

UNIVERSITI TEKNOLOGI MARA

**THE BENEFITS OF
CARBOHYDRATE MOUTH RINSING
ON CYCLING AND RUNNING
PERFORMANCE: A SYSTEMATIC
REVIEW**

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of the requirements for the degree of
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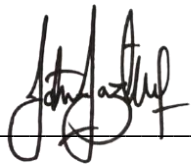
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ABSTRACT

The carbohydrate (CHO) mouth rinsing consistently provides a positive central activation system via mouth receptors, improving exercise performance. Despite an increasing number of research demonstrating the benefits of CHO mouth rinsing on exercise performance, a limited summary review has been conducted to elucidate the evidence of CHO mouth rinse effects on exercise performance, such as type of solution and beverage concentration. Therefore, this summary review aimed to identify the studies investigating the effect of CHO mouth rinsing on exercise performances, type of solution used and beverage concentration. Specifically focused on the main outcome of the studies such as time trial (TT), time to exhaustion (TTE) and mean power output. A summary review was conducted to assess the effect of CHO mouth rinsing on running and cycling performance within 1-hour duration of exercise time. The literature search was conducted using specific keywords (carbohydrate mouth rinse, performance, cycling and running exercise) on the following electronic database: PubMed, Google Scholar and Web of Science. The result of the search identified 85 studies and 5 studies manually inserted of which 22 studies met the inclusion and exclusion criteria, then each study was summarized and compared. The overall effect of CHO mouth rinsing on exercise performance was $7.5\% \pm 10\%$. In 7 of them investigated the effectiveness of CHO mouth rinsing in running exercise performance (TT and TTE) with performance benefit of 1.5% to 29% (N = 4) While 15 studies were performed in moderate to high intensity cycling exercise with 1.1% to 39% (N = 10) performance improvement. Maltodextrin was commonly used as CHO solution (N = 12), while others utilized the use of glucose, electrolyte beverages, dextrose or sucrose. The solution concentration was varied between studies ranging between 3% to 16% concentration; however, 6.4% (N = 12) was commonly used in CHO mouth rinsing intervention. A possible mechanism of CHO mouth rinse in improving exercise performances was the stimulation of the oral receptors, leading to brain region (insula/operculum frontal, orbitofrontal cortex, and striatum) activation related to reward and motor control behaviour. Variability between studies involving fasting period prior to trial, duration of mouth rinse, type of activity/exercise protocol and sample size were also investigated. This review summarizes the current knowledge regarding the effect of CHO mouth rinsing, exercise performance, solution concentration and solution type within different exercise modalities (TT vs TTE).

Keywords: mouth rinse; exercise; physical performance; maltodextrin

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