Glucose control vital for sports skill

Mild hypoglycaemia – below-normal blood glucose levels – markedly reduces sports skill performance and cognition in young athletes with Type 1 diabetes.

Research at Toronto universities showed sports performance skills among youth with Type 1 was 20% lower at the time of skill testing when glucose concentrations were hypoglycaemic (low) compared to either acceptable or hyperglycaemic (high).

Research written up in *Blood Glucose Levels and Performance in a Sports Camp for Adolescents with Type 1 Diabetes Mellitus: A Field Study*, was by Dylan Kelly and Michael Riddell, pictured top left, School of Kinesiology and Health Science, Muscle Health Research Centre, Physical Activity and Diabetes Unit, York University, and Jill Hamilton, Endocrinology Division, Hospital for Sick Children, University of Toronto.

The study is the first to examine sports performance associated with different levels of blood glucose levels in adolescents with Type 1 diabetes, and also the first study to measure non-endurance type sport performance in persons with Type 1 diabetes.

Twenty-seven young people with Type 1 (15 males, 12 females), 9–17 years of age, attending the 2009 York University Diabetes Sports Camp undertook multiple skill-based tests (tennis, basketball, or soccer skills) with glucose monitoring over four days.

No participant was asked to perform a sport skill if they felt symptoms of hypoglycaemia. They performed routine self-glucose monitoring before meals and sometimes (e.g. those on pump therapy) before snacks.

If symptoms of hypoglycaemia were noted by the campers during the camp, blood glucose was immediately tested and treated as required (i.e. 15 grams of fast-acting dextrose tablets).

Researchers used the child-specific Stroop test to assess the effect of glycaemia on neuropsychological performance at the sports camp. The Stroop test evaluates the ability to view complex visual stimuli and to respond to one stimulus dimension while suppressing the response to another dimension, an "executive" skill largely attributed to frontal lobe function.

Stroop testing, "reading" and "colour recognition" degraded during hypoglycaemia, while "interference" scores improved ($P<.05$). Nocturnal hypoglycaemia was present in 66% of participants, lasting an average of 84 minutes, but this did not affect sports skill performance the following day.

Any obvious decrease in sport performance, such as poor passing or failed free throws, is a warning sign to young athletes with diabetes to check for hypoglycaemia by monitoring their blood glucose levels and if necessary treat it with additional carbohydrate intake.

Balanced glucose control is particularly challenging in young people with Type 1 diabetes as insulin requirements are influenced by a number of changing variables including nutritional intake, physical activity levels, and circadian rhythms of other anti-insulin hormones.

The researchers say that because of physiological and behavioural factors, optimal glycaemic control can be particularly demanding for youth with Type 1. Regular exercise, while having several beneficial effects, can make glycaemic control 'very challenging'.

Immediately following exercise, blood glucose concentrations may be low due to excessive insulin administration or may be high due to the effect of adrenaline release from the excitement and intensity of the exercise.

A few hours later glucose levels typically fall because of elevated insulin sensitivity that helps replete glycogen stores, but symptoms of low or high glucose levels are often masked by increased physical activity and sporting competition.

In summary, researchers found that hypoglycaemia, but not hyperglycaemia, impairs sports skill performance and cognitive function in youth with Type 1 diabetes.

In contrast, prior exposure to hypoglycaemia the night before competition does not appear to influence performance the following day.

They say that vigilance in glucose control to limit hypoglycemia during sport should maximise competitive capacity in adolescents with Type 1 diabetes. ●

Researcher Dr Riddell was diagnosed with diabetes at 14 but continued to be an active adolescent engaging in various sports, including basketball, tennis and mountain biking. At that time there was limited research on the effects of sports on diabetes. Dr Riddell eventually went on to get his PhD, specialising in energy metabolism during exercise in children and adolescents. ●