TRACKING THE EYE-MIND RELATIONSHIP OF POSITIVE EMOTION USING EYE TRACKING TECHNIQUE

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ABSTRACT: This article presents an exploration and investigation of the eye movement features to track the eye-mind relationship through eye tracking device during video clips of positive emotional stimulation. The relationship of eyes gazing behavior with human mind is a challenging topic. Many parameters of the eyes gazing behavior is yet to be explored namely pupil size and pupil dilation. Since pupil size is one of the indicators of the brain's activity studies on eye-mind relationship can be beneficial and added value in learning human behavior. Prior studies have suggested that the cognitive processing and affective information affect the size of pupils in humans. Significantly, this study focus on the behavior of positive emotion by using eye tracking technique to observe the eye-mind relation. It is hypothesized from this observation that the visual attention of the gazing behavior will affect the pupil dilation and will further provide evidence of the human mind triggered emotion. Ten subjects' pupil responses were measured while watching interesting and amusing emotional clips. The results showed that the fixation duration and pupil dilation significantly different between each video stimulation. These results suggest that the measurement of eye fixation is a potential computer input for detecting emotional state.

KEYWORDS: *Eye Tracking; Fixation; Pupil Dilation*

1.0 INTRODUCTION

Emergent of eye tracking devices has attracted both academics and industries for its application in various field of studies and businesses. The main interest is to involve the inner self factor of human being to benefit research findings, commerce and productions. Studies on

individuals with physical and psychological disorders suggest that eye-tracking techniques have the potential to offer insight into the downstream difficulties in everyday social interaction which such individual's experience [1-2]. Similar objectives of eye tracking application is actively used today in the new field called Neuromarketing [3-4]. Such studies showed that eye analysis can be useful not only for diagnostic and therapeutic purpose but can be generally utilized to understand the human behavior through the relationship between the pupil responses and its attitudes and behaviors [5-7]. Benefit research findings, commerce and productions. Studies on individuals with physical and psychological disorders suggest that eye-tracking techniques have the potential to offer insight into the downstream difficulties in everyday social interaction which such individual's experience [1-2]. Similar objectives of eye tracking application is actively used today in the new field called Neuromarketing [3-4]. Such studies showed that eye analysis can be useful not only for diagnostic and therapeutic purpose but can be generally utilized to understand the human behavior through the relationship between the pupil responses and its attitudes and behaviors [5-7].

The psychological factor of the emotional part closely correlates to the to Human-computer interaction [8-9] as the pupil dilation of the eye complement the viewing of emotionally toned or exciting visual stimuli [10]. Hence, the emotional stimuli is advantageous in attracting the response of the Human-computer interaction system [11-12]. Moreover, the visual fixation recording in real-time is beneficial to examine the positive influences of subjects gazing attention. This study explored and investigated these challenges to relate the eyes gazing behavior with human mind through the eye tracking technique. The eye-mind [13] relation is very complex but very few has reported such as gazing behavior relation to personality [14]. Many parameters of the eyes gazing behavior is yet to be explored such as pupil size and pupil dilation. Since pupil size is one of the indicators of the brain's activity [15-17], studies on eye-mind relationship can be beneficial and added value in learning human behavior.

Prior studies have suggested that the cognitive processing and affective information affect the size of pupils in humans. For example, research finding had proved that pupil dilates when cognitive load was increasing [18]. Significantly, this study focus on the behavior of positive emotion by using eye tracking technique to observe the eye-mind relation. Observation will be made to the pupil dilation and its fixation to recognize the emotional state. It is hypothesized from this

observation that the visual attention of the gazing behavior will affect the pupil dilation and will further provide evidence of the human mind triggered emotion.

2.0 METHODOLOGY

2.1 Experimental Flow Chart

Figure 1 depicts the experiment flow chat.

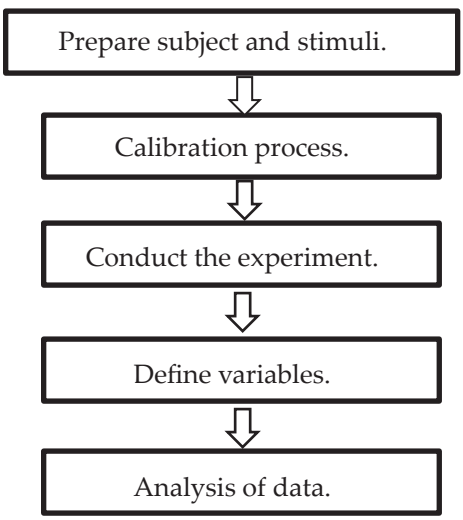

Figure 1: Flow chart of the experiment

2.2 Subjects

10 students with the age ranging from 20 to 30 years old were randomly recruited to take part in this study. The experiment was conducted in a closed air-conditioned room at the Bio-Cognition Laboratory, Malaysia-Japan International Institute of Technology.

2.3 Stimuli

Videos on interesting and amusement as shown in Figures 2 and 3 were chosen for the stimuli in the experiment. Participants were seated comfortably on a chair and were requested to view these videos.

Figure 2: Video clip on interesting

Figure 3: Video clip on amusement

2.4 Experiment Procedure

The experiment protocol was briefed and informed consent were obtained from the participants before starting the experiment. Participants were instructed to sit comfortably to watch the video clips. The Tobii TX300 eye tracking device was used as an equipment to record the subjects eyes gazing attention. The eye tracker uses infrared corneal reflection to measure point of gaze with data rates of 60 Hz, and accuracy of 0.5 degrees. Subjects were then underwent a calibration process before the start of each experiment. The device requires a calibration of the eye movements before starting the recording. At the beginning of each video the experimenter left the room to allow subject feel more freely while watching the videos.

2.5 Data Analysis

Pupil size analyzed by creating segment using Tobii Studio software which each segment represents one video. Tobii Studio generates raw data for each subject. Pupil dilation and fixation duration were extracted separately from the raw data.

3.0 RESULTS AND DISCUSSION

The data obtained from the experiment were very huge. Each subject produced thousands of pupil dilation from each video. The data were therefore averaged and took 2 days to complete processing using Microsoft Excel. As shown in Figure 4, responses of pupil size to the amusement arousal provoked roughly higher than the interesting arousal. The subjects' pupil dilation mean were obtained ranging from 3.2 and 4.93 during the exposure to the amusement and interesting video.

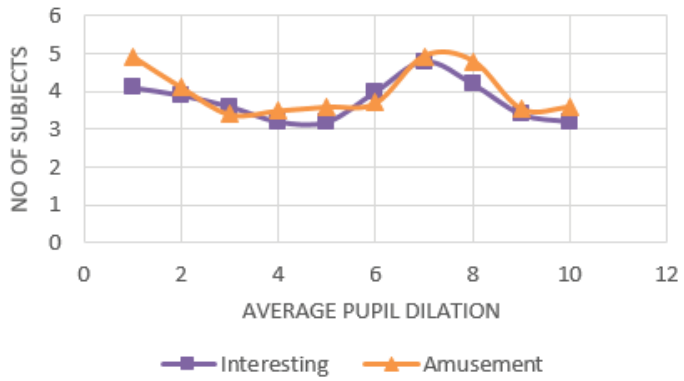

Figure 4: Average of pupil dilation

Similar process was carried for the fixation duration. Figure 5 depicts Fixation duration of amusement video was ranged from 0.3 to 0.6. Interesting video ranged between 0.2 and 0.65. However, this data experiment did not show significant in average of fixation duration differences between amusement and interesting videos stimulation.

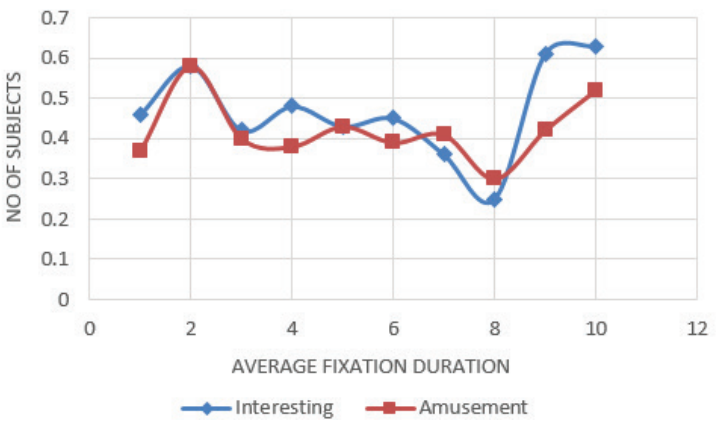

Figure 5: Average of fixation duration

As the pupil dilation is controlled by the autonomic nervous system [12], the results confirm that the autonomic nervous system reacts differently to emotionally arousing stimuli. The results also preserve of those past studies of different emotional association responses to differential autonomic nervous system activity. There is a possibility that pupil size is insensitive towards the visual stimuli. Apart from that, there are some of previous studies of discrete emotions might have failed to control for the differences in the amount of arousal generated by the respective emotions. Therefore, differences in autonomic responses attributed to particular emotions may have resulted from differences in the amount of arousal generated by the emotions.

4.0 CONCLUSION

The results of this study has confirmed empirically on the gazing behavior when presented with positive emotion stimuli. The experiment had observed that eye activities in amusement and interest stimulus can be a feasible mean to classify different affective states. Hence, emotional detection has a great role to play in future technology and the usage of eye tracking are expected to be exponentially increased, give the benefit to the fields like psychological studies and marketing. This study provides an additional measurement and benchmark on human gazing behavior during visual emotional stimulation. The average of pupil dilation and average of fixation duration were investigated. With the present finding, fixation seems to hold discriminative emotional effect due to different stimulus. Taken together, these results suggest that further studies to detect different emotional states through eye tracking will confirm the eye-mind relationship.

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