

## The influence of menstrual cycle on aerobic capacity

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### Abstract

**Introduction:** Nowadays sociocultural changes that happen in highly developed countries increased the awareness of physical activity and healthy lifestyle. The social media have a significant influence on promoting the healthy lifestyle and motivating people to live fit. More and more women in their 20s take up physical activity to gain a beautiful body and feel healthy. Considering many hormones changes during the menstrual cycle, authors of many studies try to find direct link between the female menstrual cycle and aerobic capacity or general level of performance. **The aims of the study:** Does a phase of menstrual cycle affect physical capacity and reached submaximal level of heart rate? Does a phase of menstrual cycle affect aerobic capacity of the students? Does the subjective rate of physical capacity confirms in beep test result? **Methods:** 44 students of Medical University of Silesia took part in the study. Authorial questionnaire consisting of 13 questions was used to collect essential informations such as age, phase of the menstrual cycle, subjective rate of the aerobic capacity. Study group was measured with Beep test (a shuffle test used to assess aerobic performance, consisting of 21 levels that differ in the number of stages and the speed at which a distance of 20m should be covered in a given time). Before and after (1<sup>st</sup> and 5<sup>th</sup> minute) every run heart rate was measured with pulseoximeter. **Results:** Considering the beep test result sheets, the average of student's results shows rather poor performance. (1) So far, the studies haven't indicated any link between menstrual cycle and aerobic capacity (2) There is a relation between the frequency of training sessions and the aerobic capacity. Students that do an endurance training (in many forms) tend to have average/good beep test results

## INTRODUCTION

Nowadays, the factors that determine undertaking a physical activity have become socio-cultural changes, and thus the trend of a healthy lifestyle and body cult. Sport has become not only a way to spend leisure time, but also one of the most important forms of disease prevention. Physical activity brings many health benefits, while hypokinesia is mentioned as one of the three most common death reasons. According to WHO (World Health Organisation) deficiency of sport activity is a reason of death of 6% of the world population (Biernat, Piątkowska 2012). In 2017, nearly 87% of the total Polish population met the standards (Adults aged 18–64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or do at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity) for the level of physical activity in line with WHO (MSiT 2017). As reported by Statistics Poland the number of women participating in sports activities is constantly growing (in 2014, this number was 229 000, while in 2016, 260 000)(GUS 2017) as a result of which the physiology of women has become the subject of interest and research in the sports environment (Iwińska 2010). The presented research results (Iwińska 2010) show changes in physical performance depending on the phase of the menstrual cycle and individual characteristics of the analyzed study group. In practice, most of the respondents do not have sufficient knowledge on this subject and do not adapt the training plan to the menstrual cycle (Iwińska 2010). Research carried out among high school students in Poland, showed that knowledge about the physiology of the menstrual cycle is insufficient (Kanadys 2010). This demonstrates the need to take measures to disseminate knowledge on this subject.

As stated in research carried out at the Academy of Physical Education in Katowice (Sas-Nowosielski 2017), permanent lack of time is the main factor influencing not taking up a physical activity and changing eating habits. It led to a situation in which many personal trainers and "fit-bloggers" started to offer training and diets online. Although this is a very positive phenomenon, it has many disadvantages, the most serious of which is the lack of individual approach and control over a beginner. Another popular trend has become a box diet, or diet catering. Users of such diets motivated their decision with weight reduction, lack of time and convenience (Maj 2016). However, there is a risk of not adapting the diet to lifestyle, the type of work or training properly, which can cause eating disorders.

## THE PURPOSE OF THE STUDY

- Does a phase of menstrual cycle affect physical capacity and reached submaximal level of heart rate?
- Does a phase of menstrual cycle affect aerobic capacity of the students?
- Does the subjective rate of physical capacity confirms in beep test result?

## METHODS:

44 students of Medical University of Silesia took part in the study. Authorial questionnaire consisting of 13 questions was used to collect essential informations such as age, phase of the menstrual cycle, subjective rate of the aerobic capacity. Study group was measured with Beep test (a shuffle test used to assess aerobic performance, consisting of 21 levels that differ in the number of stages and the speed at which a distance of 20m should be covered in a given time). Before and after (1<sup>st</sup> and 5<sup>th</sup> minute) every run heart rate was measured with pulseoximeter.

## RESULTS:

The first parameter taken into account in descriptive statistics was the age of the research group, the results are presented in Table 1.

**Table 1.** Descriptive statistics of the age of the surveyed women

	<b>X</b>	<b>MIN</b>	<b>MAX</b>	<b>SD</b>
<b>Age</b>	20,15	19,00	23,00	0,66

The next parameter subjected to the analysis was the maximum heart rate achieved by women during the first and second Beep Test. Detailed results are presented in Table 2.

**Table 2. Maximum heart rate**

	<b>Average</b>	<b>Median</b>	<b>Dominant</b>	<b>SD from the trial</b>
<b>Max rate 1</b>	166,356	165	157; 186	15,107
<b>Max rate 2</b>	162,756	169	177	19,047

Statistical analysis showed a moderate correlation of r-Pearson -0.459 between the Beep Test result and the BMI index value. These data are statistically significant ( $p = 0.002$ ). The lower the BMI index, the better the test result. Detailed results are presented in Table 3.

**Table 3. Is there a relationship between the results achieved in the Beep Test and the BMI index?**

	$r_{xy}$	<b>p</b>
Is there a relationship between the results achieved in the Beep Test and the BMI index?	-0,459	<b>0,002*</b>

\* statistically significant relationship,  $p < 0.05$

Another statistically significant ( $p = 0.006$ ) correlation was the relationship between the BMI value and the subjective assessment of student's own appearance. It was a moderate correlation at the level of 0.401. It means that women with lower BMI are more often satisfied with their appearance. Data are presented in Table 4.

**Table 4. Is there a relationship between the BMI value and the subjective assessment of student's appearance?**

	$r_{xy}$	<b>p</b>
Is there a relationship between the BMI value and the subjective assessment of student's appearance?	0,401	<b>0,006*</b>

\* statistically significant relationship,  $p < 0.05$

Further data analysis showed a weak correlation of -0.066 between the subjective assessment of physical performance and the actual result of the Beep Test. These results are not statistically significant ( $p = 0.665$ ). Data are presented in Table 5.

**Table 5. Is there a relationship between the results achieved in the Beep Test and the subjective assessment of your appearance?**

	$r_{xy}$	<b>p</b>
Is there a relationship between the results achieved in the Beep Test and the subjective assessment of your appearance?	-0,066	0,665

The statistical analysis was also performed on the correlation between the BMI index and the subjective assessment of physical efficiency, which is a weak correlation and amounted to: 0.138. This information is not statistically significant ( $p = 0.365$ ).

## DISCUSSION

Physical activity is one of the key elements to maintain the body's normal psychophysical condition. It affects the circulatory, nervous or motor system. Despite the fact that many people are aware of the benefits of doing sports, they do not take physical activity during their free time. As the Multicenter National Population Health Survey shows, as many as 35% of the study participants do not perform any exercise that would last at least 30 minutes a day, but not due to professional work or the need to move (Rywik 2005). The results of research among students of the Medical University of Silesia in Katowice showed that 63.6% of them are physically active in their free time, and the majority of training sessions last from 60 to 90 minutes. This difference may result from the specifics of the studies, from the continuous expansion of knowledge about the need to engage in physical activity and the prevailing fashion.

Research on physiotherapy students showed that there is a link between the BMI value and the result of Beep Test. The lower the BMI index, the higher the test result. This proves that physical activity has a direct impact on body weight, and thus on satisfaction with their own appearance.

The aim of the study was also to show the influence of menstruation-ovulatory cycle phase on the aerobic capacity of women. The results of the previously presented studies show that there is a link between the phase of the cycle and the body's efficiency, but they do not give the final results in which phase women can achieve the best results. The results of this year's research carried out at the Medical University of Silesia in Katowice prove that the best efficiency measured by the beep test was achieved by women in the follicular phase of the cycle. The average Beep Test score was then  $x = 5.13$ . In contrast, in the luteal phase, this value was  $x = 4.8$ , and during menstruation  $x = 4.72$ . The discrepancy is probably due to possible mistakes made during determining the phase of the cycle by the students, because the survey did not include individual variables.

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