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Sports Drinks vs Sports Candy During a Sports Event

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ABSTRACT

Sports drinks and sports confectionery are common nutritional strategies aimed at enhancing athletic performance, particularly in endurance and high-intensity activities. Both products are designed to deliver rapidly available carbohydrates and, in some cases, electrolytes or caffeine. However, they differ significantly in their physical form, absorption rates, and practical applications. Sports drinks provide both hydration and energy replenishment, making them ideal for maintaining fluid balance and thermoregulation during prolonged exercise. In contrast, sports confectionery such as energy gels and chews offers concentrated carbohydrate doses in portable formats, suitable for situations where fluid intake is limited or impractical. Both have been shown to improve performance by sustaining blood glucose levels, delaying fatigue, and supporting cognitive function. Nonetheless, potential drawbacks exist, including gastrointestinal discomfort, excessive sugar consumption, and misuse outside of athletic contexts. This study compares the effectiveness of sports drinks and sports confectionery in terms of hydration, energy replenishment, and their overall impact on athletic performance and recovery.

KEYWORDS: *Sports drinks, sports confectionery, athletes, performance, recovery.*

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1. INTRODUCTION

Sports nutrition research and athlete dietary guidelines often focus on the role of energy, macronutrients, and specific micronutrients in supporting performance. Current fueling recommendations generally promote a *food-first* approach, emphasizing that a well-planned, whole-food diet can provide optimal nutrition and hydration for both performance enhancement and recovery. Whole foods also supply a wide array of nutrients and bioactive compounds that contribute to overall health and long-term athletic sustainability [8, 27, 28]. However, specialized sports foods are widely used by athletes to optimize performance, especially in situations where regular food consumption is impractical. These products classified as *specialized nutritional items* offer a convenient, portable, and targeted nutrient source. They are available in diverse formats, including sports beverages, gels, confectionery, electrolyte supplements, isolated protein powders, mixed macronutrient supplements such as sports bars, and ready-to-consume liquid meals [4, 13, 34]. Sports drinks are flavoured, non-carbonated beverages enriched with carbohydrates, minerals, and electrolytes to aid recovery following strenuous exercise. They are formulated to deliver a balance of hydration and carbohydrate intake, allowing athletes to replenish fluids and energy both during and after physical activity. Expert consensus suggests that optimal sports drink formulations contain 4–8% carbohydrates (4–8 g/100 mL) and 23–69 mg/100 mL (10–30 mmol/L) sodium, ensuring rapid fluid absorption, fuel delivery, and gastrointestinal comfort [21].

Sports confectionery often referred to as “sports chews” provides a concentrated carbohydrate source in easily digestible forms such as gels, chewy cubes, or jelly beans. These products supply an additional or alternative carbohydrate intake during exercise, particularly in circumstances where frequent, small doses are preferred. They are typically packaged in portable pouches, making them practical for use in events like long-distance running or cycling. Sports

confectionery can take various shapes, including fruit-flavoured gums, sport-themed sweets, and compact chews, each designed to provide a rapid energy boost. A typical sports candy weighs between 4–8 g, delivering approximately 5 g of carbohydrates and around 20 kcal per unit.

2. Rationale for Using Sports Drinks

Sports drinks are widely consumed during exercise to maintain hydration and supply rapidly available energy, both of which contribute to improved athletic performance by delaying the onset of fatigue. Typically, an isotonic sports drink contains electrolytes especially sodium and carbohydrates such as glucose and maltodextrins. Evidence suggests that a carbohydrate concentration of 6–8% effectively replenishes muscle glycogen without impairing gastric emptying or intestinal fluid absorption. Carbohydrate concentrations above 8% may increase carbohydrate delivery to the body but risk slowing gastric emptying and intestinal absorption, which can lead to gastrointestinal discomfort.

The recommended sodium content in sports drinks is 0.3–0.7 g/L (equivalent to 5.1–11.9 mmol/L), a range shown to help replace sodium lost through sweat and to stimulate thirst [66]. The physiological benefits of sports drinks depend on how effectively their components water, electrolytes, and carbohydrates are transported into the circulatory system. This absorption process is influenced by:

1. The volume of beverage consumed;
2. Gastric emptying rate;
3. Intestinal absorption rate; and
4. Whether the drink suppresses oxidation of endogenous carbohydrate stores.

Sweat loss during exercise typically exceeds voluntary fluid intake, with athletes often replacing only about half of the fluids they lose. However, when fluid intake is carefully matched to sweat losses, athletes experience less cardiovascular drift, better maintenance of core temperature, and reduced plasma volume decline all of which contribute to improved performance [11]. Sensory characteristics such as temperature, flavour, aroma, mouthfeel, and visual appeal play a significant role in voluntary fluid consumption. Athletes are more inclined to drink cool, pleasantly flavoured beverages [3, 7, 15, 16, 32], which explains why commercial sports drinks designed to be palatable help prevent dehydration by encouraging higher fluid intake [32]. The absorption rate of carbohydrate–electrolyte solutions is most strongly affected by the amount consumed and the carbohydrate concentration [18, 20, 26]. When hydration is the primary objective, carbohydrate concentrations below 10% are recommended. Studies indicate that gastric emptying is largely unaffected by carbohydrate levels up to 8%, which has led most manufacturers to formulate sports drinks within the 6–8% range.

From a physiological perspective, the effectiveness of a sports drink in supporting homeostasis during exercise depends on the coordinated absorption of water, electrolytes, and carbohydrates. Commercial products often combine multiple carbohydrate sources such as sucrose, glucose, fructose, and maltodextrins to enhance intestinal absorption. The presence of more than one transportable carbohydrate substrate activates multiple absorption pathways, increasing solute and water uptake despite the higher osmolality. Recent studies using isotopically labelled carbohydrates have explored whether consuming sports drinks immediately before or during exercise reduces endogenous carbohydrate oxidation [5, 6, 37]. Findings indicate that carbohydrate ingestion during exercise enhances glucose availability, reduces reliance on internal glycogen stores, preserves muscle and liver glycogen, and potentially lowers gluconeogenesis rates. These metabolic effects can prolong endurance capacity, delay hypoglycaemia, and extend the time to exhaustion.

3. Rationale for Using Sports Confectionery

Sports confectionery provides a concentrated source of carbohydrates that can enhance performance through two primary mechanisms: (1) supplying fuel directly to working muscles, and (2) stimulating the brain and central nervous system (CNS) via oral carbohydrate sensing. The latter mechanism, which involves receptors in the mouth detecting carbohydrates, has been shown to reduce perceived exertion and positively influence pacing strategies, even before significant metabolic utilization occurs. Typically, sports confectionery products such as chews, gummies, or jelly-based sweets contain 75–90% carbohydrates by weight (75–90 g/100 g), delivering approximately 4–6 g per piece. Sodium content varies widely; while some varieties are low in sodium, average formulations provide 150–300 mg/100 g. certain products also include performance-enhancing additives such as caffeine. Many modern sports candies use “multiple transportable carbohydrates” (e.g., glucose and fructose), which utilize different intestinal transporters (SGLT1 for glucose and GLUT5 for fructose), allowing for increased total carbohydrate absorption rates and improved fluid uptake [2]. Sports confectionery is generally consumed alongside water or diluted fluids to meet hydration needs and to reduce the net carbohydrate concentration in the gut, lowering the risk of gastrointestinal distress. This combined intake also facilitates faster gastric emptying and better

tolerance during exercise. While sports confectionery can be used in similar contexts as sports drinks and gels, their format small, individually consumable pieces offer greater flexibility in timing and dosing.

Practical applications include:

- **Pre-exercise**: Provides a compact, low-fibre carbohydrate source for athletes who cannot tolerate heavier meals or large fluid volumes before competition.
- **During exercise**: Supplies readily available carbohydrates to the CNS and muscles, supporting endurance performance and mental alertness.
- **Post-exercise**: Can contribute to glycogen replenishment, although recovery nutrition should also include protein and other micronutrients for a complete approach.
- **Ongoing fuelling**: Delivers rapid carbohydrate energy in sports where periodic, small doses are preferable for maintaining energy balance and avoiding spikes in gut load.

Performance benefits from sports confectionery have been well-documented across multiple disciplines, with improvements attributed to both metabolic and neurosensory pathways. The combination of portability, high carbohydrate density, and flexible consumption makes them particularly useful in events where carrying or consuming larger volumes of liquid is impractical.

Table 1: Summarizing the major differences

Feature	Sports Drinks	Sports Confectionery
Principle Function	Hydration and Electrolyte Replenishment	Energy Delivery
Key Components	Water, Electrolytes, Carbohydrates	Carbohydrates (sugars, starches)
Ideal application	During and after exercise, especially endurance events	During and after exercise, for energy boost
Examples	Gatorade, Powerade, etc.	Sports mix, chews, and candies

4. Absorption and Energy Delivery of Sports Confectionery

Sports confectionery such as energy gels, chews, and carbohydrate gummies is formulated to deliver rapid energy and efficient absorption during exercise. These products primarily contain high–glycaemic index carbohydrates such as glucose, fructose, and maltodextrin, which are absorbed quickly in the small intestine [29]. The use of multiple transportable carbohydrates (e.g., glucose and fructose in a 2:1 ratio) allows simultaneous uptake via different intestinal transporters SGLT1 for glucose and GLUT5 for fructose enabling exogenous carbohydrate oxidation rates of up to 90 $g \cdot h^{-1}$ [19]. This dual-pathway absorption increases carbohydrate availability while reducing the risk of gastrointestinal discomfort by avoiding saturation of a single transport mechanism.

Sports confectionery offers a concentrated and portable carbohydrate source with low fluid content, making it particularly suitable for endurance athletes who require precise, on-the-go carbohydrate dosing during competition. Some formulations include small amounts of sodium to promote fluid consumption and contribute to electrolyte balance. Overall, these products are engineered to maximize carbohydrate absorption rates and deliver efficient energy supply to sustain performance and delay fatigue during prolonged exercise.

5. Impact of Sports Drinks on Athletic Performance

Sports drinks are designed to replace fluids, electrolytes, and carbohydrates lost during exercise, thereby supporting endurance, delaying fatigue, and aiding recovery. Their carbohydrate concentration typically 6–8% has been shown to improve performance during prolonged, high-intensity activity by preserving muscle glycogen and maintaining stable blood glucose levels [9, 29].

Carbohydrates in sports drinks are absorbed in the small intestine via sodium glucose co-transporters, which simultaneously facilitate passive water uptake through osmotic gradients [23]. This dual process ensures both efficient substrate delivery to working muscles and effective rehydration. Once in the bloodstream, carbohydrates support ATP production through oxidative phosphorylation and glycolysis, while electrolytes particularly sodium help maintain plasma volume, support neuromuscular function, and reduce the risk of hyponatraemia and muscle cramping. Sports drinks are therefore formulated to optimize both metabolic energy availability and hydration kinetics, making them a central tool for sustaining physical performance under conditions of significant fluid and energy loss.

6. Electrolyte Replacement and Hydration

Prolonged exercise leads to substantial fluid and electrolyte losses, particularly sodium and potassium, through sweat. Sports drinks containing electrolytes help maintain fluid balance, promote fluid retention,

and reduce the risk of hyponatraemia. Sodium, in particular, enhances thirst and stimulates voluntary fluid intake, thereby supporting adequate hydration.

7. Thermoregulation and Fluid Balance

Maintenance of fluid balance is essential for effective thermoregulation. Even a dehydration level exceeding 2% of body mass can impair both physical and cognitive performance, especially in hot environments or during prolonged exertion [11]. Research indicates that sports drinks are more effective than water alone in preserving plasma volume and sustaining thermoregulatory efficiency.

8. Performance Outcomes

Randomized controlled trials have shown that athletes consuming sports drinks during prolonged exercise demonstrate superior endurance and delayed time-to-fatigue compared with those consuming water or placebo [6]. However, benefits appear minimal in short-duration, low-to-moderate intensity activities.

9. Individual and Contextual Factors

The efficacy of sports drinks depends on variables such as exercise intensity, duration, environmental conditions, and individual sweat rate. Accordingly, personalized hydration strategies are increasingly recommended [19].

10. Impact of Sports Confectionery on Athletic Performance

10.1. Rapid Carbohydrate Delivery

Sports confectionery such as gels, chews, and gummies typically contains rapidly absorbed, high glycaemic index carbohydrates (e.g., glucose, maltodextrin, sucrose). These quickly elevate blood glucose levels, supporting sustained muscle activity during prolonged exercise.

10.2. Ergogenic Effects during Exercise

Current guidelines recommend carbohydrate intakes of 30–60 $g \cdot h^{-1}$ for events lasting over 60 minutes, and up to 90 $g \cdot h^{-1}$ for ultra-endurance activities. When consumed in moderation and alongside adequate fluids, sports confectionery can meet these demands without provoking gastrointestinal distress. Empirical evidence demonstrates that carbohydrate chews can enhance time-trial performance, prolong time-to-exhaustion, improve sprint capability, and maintain cognitive function under fatigue [12, 24].

10.3. Cognitive and Central Fatigue Benefits

By supplying glucose to the brain, sports confectionery can stimulate the central nervous system, delaying central fatigue and helping preserve focus, coordination, and reaction speed during extended activity [12]. Certain formulations include caffeine, which at moderate doses (~3–6 $mg \cdot kg^{-1}$ body weight) can improve endurance, enhance alertness, reduce perceived exertion, and benefit repeated-sprint performance.

10.4. Practical Advantages

Compared with liquid sports drinks, confectionery products are lighter, easier to dose, and less likely to induce bloating. Their portability makes them particularly suited for rapid ingestion during endurance events such as cycling races, marathons, and team sports. However, to prevent hyperosmolarity and gastrointestinal upset, adequate co-ingestion of fluids is essential [29].

Advantages of Sports Drinks

- **Enhanced Hydration and Fluid Retention:** Electrolytes, especially sodium and potassium, aid in maintaining fluid balance and delaying dehydration onset [57]. Sodium also stimulates thirst and encourages greater voluntary fluid intake.
- **Improved Endurance via Carbohydrate Availability:** The typical 6–8% carbohydrate solutions in sports drinks (glucose, sucrose, maltodextrin) help sustain blood glucose, spare muscle glycogen, and enhance endurance [29, 19].
- **Thermoregulatory Support:** By preserving plasma volume, sports drinks maintain sweat rate and skin blood flow, supporting thermoregulation during heat stress [11].
- **Cognitive Maintenance:** Carbohydrate intake during prolonged activity may support decision-making, reaction time, and overall mental performance [35].

Disadvantages of Sports Drinks

- **Gastrointestinal Discomfort:** High sugar concentrations or excessive fluid intake during prolonged or intense exercise can cause bloating, cramps, or diarrhoea.
- **Excess Caloric and Sugar Intake:** Regular consumption outside of exercise contexts can contribute to dental erosion and excess calorie intake, posing risks particularly for young or recreational athletes [14, 36].
- **Overhydration and Hyponatraemia:** Inappropriate use especially during prolonged or low-intensity exercise can lead to dilutional hyponatraemia, a potentially dangerous condition [25]

Advantages of Sports Confectionery

Rapid Carbohydrate Availability

Energy gels, chews, and carbohydrate gums typically contain rapidly absorbed carbohydrates (glucose,

fructose, maltodextrin) that help sustain blood glucose levels and delay fatigue during prolonged exercise [29]. These formats are particularly beneficial in endurance events lasting more than one hour.

Portability and Practicality

Compared to liquid sports drinks, sports confectionery is lighter, more compact, and easier to consume during competition. This portability is especially valuable in situations where fluid intake opportunities are limited [10].

Improved Compliance and Palatability

Favourable taste, texture, and ease of use can improve adherence to carbohydrate intake strategies during events, particularly for athletes with gastrointestinal (GI) sensitivities [50].

Caffeine-Enhanced Formulations

Some confectionery products include caffeine, which has been shown to increase alertness, reduce perceived exertion, and enhance endurance performance. These are particularly useful in multi-hour events or cognitively demanding team sports.

Disadvantages of Sports Confectionery

Gastrointestinal Distress

Without adequate fluid intake, or in individuals with low tolerance, rapid carbohydrate ingestion especially from concentrated gels or chews can cause bloating, nausea, and cramping.

Overreliance on Sugar-Based Fuels

Excessive consumption outside of high-demand exercise can lead to calorie surplus and dental erosion [14].

Risk of Improper Timing or Dosing

Inadequate intake may impair performance, while excessive intake can cause GI discomfort or energy crashes [30].

Lack of Electrolyte Support

Unlike many sports drinks, some confectionery products provide minimal electrolytes, which may increase the risk of dehydration or cramping in hot environments.

Conclusion

Sports drinks and sports confectionery is both widely used as performance aids to support hydration, energy delivery, and recovery during training and competition. Each offers distinct advantages:

- **Sports drinks** are particularly effective for sustaining hydration, supporting thermoregulation, replacing electrolytes, and providing steady carbohydrate availability during prolonged exercise.
- **Sports confectionery** offers a concentrated, portable, and rapid carbohydrate source, ideal for quick energy replenishment in endurance events or situations with limited access to fluids.

Optimal use depends on activity duration and intensity, environmental conditions, individual physiological responses, and personal preferences. For many endurance athletes, alternating between confectionery for rapid energy surges and sports drinks for hydration may yield synergistic benefits. However, overuse or misuse of either can result in gastrointestinal discomfort, excessive calorie intake, or electrolyte imbalance. When strategically integrated, both products can contribute to improved performance and more effective recovery.

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