Blinking Responses of Young Infants after Disappearance of Visual Target

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BLINKING RESPONSES OF YOUNG INFANTS AFTER DISAPPEARANCE OF VISUAL TARGET

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The blinking responses preceding to their searching behavior was studied in 23 infants of 30 to 95 days old (12 girls and 11 boys). In the specific experimental paradigm which was designed to elicit the searching behavior of infants, the significant increase of the blinking responses during 5 seconds just after the disappearance of the visually followed object was confirmed. This increase of blinking responses was more frequently observed in the infants who searched for the disappeared object. These blinking responses are interpreted as one of the indices of surprise responses in infants.

Key words: blinking response, infant, surprise response.

Previously, we proposed an experimental paradigm successfully eliciting searching behavior of infants as young as 2 to 3 months old (Murai & Nihei, 1983). In this paradigm, a human face moved a few times across the infant's sight eliciting visual pursuit from the infant, and then it suddenly disappeared. This experimental condition is very effective in attracting and enchaining the attention of infants, and consequently is liable to elicit the searching behavior. Through our investigations so far on the searching behavior of young infants, we have noticed that the blinking responses occur in most of the infants just after the disappearance of the object followed.

The aims of this work were to confirm this phenomenon, and further to consider the meaning of this particular response.

Materials and Methods

Subjects: Forty-one healthy infants (21 females, 20 males) served as subjects with their mothers' consent. They were selected from the infants coming to the Tohoku Teishin Hospital in Sendai city for the health care visit after birth. They had

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a mean age of 37.2 days, ranging from 27 to 95 days.

Procedure: The infants were tested between 12 : 30 and 14 : 30 hours in a quiet room of the Hospital. Experimental paradigm, video tape recording, and method of analysis were identical to those in the previous research (Murai & Nihei, 1983).

The searching behavior of infants was elicited by the sudden disappearance of the visual target (experimenter's face) moving across their sight. That is, the infant was placed in a baby seat inclined at 15° angle. During each trial, an experimenter stood on his knees at the head side of the seat and then looked into the infant's face at a distance of about 25 cm. When the infant had fixed its eyes on his face, the experimenter slowly moved his face from side to side (nearly 4 right-left cycles per minute), making sure that the infant's eyes were following his move. After making about two and half round trips sideways, the experimenter quickly leaned backward and removed himself out of the infant's sight. After a few minutes intervals, this procedure was repeated until the infant could not maintain an alert state.

Two video cameras recorded the events. One camera took a picture of the infant's face and the other a picture of the upper half of the experimenter's body. The two pictures were combined by a video camera wiper into one split-screen view and real time from a video timer was also fed onto the video tape.

Behavior of the infants were analyzed from video tape recordings by two observers. *The pursuit behavior* was defined as the movements of infant's head and eyes synchronizing with those of the experimenter as a visual target. *The searching behavior* was defined as the rapidly repeated movements of infant's head to both sides with its eye movements looking for the disappeared visual target. The behaviors were determined by the complete agreement of two observers. In addition, the judgment was confirmed by microanalysis; video tapes were replayed every 6 frames (every 200 ms) and the X-coordinates of selected points on a stopped video tape image were detected and plotted by means of a video position analyzer (Nihon Koki, VPA-1100) and microcomputer, thereby enabling us to microanalyze the relation of lateral movements of the infant to those of the visual target. *The blinking response* was defined as the closure and opening of eyelids of both eyes, the time of closure not exceeding the length of successive 30 video frames or less (or one seconcd or less).

Results and Discussion

The present analyses were made on the data of the second trial because the infants' reaction was most dependable on this trial. Data analyses were performed on data for 23 infants (12 females, 11 males) whose pursuit behavior was successfully observed. Data for 18 remainders were discarded (3 because of fussy state and 15 because of drowsy state).

The numbers of blinking responses were counted for the 10-second durations before and after the disappearance of the visual target. Fig. 1 shows the mean

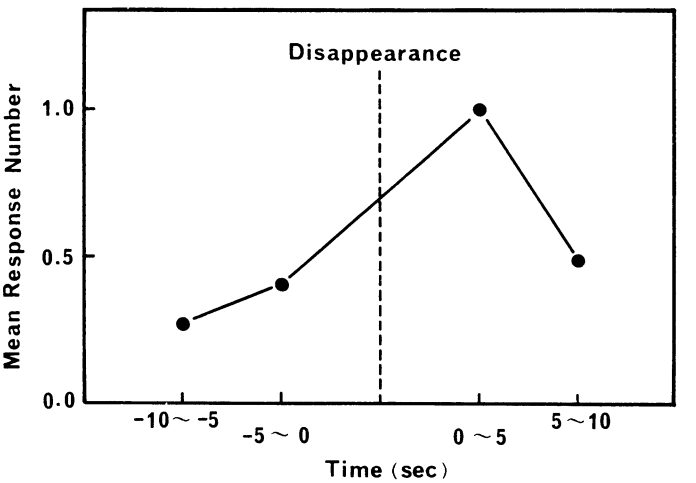

Fig. 1. The mean numbers of blinking responses observed for four 5-second durations before and after the disappearance of the visual target.

numbers of blinking responses observed for four 5-second durations before and after the disappearance of the target. As seen in this figure, the number of blinks clearly increases immediately after the disappearance of the target, with statistically significant difference between those during 5 seconds just before and after the disappearance of the target ($t(22)=2.52$, $p<0.02$).

After the disappearance of the visual target, rapidly repeated right-left movements of both head and eyes (about 10 to 15 cycles per minute) were observed in 14 out of 23 infants. As mentioned above, we defined these rapid movements as the searching behavior. In order to consider the meaning of the increased blinks after the

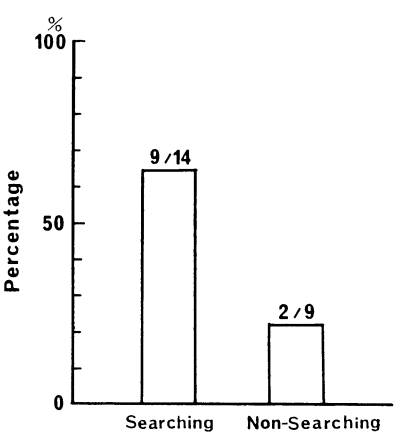

Fig. 2. The percentage of the infants in searching and nonsearching groups who showed the increase of blinking responses after the disappearance of visual target.

disappearance of the visual target, we compared the blinking responses between 14 infants who showed the searching behavior (searching group) and 9 ones who did not show the behavior (non-searching group).

Figure 2 demonstrates the percentage of the infants in two groups who showed the increase of blinks after the disappearance of the target. Blinking responses increased in 9 infants (64.3%) of the searching group, whereas only in 2 (22.2%) of the non-searching group. The statistical analysis indicated that there is a marginally significant difference between the two groups ($p=0.06$ by Fisher's exact probability test, two-tailed).

For the infants who showed searching behavior, we assumed, the disappearance of the visual target means not only the vanishing of the visual stimulus but the unexpectedness of the loss of visual object to which they closely directed their attention. Thus, we do not consider that the increased blinks observed in the searching group are the response to the change of luminosity in their visual fields or to other physical changes due to the disappearance of the visual stimulus.

In conclusion, the blinking responses observed just after the disappearance of the visual target are interpreted as an indicator of surprise responses elicited by the unexpected disappearance of the visual target. Bower (1971) utilized the changes of heart rate as an index of infant's surprise responses. Our present study suggests that the blinking response will be a more convenient index of surprise available to the studies of young infants.

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