Nutrition for Optimal Performance and Recovery Related to Indoor Cycling Classes

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Abstract

Jen and Mark attend group exercise classes almost every day of the week. They have found that group exercise is a great way to incorporate fitness into their schedules while having fun at the same time. Bright ‘n’ early most mornings their legs are already spinning by 6:15 a.m. They have noticed that some days they feel like they have more energy and power output than others. Some days, their energy levels seem optimal, while other days it takes every effort in them to get started and keep going in the indoor cycling class. Little do they know that these energy crashes and surges could be directly related to proper nutrition and hydration before, during, and after their workouts.

Proper nutrition is crucial to improve the health and performance of active individuals. A simple choice in food before and after a specific exercise program can make all the difference in terms of injury prevention, muscle recovery, and overall physical fitness. In this article, fitness enthusiasts will learn about proper timing and the appropriate amount and type of nutrition to yield optimal results from the average indoor group cycling class.
This article aims to help dedicated indoor cyclists get the most from their everyday exercise routines.

**What Are the Physiological Responses to Indoor Cycling?**

Intensity levels during indoor cycling have been ranked from moderate to very heavy, with nearly 25 percent of the class being performed at intensities that go beyond the ventilatory threshold (Lopez-Miñarro & Rodriguez, 2009). Indoor cycling is not a workout to be taken lightly. It is crucial to recognize the physiological effects that occur during a typical 45- to 60-minute indoor cycling class. This compilation of research will highlight average calories burned, fluid loss, differences in physiological states for different genders and ages, muscle activity, and energy use. The physiological data will then be used in determining the amount and type of nutrients an individual will need to consume before and after the specific workout. By taking the physiological components into account, indoor cycling participants can determine the optimal timing for nutrient intake, leading to quick recovery and stabilized endurance.

The physiological responses to indoor cycling can vary widely. Indoor cycling has been classified as a very demanding and high-intensity exercise that requires much attention to the body’s response in order to prevent extreme heart-rate levels and risk of injury (Piacentini, Gianfelici, Faina, Figura, & Capranica, 2009). Body fat and carbohydrate stores are the main sources for fuel during exercise and, therefore, must be carefully considered to ensure optimal fueling (Burke, Kiens, & Ivy, 2004). These stores are the
driving force for the body throughout the exercise. If the stores of carbohydrates and fats are adequate, significant energy will be provided to the body and allow the muscles to work efficiently. Therefore, it is necessary to begin a workout with enough carbohydrates stored in the body to get through, energy-wise.

When individuals reach energy “rut’s” in their cycling workouts, it is most commonly due to local muscular limitations and lack of energy rather than a lack of circulation and blood oxygen to the specific muscles (Battista, Foster, Andrew, Wright, Lucia, & Porcari, 2008). During an intense bout of cycling, muscles and tissues throughout the body are broken down in order to create the forceful movements (Aragon & Schoenfeld, 2013). The means by which individuals can replenish and rebuild these tissues is discussed later in this article. Table 1 presents numerical values from studies conducted by Piacentini et al. (2009) and Hazelhurst & Claassen (2006) that represent the evaluation of intensity during indoor cycling sessions.

Table 1: Physiological Effects of Indoor Cycling Equating to Ultimate Energy Cost, Expenditure, and Average Fluid Loss in Both Genders.

<table>
<thead>
<tr>
<th></th>
<th>VO₂</th>
<th>VO₂%</th>
<th>HR</th>
<th>% of HRmax</th>
<th>Energy Cost</th>
<th>Energy Expenditure</th>
<th>Average Fluid Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>43.9±1.2 mL/kg/min</td>
<td>75% VO₂peak</td>
<td>163±8 bpm</td>
<td>89%</td>
<td>3187±290 kJ</td>
<td>762±69 kcal</td>
<td>2.2% loss of initial body mass</td>
</tr>
<tr>
<td>Females</td>
<td>40±1.2 mL/kg/min,</td>
<td>83% VO₂peak</td>
<td>154±6.8 bpm</td>
<td>82%</td>
<td>2363±235 kJ</td>
<td>565±56 kcal</td>
<td>1.5% loss of initial body mass</td>
</tr>
</tbody>
</table>
Hydration

From data collected on the sweat response, it can be gathered that both men and women leave indoor cycling classes dehydrated (Hazelhurst & Claassen, 2006). Therefore, proper hydration protocols must be attended to prior to, during, and after indoor cycling classes.

Prior to exercise: It has been noted that in 90 minutes of indoor cycling, the average fluid loss or sweat rate was 1.12 L/hr for males and 0.57 L/hr for females (Hazelhurst & Claassen, 2003). With this in mind, while also considering that the maximum amount of water a body can absorb per hour is limited to 1.2 L/hr, it is nearly impossible to keep up with hydration during these extreme bouts of exercise. Dehydration-prevention strategies, therefore, begin in the days and hours prior to exercise as well, even if an individual may not necessarily “feel” thirsty.

During exercise: Prior to reaching for that simple H₂O, individuals should consider their options for proper hydration during exercise. Dehydration during exercise has been shown to affect cardiovascular drift over time, while fluid intake during exercise has been shown to help prevent excessively elevated heart rates (Piacentini et al., 2009). It is crucial to continually swig on fluids throughout the duration of the specific exercise bout. It has also been reported that fluids containing carbohydrate help facilitate voluntary consumption and fluid retention (Burke, 1996). Therefore, consuming some sort of sports drink that contains a carbohydrate is optimal for maintaining proper hydration and can aid in the retention of fluids that are already within the system.
Post-exercise: One study hydrated subjects with water plus sodium capsules and ultimately reported that the intake of sodium induced a more rapid restoration of plasma volume than water alone (Burke, 1996). Further research supported this claim in mentioning that carbohydrate-electrolyte beverages provided more advantages than water alone, by promoting greater fluid intake and retention (Burke, 1996). Some sport drinks even contribute to the post-exercise glycogen synthesis process by adding carbohydrates to the diet. While searching for the “right” sports drink, it is important to keep in mind the sodium concentration. An optimal sodium concentration for a sports drink is 50 to 90 mmol/L (Burke, 1996). This high level of sodium concentration is difficult to come across with popular sports drinks on the market. Popular drinks such as Gatorade and Powerade only contain sodium concentrations of 21 mmol/L and 22 mmol/L respectively. This concentration is nowhere near the optimal 50 to 90 mmol/L recommended. Therefore, it is important that individuals keep in mind the amount of sodium and electrolytes they need to replenish and add more sodium to their diet, or find drinks that reach the desired amount.

It is crucial that as an athlete or active individual, you incorporate a hydration plan for your day-to-day schedule. In fact, if someone is extremely dehydrated and partakes in any type of exercise where the heart rate levels get as high as that in an indoor cycling class, the body will have a hard time with thermoregulation and the risk of cardiovascular collapse increases drastically (Caria, Tangianu, Concu, Crisafulli, & Mameli, 2007).
Recommended Hydration Guidelines

While women tend to lose an average amount of fluids equivalent to 1.5 percent of their original body mass, men have an average fluid loss of 2.2 percent of their original body mass after an indoor cycling session (Hazelhurst & Claassen, 2006). To combat this huge deficit in proper hydration measures, individuals should aim to hydrate in the days and especially hours before a workout. Consumption of 300 to 500 mL of liquid volume has been shown to be a comfortable level of intake just prior to exercise (Burke, 1996). Individuals should aim to consume this much water within the couple of hours before exercise. During exercise, proper hydration can be reached through small, frequent swigs of water or, preferably, a sports drink with electrolytes. This consumption of electrolytes aids in the retention of fluids as well as aiding in the process of rapid glycogen synthesis (Burke, 1996). Post-exercise hydration is crucial in the recovery process, not only for electrolyte replenishment, but for transporting nutrients from post-workout meals throughout the body. Hydration is the key to maintaining proper function throughout the body and should be the prime concern of an individual partaking in strenuous exercise.

Nutrient Guidelines

Timing of Nutrient Intake

A multitude of studies have supported the concept that nutrient intake timing is in fact more important than the absolute daily intake of nutrients (Aragon & Schoenfeld, 2013). It is crucial to intake proper amounts of nutrients directly after every bout of exercise. The primary goals of nutrient intake after a workout should be to replenish glycogen stores,
attenuate muscle protein breakdown, aid in protein synthesis, and enhance muscle hypertrophy (Aragon & Schoenfeld, 2013). A study by Burke (1996) shows that the immediate intake of approximately 0.7 to 1.0 g of carbohydrate per kilogram of body mass per day (g/kg/day) promotes increased glycogen storage during the first two hours of recovery in comparison to delayed carbohydrate intake (Burke, 1996). The beneficial factors of carbohydrate and protein intake decrease rapidly after 120 minutes post-workout, only increasing the importance of an immediate consumption directly after exercise.

Pre-workout Nutrients

As mentioned previously, the fat and carbohydrate stores in the body provide the main energy for fueling exercise. While body-fat stores are prevalent throughout the body, carbohydrate sources are often limited. It has also been shown that athletes, who exercise with high carbohydrate availability, exhibit a greater increase in metabolic adaptions in training as well as an increase in the oxidation of glucose, ultimately leading to increased endurance and quicker recovery afterward (Cox et al., 2010). Therefore, individuals must ensure that they have proper amounts of carbohydrates in their system prior to workout sessions.

Post-workout Nutrients

An article in the Journal of the International Society of Sports Nutrition supports the studies by Aragon & Schoenfeld (2013), which concluded that combining a carbohydrate and a protein after exercise maximizes recovery time compared to consuming...
carbohydrates alone (Berardi, Noreen, & Lemon, 2008). When carbohydrates and proteins are consumed together, there have been observed increases in fat oxidation versus the consumption of carbohydrates alone (Berardi, Noreen, & Lemon, 2008). Furthermore, the combination of the two together has been shown to elevate insulin levels as well, which have ultimately been decreased throughout the exercise session (Aragon & Schoenfeld, 2013). When compared to carbohydrate consumption alone, a carbohydrate plus accompanying protein supplement post-exercise has been shown to replenish nearly 50 percent of the glycogen utilized during exercise in the 4 hours afterward (Ivy et al., 2002). This is significant in comparison to the 28 percent replenished by carbohydrates alone (Ivy et al., 2002). The protein plus carbohydrate post-workout nutrition needs to be taken seriously in order to achieve optimal recovery rates.

When determining post-workout nutrition, it is also important to ensure that exercisers are replenishing the lost calories as well as acquiring the proper carbohydrate-to-protein ratios for quick recovery and muscle restoration. It should be acknowledged that the calories expended during the workout must be replenished as well; see Table 1 for a breakdown of the energy expenditure by gender. Finding the correct balance between sufficient amounts of carbohydrates, protein, and overall calories is difficult, but can be accomplished by adhering to a few specific guidelines.

Exercisers should focus on replenishing lost calories and energy immediately post-workout. A combination of carbohydrates and protein is optimal to ensure proper muscle
recovery and appropriate blood-glucose levels. A goal of 0.8 to 1.2 g/kg/hr of carbohydrate intake, plus about 0.4 g/kg/hr of protein intake, post-exercise has been shown to be optimal for the greatest recovery (Beelen, Burke, Gibala, & van Loon, 2010). This amount should not be exceeded due to the body’s ability to digest and process specific and limited amounts of protein and carbohydrates.

Suggested Dietary Guidelines

Table 2 provides a sample menu that will aim to optimize the performance and muscle recovery for Jen and Mark before, during, and after their typical indoor cycling class. Jen is 5’5” and 140 lb (63.5 kg), while Mark is 5’9” and 160 lb (72.36 kg). Therefore, Jen’s optimal intake of carbohydrates and protein within the two hours post-exercise would be calculated as follows:

- \( \text{Carbohydrate: } 63.5 \text{ kg} \times 1.0 \text{ g/kg/hr} \times 2 \text{ hr} = 127 \text{ g} \)
- \( \text{Protein: } 63.5 \text{ kg} \times 0.4 \text{ g/kg/hr} \times 2 \text{ hr} = 50.8 \text{ g} \)

Mark’s optimal intake of carbohydrates and protein within the two hours post-exercise would be calculated as follows:

- \( \text{Carbohydrate: } 72.6 \text{ kg} \times 1.0 \text{ g/kg/hr} \times 2 \text{ hr} = 145.2 \text{ g} \)
- \( \text{Protein: } 72.6 \text{ kg} \times 0.4 \text{ g/kg/hr} \times 2 \text{ hr} = 58.1 \text{ g} \)

Table 2 presents an ideal eating schedule centered on a typical cycling session. The table represents proper carbohydrate-to-protein ratios in accordance with the given weights and genders. It is crucial to recognize that caloric expenditure should be accounted for in post-
exercise nutrition as well. While Table 1 gives numerical data related to exercise bouts and includes the energy expenditure, Table 2 provides tangible steps to ensure proper nutrition.

**Table 2:** Sample Menu for Timing and Intake of Carbohydrates and Protein to Enhance Recovery Time and Initial Power Output.

<table>
<thead>
<tr>
<th>Women (using Jen’s demographics)</th>
<th>Men (using Mark’s demographics)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Food Suggestion</strong></td>
<td><strong>CHO (g)</strong></td>
</tr>
<tr>
<td>At least 30 minutes before</td>
<td>Apple</td>
</tr>
<tr>
<td>Post-workout Recovery</td>
<td></td>
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<tr>
<td>Immediately After</td>
<td>2 c low-fat chocolate milk</td>
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<td></td>
<td></td>
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<tr>
<td>Within ½ hour after</td>
<td>Wheat bagel + 3 T almond butter</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>Within 2 hours after</td>
<td>2-egg omelet + 2 T cheese + ¼ c onion</td>
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<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>128.5</td>
</tr>
<tr>
<td>Optimal Intake</td>
<td>127</td>
</tr>
</tbody>
</table>

*Note: CHO = Carbohydrate*
Conclusions

While nutritional strategies can be learned and implemented, it is necessary to pay attention to the body’s response to bouts of exercise, hydration, and nutrient intake, as results and responses will differ among individuals. Due to the inconsistency of indoor cycling classes and levels of exertion across the board, it is important to take into account the individualistic components of indoor cycling, such as personal power output, VO$_2$max and heart rate. While there are a multitude of considerations to take into account with proper nutrition and hydration, it is most important to focus on always being hydrated and eating prior to, and directly after, cycling sessions to speed up the recovery process and be ready to hit the gym for a second round. When Jen and Mark focus on the foods they eat before and after their workouts, they notice a drastic increase in their energy output during the cycling sessions and their decreased recovery time after. They can’t wait to hit the gym again!
References


