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The Influence of Nutritional Ergogenic Aids on Soccer Skill Performance

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Success in soccer is determined by the number of goals scored. Consequently, the performance of skilled actions, such as dribbling, passing, and shooting, can influence the outcome of a match. In the latter stages of a match, a reduced capacity to perform certain physical components of match play (such as sprinting and high-intensity actions) is a common observation. However, evidence seems to suggest that skilled performances may also be influenced by exercise, as recent research from Swansea University has confirmed previous observations that important aspects of passing and shooting skills are influenced by soccer-specific exercise, particularly in the second half (5).

Although the cause of this reduced level of skilled performance is currently unclear, a number of factors have been proposed, including reductions in fuel availability (i.e., lowered muscle glycogen and blood glucose concentrations), impaired cognitive function (i.e., reductions in reaction times and decision making skills), dehydration (i.e., increased thermal strain due to a fluid loss in excess of 2% body mass) and changes in acid-base balance (i.e., a reduced capacity to buffer hydrogen ions produced by high-intensity exercise). Over the past decade, evidence relating to strategies that aim to minimize the effects of exercise on the performance of skills during soccer-specific exercise has begun to accumulate, and most of these strategies have related to the use of selected nutritional interventions, including carbohydrates, caffeine, buffering agents, and fluid provision.

Carbohydrates

Acute supplementation of carbohydrates is generally used to improve physical performance relating to exercise endurance (e.g., time-to-exhaustion); however, as the brain is the only organ that is primarily dependent on blood glucose concentrations for maintenance of optimal functioning, decisions made in the game and the performance of the skills executed during match play are probably influenced by blood glucose concentrations. Although the issue of whether or not blood glucose concentrations actually decline to levels that may impair performance throughout soccer match play is still under debate, carbohydrate supplementation strategies which aim to elevate blood glucose concentrations throughout exercise are routinely used and advocated in most team sports. Although the primary reason behind this is related to physical performance, evidence suggests that exogenous carbohydrates may offer an acute strategy to prevent reductions in skilled performances throughout simulated or actual soccer match-play.

A study headed by Stephan Bandelow, PhD, at Loughborough University recently identified that serum glucose concentrations appear to be an important determinant of cognitive function before, at halftime, and after soccer match play performed in the heat (2). Specifically, higher glucose concentrations were associated with faster visual discrimination, faster fine motor speed and faster psychomotor speed. Therefore, as cognitive processes are crucial to the skilled actions involved in competitive team sports, and the role that blood glucose plays in the maintenance of the functioning of the brain, it is plausible that carbohydrate supplementation regimens in the form of sports drinks and sports gels could maintain selected soccer skills in the latter stages of a soccer match; however, further research is warranted to identify the specific carbohydrate supplementation strategies that achieve this aim optimally.

Caffeine

Caffeine is a central nervous system stimulant which has consistently been reported to enhance concentration and reaction time during non-sports-related tasks. Consequently, supplementation of caffeine may improve performance for athletes participating in team sports that require the execution of skills, concentration, and cognitive

function. Although previous researchers have attempted to investigate this in soccer players, the precise effects of caffeine on soccer skills are currently unknown and thus, remain undetermined. That said, it is physiologically plausible that caffeine could improve skilled performance either on its own due to its stimulatory effects on the brain, and/or by increasing the oxidation of co-ingested carbohydrates as observed by researchers at the University of Birmingham (7).

Buffering Agents

Supplementation of buffering agents (e.g., sodium bicarbonate and sodium citrate) aim to increase the body's tolerance to the change in acidity that occurs throughout high-intensity exercise and is a relatively common supplementation strategy used by today's athletes. Although the effects of this type of ergogenic aid have consistently been shown to improve physical performance (e.g., sprinting and exercise endurance), researchers at the National Taiwan College of Physical Education recently observed that reductions in skilled performance that occurred following a simulated tennis match were prevented when players ingested the buffering agent, sodium bicarbonate (6). This data suggests that the performance of tennis skills may be improved by ingesting buffering agents. Although this finding remains to be confirmed in soccer players, it is scientifically plausible that the effects are not limited to tennis alone as both soccer and tennis require skilled actions to be performed throughout high-intensity exercise.

Fluid Provision

In athletes that started exercise in a fasted and energy-depleted state and also drank a beverage that did not replace fuel or electrolytes during a continuous 90 min exercise test, Ajmol Ali, PhD, and colleagues observed reduced shooting performances after exercise compared to before exercise (1). Similarly, in a study headed by Stephen McGregor, PhD, soccer dribbling performance was observed to decline by 5% when players were prevented from drinking any fluid during 90 min of exercise (4). Although the application of these findings is limited by the unrealistic nature of the state of the participants before exercise (i.e., you would not be recommended to start exercise without having eaten and while being in a poor state of recovery), and the fluid intake regimens used during exercise (i.e., current recommendations advocate consumption of 150 – 300 mL of a carbohydrate-electrolyte beverage every 15 min during exercise lasting longer than 60 min when weight loss is not desired), the link between dehydration and impaired performance is strengthened by the fact that strength, power and anaerobic endurance are also compromised by dehydration (3). Therefore, consuming fluid in a manner that adheres to the recommended guidelines for athletes may prevent the performance deterioration that appears to result from dehydration.

In summary, despite coaches and athletes allocating a large proportion of training time to improving soccer skills, it is also possible that certain nutritional strategies may have an acute effect on skilled performances throughout the duration of match-play. Although research to identify the effects of carbohydrates, caffeine, buffering agents and fluid provision on the quality of skills performed during exercise is ongoing, athletes are recommended to consider their use when seeking to maintain their skilled performances throughout exercise. ■

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