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Ad libitum fluid ingestion rates in a euhydrated state and following two methods of dehydration

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Introduction

Many factors such as drink composition and drink rate influence post-exercise rehydration (Evans *et al.* 2017). For standardisation purposes, studies adopting fixed, and often very large, fluid ingestion volumes were primarily used by expert bodies to develop their post exercise fluid replacement guidelines (Sawka *et al.* 2007). In addition, these studies primarily used exercise induced dehydration methods.

Aims: The aim of the present study was to assess whether voluntary post exercise rehydration was influenced by the method of weight loss.

Method

Six recreationally active (4 male, 2 female) participants of age, mass and $\dot{V}O_{2peak}$ 26 ± 4 yrs, 66.68 ± 7.41 kg and 51.6 ± 8.1 ml.kg⁻¹.min⁻¹, respectively, either remained euhydrated (EU), or reduced their body mass by 24h fluid restriction (FR: BM $\Delta 2.1\%$), or a combination of intermittent exercise in the heat (34°C, 60% rh) followed by 13h fluid restriction (FREX: BM $\Delta 2.3\%$), 15 min post-performance of a short maximal exercise capacity test, they remained in the laboratory for 60 min and voluntarily ingested a carbohydrate electrolyte drink (6% carbohydrate and 19 mM [Na⁺]) *ad libitum*. Drink volumes were monitored without participants knowledge at 10-, 30- and 60-min post start of drinking and water intake from food and fluids were monitored for a further 180 min via dietary analysis (Figure 1). Blood and urine samples were collected. Data were analysed using repeated measures ANOVA and are presented as mean \pm SD.

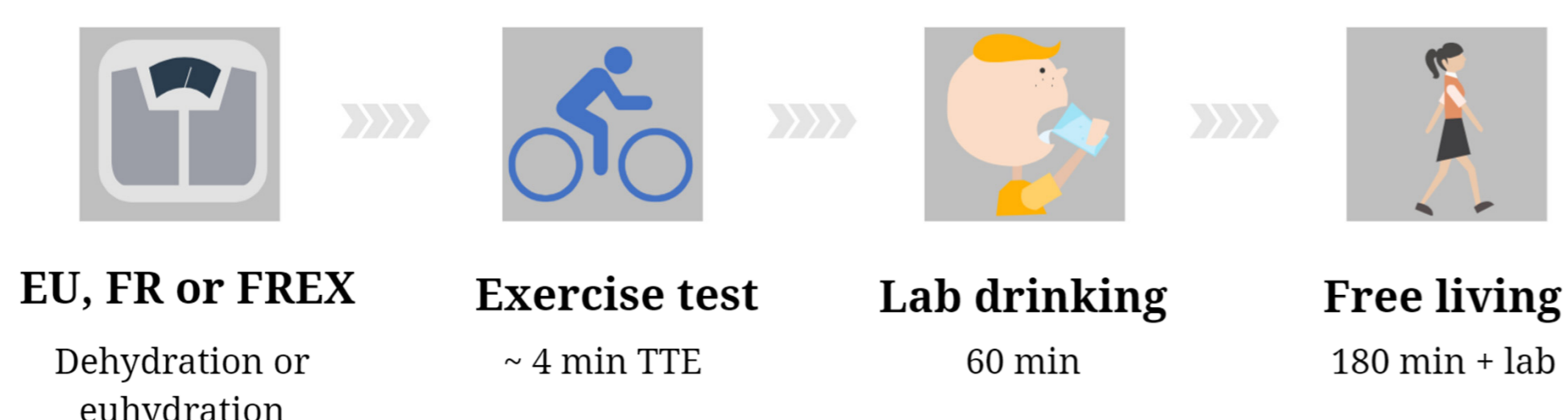


Figure 1: Protocol schematic

Table 1: Mean \pm SD post exercise fluid intake (ml)

Fluid intake period	EU	FR	FREX
0-10 min	398 \pm 244	774 \pm 340*	710 \pm 354*
10-30 min	281 \pm 165	578 \pm 386	382 \pm 108
30-60 min	329 \pm 198	334 \pm 238	337 \pm 237
0-60 min	1008 \pm 523	1676 \pm 907*	1428 \pm 607
60-240 min	925 \pm 593	909 \pm 227	965 \pm 543
Total (0-4h)	1932 \pm 809	2585 \pm 766*	2393 \pm 695

* significantly different from EU trial (P<0.05)

Results

Drink volumes ingested in the initial 60 min were high in all three conditions and appeared greatest on the FR trial compared to EU (Table 1). Drink rates were greatest in the initial 10 min of fluid access, ranging between 40-50% of total fluid intake in the initial 60 min, but did not differ between trials. Fluid intake volumes were identical on each trial during the 1-4h period (P=0.97). Total urine volume was significantly greater in the EU trial (1113 \pm 369 ml; P<0.05) compared with the FR and FREX trials, but did not differ between the FR and FREX trials (FR: 722 \pm 427 ml; FREX: 542 \pm 452 ml). Subjective feelings of thirst and mouth dryness were high post exercise in all trials, but reduced at 1h and 4h post drinking.

Discussion

Fluid intake in the initial 60 min were higher on all trials than over a 180 min period in a recent study (Funnell *et al.* 2023), which may be partially explained by higher self-reported thirst ratings at the commencement of drinking in the present study. High drink rates were particularly unexpected on the EU trial where prior body mass losses were of small in magnitude at 0.31 (0.11) kg. The nature of the exercise led to transient, but markedly elevated self-reported thirst and mouth dryness, serum osmolality and reduced plasma volume which may have driven these high drinking rates on the EU trial.

In conclusion, voluntary post exercise fluid ingestion rates can be high and are similar despite varied methods of dehydration.

References:

- Funnell MP *et al.* (2023) Ad-libitum fluid intake was insufficient to achieve euhydration 20 h after intermittent running in male team sports athletes, *Physiology & Behavior* 268: 114227
- Evans GH *et al.* (2017) Optimizing the restoration and maintenance of fluid balance after exercise-induced dehydration *Journal of Applied Physiology* 122: 945-951
- Sawka MN *et al.* (2007) American College of Sports Medicine position stand. *Exercise and fluid replacement. Medicine & Science in Sports and Exercise* 39: 377-390