

When You Eat is as Important as What You Eat - A Kap Study on Chrono Nutrition in Athletes

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Abstract: ***Background:** Chrono Nutrition (CN) is a target focused dietary approach laying emphasis on meal timing and meal sequencing based on the body's natural circadian rhythms. Eating at the right time of day since food controls the body's cycles, increases metabolism, and aids in detoxifying is also important and known as nutrient timing. Delivering the right macronutrients at the right moment to maximize their utilization by the body is known as nutrient timing. The energy phase, the anabolic phase, and the adaptation phase are the three stages of nutrient timing in relation to exercise. **Objective:** The study aims at the studying the Knowledge, Attitude and Practices based on nutrient timing amongst the athletes. **Methodology:** The study was done using a well - planned questionnaire, through the filling of Google forms. 59 individuals participated in the study. Among 59 participants, 41 were male and 18 were female most of them being between the age of 15 to 25 years who are practicing sports actively. Also, Google Forms has provided a better reach of the participants. **Results and Discussion:** The majority of participants 54.2% (32) were either aware of CN or diets based on nutrient timing from social media content or from recent internet searches or other players. The major misconception was that 73.6% (43) of them believed only protein is required for recovery. 100% (59) showed a keen attitude on following CN or nutrient timing - based diet if it increases performance. When a question was asked to understand the attitude of participants with regard to carbohydrate consumption during weight loss 42.4% (25) of the participants did not show positive attitude. Of the participants, 28 (42.8%) did not adhere to a diet based on nutrients. A healthy habit of delaying tea and coffee consumption after a major meal was followed by 84.7% (50) of the participants. **Conclusion:** The study revealed that the participants were well informed about CN and had a positive attitude to follow it especially to improve their performance. The proof of meticulous planning, the consumption of whole foods, fortified foods, and dietary supplements are all included in nutrient timing - based diets. Following high - volume or severe exercise, timing of energy intake and the ratio of specific ingested macronutrients may help with recovery and tissue repair, boost muscle protein synthesis, and elevate mood states.*

Keywords: Chrono Nutrition (CN), Nutrient timing, Diets, Athletes.

1. Introduction

A Knowledge, Attitude, and Practices (KAP) survey is a quantitative approach that offers access to both quantitative and qualitative data using predefined questions organized in standardized questionnaires. KAP surveys identify misunderstandings or misconceptions that could get in the way of our intended actions and possibly prevent people from changing their behavior. A KAP study provides an intervention approach based on the unique local conditions and the cultural elements influencing them; organize activities appropriate for the specific population engaged. ⁽¹⁾

Chrono nutrition is a target focused dietary approach laying emphasis on meal timing and meal sequencing based on the body's natural circadian rhythms. The concept is based on eating specific foods at specific times to align better with metabolic health impacting on improved health and better weight management.

The deep - rooted idea behind chrono nutrition is the internal biological clock of our body and its influence by various physiological functions like metabolism and digestion, environmental cues such as darkness and light, synchronizing the rhythm of 24 hours day and night cycle.

Eating at the right time of day is crucial as the food controls your body's cycles, increases metabolism, and aids in detoxifying. An hours - long process of digestion,

absorption, and metabolism is started every time you consume, even a small morsel of food. ⁽²⁾

Maintaining the body's energy levels and general health and well - being depends on the regularity and timing of the meal and snacks throughout the day. Regular digestion is further supported by the timing of meals. Long stretches of time without eating may lead to overeating or eating quickly which in turn affects digestion.

Consuming food alters the brain's internal clock. This clock regulates circadian cycles and affects every facet of metabolism, including the operation of the organs. Normal biological cycles are upset when daytime feeding is restricted or done in an erratic manner. This ultimately results in irregular meal timing, influencing the onset of obesity, type - 2 diabetes, and cardiovascular disease (CVD).

Nutrient Timing:

Defined as delivering the right macronutrients at the right moment to maximize their utilization by the body. The energy phase, the anabolic phase, and the adaptation phase are the three stages of nutrient timing in relation to exercise.

The time right before and during exercise is referred to as the energy phase. The time just after exercise, known as the anabolic phase, lasts for roughly sixty to ninety minutes. The muscle that has been worked out is particularly responsive to dietary intervention during this period, this is also known as

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the anabolic or metabolic window. The anabolic phase is followed by the adaptation phase. If the right foods and supplements are consumed during this time, an increased response to dietary intervention can be maintained for several hours, which will promote recovery and training adaption. ⁽³⁾

The Energy Phase:

Pre - exercise and during - exercise are the two crucial times throughout the energy phase.

The four hours prior to activity, known as the pre - exercise phase, is when nutrient supplementation can improve exercise performance. The main goal of the energy phase is vitamin replenishment during doing out.

Pre - Exercise or 4 hours or less before exercise:

Nutritional interventions such as carbohydrate loading intend to optimize muscle glycogen stores in the days preceding an endurance competition and have demonstrated efficacy in elevating glycogen storage to levels above average while simultaneously enhancing exercise performance in sessions longer than ninety minutes. Eating a meal with 150–200 g of carbohydrates four hours before working out will greatly boost muscle glycogen stores and enhance fitness levels.

During Exercise:

The major goal of taking carbohydrates during vigorous and extended exercise is to keep blood glucose levels normal, or euglycemia. Long - term, high - intense exercise are just not sustainable when blood glucose levels drop and muscle glycogen stores are exhausted. ⁽³⁾

The Anabolic Phase:

Breakfast is widely regarded as the most significant meal of the day, and current research seems to back up this assertion. The post - exercise meal may be considered the second most essential meal of the day. The body enters a catabolic condition right after a strenuous workout session. The levels of muscle and liver glycogen are low or depleted, muscle protein breakdown increases, blood insulin lowers, cortisol and other catabolic hormones are raised, and substrate availability is limited. Unless these steps transit the body into mostly an anabolic state, this catabolic state will persist for several hours even after activity ends. Nutrient intervention is needed in order to make this metabolic change ⁽³⁾

The Adaptation Phase:

The first four to six hours following the end of the post - exercise supplement's effects are known as the adaption phase. Periodic carbohydrate feedings can sustain a fast rate of muscle glycogen accumulation for up to 6–8 hours after post - exercise supplementation. ⁽³⁾

2. Materials and Methods

The participants in this study were athletes from a variety of sports, including tennis, shooting, badminton, basketball, cricket, handball, kabaddi, lawn tennis, and athletics. Thirty - five percent (n=18) of the 59 participants in the study were female, and 41 percent (n=69.5%) were male. The athletes

were mostly under the age of 15 - 25 years. Google Forms were used to fill out a carefully designed questionnaire for the study. Additionally, participants can now be reached more easily thanks to Google Forms.

3. Results and Discussion

Deliberate correct meal timings and diet modifications are primarily explored in relation to different sports performance and exercise regimens, it's feasible that they could also have implications in particular, non - athletic populations or even clinical populations. ⁽⁴⁾

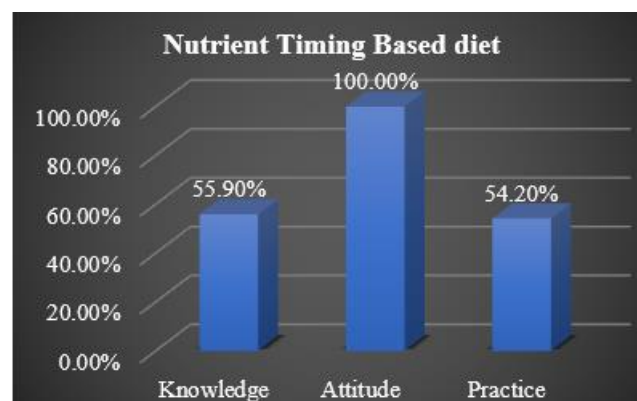


Figure 1

As seen in Figure 1, 55.9% (n= 33) athletes had knowledge about Nutrient timing - based diet; all athletes had positive attitude towards following nutrient timing - based diet if it enhances their performance and only 54.2% (n=32) of the athletes were already practicing nutrient timing - based diet.

A study Conducted by Anca Magdalena Munteanu et al. states that in any sport discipline, nutrients timing is so important to meet exercise performance and to recover from the stress of a workout. Nutrient timing (NT) is a new system of exercise nutrition that helps increase strength and lean body mass in the quickest amount of time without changing the exercise programme or caloric intake. ⁽⁵⁾

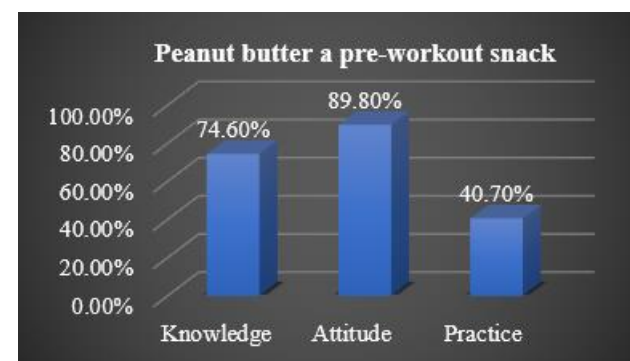


Figure 2

Peanut butter is a common food consumed by athletes worldwide in recent age for long - lasting energy and to maintain their competitive lifestyles. For optimal performance, recuperation, and overall health, peanuts and peanut butter can be a crucial component of any nutrient - dense diet, regardless of one's level of athletic achievement. ⁽⁶⁾ Peanut butter has a range of nutrients like protein, good fats, vitamin E, magnesium, Folic Acid, Copper,

phosphorous etc. A University study reports participants who ate peanuts every day in a controlled quantity did not overeat daily calories. (7) Peanut eaters tend naturally to eat less at other times of the day. Plus, if you enjoy what you are eating on your reducing diet, you will stay with the food plan and be able to keep the weight off. (8)

As seen in the Figure 2, 74.6% (n=44) of the athletes agreed that peanut butter is a good pre - workout snack; 89.8% (n=53) of the athletes had agreed to have peanut butter if its beneficial as a pre workout snack and 40.7% (n=24) of the athletes are already eating peanut butter as a pre workout snack.

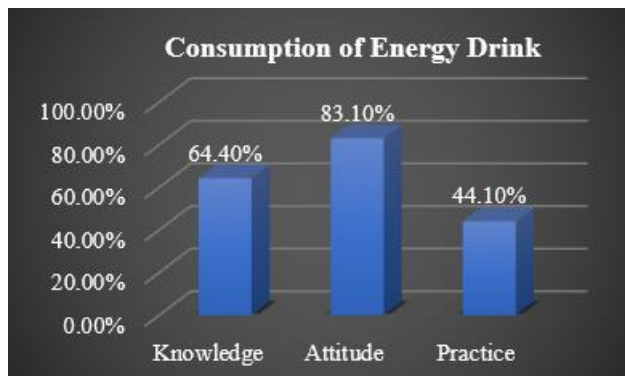


Figure 3

The past decade has seen a rise in the use of energy drinks (especially those with taurine and caffeine) by athletes and teenagers looking to boost their mental and physical capabilities. (9) A review conducted by Duchan et al states that the energy drinks have recently been marketed as sports beverages to improve performance, despite their usual promotion as energy boosters. The caffeine in energy drinks gives them their ergogenic effects. While there have been reports of major adverse events including seizures and arrhythmias linked to energy drink usage, these are extremely rare. Energy drink usage has drawn criticism for its potential to contribute to obesity and dental issues. (10) As seen in Figure 3, when asked whether energy drink helps to hydrate the body 64.6% (n=38) of the athletes agreed with the statement; 83.1% (n=49) of the athletes had positive attitude towards consuming energy drink if it helps in hydrating the body and 44.1% (n=26) of the athletes are actually having energy drinks during workout.

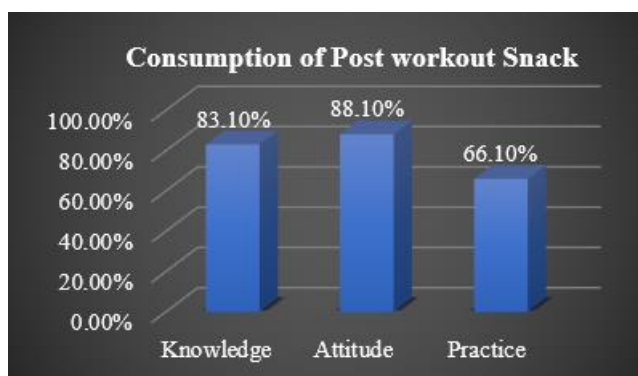


Figure 4

Refueling your body is crucial for recovery, especially if your workout is strength - based and lasted longer than 60

minutes. A combination of carbohydrates and proteins that aid in fuel provision, repair, and rebuilding should be included in the post - workout snack. (11)

As seen in Figure 4, 83.1% (n=49) of the athletes had the knowledge regarding the importance of having post workout snack; 88.1% (n=52) of the athletes had the positive attitude towards following it and 66.1% (n=39) of the athletes are practicing it.



Figure 5

A study conducted by Burke et al. states that restoring muscle glycogen stores requires an adequate intake of carbohydrates, and additional dietary tactics pertaining to when and how carbohydrates are consumed, as well as the addition of other nutrients, may either directly speed up the rate of glycogen recovery or make it more feasible to meet carbohydrate intake goals. (12)

As seen in Figure 5, 72.9% (n=43) of the athletes had the knowledge about the importance of carbohydrate after workout; 57.6% (n=34) of the athletes had positive attitude towards having carbohydrate after workout even during weight loss and 64.4% (n=38) of the athletes are already including carbohydrate source in their post workout snack.

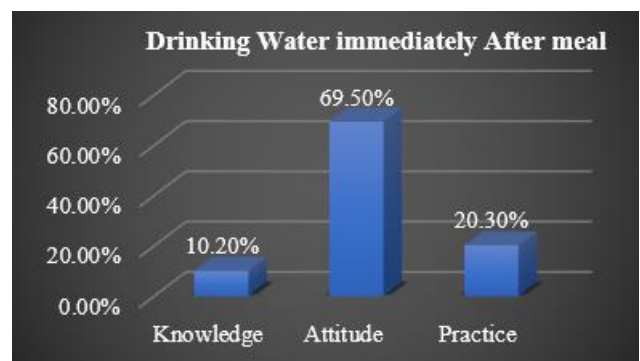


Figure 6

According to Ayurveda viewpoint, we should always drink water when we feel like. It has been debatable to drink water with meals, but it turns out, drinking water before eating can ease the digestion process. It is possible that we hear that drinking water just after eating can interfere with digestion and improper nutritional absorption. However drinking water after a meal not only helps the body absorb the nutrients better but also aids in the breakdown of the food, preventing indigestion, bloating, and constipation. A study revealed participants who did not drink water while eating

but do so after are less prone to gastro intestinal tract contamination with germs within an hour of eating. On the other hand, persons who drink water while eating are more likely to contract a pathogen. ⁽¹³⁾

As seen in Figure 6, only 10.2% (n=6) of the athletes agreed to that drinking water immediately after meal is good; 69.5% (n=41) of the athletes had attitude of drinking water after meal if it helps in digestion and 20.3% (n=12) of the athletes are already drinking water immediately after meal.

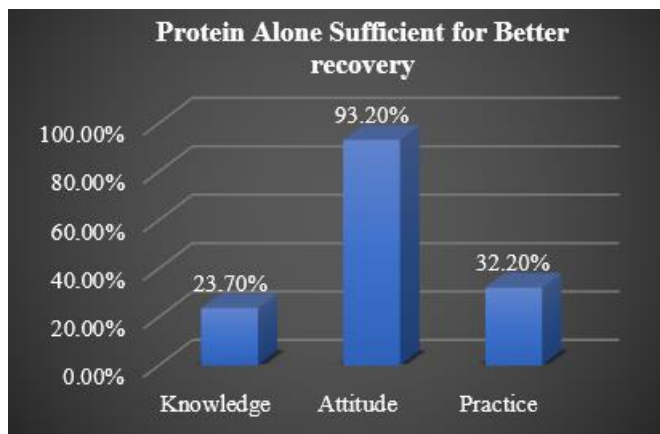


Figure 7

A study conducted by Beelen et al. has demonstrated that eating CHO and protein in the early stages of recovery improves performance during later exercise sessions. This may be beneficial for athletes who have many training or competition sessions scheduled on the same or consecutive days. ⁽¹⁴⁾

As seen in Figure 7, 23.7% (n=14) of the athletes agreed that protein alone is sufficient for better recovery; 93.2% (n=55) of athletes had a positive attitude when asked if having a combination of protein and carbohydrate snack after exercise aids in improved recovery and 32.2% (n=19) of the athletes are taking only protein for recovery after exercise.

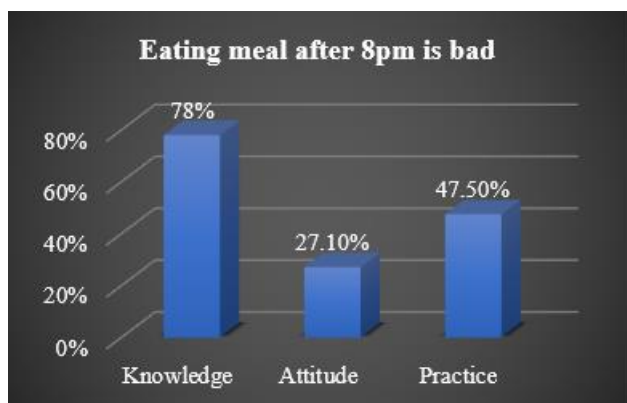


Figure 8

Adele Davis, a pioneer in nutrition, famously advised people to "eat breakfast like a king, lunch like a prince, and dinner like a pauper" many years ago. 90% of the calories should be consumed before 8 p. m. through regular meals. Eating every three to four hours has the advantage of regulating blood sugar, which in turn helps decrease cravings and hunger. A study done on 160 participants concluded

consuming food after 8: 00 p. m. at night is significantly connected with the chance of being overweight or obese. ⁽¹⁵⁾

As seen in Figure 8, 78% (n=46) of the athletes had a knowledge that eating meal after 8: 00pm is bad for health; 27.1% (n=16) of the athletes had attitude of eating meal after 8: 00pm even if it hinders digestion and 47.5% (n=28) of the athletes are eating meal after 8: 00pm.

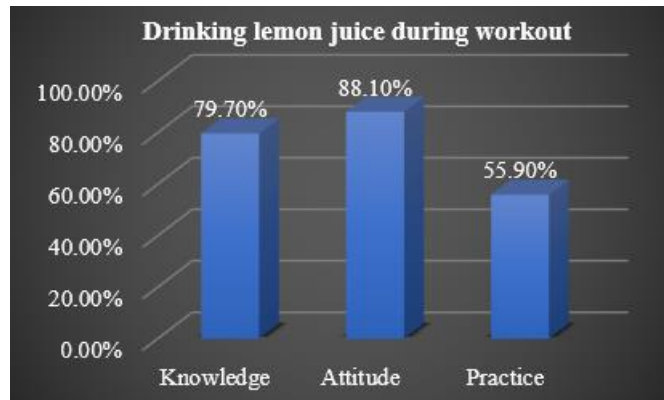


Figure 9

Vitamin C, iron, magnesium, calcium, potassium, fiber, and B - complex vitamins are just a few of the vital elements found in lemons. During exercise, sipping on lemon water helps in hydration, regulates body temperature, lubricates joints, and safeguards the spinal cord. ⁽¹⁶⁾ A study conducted by Taghiyar et al. findings suggest that vitamin C and E supplements may help lower the indicators of muscle injury associated with aerobic exercise. ⁽¹⁷⁾

As seen in Figure 9, 79.7% (n=47) of the athletes had knowledge regarding the benefits of drinking lemon water during workout; 88.1% (n=52) of the athletes have positive attitude and 55.9% (n=33) of the athletes are already practicing it.

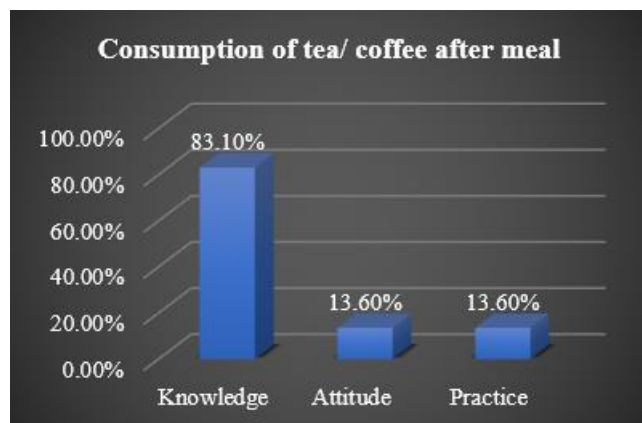


Figure 10

For many ailments, tea is the best natural remedy. However, it's commonly believed that consuming tea right after eating poses a health risk. Although tea's caffeine content may prevent the digestive system from absorbing nutrients, tea is beneficial for the stomach and digestive system. The availability of catechins in the body is reduced when tea is consumed after a meal. ⁽¹⁸⁾ According to the data currently available, healthy individuals who do not run the risk of iron deficiency do not require any advice regarding tea drinking

restrictions. The recommendation should be to wait at least one hour after eating before drinking tea and to drink tea between meals for those in risk of iron deficiency.

As seen in Figure 10, 83.1% (n=49) of the athletes had the knowledge about the consumption of tea/coffee immediately after meal is bad; 13.6% (n=8) of the athletes had attitude of drinking tea or coffee after meals even if it hinders nutrient absorption and 13.6% (n=8) of the athletes are drinking tea/coffee immediately after meal.

4. Conclusion

Proponents of chrono nutrition (CN) advocate for eating a larger portion of calories earlier in the day, typically with a substantial breakfast and a lighter dinner, is based on the science that our metabolism is more efficient in the morning and declines as the day progresses. Consuming most of our calories earlier in the day may help to optimize energy expenditure and promote weight loss or weight maintenance. CN principles can be particularly relevant for athletes due to the potential impact of meal timing on performance, recovery, and overall well-being. By integrating chrono nutrition principles into their overall nutrition plan, athletes may be able to enhance their performance, recovery, and overall health outcomes. Working with qualified sports nutrition professional can help athletes develop individualized strategies that align with their specific goals, preferences, and training demands While some research suggests that aligning meal timing with circadian rhythms may have benefits for metabolic health, more studies are needed to fully understand the effects of CN on long-term health outcomes.

Contribution of authors:

Study Design: Swetha Guntoju

Methodology: Namratha Pramod

Data Collection: Swetha Guntoju and Namratha Pramod

Data Analysis: Swetha Guntoju

Manuscript Drafting: Namratha Pramod

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