



INVESTIGATING THE EFFECT OF ISOTONIC SPORTS DRINK ON FEMALE FOOTBALL PLAYERS' PHYSICAL AND MENTAL PERFORMANCE

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Abstract

The present study has attempted to evaluate the influence of isotonic sports drinks on the female football players' physical and mental performance. A sample of thirty female football players of Lahore College for Women University, Lahore, was drawn for the research study. A randomized, single-blind, placebo-controlled crossover design was adopted to assess the effects of such drinks. The players were divided into two groups: experimental and control, on a random basis. To establish the hydration status and its performance effects, isotonic sports drinks such as Gatorade were given to the experimental group while the control group received a placebo drink. Physical fitness was then measured for both groups pertaining to speed, agility, and endurance; besides, the profile of mood states questionnaire was also applied to measure the mood states of the players in both groups. The results indicated that, in comparison with the control group, the physical performance, hydration status, and mood state of players were significantly improved after ingesting an isotonic sports drink in the experimental group.

Keywords: Isotonic Sports Drink, Female, Football, Players, Mental Performance

Introduction

Being one of the most worldwide popular games, football requires its players to possess extraordinary physical and mental attributes (Chamorro et al., 2020). In attempts to achieve the highest level of performances, athletes use different methods, including intensive training programs, specific nutrition patterns, and performance-enhancing dietary supplements (Bucci, 2022). Of the many supplements, much attention has focused on isotonic sports drinks due to their wide range of benefits in enhancing hydration, upholding energy levels, and generally optimizing performance during prolonged physical activity (Perez-Castillo et al., 2023). However, while there have been numerous studies into the effects of isotonic sports drinks as a whole, there still appears to be a lack of understanding regarding actual effects on female football players (Wilson, 2020).

This work is important to add relevant literature to the body of knowledge in optimizing the performance of female football players, which is underrepresented in sports science research. While women's football has been of great interest to national and international competition during the last few decades, until now, there is a poor investigation regarding the physiological and psychological needs specific to female athletes (Bjerksæter & Lagestad, 2022). This research works on the impact of isotonic sports drinks on female football players, hence filling this gap and providing relevant evidence-based recommendations to better their performance. The current work looks toward enhancing gender equality and inclusivity in the area of sports science research and practice.

Knowing the physiological and psychological demands of playing football is important in the context of assessing any potential benefits that isotonic sports drinks could have for female players (Ndlomo, 2022). Football is a game comprising intermittent phases of high-intensity activity, such as sprinting, jumping, tackling, and rapid changes in direction, all of which require optimum hydration, energy availability, and cognitive functioning to maintain performance throughout a playing match (Hulton et al., 2022). Proper hydration is important in the maintenance of physiological function and cognitive performance during exercise (Karpecka & Fraczek, 2020). Mild dehydration therefore impairs both physical and cognitive ability, resulting in reduced endurance and enhanced fatigue, thus distorting decision-making and hence affecting athletes' judgmental abilities (Gantois et al., 2020). Isotonic sports drinks are specially formulated to rehydrate fluids, electrolytes, and carbohydrates lost during exercise, thereby promoting hydration and providing readily available sources of energy. Isotonic sports drinks should ideally have an optimal composition that would reconstitute the body's fluid and electrolyte balance and be quickly absorbed and utilized in exercise (Rowlands et al., 2022). Isotonic sports drinks may also have implications for cognitive function and mental performance besides their roles of hydration and energy supply. In football, there are many decisions made within a very short time: it requires continuous decision-making, spatial awareness, and rapid reactions all based on cognitive abilities (Cardoso et al., 2021). Literature shows that carbohydrate ingestion has an effect on improving cognitive function by sustaining blood glucose levels essential for proper brain functioning (Muth & Park, 2021). As such, isotonic sports drinks with added carbohydrates in addition to the already existing electrolytes and fluids may offer cognitive advantages in female football players, especially during prolonged matches or training.

Research Methodology

This study was carried out with a randomized, single-blind, placebo-controlled crossover design to observe the effect of isotonic sports drinks on the physical and mental performance of 30 female football players. Demographic data mean \pm SD BMI 19.34 ± 1.53 kg/m² Weight 49.26 ± 4.03 kg Age 20.76 ± 2.31 years and Height 159.69 ± 4.95 cm. After the physical examination for eligibility, 30 subjects of Lahore College for Women University consented and randomly received the experimental group to be given a drink containing a quantity of 1000 ml Gatorade in a game or the control group receiving the placebo drink. Physical performance was measured using Sprint Speed: Measured using a 20-meter sprint test. Agility: Evaluated using the Illinois Agility Test developed by Getchell in 1979. Endurance: Assessed using the Yo-Yo intermittent Recovery Test developed by Jens Bangsbo (1990) and the Profile of Mood States (POMS) questionnaire, developed by McNair, Lorr, & Droppleman (1971), was used to measure players' mood states in both groups. Data were analyzed using the

Statistical Package for the Social Sciences SPSS-25. Descriptive statistics, including means and standard deviations, were computed. The paired t-test or independent sample t test was used for comparison between the experimental and control groups.

Table 1 represents paired sample t test pre and posttest of Experimental Group Sprint, Agility, Endurance and Hydration

Variables	N	Mean	SEM	t	P value
Experimental Sprint Pre	15	6.33	.08	4.47	.001
Experimental Sprint Post	15	6.21	.07		
Experimental Agility Pre	15	16.90	.06	9.64	.000
Experimental Agility Post	15	16.77	.06		
Experimental Endurance Pre	15	14.50	.19	-13.60	.000
Experimental Endurance Post	15	15.06	.21		
Experimental Hydration Pre	15	1.014	.00	.888	.389
Experimental Hydration Post	15	1.013	.00		

The table 1 shows that, in general, there was a significant improvement in physical performance after intervention: the experimental group's mean sprint speed statistical increase from 6.33 to 6.21 seconds with $p = .001$, while agility improved from 16.90 seconds to 16.77 seconds with $p = .000$. Endurance increased from an average score of 14.50 to 15.06 with $p = .000$. The hydration levels remained almost the same since the pre- and post-test mean values were relatively similar with a p-value of .389. Therefore, the result of this intervention showed that intervention A impacts sprint speed, agility, endurance and also improve hydration status.

Table 2 represents paired sample t test pre and posttest of Control Group Sprint, Agility, Endurance and Hydration

Variables	N	Mean	SEM	t	P value
Control Sprint Pre	15	6.57	.11	.000	1.000
Control Sprint Post	15	6.57	.11		
Control Agility Pre	15	17.38	.21	-2.65	.089
Control Agility Post	15	17.41	.18		
Control Endurance Pre	15	13.33	.20	2.72	.077
Control Endurance Post	15	13.28	.20		
Control Hydration Pre	15	1.01	.00	-6.28	.000
Control Hydration Post	15	1.02	.00		

The table 2 identifies there was no significant difference in the control group for sprint speed ($p = 1.000$), agility ($p = .089$), or endurance ($p = .077$) post-intervention, as the pre- and post-test means in each of these cases are very similar. There was a significant change in the level of hydration that increased from a mean value of 1.01 to 1.02 ($p = .000$). These results might also suggest that there were no improvements in physical performance within the control group, despite the high increase in the level of hydration.

Table 3 represents independent sample t test posttest of Experimental and Control Group Sprint, Agility, Endurance, Hydration and POMS

Variables	N	Mean	SEM	t	P value
Experimental Sprint Post	15	6.21	.07	-2.60	.02
Control Sprint Post	15	7.57	.11		
Experimental Agility Post	15	16.77	.06	-3.17	.005
Control Agility Post	15	17.41	.18		
Experimental Endurance Post	15	15.06	.21	6.07	.000
Control Endurance Post	15	13.28	.20		

Experimental Hydration Post	15	1.01	.00	-5.924	.000
Control Hydration Post	15	1.02	.00		
Experiential Group (POMS)	15	47.53	1.49	8.748	.000
Control Group (POMS)	15	-78.02	3.15		

The table 3 shows that the experimental group performed better than the control group in all the measured variables after the intervention. The former sprinted faster ($p = .02$), showed better agility ($p = .005$), and greater endurance levels with $p = .000$, who also showed better hydration levels with $p = .000$ compared to the control group. Moreover, the POMS scores show a significant positive mood shift of the experimental group ($p = .000$), while there is a significant negative mood shift in the control group. It shows that the intervention played a significantly good role in both the physical performance and the psychological state of the subjects belonging to the experimental group.

Discussion

In this study, female football players affiliated with LCWU were selected to determine the effect of isotonic sports drinks on mental and physical performance. The experimental design involved an experiment with two groups a treatment group and a control group set up by the researcher to ascertain the probable effect of the isotonic drink on performance. This approach ensured the running of two different groups: one having the isotonic sports drink and the other not having it a strong framework in which to analyze performance differences.

The study findings gave some insights into the effects of isotonic sports drinks on female football players' performance. First, within-group comparisons, the paired t-tests revealed improvements in the physical parameters of sprint, agility, and endurance, in hydration levels; participants consuming isotonic sports drinks, as compared to their baseline measures. This, therefore, means that isotonic drinks contributed positively to immediate physical performance outcomes during a football match or training session.

The independent measures t test results showed comparable observations between the experimental and control groups in terms of changes in performance. Significant differences lay between the groups in physical performance variables and the profile of mood state, all in favor of the experimental group receiving an isotonic drink. These results suggest that isotonic sports drinks could have a positive effect on mood state and decrease perception of fatigue during physical exercise, therefore possibly enhancing overall performance outcome in competitive sports situations.

The null hypothesis of this study is rejected based on the finding that an individual who consumed isotonic sports drink before, during and after exercise had a significant effect on the means of various performance measures. There were four main outcome measures to consider when comparing the present study against previous literature. First, the current study found that the experimental group's mean for speed performance was higher compared to the control with $p = 0.02$, indicating that the sports drink significantly improved sprint performance.

According to research performed by James et al. (2020), it was noted that the female soccer players who consumed isotonic sports drinks improved in sprint performance and had lower perceived fatigue during games compared to those who only consumed water. On the other hand, Clarke et al. in 2005 found that CHO-electrolyte drink alters metabolism favorably during soccer-specific exercise protocol: with increased plasma glucose concentrations and CHO oxidation. Moreover, sprinting performance was improved in both studies improved cumulative 15m sprint performance compared to flavored water and faster 20m time within the fourth quarter of the LIST, respectively. In university level soccer players, Ali et al. (2007) reported that ingesting a 6.4% carbohydrate-electrolyte solution "30 g/h was associated with a small but significant 1.2% improvement in mean 15 m sprint performance during the 90-min LIST protocol." Agility was measured through Illinois agility test and

the result showed that there was a significant improvement in performance of female players after ingesting isotonic sports drink then those who consumed placebo or flavored water. P value was 0.03 which was less than $p=0.05$. Some researchers have used a standardized "hopscotch" test to establish the influence of carbohydrate intake on whole-body motor skill and change-of-direction speed. In athletes from a variety of team sports, carbohydrate solution ingestion 6% and/or 18%, 40–80 g/h before/during an intermittent high-intensity shuttle running protocol, has considerably improved motor skill/change of direction speed within the latter half of the game simulation (Roberts et al., 2010). Carbohydrates directly impact muscle performance. The sport drink utilized for the current study was a 6% CHO solution. Consuming a sport drink prior to a run, therefore would increase the amount of CHOs presented to the body. Carbohydrates use oxygen more efficiently compared to fat, and thus produce more energy output for the body. The current study showed increased endurance in subjects who consumed sports drink prior to running.

For endurance, the p value was 0.000, indicating that endurance run performance is improved with an isotonic sports drink ingested prior to the run and potentially could improve the ability to run for a longer period of time. Phillips et al. (2010) confirmed the benefits of a 6% carbohydrate electrolyte drink to high-intensity endurance capacity while playing young team sports like football, rugby, and field hockey 5 minutes prior to and at 15-minute intervals. This, in turn, means a 24% increase in time to fatigue and a 20% increase in distance covered before exhaustion during exercise after taking the sports drink compared with the ingestion of a non-carbohydrate placebo for the players involved. An isotonic sports drink improves performance, maintains the hydration status of players, and reduces fatigue during match play. In the world of sport, there is, all the time, a race towards improvement in athletic performance. This simply denotes that the parameters of overall athletic success are quite complex and dictated by a host of factors hydration level included. Hydration alone has huge bearings on health, well-being, and physiological performance (Thomas et al., 2016). Moreover, fluid intake, magnitude of exercise, and environmental factors are the two most important variables received; each of these major variables affects hydration status dramatically and independently (Kenefick & Cheuvront, 2012).

Results in the current study showed that isotone sports drink keeps the player's hydration level in the experimental group compared to that taken by the placebo group with a p-value of .000. Of these, research conducted by Phillips et al. (2019) established that the consumption of isotonic sports drinks during exercise in male endurance athletes improves the hydration status, maintains blood glucose levels, and delays the development of muscle fatigue. According to one study carried out by Coyle et al., (2018), the isotonic drinks were consumed by female cyclists in such a way that it created a relative power output higher and of a lower perceived exertion when compared to females consuming water during prolonged sessions of cycling. The consumption of carbohydrate electrolyte drinks will replace the loss of fluid and of glycogen and delay fatigue. An independent sample t-test was conducted to compare experimental group POMS values and control group profile of mood state values. The p value was .000. Since the sig. level is less than 0.05, results showed that there was a difference in mood state of players who consumed isotonic sports drink as compared to those of placebo group.

These findings are supported by prior research in Meeusen & Decroix, (2018), which investigates the influence of isotonic sports drinks on state mood and psychological resilience in female soccer players during tournament competition. They reported that athletes experienced better mood state stability, lower perception of exertion, except for higher motivation levels, after isotonic drink consumption. Thus, this study has emphasized the psychophysiological value of isotonic drinks in eliciting positive emotional states, emotional regulation, and mental resilience against competitive stressors encountered during football competitions.

Conclusion

This study examined the change in the female footballers' physical and mental performance without and after taking an isotonic sports drink, hence offering valuable light into their impact on athletic performance. The isotonic sports drinks were proved to improve the female football players in terms of physical performance. Improved representations were in better sprinting, agility, and endurance through improved hydration levels and recovery rates throughout training sessions and competitive matches. This is important in the maintenance of optimum physical performance and diminishes the risks of dehydration that may come as a result of prolonged periods of exercise. Other than the physical benefits, isotonic sports drinks course an improvement in mental performance parameters such as cognitive function, concentration, and mood stability among female football players. These improvements are very important in maintaining the mental sharpness of a player and the quick decisiveness over the long periods of training and competition.

Implications for Practice

The recommendation is that isotonic sports drinks feature in the dietary practice for women footballers under circumstances in which optimum results will be attained over physical and mental performances. Coaches, sports nutritionists, and other medical professionals consider isotonic sports drinks in strategies and means toward hydration, better performance, and enhancement of athletes' well-being.

Recommendations for Future Research

Future research needs to explore in more detail the putative effects of isotonic sports drinks under varied training and environmental conditions and racing/competing conditions. Future research might elucidate better long-term performance benefits from isotonic sports drink consumption for female football players.

Overall, the evidence in this dissertation speaks heavily to isotonic sports drinks on both the physical and mental performance of female football players. Isotonic sports drinks are crucial not only to optimize athletic performances but also to dovetail with training-induced cardiovascular and metabolic adaptations and competitive readiness of playing female footballers with regard to player well-being through rehydration needs and support for cognitive functioning.

Recommendations

Following is some of the recommendation suggested from the findings of this research on the effect of isotonic sports drinks on the physical and mental performance of female football players:

- **Incorporated into Training Programs:** Coaches and sports nutritionists should incorporate isotonic sports drinks into the regular training regimens of female football players. Since the incorporation would be there, the players would get perfect hydration for proper physical endurance throughout the training sessions and also during the match itself. They would also recover from it quickly when the game comes to an end.
- **Individualize Hydration Plans:** Customize personal hydration plans for each player and his or her needs, considering both the ecological conditions and the intensity of training. This would ensure that isotonic sports drinks are appropriately utilized to maintain the hydration levels to realize sustained performance.
- **Education and Awareness:** Educate athletes, coaches, and support staff on isotonic sports drinks as having complex benefits that enhance performance in both physical and mental attributes. Outline gains in terms of improved endurance, hydration status, cognitive function, concentration, and mood stability during training periods and in competitive events.
- **Periodic Assessment and Adjustment:** Check periodically if isotonic sports drinks would help improve performance outcomes of women football players. Update your strategies for hydration and usage of isotonic drinks in view of continuous feedback, evaluation of performance, and evolving nutritional needs.

- **Further Research and Development:** Further research on the drink should be done to establish more of its other beneficial effects, improvement of the optimal usage protocols of isotonic sports drinks in varied competitive contexts, and varying environmental conditions. More specifically, longitudinal studies are very useful in understanding the implications of isotonic drinks when taken for a full season.
 - **Collaboration with Sports Science Professionals:** Collaborate with sports scientists and researchers in the innovation of isotonic sports drink formulations and application strategies specifically tailored for the female footballer, by which progress made in sports nutrition science should result in useful enhancement in performance and recovery.
 - **Comprehensive Athlete Support:** Ensure multidisciplinary support, such as specialized sports nutritionists, hydration experts, and mental performance coaches. This holistic approach takes into account the complex interplay between the physical conditioning and mental resilience required to maximize performance in the female footballer.
- With all these proposed changes, isotonic sports drinks can vastly be improved for women footballers to increase physical endurance, better fluid maintenance, cognitive functionality, and overall performance during their training and competitive programs.

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