The Effect of Bicycling on Long Term Memory

Unun Umaran[1,2], Adang Suherman[1], Herman Subarjah[1] and Mohammad Zaky[1,3]
[1]*Faculty of Sport and Health Education, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudhi No. 229, Bandung, Indonesia*
[2]*Physical Education, Health and Recreation, Universitas Islam 45 Bekasi, Bekasi, Indonesia*
[3]*Physical Education, Health and Recreation, STKIP Bina Mutiara Sukabumi, Sukabumi, Indonesia*
ununumaran@upi.edu

Keywords: Bicycling Activity, Long Term Memory.

Abstract: The research was done because some theories say physical activity is able to give a positive influence on cognitive function. Lack of motion or not performing physical activity may lead to memory degeneration (dementia). The method used was *Ex Post Facto*. The sample was 30 bike to work community members aged 20 to 35 years old. Purposive sampling technique was used to choose the sample. The main Instrument was Word Test. The data analysis was performed in SPSS 17 by which the researcher carried out Kolmogorov-Smirnov for normal distribution test, Lavene Statistic for Homogeneity test and Independent sample test to see the score differences. The results showed that the average score of cycling group ability was better than motor group (control). It was confirmed by the result of the analysis showing that long term memory ability was 75,53 Vs 63,97 and t = 2,996 (0,004) ($p<0,05$), meaning that there is significant different between long term memory of cycling group and riding group. It implies that cycling activities have positive impact on the long term memory.

1 INTRODUCTION

Health is a factor that is very supportive for daily activities. Doing regular physical activity is the most important thing that can help a person maintain good health. The phenomenon that occurs at the present time especially for the adult, they are busy with work routine experiencing lack of physical activity due to routine work. Thus, of course, it will result in physical fatigue and may also lead to memory fatigue. There are several assumptions that if it is not offset by physical activity, cognitive ability will decrease. This is in accordance with the opinion of Manoux, et al (2005); in his research on the relationship between physical activity and cognitive function in middle age i.e. all 35-55-year-old state employees based in London department, suggested that the lack of physical activity is a risk factor for cognitive function decline, our results show small but significant the relationship between physical activity and cognitive function in middle age. Age and sex adapted to the relationship between physical activity and cognitive performance are greatly attenuated by in addition to education and socioeconomics. Aspects of cognitive function that mostly decline with age are intelligence (as estimated with AH 4-I), and our results show that low levels of physical exercise have been a risk factor in middle age. The fluid of intelligence is considered essentially related to the information process and involves short-term memory, abstract thinking, creativity, problem-solving ability, and reaction time. Our results of physical activity and cognitive function show the protective effect of physical activity on cognitive decline and dementia among the elderly. Physical activity has been shown to maintain cerebral blood flow, and may increase aerobic capacity and supply of brain nutrients. Physical activity is also believed to facilitate the metabolism of neurotransmitters.

Furthermore, Zervas and Stambulova in Auweele et al. (1999) assume the relation between physical activities and cognitive function. It was believed that the impact of physical activities on cognitive function mostly rely on the intensity and volume of the physical activities. The intensity of lower-to-moderate physical training tends to support the assertion that a physical limb facilitates cognitive functioning.

Umaran, U., Suherman, A., Subarjah, H. and Zaky, M.
The Effect of Bicycling on Long Term Memory.
In *Proceedings of the 2nd International Conference on Sports Science, Health and Physical Education (ICSSHPE 2017) - Volume 2*, pages 440-443
ISBN: 978-989-758-317-9

In addition, Jhon and Eric (2008): By doing physical activity, it will happen oxygen-filled blood supply into the brain. This will stimulate the growth of new cells in the brain so that the brain cells will multiply and with the number of new cells will form new neurons that have more synapses that will eventually make the brain capable of receiving more impulse and able to store longer and faster to be reappeared when asked. In addition to the growth of many new cells, another impact is to grow and develop a type of protein in the brain that is called the Brain Derived Neurotropic Factor (BDNF). The function of BDNF itself is to build and maintain the cells in the brain of the Hippocampus, the part of the brain associated with the brain's ability to receive and store information obtained, in other words the hippocampus is related to the quality of the brain's memory work. With the abundance of BDNF in the hippocampus, the memory capacity of the brain gets better and last longer.

So it is clear that physical activity can affect memory performance. Conversely, if the lack of movement in this case does not do physical activity due to unhealthy lifestyles, will cause a decrease in memory performance of a person. From some of these findings, it can be raised a problem that the high demands of work that require good body condition should be supported by a healthy lifestyle that is by doing physical activity one of them is by cycling. This problem is raised because there is no empirical data concerning research aimed at people already working, requiring memory work demands especially in the productive age between the ages of 20 to 35 years.

Lately there has been a b2w community called Bike to Work, which raised the popularity of bicycles as motor vehicle replacement vehicles to go to the office. There is an interesting phenomenon that can be studied in this bike to work community. For office workers, cycling not only makes life healthier, but it is also believed to help to refresh one's memory. This is in accordance with that disclosed by Holmann in tieneke (2008) in his research revealed, that the youth (students) who exercise cycling is known to have blood flow to the brain increased 30%. The increased blood flow in the brain will trigger the brain to release some proteins, including a kind of brain-growing protein called Brain Derived Neurotropic Factor (BDNF) that causes the growth of new nerve cells in the working hippocampus saves memory for a long time and minimizes the occurrence of concussions. Given this BDNF growth, the cycling students are relatively faster and better at completing the test than the students who are not cycling.

The human memory system has two forms; short term memory and long term memory. Short-term memory has a role as a place to store memories that are only temporary or in other words that information can be remembered after a few minutes of noticing and memorizing. While Long-term memory, is part of the human brain that has the task of storing memory for a long period of time. Long-term memory is considered necessary for someone, this is because it will be stored in the brain and will make someone remember it with the old and make the process of motion that automation.

Based on the above explanation, the focus of research conducted is to describe the effect of cycling activity on the ability of long term memory for the perpetrators.

2 METHODS

The method used in this research was ex-post facto study in intact-group comparison. The method focuses more on comparative study. The aim of ex post facto research is to see the effect of certain phenomena and examine the causal effect of the data after the event has been completed.

2.1 Research Design

To provide an overview of the flow of thought in this study the authors provide a description of a research design that the authors use in figure 1.

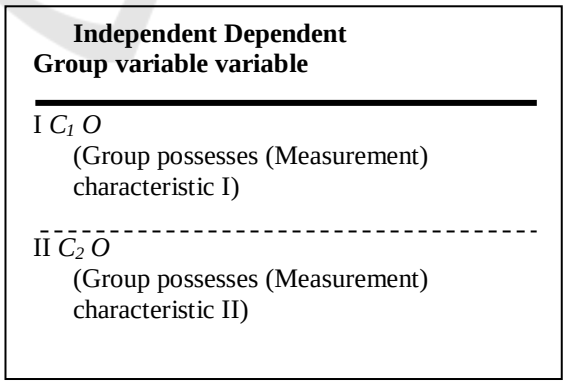

Figure 1: Research Design.

2.2 Population and Sample

In this study the authors take a population of bike-to-work members (active bike to work) Bandung as

many as 128 people. The sample was 30 people. The amount is based on the results of categorizing the sample in accordance with the characteristics of the study. While for comparison, the authors use the control group (using motor vehicles) as many as 30 people, and the number is based on the categorization of the determination criteria similar to the sample studied.

2.3 Research Instrument

The instrument used to obtain the capability data of long term memory is used as a test remembers the word or called "Word *Test*". The instrument was adopted from Miller (1956) in "The Magical 7+2".

The research procedure was listed as follows:

- The sample is shown 15 words (not interconnected), to be memorized for 1.5 minutes;
- After 1.5 minutes, the sample is required to rewrite the words shown;
- The number of words that can be written correctly, describes the ability of long term memory of the sample.

2.4 Data Analysis Technique

The data was analyzed through the following steps:

- Choosing 30 people as the sample, in this case bike-to-work community in Bandung and the control group is those who ride motorcycle to work;
- Testing instrument validity and reliability;
- Testing data homogeneity and normal distribution;
- Testing differences by comparing the long term memory test result from experimental and control group. The test was carried out to identify if there is significant effect of bicycling activity and long term memory;
- The statistical computation was carried out through SPSS 17.

3 RESULT AND DISCUSSIONS

After the test had been done, the next step was to perform the data analysis to generate the interpretation.

Table 1: Long Term Memory Data Description.

Sample Group	N	Means	Standard Deviation	Variance	Lowest Score	Highest Score
Bicycling	30	75,53	15,34	235,36	40	100
Control Riding	39	63,97	14,55	211,69	33	87

From the description in table 1, it was shown that the means of bicycling group has higher long term memory capability than those riding motorcycle. It can be assumed that groups using bicycles are better in terms of long term memory compared to motorcycle groups.

The first step taken before testing the hypothesis is to test the normality, the result is as follows table 2:

Table 2: Skill Data Normal Distribution Test Result Long term memory.

Tests of Normality							
Control		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	Df	Sig.	Statistic	Df	Sig.
Long term memory	Bicycling	.148	30	.093	.949	30	.158
	Riding	.133	30	.188	.957	30	.255
a. Lilliefors Significance Correction							
*. This is a lower bound of the true significance.							

The sig. value for the cycling group based on Kolmogorov Smirnov was 0,093 which is higher than 0,05. Similarly, the motorcycle group has sig. value 0,188 which is higher than 0,05. It means that if the probability or sig. value is higher than 0,05 it can be deduced that the data are normally distributed. Based on the analysis, the data from both groups are normally distributed.

After the normal distribution, the homogeneity test was then carried out. The result was presented as follows table 3:

Table 3: Homogeneity Test Result.

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Long_term_ Memory	Based on Means	.087	1	58	.769
	Based on Median	.045	1	58	.832

The probability value (Sig.) For long term memory based on the average value is 0.769 and greater than 0.05 and based on the median (midpoint) probability (Sig.) Is 0.832 and greater than 0.05. Referring to the decision criteria, it can be concluded that long term memory data for cycling groups and motor groups have the same variance, meaning the research data is Homogeneous.

Thus, the test for long term memory data of cycling group and motor group can use parametric statistical test because the data is normal and homogeneous distributed.

Further data obtained are calculated by using different test to determine the effect or difference between the ability of long term memory group cycling with the control group. Testing was done by comparing the mean (t) value between the cycling group and the control group. The result was presented as follows table 4:

Table 4: Different Test Result Long Term Memory Skill of control group and bicycling group.

		Lavene Test for Homogeneity of Variance		t-test Means			Description
		F	Sig.	T	Df	Sig. (2-tailed)	
Long term memory	The Variance is deemed Homogenous	0,087	0,769	2,996	58	0,004	Significant
	The Variance is deemed not Homogenous			2,996	57,838	0,004	Significant

The F observed value for long term memory was 0,087 with probability (Sig.) 0,769. Because (Sig.) 0,769 > 0,05, Ho was accepted. The variants are not different significantly. In conclusion that the variance of long-term memory capability between cycling and control groups is the same or not significantly different. Thus, for the mean test (t) refers to the values in the same row column assumption variance. The t observed value for long term memory was 2,996 with probability (Sig.) 0,004. Because (Sig.) 0,004 < 0,05, Ho was rejected. There is a significant influence between Long term memory cycling with the control group. Based on the results of the processing, it can be concluded that, cycling activity has a positive effect on the ability of Long term memory.

Based on the results of the processing, it can be concluded that, cycling activity has a positive effect on the ability of Long term memory. Thus cycling activities not only provide a positive effect for body fitness alone but also to improve the function of the brain especially related to the quality of brain memory.

4 CONCLUSIONS

Based on the results of processing and data analysis has been done by the author, it can be concluded from the results of research. It is based on facts and the existing data that the authors obtained. The conclusion is that cycling activities can affect the ability of *long term memory*. This is evidenced by the long term memory capabilities of the cycling group is better than the ability of long term memory groups that use motorcycles (control).

REFERENCES

Auweele, Y. V., Bakker, F., Biddle, S., Durand, M., Seiler, R., 1999. *Psychology for Physical Educators*, Human Kinetics. Champaign, Illinois.

Jhon, J. R., Eric, H., 2008. *SPARK: The Revolutionary New Sciene of Exercise and the Brain*, Little, Brown and Company. NewYork.

Manoux, S. A., Hillsdon, M., Brunner, E., Marmot, M., 2005. Effects of physical activity on cognitive functioning in middle age: evidence from the Whitehall II prospective cohort study. *American journal of public health*. 95(12), 2252-2258.

Miller, G. A., 1956. The Magical Number Seven. *The Psychological review*. 63:81-97.

Tieneke, A., 2008. *Meningkatkan kecerdasan Anak dengan Olahraga*, Multiply. Tieneke & Family. [online] available at: http://www.tieneke.com/ [26 September 2008.