Studia Kinanthropologica, XV, 2014, (3), 241-244
The Scientific Journal for Kinanthropology

POSTURÁLNA STABILITA A JEJ ZMENY POČAS TEHOTENSTVA

POSTURAL STABILITY DURING PREGNANCY AND ITS CHANGES

D. Psalmanová[1], R. Vobr[2]

[1]Masaryk University Brno, Faculty of Sport Studies, Czech Republic
[2]University of South Bohemia, Faculty of Education, Czech Republic

ABSTRACT

Pregnancy is very important life period in which women are more physical inactive than before. Many changes are appeared in pregnant bodies. The level of postural stability gradually decreases which is caused by the shift of the center of gravity forward (increase in weight and volume of abdomen) and the bend spine backward. This was tested by using stabilographic platform SWAY and stability test in standing position for 40 seconds with the aim to keep the center of gravity above the area with a radius of 1 mm. Also, there occur weaker muscle tone and loss of origin strength in postural and other muscles. We recommend adequate physical activity with keeping the correct basic positions like sitting and standing during pregnancy.

Keywords: pregnancy; postural stability; body posture

SÚHRN

Těhotenství je významným obdobím v životě ženy, které se ale vyznačuje také sníženou pohybovou aktivitou. Také přichází k velkému množství změn v těle těhotné ženy. Vlivem posunu centrálního těžiště směrem vpřed (zvětšený objem a hmotnost břicha) se více ohýbá páteř. Přichází také ke změně stability postoje ke snížení úrovně rovnováhových schopností, které jsme testovali na stabilometrickej plošině SWAY 40 sekundovým testem udržování statické polohy těla. Postupně snižována úroveň stability je zapříčiněna také oslabenými svaly a jejich sníženým tonusem. Tím je tělo ženy méně silné, méně odolné proti bolestem. Doporučujeme přiměřenou pohybovou aktivitu a udržování správných poloh vsedě a vstoje.

Kľúčové slová: tehotenství; posturální stabilita; tělesný postoj

Introduction

Pregnant women seem to be less active during the important gestation period of their lives. Inactivity has several negative impacts for body posture, movement and stability. Engaging in regular physical activity during pregnancy is very helpful for building some extra power and better stability. Physical activities before and during pregnancy have a positive impact on the quality of pregnancy, reducing the incidence of pain and improving muscle quality and tone. The authors Cepková (2005), Ružičková (2005) and Wagner & Wagnerová (2005) solved these problems in their works by comparing the non pregnant population that was studied scientifically and mentioned in publications by Zemková (2004) and Zvonař (2007).

In practice, we meet with various reliability tests, and it is known that tests with easier and lower sensitivity have a higher reliability, than tests with more difficult and higher sensitivity (Psalman, Duvač & Kucharska, 2002). This research belongs to a sensitive test of maintaining static equilibrium in various positions on stabilographic platform SWAY, that allows us to diagnose the level of development of static equilibrium.

Purpose

Based on standard laboratory testing we try to find the level of static balance in pregnant women.

Methods

During a one year period 32 pregnant women were tested in static balance abilities. First test was realized at the beginning (week 13) and the second test at the end (week 39) of pregnancy. Each test included two attempts (Attempt 1 and 2). The rest between both attempts was 2 minutes. The age of this experimental group was from 20 to 29 years, all women were in healthy shape. Control group was

created from non pregnant healthy university students within the age range of 20 to 25 years. For the testing of balance abilities, the test of stability on stabilographic platform SWAY was chosen with dimensions of 700 x 500 x 80 mm. The subject is required to stand on the platform for 40 seconds, with the aim was to keep the center of gravity of the subject above the area with a radius of 1 mm. Values are expressed as a percentage of the time in a stable position above this area. The tests were conducted in two modifications - standing on two legs with visual control and without.

It is generally known that the position of the center of gravity of an object affects its stability. The lower the center of gravity is, the more stable the object. In case of pregnant women it appears not be completely valid due to other more relevant influences. Regarding to this we can also state that the center of gravity in most cases keeps the same or very similar height position during the whole pregnancy and is not significantly lowered. Increasing the area of the base will also increase the stability of an object, the bigger the area the more stable the object. Pregnant women need to have a greater feeling of stability and also to respond to the gradual expansion of the pelvic region. Therefore, they will stand on their feet in a little extended position.

consideration only the total body weight because the main weight changes happen in specific place of the pregnant body – in abdominal area. The weight is changing during the whole pregnancy and pregnant person has to accept this. Also the movement in center of gravity shifts forward up to 4 cm which can play a key role in the level of static balance abilities.

Height and age have also been shown to impact a human's ability to balance. Height influences body sway in that as height increases, functional reach typically decreases. Older adults have more body sway with all testing conditions. Tests have shown that older adults demonstrate shorter functional reach and larger body sway path lengths (Hageman, Leibowitz & Blanke, 1995).

Results

Weight of the female body during pregnancy has the gradual increase (figure 1). It is evident that there is a smaller increase in the first 13 weeks of pregnancy. The monitored week 39 is already characterized by a huge weight gain of pregnant women. Weight and mass changes are individual states and their values are represented by descriptive statistics in table 1 (average, minimum, maximum and standard deviation).

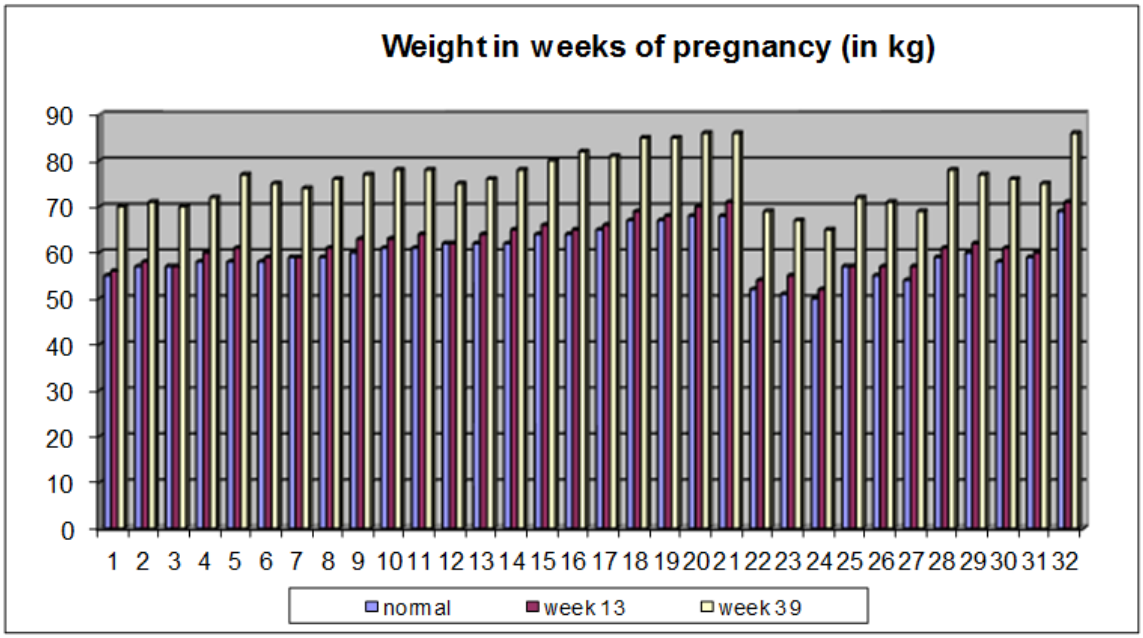

Figure 1. Weight before pregnancy (normal) and, in week 13 and 39 of pregnancy.
Obrázok 1. Telesná hmotnosť pred tehotenstvom (normálna) a v 13. a 39. týždni tehotenstva.

The important indicator is the body weight, which affects the body composition in pregnant women. But there is not enough to take into the

The observed women at the beginning of their pregnancies achieved the average values of 55% (Attempt 1) respectively 53% (Attempt 2) in the stability test with visual control. At the end of pregnancies results show the average values of 44% and 41%. It is therefore a decrease in the level of stability within the range from 20 to 22.6 percent. In the case without visual control (closed eyes) the maintaining of stability become more difficult

Table 1. Descriptive statistics of weight during pregnancy – normal weight, pregnancy weeks 13 and 39.
Tabulka 1. Popisná štatistika hmotnostných ukazovateľov – normálna hmotnosť a v 13. a 39. týždni tehotenstva.

Weight	Average	St.deviation	Minimum	Maximum
Normal weight	59,9	4,9	50	69
Weight in week 13	61,7	5,0	52	71
Weight in week 39	76,2	5,7	65	86

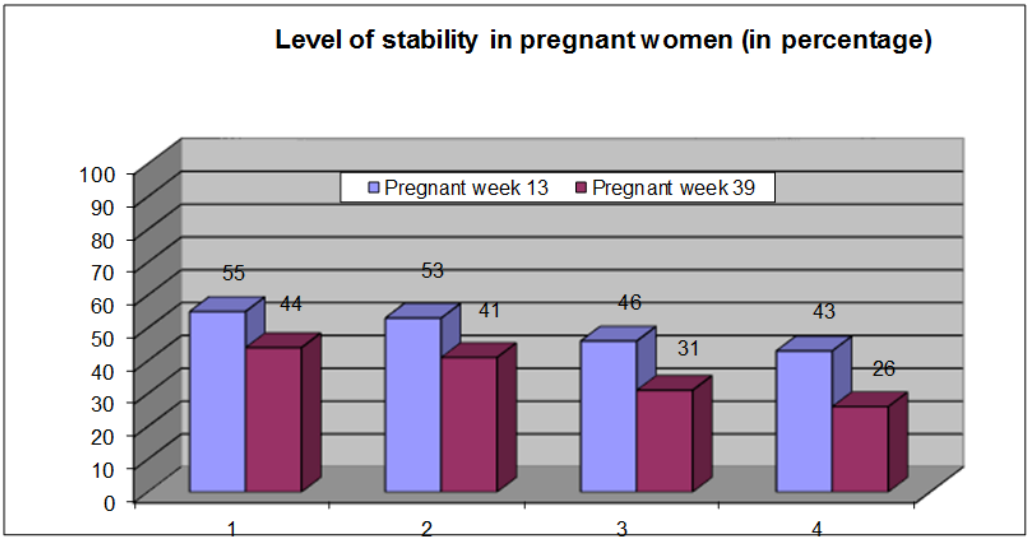

Figure 2. Level of stability in pregnant women (%)
Obrázok 2. Úroveň stability tehotných žien (%)

Legend:
1-first attempts in pregnant weeks 13 and 39 (with visual control)
2-second attempts in pregnant weeks 13 and 39 (with visual control)
3-first attempts in pregnant weeks 13 and 39 (without visual control)
4-second attempts in pregnant weeks 13 and 39 (without visual control)

and the decrease of stability during pregnancy is ranged from 32.6 to 39.5 percent (average values were 46 and 43% in early pregnancy versus 31 and 26% at the end of pregnancy (figure 2)).

Comparison of stability is also documented by comparison with a university student from Bratislava, which were of comparable age. As shown in Figure 3, the difference is statistically significant.

For better visual results, we attach one of the graphic outputs (figure 4), which captures the movement of the center of gravity during the 40-second test time. It is evident that keeping the body in a motionless position to be in static equilibrium is not easy, and therefore must be fulfilled to address many of the assumptions that have a major influences on the study. It is not only body structure, quality of muscles and body posture but also physical activity, which activates the balance system of humans. Based on the aforementioned changes in the period of pregnancy, a large number of changes are also very significant and important for the quality of life of the pregnant woman.

Conclusions

During pregnancy, the level of postural stability gradually decreases, which is caused by the shift of the center of gravity forward. This results in the increase in weight and volume of abdomen, and the backward bend of the spine. The reduction in physical activity also results in the weakening of muscle tone and loss of original strength in posture and muscles. We recommend adequate physical activity in accordance with correct basic positioning during sitting and standing throughout pregnancy. However, this test is for measuring of anterior, posterior and lateral sway. Our research was done to create a repeatable and reliable balance assessment tool, which can be extended by other clinical tests and identify other powerful outputs appearing in period of pregnancy.

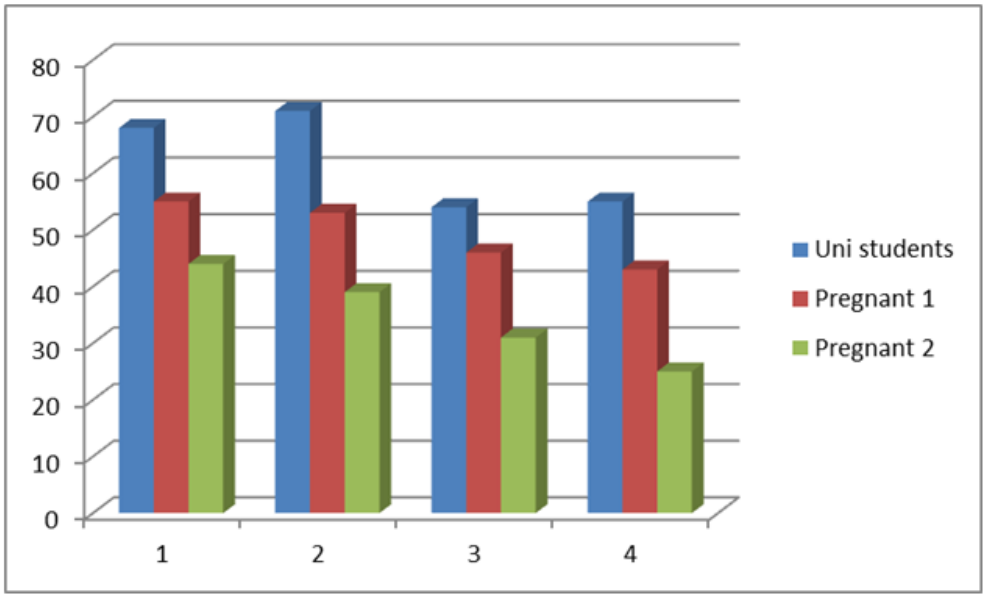

Figure 3. Comparison of stability level between university students and pregnant women in weeks 13 and 39 (1,2,3,4 – the same like in legend - figure 2).
Obrázok 3. Porovnanie úrovne rovnováhy univerzitných študentiek a tehotných žien v týždňoch 13 a 39 (stĺpce 1,2,3,4 vyjadrujú rovnaké testy ako je uvedené v legende k obrázku 2).

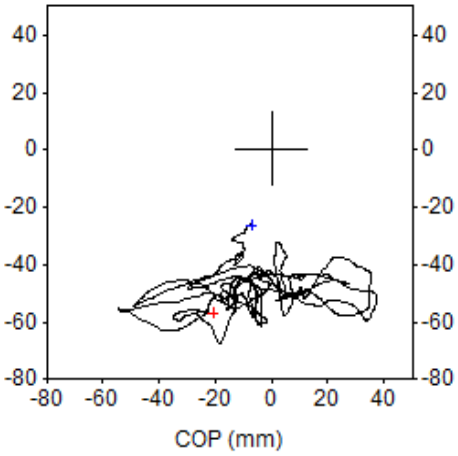

Figure 4. Center of gravity and its trajectory during stabilty test expressed as center of pressure COP (in mm) on stabilographic platform.
Obrázok 4. Centrálne ťažisko a jeho trajektória počas testu stability vyjadrené ako centrum tlaku na stabilografickej plošine.

References

Cepková, A. (2005). *Pohybové aktivity počas tehotenstva a po pôrode.* Bratislava: Vydavateľstvo STU.

Duncan, P. W. et al. (1990). Functional reach: a new clinical measure of balance. *Journal of gerontology, 45*(6), 192–197.

Hageman, P. A., Leibowitz, J. M., & Blanke, D. (1995). Age and gender effects on postural control measures. *Archives of Physical Medicine and Rehabilitation, 76*(10), 961–965.

Psalman, V., Duvač, I., & Kucharska, E. (2002). Spoľahlivosť a štandardizácia testu dynamickej rovnováhy na balansometri. In: *Zborník z medzinárodného vedeckého seminára Nové pedagogické metódy a formy v telesnej výchove a športe.* Trenčín, Trenčianska Univerzita Alexandra Dubčeka .

Ružičková, D. (2005). Oriental dance during pregnancy. *Žena, Newsletter of International Women's Club of Bratislava, 10*(20).

Zemková, E. (2004). Balance improvement in elderly women – the effects of exercise. *Žena, Newsletter of International Women's Club of Bratislava, 10*(19).

Zvonař, M. (2007). Objem a frekvence pohybové aktivity ve vztahu ke zdravotnímu stavu populace středního a staršího věku. In. *Sport a kvalita života.* Brno: Masarykova univerzita, Fakulta sportovních studií.

Wagner, R., & Wagnerová, J. (2005). Pregnancy and movement. *Markíza.* 12.

MUDr. Dagmar Psalmanova
Tomasikova 10A
821 03 Bratislava
psalmanova@agyn.sk