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# Relationship of Terror Feelings and Physiological Response during Watching Horror Movie

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**Abstract.** Movie is one of the most popular media types. Horror movie is a kind of attractive movie contents which part of people want to watch very much. Although the users feel terror of the contents, the users want to watch the horror movies to have extraordinary feelings such as excitements. Therefore, terror feelings of the horror movies are considered as an important factor to establish more attractive movie contents, and the effect of horror movie is highly believed. However, few previous studies have investigated a relationship of horror movie and its terror feelings. This study aims to investigate psycho-physiological effects of horror movies on the user for clarifying the relationship. In the experiment, physiological data (electrocardiogram and respiration, and skin conductance) of ten male subjects were measured. Additionally, after watching movie contents, the experimenter asked the subjects points in movie affecting terror feelings on the subjects and how the subjects felt in these points. The experimental results shows that change in intensity and cycle of respiration: in the point affecting terror feelings on the subject, the intensity of respiration was augmented and the cycle of respiration was shortened.

**Keywords:** Horror movie, Terror Feeling, Respiration, Skin Conductance

## 1 Introduction

Movie is one of important media type which is very popular and has strong effects on people. Some movies makes people very exciting, on the other hand, some other movies makes people very sad. This must be come from effective combination of stimuli related to sight and hearing of the movies.

It is interesting that many people loves horror movie although they do not like to be in horror situation in their real life: of course, they can enjoy horror movies because of its hypothetic horror. From same point of view, positive effects of horror game were argued and applied on various situations [1].

Various previous studies have investigated the relationships of physiological change and subjective feelings including Kansei. As a representative of the studies, Picard et al. have investigated the relationships by employing multiple physiological indices [2]. It is very important to reveal the relationship for presuming the user's state without subjective evaluation for various objectives.

However, the relationship in horror movie was investigated by few previous studies. As one of the related studies, Nagano et al. have investigated the effects of Japanese horror game [3]. In a mean of investigating the physiological changes during the user feeling terror, this previous study and the present study have same objectives. However, during playing game, user's operation must be cause of physiological noise. To observe and investigate the relationship, it is better to affect the subject by only terror feeling without other tasks.

This study aims to investigate the relationship of terror feeling and physiological indices. An experiment is conducted to investigated the relationship, and a Japanese horror movie is selected as a stimulus that affecting the subjects terror. Respiration, electrocardiogram, and skin conductance were measured as the physiological indices. With a questionnaire, subjective terror feelings of the subjects during the stimulus were investigated.

## **2 Experimental Method**

### **2.1 Subjects and stimulus**

The time length of physiological measurement was forty minutes. Beforehand of the measurement, the experimenter described the all of procedures of the experiment to the subject. The experiment was composed of three steps as shown in Fig. 1; prior rest period (5 min), movie period (32 min), and post rest period (3 min). During these three periods, the experimental room was kept quietly and dark. Immediately after these three periods, as questionnaire period, the experimenter asked the subject his terror feelings of the movie stimulus by replaying each of scenes of the stimulus considered as affecting terror feeling as described in the next subsection 2.2.

During the 40 min measurement, as physiological indices, respiration, Garvanic Skin Response (GSR), and electrocardiogram were measured. In the measurement, a device of physiological measurement and software (MT-BA-BM2 and Real-Time EFRP II, Melon Technos) and physiological amplifiers (RSP100C and GSR100C, BIOPAC Systems) were used. Prior to the experiment, these devices were attached on the subject by the experimenter. Band of RSP100C was attached on the subjects' chest, and electrodes of GSR100C were attached on index and middle fingers of left hand.

### **2.2 Experimental procedure**

Ten male students participated in the experiment as subjects. They participated in the experiment individually. As a movie stimulus, one of Japanese famous horror movies, "Juon 2" [4] was employed. In detail, time length of the movie was about 90 min and was composed of several related parts. Two successive parts of the movie was selected as the stimulus: these parts were merged into one stimulus. Time length of these parts was totally 32 min. All of the subjects had no experience of watching this movie.

The experimenter investigated contents of the stimulus and picked up eight scenes where the subjects seemed to feel terror (Fig. 2). Prior four of them were considered as scenes that affect the subjects sudden terror. On the other hand, latter four of them were considered as scenes make the subjects shiver. In other words, the scene makes the subjects shiver is also considered as scenes where the subjects can predict something will happen. These scenes were selected by the experimenters, and reasons of selection were sudden loud sounds, sudden scream, and sudden happenings after silent and/or dark scenes.

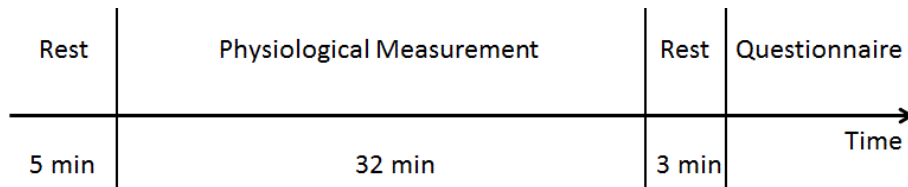


Fig. 1. Procedure of the experiment.

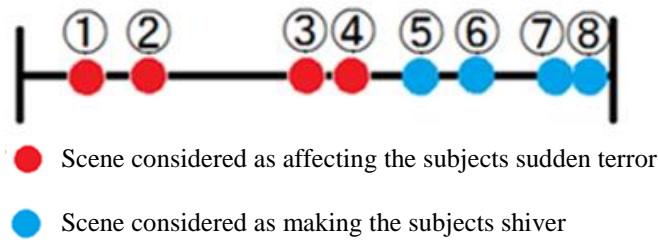


Fig. 2. Location of eight scenes affecting the subjects terror feeling in movie stimulus and type of these scenes.

### 3 Experimental Results

This section mainly shows results of change in respiration and show an example of GSR: analysis of electrocardiogram is not finished.

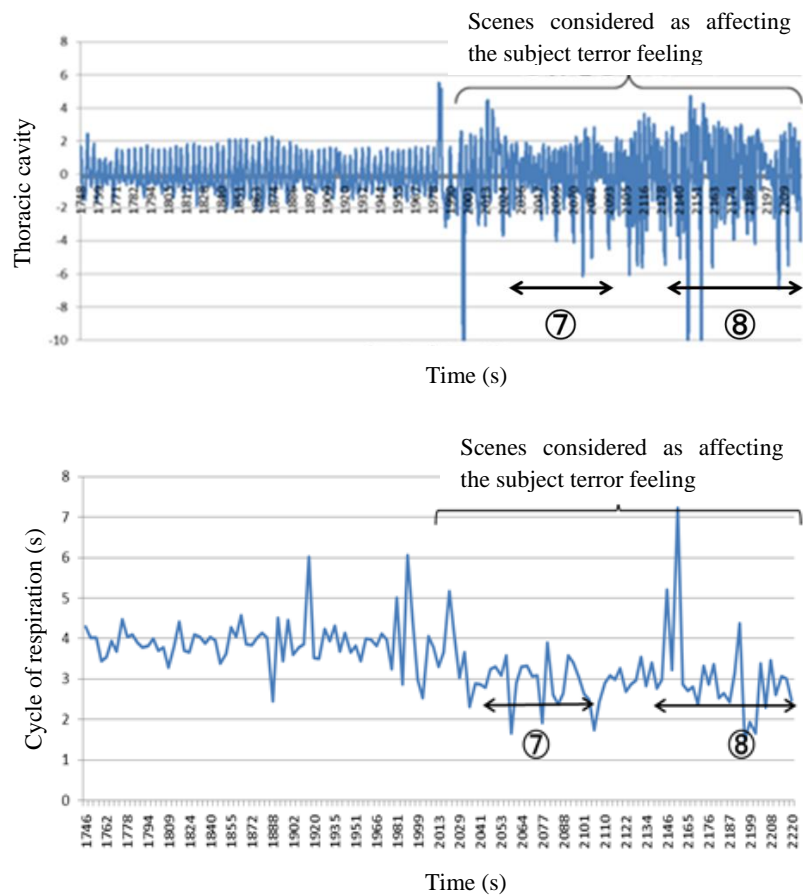
#### 3.1 Result of change in respiration

Fig. 3 shows an example of respiration of subject who felt terror feelings around scenes 7 and 8. Upper figure shows intensity of respiration, and lower figure shows cycle of respiration. The intensity of respiration was measured by change in thoracic cavity, and it means deepness of respiration. The cycle of respiration means was obtained by analyzing intensity of respiration: band pass filter was applied on data of the intensity.

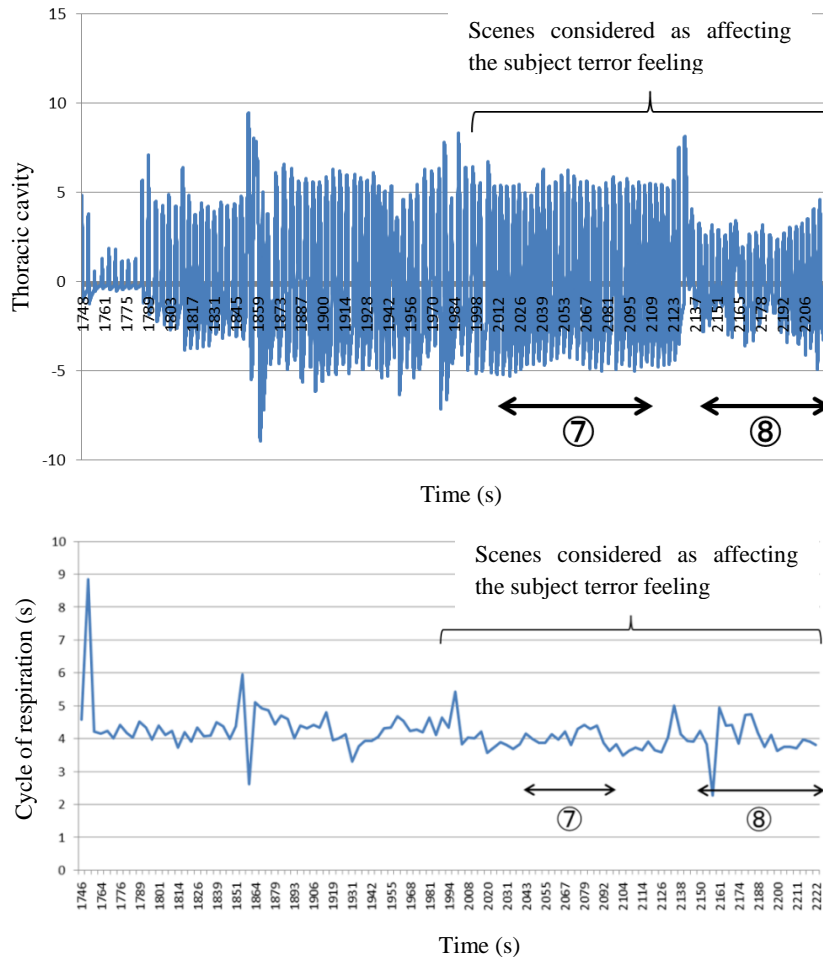
Around the scene 7, the intensity respiration began to increase by comparing to prior to the scene 7. The increase continues to the end of the scene 8, and sometimes

the rapid changes of the intensity were observed. In accordance with the change in the intensity of respiration, the cycle of respiration began to accelerate around the scene 7 from 4 s to 3 s, and shortened cycle was kept till the end of the scene 8.

To compare the respiration between subjects who felt terror and who did not felt terror, Fig. 4 shows another example of subject who did not felt any terror around scenes 7 and 8. In this subject, the intensity of respiration did not change in the scene 7, the intensity decreased around the scene 8. The cycle of respiration did not change around the scenes 7 and 8. Note that the intensity of respiration is an index which cannot be compared between subjects, because the value of the intensity is defined by tightening of the band of GSR100C.



**Fig. 3.** An example of change in respiration of one subject who felt terror feeling around the scenes 7 and 8.



**Fig. 4.** An example of change in respiration of one subject who did not feel any terror around scenes 7 and 8.

To observe trend of the change in the cycle of respiration with covering all of the subjects, mean cycles of respiration prior to and during the horror scenes 7 and 8 were obtained by summarizing subjects who did not feel terror, subjects who felt terror, and all subjects, respectively (Table 1). The horror scene here means around scenes 7 and 8, and prior to horror scenes means general scene without horror just after changed from a certain scene. In all of the subjects, cycle of respiration was shortened in the horror scenes although in a case the subjects subjectively responded as they did not feel terror at all.

To investigate the change in the cycle of respiration, statistical analysis is applied to the data of all of the subjects in Table 1. In detail, Sign Test was employed. The difference in cycles of respiration was significantly different between prior to and during the horror scenes ( $P < 0.01$ ).

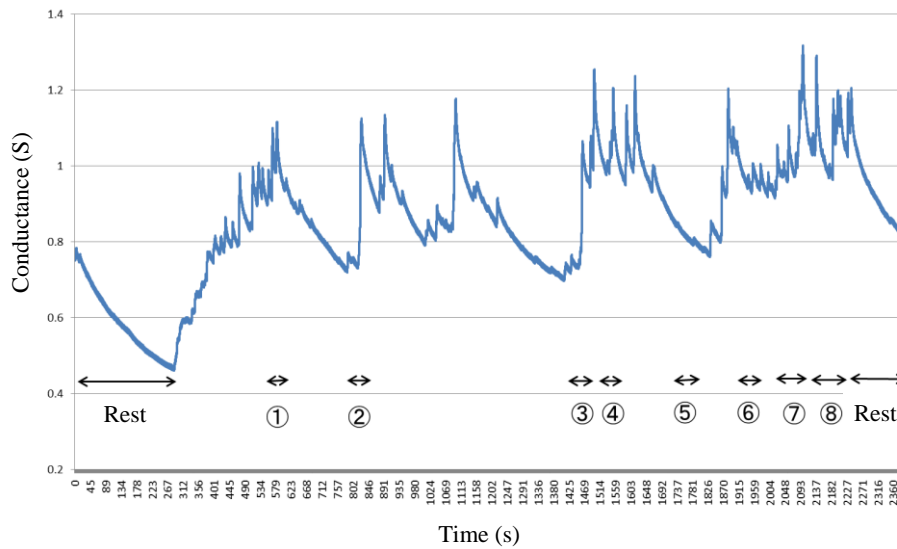
**Table 1.** Mean cycle of respiration (s) between subjects during prior to and during the horror scenes 7 and 8.

	Prior to Horror Scenes (4:07)	During Horror Scenes (3:45)
6 subjects who did not feel terror	4.68	4.11
4 subjects who felt terror	4.15	3.47
All of 10 subjects	4.47	3.85

### 3.2 Result of change in Galvanic Skin Response

As result of change in GSR, only two examples of change in GSR are suggested, because analysis of GSR is not finished. Fig. 5 shows an example of change in GSR of one subject who felt terror. This example shows the change in GSR during all of the experiment (40 min) including prior and post rests, and time periods of the eight scenes considered as affecting terror are also described in the figures.

Conductance of GSR was low level in the prior rest, and increased from just after beginning the movie stimulus. In almost all of the scenes considered as affecting terror feeling to the subject, the conductance increased. This subject subjectively explained that he did not felt terror in scenes 3, 5, 6, and 7. In most of these scenes, relatively low reactions in the conductance were observed, especially in the scene 5. Moreover, in some periods like around 1100 s that is not related to the scenes, the conductance raised



**Fig. 5.** An example of change in Galvanic Skin Response in one subject.

## **4 Discussion**

During the scenes considered as affecting the subjects' terror feeling, the intensity of respiration was increased in some samples of the subjects. Furthermore, the cycle of respiration was accelerated, and the cycle was statistically increased by comparing with prior to the scenes. The change in the cycle of respiration is considered as a result of change in autonomic nervous activity. We have to investigate the change in autonomic nervous activity by combining the analysis of GSR and heartbeat (which were not finished).

The cycle of respiration was accelerated in both of the subjects who felt terror and did not feel terror. If the subjects responded as felt no terror, the movie stimulus may affect the subject. Moreover, there is a possibility that the subjects told a lie that they did not feel any terror although they felt terror. In such the case, pride of the subject must be a reason of the lie: feeling terror might be a shame feeling. This is a severe problem that makes difficult connecting the terror feeling and physiological information. Presuming the terror feeling via physiological information is possible to apply to user's terror in some simulations of safety system [5]. By improving the experimental procedure, we have to connect them.

## **5 Conclusion**

In this study, we focused on the psycho-physiological effects of horror movie and investigated the relationship of terror feeling and physiological change. Intensity and cycle of respiration was mainly analyzed, and the intensity was augmented during the scenes considered as affecting the subjects' terror feeling. The cycle was accelerated in accordance with the augmentation of the intensity. The change in the cycle was significant in all of the subjects although subjects subjectively explained that they did not feel any terror.

As next steps, we have to investigate the relationship after analyzing GSR and electrocardiogram. Combining various physiological data will dedicate to precise presuming subjects' psychological state as the previous study did [2]. In the use of GSR as skin conductance index, a recent study suggested that asymmetry of activity between right and left hands [6], therefore, the asymmetry should be considered and be utilized for further investigations.

## **Acknowledgment**

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