The Effect of Turmeric Consumption to VO$_2$Max and Lactate Threshold

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Abstract. Ergogenic aids is any substance or phenomenon that allow to enhance sport performance. Despite the list of possible ergogenic aids are much, it isn’t always considered as safe and legally utilize. It’s anticipated by making use of natural food as an ergogenic aids. Spices are the one of many kind of natural foods which has been thoughtfully considered as an ergogenic aids and the one is turmeric. Turmeric is a horticultural plant which contains cur cumin and it’s valuable to our body. The aim of this study is to figure out the effect of turmeric consumption which combined with aerobic exercise to VO$_2$Max and Lactate Threshold (LT). 12 students (19, 7±0, 45) of Sport Science major batch 2014 became the participants in this study. Experimental study was used as the research method by using randomized pretest-posttest comparison group as the design. This study was divided into 2 periods, each period was completed in 2 weeks. This study applied 4-weeks-wash-out-phase in order to avoid the carry out effect from previous period. Turmeric was orally consumed in the dose of 2 capsules (@ 550 mg) per day during the treatment period. Cardiopulmonary exercise test (12km/h protocol) with gas analysis method was utilized as the instrument to obtain the data. This study revealed the different mean value between before and after treatment in both of variables with sig.>0.05. With those results it can be concluded that there is no significant effect between before and after turmeric consumption to VO$_2$Max and LT.

1. Introduction

Various ways has been completed by a coach or athlete in attempt to improve sport performance, and one of that way is using supplements or well-known as ergogenic aids.

Ergogenic aids is any substance or phenomenon that enhances performance [1]. All athletes want to reach their peak performance in order to gain a highest achievement from all competition they compete in. Therefore, utilizing ergogenic aids as an agent to enhance their performance is necessary.

In the other hand, the list of possible ergogenic is long but a number that can be utilized is much shorter. In fact, some ergogenic substances or phenomena’s actually can impair performance (this also known as ergolytics). These are usually drugs that some people believe that it has any side effect as a consequence of the utilization [1].

Hence, using a natural food as an ergogenic aids is more suggested. Because, not only the nutritional contents but also it is valuable to our health [2]. The implementation of natural food as an ergogenic aids had been proved by many experts [3] [4] [5] [6].
Despite of natural food (e.g. fruits and vegetables), it has been thoughtfully considered that spices also have an ergogenic effect. And one of them is turmeric. Turmeric is horticultural plant that many of it has grown in some region of Asia. Besides the nutritional content, turmeric has also a typical chemical substance named cur cumin [7].

Through the research, some experts has proved the advantage of turmeric or in this case is cur cumin itself [8] [9]. Those findings prove that cur cumin has many advantages which can support physiological aspects during or post exercise.

Physiological aspects which related to sport or exercise are much. Several of it are VO\textsubscript{2}Max and Lactate Threshold (LT) [1]. As we know that VO\textsubscript{2}Max is “the maximal capacity for oxygen consumption by the body during maximal exertion. It is also known as aerobic power, maximal oxygen intake, maximal oxygen consumption, and cardiorespiratory endurance capacity” [1] and LT is “the point during exercise of increasing intensity at which blood lactate begins to accumulate above resting levels, where lactate clearance is no longer able to keep up with lactate production” [1].

Both of substances are important towards sport, especially in endurance event (e.g. marathon, cycling, soccer, etc.) [1], consequently, plenty of studies have completed to figure out the effect of various type of ergogenic aids to the improvement of VO\textsubscript{2}Max and LT [10] [11].

According to the importance of those substances to sport performance, also considering advantages of turmeric as an ergogenic aids, it is necessary to commit a study which is revealing about the effect of turmeric consumption to VO\textsubscript{2}Max and LT. In fact, study nowadays hasn’t investigated it yet.

2. Method

2.1. Design
Generally, randomized pretest-posttest comparison group design was used as research design [12], but this study also used 2 x 2 crossover design in order to compare the effect of treatment within the sample. All samples received two treatments, then the results were compared. It aims to avoid the variances of the sample which may affect to the result if it compared both of experiment and control group only [13].

2.2. Sample
12 students (19.7±0.45) of Sport Science major Universitas Pendidikan Indonesia batch 2014.

2.3. Instrument
Cardiopulmonary exercise test (using Cosmed T 150) with gas analysis method was utilized as the instrument to obtain the data [14].

2.4. Protocol
VO\textsubscript{2}Max was measured by using 12 km/h protocol, while LT was predicted by using modified v-slope.

2.5. Procedure
Sample was divided into two groups randomly. Group 1 was the experiment group which received aerobic exercise and turmeric as treatment. Then, group 2 was control group which only received aerobic exercise without turmeric. This study was divided into 2 periods, each period was completed in 2 weeks. Turmeric was orally consumed in the dose of 2 capsules (@ 550 mg) per day during the treatment period [15]. Aerobic exercise (Jogging) was scheduled 4 times in a week during the period, using vigorous intensity (60-90% maximum heart rate) which based on American College of Sport Medicine Guidlines [16]. After first period has done, this study applied 4-weeks-wash-out-phase in order to avoid the carry out effect from previous period [17]. Next period, the group which previously being the experiment group, switched and then became the control group, as well as the other group. At the beginning of each period sample performed the pre test to find out their level of VO\textsubscript{2}Max and LT. Also at the end of period sample did the post test to figure out the effect of the treatment.
3. Result

Table 1. Statistical result for VO\(_2\)Max (ml/kg/min)

| Group                                      | N  | Mean   | Std. Dev | Sig. |
|--------------------------------------------|----|--------|----------|------|
| Experiment (turmeric + exercise)           | 12 | 0,791  | 5,422    | 0,623|
| Control (only exercise)                    | 12 | -0,027 | 4,07     | 0,982|

Table 1 shows mean value of VO\(_2\)Max alteration in the number of 0,79 ml/kg/min in experiment group meanwhile -0,02 ml/kg/min in control group. Both groups show the signification value from the statistical result are 0,623 and 0,982.

Table 2. Statistical result for LT (second)

| Group                                      | N  | Mean   | Std. Dev | Sig. |
|--------------------------------------------|----|--------|----------|------|
| Experiment (turmeric + exercise)           | 12 | 61,33  | 195,67   | 0,301|
| Control (only exercise)                    | 12 | 1,333  | 145,48   | 0,975|

Table 2 shows mean value of LT alteration are 61, 33 second in experiment group meanwhile only 1, 33 second in control group. Both groups show the signification value from the statistical result are 0,301 and 0,975.

Both of variables show the signification value are > 0, 05. It can be interpreted that there is no significant differences between before and after the treatment.

![Figure 1](image_url)
4. Discussion
Figure 1 shows the alteration graph of VO\textsubscript{2}Max between before and after treatment. As we can see from the graph and those statistical result, there is no significant alteration in both of groups. It happened, due to the duration of treatment that were only 2 weeks, whereas the study which had been done by Gormley[18] figured the exercise duration for improving VO\textsubscript{2}Max is at least 6 weeks. In the other hand, improving VO\textsubscript{2}Max can be completed in short term of exercise period (2 weeks), but it can be reached by performing High Intensity Interval Training or known as HIIT [19] [20] [21]. Similarly, LT is also has the same problem with VO\textsubscript{2}Max. Due to lack of treatment duration the result wasn’t best [22].

As we know from this study, the treatment which received by experiment group were aerobic exercise and consuming turmeric in doses that had been considered before, in order to see the effect of those treatment. The results of this study are inconsistent with the study conducted by Ray Hamidie [8]. The study revealed that turmeric (cur cumin) supplementation combined with aerobic exercise can significantly improve mitochondrial biogenesis which located in skeletal muscle. The study did not directly connect between the effects of cur cumin against VO\textsubscript{2}Max and LT; but physiologically, the large number of mitochondria as the result of increased mitochondrial biogenesis, will support the increment of VO\textsubscript{2}Max as the response of aerobic exercise [23]. These effects also influence LT, where the more mitochondria then will affect in reducing the amount of lactic acid and all forms of fatigue in response to the increment of the exercise intensity [24] [25]. The study of Ray Hamidie [8] was done with duration of 4 weeks, so that the effect of cur cumin combined with aerobic exercise was significantly achieved.

From those results, several related theories and also considering about the result from previous-relevant study, it can be concluded that the lack of exercise duration causes no significance influence of turmeric consumption to the VO\textsubscript{2}Max and LT improvement.

5. Conclusion
Based on those results, it can be concluded that there is no significant effect between before and after turmeric consumption to VO\textsubscript{2}Max and LT. Writer suggest to next study to give more duration (6 to 8 weeks) on aerobic exercise in order to gain the best result for improving cardiorespiratory endurance.
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