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LETTER *Special Section on Human Communication I*

The Effects of the Timing of Commercial Breaks on the Loss of Attention

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SUMMARY Commercial breaks are often placed at the climax of stories in recent TV programs in Japan, which may cause some serious effects on audiences, especially children, since this practice disturbs the concentrations. The experiment measured the psycho-physiological state of four children before and after commercials. The results showed that the next peak of attention is delayed by distracting the attention.

key words: *concentration, breathing, psycho-physiological experiment, kansei information processing*

1. Introduction

Concentration is a key word in various fields, such as media, entertainment and training. Concentration is the key to success in business and sport, thus we often talk about how to develop our powers of concentration and what its mechanism is.

Now recently commercial breaks are often placed at the climax of stories in TV programs in Japan. By placing TV commercials just after a climactic scene, the producer may intend us to watch both the commercial and the story after the climax without fail. However, commercials placed in the middle of the climax will discourage the audience's attention and concentration [1]. Furthermore, we might feel uncomfortable watching the scene from just before the commercial being replayed.

We can see therefore that planning a program can seriously effect the audience, especially an audience of children. The authors are anxious that children now in their developing years might grow into adults with poor concentration, after they have watched such TV programs repeatedly. In this paper, we present the influence of the timing of commercial breaks on the loss of attention of children.

Various research on attention have been published in the field of psychology. The level of concentration has been evaluated mainly by brain waves (α waves, fmθ waves) [2], [3], and the rate of the occurrence of fmθ waves is related to the number of times a person blinks [2]. It is known that concentration is related to breath as expressed with such common expressions as "hold one's breath" or "take one's breath away" [3]. Also, there have been some evaluations of concentration in the media, such as TV games [2] and interactive art [4]. However, there has been no research so far about TV commercials regarding concentration.

Therefore a preliminary psycho-physiological experiment concerning breathing, heart beat and blinking was arranged. The experiment was based on the hypothesis that when the peak of concentration is disturbed, the next peak of the concentration will be delayed, in other words, the recovery of concentration will be delayed.

2. Method of Psycho-Physiological Experiment

There were four subjects in this experiment; a toddler (a 2-year-old female), an infant (a 3-year-old female), an elementary school child (an 11-year-old female) and a junior high school student (a 13-year-old female). They were shown a TV program for infants of about 30 minutes as the stimulation. The contents of the stimulation are shown in Table 1. There were two commercial breaks (CM1, CM2). Here CM1 was a 1-minute commercial placed after the first half of the story (Story A) came to a good stopping place and CM2 was a 1-minute commercial placed during the climax of the second half of the story (Story B). In addition after CM2, 18 seconds of the scene just preceding the commercial was replayed, and then the story was continued. The

Table 1 Contents of the TV program and scenes before and after the commercials (from Tottoko Hamtaro "Tottoko Panic ! Hinamatsuri").

Story	Synopsis	Scene No.	Start time	Contents
The first half Story A	At the Hinamatsuri party, a member of Hamuchans (T-kun) carelessly upsets dolls displayed on tiers.	ScA1	12:05	Dolls displayed on tiers falls slowly (with a BGM of "the Destiny").
		ScA2	12:14	Dolls lay scattered on the floor.
		CM1	12:20	CM1
The second half Story B	Hamuchans try to put dolls back on the tiered stand, but a dog disturbs them. T-kun runs about trying to attract the dog's attention.	ScB1	19:09	T-kun is approached by the dog, and cries "NO!" while running.
		CM2	19:27	CM 2
		Replay	20:24	(=ScB1)
		ScB2	20:42	The dog begins to jump to cornered T-kun.
		ScB3	20:53	The master appears and catches the dog. T-kun is saved.

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breathing, heart rate and blinking of the subjects during the program was measured.

3. Result of Experiment 1 (In General)

Here, we take the example of the subject 3-year-old female to show the result of this experiment. Figure 1 shows the rates of blinking and breathing, and the amplitude of and curve of breathing of the subject.

When the blink rate increases, the rate of breathing decreases and its amplitude tends to increase. From observation during the experiment, we found out that she usually lost her attention to the screen while yawning, and she often blinked her eyes. This could show that she had lost her attention at that time, in other words, it could be said that she was relaxed or bored.

Also, when she seldom blinked, we found both the rate of breathing and the amplitude of breathing were very small. It could be said that she had, "her breath taken away", that is, she was tense or her attention was concentrated. By comparing the rate of breathing, various amplitudes of breath and the progress of the stimulation, we found out that concentration could be classified into four categories as shown in Table 2.

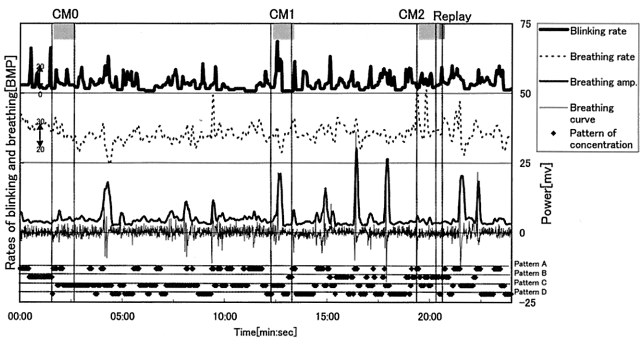


Fig. 1 The results of experiment to measure the psycho-physiological state before and after the commercials (subject: 3-year-old female).

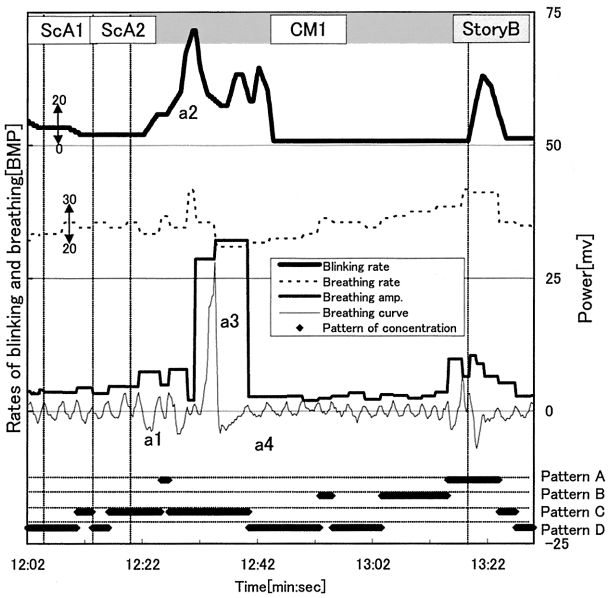
Table 2 Four categories of the pattern of concentration.

Pattern of concentration	Breathing rate	Breathing amp.	Contents of stimulation	State of subject
A	High	High	High-tempo and cheerful song. Chasing (noisey) scene.	Concentration with excitement
B	High	Low	Chase scene. Looking the other way (Shaking head).	Unstable
C	Low	High	Ordinary scene.	Relaxed/bored
D	Low	Low	Melancholy and passionate piano song. At the turn of the scene.	Concentration with tenseness

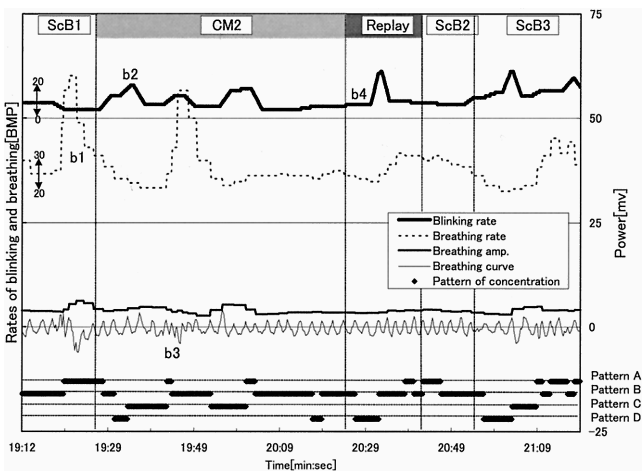
4. Result of Experiment 2 (In Detail)

In Fig. 2 we show an enlargement of Fig. 1 so that we can see the details of the experiment before and after the commercials were placed. The state of the subject during the experiment is also shown in Fig. 3.

Figure 2 (a) indicates before and after CM1 was placed. From a tense condition (Pattern D) at the climax of the TV program (ScA1), where her amplitude of breathing was increased, her condition gradually relaxed after the first part of the story (ScA2) ended. By placed CM1 here, her breathing was delayed at first (at point a1, what is called "holding her breath"), then, with deep breathing (point a3) after sudden blinking (point a2), her tension was released and she became relaxed at once (Fig. 3 (a)). Five seconds later (point a4),



(a) Played at a natural pause in the story.



(b) Played at the climax of the story.

Fig. 2 Detailed result of the experiment before and after the commercials were played (an enlargement of Fig. 1).

(a) 5 seconds after CM1starts (middle).

(b) 5 seconds after CM2 starts. (c) 5 seconds after the replay starts.

Fig. 3 Appearances of the subject after playing the commercials.

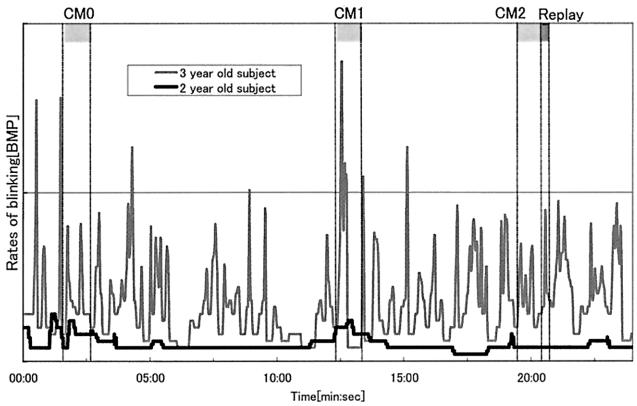
even though it was during the commercial break, her status changed to next one of tensed and concentrated (Pattern D). (Only, Pattern B seen in the second half of the commercial break was caused by the subject turned back, so that this was unrelated to this experiment.)

On the other hand, in Fig. 2 (b), which was before and after CM2 was placed, the subject was extremely excited (Pattern A) while she watched the chase scene of the program (ScB1). The increase of her breathing rate at point b1 was caused by her stamping, as she could not restrain her excitement. As a consequence of CM2 being placed in this situation, there was no sudden blinking, which was seen in Fig. 2 (a), but weak blinking (point b2) continued for nearly 10 seconds. During this period, she absently opened her eyes wide, and turned her eyes away from the TV screen (Fig. 3 (b)). Next, a breathing disorder with a short amplitude (point b3) was observed, after that this unstable condition continued until the commercial break ended (Pattern B). Then she began to pay attention to the TV when the story was resumed, however, after 5 seconds, the subject noticed it was a replay (Fig. 3 (c)). Both the rates of blinking and breathing went up and changed to Pattern B again. After that, she didn't pay strong attention to the climax scene (ScB2), then finally she concentrated on the final scene (ScB3). As you can be seen, Pattern C and D were the main patterns during CM1, however, Pattern B was often seen during CM2, so, they show very different aspects.

5. Discussion

5.1 Results of the 3 Year Old Subject

From these results, the possibility of our hypothesis has been proved that when the concentration is disturbed by a commercial break, it takes longer to reach the next peak. In other words, commercials at the climax of a story delay the



(a) A comparison of the blinking rates of between 2 and 3 year old subjects.

(b) Appearance of the subject.

Fig. 4 The results of the 2 year old subject.

recovery of concentration. Also, we verified that replaying a scene after a commercial break is one factor that disturbs our attention.

Next, relaxing is required before concentrating. We also found that the timing of relaxing was important. We obtained results which support existing knowledge, which says that tension and relaxation are important for concentration.

Furthermore, it is not true that there is no attention during commercial breaks, if the timing is good, it is clear that we pay more attention to them. This is because relaxation is enhanced at the start of a commercial break, when there is a scene to stimulate us to relax just before the commercial break starts. Thus, it is confirmed that it is more effective to place a commercial break after the climax of a story rather than halfway through the climax, as the audience will pay more attention to it.

5.2 The Other Results

Lastly, we will briefly mention the other results. First, the quality of the heart rate data obtained was so noisy that it could not be evaluated this time. It is considered that there was a problem in the way the heart rate sensor was worn, and some improvements are necessary to obtain the data correctly.

Second, in the results of the 2 year old subject, it could be seen that the blink rate increased slowly during the commercial breaks as shown in Fig. 4. However, there was no difference in response to the commercials between after the climax and at the climax, and there was also no response in

Table 3 The total time and the frequency of when the subjects took their eyes off the screen during the program.

Subject	Story A (579 sec)		Story B (460 sec)	
	Total time	Frequency	Total time	Frequency
2 years old	5 sec (1%)	2	5 sec (1%)	2
3 years old	22 sec (4%)	6	8 sec (2%).	4
11 years old	96 sec (17%)	35	38 sec (8%)	18
13 years old	72 sec (12%)	25	74 sec (16%)	31

particular to the replay scene. This can be explained by the difference in the stage of cognition development due to their age.

Third, the 11 and 13 year old subjects seemed to pay weak attention to the stimulation on the whole. We then counted the total time and the frequency of when the subjects took their eyes off the screen during the program as shown in Table 3. For the 3 year old subject, the frequencies during both the first and the second half of the story were low, and a loss of attention was not observed. The 2 year old subject took her eyes off the screen only 4 times (10 seconds in total) over 17 minutes and her attention was deeply concentrated on it. On the other hand, the 11 and 13 year old subjects took their eyes off the screen more than 50 times (two minutes in total). It is considered to be caused by various factors such as the stimulation, the experimental environment, and the difference between individuals.

Fourth, we confirmed the effects of the timing of commercials in this experiment, however, we could not confirm the effects of whether there is a commercial break or not.

These are future considerations.

6. Conclusion

In this paper, we conducted a psycho-physiological experiment with an index of concentration to evaluate the influence of the timing of commercial breaks on children's attention. As the result of the experiment, it was shown that concentration, blinking and breathing are mutually related. Furthermore disturbing the concentration has the possibility of delaying the next recovery of concentration. Therefore, by watching such TV programs over and over, we are afraid that the number of children who cannot maintain their attention may increase. Moreover, from the point of view of presenting commercials effectively, it is advisable that commercial breaks occur after the end of a story rather than during the climax.

In the future, we will seek to improve the experimental method of evaluating concentration. Also, we will continue to study methods which will have a good influence on the audience, for not only on commercials but also various kinds of media. We would like to demand cautions to the media companies which carry out program creation looking for only rising in an audience rating to top priority.

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