Effectiveness of Sport Drink on the Physical Performance of Junior Male Soccer Players

Ahmed Fadhil Farhan; Hazar Shakir Saleh; Raghad Adil Redin

Department of Physiotherapy, Faculty of Health Sciences, UiTM, Malaysia;
Center of Cancer Research, College of Medicine, Thi-Qar University,
Iraq; Main Office of Thi-Qar University, Iraq
ahmedfad2005@yahoo.com
hazarsaleh624@yahoo.com

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ABSTRACT

Dehydration prior to exercise leads to excess heat storage due to a reduction in sweat sensitivity when individuals were not allowed to drink fluids during exercise. The aim of the present study was to examine the effects of a sport drink on the physical performance in junior male soccer players. Thirty boys (mean ±SD: age 13.1±0.4 yr; body mass index of 20.7 ± 1.5 kg/m^2; stature: 161 ± 0.5 m) from international school in Malaysia, with 3.8 ± 1.2 years playing experience, participated. Players were randomly assigned to three groups experimental (EXP-1, n = 10), (EXP-2, n = 10), and control (CON, n = 10). The EXP-1 and EXP-2 groups followed "The 11" training programme 3 days per week, for 6 weeks, completing all but one of the 10 exercises and the CON group perform usual training 3 days per week, for 6 weeks. The EXP-1 group consumed sport drink, EXP-2 group consumed water and the CON group consumed water. Participants and parental informed consent was obtained prior to participation. All participants were interviewed at baseline to obtain the health history using a checklist (medical questionnaire). The assigned physical performance variables was tests at baseline, (pre-test) and after the intervention, (post-test). All groups performed a battery of soccer-specific physical tests included 5 activities such as explosive leg power, agility, core stability, sprinting, and dribbling. The results for analysis of repeated measures ANOVA, showed the EXP-1 and EXP-2 groups was significantly higher ($p<0.05$) in the all physical performance variables, than the CON group. The sport drink indirectly might help improve physical performance in the EXP-1 groups. Therefore, proper hydration requires fluid intake before and after exercise or activity.

Keywords: *Sport drink, Physical performance, Soccer players, Functional variables.*

Introduction

Sports and recreational activities for children and youth have numerous benefits, including physical fitness, acquisition of motor skills (DiFiori et al., 2014), psychological and social health benefits, and metabolic health benefits especially among children with cardiovascular diseases (Eime et al., 2013).

Soccer is the most popular sport in the world and is performed by men and women, children and adults with different levels of expertise. According to Koutures and Gregory (2010) "participation in soccer is an effective way for children to increase their level of physical activity and fitness, because it requires intensive physical effort over an extended period of time through practice and games". However, according to, Junge and Dvorak (2004), soccer like most sports is associated with a certain risk of injury for players, both at the competitive and recreational level. On the other hand, several studies have shown that the incidence of football injuries can be reduced by adopting various injury prevention strategies including: warm-up, with an emphasis on stretching; proper medical attention for injuries; appropriate recovery methods and time; appropriate cool-down; use of protective equipment; good playing field conditions and adherence to existing rules (Fuller et al., 2011; Junge et al., 2002; Kiani et al., 2010).

According to Purcell and Section (2013), proper nutrition is vital for child and adolescent athletes to attain proper growth and perform optimally in sports. Young athletes need to learn what foods are good for energy, when to eat certain foods, how to eat during an event, and when and what to eat to replenish after activity. A well-balanced diet containing appropriate amounts of macronutrients (protein, carbohydrates and fat) and micronutrients (vitamins and minerals) is essential to provide enough energy for growth and activity. Fluids are also essential for hydration to support growth and athletic performance.

Fluids, particularly water, are important nutrients for athletes. Athletic performance can be affected by what, how much and when an athlete drinks. Fluids help to regulate body temperature and replace sweat losses during exercise (Rowland, 2011). Environmental temperature and humidity can affect how much an athlete sweats and how much fluid intake is required. Hotter temperatures and higher humidity make a person sweat more, and more fluid is needed to maintain hydration. Dehydration can decrease performance and put athletes at risk for heat exhaustion or heat stroke (ACSM, 2007; Hoch et al., 2008; Rowland, 2011).

However, according to Stefan (2007), sports drinks can be more advantageous than water for athletes. Sports drinks contain electrolytes, such as sodium and potassium, which are known as the most important additives, in addition carbohydrates. Sport drinks will also interact with factors such as the volume and concentration of other ingested solutions, because such factors can interfere with gastric emptying and intestinal absorption processes (Shalesh et al., 2014). Klimt's (1992) findings do show that the average heart rate for an 11-12 year old boy during a soccer game is 160-180 beats per minute. This is comparable to the elite athlete's heart rate (155-170 beats/minute). Recovery time for children is faster during short-term intense exercise and blood lactate levels are 3-4mM, which is lower than their adult counterparts.

Balsom et al. (1999) found that those players, who began the match with proper glycogen levels and continued to supply the body with CHO during the game, increased their running distance at speed by 33% in the second half. The demands of soccer on young players are somewhat similar to that of an elite athlete. Even though an under 12 game is 60 minutes (rather than 90), a competitive young athlete exerts a great amount of energy and experiences high levels of intensities. It is important to consider the fact that children have a much higher energy cost per kg of body mass when walking or running. Unfortunately, research on the caloric cost during a youth game is lacking (Stewart, 2001). In conclusions, nutrition is an important part of sport performance for young athletes, in addition to allowing for optimal growth and development. To optimize performance, young athletes need to learn what, when and how to eat and drink before, during and after activity.

Methods

Subjects

The sample of participants was 30 boys (mean ±SD: age 13.1±0.4 yr; body mass index of 20.7 ± 1.5 kg/m^2; stature: 1.6 ± 0.5 m) from international school in Malaysia, with 3.8 ± 1.2 years playing experience, participated. Players were randomly assigned to three groups experimental (EXP-1, n = 10), (EXP-2, n = 10), and control (CON, n = 10). The EXP-1 group consumed sport drink, EXP-2 group consumed water and the CON group consumed water. Participants and parental consent were completed, and all participants were interviewed at baseline to obtain the demographic characteristics, and health history using a checklist of a medical questionnaire. The assigned physical performance variables was tests at baseline, and after the intervention. All groups performed a battery of soccer-specific physical tests included 5 activities such as explosive leg power, agility, core stability, sprinting, and dribbling.

Physical tests

Participants performed the following tests, before and after a 6 week intervention: 1) Standing long jump test (SLJT) (to measure leg power); 2) Illinois agility test (IAT) (to measure agility); 3) Prone hold test (PHT) (to measure core stability); 4) 20 metre sprint (ST) (to measure speed) and 5) Speed dribbling test (SDT) (to measure dribbling). A standardized ten minute soccer-specific warm-up was conducted prior to each battery of physical tasks. Pre- and post-tests were performed at the same time of day (17:00 ± 0.5hrs), in the same indoor venue.

Sport drink

Pocari Sweat was chosen for the current study, because this drink is the most popular sport drink in Malaysia. Pocari Sweat, is a health drink that replenishes water and electrolytes in the body that are lost through perspiration. It is the most suitable drink for people going through dehydration because of everyday physical activities at work, in sports and at home, especially during summer. 100 ml of water was given to the EXP-2 and CON group before and after the intervention, while similar amount of Pocari Sweat was given to the EXP-1 group before and after the intervention. All drinks were of the same color and provided within containers of the same design. They were kept in the refrigerator at 8 – 9 °C temperature. The composition of this drink is presented in Figure 1.

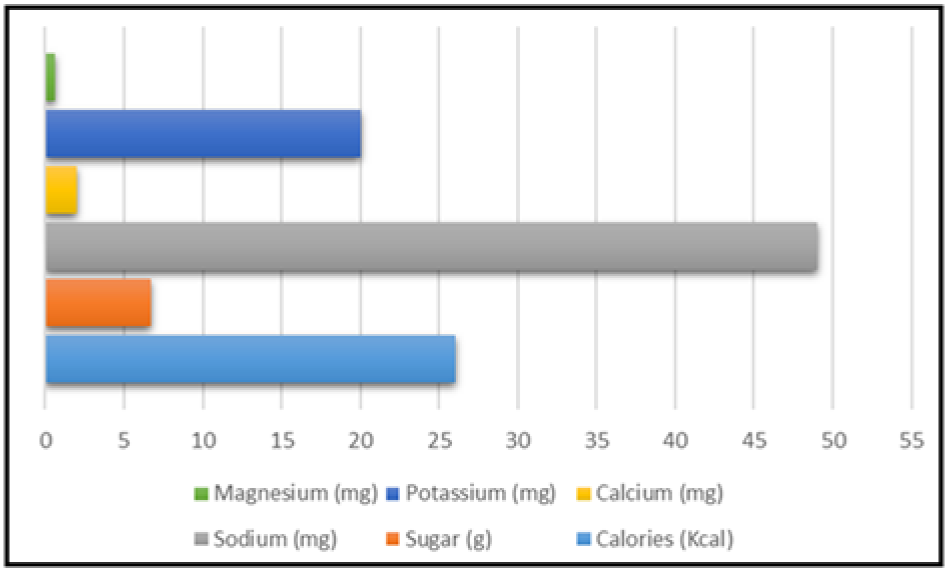

Figure 1.Composition of Pocari Sweat drink (Nutritional Facts per 100 ml)

Exercise intervention - "The 11"

The full version of "The 11" training programme can be viewed online on the FIFA website (www.fifa.com). The EXP-1 and EXP-2 groups followed "The 11" training programme 3 days per week, for 6 weeks, completing all but one of the 10 exercise, while the CON group perform usual training 3 days per week, for 6 weeks. The guidelines for completion of Exercise 3 (hamstrings) were not considered appropriate for this age group and as such, this exercise was excluded from the intervention. To facilitate understanding, compliance, ongoing safety and correct execution, full instruction in the technique of each exercise was provided to participants, coaches and parents in week 1. Once each week, the EXP-1 and EXP-2 groups performed their exercises under supervision.

Statistical analysis

Means ± SD were calculated for all measures. A statistical software package (SPSS v19) was used to compare groups. The differences between pre- and post-intervention scores, for all EXP-1, EXP-2 and CON, were compared using repeated measures ANOVA and independent *t*-tests. Significance was set at $p \leq 0.05$.

Results

No significant differences were seen between the EXP-1, EXP-2, and the CON groups at baseline in the all characteristics (Table 1). Results from the pre- and post-intervention data, and percent changes, for all measures were presented for all groups in (Table 2). The EXP-1 and EXP-2 groups was significantly higher in explosive leg power (4.95 % vs 1.87 % vs -5.47 %, p=0.05), agility (-12.52% vs -5.36% vs 1.95%, p=0.05), core stability (31.65% vs 22.02% vs -4.15%, p=0.05), speed (-11.80% vs -3.82% vs 4.13%, p=0.05) and dribbling (-8.08% vs -5.91% vs -3.41%, p=0.05), compared to CON group.

Table 1. Comparison of Baseline Characteristics of the EXP-1, EXP-2, and CON Groups

Characteristics	**EXP-1 (n = 10)**	**EXP-2 (n = 10)**	**CON (n = 10)**	**P-value**
Age (yrs)	13.67 ± 0.47	13.54 ± 0.43	13.53 ± 0.75	0.74 NS
Weight (kg)	52.76 ± 5.71	51.78 ± 6.72	53.31 ± 4.59	0.38 NS
Height (cm)	160.27 ± 0.18	161.78 ± 0.34	162.46 ± 0.47	0.92 NS
BMI (kg/m^2)	21.67 ± 1.51	21.87 ± 1.12	20.12 ± 1.93	0.26 NS
Soccer experience (yrs)	3.84 ± 0.26	3.59 ± 0.51	3.90 ± 0.59	0.86 NS

NS (non-significant): p > 0.05;
Data are presented as mean ± SD.
Legend: EXP = experimental; CON = control.

Table 2. Pre- and Post-Intervention Data, and Percent Changes, for All Measures in EXP-1, EXP-2, and CON Groups

	EXP-1 (n = 10)			**EXP-2 (n = 10)**			**CON (n = 10)**			
	Pre	**Post**	**Δ%**	**Pre**	**Post**	**Δ%**	**Pre**	**Post**	**Δ%**	***P***
SLJT(cm)	2.11 (.02)	2.22 (.05)	4.95	2.10 (.09)	2.14 (.15)	1.87	2.12 (.08)	2.01 (.21)	-5.47	.013
IAT(s)	15.72 (.72)	13.97 (.53)	-12.52	15.32 (.56)	14.54 (.75)	-5.36	15.56 (.93)	15.87 (.86)	1.95	.023
PHT(s)	47.5 (13.1)	69.5 (12.2)	31.65	44.6 (11.1)	57.2 (10.4)	22.02	45.3 (16.2)	43.5 (12.3)	-4.15	.017
20m-ST(s)	3.60 (.45)	3.22 (.33)	-11.80	3.53 (.61)	3.40 (.45)	-3.82	3.71 (.07)	3.87 (.48)	4.13	.011
SDT(s)	5.75 (0.27)	5.32 (0.47)	-8.08	5.73 (0.15)	5.41 (0.36)	-5.91	5.65 (0.37)	5.85 (0.41)	3.41	.035

Δ% = change.
P value reflects differences between the change scores for each group
Data are presented as mean ± SD.
Legend: EXP = experimental; CON = control.

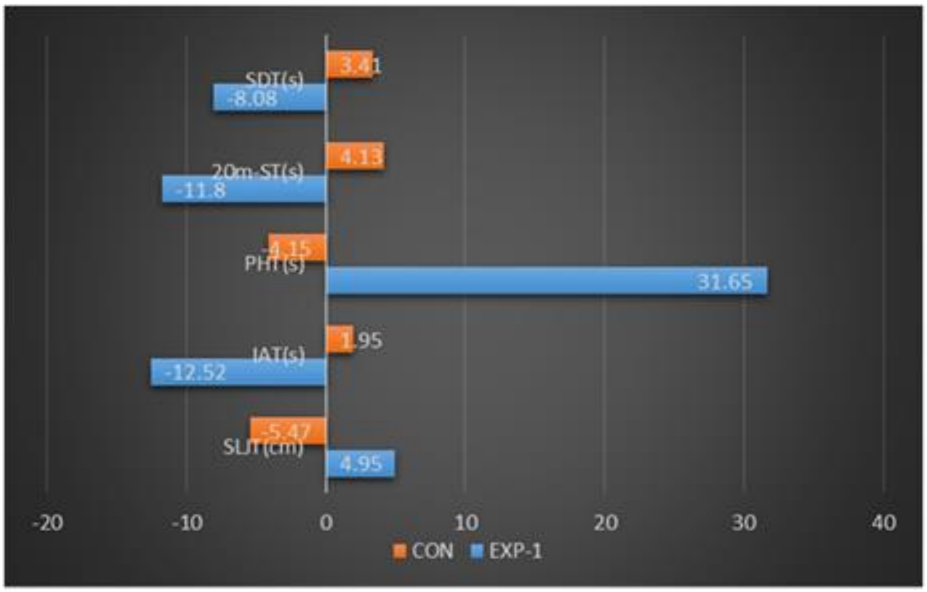

Figure 2. Percent changes of pre-and post-intervention, for physical performance variables between EXP-1 and CON groups

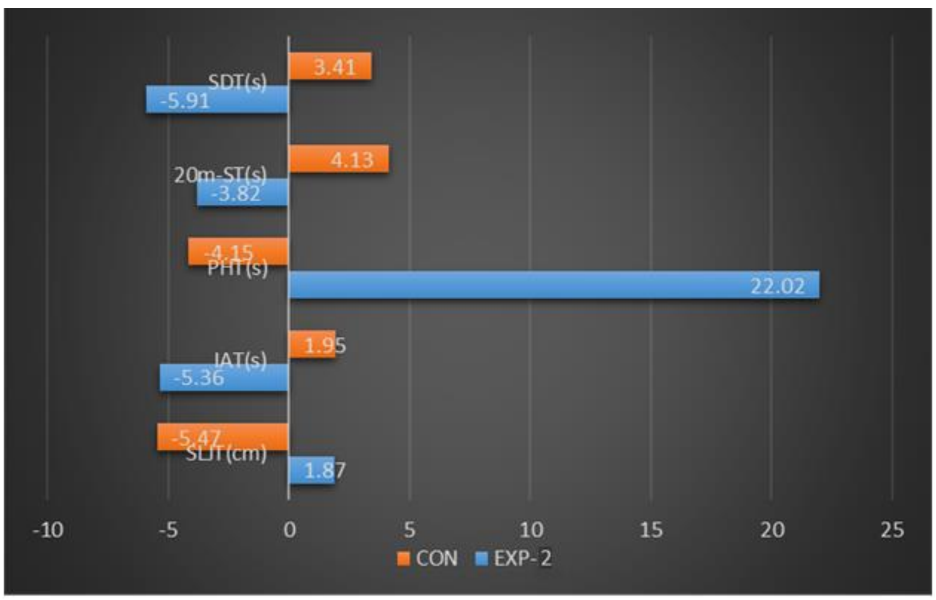

Figure 3. Percent changes of pre-and post-intervention, for physical performance variables between EXP-2 and CON groups

Discussion

The main finding of this investigation was that significant physical performance differences were observed in all of the variables tested between an EXP-1 and EXP-2 groups using “The 11” injury prevention program and a CON group warming up as usual. The largest improvement was observed for prone hold test (PHT) (EXP-1= 31.65%; EXP-2= 22.02%; CON = -4.15%, $p < 0.05$, Figure 2 and Figure 3).

According to Sharma, (2012) “the core musculature includes muscles of the trunk and pelvis that are responsible for maintaining the stability of the spine and pelvis and are critical for the transfer of energy from larger torso to smaller extremities during many sports activities.” Therefore, the theoretical belief is that if the extremities are strong and the core is weak, the decrease in muscular summation through the core will result in less force production and inefficient movement patterns.

According to Kiew et al. (2001) during exercise, it is necessary to replace the lost of fluids to remain well hydrated. The fluids intake is considered a physiological ergogenic aid to enhance the performance. The aim of this study was to evaluate the effects of acute ingestion of herbal drink (H) or water placebo (P) on cycling performance. The subject of this study were nine trained young male cyclists exercised at 71.9 ± 0.7% (VO2 max) on a cycle ergometer until exhaustion at two separated occasion trials in 1-week. In each exercise subjects have of H or P every 20 min. There was no significant difference between herbal drink and water placebo trials in the total of running time to exhaustion. Changes in oxygen consumption were similar in heart rate and perceived rate of exertion for both groups. These results show there was no different between herbal drink and water placebo in physiological responses and exercise performance during endurance cycling (Shalesh et al., 2014).

In the present study, ‘The 11’ resulted in improved speed (EXP-1 = -11.80%; EXP-2 = -3.82%; CON = 4.13%, $p < 0.05$, Figure 2 and Figure 3) and horizontal jump leg power (EXP-1 = 4.95%; EXP-2 = 1.87%; CON = -5.47%, $p < 0.05$, Figure 2 and Figure 3). In soccer, leg power would likely be associated with improved jumping and sprinting ability on the field. However, it may also serve to reduce the risk of knee ligament sprains (Kiani et al., 2010). Vassil and Bazanov, (2012) found that such a plyometric training program improved maximum height of vertical jump by 4.9%, which was agreement that observed in the present study.

The ability to jump higher to head the ball in attacking or defensive situations, as well as running with or to meet the ball in attacking play or to close down a player during defensive play are critical to the prevention and scoring of goals respectively. Physical training interventions that can improve these measures are likely to result in enhancement of player performance (Kilding et al., 2008).

Gonzalez et al. (1992) reported that sports drinks help the body to retain fluids after exercise better than when water alone was used. While Jordan (2002) found that water drinking blunts the orthostatic tachycardia but has only a modest effect on blood pressure. Water drinking also has effects on blood pressure and heart rate in normal subjects, although the actions are more subtle. The cardiovascular effects seem to be in part mediated through sympathetic activation.

Shalesh et al. (2014) found that the physical effort incremental exercise has made a change in the Value of heart rate, blood pressure, and blood electrolyte (Sodium and potassium) comparing to the rest time, There is also statistical significant different in the heart rate, diastolic blood pressure, and blood electrolyte (Sodium and potassium) during the physical effort in favor of the group which have taken sports drink and there is no statistical significant different in the systolic blood pressure during the physical effort between the water group and sport drink group. Through what has been reached must expand the use of covariance analysis method to include aspects of physical, skill, tactical and psychological, cause of success it in the discovery of the difference between the groups with a statistically rid of associated variables, and increase the attention of compensation of the internal body fluids before, during and after the football match to maintain the water balance of the body.

Vrijens & Rehrer (1999) compared intakes of plain water versus sports drinks during exercise, and observed that people who consumed plain water were more likely to have lower sodium levels. This decrease in sodium concentration was related to decreased exercise endurance and earlier fatigue. Electrolyte replacement promotes suitable rehydration, which is important to delay fatigue during exercise. Carbohydrates a primary fuel utilized by exercising muscle are important in maintaining exercise and sport performance (Sawka et al., 2007) Electrolytes such sodium and potassium in sports drinks help in keeping the blood pressure and heart rate lower than water consumed alone (Taylor & Madeleine, 2008).

Conclusions

In conclusion, the results of this study show that “The 11”, with sport drink (Pocari Sweat) and water is an appropriate and effective tool for improving football-specific physical performance characteristics of young soccer players. Thus, this offers soccer coaches, physical education teacher, physical training, etc. working on related sport, the opportunity to develop similar studies which it raise the efficiency of players technique and functional.

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