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# The Effect of Caffeine, Glucose, and Combined Caffeine-Glucose Mouth Rinsing on Vertical Jump Performance Among Male Amateur Volleyball Players

Wan Amirul Aidid Wan Nazari[1*], & Adam Linoby Feizrel Linoby[1]
[1]*Faculty of Sports Science and Recreation, Universiti Teknologi MARA Negeri Sembilan, Seremban Campus, Malaysia*
[*]*Corresponding author: 2022615662@student.uitm.edu.my*

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## I. INTRODUCTION

Mouth rinsing stimulates oral receptors that activate brain regions associated with motor control and performance enhancement. Carbohydrate and caffeine mouth rinsing have been shown to improve strength and muscular performance without ingestion [1]. Caffeine, even at very low to moderate doses, has demonstrated significant ergogenic effects on vertical jump performance [2]. Additionally, combining caffeine with other ergogenic aids may enhance performance through complementary mechanisms [3]. Therefore, this study investigated whether caffeine, glucose, or their combination via mouth rinsing could improve vertical jump height among male amateur volleyball players.

## II. METHODS

Twelve male amateur volleyball players aged 18–25 years participated in four testing sessions using a randomised repeated-measures design. The conditions were placebo, glucose (6.4%), caffeine (1.2%), and caffeine–glucose (1.2% + 6.4%), each separated by a 48-hour washout period. Participants rinsed 25 mL of solution for 10 seconds before performing three countermovement jumps on a Vertec device, which measures vertical jump height.

## III. RESULTS AND DISCUSSION

Table 1 shows a steady increase in jump height from placebo to caffeine–glucose. The mean jump height improved from 31.9 ± 1.80 cm (placebo) to 32.5 ± 1.76 cm (glucose), 33.8 ± 1.77 cm (caffeine), and 34.7 ± 1.59 cm (caffeine–glucose). The improvement observed in the caffeine condition supports previous findings that caffeine enhances explosive performance [2]. The modest increase in the glucose condition is consistent with evidence that carbohydrate mouth rinsing can stimulate central drive and improve muscular performance [1].

A significant main effect of condition was found, $F(3, 33) = 336.0$, $p < 0.001$, $\eta^2_p = 0.968$, suggesting that approximately 96.8% of the variance in vertical jump performance was explained by the experimental condition, reflecting a very strong treatment effect. (Table 2). The caffeine–glucose combination produced the greatest improvement, suggesting a possible additive effect, similar to findings where caffeine combined with another ergogenic substance enhanced muscular performance [3].

TABLE I
DESCRIPTIVE ANALYSIS

| | Placebo (cm) | Glucose (cm) | Caffeine (cm) | Caffeine–Glucose (cm) |
|---|---|---|---|---|
| N | 12 | 12 | 12 | 12 |
| Mean | 31.9 | 32.5 | 33.8 | 34.7 |
| Standard deviation | 1.80 | 1.76 | 1.77 | 1.59 |
| Minimum | 28.4 | 29.7 | 30.4 | 31.5 |
| Maximum | 35.1 | 35.9 | 36.7 | 37.4 |

TABLE II
WITHIN SUBJECT EFFECT

| | Sum of Squares | df | Mean Square | F | p | $\eta^2_p$ |
|---|---|---|---|---|---|---|
| **CONDITION** | 56.34 | 3 | 18.7785 | 336 | <.001 | 0.968 |
| **Residual** | 1.85 | 33 | 0.0560 | | | |

## IV. CONCLUSIONS

Both caffeine and caffeine–glucose mouth rinses significantly improved vertical jump height compared with placebo and glucose alone. The combined rinse yielded the greatest performance gain, likely due to complementary effects on central stimulation and motivation. Mouth rinsing offers a simple, safe, and effective non-ingestive method to enhance explosive power in amateur volleyball players.

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