

Behavior Regarding Fluid Consumption Following Physical Activity In Indonesian Active Individuals Comportamiento en relación al consumo de líquidos después de la actividad física en individuos ativos indonesios

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Abstract. There is a lack of reliable information regarding post-exercise rehydration behaviours, particularly with regards to beverage preference and encouragement. Using a random sampling technique, 661 participants from three groups (sports enthusiasts, athletes, and coaches) were chosen randomly to fill out a questionnaire on fluid intake following exercise. Pearson Correlation is used to examine the data and find the connection between exercise modality, frequency, and duration. The study indicated that mineral water, electrolyte drinks, and milk were the three most frequently consumed options for rehydration following exercise. For sports enthusiasts, taste and accessibility are the most important factors in purchasing a beverage, followed by personal preference about the advantages of the beverage's contents. The major aspect for athletes and coaches, however, is knowledge of the components' favorable benefits. In contrast to the majority of participants in this survey, who had reasons to emphasize accessibility, the majority of sports enthusiasts choose mineral water as their preferred beverage. Whilst, athletes and coaches who are aware of the influence that beverages have on performance tend to place a higher priority on the content's performance-enhancing capabilities.

Key words: Consumption behavior, Beverages, Physical Activity.

Resumen. Se carece de información fiable sobre los comportamientos de rehidratación tras el ejercicio, especialmente en lo que respecta a la preferencia de bebidas y el estímulo. Mediante una técnica de muestreo aleatorio, se eligió al azar a 661 participantes de tres grupos (entusiastas del deporte, atletas y entrenadores) para que rellenaran un cuestionario sobre la ingesta de líquidos después del ejercicio. Se utilizó la correlación de Pearson para examinar los datos y hallar la conexión entre la modalidad de ejercicio, la frecuencia y la duración. El estudio indicó que el agua mineral, las bebidas con electrolitos y la leche eran las tres opciones más consumidas para rehidratarse después del ejercicio. Para los aficionados al deporte, el sabor y la accesibilidad son los factores más importantes a la hora de comprar una bebida, seguidos de las preferencias personales sobre las ventajas de su contenido. Sin embargo, el aspecto más importante para los atletas y entrenadores es el conocimiento de los beneficios favorables de los componentes. A diferencia de la mayoría de los participantes en esta encuesta, que tenían motivos para destacar la accesibilidad, la mayoría de los entusiastas del deporte eligen el agua mineral como bebida preferida. Al mismo tiempo, los atletas y entrenadores que son conscientes de la influencia que tienen las bebidas en el rendimiento tienden a dar mayor prioridad a las capacidades de mejora del rendimiento del contenido.

Palabras clave: Comportamiento de consumo, Bebidas, Actividad física.

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Introduction

Everyone needs to stay hydrated in order to sustain the many activities they engage in on a daily basis. Even without food, a human being can live for more than three weeks, but only three days without water. Understanding the significance of fluid intake, it is suggested that one consume eight glasses of water daily. Mineral water is sufficient to replace fluid consumption for activities lasting less than an hour for individuals who are active with moderate to severe physical activity. However, extra electrolyte-rich (Na⁺ and K⁺) drinks should be made available if the physical activity is moderately intense and lasts for more than one to two hours. Meanwhile, if the workout lasts longer than two hours, you'll need fluids with extra carbohydrates and/or protein in addition to sodium and potassium to replace lost electrolytes. (Jeukendrup, 2011; Kreider et al., 2017; Porcari et al., 2015; Potgieter, 2013a). Sodium-containing carbohydrate and electrolyte drinks have been shown to increase fluid retention and stimulate thirst, while drinking only water has been shown to increase urine production, leading to a reduction throughout intake and an increase in sweating due to exercise and fatigue (Dieny & Putriana, 2015), whether it should be maintain our nutritional status after exercise (Contreras-Mellado et al., 2022).

Many places have spread the word about the importance of staying hydrated before, during, and after sleeping (Kemenkes RI, 2020; Potgieter, 2013b; Purcell, 2013). However, surveys show that many people, especially adolescents, still have the habit of skipping meals and fluid intake (Carrasco-Luna et al., 2018). Youth football players in Indonesia, according to a study (Penggali et al., 2019), lose an average of 1.59 and 1.62 percent of their body weight, respectively, during summer and winter training camps due to dehydration (Berta Yurezka, Laksmi Widjanti, 2017). The recommended range for fluid intake by athletes throughout the training period (i.e., before, during, and after exercise) is 2.4–3.4 liters, as advocated by numerous studies and cited by reputable reference sources like the American College of Sports Medicine (ACSM), the National Athletic Trainers' Association (NATA), and the American Dietetic Association (ADA) (Dieny & Putriana, 2015). The findings of this study indicate that there is still a lack of public awareness regarding the importance of meeting fluid needs.

It's important to be mindful when consuming fluids after exercise because there's such a wide variety of options to choose from. Field observations reaffirm the literature discussing the high consumption of mineral water after exercise among Indonesians (Dieny & Putriana, 2015) and show that the vast majority of people hold drinking

containers filled with water alone. Athletes who are aware of the benefits of drinking plenty of water also tend to drink more electrolyte drinks and even energy drinks, though it remains unclear whether or not this trend is reflective of actual consumption patterns while competing. A study conducted in one area of Indonesia, specifically the Yogyakarta region, found that athletes who are aware of the signs of dehydration due to inadequate fluid intake are able to take steps to avoid the condition from worsening. At 83.34%, the vast majority of study participants were adequately hydrated (Nurfadhila, 2021). Yet, many sports enthusiast still report feeling thirsty during workouts in other sources (Colquitt et al., 2016), because of intense workouts (Terrones-Concepción et al., 2022). Boundaries in terms of subject involvement, homogeneity, and voluntary involvement undermine the viability of public consumption behavior. According to data gathered for the Indonesian Regional Hydration Study (THIRST), nearly half of the people studied had problems with their body's ability to retain water. Water scarcity affects 49.5% more 15-18 year olds than it does 42.5% of 25-55 year olds (Tauchid & Noordia, 2020). Some findings from these studies suggest that there is still a lack of public awareness regarding the importance of meeting fluid needs, especially among adolescents. There is a lack of reliable information about how often people in Indonesia drink after working out. Recovery after exercise or sports can be beneficial for rehydration, cell regeneration, and replenishment of carbohydrate stores, but only if the right pattern of consumption behavior is followed (Alghannam et al., 2018). Therefore, this study is necessary to analyze the consumption patterns of sports enthusiast, athletes, and coaches to determine how fluid intake behavior is applied in the context of leading an active and healthy lifestyle.

Method

Subjects/ Participants

A total of 661 respondents filled in voluntarily with the category of respondents divided into three groups, namely sports enthusiast, athletes, and coaches.

Research Instruments and Procedures

Due to the pandemic conditions, questionnaires asking about fluid intake after exercise were distributed both online and offline. Authorities in various parts of Indonesia were sent questionnaires, with most responses coming from Java Island, which has the most people. Many factors, including exercise type, frequency, and duration, as well as environmental conditions, can influence a person's fluid needs, so the facilitator asks questions to guide the subject's responses. After that, there are the main questions, which offer a selection of 12 different beverages; each respondent can pick as many as three questions to answer. Afterwards, there is an option question with compelling arguments in favor of each of the three beverages. Each participant should be able to identify three of the eight possible motives for

their beverage preference. The questionnaire behavior beverages consumption after exercise (Table 1) was valid and reliable (Cronbach Alpha (r): $0.637 > 0.230$).

Table 1.
Instruments description

Core Variables	List of choices	Core Variables	List of choices
Exercise type	Aerobic	Optional beverages available	12 beverages option
	Combination		
Exercise frequency	once a week	Motives of consumption	8 motives
	twice a week		
	third times a week		
	4-5 times/week		
Exercise duration	6-9 times/week		
	> 10 times/week		
	< 60 minutes,		
	60 – 120 minutes,		
	> 120 minutes		

Ethical Clearance

Respondents are required to sign a declaration of informed consent on the first page of the questionnaire. Participation in this study is voluntary, and researchers keep the data confidential. This research has been approved by the ethical commission and the Medical and Health Research Ethics Committee (MHREC) of the Faculty of Medicine, Public Health, and Nursing, Gadjah Mada University, with the reference number KE/FK/0637/EC/2022.

Statistic analysis

Data was analyzed statistically with IBM Stats 24, with quantitative descriptive calculations (Chi-Square) and correlation tests (Pearson Correlation) between exercise frequency and duration and fluid intake.

Results

The first data obtained relates to the predominant type of exercise performed routinely during physical activity, with aerobic, anaerobic, or a combination of the two as the dominant choice (Table 3). Based on the classification of the respondents, a summary of the types of exercise that occur and are exercised can be seen in table 2, and for a deeper detailed outline, see figure 1.

Using the description of the typical form of exercise (Figure 1), questions are developed to determine how many sessions the respondent typically completes per week. The data accurately reflect what is occurring in the field due to their diverse distribution. Due to the fact that the majority of respondents were sports enthusiasts, it is known that the highest percentage of subjects engage in physical activity twice per week, although three times per week also meets WHO guidelines.

After investigating the weekly frequency of physical activity, the steps of the investigation are narrowed to determine the average duration of physical activity for all respondents, as shown in Table 3. The majority engage in sports for between 60 until 120 minutes, primarily engage for an average of 90 minutes (Table 4)) and are considered to have met the WHO-recommended minimum standards of 50 minutes per session, three times per week.

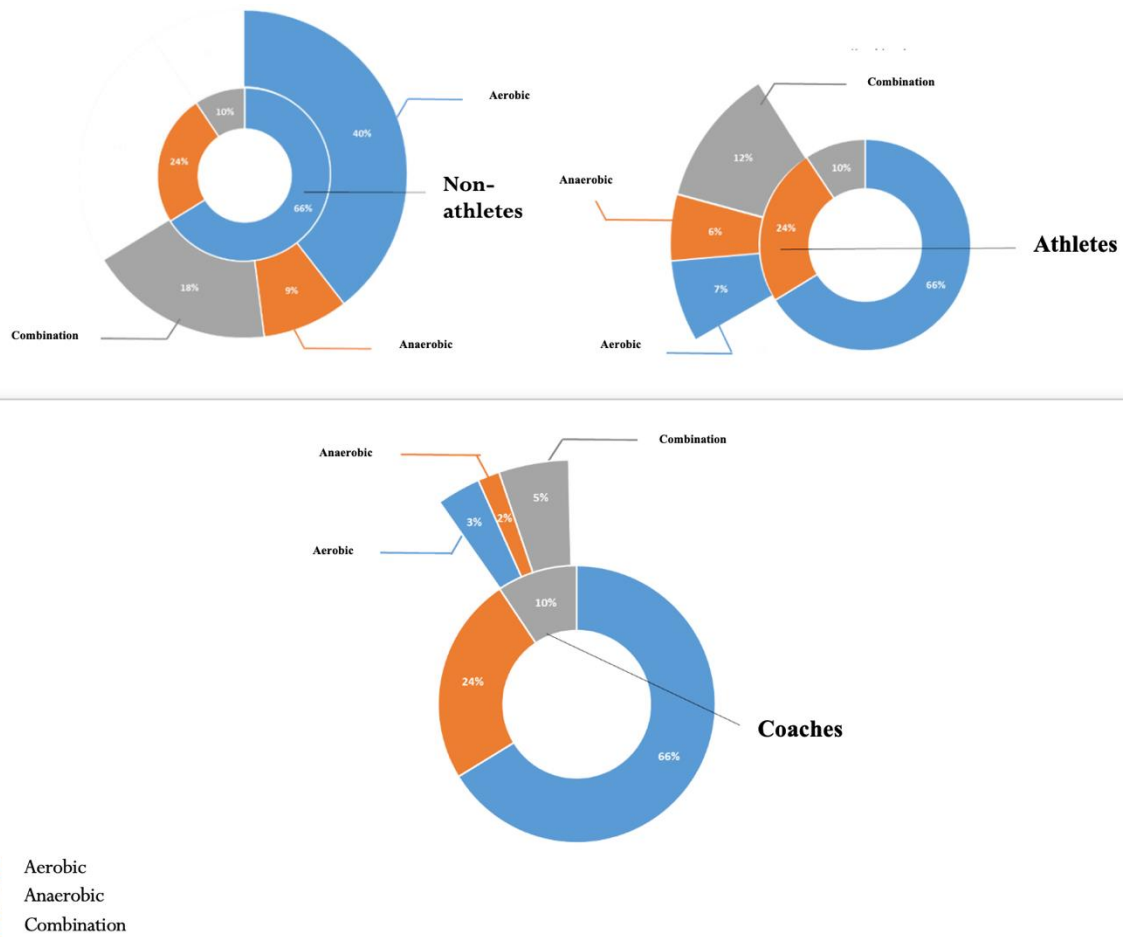


Figure 1. Distribution of percentages and types of exercises performed by all respondents

Table 2.

Respondents characteristics				
Variables	Non-athletes	Athletes	Coaches	Total respondents
Gender				
Males	287	91	50	428
Females	151	70	12	233
Total	438	161	62	661
Participants Age (Years)				
11-15	12	16	0	28
16-20	298	125	10	433
21-25	60	19	22	101
26-30	37	1	17	55
31-35	17	0	7	24
36-40	5	0	2	7
41-45	6	0	2	8
46-50	3	0	1	4
51-55	0	0	1	1
Demography (Province)				
West Java	132	46	23	202
Yogyakarta	94	33	8	134
Central Java	65	15	3	83
East Java	58	40	11	109
Bangka Belitung	1	2	1	4
Banten	29	11	3	43
Bali	1	0	1	2
DKI Jakarta	17	2	1	20
Bengkulu	14	9	5	27
North Sumatera	4	0	0	4
West Sumatera Barat	4	1	0	6
South Sumatera	0	1	0	1
South East Sulawesi	2	0	2	3
East Papua	0	0	1	1
NTT	1	1	0	2
South Sulawesi	1	0	0	1
Jambi	1	0	1	2
Riau	6	0	0	5
Gorontalo	0	0	0	1
Central Kalimantan	2	0	1	3
East Kalimantan	3	0	1	4
Lampung	3	0	0	4

Table 3.

Exercise frequency

Frequency	Non-athletes (n=438)	Athletes (n=161)	Coaches (n=62)	Total (n=661)
once a week	94 (14.22%)	6 (0.90%)	5 (0.75%)	105
twice a week	147 (22.24%)	24 (3.63%)	13 (1.96%)	184
third times a week	132 (19.96%)	53 (8.02%)	22 (3.32%)	207
4-5 times/week	63 (9.53%)	47 (7.11%)	21 (3.17%)	131
6-9 times/week	2 (0.3%)	26 (3.93%)	1 (0.15%)	29
> 10 times/week	0 (0%)	5 (0.75%)	0 (0%)	5

Table 4.

Exercise duration				
Exercise duration	Non-athletes (n=438)	Athletes (n=161)	Coaches (n=62)	Total (n=661)
60 minutes	125 (18.91%)	6 (0.15%)	10 (1.51%)	141
90 minutes	266 (40.24%)	102 (15.43%)	48 (7.26%)	416
120 minutes	47 (7.11%)	53 (8.02%)	4 (0.61%)	104

Examine the multiplication between frequency and duration, calculate the volume of exercise, and determine whether or not it meets WHO recommendations. Under 18 years old may accumulate up to 420 minutes per week, whereas over 18 years old may accumulate up to 150 minutes per week.

Table 5 displays the tracking of fluid consumption after exercise, which is typically performed by all non-athletes, athletes, and coaches, with a maximum of three beverage options from each respondents.

Table 5. Recovery fluid intake; the amount of fluids ingested after exercise

Fluid Intake (n (%))	Non-athletes (n=438)	Athletes (n=161)	Coaches (n=62)	Total (n=661)
1. Plain water	413 (66%)	149 (23%)	60 (9%)	622
2. Electrolyte drink	173 (66%)	67 (25%)	21 (8%)	261
3. Electrolyte drink with carbs and/or protein	18 (60%)	9 (30%)	3 (10%)	30
4. Coconut water	44 (54%)	29 (35%)	8 (9%)	81
5. Plain milk	41 (62%)	20 (30%)	5 (7%)	66
6. Pasteurization milk	4 (57%)	2 (28%)	1 (14%)	7
7. UHT milk	90 (65%)	41 (29%)	7 (5%)	138
8. Whey milk	16 (55%)	7 (24%)	6 (20%)	29
9. Sport bar	2 (40%)	3 (60%)	0 (0%)	5
10. Sport gel	1 (50%)	1 (50%)	0 (0%)	2
11. Energy drink	7 (70%)	2 (20%)	1 (10%)	10
12. Sport drink	2 (100%)	0 (0%)	0 (0%)	2
	811	330	79	1253

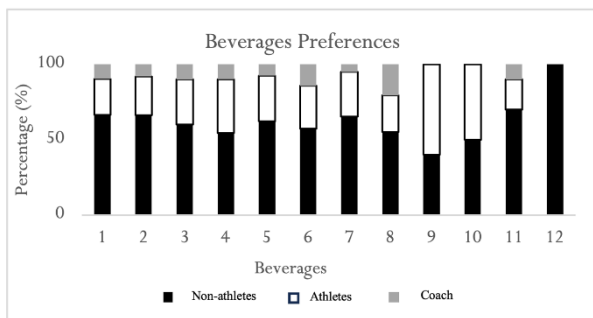


Figure 2. Beverages preferences

It is also well-known that all subjects choose different beverages for different reasons, including content benefits, convenience, taste, price, cost, hygiene, availability of alternatives near the venue, peer pressure, and general trends. From Table 6., displays the various responses of motives among the 661 respondents who completed out the survey, with a maximum of three beverage options from each respondents.

Table 6. Motives for selecting the type of beverage

Motives	Non-athletes (n=438)	Athletes (n=161)	Coaches (n=62)	Total (n=661)
1. The benefits of the content that is owned	201 (60%)	100 (30%)	31 (9%)	332
2. Easily accessible	242 (77%)	59 (18%)	13 (4%)	314
3. Taste	223 (73%)	70 (23%)	10 (3%)	303
4. Cheap	170 (75%)	44 (19%)	11 (4%)	225
5. Hygienic	117 (71%)	35 (21%)	11 (6%)	163
6. No other options around the gym	18 (100%)	0 (0%)	0 (0%)	18
7. Following other friends	7 (77%)	2 (22%)	0 (0%)	9
8. Simply follow the trend to attract the attention of others.	1 (50%)	0 (0%)	1 (50%)	2
	942	310	77	1366

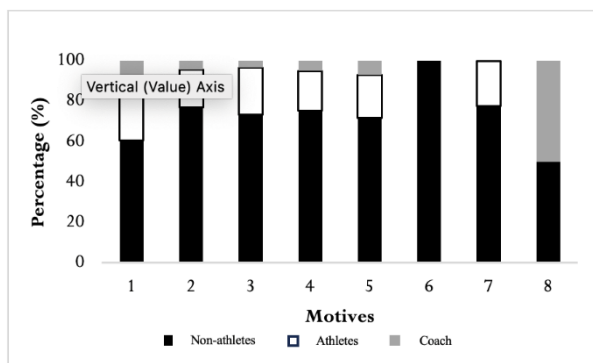


Figure 3. Motives for selecting beverages

With a Pearson correlation value of (p-value: 0.023 < 0.05), there is a significant correlation between the selection of beverages and the motivations or motives for selecting beverages after exercise. In addition, aspects of beverage selection are considerably correlated with exercise duration (p-value: 0.018 < 0.05). However, this remains with regard to the relationship between type of exercise and exercise frequency (p-value > 0.05).

Discussion

This study examines the types of beverages consumed by athletes, sports enthusiasts, and coaches after exercise, along with the reasons for their selection. The results demonstrated that mineral water, coconut water, and milk are the most frequently consumed beverages by all three categories; alternatively, general discovery, the benefits of the content that is owned, the convenience of accessibility, and the flavor of beverages are the determining variables.

The recommended fluid intake after exercise is as follows: (1) mineral water only if the exercise ends less than an hour; (2) drinks containing sodium and potassium to replace lost minerals, which are expelled with sweat, if the exercise lasts between 60 and 120 minutes; and (3) fluids containing carbohydrates and protein to aid in muscle recovery if the exercise lasts longer than two hours. (Kenney et al., 2015; Porcari et al., 2015). Sweat production rates can reach 3–4 liters per hour (Tauchid & Noordia, 2020). It is suggested that high-sodium beverages be consumed in the hours leading up to physical activity (Castro-Sepulveda et al., 2016). Similarly, try to drink fluids at 15-20 minutes intervals while working out. But after exercise, you should rehydrate with drinks high in sodium and potassium, and if your workout was particularly strenuous, you should also consume some extra carbohydrates (McDermott et al., 2017; Porcari et al., 2015). its suggested alternate sources of nutrition like milk (Amiri et al., 2019; Dow et al., 2019; L. J. James et al., 2019) and coconut water (Syafriani et al., 2014), besides of electrolyte drink (Simulescu et al., 2019).

The effects of hypohydration on health are clear, and the effects on physical performance in sports and other activities are obvious (Pegoretti et al., 2015). Some people drink too much and even experience hyponatremia during exercise, while the vast majority of people actually drink less than they sweat. Athletes need to know how to determine how much water they need to stay hydrated and how to create a hydration plan that works for them in their specific sport and environment. The state of your fluid and electrolyte balance can have a major effect on your health and athletic performance, instead of drinking too much on beer even only 2/3 times a month (Rodríguez-Fuentes et al., 2022).

Homeostasis, thermoregulation, metabolism, cognition, and other essential processes all rely on water (Yates et al., 2018). In line with earlier studies, it just found

that during exercise or other forms of physical activity, the majority of participants only drank water. (Smith et al., 2021). The majority of experiments use a control group that only receives water. Water consumption prior to exercise has been shown to reduce the content of Na⁺ in plasma during exercise, which is an effect that has been rarely discussed thus far. This is in contrast to the results obtained when discussing the consumption of non-alcoholic beer prior to exercise, which has been widely studied (Castro-Sepúlveda et al., 2016). Na⁺ depletion during exercise can lead to muscle disorders and conditions that can reduce performance on the field, so this will have an effect on the electrolyte content available during exercise.

There are still many pros and cons regarding the provision of fluids at an optimal temperature for consumption, particularly when exercising under conditions of elevated body temperature and fatigue. A decade ago, some previous studies began to find a silver lining, namely that it is preferable to consume beverages at temperatures lower than 22°C (Burdon et al., 2012). Specifically, the application to ten elite cyclists produced evidence that if a person engages in sports in a hot environment, cold water consumption is preferable to warm water consumption, as warm water consumption has not been shown to improve body regulation (Lamarche et al., 2015). Despite contradictory research, training in a hot environment, regardless of whether athletes consume cold or warm water, has no significant effect on their cognitive abilities (Lee et al., 2021).

This study demonstrated that water consumption is extremely prevalent due to several crucial factors, such as accessibility and affordability. As a result, water consumption is the most prevalent compared to other types of beverages. In addition to drinking water, children and adolescents can supplement their fluid intake with a nutritionally-balanced diet after engaging in strenuous physical activity (Simulescu et al., 2019). A study demonstrates that drinking water reduces the risk of dehydration and hypotension (low systolic and diastolic blood pressure) (Endo et al., 2012). Water has a significant function as the primary beverage for restoring lost fluids in workouts lasting less than 60 minutes.

On the other hand, it has been demonstrated that sports enthusiasts, athletes, and coaches place electrolyte drinks at the very second top of the consumption list. The convenience with which electrolyte drinks may be obtained, the composition of the beverages themselves, and the allure of drinking them are the factors that contribute to their widespread usage. According to Castro-Sepúlveda et al. (2016), electrolyte drinks are thought to drop potassium levels less than the consumption of milk ingested. This may be noticed in the electrolyte content of the urine. Although there are a lot of studies that explain the positive effect that drinking electrolyte drinks has on performance out in the field (Berry et al., 2021), the most important thing is for everyone to make sure that they are adequately hydrated as opposed to meeting their needs for

carbohydrates during short-term exercise. There is not a very significant difference in the ability to do the treadmill until you experience significant fatigue when comparing electrolyte drinks with coconut water. The four types of drinks that were compared were mineral water, factory-made coconut water, pure coconut water, and sports drinks. The conclusion that can be drawn from this comparison is that there is not a very (Kalman et al., 2012).

The last three highest chosen beverages is milk. This survey indicates that, after water and electrolyte drinks, milk is the third most popular beverage ingested after exercise. Milk consumption has been the leading brand for many people who consume a recovery beverage after physical activity or exercise (Castro-Sepúlveda et al., 2016; Desbrow et al., 2014; Rankin et al., 2018), both as an alternate beverage (Pegoretti et al., 2015) and according to the most recent scientific standards (Castro-Sepúlveda et al., 2016; Desbrow et al., 2014; Rankin et al., 2018), due to the numerous benefits. Several studies state that the recommended intake of milk is approximately 500 ml (Rankin et al., 2018) and some recommend a dose of 250 ml of chocolate flavor which is widely recommended for consumption (Dow et al., 2019), in addition to the fact that more milk consumption is recommended due to satiety caused by moderate consumption of milk compared to isocaloric and electrolyte drinks (Desbrow et al., 2014). Similarly, the added calories, protein, and salt in milk-based beverages can aid in fluid recovery after exercise.

People who exercise regularly can benefit greatly from drinking milk. It has been shown in certain studies that drinking milk immediately following exercise improves performance. Consuming milk after exercise, for instance, has been shown to be beneficial for preventing the loss of muscular function associated with repeated sprinting and jumping in female participants (Rankin et al., 2018) and also DOMS (Rodríguez et al., 2019). As the levels of electrolytes in the body can be measured in the urine, scientists are interested in seeing how milk and electrolyte drinks affect these levels. Sodium (Na⁺) and potassium (K⁺) levels in 14 athletes were tested, with 7 in each of two groups (electrolyte drinks and milk). In a study comparing the use of electrolyte drinks and milk, researchers found that the milk group had lower sodium levels in their urine compared to the electrolyte drink group, but the electrolyte drink group had higher potassium levels in their urine (Castro-Sepúlveda et al., 2016).

However, when milk is used in conjunction with strength training programs, older adults has an improvement in muscular function (Granic et al., 2019), in which the participants are elderly people at risk for sarcopenia, a condition characterized by disorders of the muscles and marked by a loss of bone and muscle mass, strength, and function that can have negative effects on health, including increased vulnerability to injury from falls, diminished physical ability, diminished quality of life, and even death. The content, which is rich in natural macro and micronutrients, is a novelty that is not held by any other

types of beverages; there are no benefits and no drawbacks for adults (Granic et al., 2020; Rasane et al., 2020). Milk should be substituted or have its composition altered for persons who have lactose sensitivity issues (L. James, 2012). Milk, on the other hand, is extremely useful not only when ingested before exercise, but also, and especially for the purpose of enhancing recovery after exercise ((Dow et al., 2019; Gao et al., 2020; Pritchett & Pritchett, 2013).

Recommendations for time, length, and type of beverages that must be consumed remain to be taken into account while choosing the top three beverages to consume immediately after exercise. Coconut water is an alternative option if all three chosen beverages nothing nearby to the field. Coconut water categorized as a natural and extensively consumed in tropical areas due to its health-benefit content; yet, certain cultures and traditions discourage its consumption (Yong et al., 2009). Coconut water has been considered for a long time to have a sweeter flavor that reduces the danger of vomiting, makes one feel fuller, and prevents stomach problems; in addition, it is simpler to eat in large numbers (Ismail et al., 2002). Coconut water has been demonstrated to lower the risk of overheating due to exercise (Laitano et al., 2014), in addition to enhancing performance in hot environments. Even though pros and cons have been identified, sport drinks and energy drinks are still debatable for practical reasons (Hennessy et al., 2021). After all data have been published, the consumption patterns of all athletes, sports enthusiasts, and coaches must be taken into consideration so that the objectives can be met.

Conclusion

Most respondents are aware of the importance of rehydrating after exercise with fluids, but they haven't given much thought to replacing electrolytes that are lost in sweat. It's important to remember to rehydrate as soon as possible after exercise, as doing so can help prevent fatal fluid deficiency by replacing electrolytes that were lost during exercise.

Conflict of interests

This study has no conflict of interest.

Acknowledgement

Nothing to declare

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