

**The Effect Of Brown Sugar Supplement On Heart Rate Recovery In Female Volleyball Athletes**Salma Ramadhania^{1*}, Agung Wahyudi²¹²Physical Education, Health and Recreation, Faculty of Sports Science,
Semarang State University, Indonesia**Keywords**Recovery; Brown
Sugar; Women's
Volleyball**Abstract**

This study aims to analyze the effect of brown sugar supplement on heart rate *recovery* in Voppick Kebumen women's volleyball athletes. This study uses an experimental method with a *two-period crossover design*. The research sample amounted to 30 female volleyball athletes who were divided into two groups. This research instrument uses bleep test which aims to increase the athlete's pulse until it reaches a tired state, pulse measurement using palpation techniques and also *stopwatches* to measure recovery time. The results of this study show that brown sugar solution has a significant influence on the *pulse recovery* of Voppick Kebumen women's volleyball athletes. Based on the results of the hypothesis test, it showed a Sig. value of $0.000 < 0.05$ with a t-value of 18.489 and the results of the *effect size* calculation, obtained a Cohen's d value of 2.212 which belongs to the large category. The conclusion of this study shows that the administration of brown sugar solution drinks has a significant influence on *pulse recovery* in women's volleyball athletes Voppick Kebumen. In addition, brown sugar supplement have been shown to be effective in helping to speed up the recovery of the pulse after physical activity.

✉ Corresponding author :

E-mail: salmaramadhaniao6@students.unnes.ac.id

INTRODUCTION

Volleyball is one of the achievement sports that has experienced rapid development and has the characteristics of high-intensity physical activity. In this game, athletes are required to perform various explosive movements such as jumping, smash, blocking, and fast movement movements in a short period of time (Wahyudi et al., 2022). Success in volleyball depends not only on mastering the technique and strategy of the game, but also greatly influenced by the physical condition and physiological readiness of the athlete in the face of the demands of training and matches (Suhartono et al., 2025). The characteristics of volleyball games played in several sets with a long duration require athletes to be able to maintain a stable and consistent physical performance during the match (Wahyudi Agung, 2025).

Intense and repetitive physical activity in volleyball can improve the performance of an athlete's cardiovascular system (Agung Wahyudi et al., 2025). One of the common physiological indicators used to indicate the body's response to physical activity is pulse. The pulse increases as the intensity of activity increases as the body adapts to meet its oxygen and energy needs (Darmawan et al., 2025). In competitive match situations, the heart rate increases rapidly, especially when athletes engage in long rallies, perform repeated smashes, and endure intense game pressure. This significant increase in heart rate reflects a significant workload on the heart in supporting the physical activity of volleyball athletes, particularly during the high-intensity and fast-paced phases of play (Wahyudi & History, 2017).

An increase in pulse rate that occurs during physical activity will be followed by a recovery process after the activity is completed. *Recovery* is a physiological process that aims to return the body to a state of homeostasis (Burhan, 2021). This situation can affect reduced focus, decreased quality of playing technique, and athletes' readiness to undergo the next physical activity (Koesherawati et al., 2022). Physical fatigue that is not accompanied by an optimal recovery process can cause a build-up of fatigue and risk reducing athletes' performance continuously. In volleyball athletes who have a busy training schedule and matches, *Recovery* It is very important to maintain performance and reduce the risk of overtraining and injury (Sinulingga et al., 2023).

Factors that play an important role in supporting the process *Recovery* That is, paying attention to the intake of food into the body. The food given to athletes should have nutrients that can meet the needs of athletes' daily activities and sports (Purba & Setiowati, 2022). Food and drink affect an athlete on several things, namely blood pressure, sugar levels and pulse, intake also affects the delay of fatigue. One of the important nutritional intakes for athletes is carbohydrate nutrients because they can support athletes' energy needs during training sessions and during matches (Permadi et al., 2024). Drinks containing carbohydrates are a practical choice in the process *Recovery* Because it is easy to consume and quickly absorbed by the body. Giving carbohydrates in the form of drinks is considered more effective in the initial recovery phase because it can accelerate the absorption of nutrients and help the body return to a more stable physiological condition.

The body's glucose needs can be obtained through the consumption of carbohydrate foods or drinks. Intake of drinks containing around 6–8% glucose is known to help athletes delay the onset of fatigue (Rubiono & Setiawan, 2020). One of the natural ingredients that has the potential to be used as a recovery drink is brown sugar. Brown sugar contains simple carbohydrates that the body can quickly process into glucose as an energy source. In addition to being easy to find, the price is relatively affordable, and safe to consume, so it has the opportunity to be used in athlete coaching programs (Dwi Nugroho et al., 2023). The use of natural ingredients such as brown sugar also supports the use of local sources of nutrients that are more economical and easily accessible to athletes at various levels of coaching.

In the training process, female volleyball athletes at Club Voppick Kebumen often experience fatigue after doing high-intensity physical activity. This fatigue causes athletes to be less than optimal when they return to resume the next training session because the body's condition has not fully recovered. One of the causes is a poor *recovery* process, which is characterized by slow pulse recovery after doing activities. Based on the results of the study, most of the athletes of Club Voppick Kebumen only consume water after training as a form of *recovery*. Meanwhile, previous research has shown that carbohydrate-based recovery drinks can accelerate pulse recovery after physical activity. The body also needs additional energy intake to help speed up the recovery process.

According to (Khairiyah et al., 2025), that the administration of brown sugar water solution drinks has an effect on *Recovery* pulse in female futsal athletes. However, the research was carried out on futsal sports, so that the characteristics of physical activity are different from volleyball which has its own movement patterns and physical demands. The difference in the characteristics of these sports allows for differences in the physiological response of athletes to the administration of drinks *Recovery*, so that the results of research on futsal cannot necessarily be generalized to volleyball athletes.

Therefore, based on the results of the study, the study was interested in examining the effect of giving brown sugar solution on pulse *recovery* in female volleyball athletes at the Kebumen Voppick Club. The purpose of this study is to find out whether there is an the effect of brown sugar supplement on heart rate recovery in female volleyball athletes and to find out how effective brown sugar water solution drinks are in accelerating pulse recovery after physical activity.

The research hypothesis states that the first hypothesis (H_{a1}) states that there is an effect of giving brown sugar solution drinks on pulse *recovery* in female volleyball athletes and the second hypothesis (H_{a2}) states that the administration of brown sugar solution drinks is effective in accelerating the decrease in pulse rate after physical activity in female volleyball athletes.

METHODS

This study is a type of quantitative research that uses experimental methods to compare the pulse recovery ability of female volleyball athletes who consume brown sugar solution drinks with athletes who consume only regular water (Sinaga et al., 2018). The design in this study is the design *Two-period crossover design*, that is, a research design involving two groups of subjects with relatively similar initial abilities. Sampling was admitted by the total sampling method. The population in this study is female volleyball athletes at Club Voppick Kebumen consisting of 30 female athletes aged 16-19 years. The location of the research was carried out on the volleyball court of Club Voppick Kebumen.

Schematically the research design can be described as follows:

Group 1 : $O_1 \rightarrow X_1 \rightarrow O_2 \rightarrow \text{Washout} \rightarrow O_1 \rightarrow X_2 \rightarrow O_2$

Group 2 : $O_1 \rightarrow X_2 \rightarrow O_2 \rightarrow \text{Washout} \rightarrow O_1 \rightarrow X_1 \rightarrow O_2$

Description:

O_1 = Pretest pulse measurement

X_1 = Brown sugar solution treatment

X_2 = Water treatment

O_2 = Recovery pulse measurement (posttest)

Washout = 1 Week Break Time

Data collection in this study uses *bleep test*, which aims to increase the pulse rate of athletes until they reach a state of fatigue. After the test is complete, the pulse measurement is carried out manually using the palpation technique. This process utilizes supporting facilities and tools such as volleyball courts, cones for track markers, stationery for data recording, speakers to provide rhythm *Beep*, and *Stopwatch* to measure the length of time *Recovery* pulse. The solution of brown sugar water drinks in the study, namely by using 80 grams of good quality brown sugar dissolved in 250 ml of water (Alawi & Ray, 2021).

The data collection procedure begins with: (1) warming up first for about 10 minutes to avoid possible injury, (2) then all samples take a bleep test, (3) after that the samples that have been completed are given treatment, (4) then the sample is checked the pulse to find out how much time it takes to return to a normal pulse.

The data analysis technique obtained from the effect of giving brown sugar drinks on pulse *recovery* was carried out by conducting a data normality test using SPSS version 23, then the data was analyzed using a Hypothesis Test (paired t-test) to find out the difference in pulse *recovery* given ordinary water drink treatment compared to brown sugar water drink treatment. Then, using the Effectiveness Test (Cohen's d). After the results have been obtained, the data is described according to the formulation of the problem that has been formulated.

RESULTS AND DISCUSSION

This study uses a *two-period crossover design*, which is a research design that involves two groups of subjects with relatively similar initial abilities. This study was carried out for 3 weeks with a total of two treatment periods. Each treatment period is carried out in one meeting. The research sample used all members with group divisions carried out based on the results of the initial bleep test ranking. Athletes were ranked from 1st to 30th, then divided into two groups with initial abilities that were relatively balanced with the ABBA system, namely the design of treatment sequence arrangements in experimental research that was not in the form of a mathematical formula, but a treatment balancing pattern. Group 1 consists of 15 athletes A, while group 2 consists of 15 athletes B.

After conducting research and conducting a data processing process for 30 female volleyball athletes at the Kebumen Voppick Club. The data from the research subjects will be described as follows:

Table 1. Normality Test

Variable	Statistic	Df	Sig.
Sugar Solution	.950	30	.170
Water	.961	30	.335

Based on the results of the normality test, the pulse *recovery* variable in the brown sugar solution treatment obtained a significance value of 0.170. Meanwhile, in water it is 0.335. Because both significance values are greater than 0.05, the data in both treatments are declared to be normally distributed so that the analysis can be continued using the paired sample t-test.

Table 2. Hypothesis Test

Variable	T	Df	Sig.	Remarks
Brown Sugar Solution – Water	18.489	29	0,000	Significant

Based on the paired sample t-test, a value of Sig. $0.000 < 0.05$ was obtained, so that there was a significant difference between the treatment of brown sugar solution and water at the Volpick Kebumen volleyball club.

Table 3. Effectiveness Test

Variable	Cohen's value d	Categories	Remarks
Pulse Recovery Brown Sugar Solution	2.2126	Large	Effective treatment

Based on the results of the effect size calculation, Cohen's d value of 2.2126 was obtained which is included in the large category. This shows that the administration of brown sugar solution has a great and effective influence on *Recovery* pulse.

The results of the study showed that the administration of brown sugar solution had a significant effect on *Recovery* the pulse of the women's volleyball athletes of Club Voppick Kebumen compared to the administration of water. Based on the normality test, the data on both treatments were normally distributed because the significance value of brown sugar solution was 0.170 and water was 0.335, both greater than 0.05. Thus, the data are eligible to proceed to parametric tests using paired sample t-tests. The results of the hypothesis test showed a Sig. value of $0.000 < 0.05$ with a t-value of 18.489, so that there was a very significant difference between the treatment of brown sugar and water solution on *Recovery* athlete's pulse rate (Gonzalez et al., 2022).

Brown sugar solutions are more effective in helping to accelerate pulse recovery after physical activity. *Recovery* Pulse rate is an indicator of the body's ability to return to normal conditions after doing moderate to high intensity activities. The faster the pulse returns to the resting state, the better the recovery ability of the athlete's body. The carbohydrate content in tamarind sugar is the main factor to help the energy recovery process and accelerate the body's metabolic system after exercise (Podlogar et al., 2025).

According to (Sims et al., 2023), brown sugar contains glucose and sucrose which the body can absorb as a quick source of energy. Simple carbohydrates function to restore muscle glycogen reserves that are reduced during physical activity. In addition, brown sugar contains minerals such as potassium, iron, and magnesium that help maintain electrolyte balance and support muscle and heart function. Thus, the process of *Recovery*, reduce fatigue, and help the body return to the position of homeostasis.

Based on the effectiveness test, Cohen's value d of 2.2126 belongs to the large category. This shows that the effect of brown sugar solution is not only statistically significant, but also practically strong and provides real benefits for athletes in the process of recovering pulse after physical activity. Value *effect size* large indicates that the treatment has a substantive impact in sports experiment research.

CONCLUSION

Based on the results of this study, the administration of brown sugar supplement drinks had a significant effect on pulse recovery in Club Voppick Kebumen women's volleyball athletes. Brown sugar solutions have been shown to be effective in helping to accelerate pulse recovery after physical activity. Thus, brown sugar solution can be used as an alternative to natural drinks that are easy to obtain and economical to help the recovery process of athletes after training and matches. The results of this study are not only beneficial for volleyball coaches and players, but can also contribute to the overall development of sports science.

REFERENCES

- Agung Wahyudi, Competition, Susetyo, D. A., & Athletics. (2025). *Physical Condition Profile of Male Volleyball Athletes for the 2025 Magelang Regency Pre-Provincial Athletics Competition*. 6, 354–363.
- Alawi, C. M., & Ray, H. R. D. (2021). The Effect of Consuming Palm Sugar (*Arenga Pinnata*) Before Exercise on Muscle Endurance. *Indonesian Journal of Sports Science*, 2(2), 53–58.
- Burhan, Z. (2021). The Effectiveness of Giving Massage with Active Recovery on Lowering Pulse Rate in Ungga Electric Men's Volleyball Athletes. *Scientific Journal of Global Education*, 2(1), 81–86.
- Darmawan, S., Irsyad, M., Fauzia, S., & Setiawan, M. A. (2025). Systematic Literature Review: The Impact of Active Recovery on Post-Sport Pulse Reduction. *Indonesian Journal of Sports and Health (JOKI)*, 6(1), 52–65.
- Dwi Nugroho, M., Sukarmin, Y., & Suhartini, B. (2023). Fulfillment of nutrition intake of volleyball athletes to achieve achievement: a systematic review. *Int J Multidiscip Res Anal*, 6, 5.
- Gonzalez, D. E., McAllister, M. J., Waldman, H. S., Ferrando, A. A., Joyce, J., Barringer, N. D., Dawes, J. J., Kieffer, A. J., Harvey, T., Kerkick, C. M., Stout, J. R., Ziegenfuss, T. N., Zapp, A., Tartar, J. L., Heilesen, J. L., VanDusseldorp, T. A., Kalman, D. S., Campbell, B. I., Antonio, J., & Kreider, R. B. (2022). International society of sports nutrition position stand: tactical athlete nutrition. *Journal of the International Society of Sports Nutrition*, 19(1), 267–315. <https://doi.org/10.1080/15502783.2022.2086017>
- Khairiyah, M., Imanudin, I., Zaky, M., & Haryono, T. (2025). *DJS (Dharmas Journal of Sport) The Effect of Brown Sugar Water Solution Drink on Pulse Recovery in Women's Futsal Athletes, Faculty of Sports and Health Education, Universitas Pendidikan Indonesia*. Sec. 1, 43–48.
- Koesherawati, T., Rejeki, H. S., & Samodra, Y. T. J. (2022). Acceleration of Recovery with Pulse Indicator: Relation to Exercises That Have Been Done. *Journal of Recreational Health Education*, 8(2), 386–396.
- Permadi, M. R., Purnasari, G., & Renamastika, S. N. (2024). The Nutrition Counseling Improve Volleyball Athletes Knowledge. *International Journal of Healthcare and Information Technology*, 1(2), 68–74.
- Podlogar, T., Smith, N. C., Gonzalez, J. T., & Wallis, G. A. (2025). Personalised carbohydrate feeding during exercise based on exogenous glucose oxidation : a proof - of - concept study. *Performance Nutrition*, 1–10. <https://doi.org/10.1186/s44410-025-00003-9>
- Purba, D. P., & Setiowati, A. (2022). The effect of giving brown sugar water on aerobic endurance in football players in Semarang. *Journal of Sport Science and Fitness*, 8(2), 104–111.
- Rubiono, G., & Setiawan, D. (2020). Review of Research Trends on Drinks Consumed for Physical Recovery During Exercise. *Proceedings of the National Seminar on Sports Science and Technology (SENALOG)*, 3(1).
- Sims, S. T., Kerkick, C. M., Smith- ryan, A. E., Janse, X. A. K., Jonge, D., Hirsch, K. R., Arent, S. M., Hewlings, S. J., Kleiner, M., Bustillo, E., Tartar, J. L., Starratt, V. G., Richard, B., Greenwalt, C., Rentería, L. I., Ormsbee, M. J., Trisha, A., Campbell, B. I., Kalman, D. S., ... Kalman, D. S. (2023). Journal of the International Society of Sports Nutrition International society of sports nutrition position stand : nutritional concerns of the female athlete. *Journal of the International Society of Sports Nutrition*, 20(1). <https://doi.org/10.1080/15502783.2023.2204066>
- Sinaga, F. A., Ginting, S. B., Recovery, D. N., Physical, A., & Introduction, A. (2018). *The effect of giving tomatoes on the recovery pulse after maximum physical activity*. 2(1), 1–12.
- Sinulingga, A. R., Nova, A., Maesaroh, S., & Firmansyah, G. (2023). The Fatigue Index of Swadaya Bhayangkara

- Volleyball After a Match. *Journal of Physical Education, Sport and Health*, 6(2), 237–248.
- Suhartono, R., Rosidi, S., & Purwati, T. (2025). The Joy Of Sport And The Coaching Responsibilities Of Sportsmen And Youth Volleyball Athletes. *JOURNAL OF PENJAKORA*, 12(2).
- Wahyudi, A., & History, A. (2017). *Journal of Physical Education , Sport , Health and Recreations*. 6(2), 140–143.
- Wahyudi, A., Wijayanti, D. G., & History, A. (2022). *Journal of Physical Education , Sport , Health and Recreations*. 11(1), 26–29.
- The Great Revelation. (2025). *Enhancing Elementary School Students' Cognitive Development through Volleyball Learning Using the Simulation Method on Locomotor , Non-Locomotor , and Manipulative Movements*. 6(2020), 347–353.