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Comparison of selected characteristics of gait in men and women

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ABSTRACT

Došla J, Korvas P, Zvonař M, Musil R, Šenkýř J, Kalina T. Comparison of selected characteristics of gait in men and women. *J. Hum. Sport Exerc.* Vol. 8, No. Proc2, pp. S114-S119, 2013. In this research, we have attempted to find out and compare selected characteristics of gait in men and women; 20 men and 20 women aged 30-39 were observed. The average age of men was 34.0 years, of women 34.1 years respectively. For measuring, pressure shoe insoles were used (Pedar Mobile, Novel Munich, 99 sensors, 100 Hz). Each person had three attempts: two trial attempts, the third one was measured. For observation, we selected three stances of each leg, always between the third and eighth stride. Significant differences between men and women were found in stance duration in the active part of stance while the passive part of stance was similar. With applied force (F1, F2, F3) during stance, after recalculating per a kilogram of weight, no statistically significant differences were found. No significant differences between the right and left legs were found either. **Key words**: GAIT, PEDAR, ACTIVE PART OF STANCE, PASSIVE PART OF STANCE.

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INTRODUCTION

The significance of walking as a motor activity in today's dehumanized world is still growing. It is necessary to deal with walking not only as a means to increase physical fitness; it is also important to study its quality. Some physical features such as obesity have a significant influence on the distribution of plantar pressures (Hills et al., 2001; Dowling et al., 2004). Static and dynamic characteristics of the foot change not only in children (Müller et al., 2011) but in adults as well (Korvas et al., 2012). In foot area, vertical forces during walking can be measured with different devices. One of the most frequently used devices is Pedar or various force plates. Some studies comparing the use of Pedar agree on different results when different devices are sued for measuring (Boyd et al., 1997). Our study compares selected parameters of gait in men and women aged 30-39.

MATERIAL AND METHODS

In our research, 20 men and 20 women aged 30-39 were observed. The average age of men was 34.0 years, of women 34.1 years respectively. Average BMI was 25.0 for men and 23.0 for women. Persons from common population were measured, with no serious health problems which could affect the results of the measuring.

Table 1. *Men characteristics*

Variable	Valid N	Mean	Minimum	Maximum	Std.Dev.
Age	20	33.9500	30.0000	37.5000	2.52764
Height	20	182.7550	173.5000	196.0000	6.49579
Weight	20	83.7150	67.3000	106.1000	11.84084
BMI	20	24.9700	21.1000	30.2000	2.59029

Gender=M Descriptive Statistics (data) Exclude condition: v2='L'

For measuring, pressure shoe insoles were used (Pedar Mobile, Novel Munich, 99 sensors, 100 Hz). Each person had three attempts: two trial attempts; the third one was measured. For observation, we selected three stances of each leg, always between the third and eighth stride. We compared four force parameters: F1 - maximal vertical ground reaction force peak during absorption stage (loading response, LR), F2 - lowest force during decline between both peaks, F3 - maximal vertical ground reaction force peak during propulsive stage (terminal stance, TSt), Fm - average vertical force of whole stance. Individual force characteristics (F1, F2, F3) of vertical ground reaction were recalculated in percentage of body weight. Further, we compared four time characteristics: t – time of whole stance, t1 – time of absorption stage, t2 – time of propulsive stage, t2/t1 – ratio between time of propulsive stage and time of absorption stage. We compared differences between men and women as well as differences between the right and left legs. For statistics, we used analysis of variance (ANOVA) and Fisher's post hoc LSD test. The level of 5% was set as a limit for statistically significant differences (p=0.05).

Table 2. *Women characteristics.*

Variable	Valid N	Mean	Minimum	Maximum	Std.Dev.
Age	20	34.1200	31.0000	38.4000	2.420874
Height	20	166.4300	152.0000	182.0000	6.330552
Weight	20	63.9450	49.5000	86.2000	8.969919
BMI	20	23.0450	18.8000	27.1000	2.37984

Gender=F Descriptive Statistics (data) Exclude condition: v2='L'

RESULTS

We have succeeded in proving statistically significant differences with two time characteristics First significant differences between men and women were found in the duration of the whole stance (t). The average duration of stance was 0.69 second in men and 0.64 second in women.

Table 3. *Statistical comparison of stance duration in men and women*

Gender	{1} 0.64025	{2} 0.68950
F		0.000203
M	0.000203	

LSD test; variable t (data) Probabilities for Post Hoc Tests Error: Between MS = 0.00318, df = 76.000

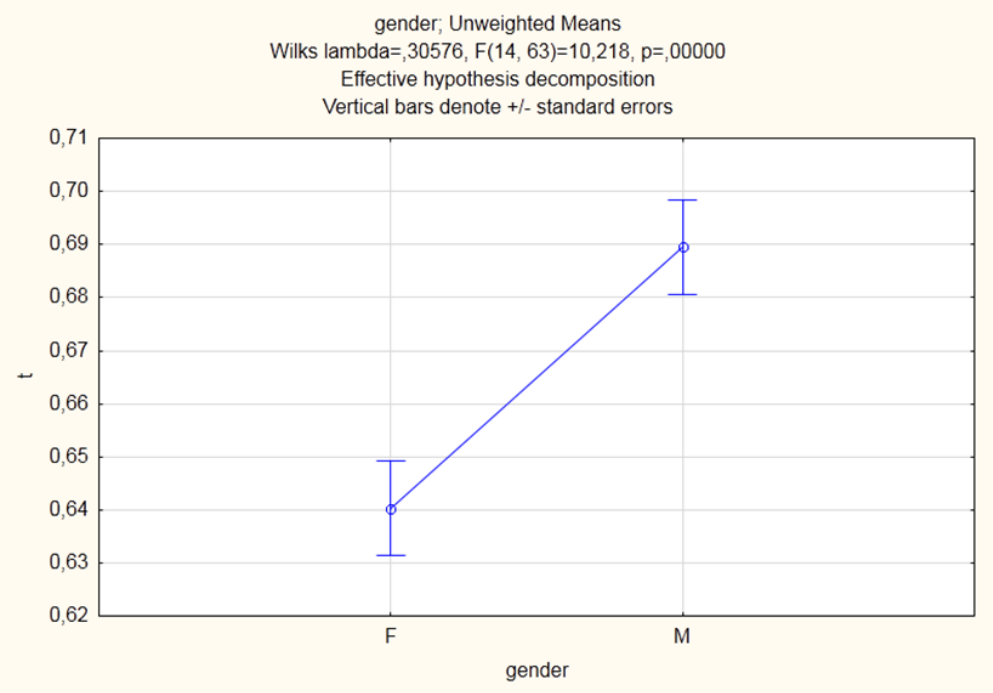

Figure 1. *Differences between men and women in stance duration*

Another statistically significant difference was found out in the duration of active part of stance (t2). The average duration of the active part of stance was 0.37 second in men and 0.34 second in women.

Table 4. *Comparison of active part of stance duration in men and women*

Gender	{1} 0.33875	{2} 0.37325
F		0.000033
M	0.000033	

LSD test; variable t2 (data) Probabilities for Post Hoc Tests Error: Between MS =0.00122, df = 76.000

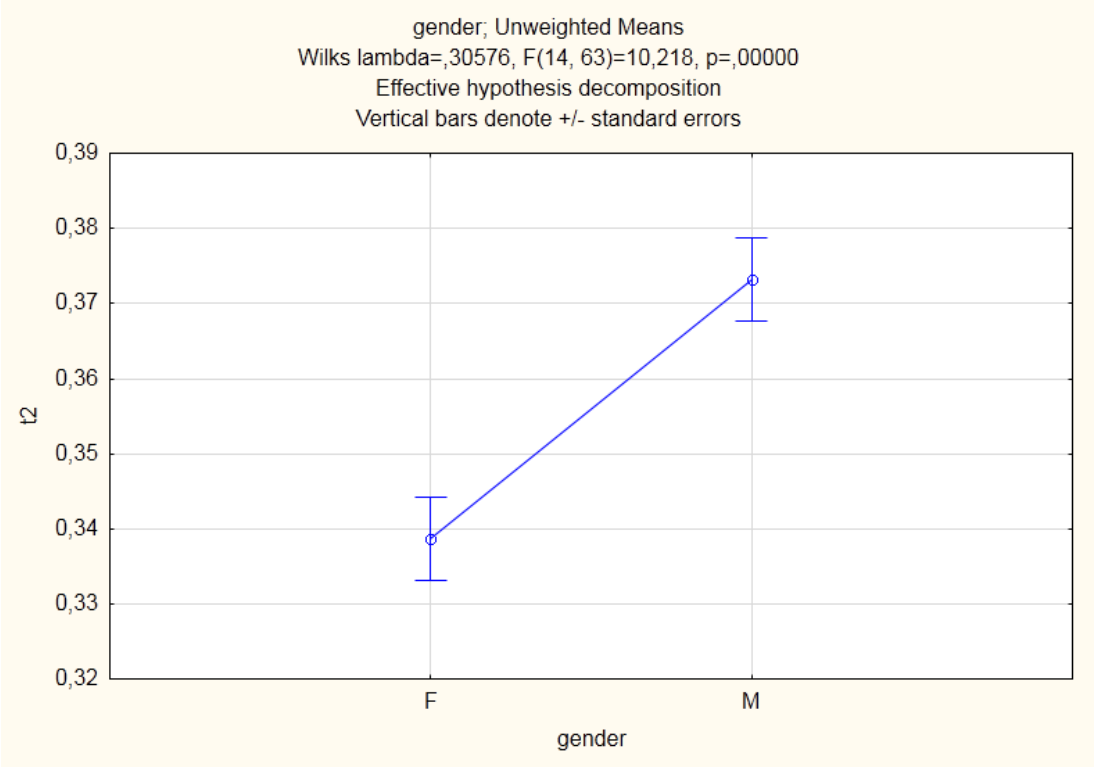

Figure 2. *Differences between men and women in active part of stance duration*

In the passive part of stance no statistically significant differences were found. In average, the passive part of stance lasted for 0.32 second in men and 0.31 second in women.

With applied force (F1, F2, F3) during stance, no statistically significant differences were found. The average vertical force after recalculation into percentage of body weight was for F1 113%, F2 75% and F3 120%. The values measured in women were for F1 111%, F2 74% and F3 118%.

Values close to the 5% level of significance were measured also for t2/t1 when there was p=0.06 when men and women were compared. The value was 1.19 in men and 1.12 in women.

Table 5. *Differences between men and women at t2/t1*

Cell No.	Gender	{1} 1.1221	{2} 1.1868
1	F		0.059963
2	M	0.059963	

LSD test; variable t2/t1 (data) Probabilities for Post Hoc Tests Error: Between MS = 0.02289, df = 76.000

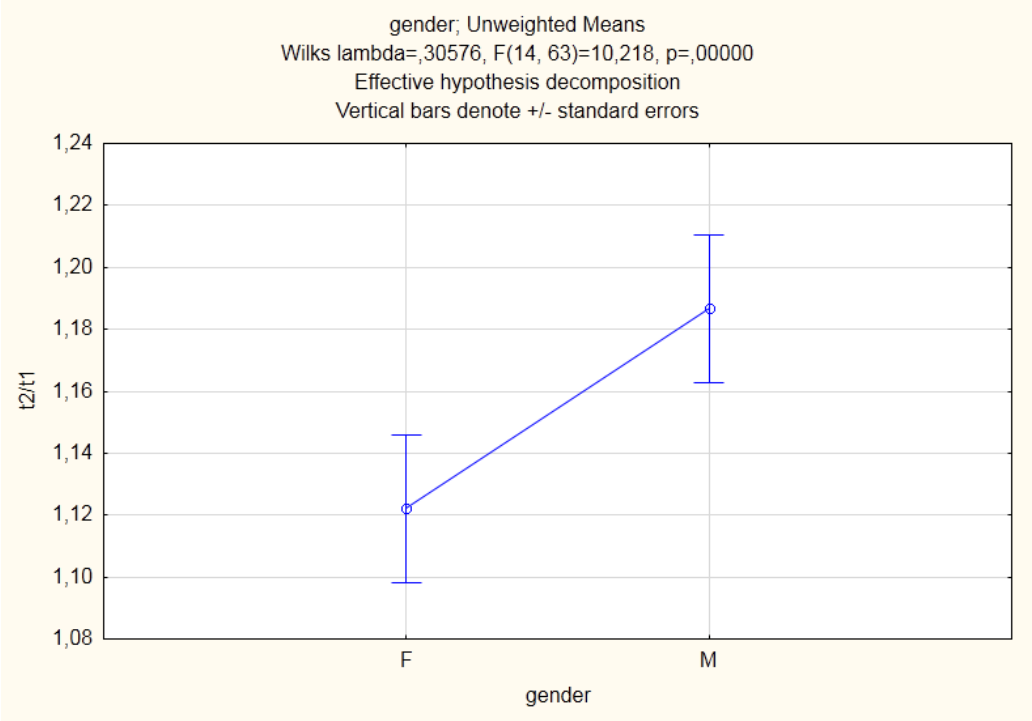

Figure 3. *Differences between men and women at t2/t1*

DISCUSSION

In our research, we focused on the selected characteristics of gait in men and women. We have examined force and time characteristics of gait using Pedar pressure insoles. We have not succeeded in finding statistically significant differences when comparing the right and left feet, neither in men nor women. This result could have been expected in healthy persons. Also, when comparing all vertical force characteristics (F1, F2, F3, Fm) after recalculation into the percentage of body weight no statistically significant differences were found. Bigger vertical force was found in the active part of stance (F3) both in men and women.

Statistically significant differences between men and women were found in the active part of stance and during measuring the whole stance. In the passive part of stance, no statistically significant differences were found. Duration of stance in men was by 0.04 second longer than in women (men 0.69 second, women 0.65 second). The first part of stance (passive part) in men was by 0.01 second longer than in women (men 0.32 second, women 0.31 second), while the other part of stance (active part) in men was by 0.03 second longer than in women (men 0.37 second, women 0.34 second).

When we compared the active and passive parts of stance (t2/t1), a higher value was measured in men (1.19) than in women (1.12). This result was close to the 5% level of probability (P=0.06).

CONCLUSIONS

The main difference between men and women was measured in the active part of stance, which lasted longer in men. Alike, stance duration in men was statistically significantly longer than in women. Differences between men and women in vertical forces were only in absolute values; after recalculating into the percentage of body, no significant differences were found.

The ration of the active and passive parts of stance was higher in men than in women and it was only slightly below the 5% level of probability.

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REFERENCES

1. BOYD LA, BONTRAGER EL, MULROY SJ, PERRY J. The reliability and validity of the novel Pedar system of in-shoe pressure measurement during free ambulation. *Gait & Posture*, 1997; 5(2):165.
2. DOWLING AM, STEELE JR, BAUR LA. What are the effects of obesity in children on plantar pressure distributions? *International Journal of Obesity*, 2004; 28(11): 1514-9.
3. HILLS AP, HENNING E, McDONALD M, BAR-OR O. Plantar pressure differences between obese and non-obese adults: a biomechanical analysis. *International Journal of Obesity*, 2001; 25(11):1674-9.
4. KORVAS P, MUSIL R, DOSLA J, CACEK J. Cross-sectional comparison of selected gait characteristics of women of different ages. *European Association for Sport Management*; 2012.
5. MULLER S, CARLSOHN A, MULLER J, BAUR H, MAYER F. Static and dynamic foot characteristics in children aged 1-13 years: A cross-sectional study. *Gait & Posture*, 2011; 35(3):389-94.

