ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 8, Issue, 2, pp. 15608-15611, February, 2017

International Journal of Recent Scientific Research

Research Article

FLUID INTAKE AND PERCEIVED EXERTION AMONG ADOLESCENT HOCKEY PLAYERS AT NATIONAL HOCKEY ACADEMY, SPORTS AUTHORITY OF INDIA

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ARTICLE INFO

Article History:

Received 16th November, 2016
Received in revised form 25th December, 2016
Accepted 23rd January, 2017
Published online 28th February, 2017

Key Words:

Fluid Intake, Perceived Exertion, Sweat Loss, Hydration, Fatigue

ABSTRACT

Background: Many adolescents competing in sports focus on improving sport-specific skills, cardiovascular endurance and muscle strength to optimize athletic performance, while the role of proper hydration is often overlooked. This study aims to evaluate the fluid consumption pattern and perceived exertion among adolescent hockey players at National Hockey Academy, Sports Authority of India.

Methodology: 30 Adolescent Hockey Players were assessed for fluid consumption pattern; perceived exertion; sweat loss, type and amount of fluid consumed in time intervals for 3 consecutive training days.

Results: The mean fluid consumption was 4.38 ±1.48 L/day. Plain water was the primary fluid intake source. 93.33%, 100% and 96.67% revealed consumption of plain water before, during and post training respectively. Majority (90%) consumed milk as an intermittent fluid followed by tea (80%) and fruit juice (76.67%) with a mean intake of 276.40 ± 197.70ml, 90.0 ± 60.74ml and 57.6+ 37.6 ml respectively in addition to plain water. Significant correlation was observed during and post training fatigue levels ($p<0.05$) inspite of significant ($r = 0.686$; $p<0.01$) fluid replenishment for sweat loss during training. The post training fluid intake level was significant with fatigue during and post training (($p<0.05$) and during training fluid intake ($p<0.01$). However, no significant difference was observed for before training fatigue and fluid intake with during and post training fatigue and fluid intake.

Conclusion: Though plain water alone is adequate to replenish hydration status along with food intake to address electrolyte losses awareness on the importance of optimal rehydration and electrolyte replacement with appropriate fluids and timing of the intake should be increased.

INTRODUCTION

Team sports are based on intermittent high-intensity activity patterns, with varying characteristic between and within codes, and from one game to the next. Despite the challenge of predicting exact game demands, performance in team sports is often dependent on nutritional factors and poor hydration compromises performance and heightens the risk of heat stress which adolescents are particularly susceptible to.

Prevention of dehydration may be of greater significance in the younger players as adolescents are at a greater risk of suffering from heat illness as they produce a greater amount of metabolic heat compared to adults, mainly due to their greater surface area to body weight ratio and they cannot produce sweat as efficiently as adults (Micheli LJ and Jenkins M 2001, Unnithan VB and Goulopoulou S 2004).

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 T, 2011). Environmental temperature and humidity can affect how much an athlete sweats and how much fluid intake is required. Dehydration can decrease performance and put athletes at risk for heat exhaustion or heat stroke (Hoch AZ *et al*., 2008; Rowland T, 2011; ACSM 2007).

Proper hydration requires fluid intake before, during and after exercise or activity. The amount of fluid required depends on many factors, including age and body size (Rowland T, 2011; ACSM 2007).

One of the contributing factors to the recovery of an athlete is the initial fatigue from which that the athlete is attempting to recover. Multiple types of fatigue can be assessed at differing time intervals to determine the impact of fatigue on performance (Twist & Highton, 2013; Nourbakhsh, Sepasi, & Rezaee, 2011).

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Fatigue is referred to the decline of muscle force which causes an athlete to slow down. Exercise scientists describe fatigue as an exercise-induced impairment of performance and perceived fatigue of the individual can be determined through the "rating of perceived exertion" (RPE) at the time during exercise (Knicker *et al.*,2011). Robson-Ansley *et al* looked at the multiple factors that go into fatigue measurement. The factors discussed in their study include: rest, sleep, nutrition and hydration (Robson-Ansley *et al.*, 2009).

Replenishment as it pertains to recovery can first be looked at in the realm of hydration. The main issue with hydration recovery is with dehydration or hypohydration, when less fluid is taken in than what is lost from the body, typically in sweat (Kovacs & Baker, 2014). Impairments due to hypohydration include postural balance, cognitive performance, mental readiness and aerobic performance, which can see a decrease by 40-60% when the individual loses two percent or more of their body weight through fluid (Kovacs & Baker, 2014; Nedelec *et al.*, 2012).

In a broader sense fatigue can be looked at in two realms; chronic and acute fatigue. While one can cause changes in the other, acute fatigue can be looked at specifically, on game-day for areas of concern to mitigate perceived fatigue at specific times for improved performance while chronic fatigue continues for a greater length of time after just moments of performance and continually impacts recovery, training capacity and mental health if not corrected (Noakes, 2012; Amann *et al.*, 2013; Finsterer, 2012; Marcora, 2009).

METHODOLOGY

Subjects

The study was conducted on 30 adolescent hockey players, out of which 24 were male and 17 were female. All the hockey players recruited to the National Hockey Academy (NHA) are trained at Major Dhyan Chand National Stadium, New Delhi. Informed consent was taken from all hockey players before conduct of the study.

The fluid intake was recorded in time intervals of early morning (wake up time), between and during breakfast; midmorning; lunch; midevening; dinner; before bed and midnight by 24 hour recall method for 3 consecutive days. Pre, during and post training fluid intake was measured in standardized bottles, glasses and cups used for the purpose. All fluid intakes were recorded in ml and fluid consumed counted for a day's total intake. The stated level of fatigue by the athlete was subjectively measured using Borg's RPE (Rate of Perceived Fatigue) scale ranging from 6-20 with a value of six considered, no exertion at all, and a value of 20 considered, maximal exertion before, during and post training. Pre and post training body weights were recorded immediately prior to and on completion of the training session in their training outfit, barefoot using a digital SECA weighing scale on a flat surface. Food Frequency Questionnaire was used to elicit information on the fluid consumption pattern across various fluids consumed.

Statistical Analysis

Mean, SD and percentages were used for calculating participant characteristics and amount of fluid consumed. Pearson's correlation co-efficient test was used to detect the relationship between parameters of fluid intake and sweat rates. One way ANOVA Post Hoc α-Tukey test was used to observe relationship between fatigue levels at individual time points using the Statistical Package for the Social Sciences (SPSS) version 17.

RESULTS

The total number of participants within the study was 30. All the hockey players were in the age group of 13 to 17 years. One in every three players slept for more than 8 hours a day. All the players had normal BMI as per WHO, 2007 guidelines.

Table 1 General profile of Hockey Players

S.No.	Variables	Mean ± SD		
		Male (n=21)	Female (n=9)	Total (n=30)
1	Age (years)	15.76 ± 1.55	15.67 ± 1.22	15.73 ± 1.44
2	Weight (kg)	63.03 ± 6.53	52.51 ± 4.91	59.88 ± 7.75
3	Height (cm)	169.55 ± 6.92	156.0 ± 3.77	165.75 ± 8.47
4	BMI	22.0 ± 1.52	21.40 ± 1.50	21.82 ± 1.51
5	Training Years	3.74 ± 0.82	3.56 ± 0.77	3.68 ± 0.79
6	Sleep Hours	7.81 ± 1.38	8.22 ± 1.20	7.93±1.32

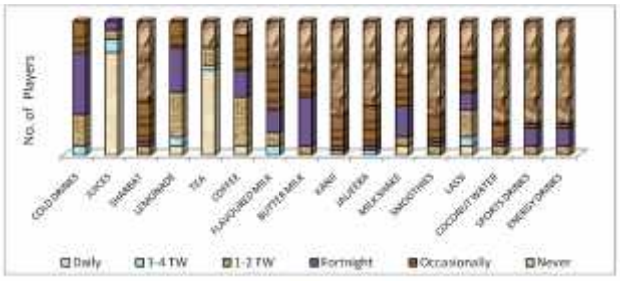

Fig. 1 Frequency of fluid intake of Hockey Players

The mean fluid consumption of hockey players was 4.38 ±1.48 L/day. Plain water was the primary fluid intake source and 93.33%, 100% and 96.67% revealed consumption of plain water before, during and post training respectively. Majority (90%) consumed milk as an intermittent fluid followed by tea (80%) and fruit juice (76.67%) with a mean intake of 276.40 ± 197.70ml, 90.0 ± 60.74ml and 57.6± 37.6 ml respectively. Commercial sports drink and energy drinks have never been consumed by 76.67%.

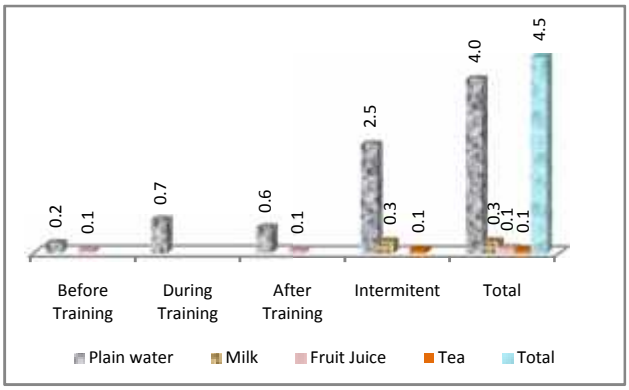

Fig 2 Mean intake of fluids (L/day) in pre, during, post training and intermittent time intervals of cyclists

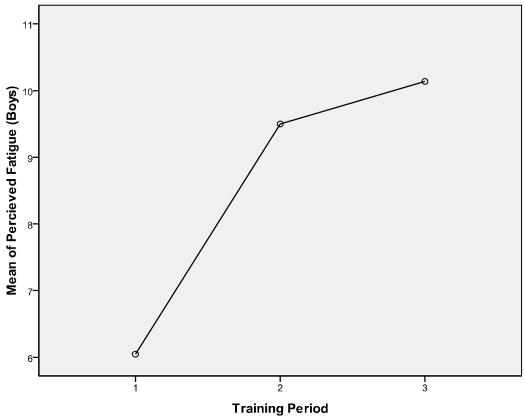

Fig 3 Comparison of means for Rating of Perceived Exertion (RPE) in boys at different time intervals of training session

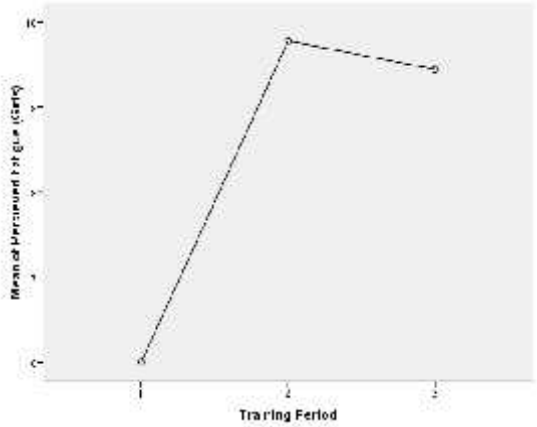

Fig 4 Comparison of means for Rating of Perceived Exertion (RPE) in girls at different time intervals of training session

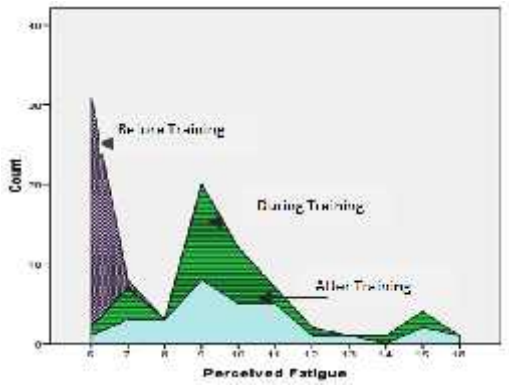

Fig 5 Comparison of means for Rating of Perceived Exertion (RPE) in different time intervals of training session

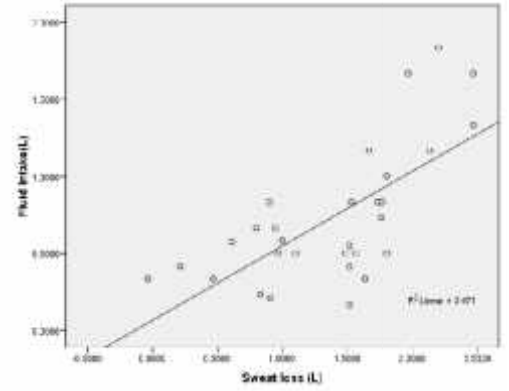

Fig 6 Pearson's Correlation between during training fluid intake and sweat loss

The mean difference between and within time intervals of perceived exertion among both boys and girls was significant ($p<0.05$). However, perceived fatigue has not reduced in the post training phase among boys.

Significant correlation was observed during and post training perceived exertion levels ($p<0.05$) inspite of significant ($r = 0.686$; $p<0.01$) fluid replenishment for sweat loss during training. The post training fluid intake level was significant with perceived exertion during and post training (($p<0.05$) and during training fluid intake ($p<0.01$). However, no significant difference was observed in pre training perceived exertion and fluid intake with during and post training perceived exertion and fluid intake.

DISCUSSION

Fluids are a vital requirement for humans. Fluid intake can be obtained from a variety of fluid sources other than water. The selection of appropriate fluids, timing of the intake and supplement choices are important for optimal health, especially in young people. Athletes seldom replace fluids lost through sweat. Fluid replenishment is calculated by weighing athletes both before and after a workout and for every one kilogram of weight loss the water intake should be one liter, specifically for exercise that lasts less than three hours has been researched extensively for this calculation (Distefano LJ *et al.*, 2012; Sawka MN, 2007; Shirreffs SM and Sawka MN 2011).

Proper hydration during training or competition will enhance performance, avoid ensuing thermal stress, maintain plasma volume, delay fatigue, and prevent injuries associated with dehydration and sweat loss. In contrast, hyperhydration or overdrinking before, during, and after endurance events may cause Na(+) depletion and may lead to hyponatremia (Von Duvillard SP *et al.*, 2004).

The American Academy of Pediatrics in 2011 recommends adolescents to consume readily accessible fluids at regular intervals before, during, and after activity to offset sweat loss and maintain adequate hydration while avoiding overdrinking. An average fluid intake up to 1 to 1.5 L per hour is advocated to minimize sweat induced body water deficits during exercise as long as pre training hydration status is good. Electrolyte supplemented beverages that emphasize sodium may be warranted during long-duration (≥1 hour), repeated same-day sessions of strenuous exercise, sports participation, and hot weather (AAP, 2011).

CONCLUSION

Though plain water alone is adequate to replenish water along with food intake to address electrolyte losses awareness on the importance of optimal rehydration and electrolyte replacement with appropriate fluids and timing of the intake should be increased. Urine osmolality and urine specific gravity the better indicators of dehydration need to be explored.

Acknowledgment

My sincere thanks to the participants and coaches for their co-operation in data collection at time intervals especially during training session.

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How to cite this article:

Vani Bhushanam Golla *et al*.2017, Fluid Intake And Perceived Exertion Among Adolescent Hockey Players At National Hockey Academy, Sports Authority of India. *Int J Recent Sci Res.* 8(2), pp. 15608-15611.