

Estimation of Differences in Work Attitudes by National Character from Psychological Change Points

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ABSTRACT

More and more foreign workers work in Japan year by year. However, there is a problem that a few foreign workers keep working in Japan. One of the reasons is the work attitudes of foreign workers is different from those of Japanese companies. Japanese companies want to fully understand their work attitudes so that they can develop foreign workers' human resources appropriately. This study proposes a method for estimating the differences in the work attitudes from physiological characteristics during video watching. The method uses videos to collect psychological change points during the viewing. Pupil diameter is measured to estimate cognitive change while EDA is measured to estimate emotional change. Change points are detected from time series of the physiological characteristics to know the scene causing the changes. The work attitudes are also examined from questionnaires. An experiment reveals differences in cognitive change indicating that Japanese and Vietnamese have different views on work. It also showed that Japanese and Vietnamese have different attitudes towards work difficulties and responsibilities. Differences in emotional change indicated that Japanese and Vietnamese differ in the factors that cause emotional change. The findings can be used for human resource development to assign suitable work to foreign workers.

Keywords: work attitude, foreign workers, national character, physiological signals, change point detection, psychological changes

INTRODUCTION

Every year, more and more foreigners come to Japan in search of jobs. According to the Employment Status of Foreigners in 2022, the largest number of foreign workers in Japan is Vietnamese [1]. However, the retention rate of them in Japanese companies is low. While the overall turnover rate of the information and communications industry in Japan is 13.3%, the turnover rate of directly employed foreign workers is 20.1% [2, 3]. The high turnover rate of foreign workers may come from the difference between the work attitudes of foreign workers from that of Japanese companies. Japanese companies fail to understand the differences, which prevents them from developing foreign workers appropriately. At the same time, foreign workers lack knowledge and understanding of the unique work attitudes in the Japanese society.

According to Tago [4], Japanese people prioritise work over family, while Vietnamese people prioritise family over work. Japanese people tend to undertake not only tasks allocated to them but also additional tasks even though the tasks are not allocated to them according to the situation. Vietnamese people, on the other hand, tend not to spontaneously undertake tasks not assigned to anyone. They are inclined to define their individual tasks. For many Vietnamese, work is a means of earning money. They tend to change jobs easily according to higher wages. Few Vietnamese people consider working to be the purpose of their lives like the Japanese do. Japanese people cooperate with others guessing their feelings and situations, whereas Vietnamese people tend to work through direct communication. We can see various kinds of differences in work attitudes between the Japanese and Vietnamese.

According to [5], the points that Japanese companies should take care for at accepting foreign workers include balancing work and private life, cross-cultural understanding, and training on Japanese business manners and common sense. It suggests that Japanese companies should have foreign workers understand Japanese work attitudes and working styles to retain them. To teach knowledge and skills required in Japanese companies, they provide new employees with group training mainly consisting of lectures and field practices. After that, it is typical for the employees to move on to OJT (On-the-Job Training) to acquire individual specialized knowledge and skills by the department to which they are assigned. At this time, training related to work attitudes unique to Japanese companies is not provided to foreign workers. The training is considered to lead to early job leaving because foreign workers fail to acquire the work attitudes required by Japanese companies. The training should reflect the differences in work attitudes of foreign workers.

Let us focus on the work attitudes required by Japanese companies. To work in Japanese companies, foreign workers are required to attain an understanding of business culture and customs resulting from the unique work attitudes in Japanese companies.

The study of work attitudes in Japan by Kiyokawa et al. [6] has defined work attitudes in three parts. The first is the essence and significance of labour. It refers to people's perception of the meaning and value of labour itself, such as what labour means to them and why they work. The second is the work ethic. It means a way of perceiving the relationship between people and labour, such as the relationship between home and work, and between home and enterprise. The third is the environment of work. It includes attitudes towards working conditions in the broadest sense, such as views on the labour market, institutional aspects, the Japanese perception of employment, and human relations in the workplace.

This study analyses the differences in work attitudes focusing on differences in national character. A method is proposed to estimate differences in work attitudes, finding psychological change points based on physiological characteristics and questionnaires while subjects are watching videos showing work attitudes.

ANALYSIS OF WORK ATTITUDES WITH PHYSIOLOGICAL REACTIONS

Methods of Assessing Psychological Change

The investigation of work attitudes needs to examine what kind of psychological changes subjects undergo in response to the work attitudes presented to them. For example, we can

examine whether subjects react positively or negatively to work attitudes presented to them. Psychological change can be assessed in the following two ways.

The first is a perception-based assessment method, where psychological change is assessed based on human perceptions expressed through interviews, questionnaires, and dialing devices [7]. This method has been used as a psychometric scale in many surveys. However, the method is dependent on spontaneous human responses. In addition, the result may vary with questions in questionnaires and interviews [8]. For example, a question in Japanese and in English may not always be interpreted in the same way, even if they intend to ask the same question.

The second method is to assess psychological changes through physiological characteristics. Physiological characteristics derive from the reactions of the human body. Examples include pupil dilation or contraction, heart rate, electrodermal activity (EDA), and brain waves. We cannot deliberately alter physiological characteristics. For accurate assessment of human psychological changes, physiological characteristics are more useful than perception-based assessment methods.

Physiological Responses and Psychological Changes

Many studies have been conducted to assess psychological change using physiological characteristics. Psychological change has cognitive and emotional aspects. The former refers to the extent to which a person pays attention to and concentrates on an object. The latter is related to the degree to which a person likes or dislikes an object.

The sympathetic part of the autonomic nervous system causes the pupil to expand. Pupils dilate when a person is paying attention to an object or concentrating on it [9, 10]. Pupil diameter is expected to change at psychological changes in cognitive aspects. EDA means changes in the electrical properties of the skin in response to sweat secretion [11]. Changes in human emotions are known to be reflected in EDA [12]. Psychological changes in cognitive aspects are considered to appear as changes in the EDA of subjects.

Change Finder

Sometimes, we want to find the point at which an observed value changes in the time course. Change Finder is a method that detects change points by constructing an AR model using a partial time series model. It calculates a change point score based on the difference of observed values from predicted values [13].

If we figure out the degree of change by taking the difference of the newly observed value from the predicted value from the AR model built from the recent time series, it is easily affected by noise, which causes a high possibility of false positives. Change Finder builds an AR model from recent time series to smooth the time series, which contributes to noise reduction. It builds another AR model from the smoothed time series. The change score, the degree of change, is calculated from the difference of the newly observed value from the predicted value using the latter AR model. The change score is figured out as log loss.

If a short time series is used for the smoothing, changing points are detected immediately after they appear, but they are sensitive to temporary fluctuations in observed values. On the other

hand, if the time series is long, Change Finder can detect change points with no effect of temporary fluctuations, although change points are detected after a long delay.

PHYSIOLOGICAL RESPONSES TO VIDEO WATCHING

This study proposes a method to examine work attitudes based on differences in physiological characteristics during video watching. While target persons watch videos, psychological change points are detected from their physiological signals. What kind of psychological change occurs at the change points is estimated from the questionnaire results. The overall diagram of the method is shown in Figure 1.

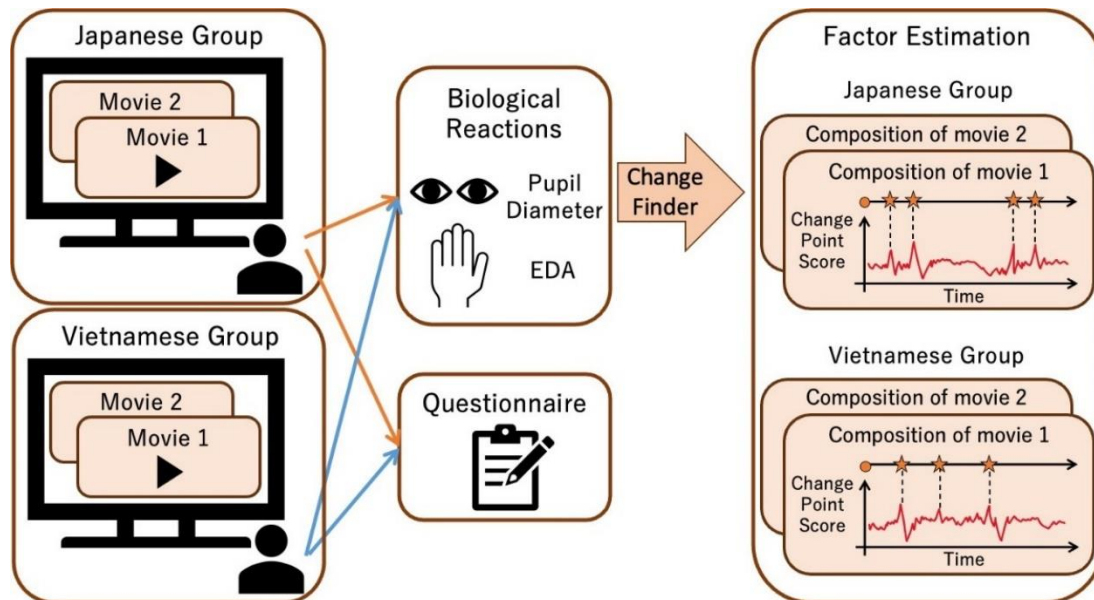


Figure 1: The overall diagram of the method

Comparison of Work Attitudes Using Videos

Work-related videos are selected based on the following conditions. First, the videos have storytelling content. In storytelling videos, characters convey a certain message to viewers in the scene development. Storytelling content includes story plot, characters, and verisimilitude [14–16]. The story plot is the time sequence of events that affect the characters. The characters play a fundamental role in causing viewers to empathize with their experiences in the events of the story. The characters, along with the story plot, help to get the story near a real-life experience [17]. Verisimilitude refers to the likelihood of the events happening in the story. It enhances the perception that the story resembles a real-life experience, which increases the listener's emotional involvement in the story [18]. Storytelling videos are more likely to make viewers empathize with the characters. They have the power to cause emotional changes. Work attitudes are vividly presented with emotional involvement with the characters in storytelling videos. The other condition is the length of the video. It is desirable to keep the head position to collect pupil information. Watching videos for long periods in a specific posture can be stressful for the subjects. To minimize head movements while watching a video as much as possible, videos of up to five minutes in length are used in this experiment.

The selected video is cut into several sequences. Every sequence consists of several scenes. Each scene is split into finer shots. Sequences, scenes, and shots are cut out according to the change

of storylines and scenery transitions. When any physiological characteristic changes for more than 1 second in the shot, the shot is regarded to cause the change.

Change Detection in Pupil Data

Since blinks bring data loss, they are detected to interpolate missing data. A continuous data loss of more than 75 ms and less than 425 ms is considered to be a blink [19, 20]. The pupil diameter before and after the data loss due to blinking is detected as smaller than the actual pupil diameter. Therefore, data within 50 ms before and after the blink and blink are dropped. Time series of observed pupil data are smoothed in the following way. The anomalous pupil diameters are removed for each subject. The first quartile $Q1$, third quartile $Q3$, and quartile range IQR are calculated. The lower and upper thresholds are calculated with the following formula.

$$\text{Lower threshold} = q1 - iqr * 2.0 \quad (1)$$

$$\text{Upper threshold} = q3 + iqr * 2.0 \quad (2)$$

Data outside the upper and lower thresholds are dropped as outliers. Linear interpolation is applied to fill in the missing values of the deleted data. Furthermore, the Kalman smoothing [21] is applied to the interpolated data to smooth the data.

Finally, Change Finder is applied to the smoothed pupil data. In this study, the top 3% of change point scores are criteria to detect change points.

Change Detection to EDA Data

In general, there are 2 kinds of people; those who self-regulate their EDA and those who do not. Figures 2 and 3 show examples of the EDA waveforms of non-self-regulated and self-regulated subjects. The EDA waveform of the self-regulating subject is characterized by a very small amount of change.

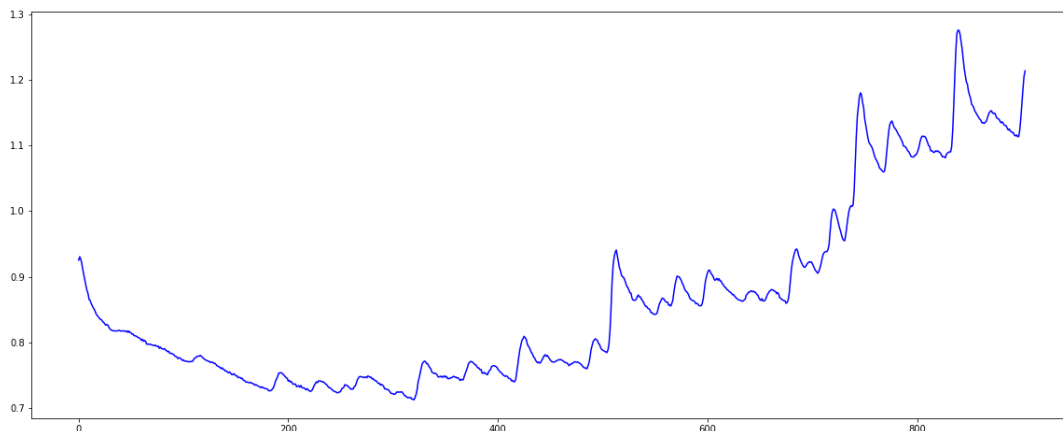


Figure 2: EDA of subjects without self-control (memory width of 0.05 on the vertical axis)

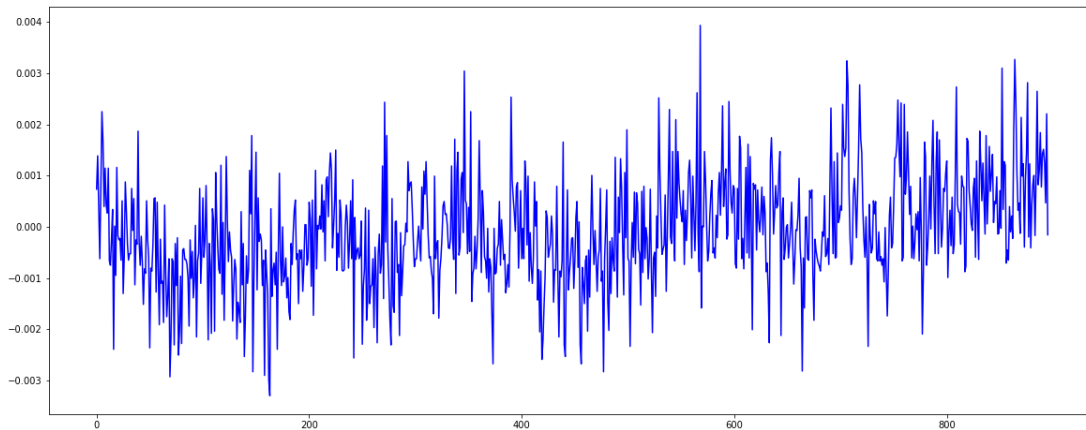


Figure 3: EDA of subjects with self-regulation (memory width of 0.001 on the vertical axis)

In this method, subjects are divided into self-regulating and non-self-regulating subjects according to the waveforms of EDA data [22]. Change Finder is applied only to EDA data from non-self-regulated subjects. Points with the top 5% of change point scores are considered as change points.

Psychological and Physiological Changes

Russell's circumplex model of affect [23] is well known as an emotion model. The model places all emotions on a plane represented by two dimensions: valence and arousal.

Partala T et al. have shown that pupil diameter changes when subjects perceive positive or negative stimuli [24]. Lo'pez-Gil JM et al. have revealed that EDA is an indicator of arousal [22]. Accordingly, changes in pupil diameter can correspond to changes in valence in Russell's circumplex model. Changes in EDA can also correspond to changes in arousal. Pupil diameter and EDA changes go well with Russell's circular model to estimate the factors affecting psychological changes.

Estimation of Differences in Work Attitudes

The method regards the work attitudes shown in the scenes to cause psychological changes in the subjects. The aspects that subjects perceive from the video are different for each subject. Consequently, they can perceive different work attitudes even if they watch the same video.

To find out work attitudes perceived from the video, viewers answer a questionnaire for each sequence after viewing the video. The questionnaire is given in an open-ended format.

The question is "Please tell us specifically why your work attitudes match or do not match those shown in the sequence." Viewers are requested to include the following in their answers.

- Which work attitudes did you perceive in the sequence?
- What are your own work attitudes related to it?

The answers to the questionnaire provide insight into work attitudes perceived from the video. In addition, the emotions of the subjects are estimated from the words used in their

answers. In this way, differences in work attitudes are estimated for the scene where the change point occurs.

EXPERIMENT

Purpose and Outline of Experiment

The purpose of this experiment is to investigate the differences in work attitudes between Japanese and Vietnamese.

The Tobii Pro Nano [26] is used to measure pupil diameter. The Tobii Pro Nano is an eye tracker that can capture data such as pupil diameter and gaze coordinates. The eye tracker is placed at the bottom of the display. The Tobii Pro Nano uses the pupil center corneal reflection method (PCCR) [27]. Subjects are instructed not to move their head during video watching [28]. Pupil diameter is recorded at 60 Hz.

Empatica Embrace Plus [29] is used to measure EDA. Empatica Embrace Plus is a wearable device that can measure EDA, heart rate, respiration rate, and other data. Subjects are instructed to wear the device on their left wrist while watching the video. EDA is recorded at 4 Hz.

Videos

Videos are selected that include a theme with which Japanese and Vietnamese people have very different values. Dentsu Soken et al. [30] show that Japanese and Vietnamese have very different values related to the environment. According to it, videos related to work and the environment are selected for the experiment. The details of the video used in the experiment are shown in Tables 1 and 2. In Video 1, the average duration of a sequence is 24 seconds, and the average duration of a shot is 6 seconds. In Video 2, the average duration of a sequence is 21.4 seconds and the average duration of a shot is 6.3 seconds.

Table 1: Description of videos

Title	Length	Number Of sequences	Number of shots	Main characters	URL
Mum's Words	3:36	9	36	Daughter, Mother	https://youtu.be/B33-If1hXU0?si=jzKx4545H871ZuTY
My Dad's Job	3:34	10	34	Son, Father	https://youtu.be/rU3OfcN-d60?si=6-t1dLcnAN9ezXNd

Table 2: Outline of videos

Title	Outline
Mum's Words	A daughter's job is to protect the environment. She is passionate about her work and performs her duties with enthusiasm. Although she faces daily challenges, she continues her work in the hope that one day local people will take an interest in environmental protection. The mother's voiceover ponders over her daughter's career choice and worries about the tough job scope and the challenges.

My Dad's Job	"What does your parent do?" Through his composition assignment, a son brings us through a day in his father's shoes, as he carries out his duties as a dengue control officer. Through the son's eyes, the video shows how his father daily does his best to protect others, with patience and resilience in overcoming the challenges he faces every day.
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Experimental Method

Subjects consist of two groups: Japanese and Vietnamese. The experiment is conducted on one subject at a time. The experimental procedure is as follows:

1. Subjects watch videos on a display. Pupil diameter and EDA were recorded during the video.
2. Subjects answer a questionnaire for each sequence after watching the video. Subjects are asked to describe why their work attitudes match the work attitudes shown in the sequences.
3. Change points are detected in the physiological data collected from Japanese and Vietnamese subjects, respectively.
4. The detected change points indicate the time points when pupil diameter and EDA of the Japanese and Vietnamese, respectively, changed significantly. Factors affecting the psychological changes at these points are examined, and differences in work attitudes are estimated.

The subjects should satisfy the following two conditions.

- They must have sufficient visual acuity and hearing ability to watch the video without any difficulty.
- The Vietnamese subjects must have a Japanese language ability of N3 or higher as defined by the Japanese Language Proficiency Test [25].

N3 is the level at which the person can understand Japanese used in daily situations to some extent.

The subjects who view Video 1 are 13 Japanese and 9 Vietnamese. Of these, pupil diameter data from two Japanese and one Vietnamese and EDA data from one Japanese and one Vietnamese could not be recorded due to a malfunction of the experimental equipment. The subjects who view Video 2 are 13 Japanese and 7 Vietnamese. Of these, pupil diameter data from two Japanese and EDA data from four Japanese and two Vietnamese could not be recorded due to a malfunction of the experimental equipment. These data are excluded from the analysis.

Detection of Cognitive Change Points

Changes in pupil diameter are detected to estimate shots that affect cognitive changes. Figures 4 and 5 show example of transition of pupil diameter and its change point score calculated with Change Finder. The solid line indicates pupil diameter, the dashed line indicates the change point score and the dash-dot line indicates the 3% threshold.

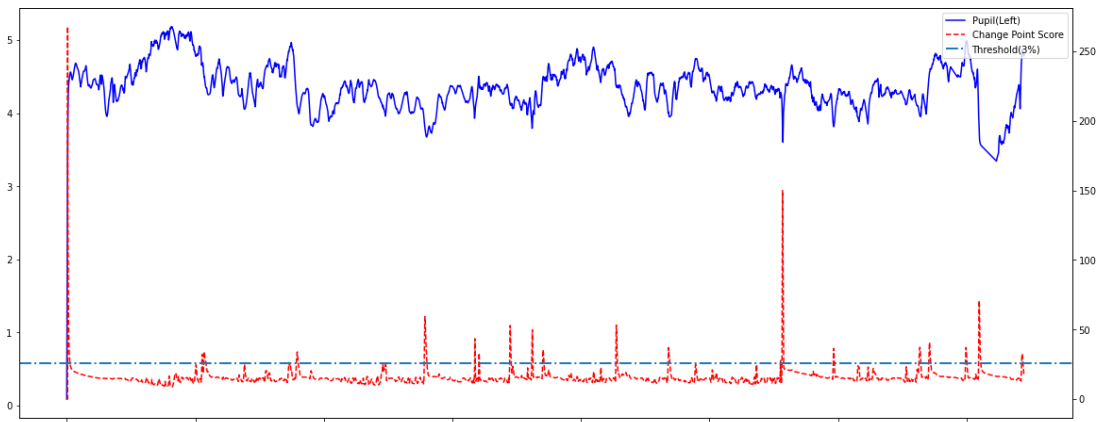


Figure 4: Pupil diameter and change point score (left eye)

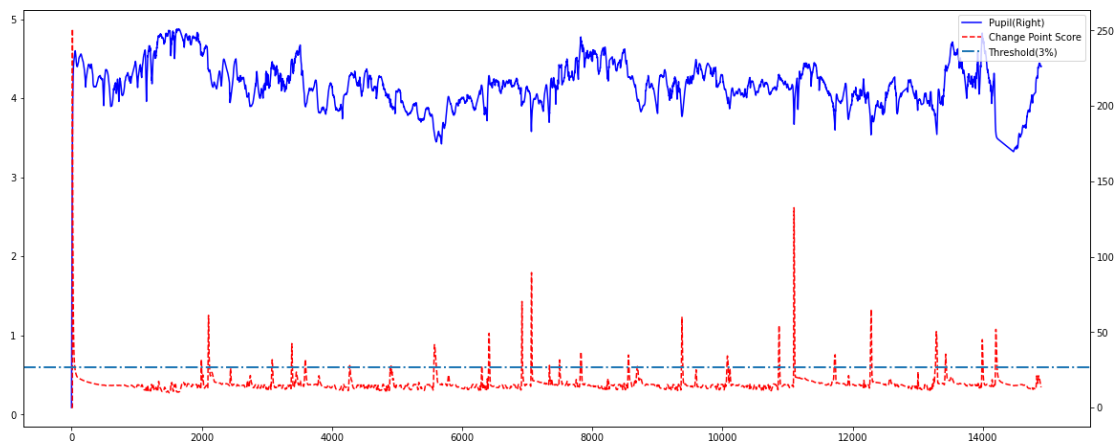


Figure 5: Pupil diameter and change point score (right eye)

For each of the Japanese and Vietnamese groups, the number of people whose pupil diameter changes within the shot is calculated. To calculate the ratio of the number of people whose pupils change in each group is determined, the number of people whose pupil diameter changed within a shot is divided by the number of subjects in each group. If the ratio is higher in a specific group, the change is considered to occur only in the group.

Tables 3 and 4 show some of the shots that affect cognitive change in the Japanese and Vietnamese groups in Video 1. As can be seen from Table 3, the mother's voiceover appears in many of the shots affecting the cognitive change of the Japanese. Similarly, a colleague appears in many of the shots that affect the cognitive change of the Japanese. On the other hand, as can be seen from Tables 3 and 4, scenes in which the daughter is facing difficulties on the job are depicted in shots affecting both Japanese and Vietnamese cognitive change. Shots affecting cognitive change are found to be everywhere in the video.

Table 3: Shots affecting cognitive change in Japanese group (Video1)

Sequence	Shot	Time	Characters	Detail
2	5	0:33-0:39	Daughter, Mother's voiceover	The daughter and her colleague are walking along having a conversation about their job. Voiceover : The mother Ponders why her daughter chose a career in environmental protection.

4	15	1:35-1:41	Daughter, Colleague, Mother's voiceover	The daughter and her colleague are making the rounds. Voiceover : the mother believes that her daughter's passion for the environment was fuelled because she kept telling her daughter not to litter.
7	28	2:37-2:40	Daughter, Colleague, Mother's voiceover	The daughter sighs when she warns a woman about the offence but is told "I don't care". Voiceover : The mother says she knows her daughter comes home exhausted every day.
	30	2:48-2:55	A resident, Daughter, Mother's voiceover	A resident picks up the rubbish she dropped and throws it into a bin. The daughter is passing by and sees the scene. Voiceover : The mother hopes that one day she will understand why her daughter loves her job of protecting the environment.

Table 4: Shots affecting cognitive change in Vietnamese group (Video1)

Sequence	Shot	Time	Characters	Detail
4	13	1:23-1:28	Daughter, A madam	Rubbish was thrown from the upper floor of an apartment building. The madam, who encountered the littering, excitedly explains the situation to the daughter. The camera focuses on the madam and the rubbish that has been thrown away.
6	24	2:24-2:27	Daughter, A girl	The daughter asks a girl who left the plastic cup on the table, to show her ID to record the offence. However, the girl is defiant, saying she has no ID.
	25	2:27-2:30	Daughter, Mother's voiceover	A man and a woman are handed a ticket by their daughter for an offence. Voiceover : The mother says she knows her daughter is facing a tough situation. her daughter comes home exhausted every day.
8	33	3:05-3:09	Daughter	The daughter is coming home from work in heavy rain. The mother is cooking dinner and waiting for her daughter to come home. The daughter says to her mother : "I'm home."

Tables 5 and 6 show some of the shots that affected cognitive change in the Japanese and Vietnamese groups in Video 2. As can be seen from Table 5, colleagues often appear in shots that influence the cognitive change of the Japanese. In addition, scenes showing fathers taking care of their sons in the morning are depicted in shots affecting the cognitive change of the Japanese. On the other hand, as can be seen from Table 6, scenes of the father facing difficulties on the job are depicted in shots that affect the cognitive change of the Vietnamese. Shots affecting cognitive change were found to be everywhere in the video.

Table 5: Shots affecting cognitive change in Japanese group (Video2)

Sequence	Shot	Time	Characters	Detail
2	3	0:13-0:26	Father, Son, Son's voiceover	In the morning, a father quietly enters his son's bedroom and wakes him up, saying that it is time to go to school. Voiceover : "My dad brings me to school early in the morning."
	5	0:30-0:33	Father, Son's voiceover	The father takes his son to school, after which he goes to work. The father notices that the bus is about to arrive and he rushes to catch up with it. Voiceover : "Then he goes to work afterwards."
3	6	0:33-0:39	Father, Colleagues, Son's voiceover	The father arrives at the meeting point and says hello to his colleagues. He offers his colleagues a drink. Voiceover : "He has a very important job."

Table 6: Shots affecting cognitive change in Vietnamese group (Video2)

Sequence	Shot	Time	Characters	Detail
4	13	1:17-1:22	Father, A resident	There is a cluster of dengue fever outbreaks. The father offers an inspection of dengue in resident's apartment, but the resident interrupts him. The resident slams the door.
	15	1:30-1:39	Father, A resident, Son's voiceover	After being refused a dengue inspection, the father thinks for a moment. He then knocks on the door again and informs the resident of the importance of the inspection. The resident understands the father's earnestness and responds to his offer.
8	28	2:48-2:52	Father, Son	The father is coming home with his son after work. The son is frolicking with his father.

Detection of Emotional Change Points

In this experiment, changes in EDA are detected to estimate the shots that affect emotional changes. Based on the EDA waveforms, subjects were divided into self-regulating and non-self-regulating subjects. In this experiment, only the EDA data of the subjects without self-regulation are analysed. Figure 6 shows the EDA data of the subjects without self-regulation and an example of the application of Change Finder. The solid line indicates pupil diameter, the dash line indicates the change point score and the dash-dot line indicates the 5% threshold.

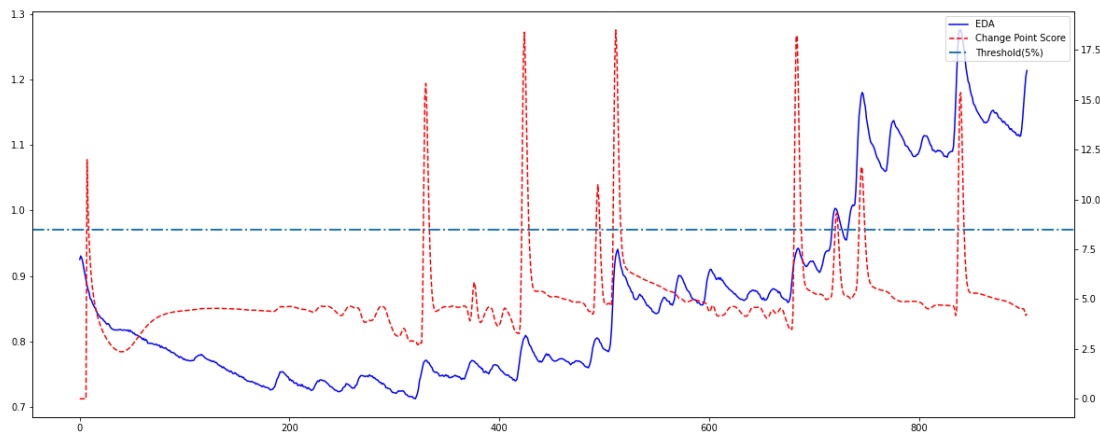


Figure 6: EDA and change points

Similar to the analysis of pupil data, the ratio of the number of people whose EDA changed of each group in the shots is determined. Tables 7 and 8 show some of the shots that cause emotional change in the Japanese and Vietnamese groups in video 1.

As can be seen from Table 7, scenes of the daughter facing difficulties on the job are often depicted in shots that affect the emotional changes of the Japanese. In these shots, the emotions of the characters are strongly expressed. On the other hand, as Table 8 shows, scenes of rubbish being thrown away are often depicted in shots affecting the emotional changes of the Vietnamese. Shots affecting emotional change are found to be everywhere in the video.

Table 7: Shots affecting emotional change in Japanese group (Video1)

Sequence	Shot	Time	Characters	Detail
4	13	1:23-1:28	Daughter, A Madam	Rubbish was thrown from the upper floor of an apartment building. The madam, who encountered the littering, excitedly explains the situation to the daughter. The camera focuses on the madam and the rubbish that has been thrown away.
	14	1:28-1:35	Daughter, A madam, Mother's voiceover	The daughter and her colleague are interviewing the madam about the situation. Voiceover: The mother thinks that her daughter is working to protect the environment because she kept telling her daughter not to litter.
6	24	2:24-2:27	Daughter, A girl	The daughter requires a girl who left the plastic cup on the table, to show her ID to record the offence. However, the girl is defiant, saying she has no ID right now.
	27	2:32-3:37	Daughter, A girl	The daughter warns the girl that if she does not pay the fine, she will have to attend court. The girl ignores the daughter's warning and says "whatever" and walks away.

Table 8: Shots affecting emotional change in Vietnamese group (Video1)

Sequence	Shot	Time	Characters	Detail
2	9	0:59-1:08	Daughter, Mother's voiceover	The daughter is taking photographic evidence of the litter left behind. The litter includes cigarette butts. Voiceover: The mother thinks that her daughter chose a job protecting the environment because she kept telling her daughter not to smoke.
5	16	1:41-1:44	Daughter, Colleague	The daughter and her colleague find cigarette butts on the ground floor of the building. The colleague suggests a look around and the daughter nods in agreement.
	18	1:47-1:51	A man	A man littering with cigarette butts.
	22	2:12-2:19	Daughter, A girl, Mother's voiceover	The daughter warns the man and the girl not to litter. The girl does not accept the daughter's warning and makes the excuse that "the cleaners should take care of it." Voiceover: The mother is wondering if her daughter's work is worthwhile.
6	23	2:19-2:24	Daughter, A man	The daughter requires the man to show his ID in order to record the offence.

Tables 9 and 10 show some of the shots where emotional change occur in the Japanese and Vietnamese groups in Video 2. As can be seen from Table 9, scenes of the father facing difficulties in his job are often depicted in shots that affect the emotional change of the Japanese. On the other hand, as can be seen from Table 10, the father reading his son's notebook is depicted in the shot affecting the emotional change of the Vietnamese. Shots affecting emotional change were found to be everywhere in the video.

Table 9: Shots affecting emotional change in Japanese group (Video2)

Sequence	Shot	Time	Characters	Detail
3	8	0:43-0:53	Father, Colleagues, Son's voiceover	The father is preparing for work having a conversation with a colleague. The father and his colleague are on their way together to make inspections of dengue fever. Voiceover: "(My father's job helps to save lives.) He says that's the best part about what he does."
	14	1:22-1:30	Father, Son's voiceover	There is a cluster of dengue fever outbreaks. The father ponders for a moment after the resident refuses a dengue inspection. Voiceover: "Some people don't understand what he does, and that makes his job even harder."
	17	1:45-1:48	Father, A resident	The father is advising the residents on how to avoid dengue fever.

7	22	2:11-2:17	Father, A resident, Son's voiceover	
	23	2:17-2:19	Daughter, A girl	
	25	2:25-2:30	Father, A resident	

Table 10: Shots affecting emotional change in Vietnamese group (Video2)

Sequence	Shot	Time	Characters	Detail
5	16	1:39-1:45	Father, A resident, Son's voiceover	The father is checking into the kitchen with the resident. Voiceover: "His job is like that of detectives we see on TV."
6	20	1:59-2:05	Father, Colleague, Son's voiceover	The father and his colleague discover something during an outdoor inspection and record it on a tablet. Voiceover: "Sometimes it's not easy to find the clues, and reach the answer."
9	29	2:52-3:00	Father, Son's voiceover	The father is putting a blanket over his son asleep in bed. The father finds a notebook on his bedside table and picks it up. Voiceover: "My dad says his job is called a Dengue Control Officer."

DISCUSSION

Differences in Cognitive Changes

This section discusses the scenes that affected the cognitive changes in Japanese group and Vietnamese group.

As can be seen from Table 3, which shows the shots that affected the cognitive change of the Japanese group, the mother's voiceovers appear in many of the shots. In these shots, the mother's voiceovers pose questions about the value of her daughter's job and the reasons why her daughter does it. For example, the voiceovers include questions such as "Why did she choose the job?" and "Is my education the reason why she chose the job?" In the questionnaire, Japanese group responded as below:

- "I want to do a job that has meaning. I want to find meaning in my work." (Sequence 5)
- "I think I should find a job that I like." (Sequence 7)
- "My parents' teachings lead me to my job." (Sequence 4)

The questionnaire responses listed are abridged where appropriate. These responses suggest that the reasons why they like their job and why they chose their job are important to the Japanese. In other words, Japanese people are considered to attach great importance to the intrinsic value of their work. Tables 3 and 4 show that some shots depict scenes in which the daughter is facing difficulties in her job. These scenes affect cognitive changes in both Japanese and Vietnamese groups. However, the Japanese and Vietnamese groups react differently when they face difficulties. In the questionnaire, Japanese group responded as follows:

- “The attitude of facing difficulties in the video matched my values.” (Sequence 2)
- “I want to do what I like as a job, but I have to overcome the work I’m not good at.” (Sequence 6)

These responses are considered to indicate that the Japanese are willing to accept and face any difficulties in work. On the other hand, Vietnamese group responded following:

- “There are difficulties in any job but it is up to each person’s choice whether to accept them and continue working.” (Sequence 3)
- “I don’t want my job become difficult or bad situations.” (Sequence 6)
- “She contributes not only to herself but also to the community. I work mainly for a salary.” (Sequence 9)

These responses may indicate that the Vietnamese people try to avoid job difficulties as much as possible. Additionally, one of the responds indicates the awareness that work is just about performing duties for Vietnamese people. The above shows that Japanese people and Vietnamese people have different ways of reacting when they face difficulties.

The Japanese group and Vietnamese group also differ in their attitudes towards work and family. Tables 3 and 4 show that the scenes depicting communication between the daughter and her mother have affected the Vietnamese group. The Japanese group answered:

- “I prioritise work over family communication.” (Sequence 1)
- “The willingness, spareing no time to work in order to achieve results, matches my work attitudes.” (Sequence 8)

The Vietnamese group, on the other hand, answered:

- “Having a meal with my mother is the happiest moment after working hard.” (Sequence 8)
- “I need my family’s help to overcome many difficulties at work.” (Sequence 8)
- “When I am full of work pressure, my family encourage me and they don’t blameme for the problem.” (Sequence 8)

The answers show that Japanese people tend to prioritise work over family time. In contrast, Vietnamese people believe that they need time with their families in order to work. This result is same with the result shown by Tago et al. for the work and family attitudes of Japanese and Vietnamese.

As can be seen from Table 5, colleagues appear in many of the shots that influence the cognitive change in Japanese group. In these shots, the father communicates with his colleagues and value co-operation with them. The Japanese group responded to the questionnaire as follows:

- “I like to work in teams.” (Sequence 3)
- “Work is about working with others.” (Sequence 3)
- “The way I approach work, working hard with colleagues to achieve the same goals, is in line with my own work values.” (Sequence 3)

These responds suggest that Japanese people consider communication and cooperation with colleagues at work to be important.

Differences are also be found between Japanese and Vietnamese attitudes towards work responsibilities. Scenes that show the father facing difficulties on his job affect the cognitive changes of the Vietnamese. In this context, the Japanese group responded as follows:

- “I feel responsible for my work and my passion for not giving up (like the father in the video) matches my work attitudes.” (Sequence 4)
- “I want as many people as possible to understand the importance of my work. The sense of mission to achieve it matches my work attitudes.” (Sequence 4)

The Vietnamese group responded as follows:

- “I am very hardworking and dedicated to my work.” (Sequence 4)
- “If it’s work, you should finish it. You should not give up immediately when you encounter difficulties.” (Sequence 4)

However, the Vietnamese group also responded that:

- “My responsibility at work is just to do the job I am paid for and to do the tasks assigned to me. I have very little responsibility towards the community.” (Sequence 5)
- “I am a officeworker, so I don’t have the diligence, thoughtfulness and responsibility for my work that the father in the video has.” (Sequence 6)

The responds above indicate that both Japanese and Vietnamese people are willing to work without giving up. However, the Japanese tend to value dedication to their work, whereas the Vietnamese tend to limit their work responsibilities only to the scope of their assigned authority. These results also show the same results shown by Tago et al. of the Vietnamese attitudes to work and salary.

Table 5 includes scene where fathers look after their families in the morning before they go to work. Meanwhile, as can be seen from Table 6, a scene where the father takes care of his family after work is included. This difference can be attributed to the different attitudes towards overtime work between the Japanese and Vietnamese.

The Japanese group responded to overtime work as follows:

- “It is important that I work a lot of overtime.” (Sequence 8)
- “I prioritise work over family and want to thoroughly work through my overtime.” (Sequence 8)

The Vietnamese group, in contrast, responded as follows:

- “I always want to finish work as planned.” (Sequence 8)
- “Even if I am so busy at work, I should still spend time with my children.” (Sequence 2)

From the responds above, it can be seen that Japanese people consider overtime work to be important for their work, whereas Vietnamese people want to avoid it as much as possible. Japanese people tend to work overtime and find it difficult to spend time with their families after work, while Vietnamese people tend not to work overtime and are more likely to spend time with their families after work. Therefore, Japanese people are more likely to empathise with scenes in which they take care of their family in the morning, while Vietnamese people are more likely to empathise with scenes in which they take care of their family after work.

This difference is considered to be the reason why Japanese and Vietnamese differ in the scenes in which cognitive change occurs. It is assumed that in the scenes in which cognitive change occurs, subjects replace themselves with the characters to empathise.

Differences in Emotional Changes

This section discusses scenes that have affected the emotional changes in Japanese group and Vietnamese group.

Table 7 shows many shots that affected the emotional change in the Japanese group, depicting strong emotional expressions of the characters. In those scenes, the madam are shouting loudly or the girl are expressing their unpleasant with a sharp look in their eyes decidedly. Japanese people usually tend to have few opportunities to express their emotions in a strong way in their daily lives. Japanese people may not be accustomed to strong emotional expression through the voices, facial expressions and attitudes like the characters in the video. Therefore, Japanese people may have feelings similar to surprise or fear in these scenes. On Russell's circumplex model of affect, it is likely that emotional changes in the direction of arousal are occurring.

Table 8, on the other hand, depicts scenes of littering in a number of shots, such as the scenes of men throwing away a cigarette, and warning the girl against littering. The responses of the Vietnamese group indicate that they felt uncomfortable with littering.

- "I resent the attitude of people who litter." (Sequence 5)
- "The daughter found rubbish being thrown away. In jobs, such unpleasant situations are inevitable." (Sequence 5)
- "The rubbish scenes left a very unpleasant impression on me. Those scenes symbolise the pressure of work and the undesirable consequences that come with it." (Sequence 5)

These responses show that the Vietnamese group feel the stress and pressure of work that the daughter in the video must feels. The Vietnamese group may be experiencing feelings similar to anger or disgust in these scenes. On Russell's circumplex model of affect, it is likely that emotional changes in the direction of arousal and unpleasant are occurring. In Video 1, both the Japanese and Vietnamese group experienced emotional changes in the direction of arousal on Russell's circumplex model of affect. As Table 9 shows, colleagues appear in the shots that affect the emotional change of the Japanese group. In the shots before and after, the scene shows that the father places great importance on communication with his colleagues. The Japanese group responded to the questionnaire as follows:

- "It is reassuring to have colleagues who empathise with me. I want to work with people like that." (Sequence 3)
- "I think it's good to work happily with colleagues." (Sequence 3)

This suggests that the Japanese may have feelings similar to feelings of security and satisfaction in these scenes. On the Russell's circumplex model of affect, an emotional change in the pleasant direction is likely to have occurred.

Table 9 also contains a shot of the father facing difficulties in his job. In this scene, the father is experiencing difficulties at work because the residents do not understand the importance of his work. The Japanese group responded to the questionnaire as follows:

- “Some jobs are not understood by others.” (Sequence 4)
- “Even if I separate it from my work, I am affected by problems at work.” (Sequence 4)

These responses show that the Japanese group feel anxious and depressed. However, in the continuing scene, the father does not give up and tries, which helps the resident to understand the importance of the father’s job. The following responses are provided in relation to this scene.

- “I think this moment makes me feel that my work is worthwhile.” (Sequence 4)
- “It’s one of the most rewarding moments.” (Sequence 7)
- “I thought the father was doing a great job.” (Sequence 4)

These responses show that Japanese people feel a sense of achievement and happiness when their work efforts are rewarded. On Russell’s circumplex model of affect, emotions are considered to changed in the unpleasant direction once, and then changed in the pleasant direction.

Differences were also found between Japanese and Vietnamese people in who they seek to understand the importance of their work. Some shots in Table 9 depict fathers giving advice to the residents. The Japanese group responded to the questionnaire as follows:

- “I want many people to understand my own work.” (Sequence 9)
- “I am happy when people around me appreciate my hard work.” (Sequence 9)

This suggests that Japanese people feel satisfied when many people understand the importance of their work.

On the other hand, in one of the shots in Table 10, a father is reading his son’s diary. In the following shot, the father is smiling as he reads his son’s diary, and the son’s voiceover is inserted, saying that when he grows up, he wants to have an important job where he can protect people like his father. The following response is provided from the Vietnamese group about this scene.

- “It is very touching that the son understands the value of his father’s job.” (Sequence 9)
- “The fact that the son understands and takes pride in his father’s job makes me very happy.” (Sequence 9)

This suggests that Vietnamese people feel happy when their families understand the importance of their work. It is considered that Japanese and Vietnamese people differ in whom they seek understanding of the importance of work.

CONCLUSION

This study proposed a method for estimating differences in work attitudes by national character. The method applied change point detection to pupil diameter and EDA while watching a video to estimate psychological change points. In addition, a questionnaire was conducted to discuss specific psychological changes. The study estimated differences in work

attitudes in two aspects: cognitive and emotional changes between Japanese and Vietnamese people.

The results showed that the cognitive changes of the Japanese group indicated that they attach importance to the intrinsic value of work and the reasons why they chose their job. It is also revealed that Japanese people consider it important to work in cooperation with their colleagues. Furthermore, the Japanese not only value working dedicatedly but also show a willingness to accept and face difficulties in their work. The Japanese tend to prioritize work over time with time shared with their families.

On the other hand, the cognitive changes in the Vietnamese group indicate that work is just about performing their duties for them. In addition, Vietnamese people tend to limit their work responsibilities only within the scope of their assigned tasks. Furthermore, the Vietnamese show an attitude of trying to avoid difficulties at work as much as possible. It turns out the Vietnamese believe that they need time with their family for their work. It is also suggested that in scenes where cognitive changes occurred, both Japanese and Vietnamese subjects replace themselves with characters in the scene.

The emotional changes in the Japanese group suggest that scenes including loud shouts and strong emotional expressions of the characters may have caused the Japanese group to experience surprise and fear. It suggests that emotions change in the direction of arousal as defined by Russell's circumplex model of affect. It is also possible that communication with colleagues and the understanding of the importance of work by many people may have made the Japanese feel a sense of security and satisfaction. It is also suggested that emotions are changing in the pleasant direction as defined by Russell's circumplex model of affect.

On the other hand, the emotional changes of the Vietnamese group suggest that they may have experienced anger and disgust during the scene where the rubbish is thrown away. It means that the emotions change in the direction of arousal and unpleasantness in Russell's circumplex model of affect. The results also indicate that the Vietnamese feel a sense of well-being when they have understanding from their families. It was suggested that the emotions changed in the direction of unpleasant in Russell's circumplex model of affect.

This method enables the estimation of differences in work attitudes by national character using physiological reactions. The differences in work attitudes estimated by the method can be used to train foreign workers in companies. In the future, further validation should be carried out using videos with several different story plots.

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