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Levels of physical activity, nutrition and body composition in the workplace: reports from a distribution company

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Abstract

Introduction. Lifestyle factors, as eating habits and physical activity, are associated with health and productivity of workers. The aim of this study is an assessment of lifestyle of the employees of an international company of household items.

Methods. 291 (170 female, 121 male) employees underwent body composition assessment and completed two questionnaires (International Physical Activity Questionnaire and National Institute for Research of the Food and Nutrition).

Results. The weight status of the sample is at the upper limits of normal weight. Products based on cereals are consumed about once a day, fresh meat 3.0 (0.0-12.0) per week, fresh fruit (5.0, 0.0-25.0) and vegetables (6.0, 0.0-14.0) less than one serving a day. No vigorous physical activity is performed (0.0, 0.0-240.0 min/week), moderate is performed 30.0 (0.0-450.0) min/week and only 106 subjects were aware of the number of daily steps.

Conclusions. Job duties can have an influence on the daily habits. Workplaces have great potential to change personal lifestyle choices and a preliminary assessment should be performed in order to propose a tailored intervention.

Key words

- workplace
- physical fitness
- nutrition assessment
- overweight
- sedentary lifestyle

INTRODUCTION

A significant proportion of current healthcare spending is attributed to non-communicable chronic diseases such as diabetes, cardiovascular disease and cancer [1-3]. An incorrect lifestyle, in terms of unhealthy diet and physical inactivity, is associated with the possibility of becoming overweight or obese: all of these are recognized risk factors associated with chronic non-communicable diseases [4, 5].

An unhealthy lifestyle reduces physical function, which negatively affects work performance, decreases quality of life and increases the use of analgesic drugs. Therefore, these factors can hinder individual opportunities to extend workers' active working time and at the same time increase the number of days of absence from work due to illness, reduce productivity and can lead to a premature loss of experienced workers [6].

Lifestyle-related risk factors are changeable, but achieving a substantial change in daily habits is difficult. Workplaces have great potential to change personal lifestyle choices: people of working age spend much of their active time at work [7].

Employers are responsible for the health and safety of their employees, but at the same time, they are interested in reducing employee turnover, increasing productivity and thus ensuring that the worker has a regular commitment [8].

Shift workers are a particular category at risk for chronic diseases. They are particularly exposed to weight gain, type II diabetes, coronary heart disease, stroke and cancer [9]. Shift workers are more prone to physical inactivity and unhealthy diets [10].

It has been shown that an appropriate initiative to promote a healthy lifestyle in the workplace has increased health, increased productivity and had a good cost-effect ratio [11, 12].

The aim of the present study is that of a preliminary assessment of the lifestyle, in terms of physical activity and nutrition, and the resulting body composition of the employees of an international company of household items on the Italian territory.

MATERIALS AND METHODS

Study population

In order to investigate lifestyle and resulting body composition in a large distribution company specialized in the DIY sector, a group of employees are voluntary enrolled in the study during a medical evaluation

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performed within the workplace. The subjects were enrolled consecutively in the period May-November 2018 and the inclusion criteria in the study were to be an employee of the company that requested the study.

After receiving written informed consent, all subjects underwent a voluntarily assessment of body composition and were required to complete two questionnaires. One regarding the daily physical activity (International Physical Activity Questionnaire, IPAQ) and the other about eating habits (National Institute for Research of the Food and Nutrition, INRAN). The study was carried out in conformity with the ethical standards laid down in the 1975 declaration of Helsinki and was approved by the local ethical committee.

Procedures

Questionnaire

International Physical Activity Questionnaire (IPAQ)

The purpose of the questionnaire was to provide common instruments that could be used to obtain internationally comparable data on health-related physical activity [13]. The question asked the time spent being physically active in the last seven days. It consists in four sections:

1. Vigorous physical activities: minutes per week. These activities refer to activities that take hard physical effort and make you breathe much harder than normal.
2. Moderate activities, but not walking: minutes per week. These activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.
3. Walking: minutes per week and number of daily steps. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.
4. Time spent sitting, including reading, watching television, studying and playing video games: minutes per day.

National Institute for Research of the Food and Nutrition (INRAN)

Questionnaire assesses eating habits in relation to the frequencies of weekly consumption of food groups [14]. Food groups were: cereals and derivate, packaged cereals, fresh meat, preserved meats, fresh fish, milk or yogurt, cheese, fresh fruit, dried fruit, vegetables, legumes, eggs, dessert items, sweetened beverages and alcohol.

Body composition analysis

The study of body composition attempts to partition and quantify body weight or mass into its basic components. Over the past century, many techniques and equations have been proposed, but all have some inherent problems: to date, there is no universally applicable criterion or "gold standard" methodology for body composition assessment [15]. The methodology used for the assessment of body composition was in accordance with our previous study [16], and taking into account the integration of anthropometry, circumferences, skinfold thickness, and a whole body bioelectrical impedance analysis.

Anthropometry and skinfold thickness

Body Mass Index (BMI, kg/m2) was calculated from body mass and height. Skinfold measurements are widely utilized to assess Body Fat Mass (FM). The same operator pinches the skin at the site to raise a double layer of skin and the underlying subcutaneous adipose tissue, but does not pinch the muscle. The calipers (Holtain, Limited Tanner/Whitehouse Skinfold Caliper) are then applied 1 cm below and at right angles to the pinch, and a reading is taken in millimetres (mm). The mean of three measurements were taken in seven different anatomical sites around the body (triceps, biceps, sub-scapula, suprailiac, pectoral, abdominal, anterior thigh) [17]. The sum the seven sites (total skinfold) and their conversion into a percentage (FM %) in kilograms of body fat were calculated. To convert the skinfold values from millimetres to a Fat Mass percentage, the average of the reported values was calculated using three different equations, as stated in the literature [18-20].

Whole-body bia

Whole-body impedance (BIA 101 Sport Edition, Akern, Florence, Italy) is generated in soft tissues to oppose the flow of an injected alternate current and is measured from skin Ag/AgCl electrodes placed at fixed-distance (5 cm) on the hands and feet. The device emits an alternating sinusoidal electric current of 400 mA at an operating single frequency of 50 kHz (± 0.1%). The bioelectric parameters measured are Resistance (RZ, Ω) and Reactance (XC, Ω). RZ reflects the amount of body water and has a reverse relationship with the opposition to an alternating current, while XC is the capacitive component of cell membranes: therefore, changes in impedance measurements reflect changes in hydration and cell mass [21]. These parameters were normalized according to a subject's height (RZ/h and XC/h, in Ω/m) in order to consider the different conductor lengths. Additional parameters were: Phase Angle (PA in degree, as ratio between RZ and XC or between intra-and extracellular volumes), Body Cellular Mass (BCM in kg), Total Body Water (TBW in L and %), Extra Cellular Water (ECW, % TBW and L), and Intra Cellular Water (ICW, % TBW) and Resting Metabolic Rate (RMR, kcal).

Statistical analysis

Data are expressed as median (minimum-maximum value). The Shapiro-Wilk test was used to assess the normal distribution of data. Due to their asymmetric distribution the Mann-Whitney's U-test was used for comparisons of continuous variables and the Chi-square test with Yates' correction or Fisher's exact test were used for comparisons of categorical variables.

Correlations were tested by Spearman rho coefficient analysis. All calculations were carried out with IBM-SPSS® version 25.0 (IBM Corp., Armonk, NY, USA, 2017). A two-sided p-value < 0.05 was considered significant.

RESULTS

291 employees have been evaluated (170 female and 121 male). 71.1% were generic sales staff, 22.8% technical office staff, 5.2% settlor and 1.5% visual merchandising employees with no difference between sexes and 26.5% are smokers.

The weight status of the sample is at the upper limits of normal weight, the males have a significantly higher value than the females ($p < 0.001$) and their median value places them in the overweight condition *(Table 1)*. Body composition analysis shows average parameters in the normal range, however the high standard deviation of these values describes a high inter-individual variability.

Eating habits report that 6.5% follow a diet, 18.2% have a food intolerance and 36.1% take a food supplement. 7.9% do not have breakfast and 10% do it at the bar. Regarding lunch, only 59.5% can consume it at home, in addition, however, 25.8% of employees take advantage of the canteen. Therefore 14.7% must be organized differently (5.2% goes to the restaurant, 5.2% to the bar, 1.7% to fast food and 2.7% skip the meal). The dinner habits are more standardized, 97.9 % consume it at home, while the remaining 2.1% is often at the restaurant. Females are more used to making mid-morning and mid-afternoon snacks than their male counterparts (females 46.5%, males 33.9%; $p < 0.05$).

The results concerning the weekly frequency of consumption of the food groups is shown in *Table 2*, no differences between the sexes were found. Products based on cereals are consumed about once a day, fresh meat 3.0 (0.0-12.0) times per week, fresh fruit (5.0, 0.0-25.0) and vegetables (6.0, 0.0-14.0) less than one serving a day.

The results relating to the physical activity questionnaire are shown in *Table 2* and no differences were found between the sexes. No vigorous physical activity are performed 0.0 (0.0-240.0) min/week, moderate 30.0 (0.0-450.0) min/week, only 106 subjects were aware of the number of daily steps (10000.0, 0.0-23000.0).

Relationship between job duties and lifestyle habits

The job does not affect the likelihood of smoking; however, it influences the habit of making mid-morning and mid-afternoon snacks and the place of consumption of lunch. Visual merchandising employees and technical office staff make snacks more regularly ($p = 0.004$), generic sales staff can often have lunch at home (72.6%) while visual merchandising employees use the canteen in 75% of cases. There are no correlations between the work task and body composition or between the work task and the frequency of consumption of certain foods. It also does not affect the amount of moderate and vigorous physical activity during the week. However, it influences the number of steps (or in any case its knowledge) and above all the hours spent sitting: generic sales staff are those who are less seated during the day (4.00, 0.0-20.0 hours/day; $p < 0.05$) and make the largest number of steps (10000.0, 1000.0-23000.0 steps /day; $p < 0.001$).

Relationship between lifestyle habits and body composition

The results about correlation between body composition and lifestyle habits were report in *Table 3*. In the sample of workers examined, the higher consumption of certain foods appears to influence body composition,

Table 1
Body composition of total sample. The differences were report between genders. Data are expressed as median (minimum-maximum values)

	Total (n = 291)	Female (n = 170)	Male (n = 121)	p value
Age (years)	42.9 (21.0-66.0)	43.0 (21.0-58.0)	39.0 (22.0-66.0)	0.049
BMI (kg/m²)	24.5 (14.6-39.3)	23.3 (14.6-39.3)	25.6 (17.5-37.7)	< 0.001
Rz/h (Ω/m)	285.6 (188.2-439.1)	326.6 (216.7-439.1)	248.9 (188.2-352.6)	< 0.001
Xc/h (Ω/m)	33.2 (21.9-53.6)	34.7 (23.3-53.6)	31.3 (21.9-51.8)	< 0.001
PA (°)	6.6 (3.9-9.2)	6.1 (3.9-8.8)	7.2 (5.4-9.2)	< 0.001
FFM (kg)	53.4 (33.8-92.2)	48.4 (33.8-67.6)	66.7 (49.2-92.2)	< 0.001
TBW (L)	39.1 (25.1-67.8)	35.4 (25.1-49.9)	48.9 (34.3-67.8)	< 0.001
ECW (L)	17.1 (11.7-26.1)	15.8 (11.7-20.9)	20.2 (13.6-26.1)	< 0.001
BCM (kg)	29.9 (16.5-64.1)	26.5 (16.5-39.5)	39.4 (26.7-64.1)	< 0.001
FFM (%)	78.0 (50.9-96.5)	75.4 (50.9-96.3)	80.5 (65.6-96.5)	< 0.001
TBW (%)	57.1 (37.3-80.3)	55.2 (37.3-72.1)	59.1 (48.2-80.3)	< 0.001
ECW (%)	43.0 (28.8-58.1)	45.3 (34.5-58.1)	40.6 (28.8-48.6)	< 0.001
ICW (%)	57.0 (41.9-71.2)	54.8 (41.9-65.5)	57.0 (41.9-71.2)	< 0.001
RMR (kcal)	1622.1 (1256.0-2609.1)	1556.9 (1256.0-2609.1)	1777.2 (1330.6-2416.8)	< 0.001
FM (%)	20.2 (6.9-36.9)	23.2 (11.4-36.9)	16.4 (6.9-30.3)	< 0.001
Σ7 skinfold (mm)	132.2 (37.8-285.8)	144.6 (49.2-285.8)	112.5 (37.8-270.8)	< 0.001

Legend: BMI = Body Mass Index; Rz/h = ratio between Resistance and height; Xc/h = ratio between Reactance and height; PA = Phase Angle; FFM = Fat-Free Mass; TBW = Total Body Water; ECW = Extra Cellular Water; BCM = Body Cellular Mass; ICW = Intra Cellular Water; RMR = Resting Metabolic Rate; FM = Fat Mass; Σ7 skinfold = Sum of 7 skinfold.

Table 2
Frequencies of weekly consumption of food groups and physical activity questionnaire divided between genders. Data are expressed as median (minimum-maximum values)

	Total (n = 291)	Female (n = 170)	Male (n = 121)	P value
Cereals and derivate	7.0 (1.0-32.0)	7.0 (1.0-32.0)	7.0 (1.0-30.0)	0.38
Packaged cereals	5.0 (0.0- 21.0)	6.0 (0.0-20.0)	5.0 (0.0-21.0)	0.15
Fresh meat	3.0 (0.0-12.0)	3.0 (0.0-12.0)	3.0 (0.0-7-0)	0.98
Preserved meat	2.0 (0.0-11.0)	2.0 (0.0-10.0)	2.0 (0.0-11.0)	0.39
Fresh fish	1.0 (0.0-7.0)	1.0 (0.0-7.0)	1.0 (0.0-5.0)	0.71
Milk or yogurt	4.0 (0.0-15.0)	5.0 (0.0-15.0)	4.0 (0.0-10.0)	0.31
Cheese	3.0 (0.0-15.0)	3.0 (0.0-15.0)	2.0 (0.0-11.0)	0.58
Fresh fruit	5.0 (0.0-25.0)	5.0 (0.0-21.0)	5.0 (0.0-25.0)	0.39
Dried fruit	1.0 (0.0-10.0)	1.0 (0.0-10.0)	1.0 (0.0-10.0)	0.13
Vegetables	6.0 (0.0-14.0)	6.0 (0.0-14.0)	5.0 (0.0-14.0)	0.18
Legumes	2.0 (0.0-7.0)	1.5 (0.0-7.0)	2.0 (0.0-7.0)	0.25
Eggs	1.0 (0.0-7.0)	1.0 (0.0-7.0)	1.0 (0.0-5.0)	0.17
Dessert items	4.0 (0.0-21.0)	3.0 (0.0-15.0)	4.0 (0.0-21.0)	0.90
Sweetened beverages	1.0 (0.0-21.0)	1.0 (0.0-10.0)	1.0 (0.0-21.0)	0.75
Alcohol	1.0 (0.0-14.0)	1.0 (0.0-14.0)	1.0 (0.0-14.0)	0.53
Vigorous (min/week)	0.0 (0.0-240.0)	0.0 (0.0-180.0)	0.0 (0.0-240.0)	0.92
Moderate (min/week)	30.0 (0.0-450.0)	17.5 (0.0-300.0)	40.0 (0.0-450.0)	0.13
Walking (min/week)	60.0 (0.0-800.0)	60.0 (0.0-800.0)	60.0 (0.0-600.0)	0.20
Number of daily steps*	10000.0 (0.0-23000.0)	10000.0 (0.0-19000.0)	10000.0 (7.0-23000.0)	0.57
Sitting position (h)	5.0 (0.0-20.0)	5.0 (0.0-20.0)	4.0 (0.0-20.0)	0.08

*106 subjects answered the question concerning the numbers of daily steps

in particular:
- packaged cereals reduces ECW (R = -0.139, p = 0.018);
- preserved meats reduces FFM % (R = -0.117, p = 0.046);
- dried fruit reduces TBW equally between the intra and extra cellular compartment (R = -0.127, p = 0.031);
- vegetables reduce ECW (R = -0.127, p = 0.031);
- legumes redistribute water by increasing the intracellular compartment (R = 0.139, p = 0.017) and reducing the extracellular compartment (R = -0.139, p = 0.017).
- Vigorous (R = -0.184, p = 0.002) and moderate (R = -0.127, p = 0.030) physical activity is reduced with increasing age, relationships with body composition are:
- moderate activity increases TBW (R = 0.132, p = 0.024) and FFM (R = 0.126, p = 0.031) and reduces FM (R = -0.129, p = 0.028);
- time spent sitting reduces RMR (R = -0.139, p = 0.018).

DISCUSSION

Goetzel, *et al* [22] study on the general working population suggests that workplace health promotion can improve health outcomes and productivity.

The results of the present study show that the average condition of the employees of this company is in a condition of general overweight, despite the young age. The differences in body composition between the sexes are physiologically normal; however, the males appear to have greater parameters than the female counterpart. There is a high variability of body composition parameters, attributable to the habits that each individual adopts independently of one another, this is an aspect that characterizes the study of lifestyle.

Eating habits are not in line with international guidelines, if we compare these results with the guidelines of healthy and correct nutrition, it is possible to detect a reduced consumption of fruit, vegetables, milk, cereals, eggs and legumes. Above the guidelines are preserved meat, cheeses, dessert items and sugary drinks [23].

Also, the physical activity performed does not appear to be in line with the recommendations, the sample is described with a level below the recommendations since the 150 minutes of moderate/vigorous physical activity are not reached. The number of daily steps seems to be in line, but it must be reported that only 106 out of 291 was aware of this value.

Job duties can have an influence on the daily habits. In fact, this study shows how some workers manage to carry out the five daily meals more regularly (including snacks) and in more healthy places such as, for example, lunch at home on a regular basis. Also, physical activity of each person is largely influenced by the job

Table 3
Spearman's rho correlation between body composition and lifestyle in terms of eating habits and physical activity level

		Cereals and derivate	Packaged cereals	Fresh meat	Preserved meats	Fresh fish	Milk or yogurt	Cheese	Fresh fruit	Dried fruit	Vegetables	Legumes	Eggs	Dessert items	Sweetened beverages	Alcohol	Vigorous (min/week)	Moderate (min/week)	Walking (min/week)	Sitting position (h)
Age (years)	R	-0.019	0.021	0.055	0.034	-0.036	0.033	-0.015	0.057	-0.008	0.042	0.011	-0.070	-0.006	-0.008	0.079	-0.184**	-0.127*	-0.017	0.043
	p value	0.748	0.717	0.349	0.563	0.540	0.579	0.795	0.329	0.887	0.476	0.850	0.231	0.918	0.893	0.177	0.002	0.030	0.767	0.468
BMI (kg/m²)	R	0.029	-0.038	0.116*	0.038	-0.021	-0.008	0.049	-0.059	-0.113	0.005	0.018	-0.007	-0.028	0.018	0.030	-0.016	-0.028	-0.007	-0.027
	p value	0.620	0.524	0.049	0.522	0.715	0.891	0.409	0.314	0.054	0.938	0.759	0.909	0.639	0.762	0.609	0.784	0.632	0.908	0.642
Rz/h (Ω/m)	R	0.066	0.066	-0.013	0.071	0.028	0.012	0.005	0.050	0.105	0.073	-0.064	0.026	-0.044	-0.001	-0.051	0.005	-0.113	0.012	0.063
	p value	0.265	0.259	0.820	0.224	0.629	0.834	0.932	0.392	0.074	0.217	0.277	0.663	0.457	0.981	0.387	0.935	0.055	0.839	0.286
Xc/h (Ω/m)	R	-0.035	0.119*	-0.020	-0.018	0.024	-0.084	-0.021	0.039	0.086	0.125*	0.047	0.024	-0.098	-0.047	-0.049	0.004	-0.003	-0.022	0.038
	p value	0.557	0.043	0.738	0.761	0.685	0.155	0.718	0.503	0.143	0.033	0.429	0.678	0.094	0.428	0.402	0.950	0.962	0.709	0.518
PA (°)	R	-0.089	0.038	-0.008	-0.110	-0.009	-0.063	-0.017	-0.011	-0.038	0.043	0.140*	-0.019	-0.037	-0.038	0.017	0.002	0.107	-0.050	-0.049
	p value	0.128	0.522	0.886	0.061	0.878	0.285	0.778	0.854	0.520	0.463	0.016	0.752	0.535	0.523	0.772	0.968	0.068	0.396	0.408
FFM (kg)	R	-0.048	-0.086	0.029	-0.038	-0.037	-0.037	-0.015	-0.051	-0.127*	-0.080	0.064	-0.068	0.007	0.016	0.045	-0.018	0.078	-0.058	-0.075
	p value	0.417	0.144	0.627	0.517	0.534	0.525	0.792	0.388	0.031	0.172	0.277	0.246	0.910	0.792	0.447	0.756	0.184	0.323	0.203
TBW (L)	R	-0.050	-0.094	0.029	-0.037	-0.037	-0.034	-0.011	-0.055	-0.127*	-0.087	0.058	-0.067	0.013	0.016	0.047	-0.018	0.074	-0.055	-0.075
	p value	0.392	0.111	0.617	0.533	0.527	0.563	0.849	0.348	0.030	0.138	0.323	0.257	0.829	0.789	0.422	0.763	0.210	0.352	0.200
ECW (L)	R	-0.001	-0.139*	0.046	0.028	-0.022	0.010	0.013	-0.058	-0.119*	-0.127*	-0.007	-0.071	0.056	0.034	0.066	-0.010	0.014	-0.030	-0.086
	p value	0.987	0.018	0.438	0.632	0.703	0.862	0.821	0.323	0.043	0.031	0.906	0.228	0.338	0.564	0.265	0.869	0.811	0.611	0.143
BCM (kg)	R	-0.066	-0.056	0.013	-0.069	-0.040	-0.047	-0.022	-0.046	-0.115*	-0.052	0.094	-0.058	-0.003	0.009	0.031	-0.012	0.096	-0.066	-0.071
	p value	0.262	0.345	0.821	0.241	0.494	0.421	0.715	0.439	0.050	0.375	0.110	0.326	0.965	0.876	0.602	0.833	0.101	0.260	0.229
FFM (%)	R	-0.072	0.020	-0.108	-0.117*	0.018	-0.016	-0.060	0.028	0.031	-0.047	0.078	-0.011	0.047	-0.015	0.031	0.017	0.132*	0.003	-0.020
	p value	0.221	0.734	0.067	0.046	0.759	0.780	0.311	0.628	0.593	0.425	0.185	0.854	0.425	0.805	0.603	0.774	0.024	0.956	0.733
TBW (%)	R	-0.068	0.016	-0.110	-0.113	0.019	-0.010	-0.055	0.028	0.034	-0.050	0.073	-0.005	0.057	-0.016	0.031	0.012	0.126*	0.008	-0.022
	p value	0.249	0.784	0.061	0.053	0.753	0.862	0.346	0.632	0.562	0.392	0.211	0.929	0.332	0.789	0.596	0.838	0.031	0.891	0.705
ECW (%)	R	0.091	-0.036	0.009	0.108	0.012	0.060	0.016	0.012	0.039	-0.038	-0.139*	0.018	0.036	0.036	-0.016	0.000	-0.109	0.051	0.052
	p value	0.120	0.542	0.875	0.065	0.843	0.309	0.783	0.833	0.503	0.521	0.017	0.766	0.541	0.545	0.783	0.997	0.064	0.386	0.380
ICW (%)	R	-0.091	0.036	-0.009	-0.108	-0.012	-0.060	-0.016	-0.012	-0.039	0.038	0.139*	-0.018	-0.036	-0.036	0.016	0.000	0.109	-0.051	-0.052
	p value	0.120	0.542	0.875	0.065	0.843	0.309	0.783	0.833	0.503	0.521	0.017	0.766	0.541	0.545	0.783	0.997	0.064	0.386	0.380
RMR (kcal)	R	-0.010	-0.038	0.078	0.019	-0.064	0.077	0.030	-0.002	-0.095	-0.087	0.056	-0.088	0.036	0.066	0.034	0.094	0.081	0.092	-0.139*
	p value	0.869	0.519	0.184	0.747	0.278	0.191	0.616	0.975	0.106	0.140	0.339	0.135	0.536	0.259	0.568	0.110	0.170	0.116	0.018
FM (%)	R	0.004	0.006	0.046	0.058	-0.059	0.029	0.029	-0.030	-0.035	0.016	-0.021	0.068	0.006	0.083	-0.009	-0.067	-0.129*	-0.003	0.051
	p value	0.944	0.924	0.436	0.327	0.318	0.626	0.620	0.610	0.547	0.786	0.719	0.250	0.914	0.159	0.877	0.257	0.028	0.955	0.388
Σ7 skinfold (mm)	R	0.030	-0.031	0.084	0.021	-0.067	0.033	0.020	-0.056	-0.046	0.013	-0.072	0.069	-0.019	0.063	0.024	-0.042	-0.097	-0.066	0.047
	p value	0.609	0.604	0.153	0.722	0.257	0.580	0.732	0.342	0.437	0.820	0.222	0.240	0.741	0.287	0.688	0.480	0.099	0.263	0.426

Legend: BMI = Body Mass Index; Rz/h = ratio between Resistance and height; Xc/h = ratio between Reactance and height; PA = Phase Angle; FFM = Fat-Free Mass; TBW = Total Body Water; ECW = Extra Cellular Water; BCM = Body Cellular Mass; ICW = Intra Cellular Water; RMR = Resting Metabolic Rate; FM = Fat Mass; Σ7 skinfold = Sum of 7 skinfold.
*Correlation is significant at the .05 level (2-tailed). **Correlation is significant at the .01 level (2-tailed).

function, some job duties require prolonged sitting position (for example at the cash desk, or for an office worker on the computer), the tasks of others involve moving within the stores and in some cases also moving loads (sales staff). Therefore, even if it has been observed that the work task does not influence the personal choice of certain foods, it is possible to demonstrate that in any case it involves a modification of the energy balance that could influence the resulting body composition.

The relationships studied in the present work between lifestyle and body composition show interesting associations, the current habits of employees in the workplace should undergo some changes in order to achieve health improvements. In fact, if those who have a sedentary job organize lunch with preserved meat, they will see a reduction in RMR due to reduced physical activity and a reduction in FFM for the choice of food: this will create a vicious circle that will lead to a worsening of the worker's condition over the years. In addition, it is known that over time the vigorous activity naturally tends to decrease, therefore, it is necessary to set one's habits early towards a moderate activity, to have habits consolidated later on. The other relationship found in this work confirm the recommendations on proper nutrition: favor fresh fruit and vegetables, dried fruit, cereals and legumes during the week.

Workplaces, as physical and social settings, have great potential for promoting health and wellbeing [24]: literature reports a positive impact of programs aimed at promoting healthy habits in the workplace, an increase in physical activity (including walking) has been reported in programs whose main purpose was physical activity [25, 26]. Other interventions focused on dietary intervention reported an increase in the consumption of fruit and vegetables and a reduction in lipids [27]. These interventions reported a parallel improvement of the psychological state, of the quality of life [28], a reduction of absenteeism [29] and absences due to illness from work [30].

In particular a recent review [31] suggest that workplace healthy lifestyle interventions with a group-based element can be implemented for shift workers by ensuring flexible modes and organizational level adaptations, and can be effective in promoting weight loss and physical activity.

The initiatives should be tailored according to the type of worker we need to improve, but interventions based on groups of workers with similar characteristics have the advantage of support among colleagues, are the most advantageous in cost-effectiveness and often are the type of initiatives preferred by employees to improve the lifestyle in the workplace [32].

Interventions to improve the lifestyle require an approach that considers not only the characteristics and habits of the workers, but also the organizational determinants that act as a barrier or facilitator in order to successfully implement [33].

In this context, a preliminary assessment of the lifestyle of workers should be performed in order to obtain the information necessary to plan an adequate intervention to improve physical fitness related to health of employees.

Conflict of interest statement

None of the Authors declares competing financial interests.

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Ethical approval

The local ethics committee approved the study.

Informed consent

Informed consent was obtained from all the participants included in the study.

Authors' contribution

GM, CP, EE and AG carried out the evaluation and drafted the manuscript; GM and CP perform the design of the study. VB performed the statistical analysis; GM conceived of the study and coordination to draft the manuscript.

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