

# Fluid losses and Voluntary Fluid Intakes in New Zealand Age Group Triathletes During the 1998 ITU World Championship Triathlon

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The adverse effects of dehydration on sporting performance are one of the most thoroughly investigated areas in sports science. It is well established that athletes can lose sweat in excess of one to two litres per hour during intense exercise in the heat. A one litre fluid loss causes core temperature to rise by 0.3°C during exercise in the heat, heart rate to be elevated by 8 beats per minute and cardiac output to decline by 1 litre per minute. It has been found that sweat rates are highly individual and that athletes do not voluntarily replace more than 50% of the fluid loss incurred during exercise. Most of the research in the area of dehydration is conducted within a laboratory setting which may not accurately reflect field conditions. Considering all of this, it is clearly important that athletes assess their sweat induced fluid losses and fluid requirements in the field and that they develop appropriate individual fluid plans in order to maximise performance and prevent problems resulting from dehydration.

The aim of this field study was to first estimate sweat induced fluid losses in New Zealand age group triathletes during an Olympic Distance Triathlon race and to secondly provide feedback on fluid losses and fluid needs to individual athletes to assist them in developing appropriate individual fluid plans for use during competition.

## Methods

### *Subjects*

Six female and 15 male New Zealand age group triathletes volunteered to participate in a field study in which sweat induced weight loss was measured during the 1998 ITU World Triathlon Championships in Lausanne, Switzerland. Recruitment took place at a team meeting two days prior to the race and the aims and procedures of the study were explained at this meeting.

At the World Triathlon Championships each age group spans five years, except for the junior age group which is from 16-19 years. The women's races preceded the men's and the higher age groups took place before the lower age groups. The first race in which subjects participating in this study competed started at 7 am with subsequent starts at 10 minute intervals. The last start for subjects in this study was at 9.30 am for the 20-24 year old males. Table one shows the age groups in which subjects participating in this study competed.

### *Study design*

Subjects reported to the New Zealand tent which was situated close to the starting line for a weigh in approx. 30 minutes prior to the start of their individual race and again as soon as was practical, but within half an hour of, finishing. Subjects were weighed in their racing togs and were dried off thoroughly with a towel before the post race weight measurement. A Wedderburn Tanita 1609 N set of weighing scales was used. Outside

temperature at 6.40 am was  $12.5^{\circ}\text{C}$  and had increased to  $16.6^{\circ}\text{C}$  by 11.40 am

Table 1. Age groups in which New Zealand triathletes raced at the 1998 ITU World Triathlon Championships.

Age group	Females	Males
65 - 69	-	1
50 - 54	2	1
45 - 49	2	4
35 - 39	1	2
30 - 34	-	1
25 - 29	1	4
20 - 24	-	2

Subjects were instructed to estimate and report on the amount and type of fluid consumed between the pre and post race weight measurements. Fluid intake for each athlete was reported on and recorded at the post race weight check.

Subjects were further asked to report on urine output and bowel motions between the pre and post race weight checks. They were instructed to report on the frequency of passing urine and to indicate if they passed a small, medium or large amount. A small volume was estimated to be 100 ml urine, medium 200 ml and large 300 ml.

Fluid loss (g) was estimated using the following equation:

Fluid loss = reduction in body weight (g) + fluid intake (g) - urine output (g).

Percent dehydration is defined as the body weight loss which occurred during the race and was calculated as follows:

Percent dehydration = (body weight reduction - urine output) / initial body weight x 100

## Results

All subjects lost weight during the race and mean weight loss was 1200 g (range 200 - 2600 g). Mean total fluid intake between pre and post race weight measurements was 1120 g (range 500 - 2500 g). Mean estimated urine output was 120 g. Total mean fluid loss (reduction in body weight + fluid intake - urine output) was thus 1200 plus 1120 - 120 = 2200 g. Mean percent dehydration (body weight loss - urine output / initial body weight x 100) was 1.4%.

## Discussion

A limitation of this study was that due to it's nature, fluid intakes and urine output could not be accurately measured and had to be estimated by subjects. However, as this study was conducted during an important international race it does provide valuable information on fluid losses and intakes during such an event and under specific climatic conditions. The results indicate that despite the perceived cool temperatures during the first part of the morning during which the age group World Championship race

took place, the triathletes in this study did become dehydrated and had not judged their fluid requirements accurately. As scientists now believe that there is no critical amount of dehydration which can be tolerated without physiological consequence, these triathletes would have benefited from larger fluid intakes during the race. As sweat rates are highly individual and because athletes do not voluntarily meet their fluid requirements, assessing fluid losses in both training and racing is of significant benefit in developing appropriate fluid intake plans for individual athletes.

### References

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