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## ORIGINAL

# INCIDENCE OF HYPOHIDRATION IN ATHLETES AND SEDENTARY MALE ADULTS WITH INTELLECTUAL DISABILITY

# RIESGO DE DESHIDRATACIÓN ENTRE DEPORTISTAS Y SEDENTARIOS CON DISCAPACIDAD INTELECTUAL

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**ABSTRACT**

The current study was designed to determine hydration status of well-trained, male athletes with ID. A secondary purpose was to compare these results with hydration status of sedentary young adults with ID.

A total of 22 athletes with ID volunteered for this cross-sectional, descriptive study. The control group included 22, age, sex and IQ-matched sedentary adults with ID. Main outcome measurements were urine specific gravity (USG) and daily fluid intake for three consecutive days.

With regard to athletes with ID, it was found that 5 participants (21,7%) stayed significantly hypohydrated, 12 athletes (52,2%) appeared hypohydrated and 6 participants (26,1%) stayed euhydrated. In fact, a significantly lower percentage of athletes was euhydrated when compared to sedentary matched adults with ID (26,1 vs. 40,9%; $\chi 2=5,67$; $p<001$).

In conclusion, athletes with ID are at increased risk of dehydration that may be explained, at least in part, given that ad-libitum fluid consumption was insufficient.

**KEY WORDS:** Intellectual disability; Sport; dehydration; urine specific gravity

**RESUMEN**

El presente estudio descriptivo de tipo transversal se diseñó para determinar el nivel de hidratación de deportistas con discapacidad intelectual y su comparación con adultos sedentarios con la misma discapacidad.

Participaron 22 deportistas federados que realizan el mismo programa de entrenamiento además de 22 adultos sedentarios ajustados en sexo, edad y cociente de inteligencia. Los parámetros ensayados fueron la densidad urinaria determinada mediante refractómetro así como la ingesta diaria de líquido ad-libitum. Este protocolo fue aprobado por un Comité de Ética Institucional.

Tan solo 6 deportistas (21,6%) presentaron valores de euhidratación frente a 9 (40,9%) de los participantes sedentarios incluidos en el grupo control. Las únicas diferencias significativas respecto a la ingesta de líquidos se estableció precisamente entre deportistas y sedentarios con euhidratación.

Se concluye que los deportistas con discapacidad intelectual se encuentran en riesgo de deshidratación que podría explicarse, al menos en parte, por una insuficiente ingesta hídrica.

**PALABRAS CLAVE:** Discapacidad intelectual; Deporte; deshidratación; Densidad de orina

## 1 INTRODUCTION

Despite ongoing efforts to educate athletes about the harmful effects of dehydration in performance and health status, many athletes are known to show up for practice or games in a hypohydrated state (Maughan and Shirreffs, 2010). The negative effects of dehydration on performance have been widely demonstrated in able-bodied athletes (Baker et al. 2007). Furthermore, it may negatively impact athlete´s health status (Howe and Boden, 2007).
Fortunately, in recent years, many athletes with intellectual disability (ID) participate in competitive and recreational sports events such as Special Olympics (Eidelman, 2011). Similarly, there is an increasing number of research papers focused on benefits induced by short-term intervention programs based on regular exercise for people with ID (Rosety et al. 2010; Ordonez et al. 2013)
However, to date, the estimation of hydration status in people with ID has received no attention in the literature despite they might be at increased risk for dehydration (Ball et al. 2012; Lazenby, 2008). This situation could be even more complicated for men given that women have a higher thermoregulatory threshold and, therefore, do not begin sweating until their core temperatures are higher (Lopez et al. 1994).

## 2 OBJECTIVES

For the reasons already mentioned, the current study was designed to determine hydration status of well-trained, male athletes with ID. A secondary purpose was to compare these results with hydration status of sedentary young adults with ID.

## 3 MATERIAL AND METHODS

### *3.1 Participants*

A total 22 athletes with ID volunteered for this cross-sectional, descriptive study. In a more detailed way, participants met the following inclusion criteria: (1) Male (2) Young adults (18-30 years); (3) Well-trained athletes that take part in competitive events (4) An intelligence quotient (IQ) range of 60–69, determined by Stanford-Binet Scale. The control group included 22, age, sex and IQ-matched sedentary adults with ID.

### *3.2 Outcomes*

The first morning urine was collected to assess urine specific gravity given that it is considered a more accurate indicator of hydration status (Volpe et al. 2009). Each participant was given a sterile container and gave a representative mid-stream urine sample. The samples were collected and analyzed fresh within an hour of collection.

Urine samples were analyzed for specific gravity (USG) using a clinical handheld refractometer (A300, ATAGO Co, Tokyo, Japan). A drop of urine was placed onto the refractometer using a disposable, mineral-free pipette. It should

be pointed out that the same researcher read and recorded the corresponding specific gravity. All measurements were conducted in duplicate, and the average urine specific gravity was used for the final assessment for each participant (Volpe et al. 2009).

The refractometer was calibrated before each analysis using distilled water. Three hydration-status groups were defined based on urine specific gravity, which has been found to be valid and reliable (Sawka et al. 2007): Euhydrated was defined as urine specific gravity less than 1.020 g/l; hypohydrated, from 1.020 to 1.029 g/l; and significantly hypohydrated, equal to or more than 1.030 g/l.

The overall volume of fluid intake was measured for 3 consecutive days (2 weekdays and 1 weekend day) either Thursday, Friday and Saturday or Sunday, Monday and Tuesday. Participants and caregivers were instructed to drink as much or as little as they wanted but to drink only from the bottles provided to them. Furthermore, participants were unaware that their fluid consumption was measured in order to not affect drinking behavior.

*3.3 Ethics and statistics*

The present research has been conducted in full accordance with ethical standards in sports and exercise science research (Harris and Atkinson, 2011). Oral and written informed consent was obtained from participants and their legal representatives. Furthermore, this protocol was approved by an Institutional Ethics Committee. Regarding statistics analysis, chi-square test ($\chi 2$) was used to determine the prevalence of hypohydration in well-trained adults with ID. Furthermore the same test was performed to compare the hydration status of well-trained versus sedentary adults with ID. It should be pointed out the alpha level was set a priori at 0.05.

## 4 RESULTS

With regard to athletes with ID, it was found that 5 participants (21.7%) stayed significantly hypohydrated (USG=1.032 ± 0.003). Furthermore, 12 athletes (52.2%) stayed hypohydrated (USG= 1.026 ± 0.002). Lastly, 6 participants (26.1%) stayed euhydrated (USG=1.014 ± 0.004). These results are listed in table 1.

**Tabla 1**. Nivel de hidratación, densidad urinaria e ingesta diaria de líquidos en varones adultos deportistas y sedentarios con discapacidad intelectual (DI).

| | DEPORTISTAS CON DI | | | CONTROLES CON DI | | |
|---|---|---|---|---|---|---|
| | **Porcentaje** | **USG** | **Ingesta** | **Porcentaje** | **USG** | **Ingesta** |
| **Deshidratación significativa** | 21.7% | 1,032 (0.002) | 1150 (309) | 13.6% | 1.031 (0.001) | 1072 (282) |
| **Deshidratación** | 52.2% | 1.026 (0.002) | 1298 (386) | 45.5% | 1.024 (0.003) | 1184 (318) |
| **Euhidratación** | 26.1% [a] | 1,014 (0.004) | 1511 [a] (472) | 40.9% | 1.017 (0.002) | 1392 (404) |

**Nota**: DI: Discapacidad intelectual. USG: Densidad urinaria expresada en g/ml. Ingesta diaria de líquidos expresada en ml/día. Ambos valores expresados como media (sd). [a] $p<0,05$ respecto a controles.

Our results also demonstrated that a significantly lower percentage of athletes was euhydrated when compared to sedentary matched adults with ID (26.1 vs. 40.9%; $\chi 2 = 5.67$; $p< 0.01$). Lastly, regarding the fluid intake, significant differences were found just between euhydrated athletes and sedentary adults with ID (1511±472 vs.1392±404 ml; $\chi 2 = 7.60$; $p= 0.02$).

## 5 DISCUSSION

To the best of our knowledge, this was the first study that highlight athletes with ID are at increased risk of dehydration. In a more detailed way, the current study has also shown their risk was higher compared to sedentary young adults with ID. Similarly, the percentage of euhydration among athletes with ID was lower than the percentage reported among non-disabled athletes (Volpe et al. 2009). It should be pointed out that the current study was performed on Spring (April) so that the situation could be even worst in summer time.

Our results suggested that the high percentage of hypohydration among athletes with ID should be explained by their low daily fluid intake when compared with able-bodied athletes (Beis et al. 2011; Rodriguez-Perez et al. 2012). In fact, it is even lower than the fluid volume consumed just during the games by some NBA players in competition (Osterberg et al. 2009). Consistent with previous studies in recreational exercisers without ID (Stover et al. 2006), prescribed drinking volumes might be more effective than fluid ingestion ad libitum. Accordingly, athletes and their coaches and caregivers should be educated about proper hydration techniques as well as being encouraged to execute a proper hydration schedule.

Despite several health benefits associated with physical activity, it is widely accepted it comes with an inherent risk of sports-related injuries such as those associated with dehydration (Howe and Boden, 2007). Previous studies have also reported the injury risk may be complicated by pre-existing disability (Ramirez et al 2009). This is of particular interest given that sport-related injuries and discomfort represent serious barriers to physical activity that may

lead to participants interrupting their training programme (Mahy et al. 2010). Furthermore, Hillman et al. (2001) have already found that exercise-induced dehydration may result in increased oxidative stress. In this respect, it should be pointed out that people with ID present higher oxidative damage when compared to non-disabled matched controls that has been associated with early aging, immunosupression, neurodegeneration, etc. (Pagano and Castello, 2012).

The reasons already mentioned justified the importance of assessing hydration status in this group not only for research tasks but also in the field. Fortunately, there are several methods of assessing and monitoring athlete´s hydration status. In this line, urine specific gravity (USG) was used in the current study because it is an accurate, fast, simple and validated technique (Volpe et al. 2009).

Other techniques to assess hydration status include the use of urine colour charts, although urine colour may be confounded by intake of vitamin supplements (Holway and Spriet, 2011). In this respect, it should be pointed out that dietary supplements to enhance either cognitive function or psychomotor development are usually taken by people with ID despite a systematic review of the literature concluded results are controversial (Salman, 2002). Drawing blood from all participants would not have been feasible because of the number of athletes and expense of analyzing for plasma osmolarity (Maughan, 2003). Furthermore, fear of medical procedures in general and needles in particular can be a difficult clinical challenge to provide effective health care for individuals with intellectual disability (Wolff and Symons, 2013).

Lastly, survey instruments and perceptual measures have been validated and demonstrated to have high reliability in documenting common signs and symptoms related to exercising in the heat and dehydration in able-bodied athletes (Coris et al. 2006; Cleary et al. 2012; O`Neal et al. 2011). However to date, these questionnaires are not available in the literature for people with ID. Accordingly, future studies on this topic are still required in order to provide an easier, quicker and cheaper assessment of hydration status for this group. Finally, strengths of the current study included the homogeneous and large sample size that allowed authors detect significant differences between athletes and sedentary adults with ID. Furthermore, the presence of a control group consisting of age, sex and IQ matched adults with ID may reduce the recruitment bias of healthy controls.

The present study had some limitations that should be considered too. A major limitation was that the data regarding fluid intake was provided by caregivers and relatives. In spite of they all were well trained by researchers to do this task with accuracy, it can not be discarded there is a risk of under/overestimation. Another limitation of our study was that we did not focus on education for the coaching staff and caregivers concerning hydration. In this respect, Volpe et al. (2009) reported that educating and changing behaviors of coaches might be as beneficial in preventing hypohydration as educating the athletes.

## 6 CONCLUSION

Athletes with ID are at increased risk of dehydration that may be explained at least in part given that ad libitum fluid consumption was insufficient. Furthermore, these findings should form an important basis for continued research aimed at examining the drinking behaviors and hydration status during competition in this group.

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