The classification of participants based on reaction time increase-decrease rate model on the personality traits word.

○ Kouhei Matsuda: Tohoku Bunkyo Collage, JAPAN jetta@t-bunkyo.ac.jp
Emi Sato: Tokyo Fuji University, JAPAN karen@ff.iij4u.or.jp

Introduction

1. iIR-HEG and performing personality self-rating.

The prefrontal cortex plays an important role in brain activity and regulation during performance. Changes in blood flow in the prefrontal cortex indicate degree of concentration in learning and performance (Ridderinkh et al, 2004). It will be could examine the relationship between brain activity and performance.

2. Reaction time(RT) when personality self-rating

RT is indicative of it is a consciously time voluntary reaction to stimulation sense from giving stimulation to taking place of the reaction. Reaction time are objective rather than subjective indicators of cognitive performance (MacLeod,1993).

3. Inter-individual and Intra-individual difference

We considered that it is possible to identify personality traits common among individuals by dividing the RT of performance by the means of the simple response session of each individual. It is possible to indicate quantitative data about an individual by considering intra-individual differences in the RT during personality self-rating.

Therefore, in this research, we examined whether it is possible to identify a certain personality feature as the mental performance of personality self-rating by using the sRT model. The each sRT was calculated by the Equation 1 from the intra-individual means of simple RT and self-rating RT for each traits word.

$$sRT_k = \frac{RT_k - mrt_k}{RT_k}$$

Equation 1. the calculation of sRT

Where, mrt_k was an intra-individual means of simple reaction time RT_k in session 1 of each traits word k.

Purpose

The sRT was calculated for each participant by multiplying of each 5 factors of BigFive by 4 traits terms, the sRT per participant was 20 traits.

For these, intra-individual differences were used to detect and classify inter-individual differences, and to examine the relationship between each psychological and physiological dependent variable.

Procedure

1. Participants

21 university students, 13 males and 8 females.

2. Procedure

We measured the cerebral blood flow by HEG and reaction time in each 7 personality self-rating condition.

1. Saliva amylase 1
2. Questioner-condition1: Big5
3. PC condition1: Simple response session.
4. PC condition2: Personality self-rating session by trait term.
5. PC condition3: Personality self-rating session by sentence.
6. Questioner-condition2: BIS/BAS and Lie scale by MMPI.
7. Saliva amylase 2

Table 1. Stimulus terms.

Traits Factors		Stimuli Terms			
Big Five	Extroversion	active E11	sociable E12	passive E21	restrained E22
	Agreeableness	kindly A11	affable A13	headstrong A23	tightwad A24
	Conscientiousness	capable C13	conscientious C14	sloppy C21	unreliable C24
	Neuroticism	easygoing N12	sedate N13	irascibleness N22	worrier N23
	Openness to experience	intelligent O11	clever O14	conservative O21	naivete O22
Practice Stimuli Terms		sincere	amenable	philosophical	

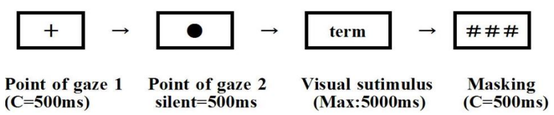

Fig. 1. The sequence of stimulation.

Analysis

The index dependent variables used nIR-HEG and salivary amylase as a physiological, and used the scale values of BigFive as a psychological. Based on sRT, we calculated the squared Mahalanobis' distance as the similarity index between each participants. We performed hierarchical cluster analysis by ward method. The differences between classified clusters were compared for HEG, salivary amylase and BigFive as dependent variables.

Result

1. Cluster Analysis

The participants were classified by hierarchical cluster analysis based on ward method using sRT obtained from 20 traits words. The index of the distance between each 21 participants were the squared Mahalanobis distance. The dendrogram was obtained from this cluster analysis in Fig. 4.

The dendrogram showed that the participants were classified into two major clusters. The agglomerative coefficients of these two clusters were 1.33 times in ratio of standard deviation.

2. Classified RT by each personality trait term.

The 2-way ANOVA of RT with sRT clusters showed that significant differences in main effects were observed between cluster ***(F(1, 30) = 48.28, p.<.01)***, and between BigFive factor ***(F(4, 30)=11.31, p.<.01)***. However, no interaction between cluster and factor was. For self-rating RT, the main effect between clusters was observed ***(F(1, 30)=19.43, p.<.01)***, between BigFive factors ***(F(4, 30)=11.31, p.<.01)*** was not observed ***(F(4, 30)=0.28, ns.)***, no interaction between cluster and factor was observed ***(F(4, 30)=0.67, ns.)***.

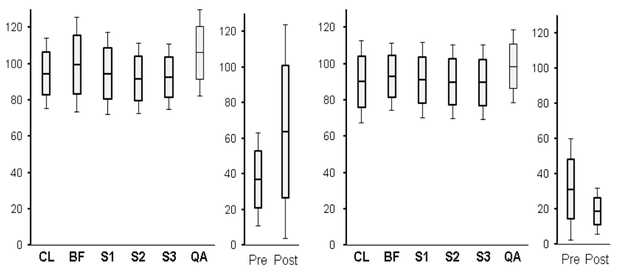

Fig.2. The HEG and salivary amylase values as the clustered physiological indexes.

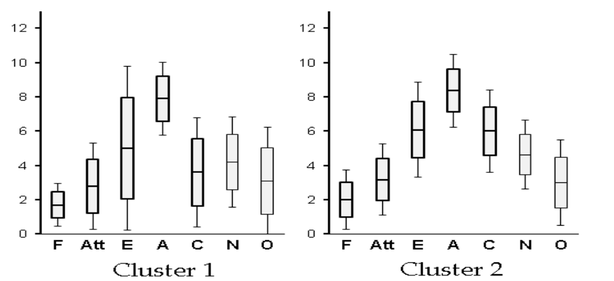

Fig. 3. The Big Five Personality Inventory scales as the clustered psychological indexes

3. Clustered physiological index

The significant differences were observed in salivary amylase after the task ***(t(19)=2.44, p.<.05)***, in Fig. 2. The participants included in cluster 1 had increased stress responses after the PC session and decreased in cluster 2.

Discussion

From this result, the variation rate of reaction time intra-individuals due to conditions was effective in detecting inter-individual differences. These two clusters clearly increased the judgment time by the trait words active, restrained, tightwad, sedate and intelligent. The RT measured as rating time to negative stimulus words increased.

The participants included in cluster 1 showed innovative dominance. The participants included in cluster 2 were obedient and conscientiousness.

This personality measurement method was considered effective in situations where respondent self-bias will not occur.

Conclusions

The result provided derived two unique clusters by sRT. Therefore, we suggested the possibility to classify personality traits from RT by using sRT based on the intra-individual differences.

Acknowledgment

This work was supported by JSPS KAKENHI Grant Number 24530846. Grant-in-Aid for Scientific Research (C) as “The Experimental study of the personality by the physiological and behavioral indexes.” in Japan.

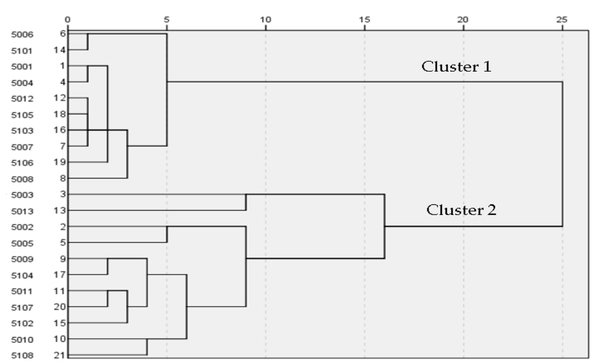

Fig. 4. The dendrogram of each participants

The change tendency of Personality in Stress Response during Personality rating.

○ Emi Sato: *Tokyo Fuji University*, JAPAN karen@ff.iij4u.or.jp
Kouhei Matsuda: *Tohoku Bunkyo Collage*, JAPAN jetta@t-bunkyo.ac.jp

Performance and Stress

Performance such as work or study increases physiological or mental arousal, stress. People with certain personality traits may feel some stressed, when performing personality self-rating. As the brain under stress conditions is secreted high levels of cortisol, salivary amylase are measured as stress indicators in this experiment.

Performance and personality

This study measure that changes in cerebral blood flow in the prefrontal cortex indicate degree of concentration in learning and performance.

Hemencephalography(HEG) is a method of measuring cerebral blood flow and used as an indicator of brain activity by a type of functional near infrared imaging that measures the level of neural activity in the brain. Although there are individual differences frontal blood flow, it is possible to appear personality traits that appear during performance.

And, we measure Reaction Time(RT) as the decision to press the response key to personality self-rating, when performing personality self-rating. RT can examine individual differences in response to stimuli and each individual's response to specific personality traits.

Thus, we measure stress responses with three indicators in personality self-rating, and examine the relationship between performance and personality trait.

Purpose

Our hypothesis is that there is a specific personality traits which becomes a stress factor during of personality rating.

Methods

Participants The participants were 21 graduate students, aged 18 to 30 years.
Experiment period May-December 2014
Equipment ProComp TM7500(Thought Technology Ltd, Canada),a laptop computer (Dell-Vostro 3360), E-prime 2.0 (psychology software tool), and Saliva amylase (NIPRO;27B1X00045000073), *Helectroencephalography (HEG).*
Inventory Big5, BIS/BAS, Lie scale for Japanese.

Procedure

We measured the cerebral blood flow by HEG and reaction time in each Personality self-rating condition.

1. Saliva amylase 1
2. Questioner-condition1: Big5
3. PC condition1: Simple response session.

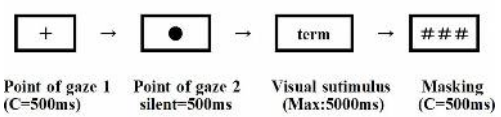

Fig. 1. The sequence of stimulation in the simple-response session (session 1).

4. PC condition2: Personality self-rating session by trait term.
5. PC condition3: Personality self-rating session by sentence.
6. Questioner-condition2: BIS/BAS and Lie scale by MMPI.
7. Saliva amylase 2

Table 1. Stimulus terms of personality traits used in experiment.

Traits Factors		Stimuli Terms			
Big Five	Extroversion	active	sociable	passive	restrained
	Agreeableness	kindly	affable	headstrong	tightwad
	Conscientiousness	capable	conscientious	sloppy	unreliable
	Neuroticism	easygoing	sedate	irascibleness	worrier
	Openness to experience	intelligent	clever	conservative	naivete
Practice Stimuli Terms		sincere	amenable	philosophical	

Result and Discussion

Cluster Analysis and ANOVA in salivary amylase and Reaction Time

To examine the change in RT of simple response session by amylase, we performed non-hierarchical cluster analysis with the value of salivary amylases1 and Amylases2 by k-means method. As a result, we obtained three clusters. And results of *ANOVA* in these three clusters and questionnaire scores, a significant difference was found in Extraversion in Big Five ($F(2,20)=5.93$, $p < .01$)(Fig2). A significant difference was observed in BAS-Drive in BIS/BAS($F(2,20)=2.47$,$p<.10$) (Fig3).

・Cluster1(N=6) was the value of amylase1 was 64, the value of Amylase2 decreased to 33. Results of *ANOVA*, the Means of Neuroticism, Conscientiousness and Openness to experience scores were higher than those of other clusters, and BAS-Drive was higher than those of 13.65 and other clusters.

・Cluster2(N=11) was the value of Amylase1 was 14, and Amylase2 was 11. It was suggested that people in this cluster was not stressed in the personality rating. Results of *ANOVA,* the Means of the Agreeableness scores was higher than the other clusters.

・Cluster3(N=4) was the value of Amylase1 value was 40, and Amylase2 increased to 173. Results of *ANOVA*, the Means of Extroversion, Conscientiousness, and Openness to experience scores were extremely low compared to other clusters.
It was suggested that people in this cluster were extremely introverted, low in openness, and low in the motivation to follow one's goals.

Conclusions

This experiment was found that stress responses during personality rating were related to the personality traits of Extroversion, Agreeableness, and attitude scale. This study was suggested that performance was not good when you were conscious of yourself too much, and that you could get good performance results by focusing on tasks, when doing some kind of performance.

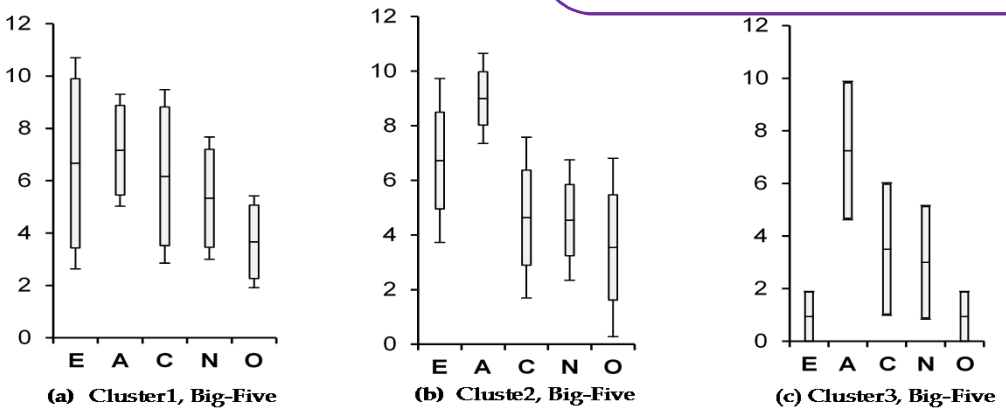

Figure2. Three clusters according to amylase value and Big-Five questionnaires

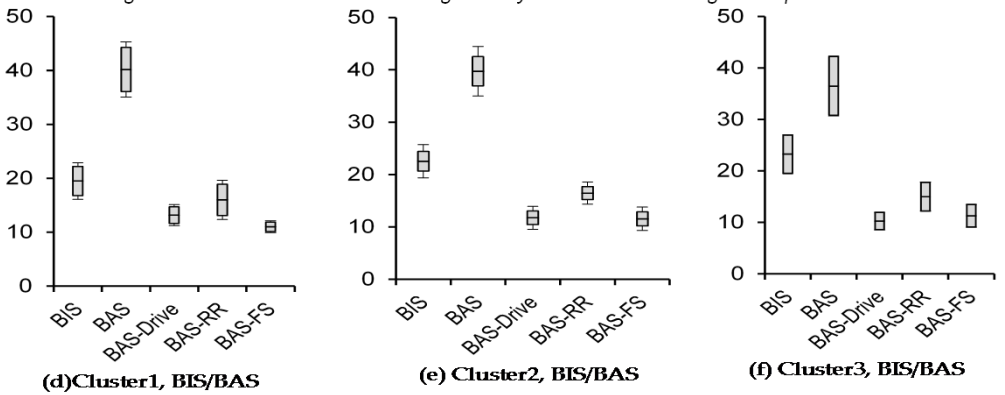

Figure 3. Three clusters according to amylase value and BIS/BAS questionnaire