

## THE IMPACT OF USING SMART WATCHES ON STUDENTS' EFFORT CAPACITY: A COMPARATIVE STUDY

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**Abstract.** The increasing use of smartwatch technology among university students has raised questions about its potential impact on physical health and effort capacity. This study aims to evaluate the influence of smartwatch usage on the physical performance and effort capacity of students, focusing on those who utilize these devices for monitoring physical activity and health functions.

In this comparative study, we employed a questionnaire to assess the adoption and usage patterns of smartwatches among students. The research sample was divided into two groups: a control group and an experimental group. Both groups participated in weekly aerobic gymnastics classes. However, the experimental group, equipped with smartwatches, was tasked with achieving a daily goal of 13,000-15,000 steps or expending 600 kcal.

At the conclusion of the experiment, we evaluated the exercise capacity of all students using the Ruffier and Harvard tests. The results revealed significant differences between the two groups, with the experimental group demonstrating notably higher effort capacity. This suggests that the regular use of smartwatches, combined with specific fitness targets, can enhance physical performance and overall health among students. Our findings underscore the potential benefits of integrating wearable technology into student lifestyles, particularly in promoting physical activity and improving exercise capacity. This study contributes to the growing body of literature on the impact of smartwatches on health and fitness, highlighting their role as valuable tools for monitoring and enhancing physical performance in an academic setting.

In conclusion, smartwatches can be useful tools for students, but they must be used with discernment. It is important to strike a balance between the benefits and distractions these devices bring. Students' effort capacity may be influenced by how they integrate smartwatches into their daily routine.

**Keywords:** smartwatch, physical activity, effort capacity, students, aerobic gymnastics.

### Introduction

Physical activity and an optimal effort capacity represent the essential pillars of students' health and well-being (Gulap, 2015), exerting a profound impact on the physical, mental and emotional aspects of their lives (Colectiv DEFS, 2014):

*Physical health:* Regular physical activity has many benefits for students' physical health. This includes strengthening the cardiovascular system, reducing the risk of chronic diseases such as diabetes and cardiovascular disease, maintaining a healthy weight, and improving muscle endurance and flexibility (Collins, 2012).

*Mental health:* Exercise is recognized for its ability to improve mood and reduce stress, anxiety and depression. For students, who may be under high levels of stress due to academic tasks and other pressures, physical activity can be an effective way to maintain mental balance and improve emotional well-being.



*Improving academic performance:* There is evidence to suggest that regular physical activity can improve memory, concentration and learning ability. By increasing blood and oxygen flow to the brain, exercise can enhance cognitive functioning, which can have a positive impact on students' academic performance.

*Healthy lifestyle:* Promoting a healthy lifestyle among students can help establish long-term healthy habits. By learning to make physical activity an integral part of their daily routine, students can develop habits that support their long-term health and well-being, thereby reducing the risk of disease and health problems later in life.

*Social Interaction and Belonging:* Participating in physical activities can provide students with opportunities to interact and socialize with their peers outside of the academic environment. These positive social interactions can help improve self-esteem, social relationships and a sense of belonging to the university community.

It is recognized that smart devices have become an integral part of modern life, influencing various aspects of human behavior, including physical activity and effort capacity (Diachenko et al., 2021). In recent years, research has investigated how the use of these devices affects the level of physical activity and effort capacity of individuals, with a particular focus on young people, including students.

Recent research has revealed that the use of smart devices such as smartphones and tablets can have both positive and negative effects on users' physical activity. On the one hand, these devices provide easy access to apps and technologies that promote physical activity, such as fitness apps and health monitors. Studies have shown that using these apps can increase motivation and engagement in physical activity by providing goals, feedback and social support (Shuang Wu et co, 2023; Siepmann et co, 2021; Zahrt et co, 2023).

## **The research organization**

### ***The purpose of the paper***

The purpose of this paper is to investigate and compare the level of effort capacity and motivation for physical activity between students who wear smartwatches and those who do not. The study aims to provide a deeper understanding of how the use of these smart devices can influence physical behavior and motivation among students enrolled in aerobics classes.

### ***The hypothesis of the research***

The use of smartwatches contributes to a better motivation for practicing physical exercise and, implicitly, to a better effort capacity of students.

### ***The objectives and the tasks of the research***

To achieve the proposed goal, the following research *objectives* were set:

- establishing the research sample – 30 students, 1st year at various faculties, enrolled in aerobic class: 15 who wear smartwatches - the experimental group, 15 students who do not use such devices;
- elaboration of the opinion questionnaire about the students' perceptions regarding smartwatches, using the Google Forms platform;

The *tasks* of the research:

- the evaluation of the effort capacity of the two groups, using the Ruffier test and the Harvard test;
- The online administration of the questionnaire;
- Analyzing and interpreting the results.

### ***The research stages***

Our approach took place during the first semester of the academic year 2023–2024.

Out of 100 female students enrolled in the aerobic gymnastics course, only 25 use smartwatches and only 15 female students wanted to be part of our experiment.

Thus, we set up a control group that does not use such devices, composed of 15 female students, and the experimental group, made up of 15 female students who wear smartwatches.

In the first two weeks of October, the initial testing of the two groups took place.

In addition, those in the experimental group were administered the online questionnaire regarding the students' perception of the use of smartwatches.

Also, the students in the experimental group, apart from the aerobic gymnastics lesson they attended weekly, set daily goals of 13,000-15,000 steps or a consumption of about 600 kcal.

At the end of the semester, in January, the final evaluation of the effort capacity of the two groups took place.

### ***The research methods***

In our approach we used the following research methods:

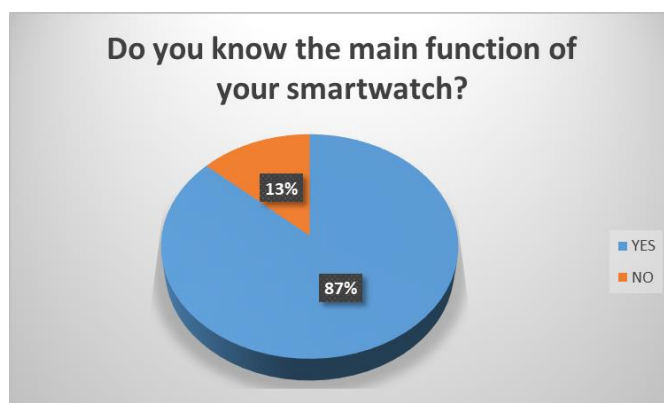
- The study of the specialized literature;
- The statistical-mathematical method;
- The experimental method;
- The graphical method;
- The questionnaire-based survey method;

The spectrum of questions of our questionnaire included aspects related to:

- demographic information such as age, year of study, frequency of using smartwatches;
- knowledge about the main functions of smartwatches, the motivation for using them;
- perceptions and attitudes towards the influences of smartwatches in everyday life, the advantages/disadvantages of their use;
- perceptions regarding the role and the importance of these devices.

### **Results**

✎ 13% of the participants in our survey do not know all the functions of the smartwatch they wear, while for the rest these devices have no unknowns.



**Figure 1.** The percentage of those who know all the functions of their smartwatch

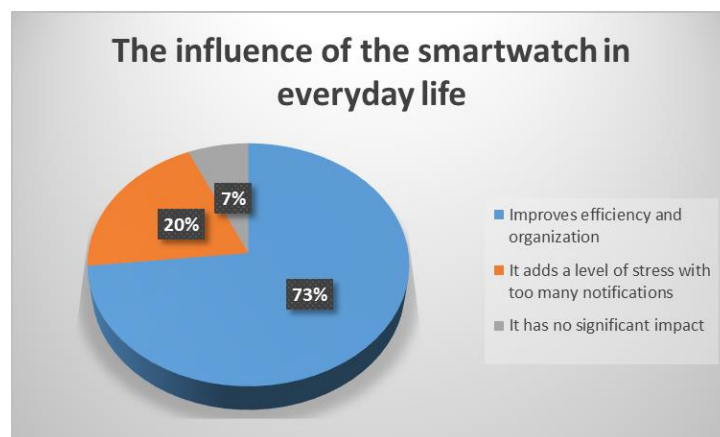
✎ Most of our subjects (46%) have been wearing the watch for more than 2 years, 27% between 1 and 2 years and only 7% have been using this device for less than 6 months.

✎ Among the main reasons for using this gadget, the monitoring of physical activity and the accessibility of notifications were the first, followed by the integration with other devices (laptop) and the health functions.



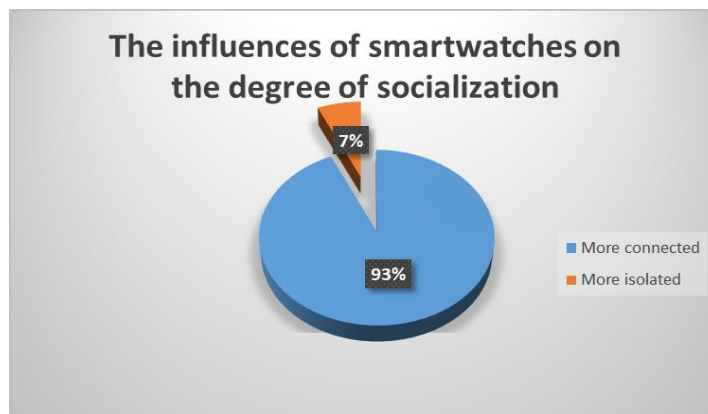
**Figure 2.** Motivation for using smartwatche

✎ Being asked how wearing a smartwatch influences their daily life, an overwhelming majority answered that it improves their efficiency and organization, fewer believe that it brings them extra stress due to notifications and only 7% that it has no significant impact on their lives.



**Figure 3.** The influence of smartwatch in everyday life

✎ Many of those interviewed (93%) believe that the use of smartwatches does not negatively influence socialization, on the contrary, they believe that it makes them more connected with those around them.



**Figure 4.** The influence of smartwatches on the degree of socialization

✎ The overwhelming majority of those who participated in our study consider the use of smart watches a necessity, and not a luxury.

✎ How do you think smartwatches impact a student's academic life?

The spectrum of answers to this question is very wide, the students considering that increasing *productivity and organization* is particularly important. Features such as alarms, reminders, notifications, and time management apps can help students better manage their academic schedules and daily tasks.

Another important aspect in the view of those interviewed was the *accessibility of information*. Smartwatches provide quick access to important information such as emails, messages and class notes. This can save time and help with quick responses to academic requests.

Also in the top of the benefits that derive from the use of smartwatches is *health monitoring*. Students can use smartwatches to track their physical activity, sleep and other aspects of their health, which can contribute to a more balanced lifestyle and, implicitly, to a better academic performance.

Regarding *the functional evaluation*, we present in table 1 the calculated statistical indicators.

**Table no. 1** – statistical indicators, functional evaluation (final test) – control group – experimental group

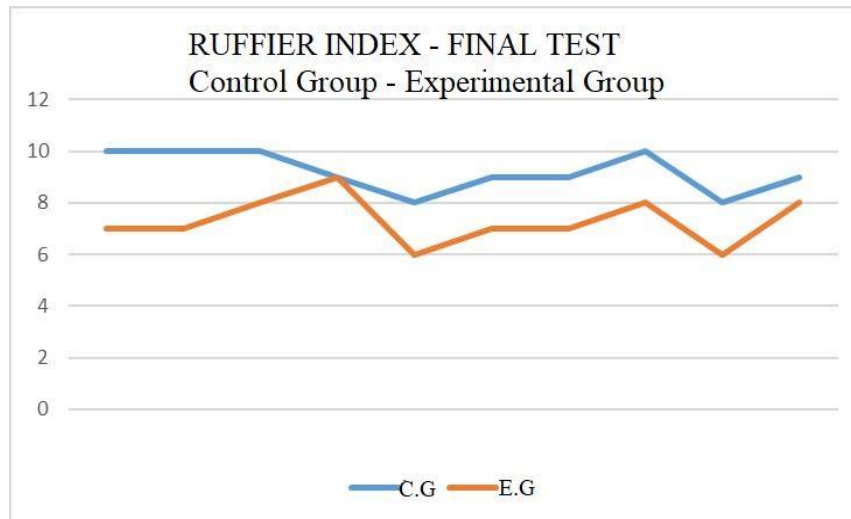
Test	Indicatori statistici (n=8)					Significant/insignificant at p=0,05
	Control group $\bar{X}$	Experimental group $\bar{X}$	statistical T	Tabular T	p	
<i>Ruffier</i>	9.2	7.3	6.8	2.26	<0,001	Significant
<i>Harvard</i>	79	85.7	8.6	2.26	<0,001	Significant

To calculate the Ruffier index, we used the heart rate dynamics at a standard effort (squats) and, by applying a formula (3 pulses), a mathematical value results, easy to follow in dynamics and to interpret.

As can be seen in table 1, the Ruffier index recorded an average value of 9.2 in the control group and 7.3 in the experimental group, values that place the students at average adaptability to effort. The t-student test indicates a value of 6.8 for  $p < 0.05$ , which leads to the validation of the hypothesis, so the recorded differences are statistically significant. In other words, both the participation in the aerobic lessons, but also the rigorous monitoring with the help of smartwatches of various parameters of the daily effort, led significantly to the improvement of the capacity to adapt to the effort of the subjects included in the research.

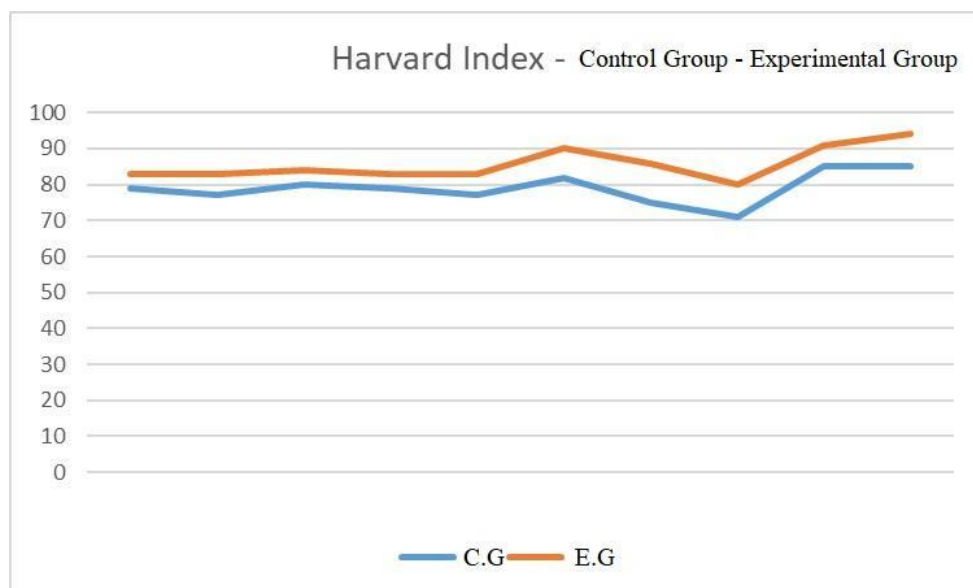
The scatter of the data from the mean in the Ruffier test is small, which reveals that the homogeneity of the group is very good.

The values recorded by the subjects of our research in this test, from the two groups, are graphically represented in figure no.5.



**Figure 5.** Graphical representation of the Ruffier index values recorded by students at the final test, comparison – control group – experimental group

In the case of the functional indicator measured, the Harvard index, an average value of 79 was recorded by the control group and 85.7 by the experimental group, at the final test, values that place the students at a “good” effort capacity. The t-student test indicates a value of 8.6 for  $p < 0.05$ , which leads to the validation of the hypothesis, so the recorded differences are statistically significant. In other words, both the means used in the aerobics lessons, but also the monitoring of the effort on the other days led significantly to the improvement of the cardiovascular resistance of the female students included in the research.



**Figure 6.** Graphical representation of the Harvard index values recorded by students at the final test, comparison – control group – experimental group

The values recorded by the subjects of our research in Harvard test, from the two groups, are graphically represented in figure no.6.

## Conclusions and proposals

**Enhanced Physical Performance:** Students in the experimental group who regularly used smartwatches and adhered to daily physical activity goals (13,000-15,000 steps or 800 kcal) demonstrated significantly improved effort capacity compared to the control group. Higher scores on both the Ruffier and Harvard tests evidenced this improvement.

**Positive Influence on Health Monitoring:** The integration of smartwatches into daily routines facilitated better monitoring of physical activities and health metrics. This continuous feedback likely motivated students to maintain or increase their physical activity levels.

**Behavioral Changes:** The data suggests that the use of smartwatches promotes positive behavioral changes towards physical health. Students using these devices were more inclined to meet and exceed their fitness targets, contributing to overall better physical health and fitness.

**Potential for Broader Applications:** Given the significant benefits observed, there is potential for broader application of smartwatch technology in educational institutions to foster healthier lifestyles and improve students' physical performance.

**Further Research:** Studies that are more comprehensive should be conducted to explore the long-term effects of smartwatch usage on physical health and academic performance. Future research could also investigate the psychological impacts, such as motivation and stress levels, associated with the use of these devices.

**Educational Workshops:** Conduct workshops to educate students on the effective use of smartwatches for health monitoring. Providing training on interpreting data and setting realistic goals can empower students to make the most of these technologies. By leveraging the capabilities of smartwatches, educational institutions can play a crucial role in promoting healthier lifestyles and enhancing the physical effort capacity of their students, leading to improved overall well-being and academic success.

In conclusion, smartwatches can be useful tools for students, but they must be used with discernment. It is important to strike a balance between the benefits and distractions these devices bring. Students' effort capacity may be influenced by how they integrate smartwatches into their daily routine.

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