

Changes in the physical activity intensity of Erasmus University students due to the COVID pandemic with respect to gender

Marcel Kawalec

Abstract—Due to the worldwide pandemic, many people all around the globe had to apply the new style of living and working. It also has affected the physical health of society as a whole. This paper investigates the pandemic effect on Erasmus University students' physical activity with respect to their gender. First, it presents changes in students' mental background to further examine the changes in a specific activity, like intense training or walking. With the use of *unpaired t-test*, the data were analyzed in search of the clear difference between the mean values of the group. It might be concluded that pandemic influenced badly on physical activity in general, however for most of the outcomes the null hypothesis, claiming that the mean values of the surveyed groups are the same, cannot be rejected. The next aspect is that although, there are some serious changes observed for certain groups, for most of them a one-year time might not be enough time to apply changes in the functioning. Paper resulted in showing specific trends for each group and physical activity. It may be useful source for more detailed researches in the future.

I. INTRODUCTION

The COVID pandemic has compelled humanity to drastically change the way societies are functioning. Virus development has affected almost everyone and most social life fields, like economics, politics, culture, education and relations. Even though the pandemic has left a mark on our social status, it has also caused mental changes in many people.

Physical activity, which is one of the most important parts of our lives, has not been spared. Some parents reported an increase in physical activity of their children during homeschooling [1]. Practical work like carpentry, cooking, gardening are just a few examples of how the lockdown could positively affect time distribution. Unfortunately, people with such opportunities are in minority [1].

Schools and Universities were forced to cancel or made homeschooled Physical Education (PE) classes [1]. In many countries, like Norway, "social distancing measures require people to stay at least 1 meter apart from each other and avoid gatherings with anyone other than their closest family members" [1]. The regulations resulted in canceling prevalent parts of planned events. For the first few months of the pandemic, going outdoors has been limited to only necessities, such as groceries and pharmacy.

Naturally, lockdown had an impact on those who now had to spend the whole day in front of the screen. Experts around the world agree on the importance of activity in the first twenty years of life. "Prior research has determined that physical activity (PA) plays an important role in both physical and psychosocial health and wellbeing for children

and young people" [2]. In the article *Physical activity, sedentary behavior and sleep in Italian medicine students*, authors claim that aerobic physical activity has a beneficial effect on sleep time. They get in detail explaining its effect on "metabolic, endocrine, vascular and immune systems, on mood and circadian rhythm" [3]. On the other hand, scientists state that dramatic psychological changes may take place at that time. The mentioned period is important as it establishes habits and behaviors for their adult life [2].

Even before the pandemic, University students were a population of intensified risk of sedentary behavior. The lockdown did not help to turn the bad course, but "put them at even greater risk" [3]. Research conducted in Turkey [4] shows that anxiety among students escalated in comparison to pre-pandemic times.

After the first year of a expanding pandemic, there are couple of papers written on the COVID-19 situation's impact on both males and females. It is worth mentioning that a large number of them focus on a narrow group of society, like students only. One could question the effectiveness of that approach. But, each group in society has its view of the world and needs. Although it is important to follow the actual trends in society as a whole, it is much easier to find solutions to the remaining problems of a specific group of people. That is why such an approach is beneficial in the end.

The paper aims to check how COVID has affected Erasmus University students' physical activity with respect to their gender.

II. METHODS

The following chapter starts with describing the research study. Then, the performed data analysis is presented.

A. Questionnaire

For the research project, a questionnaire was conducted among Erasmus University students in 2019 and 2020. Number of participants changed from 94 people in 2019 to 99 people in 2020, giving total number of 193 students. More detailed data are depicted in the Table 1 below.

TABLE I
STUDY SAMPLES

Years	Females	Males	Undeclared	Overall
2019	59	32	3	94
2020	52	36	11	99

The first three sets of questions were asked prior to measuring physical activity. They were living situation, self-assessment and attitude towards physical activity.

Then, the Shortened International Physical Activity Questionnaire (IPAQ) was given to the study sample one week before and after measuring week. The idea of the IPAQ is to estimate the Metabolic Equivalent of Task (MET). In order to collect data, students were asked to fill the form with the time spent on specific activity. Therefore, with the help of prepared formula, each participant was assigned with total IPAQ score, depending on their vigorous, moderate and walking activity.

During the measurement week, students were additionally asked to wear *Omron* device whenever they performed PA. The fitness tracker collected daily information, which are: number of steps, distance travelled and number of calories burned. Also, they were asked to use the smartphone application which gathered information only about the number of steps taken daily.

B. Data analysis

As stated prior in the Introduction section, the paper will be comparing psychical activity between genders. The first collected data are Tables 1 and 2, which gather mean and standard deviation attitudes values for each group. Then, normal distribution graph was performed. The purpose of describing the attitude was to find the factor which has an influence on the activity.

The time spent weekly active on specific exercise was calculated, as presented in (1).

$$SA = NAD \cdot (TRH \cdot 60 + TRM) \quad (1)$$

where:

SA - specific activity, *min*

NAD - Number of active days

TRH - Average number of hours spent on activity daily, *hour*

TRM - Average number of minutes spent on activity daily, *min*

Having all the necessary information, the mean and standard deviation for 2019 and 2020 for both males and females was computed. Mean and standard deviation are regarded the following data: Physically intense activities, moderately intense activities, walking and sitting. Also, it was checked during the research if the mean values are significantly different from each other or whether there is a chance of them being the same. To achieve that, p-value was derived using *Unpaired t-test*. It was chosen among the other tests as it enables to compare data for the different number of participants. The test null hypothesis stated that the samples have equal mean values. The alternative one stated that they are not the same. All the p-values lower than 0.05 reject the null hypothesis.

In the given data set, it rarely happened that typing errors occurred. For instance, someone declared walking 12600 minutes per week, while even if they walked for 24 hours for 7 days, it would give 10080 minutes. Whenever such extreme input occurred, it was deleted to make the whole data set more relevant.

For the purposes of the research, all the calculations were conducted with help of academic licence of *MATLAB R2020b* software. The full code can be found in the GitHub repository:

III. RESULTS

Figure 1 represents normal distribution over different groups considered in the study. The Attitude was displayed with a 0-7 scale, where 0 means extremely low perceived physical activity and 7 is a very high level of being active.

TABLE II
FEMALES ATTITUDE

Attitude	Females 2019	
	Mean	Standard Deviation
	3.9746	1.4246
	Females 2020	
	Mean	Standard Deviation
	4.0288	1.1437
P-value	0.8269	

TABLE III
MALES ATTITUDE

Attitude	Males 2019	
	Mean	Standard Deviation
	4.8281	1.5325
	Males 2020	
	Mean	Standard Deviation
	3.6111	1.5771
P-value	0.002	

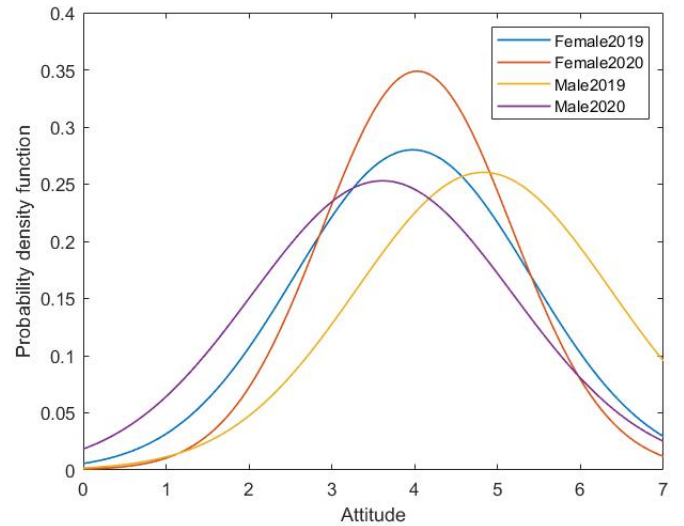


Fig. 1. Normal distribution over different groups

From the given data, it can be pointed out that quite different graph behaviours are to be seen for each gender. Regarding Tables 2 and 3., the mean attitude value for women remained approximately 4 out of 7 for both years, while the standard deviation in 2020 was reported lower than in 2019. Contrary for men, it is mean value changing with almost constant standard deviation values. *P-values* for women and

TABLE IV
FEMALES SPECIFIC ACTIVITY DATA

Intensity	Females 2019		Intensity	Females 2020		P - value
	Mean [min.]	Standard Deviation [min.]		Mean [min.]	Standard Deviation [min.]	
Physical Intense Activities	146.86	132.74	Physical Intense Activities	172.35	138.79	0.33
Moderate Intensity	217.12	142.59	Moderate Intensity	192.50	178.04	0.42
Walking at least 10 min.	178.39	168.70	Walking at least 10 min.	189.52	229.27	0.77
Sitting during a weekday	435.42	283.92	Sitting during a weekday	532.13	283.92	0.10

TABLE V
MALES SPECIFIC ACTIVITY DATA

Intensity	Males 2019		Intensity	Males 2020		P - value
	Mean [min.]	Standard Deviation [min.]		Mean [min.]	Standard Deviation [min.]	
Physical Intense Activities	266.25	235.70	Physical Intense Activities	138.83	127.61	0.01
Moderate Intensity	372.19	306.13	Moderate Intensity	233.43	198.66	0.03
Walking at least 10 min.	337.78	295.82	Walking at least 10 min.	140.29	138.68	$7 \cdot 10^{-4}$
Sitting during a weekday	564.38	283.92	Sitting during a weekday	444.89	283.92	0.15

men were 0.8269 and 0.002 (null hypothesis to be rejected) respectively.

Tables 4 and 5 collect information for mean and standard deviation with the *unpaired t-test* value. From presented *P - values*, there are three cases for which $P < 0.05$. Hence, for them, the null hypothesis claiming that mean values of the tests are the same can be rejected. The others vary from 10% up to 77%, meaning the alternative hypothesis cannot be used.

IV. DISCUSSION

The main objective of the paper was to conduct data analysis regarding women and men physical activity. From Figure 1, it can be concluded that more women are assessing their activity at a similar level as the standard deviation value lowered in comparison to 2019. Moreover, the outcome shows that men's mentality was much more violated as mean value changed for 1.2 in 0-7 scale in only 1-year time.

A decreasing trend could be observed according to data in Tables 1 and 2. Women reported an 18.97% increase in intense activities, while their men equivalents were diagnosed with a decrease of 47.86%. For the moderate intensity, the research shows quite similar trend. For both women and men, a decrease was equal to 11.34% and 6.88% respectively. With regard to last activity on the list, walking, the drops in activity are much more significant than comparing to moderate ones. Women are reported to reduce the weekly time spent on walking by approximately 1.5 hours, which results in 32.11% drop as to in 2019. For men, it is even more. The change is claimed to decline by 58.47% related to pre-pandemic times.

As shown above, decreasing trend can be indicated for both genders. However, for women it cannot be considered reliable as the *P - value* is highly above 0.05. Nevertheless, the trend may be interesting in case of further research.

By comparing compiled information from the third chapter, a primary relation between perceived attitude and the performed physical activity might be accepted and used for more detailed investigation.

Quite similar research was done on Italian students, published in *European Journal of Sport Science* and also Spanish students. Both papers use the *Paired t-test*. Its results show that almost all of the diagnosed groups were reporting decreased activity, while sedentary time increased in all cases [3] [5].

Some results could also be found in one of the articles in the *International Journal of Environmental Research and Public Health*, where they confirm the decreasing activity in vast majority of groups as well [6].

During the research, there could be some concerns pointed out. Firstly, the data set was built on different study samples which have to cause some error by the definition. Secondly, the number of students taking part in the research was also different in the following years. Thirdly, the questionnaire asked the participants only two questions regarding their perceived activity which might not show the full scale of the problem. Fourthly, people tend to round off the time spent on activities. For instance, there is a risk that in such surveys 25-min run might be registered as a half an hour. For a single run, such data does not affect the results, but considering the week time, it might be significant change. Lastly, it is worth

mentioning that the time spent on gathering data was one week only. In order to make the research more relevant, longer study should be proposed.

Having the knowledge about specific groups activity, the further papers may investigate on them with much more details. The study showed the both men and women need to be more engaged in the psychical activity.

V. CONCLUSION

The purpose of the paper to conduct the study regarding the changes of physical activity for women and men was completed successfully. The data processing enabled to observe the relevant changes in students healthy habits. The decreasing trend in physical activity can be also found in different papers, suggesting the issue does not only concern Erasmus University Student, but is a global issue. The paper verified the need for individual approach to each of the group and can be used for further research.

REFERENCES

- [1] A. Roe, M. Blikstad-Balas, and C. P. Dalland, "The impact of covid-19 and homeschooling on students' engagement with physical activity," *Frontiers in Sports and Active Living*, vol. 2, p. 205, 2021.
- [2] F. B. Ortega, J. R. Ruiz, M. J. Castillo, and M. Sjöström, "Physical fitness in childhood and adolescence: a powerful marker of health," *International journal of obesity*, vol. 32, no. 1, pp. 1–11, 2008.
- [3] F. Luciano, V. Cenacchi, V. Vegro, and G. Pavei, "Covid-19 lockdown: Physical activity, sedentary behaviour and sleep in italian medicine students," *European Journal of Sport Science*, pp. 1–10, 2020.
- [4] M. Kirmizi, G. Yalcinkaya, and Y. S. Sengul, "Gender differences in health anxiety and musculoskeletal symptoms during the covid-19 pandemic," *Journal of Back and Musculoskeletal Rehabilitation*, no. Preprint, pp. 1–7, 2021.
- [5] A. Rodríguez-Larrad, A. Mañas, I. Labayen, M. González-Gross, A. Espin, S. Aznar, J. A. Serrano-Sánchez, F. J. Vera-Garcia, D. González-Lamuño, I. Ara *et al.*, "Impact of covid-19 confinement on physical activity and sedentary behaviour in spanish university students: Role of gender," *International journal of environmental research and public health*, vol. 18, no. 2, p. 369, 2021.
- [6] A. Castañeda-Babarro, A. Arbillaga-Etxarri, B. Gutiérrez-Santamaría, and A. Coca, "Physical activity change during covid-19 confinement," *International Journal of Environmental Research and Public Health*, vol. 17, no. 18, p. 6878, 2020.