The tools for evaluating the degree of fatigue state

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Fatigue is an indispensable sense for ordering rest. However, the neural and molecular mechanisms of fatigue sensation remain unclear. One of the fundamental reasons why there is no advance in the field of fatigue science is that there is no good tool for evaluating the degree of fatigue state objectivity. However, loss of concentration, delay of response time for stimuli, slack in action, these phenomena are known to be associated with fatigue state. In this project, we focus on these changes of brain function and behavioral characteristic in fatigue state, and try to find the way for evaluating the fatigue state objectivity.

- **ATMT: a computer-assisted system for assessment of fatigue- Development of Advanced Trail Making Test for evaluating mental function -**

When we evaluated the brain function using ATMT software (Fig. 1), it became clear that the patients with chronic fatigue syndrome (CFS) are easy to cause a mental fatigue in the late phase as compared with a healthy person. Moreover, the fall of the visual search response was well correlated to the degree or stage of CFS. Therefore, there is a possibility that ATMT software is useful for evaluating the brain dysfunction associated to morbid fatigue state such as CFS. On the contrary, the fall of the visual search response was not found in fatigue state after exercise, such as a bicycle ergometer. All subjects felt severe fatigue and muscular weakness by movement load. Therefore, the changes of brain function in fatigue state seem to be not compatible between morbid fatigue and physical fatigue after exercise.

ATMT: a computer-assisted system for assessment of fatigue

- Development of Advanced Trail Making Test for evaluating mental function -

Osami Kajimoto (Soiken Inc.)

ATMT (Advanced Trail Making Test) is an instrument for evaluating fatigue, which was developed by Department of Psychiatric Medicine, Division of Psychophysiology, Osaka University Medical School and Soiken Inc. (Toyonaka City, http//www.soiken.com), to which the copyright belongs. The test consists of the visual search response task in which a person being tested pushes the figures (1 though 25), as quickly as possible, on the touch panel display of the personal computer. When a figure on the display is touched, it disappears and then a new target figure appears at random location (e.g. when you push the figure of 1, it disappears and the figure of 26 appears, when you push the figure of 2, it disappears and the figure of 27 appears. The task is repeated until the target figure reaches 40). It differs from conventional TMT on the A4- size-sheet (task of drawing a line in a manner of one-stroke writing on the figures randomly arranged) in a couple of points. It can

measure the search response time for every target. Also, it offers flexibility in the test design: it can rearrange all targets at every response or, alternatively, can delete the responded target and add a new target. Therefore it can evaluate the increase in mental fatigue during execution of the task and also examine the degree of utilization of the working memory to increase the efficiency of search. More specifically, by comparing the difference of searching time between in the case of a target figure changing every time and in the case of being fixed, we can tell how memory is utilized to increase the efficiency of search, and thus evaluate the ability of working memory. It was proved in previous studies that ATMT search response time was prolonged when healthy volunteers were given mental-work load. Moreover, it was revealed that prolongation of ATMT search response time depends on the volume of mental-work load. This is likely to be associated with the fact that attention peripheral visual field becomes narrow by mental work-load. These observations thus highlight ATMT as a new standard evaluation item for the quantitative measurement of the degree of fatigue.

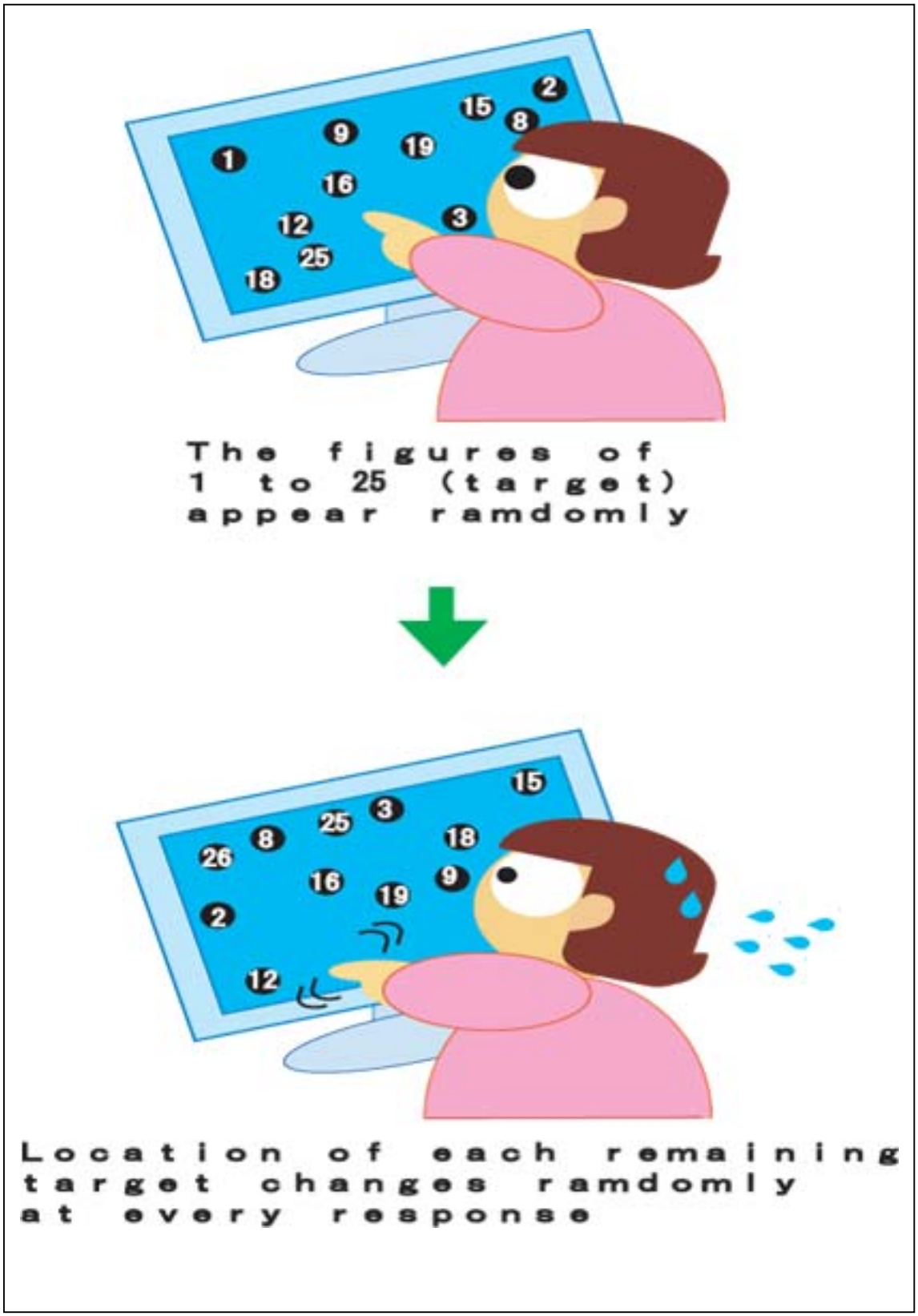
1
9
19
15
2
8
16
12
3
25
18
The figures of
1 to 25 (target)
appear ramdomly
26
8
25
3
18
15
16
9
19
2
12
Location of each remaining
target changes ramdomly
at every response

Fig. 1.