

# Effectiveness of Two Types of Exercises before Classes on Inhibitory Function

KUuUBUVY'BcfjU\_]'1z'HUViW\]'<]gUU\_]'2z'Gini\_'GUhc\_c^3z' KUuUBUVY'Hcg\]U\_]'2z'HYfUgUkU'GU\_]'4z'BU\_UXY'?Y]gi\_Y^5z'HYfUgUkU'?c^]5'

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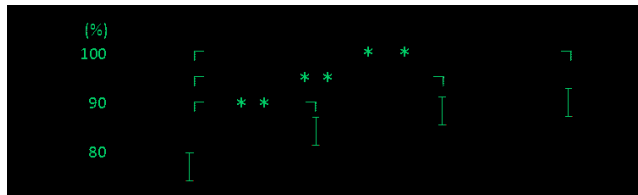
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did one of four activities on one day every other week. The four

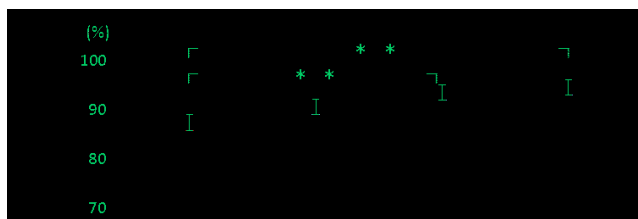
## GO/NO-GO task analysis

Response time, which was the time taken to squeeze the rubber ball, was recorded for each phase: formation, differentiation, and reverse differentiation. A total of 40 repetitions were used for analysis, including 20 repetitions each for the differentiation and reverse differentiation.



**Figure 6** The accuracy rate of case 8 for the GO/NO-GO task after each activity.

The accuracy rate for exercise 2 was 94.5%, followed by exercise 1, 93.4%, reading 90.5%, and control, 87.3%. Compared with the control activity, accuracy rates were significantly improved after exercises 1 and 2 (control vs. exercise 1,  $P < 0.01$ ; control vs. exercise 2,  $P < 0.01$ ). Figure 7 shows the results for case 9.



**Figure 7** The accuracy rate of case 9 for the GO/NO-GO task after each activity.

## Discussion

The GO/NO-GO task originated in Pavlov's conditioned reflex experiment, which used the sound of bells. Pavlov's concept was developed into the GO/NO-GO task using a light stimulus. Luria et al. [11], who were cerebral physiologists, revealed that the function of the prefrontal cortex is deeply associated with the conditioned reflex. Given its historical background, the GO/NO-GO task is considered a discrimination task, and it is used to evaluate the function of disinhibition of the PFC (prefrontal cortex). Sasaki et al. [12] claimed that "no-go potential" was found in in the dorsolateral parts of frontal lobes in both contra- and ipsilateral hemispheres when human subjects were not supposed to squeeze a rubber ball in a GO/NO-GO task.

Moreover; Sawaguchi et al. [13] revealed that the dorsolateral PFC plays an important role in working memory. The function of working memory is to store a variety of information temporarily and to make

final judgments. In addition, Fuster [14] claimed that the inhibitory function is carried out by collaboration between the orbitofrontal cortex, the prefrontal cortex, the basal ganglia, the thalamus and the hypothalamus.

During a GO/NO-GO task, attention control processes are required for both the initiation of action [15-17] and the inhibition of inappropriate responses [18,19]. Tamm [20] reported that the GO/NO-GO task requires multiple executive functions including working memory, interference avoidance, and the withholding of responses that have been established as proponent response.

In the present study, the increased number of errors suggests that the PFC function involved in working memory may be immature [21,22]. Consistent with these previous studies, the present research has used a GO/NO-GO task to verify the effectiveness of two types of exercise over reading or the normal morning meeting (control). Subjects have interaction and physical contact with each other in both exercises.

Compared with the control activity and exercises 1 and 2, the response time after the reading activity was the slowest. Furthermore, although the GO/NO-GO task accuracy rate after reading was higher than that after the control activity, it was lower than those for exercises 1 and 2. In particular, as shown in Figure 2, the accuracy rate after exercise 2 was significantly higher than that after reading in regards to the number of fails and mistakes during the differentiation phase. As shown in Figure 4, the total number of fails and mistakes for the differentiation and reverse differentiation phases reveals that accuracy rates after exercises 1 and 2 were significantly higher than those after the control activity, but there were no significant differences between the control activity and reading. Therefore, post-exercise 1 and 2 results were better than those of post-reading for the GO/NO-GO task.

Nakade et al. [23] and Murata et al. [24] reported in previous GO/NO-GO experiments that response times were reduced and the number of errors decreased when subjects walked an average of 7,000 steps per day for 10 months. It was also reported that when subjects continued this walking exercise for two years, response times became significantly faster and the number of errors significantly decreased.

According to previous studies, a faster response time and higher accuracy rate are considered good results for GO/NO-GO tasks. Based on this, since the accuracy rate after exercises 1 and 2 in this study were significantly higher than those after the control activity and reading it is believed that exercises 1 and 2 were effective in improving inhibitory function. In the future, the author would like to conduct further research using various methods such as a profile of mood states (POMS), the Stroop Test and the Wisconsin Card Sorting Test to investigate the prefrontal cortex.

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