Abstract
Title: Similar effects of intake of fructose and glucose mix compared with only glucose on recovery of muscle glycogen levels in adult men after exercise – A systematic review article

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Background
Athletes want to maximize their performance during training and competition. For long distance athletes, there may be limited time before the next performance, meaning that recovery relies largely on dietary intake. It is possible that by combining fructose and glucose, there would be increased intestinal uptake and therefore better recovery. Fructose is metabolized primarily in the liver, while glucose is delivered directly to muscles. As a result, taking a combination of fructose and glucose could hypothetically increase skeletal muscle glycogen replication through more effective delivery via multiple transport routes.

Objective
The purpose of this systematic review article was to investigate the effect of fructose together with glucose compared with only glucose on the recovery of muscle glycogen levels after exercise in adults aged 18-44 years.

Search strategy
The literature search was conducted in PubMed, Scopus and Cochrane Library.

Selection criteria
Measurement of skeletal muscle glycogen after exercise and post-recovery for results of the glycogen replication in healthy people aged between 18-44 years. Drinks containing a fructose and glucose mix or only glucose were provided during the recovery period.

Data collection and analysis
Selections made during search after reading of the title and abstract of potentially relevant articles. Seven articles were selected to be read in full text. Two articles were excluded when they failed to meet the criteria for the disclosure. The remaining five articles includes only men. The articles are RCT studies that have moderate to high study quality.

Main results
There is high scientific evidence (++++) that fructose and glucose mixture versus only glucose does not give significant differences in skeletal muscle glycogen replication on recovery in athletes. Despite differences in recovery time and the amount of carbohydrates in the drinks in the various studies, skeletal muscle glycogen replication appears to be unaffected by any monosaccharide intake.

Conclusions
There is strong evidence that fructose and/or glucose intake does not affect the development of muscle glycogen synthesis after exhausting exercise. The total glycogen amount synthesised is the same regardless of which monosaccharide is taken, within a range of 1.2-1.5 g/kg body weight. However, side effects suggest that it is beneficial to take a mixture of sugars to reduce the risk of gastrointestinal symptoms.

Keywords: Fructose, glucose, glycogen, post-exercise, muscle, recovery, training