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ANALYSIS OF THE ASSOCIATION BETWEEN THE ABDOMINAL VISCERAL ADIPOSITY AND THE TIME PARAMETERS OF REACTIVE FORCES TO THE SUPPORT DURING POSTMENOPAUSAL WOMEN WALK.

[1]Adriana L. Sousa,[2] Ronaldo E.C.D. Gabriel, [3]Aurélio M.Faria, [4]Florbela R. Aragão, [5]Maria Helena R. Moreira

[1] Faculty of Physical Education and Sports, Federal University of Juiz de Fora, Department of Gymnastic and Bodily Art, Brazil; sousaleite@hotmail.com
[2] Department of Sport Sciences, Exercise and Health, University of Trás-os-Montes and Alto Douro, Centre for the Research and Technology of Agro-Environment and Biological (CITAB), Portugal; rgabriel@utad.pt
[3] Department of Sport Sciences, University of Beira Interior, Research Centre in Sports Sciences, Health and Human Development (CIDESD), Portugal; afaria@ubi.pt
[4] Research Centre in Sports Sciences, Health and Human Development (CIDESD), University of Trás-os-Montes and Alto Douro, Portugal; faragao@utad.pt
[5] Department of Sport Sciences, Exercise and Health, University of Trás-os-Montes and Alto Douro, Research Centre in Sports Sciences, Health and Human Development (CIDESD), Portugal; hmoreira@utad.pt

ABSTRACT
The increase of abdominal visceral adiposity (AVA) is associated with the worsening of cardio-metabolic profile, leading to the surge of the metabolic syndrome in postmenopausal women. The increase of adiposity along with aging and menopause contributes to the changing the walking pattern in women, affecting the speed. The analysis of external load behavior through the evaluation of the time parameters of ground reactive forces (GRF) during walking enables the inclusion of preventive actions regarding risks of injuries and falls. The study aimed to analyze the association of AVA with some time parameters of the behavior of vertical and anterior-posterior components of GRF, during the walk of postmenopausal women. We examined 65 postmenopausal women, aged between 48 and 69 years. The AVA was evaluated by bio-impedance octopolar of GRF and data were collected through the Kistler 9281B force platform. The variables association was examined using Pearson's *R* correlation coefficient and a 5% degree of statistical significance was considered. Data revealed that the increase of the AVA generates a smaller discharge rate, producing a lower impulse of vertical rise off the ground.

INTRODUCTION
The loss of ovarian follicular activity, with consequent termination of ovulatory and menstrual cycles generates an increase in the levels of total and central adiposity in women, affecting the surge of a variety of diseases among which are hypertension, diabetes, venous thromboembolism, osteoarthritis and some kinds of cancer [1.2]. The increase in the levels of fatty mass particularly the AVA, affects the mass and the muscle strength, leading to the development and progression of sarcopenic obesity [3], with adverse consequences over the osteogenesis. The loss of muscle mass occurs mainly on the lower limbs, harming mobility and balance in postmenopausal women leading to a reduction in their walking speed and a lower cadence and shorter stride length [4]. Through the evaluation of the walking parameters, the GRFs have contributed to a better understanding of the temporal distribution of the loads placed on the foot during human dislocation [5, 6], not yet being clarified in the literature the effect of the AVA over the GRF during walking of postmenopausal women. The study developed now, sought to examine the relationship of the AVA with time of vertical and anterior-posterior support of the GRF, during the walking of women in this phase of climacteric

METHODS
The sample included 65 postmenopausal women (59.96 ± 4.21 years), with an average menopause time of 10.06 years (± 5.63 years), being the use of hormone therapy documented by 57% of the sample. The data of the GRF were collected through the Kistler 9281B force platform (Kistler Instruments, Amherst, NY USA), with the three steps protocol being respected [7]. The total time of support was analyzed, as well as the relationship between the load and unload rates (Fig.1)

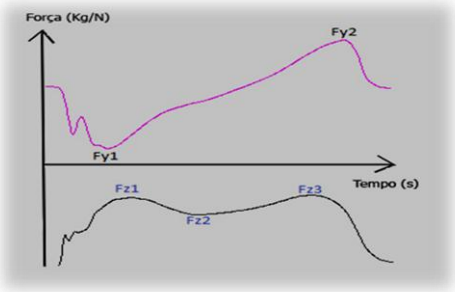

Fig.1. Graphs with the typical behavior of the vertical (Fz) and anterior-posterior (Fy) components during walking.

The height was measured with the stadiometer Seca 220 (Seca Corporation, Hamburg, Germany), with the fulfillment of anthropometric position. The AGV, fatty

mass (% FM) and the weight were assessed by the octopolar bio-impedance InBody 720 (Biospace, Seoul, Korea), and met the preparation standards identified in the literature [8]. The SPSS program (version 19.0, SPSS Inc., Chicago, USA) was used in the data processing, and a significance level of 5% was considered. The descriptive analysis included the average, standard deviation and amplitude of variables, and their association was examined through Pearson's *R* correlation coefficient.

RESULTS/DISCUSSION

The descriptive analysis of the sample is displayed in Table 1, with the main results of the study.

Table 1. Descriptive analysis of the sample (n = 65)

Variables	Average±PD	Amplitude
Age(years)	59,96±4,21	48,43–69,49
Weight (Kg)	65,26±9,17	44,60–89,00
Height (cm)	1,56±0,45	1,47–1,69
MT (years)	10,06±5,63	45,25–81,32
AVA (cm²)	126,27±20,96	83,5–171,94
FM	23,20±6,65	8,20-43,30
Ground Reactive Forces		
Rel Δt(tfz1/tzf2)	0,5 ±0,05	0,43–0 ,67
Rel Δt(tfz1/tfz3)	0 32±0,03	0,26–0,45
Rel Δt(tfz2/tfz3)	0,62±0,04	0,54–0,71
Rel Δt(tfy1/tfy0)	0,31±0,04	0,14–0,40
Rel Δt(tfy1/tfy2)	0,20±0,02	0,10–0,22
Rel Δt(tfy0/tfy2)	0,61±0,03	0 53–0,70
Rel load/unload rates Fz	1,10±0,20	0,70-1,51
Rel brakeage/propulsion rates Fy	0,90±0,22	1,64–0,40
Brakeage rate Fy(fy1/Δty1)	19,05±4,19	33,00–10,40
Propulsion rate Fy (fy2/Δty-Δty2)	21,90±5,09	13,10–37,68
Load rate Fz (fz1/Δtz1)	69,76±14 09	35,96-113,01
Unload rate Fz (fz3/Δtz-Δtz3)	64, 22±8,68	45,2–81,32

MT: Menopause time; AVA: Abdominal visceral adiposity; FM: Fatty mass; Rel Δt: relation between the times; Rel load/unload rates Fz: relation between Fz load and unload rates.

The associations identified between the GRF and the age, MT and AVA are shown in Table 2. A positive association of the MT with Rel load/unload rates Fz was identified ($r = 0.28$, $p \leq 0.05$). The older women show a stronger load rate Fz ($r = 0,25$, $p \leq 0,05$) and the unload rate Fz is more marked in women with lower visceral adiposity in the abdominal area ($r = - 0,27$, $p \leq 0,05$)

Table 2: Correlation between the sample characteristics and the GRF (n = 65).

	Age	MT	AVA
Rel Δt(tfz1/tfz2)	-0,06	-0,14	0,01
Rel Δt(tfz1/tfz3)	-0,04	-0,05	0,15
Rel Δt(tfz2/tfz3)	0,01	0,10	0,22
Rel Δt(tfy1/tfy0)	-0,05	0,02	-0,05
Rel Δt(tfy1/tfy2)	-0,10	-0,01	-0,02
Rel Δt(tfy0/tfy2)	-0,10	-0,08	0,03
Rel load/unload rates Fz	0,21	**0,28***	0,05
Rel brakeage/propulsion rates Fy	-0,08	-0,06	-0,01
Brakeage rate Fy	-0,12	-0,01	0,05
Propulsion rate Fy	0,10	-0,04	-0,05
Load rate Fz	**0,25***	0,17	-0,15
Unload rate Fz	0,07	-0,08	**-0,27***

* p <0.05, ** p <0.01; MT: Menopause time; AVA: abdominal visceral adiposity; Rel Δt: relationship between the times; Rel load/unload rates Fz: relationship between rates of loading and unloading Fz.

This result demonstrates that reduction of the unload rate, may affect negatively the mobility of postmenopausal women, slowing locomotion and consequently causing a shorter stride length. Thus, by increasing the speed of walking, as well as the stride length, there is the risk of balance loss, with imminent risk of falls affecting the physical integrity of these women. [9] The correlations, although significant, were of small magnitude and correlations with statistical significance in relation to the remaining variables ($p > 0.05$) were not recorded.

CONCLUSION

The study showed that the AVA influences the walking of postmenopausal women, compromising their mobility due to the decreased rate of vertical unload. This situation contributes to the increased risk of falls and limits functional physical aptitude of the woman, justifying the importance of the implementation of specific exercise programs aiming to improve these conditions.

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