



## The Effect of Mask Use in Maximum Physical Activity Toward Leukocyte Total

Pahala Tua Hutajulu<sup>1</sup>, Wahida Yohanis Mapandin<sup>2</sup>, Yohanis Manfred Mandosir<sup>3</sup>✉,

Pendidikan Jasmani, Kesehatan dan Rekreasi, Universitas Cenderawasih, Indonesia<sup>1</sup>

Ilmu Kesehatan Masyarakat, Universitas Cenderawasih, Indonesia<sup>2</sup>

Ilmu Keolahragaan, Universitas Cenderawasih, Indonesia<sup>3</sup>

### Article History

Received July 2021

Accepted October 2021

Published Vol.10 No.(3) 2021

### Keywords:

Physical Activity; Leukocytes; Mask.

### Abstract

The use of masks has to do for everyone who does activities outside the home. This applies when people perform physical activities outside the home. The study aims to determine the effect of using a mask on the leukocytes total when doing physical activity running. The research method used an experiment with a randomized pretest-posttest comparison group design. There are 5 participants. Data were collected through a running test. The data analysis technique used Paired Sample T-test and Independent T-test. The results of the paired t-test concluded that there was a significant effect ( $0.03 < 0.05$ ) on the number of leukocytes between before and after doing a maximum activity without a mask. Meanwhile, participants who wore masks did not show any difference in the number of leukocytes before and after maximum physical activity ( $0.13 > 0.05$ ). The results of the independent t-test concluded that there was no difference in the number of leukocytes before and after maximum activity without a mask with wearing a mask. The results of the study have implications for understanding various physical activities in increasing the number of leukocytes, but the use of masks does not affect maximum physical activity.

### How to Cite

Hutajulu, P., T., Et al. (2021). The Effect of Mask Use in Maximum Physical Activity Toward Leukocyte Total. *Journal of Physical Education, Sport, Health and Recreation*, 10 (3), 93-97.

© 2021 Universitas Negeri Semarang

✉ Correspondence address :

E-mail: johnmandoz@yahoo.com

p-ISSN 2460-724X

e-ISSN 2252-6773

## INTRODUCTION

Physical activity such as running or other sports during the Covid-19 pandemic must be carried out by health protocols so that the spread of the virus is controlled. The Covid-19 pandemic has increased the intensity of exercise or maximum physical activity such as runners (DeJong et al., 2021). Everyone performs physical activity between individuals with each other depending on the individual's lifestyle and other factors. Physical activity that is planned, structured, carried out repeatedly including physical exercise as part of physical activity. It is physical work involving the body's locomotor system aimed at carrying out daily life activities if physical activity has a specific purpose and is carried out with certain rules systematically such as the existence of time rules, pulse targets, number of repetitions of movements and others called exercise. At this time, maximum physical activity can still be carried out regularly and systematically. They have to follow government regulations.

The government recommends everyone implement 5M behaviour in preventing the wider spread of the virus. One of the rules of 5M is to wear a mask. Masks are recommended to always be worn when outside the home and during daily activities. This also applies to residents who carry out sports activities outside the home are required to wear masks, because physical activity provides many benefits to everyone. The simplest way to increase immunity is to do physical activity/sports and get enough rest and sleep. Even light physical activity, such as aerobics for 30 minutes, can activate the work of white blood cells, which are the main components of immunity in blood circulation.

However, what if physical activity is done by wearing a mask. As we know that masks for some people are uncomfortable to use and breathing is not easy. If physical activities such as running are carried out using a mask, this can provide uncomfortable breathing conditions. Although for some people wearing a mask is not a problem, because everyone's activity needs are different (Adhitya, 2016). This is also because people's immune needs are different (Ariestika & Agung Nanda, 2020).

Therefore, this study was conducted because each person's physical activity has different needs and the desired impact of each person is also different. Many studies have been conducted related to maximum physical activity that affects the health of everyone. Maximum physical activity is carried out to maintain health (Supriyoko &

Mahardika, 2018). The results of the same study were shown by Resmanto (2017) that maximum physical exercise increased the number of leukocytes and the administration of vitamin C did not reduce the number of leukocytes. In addition, physical activity can also prevent the transmission of the virus in the body (Hemilä, 2017; da Silveira et al., 2020; Abobaker, Alzwi, & Alraied, 2020). Different findings stated that strenuous activity has an impact on decreased immunity if it is done irregularly (Nieman & Wentz, 2019). Thus, exercise affects leukocytosis and hemostasis in both men and women (Sand, 2013; Sellami et al., 2018; Apollo Sinaga et al., 2017). It gave a different impact (Neves et al., 2015).

From previous researches, it is known that maximum physical activity can have an impact on a person's health, as can differences in the number of leukocytes. However, this study is different from the previous one because it focuses on the study of leukocyte counts for people who carry out maximum physical activity either using a mask or without a mask. This started from a phenomenon that occurred in society that masks caused discomfort during exercise and everyone felt that they lacked space to breathe. Moreover, maximum physical activity such as running usually spurs faster breath movements.

So, this study aims to determine the impact of using masks on people who do maximum physical activity on the number of leukocytes. The results of the study are expected to be useful in understanding everyone to carry out a maximum physical activity such as running while still using the correct mask so that the mask used is a good medium in maintaining health from the spread of the coronavirus.

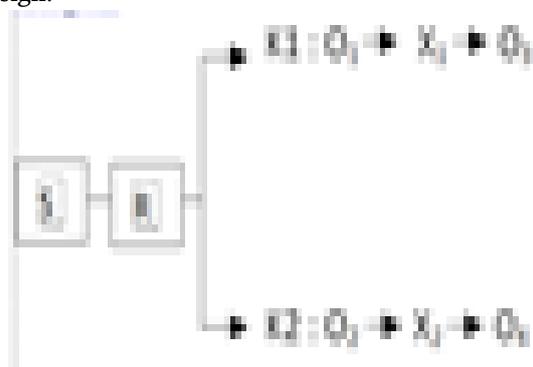
## METHODS

Participants were 5 people for each treatment group. The research sample was taken using non-probability sampling with the purposive sampling technique. The research was conducted at the Laboratory of the Faculty of Health Sciences Uncen Jayapura and HI Laboratory Diagnostic Center. It was conducted from July 2021-November 2021.

The data was collected through tests for maximum physical activity. It used Multistage Fitness Test. The maximum physical activity test for running is carried out on an open field track of 20 meters with a track width of 1-1.5 meters (Sukadiyanto & Muluk, 2011). The run activity was measured using a standard time measurement of 30-90 seconds. The test activity was carried out in

the form of running back and forth on a 20-meter field track. The running test activity was carried out 2 times. In the first test, the participants ran without wearing a mask. While the second test, participants ran using masks. Leukocyte measurements were carried out at the HI Laboratory Diagnostic Center. Leukocyte measurements were carried out after the participants did running activities. the implementation of MFT is based on patented audio, so the researcher only records the results that have been shown by the participants.

The type of research was an experimental design with a randomized pretest-posttest comparison group. The following is the research design.



The data analysis technique was obtained using statistics with a significance level of 5% through the help of SPSS. The data is presented in the form of descriptive statistics. However, before the data was processed using Paired Sample T-test and Independent T-test, the data were tested for normality using Kolmogorov Smirnov. The results of the data normality test showed that the leukocyte count variable data before maximum physical activity and the leukocyte count variable after maximum physical activity were normally distributed (Sig value > 0.05). Because the data is normally distributed so that it meets the criteria for a different test through the t-test. The following are the results of the data normality test.

Variable	Without Mask	Using Mask
	Sig. Value	Sig. Value
Leukocyte Count Before Maximum Physical Activity	0,91	0,82
Leukocyte Count After Maximum Physical Activity	0,99	0,99

## RESULTS AND DISCUSSION

The following is data on the number of respondents' leukocytes before and after doing a ma-

ximum physical activity without using a mask;

**Table 1** concludes that there are differences in the number of leukocytes of participants before and after participants perform maximum physical activity without using a mask. From the results of the average value, it is also known that there is an increase in the value before and after doing maximum physical activity. The same results were shown by participants who wore masks when running (maximum physical activity). The number of leukocytes has changed even though maximum physical activity is carried out using a mask, as shown in the following **Table 2** data.

However, the results of the test using the Paired Sample T-Test show that there is a difference in the mean value between the number of leukocytes before maximum activity and the number of leukocytes after doing a physical activity without a mask is 1.06 and the significance value of the paired t-test is  $0.03 < 0.05$ , it means that there is a significant difference between the number of leukocytes before and after performing maximal activity without a mask. The data can be seen in **Table 3** below.

**Table 3** also concludes that there is a difference in the mean value between the number of leukocytes before maximum activity and the number of leukocytes after doing physical activity with a mask is 2.14. However, the results of the paired t-test were  $0.13 > 0.05$ , it means that there was no significant difference between the number of leukocyte before and after performing a maximal activity with a mask. Thus, it can be concluded that participants who performed maximum physical activity (running) either using a mask or without a mask showed changes in the number of leukocytes.

So, it can be understood that the maximum physical activity that has been carried out in excess affects changes in the number of leukocytes (Nieman & Wentz, 2019; Sinaga, Sinaga, & Sinaga, 2017; Marpaung, Sinaga, Rismadayanti, Ginting, & Fitri, 2018). The same study is showed by Apollo Sinaga, et.al. (2017) that 10 participants have increased the number of leukocytes after they did maximum physical activity

While the results of the independent t-test concluded that there was a difference in the mean value between the number of leukocytes before maximum activity without a mask and the number of leukocytes before doing physical activity with a mask was -1.04 and the significance value of the independent t-test was  $0.41 > 0.05$ , which means that there is no difference a significant between the number of leukocytes before maximum activity without a mask and the number of leukocytes before doing physical activity with a mask.

**Table 1.** Number of Leukocyte Before and After Physical Activity Maximum Without Mask

Respondent	Number of Leukocyte (thousand/mm3)	
	Before	After
YP	7.630	8.720
YO	6.890	7.100
AL	7.700	8.240
SA	4.590	6.650
EP	8.570	10.000
Average	7.076	8.142

Source Primary Data Processing, 2021

**Table 2.** Number of Leukocyte Before and After Physical Activity Maximum Using Mask

Respondent	Number of Leukocyte (thousand/mm3)	
	Before	After
YP	10.110	11.910
YO	6.910	7.500
AL	9.180	9.470
SA	4.720	6.120
EP	9.660	16.280
Average	8.116	10.256

Source Primary Data Processing, 2021

**Table 3.** Results of Paired Sample T-Test Number of Leukocyte Before and After Performing Maximum Activities

Variable	Δ Mean	Sig. Value	Result
Number of Leukocyte Before and After Performing Maximum Activities Without Mask	1.06	0.03	Hypothesis Accepted
Number of Leukocyte Before and After Performing Maximum Activities Using Mask	2.14	0.13	Hypothesis Rejected

**Table 4.** Results of Independent T-Test Leukocyte Count Before Performing Maximum Physical Activity Without Mask and Using Mask

Variable	Δ Mean	Sig. Value	Result
Before Without Mask – Before Using Mask	-1.04	0.41	Hypothesis Rejected

However, after participants performed maximal physical activity, they also showed the same conclusion. There was no difference in changes in the number of leukocytes. This is shown in table 5 which concludes that there is a difference in the

mean value between the number of leukocytes after maximum activity without a mask and the number of leukocytes after doing physical activity with a mask is -2.11 and the significance value of the independent t-test is  $0.41 > 0.05$ , which means there is no difference a significant difference between the number of leukocytes after maximal activity without a mask and the number of leukocytes after doing physical activity with a mask, as shown in the following **Table 4**.

**Table 5.** Results of Independent T-Test Leukocyte Count After Performing Maximum Physical Activity Without Mask and Using Mask

Variable	Δ Mean	Sig. Value	Result
After Without Mask – After Using Mask	-2.11	0.29	Hypothesis Rejected

The findings show that masks can have an effect on the number of leukocytes in carrying out maximum physical activity. However, under certain conditions, it can be seen that the mask does not necessarily change the number of leukocytes. This means that it depends on the type of sport. During a pandemic, everyone should be able to manage the right kind of exercise because many public sports facilities have been temporarily closed (Yeo, 2020). The existence of physical activity becomes a very important part in maintaining the stability of the health of each person's body (Vancini et al., 2021; Antunes & Frontini, 2021).

## CONCLUSION

The results of data analysis concluded that there was a difference in the number of leukocytes before and after performing maximum physical activity running without wearing a mask. It was found that the participants who wore masks did not show a change in the number of leukocytes before and after maximum physical activity running. Thus it can be said that the number of leukocytes of participants who have carried out maximum physical activity has the same number between wearing a mask or not wearing a mask. However, the results of the independent t-test showed that the leukocyte count of participants before maximum physical activity without a mask was not different from that of participants before doing physical activity with a mask. The same thing was shown to the participants after doing a maximum physical activity without wearing a mask by using a mask.

This study is still limited to maximum physical activity in the form of running, so the results of the data show that changes in the number of

leukocytes from running activities using a mask or without a mask. Therefore, this research can be redeveloped with variations in maximum physical activity so that changes in the number of leukocytes can be understood more deeply. The use of tools such as a stationary bike or a treadmill can also be used as a medium in carrying out maximum physical activity. In addition, to improve understanding of the effect of maximum physical activity, research can be combined with measuring pulse rate in various sub-maximum physical activities.

## REFERENCES

- Abobaker, A., Alzwi, A., & Alraied, A. H. A. (2020). Overview of the possible role of vitamin C in management of COVID-19. In *Pharmacological Reports* (Vol. 1, Issue 6, p. 3). Springer Science and Business Media Deutschland GmbH. <https://doi.org/10.1007/s43440-020-00176-1>
- Adhitya, S. D. (2016). Tingkat Aktivitas Fisik Operator Layanan Internet Mahasiswa Universitas Negeri Yogyakarta Physical Activity Level Among Operators Of Layanan Internet Mahasiswa Universitas Negeri Yogyakarta. In *Pendidikan Jasmani Kesehatan dan Rekreasi* (Vol. 5, Issue 5). <http://journal.student.uny.ac.id/ojs/ojs/index.php/pjkr/article/view/2388>
- Antunes, R., & Frontini, R. (2021). Physical activity and mental health in Covid-19 times: an editorial. *Sleep Medicine*, 77, 295–296. <https://doi.org/10.1016/J.SLEEP.2020.10.007>
- Apollo Sinaga, F., Ginting, M., Fitri, K., Harefa, R., Keolahragaan, I., & Unimed, F. (2017). Pengaruh Aktifitas Fisik Maksimal Terhadap Jumlah Leukosit Pada Mahasiswa Jurusan Ilmu Keolahragaan. In *GENERASI KAMPUS* (Vol. 10, Issue 1). <https://jurnal.unimed.ac.id/2012/index.php/gk/article/view/8735>
- Ariestika, E., & Agung Nanda, F. (2020). Physical activities and vo2 max: Indonesian national team, is there a difference before and after covid-19? *Jurnal Penelitian Pembelajaran*, 6(3), 752–767. [https://doi.org/10.29407/js\\_unpgri.v6i3.14972](https://doi.org/10.29407/js_unpgri.v6i3.14972)
- da Silveira, M. P., da Silva Fagundes, K. K., Bizuti, M. R., Starck, É., Rossi, R. C., & de Resende e Silva, D. T. (2020). Physical exercise as a tool to help the immune system against COVID-19: an integrative review of the current literature. In *Clinical and Experimental Medicine* (pp. 1–14). Springer. <https://doi.org/10.1007/s10238-020-00650-3>
- DeJong, A. F., Fish, P. N., & Hertel, J. (2021). Running behaviors, motivations, and injury risk during the COVID-19 pandemic: A survey of 1147 runners. *PLOS ONE*, 16(2), e0246300. <https://doi.org/10.1371/JOURNAL.PONE.0246300>
- Hemilä, H. (2017). Vitamin C and infections. In *Nutrients* (Vol. 9, Issue 4). MDPI AG. <https://doi.org/10.3390/nu9040339>
- Marpaung, D. R., Sinaga, F. A., Rismadayanti, W., Ginting, M., & Fitri, K. (2018). Pengaruh Aktifitas Fisik Maksimal Terhadap Jumlah Leukosit Dan Hitung Jenis Leukosit Pada Atlet Softball. *Sains Olahraga : Jurnal Ilmiah Ilmu Keolahragaan*, 2(1), 1–9.
- Neves, P. R. D. S., Tenório, T. R. D. S., Lins, T. A., Muniz, M. T. C., Pithon-Curi, T. C., Botero, J. P., & Do Prado, W. L. (2015). Acute effects of high- and low-intensity exercise bouts on leukocyte counts. *Journal of Exercise Science and Fitness*, 13(1), 24–28. <https://doi.org/10.1016/j.jesf.2014.11.003>
- Nieman, D. C., & Wentz, L. M. (2019). The compelling link between physical activity and the body's defense system. In *Journal of Sport and Health Science* (Vol. 8, Issue 3, pp. 201–217). Elsevier B.V. <https://doi.org/10.1016/j.jshs.2018.09.009>
- Resmanto, R. (2017). Pengaruh Pemberian Vitamin C Sebagai Antioksidan Terhadap Jumlah Leukosit Dan Trombosit Pada Latihan Fisik Maksimal. Universitas Andalas.
- Sand, K. L. (2013). Effects of exercise on leukocytosis and blood hemostasis in 800 healthy young females and males. *World Journal of Experimental Medicine*, 3(1), 11. <https://doi.org/10.5493/wjem.v3.i1.11>
- Sellami, M., Gasmi, M., Denham, J., Hayes, L. D., Stratton, D., Padulo, J., & Bragazzi, N. (2018). Effects of acute and chronic exercise on immunological parameters in the elderly aged: Can physical activity counteract the effects of aging? In *Frontiers in Immunology* (Vol. 9, Issue OCT, p. 2187). Frontiers Media S.A. <https://doi.org/10.3389/fimmu.2018.02187>
- Sinaga, F. A., Sinaga, R. N., & Sinaga, R. (2017). Pengaruh Pemberian Vitamin E Terhadap Kadar Hemoglobin Pada Aktifitas Fisik Maksimal Mahasiswa Ilmu Keolahragaan Fik UNIMED. *Sains Olahraga : Jurnal Ilmiah Ilmu Keolahragaan*, 1(1), 30–39.
- Sukadiyanto, & Muluk, D. (2011). Pengantar Teori dan metodologi Melatih Fisik. CV. Lubuk Agung.
- Supriyoko, A., & Mahardika, W. (2018). Kondisi Fisik Atlet Anggar Kota Surakarta. *Jurnal SPOR-TIF : Jurnal Penelitian Pembelajaran*, 4(2), 280. [https://doi.org/10.29407/js\\_unpgri.v4i2.12540](https://doi.org/10.29407/js_unpgri.v4i2.12540)
- Vancini, R. L., Andrade, M. S., Viana, R. B., Nikolaidis, P. T., Knechtle, B., Campanharo, C. R. V., de Almeida, A. A., Gentil, P., & de Lira, C. A. B. (2021). Physical exercise and COVID-19 pandemic in PubMed: Two months of dynamics and one year of original scientific production. *Sports Medicine and Health Science*, 3(2), 80–92. <https://doi.org/10.1016/J.SMHS.2021.04.004>
- Yeo, T. J. (2020). Sport and exercise during and beyond the COVID-19 pandemic: <https://doi.org/10.1177/2047487320933260>, 27(12), 1239–1241. <https://doi.org/10.1177/2047487320933260>