

# Development of Human Error Pattern Self-diagnostic Questionnaire

## Background

As the background of recent significant accidents occurring frequently in industrial areas, it is said that human factors have accounted for 70 percent. In the electric power industry, for accident and trouble prevention, active measures over human errors are needed and the organizational error management approach is adopted. On the other hand, strategies to prevent human error, which are suitable for the characteristic of each employee who actually works on a site, are expected because even if the work environment is exactly the same, some people make errors while others do not.

## Objectives

To develop a questionnaire which measures an individual human error pattern. Then, paying attention to personality as the consistent individual characteristic, this study discusses about the relationship between human error pattern and personality.

## Principal Results

### 1. Development of human error pattern self-diagnostic questionnaire

- (1) The questionnaire consists of items about errors (69 items) and about personality (111 items). The contents of items about error were typical daily human errors considered to occur in each process based on the human information processing model consisting of perception, decision making, behavior, attention, and memory (Fig.1). Meanwhile, the “Big Five<sup>\*1</sup> Personality Inventory (Japanese version)” was used for the items about personality, and items about error-prone traits<sup>\*2</sup> (irresponsibility, timidity, indiscretion, weakness of self-control, and easy fatigability) were added.
- (2) The investigation using the above questionnaire was conducted for 147 adult men and women (95.5% of valid response rates), and factor analysis was performed in order to investigate the factor structure of items about errors. As a result of that, 35 items of four factors interpreted as “forgetting,” “dysfunction of attention switching,” “failure of information input,” and “simplistic thinking” were extracted (Table 1). Applying these factors to the human information processing model, they could be considered to be equivalent to the errors produced in processes of memory, attention, perception, and decision making, respectively.

### 2. Relation between individual error pattern and personality

- (1) Significant correlations were obtained between the personality factors (refer to Table 2) and the error factors as shown in Table 3. Especially (low) conscientiousness, irresponsibility, and indiscretion had medium correlation with two or more error factors. Moreover, neuroticism was correlated with dysfunction of attention switching, also weakness of self-control was correlated with failure of information input, and easy fatigability was correlated with simplistic thinking moderately.
- (2) It was suggested that there is no correlation between extrovert (or introvert) and human errors. Also there was slightly correlation between agreeableness and human errors on an individual level.

As mentioned above, it was suggested that this questionnaire could investigate the error pattern which may happen in all the processes except the behavior stage, that there is a relationship between some personalities and errors, and that there is a characteristic error pattern with personality traits.

## Future Developments

The revised questionnaire adding the items about errors which may happen in the behavior stage will be developed, and then the reliability and the validity of the questionnaire will be examined. Moreover, increasing the number of samples, more detailed examination will be performed about the relationships between errors and personalities.

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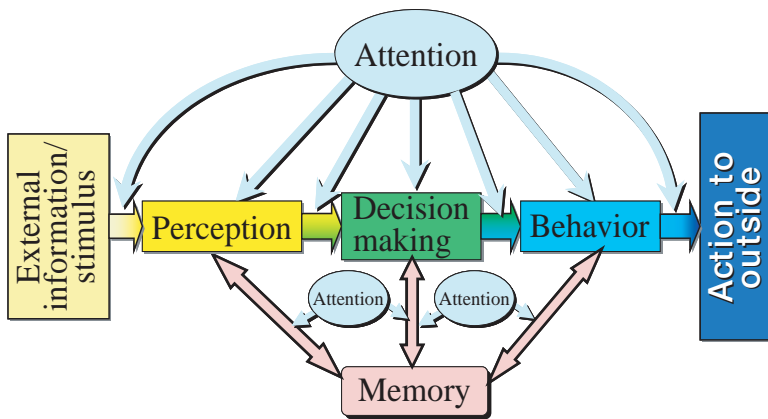
## Reference

Hirose, A., 2007, “An Approach to Measure Tendency of Human Error -Part I: Preparation of Questionnaire and Consideration of Relationship between Human Error and Personality”, CRIEPI Report Y06014 (in Japanese)

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\* 1 : The Big Five is now the most widely accepted model of personality, where most human personality traits can be boiled down to five broad dimensions of personality: extraversion, agreeableness, conscientiousness, neuroticism, and openness.

\* 2 : Reference from JISHA, 1991, “Research committee report about relationship between unsafe acts and workers’ psychological factors” (in Japanese)



Human makes an error in all the processes of information processing as shown in Fig.1. For example, “looking away and missing a signal” happens at “perception” or “attention” on the preceding perception in the figure.

Fig.1 Human information processing model\*3

Table 1 Result of factor analysis about items of errors

items	factors			
	forgetting	dysfunction of switch one's attention	failure of information	simplistic thinking
I often mislay an umbrella	0.857	- 0.120	- 0.070	0.003
I often lose a thing	0.848	0.238	- 0.192	0.044
I adhere to one idea or feeling and fail	- 0.005	0.752	0.117	- 0.204
I tend to overreact	- 0.055	0.729	0.067	- 0.078
looking away, I occasionally collide with something	0.160	- 0.209	0.826	- 0.138
I make mistakes because of looking away	0.164	0.089	0.779	- 0.140
Manipulating electric appliances without reading instructions manuals, I sometimes confuse on the way	-0.066	- 0.257	- 0.137	0.898
No matter how many times I meet the person, I often mistake his name	0.133	- 0.177	0.308	0.646

※ principal factor method/Promax rotation. Only top two items of factor loadings is shown. Indeed, there are 8-10 items per each factor.

Table 2 Example of contents of items which constitute each personality factor

Factors	Example of the contents of items
Extraversion	talkative / [-] Tends to be quiet
agreeableness	considerate / [-] even if working in good faith, one can get a less benefit
conscientiousness	think reasonably / [-] do something without considering an issue closely
neuroticism	I'm not a worrier / [-] tend to consider difficultly.
Openness	Even when most people are unsettled, I can handle calmly [-] when I run into a difficult problem, I often get confused
irresponsibility	I don't get serious until the last minute / I make promises without due
timidity	I'm not good under pressure / I'm upset when things go wrong
indiscretion	I'm a scatterbrained person / I have an impatient character
Weakness of self-control	I have a short temper / I sometimes get desperate
easy fatigability	I get exhausted easily when I try too hard / it is easy to get tired

※ [-] is an inversion item.

Table 3 Correlation between the error factors and the personality factors

Error	Personality	Extraversion	agreeableness	conscientiousness	neuroticism	Openness	irresponsibility	timidity	indiscretion	W.of self-control	easy fatigability
forgetting		-.0963	-.1563	-.3658	-.1479	-.1995	.4701	.3741	.3526	.2534	.3128
		n.s.	n.s.	***	n.s.	*	***	***	***	**	***
dysfunction of switch one's attention		-.0228	-.2121	-.4313	-.4257	-.2850	.5109	.3691	.5235	.3421	.2784
		n.s.	*	***	***	***	***	***	***	***	**
failure of information		.0200	-.2401	-.4990	-.2193	-.3272	.4029	.3336	.6038	.4150	.3084
		n.s.	**	***	**	***	***	***	***	***	***
simplistic thinking		-.0932	-.2448	-.4713	-.2353	-.3424	.3587	.4561	.3587	.1937	.4072
		n.s.	**	***	**	***	***	***	***	*	***

※ \* shows correlation analysis results. \*: p<.05, \*\*: p<.01, \*\*\*: p<.001. The colored cell shows a correlation with r= ±0.4 or more.

\*3: Reference from Haga, S., 2001, “No One is Infallible” (in Japanese)