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The relationship between Nagara action and working memory

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Abstract: In Japan, multi-tasking action is commonly referred as ***Nagara* action.** Nowadays, it is important that to think about relationship between *Nagara* action and products because of pursuing the convenience. On the other hand, inspite of difficulty of doing *Nagara* action in cognitive process, people can do *Nagara* action. The back of this topic, we think Working Memory is related. Working memory is a kind of short term memory, but it is not static but active and has important roll to support cognition. We think that when people do *Nagara* action, they use working memory for one task. So in this paper we aim to reveal the relationship between *Nagara* action and working memory, and experiment on like below with Picture Span Test. -1.Subjects is tested Picture Span Test(PST) for measuring capacity of working memory. 2.After testing PST, they answer the questionnaire about “How many *Nagara* action do you do in daily life”. 3.We analyze correlation between capacity of working memory and the frequency of *Nagara* action in daily life. From the above, we find the correlation between *Nagara* action and working memory and people whose capacity of working memory is higher tend to do *Nagara* action.

Keywords: behavior, interaction, kansei process, parallel attention, working memory

1. INTORODUCTION

1.1. Background

After the smartphones become popular communication tool, occasions for multi-tasking action, including parallel attention, tends to have risen in daily lives. In Japan, this kind of multi-tasking action (doing something while already doing original action) is commonly named as *Nagara* action. *Nagara* means ‘do while’ in one word of Japanese. Recently, accidents caused by *Nagara* action through the use of mobile phones in the public places such as train station or while driving a car are also consequentially increasing. In 2011, Google presented the concept of “Google Glass”, an argument reality eyewear which projects a smartphone-like experience with voice-enabled

interaction into the field of vision. Devices such as this, considering its convenience of use and multi-tasking capacity, might further intensify activities with *Nagara* action.

In this situation, we think that *Nagara* action is an important factor to contribute the developing devices and products and it is aim to identify more safe and smart ways to engage in *Nagara* action.

We found that *Nagara* action can be divide into two types, one is Uniprocessing *Nagara* Action and another is Piural processing *Nagara* action, and *Nagara* action starts because people could not stop the previous task they already began before they added another task to fills up the intervening times in previous research.

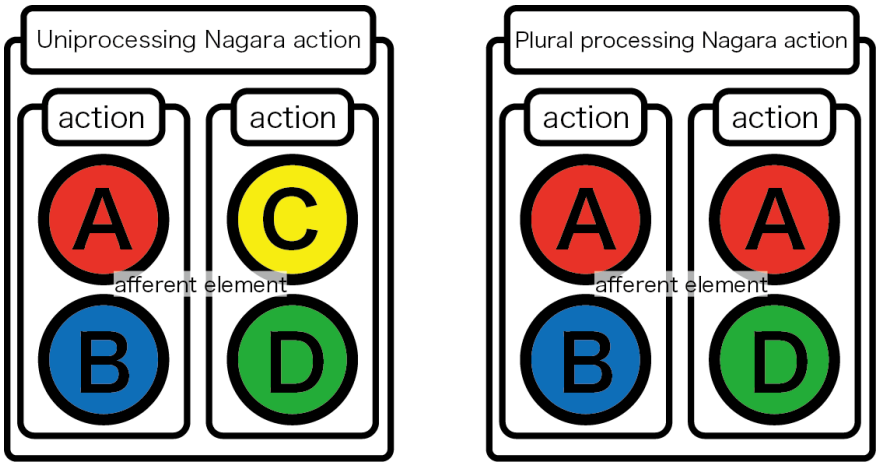

Figure 1: Description of *Nagara* action

On the other hand, Wicken said that if two tasks need one Resources, they will block each other as compared to when they need separate Resources(Wicken, 2002). However people can do *Nagara* action in such situation. How is *Nagara* action done in such situation?

1.2. Purpose

In this research, we focus on working memory, which is a kind of short memory. Our goal is revealing relationship between *Nagara* action and working memory using the Picture Span Test which is the test tool of visual working memory.

2. ABOUT WORKING MEMORY

Working memory is a kind of memory which has some features like that: memorizing 7+-2 matters for form 30 seconds to several minutes, deciding action to choice the information from the outside. Working memory is differ from short term memory which maintains information just as it is, and positively process the information.(Osaka, 2000)

There are two kind of working memory, one is visual working memory and another is verbal working memory. So we think that visual working memory is related to *Nagara* action.

Working memory has a capacity. There are differences among individuals and people whose capacity is large tend to remove interference information effectively, conversely people whose capacity is small tend not to remove them.

Furthermore working memory has an attentional control function which can advert to requisite information and ignore to redundant information. And this function's indicator is the capacity of working memory. Our goal oriented action is based on this function.

It can be said that working memory has important roll to support the foundation of highly cognition.

3. THE RELATIONSHIP BETWEEN WORKING MEMORY AND NAGARA ACTION

From the above, there are the relationship between *Nagara* action which process in two sensory areas and working memory. So we think that people whose capacity of working memory, in a word, span is high tend to work attentional control function well so that the corresponding of *Nagara* action is also high.

4. EXPERIMENT

To reveal the relationship between Nagara action and working memory, we do the experiment using Picture Span Test (Tanabe and Osaka, 2009) and questionnaire.

4.1. About Picture Span Test

Picture Span Test (PST) is the test tool of measuring the capacity of working memory developed by Tanabe and Osaka, Kyoto University. In addition to remembering a designated target object, subjects are required to judge whether each object in the scene is likely to appear in the situation of the background or not. Procedure is like that:

1. Subjects were presented with a set of scene images for 4 sec.

2. The task required judging whether each object was congruent with the semantic constrains imposed by the background of each scene image,

3. while concurrently remembering the part of the target surrounding with a red square frame. The frame was presented for the final 1 sec of the duration in order to prevent subjects from memorizing target without judging the context.

4. Subjects were instructed to respond by clicking the button placed on the computer screen.

5. The set size of PST is increased from 2 to 5, and in each set size five trials are performed.

(Tanabe,Osaka 2009)

4.2. Method

At first, we test PST for subjects (16 students at University of Tsukuba, 8 male, 8 female, age range is 21-43years). After testing PST, subjects are required to answer the questionnaire about *Nagara* action in daily life. The questionnaire is composed of 8 questions about visual Uniprocessing *Nagara* action and 8 questions about visual Piural processing *Nagara* action which we often do in daily life. These questions are required to choose the answer from [often do / sometimes do / not to do] in each time. In addition, there are 4 expletive questions about *Nagara* action. These questions are required to choose the answer from [Yes / No].

The list of questionnaire

Q1. Manuevering a mobile phone while riding a bicycle

Q2. Eating while manuevering a mobile phone

Q3. Manuevering a mobile phone while up or down the stairs

Q4. Reading a book while watching TV

Q5. Watching TV or mobile phones while brushing teeth

Q6. Telephoning using a mobile phone while walking

Q7. Eating while manuevering a PC

Q8. Manuevering a mobile phone while walking

Q9. Looking at something else while driving a car

Q10 Eating while watching TV

Q11 Listening to the music while reading a book

Q12 Write someting while talk with someone

Q13 Walking with map or map app

Q14 Looking at car navigation system while driving

Q15 Eating while walking

Q16 Listening to the music while manuevering a PC

Q17 Do you use bicycles or cars well in daily life?

Q18 Do you use smart phones well in daily life?

Q19 Are you good at doing Nagara action?

Q20 Have you ever been in danger because of Nagara action?

Figure 2: List of the questionnaire

4.3. Analyze

We compute a correlation coefficient between the score of PST and the score of the questionnaire. We convert the answer of Q1~Q16 in the questionnaire “often do” and “sometimes do” into 1, and “not to do” into 0. The total of Q1~Q16 is called Sum A, the total of questions about Piural processing *Nagara* action in Q1~Q16 is called Sum B.

Subjects whose score of PST is more than 55 are assigned to one group “high span” (in other

words “large capacity”), and the other group consisted of subjects whose score of PST is less than 24 “low span” (in other words “small capacity”).

4.4. Result

The result of PST is the number of “high span” is 5, and the number of “low span” is 1. We expected that the number of “high span” and “low span” are almost the same. However “high span” is a lot more (31%) than “low span” (0.6%).

The correlation coefficients between PST and Sum A, Sum B are summarized figure 3, the correlation coefficients between PST and Sum A is .539, and between PST and Sum B is .498, which showed that the score of PST correlated with *Nagara* action. And both correlation coefficients are significant.

Correlation coefficients

		PST score	Sum A
PST score	Pearsons ‘	1	.539*
	P value		.031
	N	16	16
Sum A	Pearsons ‘	.539*	1
	P value	.031	
	N	16	16

Correlation coefficients

		PST score	Sum B
PST score	Pearsons ‘	1	.498*
	P value		.049
	N	16	16
Sum B	Pearsons ‘	.498*	1
	P value	.049	
	N	16	16

Figure 3: The correlation coefficients between PST and Sum A, Sum B

5. DISCUSSION

High score of Sum A means that people do more *Nagara* action in daily life. So the correlation coefficient between PST and Sum A shows that people whose span of working memory is high tend to do *Nagara* action in daily life as compared to people whose span of working memory is low.

Piural processing *Nagara* action happens to be added new task (task B) to previous task (task A). Because two stimuli are processed in one sensory area at the same time, they impede each other.

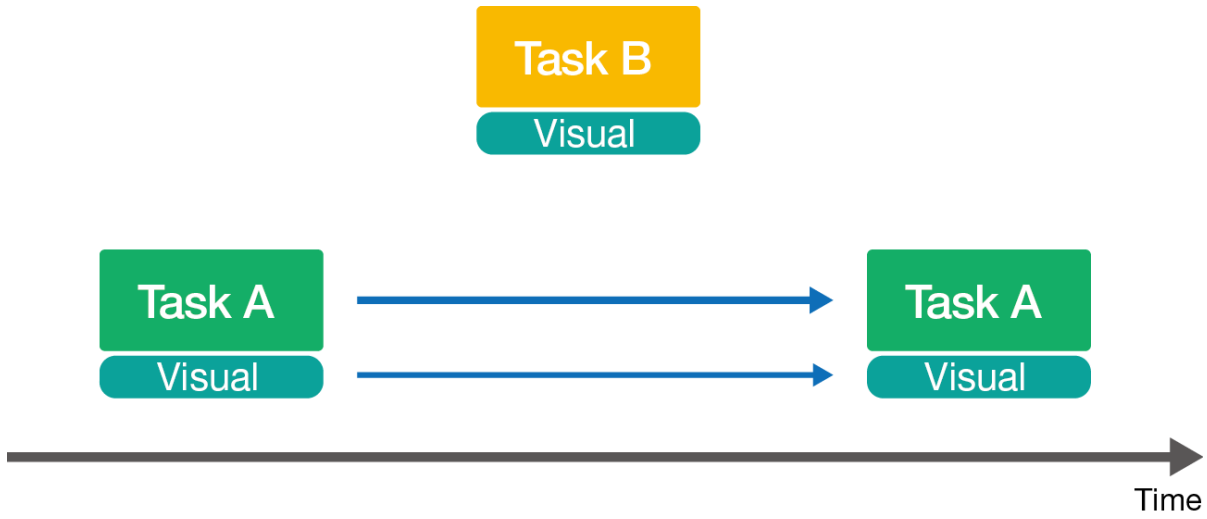

Figure 4: The mechanism of Piural processing Nagara action 1

However, because of the correlation coefficient between PST and Sum B, it can be said that people do *Nagara* action using working memory for processing task A and sensory area is used for only processing task B.

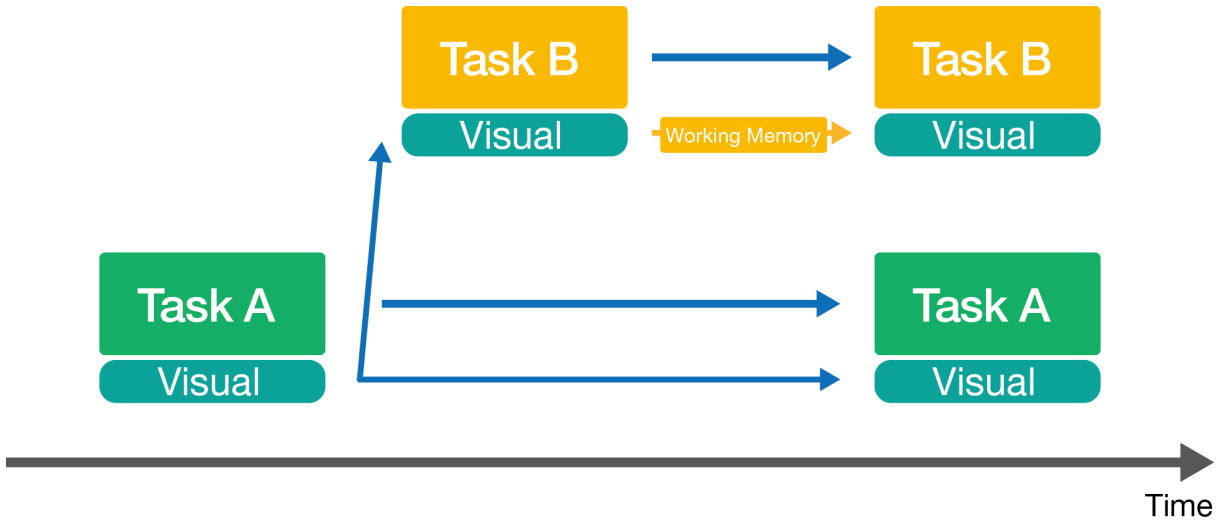

Figure 5: The mechanism of Piural processing Nagara action 2

Almost subjects answered “yes” in Q20 ”Have you ever been in danger because of *Nagara* action?”. It is thought that to keep on processing task A in working memory in spite of slipping on between a present situation and remembrance by working memory causes the occur of accidents because of *Nagara* action.

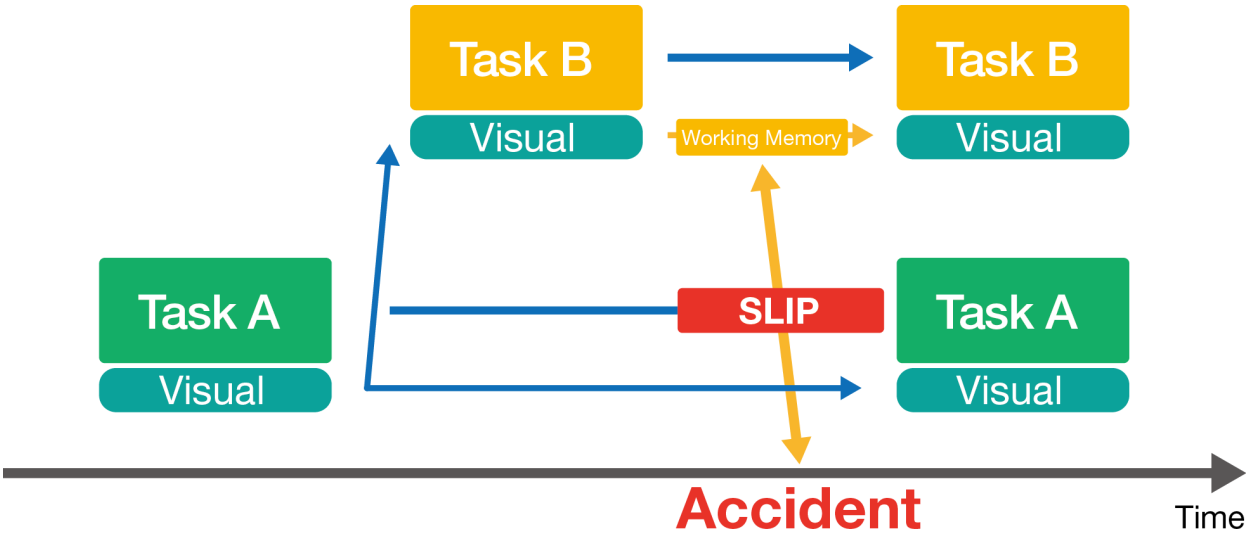

Figure 6: The mechanism of Piural processing Nagara action 3

6. CONCLUSION

From the above, it can be said that working memory is correlated with Nagara action and people whose score of PST is high tend to do more Nagara action as compared to people whose score is low.

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BIOGRAPHY

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