

The background of the entire cover is an abstract, high-energy image. It features a blurred figure of a person, likely a runner, in motion. The figure is overlaid with vibrant, streaky light trails in shades of teal, blue, and orange, creating a sense of speed and dynamic movement. The overall composition is energetic and modern.

INTERNATIONAL GRADUATE COLLOQUIUM

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EXTENDED ABSTRACT

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ISOMETRIC HANDGRIP TRAINING ENHANCES COGNITIVE PERFORMANCE THROUGH IMPROVED REACTION TIME AND ACCURACY

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I. INTRODUCTION

This study examines the acute effects of short-term interval handgrip exercise on cognitive function. By comparing reaction time, accuracy, and heart rate responses between exercise and control groups, we aim to determine whether isometric exercise enhances cognitive performance [1]. Addressing a research gap, this study explores the potential of handgrip exercise as a low-impact cognitive enhancement tool for individuals unable to engage in dynamic exercises.

II. METHODS

Sixteen FSR recreational students participated in the study, divided into an exercise and a control group. Both groups completed cognitive tasks (Stroop and Go/No-Go). The exercise group performed isometric interval handgrip exercise at 25% submaximal effort, while the control group rested. Post-exercise, both groups repeated cognitive tasks. Accuracy, reaction time, and heart rate were recorded. Data were analyzed using independent *t*-tests, paired *t*-tests, and Pearson correlation.

III. RESULTS AND DISCUSSION

A. Reaction Time and Accuracy

Levene's test shows unequal variances for Go/No-Go RT ($p = 0.014$) but not for other tasks ($p > 0.05$). Reaction time is lower, and accuracy is higher in the exercise group, suggesting improved cognitive performance (Figure 1). Exercise enhances speed and accuracy, while control groups show inconsistent performance [2].

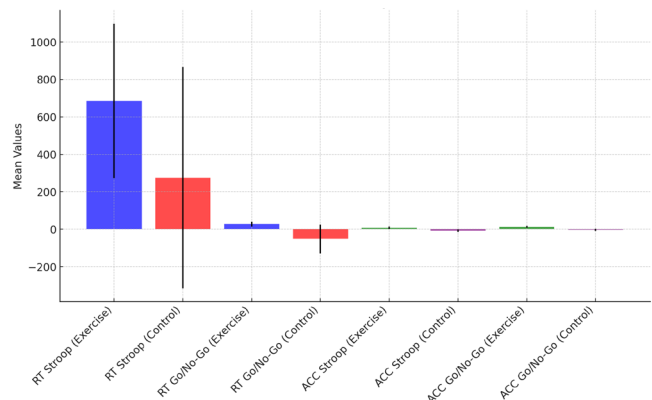


Fig. 1 Mean Reaction Time and Accuracy Across Experimental Conditions: The bar plot illustrates the mean values of reaction time (RT) and accuracy (ACC) for the Stroop and Go/No-Go tasks under exercise and control conditions. Error bars represent standard deviations

B. Pre and Post Results of Reaction Time and Accuracy

Normality assumption analysis is met ($p > 0.05$), allowing a paired *t*-test. Reaction time significantly decreased in the exercise group (2170 ms to 1458 ms) but less in the control group. Accuracy improved with exercise but remained stable in the control group (Table 1). A large effect size (Cohen's $d = 0.96$) suggests exercise enhances cognitive performance.

TABLE I
PRE AND POST RESULTS OF REACTION TIME (RT) AND ACCURACY (ACC)

Condition	Mean	Mean	SD
Exercise Pre RT	2170	459.34	162.4
Exercise Post RT	1458	283.36	100.18
Exercise Pre Acc	169	15.78	5.58
Exercise Post Acc	189	8.99	3.18
Control Pre RT	2264	379.82	134.29
Control Post RT	2041	414.86	146.68
Control Pre Acc	193	3.65	1.29
Control Post Acc	185	7.17	2.53

C. Heart Rate Responses and Reaction Time

A strong positive correlation ($r = 0.76$, $p < 0.001$) was observed between heart rate changes and reaction time improvement in the Go/No-Go Task. This indicates a physiological link between cardiovascular responses and cognitive performance. The findings align with prior research suggesting that acute physical activity, particularly isometric exercise, enhances executive functions such as inhibitory control [3].

IV. CONCLUSIONS

The exercise group showed significant improvements in reaction time and accuracy, especially in response inhibition tasks, while the control group exhibited slight cognitive declines. A strong correlation between heart rate changes and cognitive performance suggests physiological benefits of handgrip exercise. These findings support isometric training as an effective cognitive enhancement strategy.

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