

The Effect of Caffeine on Concentration and Accuracy of Archery

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Abstract. Caffeine is a psychoactive drug that functions to significantly improve exercise performance by preventing fatigue by inhibiting adenosine activation, increasing substrate distribution, increasing *heart rate*, or by increasing oxygen uptake. The purpose of this study was to determine the effect of caffeine on the accuracy and concentration of archery. The sample of this research is 12 archery athletes in Klaten Regency who have been active since 2019. This research is a *Quasy Experimental with . research One Group Pretest Posttest*. This study uses a *Scoring instrument* in archery to measure accuracy and a *Grid Concentration Test* to measure concentrations before and after treatment. The treatment was carried out by giving caffeine in 2 grams/ 100 ml cold (5-10°C) and hot (65°C – 70°C) coffee 45 minutes before the activity. Data analysis of this study used *Paired t-test* and Wilcoxon. The results showed that there was a difference between the pre - test and post - test of the two temperatures. At cold temperature accuracy, the p-value is 0.003 and at hot temperature, the p-value is 0.034. The results of the concentration with cold temperatures obtained p value of 0.10 and p value of hot temperatures of 0.004. In this study, it was concluded that caffeine consumption 45 minutes before the activity could increase the accuracy and concentration of archery.

Key words: caffeine, accuracy, concentration

Abstract in Indonesia. Kafein adalah obat psikoaktif yang berfungsi untuk meningkatkan performa latihan secara signifikan dengan cara menghindari dari kelelahan dengan menghambat aktivasi adenosin, meningkatkan distribusi substrat, meningkatkan *heartrate*, atau dengan meningkatkan penyerapan oksigen. Tujuan penelitian ini untuk mengetahui pengaruh kafein terhadap akurasi dan konsentrasi memanah. Sampel penelitian ini adalah 12 atlet panahan Kabupaten Klaten yang sudah aktif sejak tahun 2019. Penelitian ini adalah penelitian *Quasy Experimental with One Group Pretest Posttest*. Penelitian ini menggunakan instrument *Scoring* pada panahan untuk mengukur akurasi dan *Grid Concentration Test* untuk mengukur konsentrasi sebelum dan sesudah perlakuan. Perlakuan dilakukan dengan memberikan kafein dalam 2 gram/ 100 ml kopi robusta dingin (5-10°C) dan panas (65°C – 70°C) 45 menit sebelum aktivitas. Analisis data penelitian ini menggunakan *Paired t-test* dan Wilcoxon. Hasil penelitian menunjukkan terdapat perbedaan antara pre-test dan post-test dari kedua suhu. Pada akurasi dengan suhu dingin didapat hasil nilai p sebesar 0,003 dan pada suhu panas didapat nilai p sebesar 0,034. Hasil dari konsentrasi dengan suhu dingin didapat nilai p 0,10 dan nilai p suhu panas sebesar 0,004. Pada penelitian ini terdapat kesimpulan bahwa konsumsi kafein 45 menit sebelum aktivitas dapat meningkatkan akurasi dan konsentrasi memanah.

Kata Kunci: kafein, akurasi, konsentrasi

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INTRODUCTION

Caffeine is the most widely consumed psychoactive drug in the world (Temple et al., 2017). The majority of caffeine is consumed in coffee, but caffeine can also be found in a variety of foods, drugs and beverages (McLellan et al., 2016). *Coffea arabica* or arabica coffee consumed by 75% of the world's population contains 1.1% caffeine by weight of coffee and in *Coffea robusta* or robusta coffee consumed by 75% of the world's population it contains 2.2% caffeine by weight of coffee (Weinberg Bennett A., 2010). Robusta coffee has a more bitter and slightly sour taste and

contains more caffeine than Arabica coffee (Aditya et al., 2015).

Caffeine improves exercise performance significantly by preventing fatigue, increasing substrate distribution, or by increasing oxygen uptake (DePaula & Farah, 2019). In addition, caffeine can improve performance by increasing *heart rate*, so that the body is more ready to go to the training zone and can improve performance so as to get maximum results (Wirama, 2019). Consumption of caffeine in certain doses also increases concentration, but excessive caffeine

consumption also causes negative effects such as discomfort in the body in the form of shaking, insomnia, increased anxiety and excessive heart rate (Weinberg Bennett A., 2010).

Researchers are interested in conducting research on how the effect of caffeine consumption in 2 grams/100 ml of Robusta coffee with a certain brand on the accuracy and concentration of archery athletes.

METHODS

The purpose of this study was to determine the effect of caffeine on the accuracy and concentration of archery. This research is a *Quasy Experimental research with one group pretest posttest*. The research sample consisted of 12 people consisting of 5 men and 7 women who are active archery athletes in Klaten district who have been practicing regularly since 2019. The research sample has an average height of 157.75 cm, an average weight of 56.25 kg, average body mass index (BMI) 21.96 kg/m² and an average age of 18 years and has an average *peak height velocity* of 15.57.

This research was conducted by conducting a pretest without treatment on the next day, the posttest was given treatment and the posttest was then carried out with an interval of 2 days. The treatment was done by giving caffeine in the form of robusta coffee as much as 2 grams/ 100 ml 45 minutes before doing the posttest with cold temperatures (5°C - 10°C) in the first posttest and hot temperatures (65°C – 70°C) in the second posttest . This research was conducted at the *Smartku* Archery Club field in Klaten Regency and has been approved by the Health Research Ethics Commission (KEPK) Semarang State University Number 013/KEKP/EC/2021. Data retrieval using the archery *Scoring instrument* for accuracy and the *Grid Concentration Test* for

concentration. Data analysis used *Paired t-test* for data with normal distribution and *Wilcoxon test* for data not normally distributed, data were analyzed using the SPSS 25 application .

RESULTS AND DISCUSSION

The results of the study resulted in an analysis of the effect of caffeine on accuracy and concentration in archery athletes in Klaten Regency. The following is a description of the research results.

Normality Test Results

Normality test is used to determine whether the research data is normally distributed or not. The normality test in this study used the Shapiro-Wilk test. The basis for making normality test decisions is if the p value > 0.05 then the data is normally distributed, and if the p value < 0.05 then the data is not normally distributed.

Hypothesis Test Results

This test was conducted to determine the effect of consuming 2 grams/100 ml of caffeine in robusta coffee at a temperature of 5°C - 10°C and 65°C – 70°C within 45 minutes before carrying out activities on archery athletes in Klaten Regency by looking at the data on differences in results. *pretest* and *posttest* of each variable. The results of data analysis will be presented in the following table:

caffeine consumption as much as 2 grams/100 ml of robusta coffee on archery athletes in Klaten Regency with a temperature of 5°C - 10°C and 65°C – 70°C for 45 hours before carrying out activities on accuracy, and concentration of archery. . This is in line with the statement (Kisworo et al., 2021) that the benefits of caffeinated drinks, especially coffee, are that they can increase one's concentration. This statement is

Table 1. Normality Test for Accuracy

Group	Coffee Giving	p
<i>Pre-test</i>	Not given treatment	0.83
<i>Post-test</i>	5°C – 10°C	0.149
	65°C – 70°C	0.041

Table 2. Concentration Normality Test

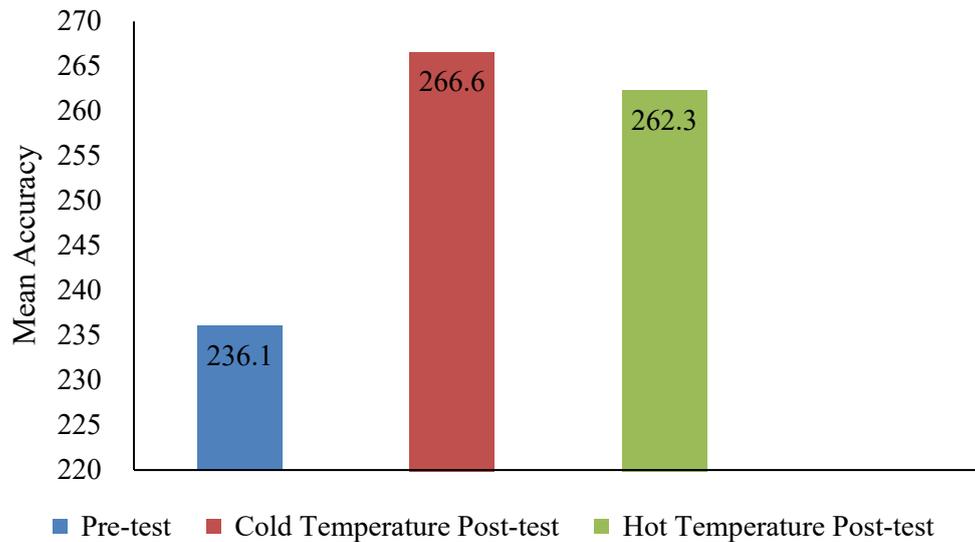
Group	Coffee Giving	p
<i>Pre-test</i>	Not given treatment	0.441
<i>Post-test</i>	5°C – 10°C	0.973
	65°C – 70°C	0.025

Table 3. Normality Test for Accuracy

Group	Coffee Giving	p
Pre-test	Not given treatment	0.83
Post-test	5°C – 10°C	0.149
	65°C – 70°C	0.041

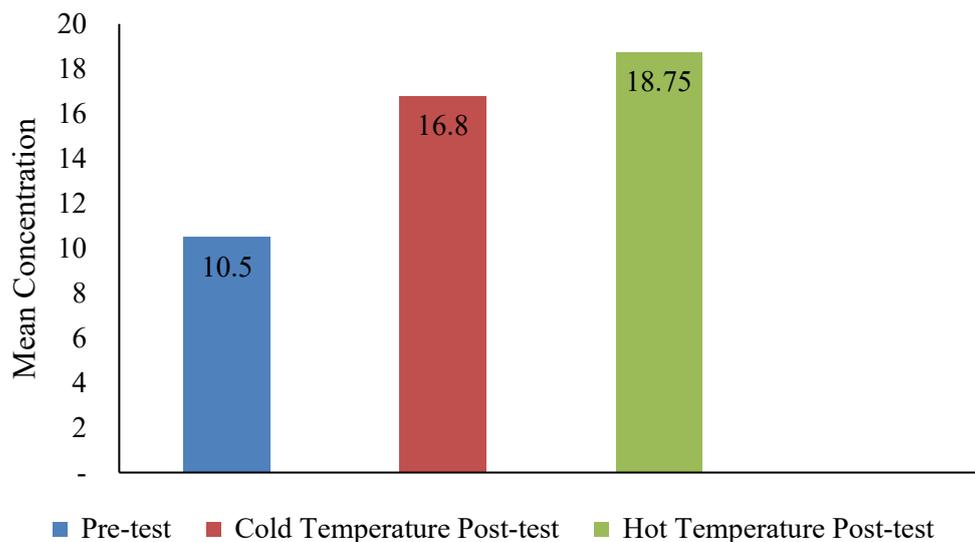
Table 4. Concentration Normality Test

Group	Coffee Giving	p
Pre-test	Not given treatment	0.441
Post-test	5°C – 10°C	0.973
	65°C – 70°C	0.025



*p<0.05 Post-test analysis of cold temperature using paired t-test (p = 0.003). Post-test analysis of heat temperature used the Wilcoxon test (p = 0.034).

Figure 1. Accuracy Results



*p<0.05 Post-test analysis of cold temperature using paired t-test (p = 0.010). Post-test analysis of heat temperature used the Wilcoxon test (p = 0.004).

Figure 2. Concentration Results

in line with (Oktadina et al., 2013) that the caffeine content in coffee can increase a person's concentration, because caffeine can affect the central nervous system which acts as a stimulant by interfering with brain chemicals, adenosine at receptors and also statements (Brice & Smith, 2001).) that consuming caffeine can improve psychomotor functions such as dexterity and accuracy.

Physiologically, caffeine is broken down in the liver by the cytochrome P 450 enzyme system which oxidizes to 3 dimethylxanthine metabolites (Listiarini et al., 2019) . Caffeine works by accelerating the activity of nerve cells so that it can reduce fatigue, increase alertness, cause feelings of energy, and increase concentration (Suyono, 2016) . Caffeine consumed before exercise can increase the average performance of $2.3\% \pm 3.2\%$ and give an ergogenic effect, namely the effect of increasing physical performance by 3 mechanisms 1) Increase intracellular calcium mobility, 2) Increase free fatty acid burning, 3) Works as an adenosine receptor antagonist so that the body does not get tired of the nervous system and neurotransmitters so that it increases the average performance of $2.3\% \pm 3.2\%$ (Ganio et al., 2009) .

Concentration on the sport of archery is very important for every athlete, because to produce maximum archery accuracy requires strong concentration (Yachsie et al., 2021) . Based on the statement and research results, increasing concentration can increase archery accuracy, this is also supported by the statement (Jannah, 2017) that concentration in archery serves to support athletes to be able to display techniques that have been studied accurately and not disturbed by the environment and statements (Mahanani & Indriarsa, 2021) that if concentration decreases it will affect the performance of the athlete himself.

CONCLUSION

Consumption of caffeine as much as 2 grams/100 ml of robusta coffee in archery athletes in Klaten Regency with a temperature of $5^{\circ}\text{C} - 10^{\circ}\text{C}$ and $65^{\circ}\text{C} - 70^{\circ}\text{C}$ for 45 hours before carrying out activities increased archery accuracy and concentration.

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