
SB (min)	0.410 (< 0.001)	0.281 (0.01)	0.381 (< 0.01)	0.272 (0.02)	0.259 (0.02)	0.237 (0.03)	−0.380 (< 0.01)	−0.282 (0.01)
LIPA (min)	−0.370 (< 0.01)	−0.246 (0.02)	−0.351 (< 0.01)	−0.023 (0.83)	−0.232 (0.04)	−0.011 (0.92)	0.352 (< 0.01)	0.028 (0.80)
MVPA (min)	−0.354 (< 0.01)	−0.261 (0.02)	−0.340 (< 0.01)	−0.436 (< 0.001)	−0.255 (0.03)	−0.404 (< 0.001)	0.339 (< 0.01)	0.436 (< 0.001)
PAL (MET_{SWA})	−0.578 (< 0.001)	−0.572 (< 0.001)	−0.456 (< 0.001)	−0.497 (< 0.001)	−0.331 (< 0.01)	−0.430 (< 0.001)	0.455 (< 0.001)	0.497 (< 0.001)
No. of steps	−0.300 (< 0.01)	−0.116 (0.30)	−0.170 (0.15)	−0.186 (0.09)	−0.109 (0.35)	−0.186 (0.09)	0.167 (0.15)	0.187 (0.09)

Abbreviations: LIPA, light-intensity physical activity; MVPA, moderate-to-vigorous physical activity; PAL, physical activity level; SB, sedentary behavior.

from a cardiovascular incident over 10 years and a lower risk of chronic disease, when compared to normal weight inactive adults.[47,48]

Public health recommendations, specifically directed at overweight and obese people, must aim to promote physical activity and discourage SB, according to recent results.[39,41,42,49] Our data support previous results that demonstrate modest changes in sedentary time in response to the participation in physical activity and exercise programs;[50] and interventions which have a particular focus on reducing SB in order to generate significant clinical changes are required.[20] Intervention time represented < 2% of total weekly time, which could contribute little to a significant change in behavioral patterns. In addition, exercise prescriptions would be more effective if individually adapted, due to the inter-individual variability in behavioral and metabolic compensatory responses.[10]

Strengths and limitations

Important strengths of this study include: (1) the objective measure of physical activity by accelerometry; (2) the randomized design; (3) the inclusion of four different training programs in the same study, combined with a caloric restriction in all interventions; (4) the direct supervision and control of exercise throughout all training sessions. A limitation of this study was the fact that it did not include a 'no treatment' control group; but rather compared the intervention with a previously described exercise recommendation, which is broadly accepted from an ethical point of view and in clinical practice. In addition, another limitation is the measuring instrument itself, which could promote a behavior change during the time that the individuals used it (reactivity). Finally, non-compliance with the criteria for the analysis of the accelerometry data pointed the difficulty of the use of the equipment by the subjects, and did not allow performing a more complete analysis of the data.

CONCLUSION

In conclusion, there were no compensatory changes, that is, SB did not increase and LIPA did not decrease, in overweight and obese individuals with a participation in a combined exercise and diet program. In contrast, minutes in LIPA increased and %SB decreased after the program, without differences among exercise modes. More investigations about the relationships between LIPA and health benefits are imperative, as well as interesting, for future guidelines concerning energy expenditure and obesity.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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