

Evaluation of weight loss and sweat rate, in soccer players who followed a different hydration plan, from the 2003 and 2004 categories of the Santos Tepic Soccer Academy

Evaluación de pérdida peso y tasa de sudoración, en futbolistas que llevaron un plan diferente de hidratación, de las categorías 2003 y 2004 de la Academia Fútbol Santos Tepic

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Abstract

Sweat losses during training cause weight loss greater than 1% and sweating rates above 1.45 L/h, with a decrease in energy and water reserves in soccer players, compromising his health and performance.

Objective: to compare and evaluate the changes made in two different hydration plans, ingesting a commercial isotonic drink versus water.

Methodology: 30 football players from Santos Tepic Football Academy, 2003 and 2004 category of the league of Football Association of the state of Jalisco, with weight data before and after training, fluid ingested during training and duration of the physical activity, the percentage of weight change and sweating rate were calculated. It was determined that there is no association between variables, because the degree of freedom (GL) obtained (3,841) for X2 and the results were lower, so it is interpreted that our value of p (p<0.05) is not significant.

Contribution: it was obtained that a marketed moisturizing drink does not have better benefits than simple water, with the right amounts in a periodized time, good hydration can be achieved, maintaining the weight change percentage and sweating rates within the permissible ranges.

Football, Hydration, Sweat rate

Resumen

Las pérdidas de sudor durante el entrenamiento causan disminución de peso mayor 1% y tasas de sudoración arriba de 1.45 L/h, con descenso en las reservas energéticas e hídricas en el futbolista, comprometiendo su salud y rendimiento.

Objetivo: evaluar los cambios obtenidos en dos planes diferentes de hidratación, ingiriendo una bebida isotónica comercial vs agua.

Metodología: se analizaron 30 futbolistas de la Academia de Fútbol Santos Tepic, categorías 2003 y 2004 de la liga de la Asociación de Fútbol del Estado de Jalisco, obteniendo datos de pesaje antes y después del entrenamiento, líquido ingerido durante el mismo y duración de la actividad física, se calculó el porcentaje de cambio de peso y tasa de sudoración. Se determinó que no hay una asociación entre variables, debido a que el grado de libertad obtenido (3.841) para X2 fueron menores, por lo que se interpreta que el valor de p (p<0.05) no fue significativa.

Contribución: una bebida hidratante comercializada no tiene mejores beneficios que el agua simple, con las cantidades adecuadas en un tiempo periodizado se puede lograr una buena hidratación, manteniendo el porcentaje de cambio de peso y tasas de sudoración en rangos permisibles.

Futbol, Hidratación, Tasa de Sudoración

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Introduction

Soccer is a team sport, which requires skill, endurance and sprinting, likewise, it requires a high energy expenditure, due to the distances that players travel during a match or training. This causes a great decrease in the energy and water reserves of the soccer player, therefore, they must be recovered in a correct way and as soon as possible (Yustika, 2019).

Nowadays, it is known that water and solute losses by sweating in soccer players can vary, even in the same training session and environmental conditions (Guillermo Casas Ares, 2018); sweat losses during physical activity can vary with a range of 400 ml/h up to 2000 ml/h (Rebeca Vega-Pérez, 2016). Sweat loss is estimated by changes in body mass after fluid intake (Fernandes*, 2020). Taking as reference the weight before and after exercise. The level of dehydration is expressed as a percentage of body mass (Rebeca Vega-Perez, 2016). Dehydration equal to or greater than a loss of 2% of body mass status comes to have a negative impact on the performance and health of players (Guillermo Casas Ares, 2018), (Baker1, 2017).

Currently, water and electrolyte requirements in players do not receive the necessary attention and in addition, athletes do not always follow the proper hydration plan to prevent dehydration.

Isotonic drinks contain sugars and minerals at the same osmotic pressure as blood, favoring rapid assimilation. The basic components are: water, simple carbohydrates (fructose, glucose, dextrose, sucrose), complex carbohydrates (maltodextrins) and minerals (sodium, potassium, chlorine and phosphorus). The hydrating drink Gatorade contains more glucose than fructose and 0.1% of calcium in its composition (Consumer, 1st), (Martínez Jr, 2008).

During competitions or intense sports practices, there are usually significant changes in body weight, mainly caused by the loss of water in the form of sweat. This can alter the homeostasis of intra and extracellular volume of the organism, and produce important alterations in body functions involving the nervous, cardiovascular, thermoregulatory, metabolic, endocrine and renal systems.

All of them can impair physical and psychological capacities during exercise (Lisett Hernández-Ponce a M. S.-G.-C.-C.-U.-P., 2021).

Material and method

Design and study population

The present experimental, longitudinal and prospective study. It was carried out in soccer modules 5 and 6, located within the facilities of the Universidad Autónoma de Nayarit at an altitude of 940 m above sea level. A total of 30 players belonging to the 2003 and 2004 categories of the Santos Tepic Soccer Academy, who competed in the league of the Amateur Soccer Association of Jalisco, were evaluated and met the selection criteria.

At the beginning, the Clinical-Nutritional History was applied according to NOM-004-SSA3-2012. The instruments used were reviewed and calibrated prior to the measurements taken. Body weight was recorded with the TANITA FitScan 577F standardized scale with a measurement range of 0 to 150 kg and an accuracy of 0.1 kg. Height was determined using the Seca 213 portable stadiometer, with a range of 20-205 cm \pm 5 mm.

For the aforementioned evaluations, two measurements were taken, one at the beginning and the other at the end of training. The players were weighed wearing their usual training uniform, which was the same for all measurements. To carry out the hydration control, two types of beverages were used, the first was an isotonic drink (Gatorade) and the other was natural water, providing sports drink to the starters and natural water to the substitutes. In quantities of 250 ml of liquid every 20 minutes (according to the American College of Sports Medicine, 2007).

Sweat rate calculation according to Dunford 2010

$$TS = \frac{P1 - P2 + I \times 60}{\text{Min.Ent.}} \quad (1)$$

- TS= Sweating rate

- P1= Weight before physical activity

- +I= Liquid intake during physical activity (in liters)
- Min. Ent= Minutes that the workout lasted
- 60= Constant to bring the calculation to the hour.

Calculation of weight percentage

It was carried out with the following formula:

$$\% \text{ Lost Weight} = \frac{\text{Pre-weight} - \text{Post-weight}}{\text{Previous weight} \times 100} \quad (2)$$

Results and analysis

The results obtained from the present study are shown in the following tables, in which a description is made of both the treated and untreated players, as well as the variable of environmental temperature and humidity. In which the mean and standard deviation are indicated.

In both the treated and control groups, the percentage of weight change was very similar, so it was necessary to establish the X2 test, based on the criteria established by the American College of Sports Medicine (ACSM), which states that a weight loss >1% can impair performance during training or a match. The mean weight loss with Gatorade was 0.59% and 0.66% with water, being higher, however, both results are very similar (Table 1).

Month:	GATORADE		WATER	
	% CP	Gr	% CP	Gr
February	0.86%	448	0.94	468
March	0.53%	302	0.61	305
April	0.63%	359	0.73	366
May	0.32%	182	0.37	187
Media:	0.59%		0.6625%	

Table 1 Variations in % weight loss in hydration plans

Percentage weight change in the players.

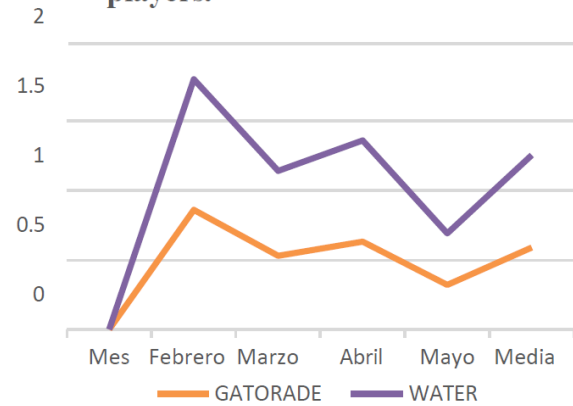


Figure 1 Comparative graph of percentage weight change

In sweating rates, the hydration plan with isotonic drink had an efficiency of 89.39%, in comparison with plain water, an efficiency of 97.91% was obtained, showing in this category, plain water a better response to maintain sweating rates lower than 1.45 L/h, this being the reference range observed in different bibliographies (Table 2, Graph 2).

Month:	GATORADE	WATER
	% CP	Gr
February	0.86%	448
March	0.53%	302
April	0.63%	359
May	0.32%	182
Media:	0.59%	

Table 2 Comparison of sweating rates of hydration plans

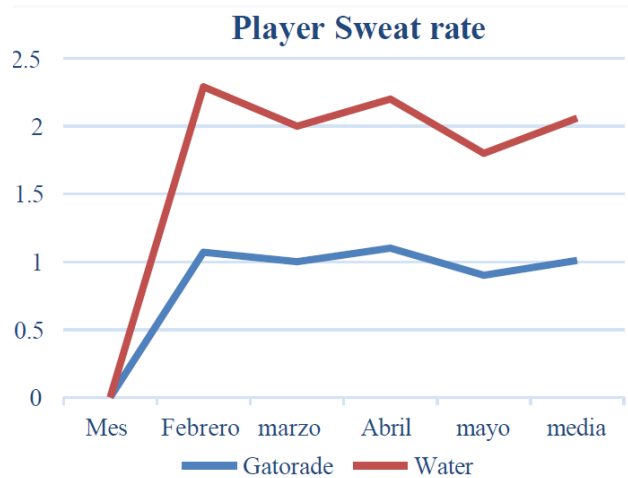


Figure 2 Comparative graph of sweating rate

Discussion

Maughan et al. 2004, conducted a study in 24 players of a soccer team, during the competitive stage, who were given 1 L of sports drink for hydration, which was ingested voluntarily. The result was a minimum weight loss of 0.54 kg, equivalent to 0.65% of body weight, and a maximum of 1.98 kg, equivalent to 2.58% of body weight. In the sweat volume, the mean was 2033 ml and the standard deviation was 413 ml. Finding no significant relationship between the variables (Rebeca Vega-Pérez, 2016).

In the study conducted ("Evaluation in weight loss and sweating rate, in soccer players who took a different hydration plan, of the 2003 and 2004 categories of the Academia Fútbol Santos Tepic."), the minimum weight change percentage obtained was -0.34% and a maximum of 2.3% for the starters, while in the substitutes, the minimum weight change percentage was 0.1% and a maximum of 2.1%, coinciding with the results (Maughan et al. 2004), without obtaining a significant relationship. The data obtained from this research were, mean sweating rate of 43.83 ± 14.70 ml/min (2.628 ± 0.882 L/h), and mean percent weight lost of $0.99 \pm 1.12\%$, with no significant differences observed in this parameter in the six encounters analyzed ($p=0.997$).

Nucciuo RP, et al. 2017. Analyzed the results of three studies, compared the impact of hydration with body weight loss. The results of the study by Ali et al. in a first division women's soccer team, showed a 2.2% loss of body weight with fluid restriction, and a 1.0% loss with water intake (Aguilera Daniela, 2016). With these results and those obtained from our research, the mean percentage weight change was 0.58% for the treated group and 0.66% for the control group. It can be concluded that the use of a hydration plan helps to maintain the levels of percentage weight change within the allowed ranges (<1% weight change according to American College Sports Medicine 2007).

Aguilera et al. 2016. Established in their research, a cut-off mark of $<27^{\circ}\text{C}$, as a suitable temperature for physical activity, as a result, obtained the loss of weight change percentage of 0.5-0.6% (Aguilera Daniela, 2016). The general average in environmental temperature in our study is 25.9°C , remaining at adequate levels for the correct functioning of the body during exercise, likewise, similar results were obtained in percentage of weight change, 0.5% for the control group and 0.6% in alternates.

Peniche et al. 2011, demonstrated that a relative humidity of 50% or more can affect the capacity to evaporate sweat and therefore limits the effectiveness of the body's cooling system during exercise. At humidity levels of 90-100%, evaporative heat loss approaches zero (Guillermo Casas Ares, 2018). In our overall humidity results, an average of 53% was obtained, approaching these to a critical value for heat loss by evaporative means. Consequently, there is an increase in body temperature, affecting the health of the players.

The environmental conditions, the hydration and type of food the player took before starting the exercise, the acclimatization to heat, as well as the individual physical characteristics of each player, influenced the variability of the percentage of weight change and sweating rate of each one, making possible the increase of body weight or a drastic change of weight change, which influenced the losses of sweating rate and performance.

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Conclusion

From this study it is concluded, that a commercialized hydrating drink has no better benefits than plain water, with the administration of adequate amounts in a periodized time, a good hydration can be achieved, maintaining the weight percentage change and sweating rates within the permissible ranges to avoid negative health effects and a decrease in the athlete's sports performance, even if the drink used during hydration is not a commercial isotonic drink. These judgments are made according to the results of the study.

The resulting effectiveness in percentage of weight change between the hydration plan with isotonic drink and plain water was 75 and 76.04% respectively, maintaining the percentage of weight change <1%.

While, in sweating rates, the hydration plan with isotonic drink presented an efficiency of 89.39%, compared to plain water, an efficiency of 97.91% was obtained, showing in this variable, plain water presented a better response to maintain sweating rates lower than 1.45 L/h, being this the reference range observed in soccer players, according to different bibliographies.

From the evidence of the study, the need arises to adjust the fluid intake of players continuously, and to ensure that they are well hydrated before the start of physical activity to minimize dehydration.

It is necessary to adjust the variables more rigorously to reaffirm the previous results.

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