

# The examination of simultaneous auditory and visual stimulus presentation method during the P300-based concealed information test: Using a 1:1:1 target:probe:irrelevant proportion.

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## Introduction

In the ERP-based CIT (concealed information test) studies, the most promising ERP index in terms of practical application is the P300 component because it is elicited by rare and meaningful events for participants so that they are equivalent to the probe items in the CIT. In the P300-based CIT protocol, visual stimuli such as photographs, words, or numbers are usually presented on a computer display, while question items are presented orally in the field CIT practice with autonomic indices. The merits and demerits of these presentation modalities are summarized in Table 1.

Table 1. The merits and demerits of auditory presentation and visual presentation in the CIT.

	Merit	Demerit
Auditory presentation	Ignoring questions could be relatively difficult.	Less information could be provided in one question.
Visual presentation	Much information could be provided in one question.	Ignoring questions could be relatively easy.

## Purpose

This study examined the effect of simultaneous auditory and visual stimulus presentation in the P300-based CIT using a 1:1:1 target: probe: irrelevant proportion to shorten the CIT protocol. We carried out two experiments which were different in terms of interstimulus interval (ISI): one was with 1500 ms ISI and the other was with 4000 ms ISI.

## Method

### Participants

Experiment 1: Nine undergraduates experienced both the subject's own name and the mock crime scenario conditions (within design).

Experiment 2: Eleven undergraduates experienced either the subject's own name condition or the mock crime scenario condition (between design).

### Apparatus and Measurement

Brainwaves were recorded from Fz, Cz, and Pz sites by TEAC polygraph system.

### Stimulus

#### Subject's own name condition

Target stimulus: Sato 「サトウ」, Probe stimulus: Subject's own name, Irrelevant stimulus: Tanaka 「タナカ」 or Kobayashi 「コバヤシ」

#### Mock crime scenario condition

Target stimulus: Cherry blossom 「サクラ」, Probe stimulus: Gold coin 「キンカ」, Irrelevant stimulus: Watch 「トケイ」

In the mock crime scenario, red and italic letter was used to highlight probe: "The culprit invaded from the front door of an Aobadai house yesterday around 2 a.m., stole *gold coin* in a black cloth bag, and then fled in the Mazda vehicle." The participants memorized the scenario until they could recite it.

### Procedure

The following three types of stimulus were presented: probe, irrelevant, and target. Each stimulus was randomly presented 40 times. During the CIT, participants were required to respond to all irrelevant and probe stimuli by pressing a left button and to the target stimulus by pressing a right button. The number of averaged epochs for the final P300 evaluation was varied, with 5, 10, or 20 epochs. In this study, Target: Probe: Irrelevant ratio was 1:1:1 in both experiments. In Experiment 1, the stimulus duration was 300 ms with 1500 ms ( $\pm 10\%$ ) ISI. In Experiment 2, the stimulus duration was 300 ms with 4000 ms ( $\pm 10\%$ ) ISI.

## Results

In both experiments, the subject's own name condition elicited larger P300s than the mock crime scenario condition (Figure 1, 2). However, three-factor repeated-measures analysis of variance for P300 amplitude revealed no significant differences for the three main effects and any interactions ( $p > .05$  each) in both experiments.

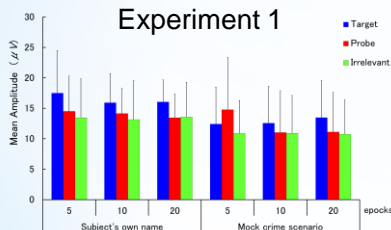


Figure 1. P300 amplitudes in the 5, 10, or 20 epochs in both conditions using ISI 1500 ms.

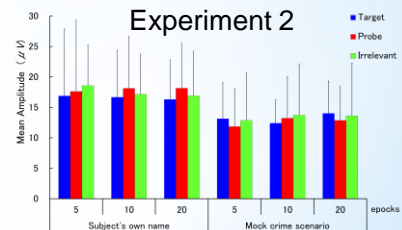


Figure 2. P300 amplitudes in the 5, 10, or 20 epochs in both conditions using ISI 4000 ms.

## Discussion

Three-factor repeated-measures analysis of variance for P300 amplitude revealed no significant differences for the three main effects and any interactions ( $p > .05$  each) in both experiments. Results suggest that presentation ratio rather than meaningfulness of probes accounts for enhanced P300 to the probes in the CIT using simultaneous auditory and visual stimulus presentation method.

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