

# Mental stress-induced changes in plasma serotonin, tryptophan, kynurenine concentrations in healthy participants

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**Abstract.** In order to investigate the effect of mental stress on the tryptophan metabolism, a stress model of visual display terminals work was loaded on healthy students. Before and just after stress, plasma samples were collected and serotonin, tryptophan and kynurenine were assayed. The plasma concentration of serotonin was increased by visual display terminals work. Both Trp and Kyn concentrations were decreased after stress load. These results suggest that serotonin formation from tryptophan may be accelerated, resulting in the suppressing of kynurenine metabolism from tryptophan. Furthermore, when these subjects were divided into two groups, one group of those accustomed to the personal computer and another group of those not accustomed, the changes of above amines and scores of Profile of Mood States in the latter group were larger than that in the former group. These results also suggest that the activation of the person with a strong psychological load is larger than that of a weak person. © 2007 Published by Elsevier B.V.

*Keywords:* Mental stress; VDT work; Serotonin; Tryptophan; Kynurenine

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## 1. Introduction

We have reported that the tryptophan (Trp)–kynurenine (Kyn) pathway is activated by exercise stress load [1]. This time, we aimed to know the influence of mental stress on the Trp metabolism.

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## 2. Materials and methods

The protocol of this study is shown in Fig. 1. This research was approved by the ethical committee at the Fujita Health University.

### 2.1. Mental stress load

The mental stress model was the VDT (visual display terminals) work done with the personal computer. The stress load was to do the word processor certificate examination problem for 90 min.

### 2.2. Subjects

The participants were 22 healthy student volunteers (3 males and 19 females,  $19.8 \pm 1.0$  years old) at our university. These subjects were divided into two groups. Those who were accustomed to the personal computer belonged to A group. This group consisted of 9 people who have been using the personal computer for 6 h or more per week, and who have acquired the word processor authorization qualification. Those who were not accustomed to the personal computer belonged to B group. This group consisted of 13 people who have been using the personal computer for 1 h or less per week, and who have not acquired the word processor authorization qualification.

### 2.3. Psychological evaluation

Psychological aspects were evaluated by the Profile of Mood States (POMS) [2] which was adapted to a Japanese version (Kanekoshobo Company, Tokyo).

### 2.4. Specimen collection and processing

Platelet-poor plasma (abbreviate to plasma) was used. 2.5 ml of blood was collected in a cold ( $2-8\text{ }^{\circ}\text{C}$ ) polystyrene tube containing sodium EDTA (5 mM), mixed gently by inversion, and immediately cooled on ice. Within 20 min the sample was centrifuged at 1700 g for 30 min at  $2-8\text{ }^{\circ}\text{C}$  degrees. The upper two-thirds of supernatant were transferred to a polystyrene tube as platelet-poor plasma and was stored at  $-20\text{ }^{\circ}\text{C}$  until assay.

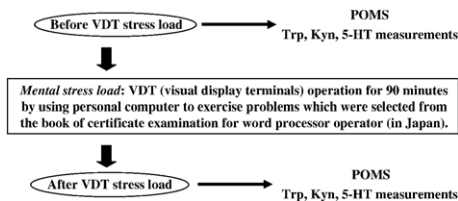


Fig. 1. Schema of the protocol in this study.

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