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Immediate Versus Delayed Dietary Intake: Preliminary Survey on Nutritional Awareness among Athletes

Dr. Shijila P S*

*Assistant Professor, School of Physical Education and Sports Sciences, Kannur University, Kannur, Kerala, India

Article Info

Abstract

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*Correspondence Author.

Dr. Shijila P S

Assistant Professor, School of Physical Education
and Sports Sciences, Kannur University, Kannur,
Kerala, India

Email address:

drshijilaps@kannuruniv.ac.in

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Understanding and harnessing the power of the nutritional window is essential for young athletes looking to optimize their performance and recovery. Nutritional timing, when strategically timed, can significantly benefit athletes by capitalizing on the heightened metabolic processes after exercise. This research paper explores the concept of the nutritional window and the ongoing discussion between immediate over delayed dietary intake in the context of young athletes. It provides a detailed overview of the metabolic processes during the nutritional window and how timely nutrient consumption can enhance athletic performance and expedite recovery. It also presents survey results on the awareness of nutritional concepts with respect to immediate v/s delayed dietary intake among young athletes. Additionally, the paper provides findings from a survey regarding the awareness and current practice of nutritional principles in the context of immediate versus delayed dietary intake among young athletes. The findings of the survey shed light on the level of awareness of nutritional timing in optimizing athletic performance and recovery. While many athletes are knowledgeable about the role of nutrition in their performance and recovery, there are also areas where education and awareness can be improved, such as the importance of immediate post-workout nutrition and the timing of nutrient intake. This information can be valuable for designing nutrition education programs and guidelines tailored to the needs of young athletes.

Introduction

Nutrient timing is a popular nutritional strategy that involves the consumption of combinations of nutrients primarily protein and carbohydrate in and around an exercise session. (Arogon et al., 2020) The "nutritional window" refers to a time

frame when the body's metabolic processes are heightened, making it a prime opportunity to support recovery and enhance athletic performance. This paper focuses on the concept of the nutritional window, immediate dietary intake versus delayed intake, and the potential

advantages it offers to young athletes. The study's objectives were to assess the awareness of this concept among young athletes and examine its potential implications.

Methods

This research employs combining theoretical considerations of the Nutritional window with survey-based data collection to investigate young athletes' awareness of the nutritional window concept.

The study begins with an introductory overview of the theoretical framework surrounding the nutritional window. It covers the research scope and ongoing discussions in the field, including potential paradoxes based on existing reviews. Following this, the study delves into the metabolic processes related to the nutritional window. The primary objective of this section is to provide a deeper understanding of the metabolic window, its physiological mechanisms, and the benefits associated with immediate dietary intake over delayed consumption.

Following the theoretical exposition, this study employed a cross-sectional survey research design using a structured questionnaire to assess the awareness and dietary practices of young athletes regarding the nutritional window concept. The study gathers empirical evidence involving a sample of 200 young athletes. The target group consisted of elite and recreational athletes; the inclusion criteria were at least 60 min of physical activity 3 times a week and age above 18 years. The recruitment of participants was realized by the "snowball method", based on different social media platforms and responses were collected by online Google forms. The resulting data is then analysed and presented in the form of descriptive statistics, using percentages serving as empirical evidence of the athletes' orientation toward this concept.

The Nutritional Window and Its Metabolic Processes: Theoretical Framework

The nutritional window typically occurs immediately after exercise, varying in duration but often lasting for the first 30 minutes to two hours. During this period, the athlete's body undergoes several key metabolic processes. The concept of the "nutritional window" is rooted in sports nutrition science, emphasizing the critical time period post-exercise when nutrient intake can significantly impact recovery, muscle synthesis, and overall performance. This

window, often referred to as the "anabolic window," suggests that consuming the right nutrients within a specific timeframe post-exercise can optimize physiological adaptations and enhance subsequent performance.

Existing literature highlights the importance of macronutrient consumption—primarily carbohydrates and proteins—immediately following exercise to replenish glycogen stores, reduce muscle protein breakdown, and promote muscle protein synthesis. Studies have demonstrated that delaying nutrient intake beyond the recommended window can lead to suboptimal recovery and prolonged fatigue.

Several theoretical models support the concept of the nutritional window, including:

1. **The Glycogen Replenishment Model:** This model posits that muscle glycogen resynthesis rates are highest within the first 30-60 minutes post-exercise. Carbohydrate intake during this period enhances glycogen storage, ensuring adequate energy availability for subsequent training sessions.(Aragon .,2018)
2. **The Protein Synthesis Model:** Protein timing is a popular dietary strategy designed to optimize the adaptive response to exercise (LoonLJ e. al .2011)The strategy involves consuming protein in and around a training session in an effort to facilitate muscular repair and remodeling, and thereby enhance post-exercise strength- and hypertrophy-related adaptations (KreiderR et al.,2008 It is generally accepted that protein should be consumed just before and/or immediately following a training session to take maximum advantage of a limited anabolic window (Noreen et al.,2002) Protein intake within the nutritional window has been shown to stimulate muscle protein synthesis by activating key pathways such as the mTOR signalling pathway, which is crucial for muscle repair and adaptation.(K Smith ,2015)
3. **The Insulin Response Theory:** Post-exercise nutrient intake, particularly a combination of carbohydrates and protein, leads to an insulin response that facilitates nutrient uptake into muscle cells, promoting recovery and reducing muscle soreness.(KL Knutson., 2020)

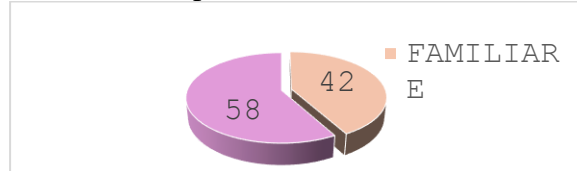
Despite the scientific backing, athlete adherence to the nutritional window varies, influenced by factors such as awareness, access to suitable foods, and individual preferences. This study aims to assess the current level of awareness and practices among young athletes regarding the nutritional window and its implications on their performance and recovery.

Results

The survey conducted among 200 young athletes provided valuable insights into their awareness and dietary practices concerning the concept of the nutritional window. The findings highlight several key aspects that are crucial for understanding how athletes perceive and utilize immediate post-workout nutrition for recovery and performance enhancement. The major areas addressed in the questionnaire are shown in the results with percentage and chi square analysis.

Percentage analysis on awareness of basic nutritional concepts and Nutritional Window

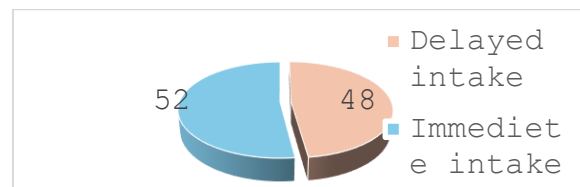
Figure 1
Responses on Awareness on Nutritional Window concepts



The findings indicate that a substantial proportion of athletes lack fundamental nutritional knowledge. Respondents consider themselves to have Limited knowledge (43.9%) very limited knowledge (32.7%) which may influence their nutritional choices. Specifically, **58% of participants were unfamiliar** with the concept of the nutritional window, highlighting a gap in awareness regarding its role in optimizing post-exercise recovery and performance. Conversely, only **42%** demonstrated a clear understanding of the concept and its physiological significance

Percentage analysis on dietary Practices Post-Workout

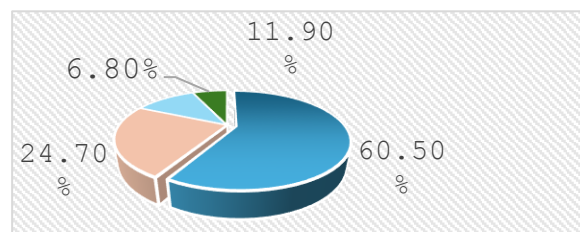
Figure 2
Responses on Immediate vs. delayed intake of post meal.



The figure shows that in the case of post-workout dietary habits, 58% of the athletes reported consuming their meals immediately after training, while 2% delayed their intake beyond the recommended window. The primary reasons for delayed intake included lack of awareness (50%) and logistical challenges (30%), such as access to appropriate food sources.

Percentage analysis on macronutrient Prioritization

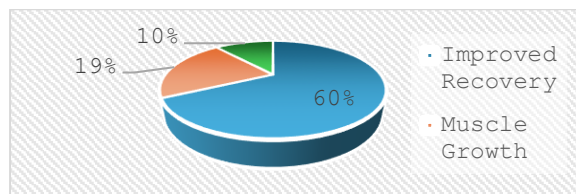
Figure 3
Responses on Macronutrient Preferences



The athletes when asked about the prioritization of macronutrients post-workout, 47% of athletes identified protein as the most crucial component for muscle repair and growth, followed by carbohydrates (38%) for energy replenishment. However, 15% were unsure about the appropriate macronutrient balance taking either only fluid or doesn't pay much attention. it indicates a need for more targeted nutritional education.

Percentage analysis on perceived benefits of immediate nutritional Intake

Figure 4
Responses on perceived benefits of immediate nutritional Intake



The survey results showed that 60% of the participants believed immediate post-workout nutrition contributed to improved muscle recovery, while 19% associated it with enhanced muscle growth and strength. Conversely, 10% of athletes were uncertain about the benefits, suggesting a lack of concrete understanding

Percentage analysis on muscle soreness and recovery perceptions

Table 1
Muscle soreness and recovery perception

Awareness Level	Lower Muscle Soreness (%)	Faster Recovery (%)
Aware	54.50%	45.50%
Not Aware	44.80%	55.20%

The survey results show athletes who adhered to immediate post-workout nutrition practices reported lower perceived muscle soreness (54.50%) and faster recovery times (45.50%). On the other hand, those who delayed their intake experienced prolonged soreness and fatigue, supporting the importance of timely nutrient consumption.

Chi-Square Analysis

The Chi-Square test was conducted to determine whether awareness of the nutritional window significantly influences various dietary behaviours and perceptions. In this survey categorizing respondents as “aware” and “not aware” allows to analyse whether knowledge of the concept translates into differences in post-workout nutritional practices, macronutrient prioritization, and perceived benefits. **Hence it** further assesses the association between awareness of the nutritional window and various

factors such as muscle soreness, perceived benefits, priority of post-workout meals, timing of food intake, and beliefs about the impact of food on performance.

Table 2
Percentage and Chis quare analysis on participants responses with respects to awareness on nutritional window concepts

Awareness of Nutritional Window & Perceived Muscle Soreness and Recovery					
Response on perceived muscle soreness and recovery	Aware (%)	Not Aware (%)	X ²	df	p-value
Improved Muscle Strength	54.5% (18)	45.5% (15)	11.865	4	0.018
Improved Muscle Recovery	54.5% (24)	45.5% (20)			
Reduced Muscle Soreness	38.1% (8)	61.9% (13)			
All the Above	44.8% (26)	55.2% (32)			
I Have Not Experienced Any	24.5% (13)	75.5% (40)			
Awareness vs. Perceived Benefits of Immediate Post-Workout Nutrition					
Responses on Perceived Benefit	Aware (%)	Not Aware (%)	X ²	df	p-value
Improved Recovery	48.8% (20)	51.2% (21)	4.845	4	0.304
Improved Muscle Growth	48.3% (29)	51.7% (31)			
Reduced Muscle Soreness	44.4% (8)	55.6% (10)			
All the Above	39.1% (27)	60.9% (42)			
Not Sure / No Impact	23.8% (5)	76.2% (16)			
Awareness vs. Immediate Priority of Post-Workout Meals					
Responses on Meal Priority	Aware (%)	Not Aware (%)	X ²	df	p-value
Carbohydrate Replenishment	53.3% (16)	46.7% (14)	1.947	4	0.746
Protein for Muscle Repair	44.0% (11)	56.0% (14)			
Hydration First	41.6% (32)	58.4% (45)			
Electrolyte Balance	37.8% (17)	62.2% (28)			
No Particular Priority	40.6% (13)	59.4% (19)			
Awareness vs. Timing of Food Intake After Physical Activity					
Responses on Timing of Food Intake	Aware (%)	Not Aware (%)	X ²	df	p-value
Immediate (0-15 mins)	44.4% (16)	55.6% (20)	3.74	3	0.291
Short Delay (15-30 mins)	38.0% (46)	62.0% (75)			
Moderate Delay (30-60 mins)	59.1% (13)	40.9% (9)			
Long Delay (>1 hour)	46.7% (14)	53.3% (16)			
Awareness vs. Belief That Food Timing Impacts Performance					

Responses on belief in Food Timing	Aware (%)	Not Aware (%)	X ²	df	p-value
Believes Food Timing Matters	43.7% (76)	56.3% (98)	4.593	1	0.032
Uncertain / No Impact	37.1% (13)	62.9% (22)			

Table reveals that 54.5% of aware athletes reported improved muscle strength and recovery, compared to 45.5% of those unaware. Additionally, 38.1% of aware athletes experienced reduced muscle soreness, compared to 61.9% of those unaware. These findings suggest that awareness positively influences athletes' perceptions of their recovery process, likely due to their adherence to better post-workout nutrition strategies. Furthermore, 44.8% of aware athletes reported experiencing multiple recovery benefits (improved strength, faster recovery, reduced soreness), while 55.2% of those unaware reported similar benefits. However, a notable contrast was seen in the group that reported not experiencing any recovery benefits, where only 24.5% of aware athletes fell into this category compared to 75.5% of those unaware. Since the p-value is less than 0.05 A statistically significant relationship exists ($X^2 = 11.86$, $p < .05$, $p = 0.018$) between awareness of the nutritional window and perceived muscle soreness and recovery.

Since the p-value is greater than 0.05, ($X^2 = 4.845$, $p > 0.05$, $p = 0.304$) there is no statistically significant relationship between awareness of the nutritional window and perceived benefits of immediate post-workout nutrition. T48.8% of aware athletes reported improved recovery, which was slightly lower than the 51.2% of those unaware who reported the same benefit.48.3% of aware athletes associated immediate post-workout nutrition with improved muscle growth, compared to 51.7% of unaware athletes.44.4% of aware athletes believed it reduced muscle soreness, whereas 55.6% of those unaware reported this benefit. A significant portion, 39.1% of aware athletes, believed in all three benefits (recovery, muscle growth, and reduced soreness), while 60.9% of those unaware held the same belief. Notably, 76.2% of those unaware were unsure or did not perceive any impact, compared to only 23.8% of aware athletes. This indicates that even if athletes are aware of the concept, they do not necessarily associate it with specific benefits.

Table shows 53.3% of aware athletes prioritized carbohydrate replenishment, compared to 46.7%

of unaware athletes. 44.0% of aware athletes prioritized protein for muscle repair, while 56.0% of unaware athletes did the same.41.6% of aware athletes prioritized hydration first, compared to 58.4% of unaware athletes. 37.8% of aware athletes prioritized electrolyte balance, while 62.2% of unaware athletes did so.40.6% of aware athletes had no priority, compared to 59.4% of unaware athletes. The analysis revealed a p-value greater than 0.05 ($X^2 = 1.947$, $p = 0.746$), indicating no significant association between awareness of the nutritional window and athletes' prioritization of post-workout meals

Table shows no significance ($p > 0.05$) in whether an athlete believes timing affects performance is not strongly influenced by their awareness of the nutritional window ($X^2 = 3.740$, $p > 0.05$, $p = .291$). Among aware athletes, 44.4% consumed food immediately (0-15 min), while 46.7% delayed intake beyond an hour, indicating that awareness alone is not a decisive factor in influencing actual food timing behaviour.

43.7% of aware athletes strongly believed in the role of nutrition, compared to 37.1% of those unaware. Since the p-value is less than 0.05, ($X^2 = 4.593$, $p < 0.05$, $p = .032$). there is a significant relationship between awareness of the nutritional window and the belief that food affects performance. This suggests that athletes who understand the concept are more likely to recognize the role of nutrition in athletic performance.

Discussion on findings

A statistically significant relationship was found ($X^2 = 11.86$, $p = 0.018$) between awareness of the nutritional window and perceived muscle soreness and recovery. This suggests that athletes who are aware of the concept may experience enhanced recovery perceptions, likely due to their adherence to better post-workout nutrition strategies. Awareness may promote timely nutrient intake, influencing muscle repair and reducing soreness, supporting the broader role of education in performance enhancement. The analysis revealed no statistically significant relationship ($X^2 = 4.845$, $p = 0.304$) between awareness and perceived benefits of post-workout nutrition. This indicates that awareness alone does not translate into a stronger belief in its benefits, suggesting that external factors such as coaching, peer influence, or ingrained habits may play a greater role in shaping nutritional perceptions.

Similarly, awareness did not show a significant association ($X^2 = 1.947$, $p = 0.746$) with meal prioritization post-workout. Despite knowledge of nutrient timing, athletes did not necessarily change their post-exercise meal composition. This finding highlights the gap between knowledge and actual behaviour, suggesting the need for structured interventions to convert awareness into practice.

No significant relationship was found ($X^2 = 3.740$, $p = 0.291$) between awareness and the belief that timing of food intake affects performance. This suggests that athletes' perceptions of timing are not strongly influenced by awareness of the nutritional window, further reinforcing the idea that behavioural change requires more than theoretical knowledge. A statistically significant relationship ($X^2 = 4.593$, $p = 0.032$) was found between awareness of the nutritional window and the belief that food impacts performance. This indicates that athletes with awareness are more likely to recognize the broader role of nutrition in athletic performance, even if they do not always adhere to optimal dietary practices.

The findings underscore the critical role of nutritional education in enhancing athletes' awareness and adherence to optimal dietary practices post-workout. Despite a moderate level of awareness, the discrepancies in actual practice highlight the necessity for targeted interventions, including workshops, educational campaigns, and personalized nutrition plans. Additionally, logistical challenges and access to appropriate nutritional resources remain barriers to effective dietary adherence. Addressing these issues through institutional support and collaboration with sports nutritionists could lead to improved compliance and, consequently, better athletic performance and recovery.

In conclusion, while young athletes demonstrate a basic understanding of the nutritional window concept, further efforts are required to reinforce knowledge and encourage timely post-workout dietary practices. The integration of structured nutrition plans and educational initiatives can play a pivotal role in maximizing the benefits of nutrient timing.

Conclusion

The findings of the survey underscore the importance of educational interventions in improving athletes' dietary behaviours. While awareness of the nutritional window is associated with perceived benefits and muscle recovery, it

does not necessarily translate into optimal dietary choices. The results suggest that while athletes may understand the concept, behavioural reinforcement through structured coaching and meal planning is required to ensure consistent application. Future research should explore structured nutritional education programs and their impact on athletes' long-term dietary adherence, ensuring that awareness leads to action.

References

- Schoenfeld BJ, Aragon AA. Is There a Postworkout Anabolic Window of Opportunity for Nutrient Consumption? Clearing up Controversies. *J Orthop Sports Phys Ther.* 2018 Dec;48(12):911-914. doi: 10.2519/jospt.2018.0615. PMID: 30702982.
- van Loon LJ. Is there a need for protein ingestion during exercise? *Sports Med.* 2014 May;44 Suppl 1(Suppl 1):S105-11. doi: 10.1007/s40279-014-0156-z. PMID: 24791922; PMCID: PMC4008809.
- Schoenfeld, B. J., Aragon, A. A., & Krieger, J. W. (2013). The effect of protein timing on muscle strength and hypertrophy: a meta-analysis. *Journal of the International Society of Sports Nutrition*, 10(1). <https://doi.org/10.1186/1550-2783-10-53>
- Phillips SM Van Loon LJ et al Dietary protein for athletes: from requirements to optimum adaptation *J Sports Sci* 2011 29 (Suppl 1) S29 S38 [https://doi.org/10.1080/02640414.2011.619204\(open_in_a_new_window\)](https://doi.org/10.1080/02640414.2011.619204(open_in_a_new_window)) 22150425
- KerksickC HarveyT StoutJ CampbellB WilbornC KreiderR et al International society of sports nutrition position stand: nutrient timing *J Int Soc Sports Nutr* 2008 5 17 2575187 [https://doi.org/10.1186/1550-2783-5-17\(open_in_a_new_window\)](https://doi.org/10.1186/1550-2783-5-17(open_in_a_new_window)) 18834505
- LemonPW BerardiJM NoreenEE The role of protein and amino acid supplements in the athlete's diet: does type or timing of

ingestion matter? Curr Sports Med Rep 2002 1 4 214 221

Atherton PJ, Smith K. Muscle protein synthesis in response to nutrition and exercise. J Physiol. 2012 Mar 1;590(5):1049-57. doi: 10.1113/jphysiol.2011.225003. Epub 2012 Jan 30. PMID: 22289911; PMCID: PMC3381813.

Rangaraj VR, Siddula A, Burgess HJ, Pannain S, Knutson KL. Association between Timing of Energy Intake and Insulin Sensitivity: A Cross-Sectional Study. Nutrients. 2020 Feb 16;12(2):503. doi: 10.3390/nu12020503. PMID: 32079066; PMCID: PMC7071301.

Aragon, Alan & Schoenfeld, Brad. (2013). Nutrient timing revisited: Is there a post-exercise anabolic window?. Journal of the International Society of Sports Nutrition. 10. 5. 10.1186/1550-2783-10-5.