The "Looking-in Response" Elicited by Interruption of Observers' View

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THE "LOOKING–IN RESPONSE" ELICITED BY INTERRUPTION OF OBSERVERS' VIEW

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When something crosses the TV screen and temporarity interrupts the view of a person who intently watches it, he often shows a head bobbing response to clear away the interceptor and to look at television. Such an adaptive information seeking behavior was tentatively named "looking-in response" and assumed to be elicited with the trigger of iconic memory fading.

The looking-in responses of 14 undergraduates were evoked by an *E*'s intentional crossings of the TV screen while they were playing TV game and its occurrence rate was obtained as a function of the interruption time.

It was found that the looking-in response was a highly patternized behavior evoked rather in an all-or-none fashion and that its identification was very easy. The response seemed to be elicited when the interruption time exceeded some critical value. Below this level, no response appeared and beyond the level, it occurred with few exceptions. The critical interruption time was different among individual *S*s.

From the results of 12 *S*s (the data of two *S*s were excluded), it was found that the looking-in response began to appear just above 130 msec of the interruption time and that its occurrence rate showed a linear increase and approached 100 % at the range from 300 msec to 350 msec. Over the range, the occurrence rate slightly decreased because the response was not elicited at very slow crossings. The interruption time at which occurrence rate of 50 % was obtained was about 250 msec.

These results revealed a good correspondence to the duration of iconic memory measured by ordinal experimental procedures.

Problem

When something passes through in front of a person who intently watches television or the like and temporarily interrupts his line of view, he often shows a response such as bobbing his head to right or left to look in the TV screen. The response elicited under such conditions is highly patternized so that every one can easily identify it. The response can be distinctively characterized as follows:

(1) A quick head tilting phase followed by a slow head returning. The center of this head tilt is not at the nose, but at the chin, distinguished from the head inclinations which we usually show in puzzlement.

(2) This response occurs as if he wants to let the interruptor go past as quickly as possible, so that it occurs always in the opposite direction to that of the interruptor's crossing.

This experiment was carried out in cooperation with Hiroko Sato (佐藤弘子), the undergraduate student of the Department of Psychology at Tohoku University.

The authors wish to thank Mr. S. Yoshida and Mr. M. Endow for their assistance and helpful advice.

(3) To direct observation, this response seems to be evoked in an all-or-none fashion.

In the present study, this response is tentatively named "looking-in response".

From the observations in our daily life, it was found that the looking-in response was not elicited when the interruptor crossed the TV screen too fast. The response seemed to be evoked when the duration of the interruption exceeded some value. However, when the crossing was too slow, the looking-in response did not appear and on such occasions other kinds of response, such as making a complaint, came to occur. This tendency was fairly common to every person.

To investigate this behavior systematically, the present study was designed to examine the occurrence rate of the looking-in response as a function of the interruption time.

The looking-in response may be considered as a kind of adaptive information seeking response, elicited rather reflexively to complement a temporal loss of information.

Although many explorative studies are necessary before elucidating the mechanism of this response, the authors, at present, have a hypothesis that the looking-in response is closely related to the process of iconic memory. For example, if all necessary informations are stored in iconic memory during the interruption, there may be no need for eliciting any special responses. The looking-in response might be triggered by fading of iconic memory.

So it was expected that the occurrence rate of the looking-in response would show a good correspondence to the duration of the iconic storage. The main purpose of the present study was to check this expectation.

Method

To investigate the looking-in response elicited naturally, the experimental conditions were arranged as follows:

(1) The situation was made close to our daily life to reduce as much of experimentative atmosphere as possible.

(2) A TV game was chosen as an attractive visual display on which the *S*s could be intent, and from which they could not look away even for a moment.

(3) The looking-in responses were elicited by an *E*'s intentional crossings of the TV screen while the *S*s were enjoying their games.

Apparatus: A TV set with a 19-in. wide screen, two TV cameras, a photocell and a beam projector were set in a room that had been used for a visiting professor's study. The arrangement of these equipments is schematically shown in Fig. 1.

Camera I, set on a tall bookshelf, took the picture of the *S*'s bust largely with a zoom lens. Camera II, placed just behind the subject's right shoulder, synchronously recorded the picture of the TV screen. Using a video wiper (SONY, CMW-100A), the picture taken by Camera II was inserted in a corner of the scene by Camera I, as is shown in Fig. 2, and a videocorder (SONY, AV-3500) recorded the whole scene.

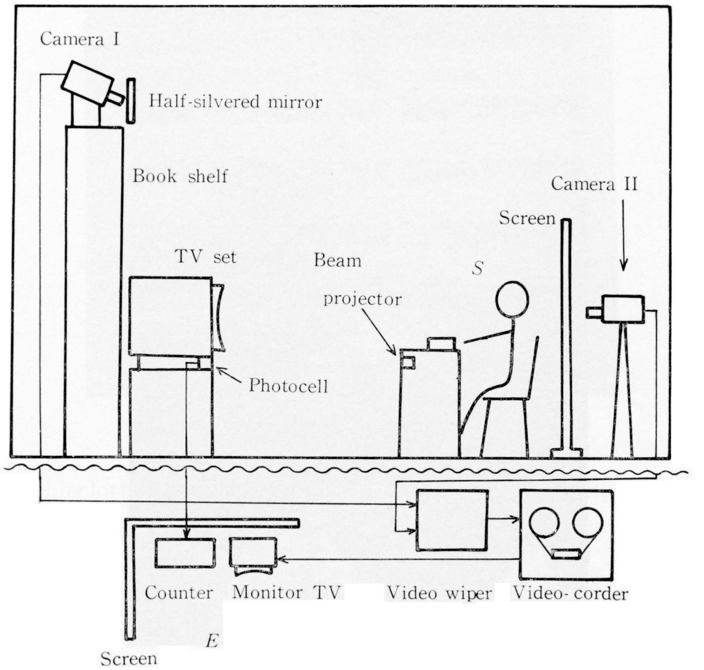


Fig. 1. Schematic representation of equipments.

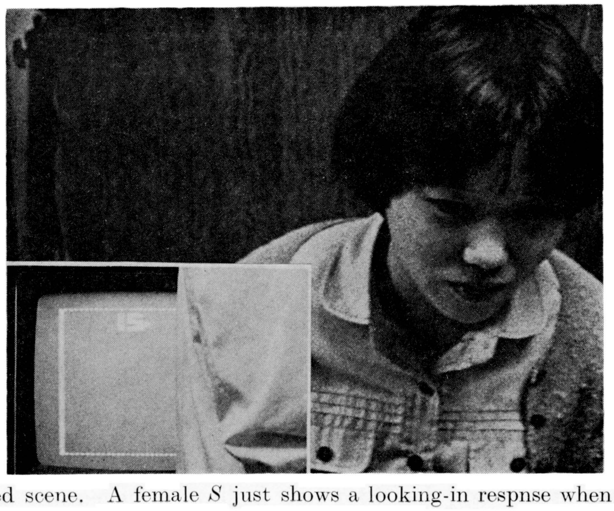


Fig. 2. A recorded scene. A female *S* just shows a looking-in respnse when an *E* crosses the TV screen.

A photocell was set just below the center of the TV screen and received the light from a beam projector attached to the inside surface of the table on which the *S* played TV game. When an *E* crossed the TV screen, he also cut this beam. The duration of the beam cutting was measured as the interruption time and displayed on a

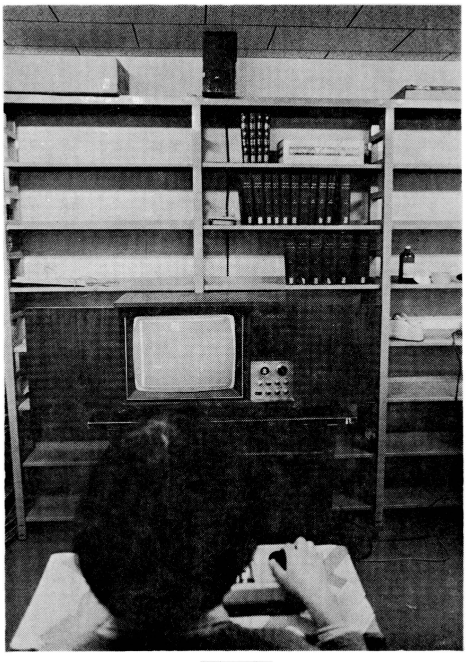


Fig. 3.

Fig. 4.

counter placed in a corner of the room, surrounded with screens. In this corner, another *E* inspected the counter and a monitor TV.

The interruption time measured in this way corresponds to the concealment duration of one picture element in the TV screen.

All these equipments were carefully camouflaged with a half-silvered mirror,

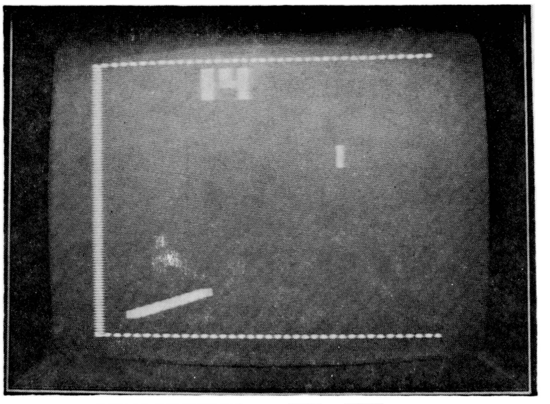


Fig. 5. Display of the TV game.

bookshelves, a tablecloth and screens. Among 15 *S*s, only one noticed the camouflage. The photographs of these settings with a *S* enjoying the TV game are shown in Fig. 3 and Fig. 4.

The adopted TV game was squash tennis for one player (Fugi Electoric, G–2200) and its display appears in Fig. 5. The game was to adjust the position of a racket (moved only vertically) with a controller at hand and to beat back a ball rebounding from surrounding walls (a locus of it appears in Fig. 5). If the player failed to return the ball, it disappeared on the right side of the screen and accumulated score of the failures was displayed in the upper part of the screen. After an interval, the ball appeared again from the left side and the play was resumed. The ball speed was constant (33.6 cm/sec). Female *S*s played with a racket of large size (3.6 cm), while male played with a small one (1.8 cm). The viewing distance was 1.3 m.

Subjects: 14 undergraduate students (7 male and 7 female) served as players. Although they were majoring in psychology, all were completely naive as to the purpose of the experiment.

Procedure: The *S* received the following instruction. "The purpose of this experiment is to examine the improvements of your skill in TV game. But before the experiment, a bit of warming-up is necessary. Please take a practice freely, for a few minutes."

As a matter of fact, this practice was assigned to the experiment. While the *S* was attracted by the TV game and intently watching television without noticing the TV cameras, a white-clad *E* walked and returned just before the TV screen and made 8 to 10 crossings within about ten minutes, pretending to make tea for the subject.

In advance, *E* had practiced crossing the TV screen at different speeds, in order to obtain various interruption times. He crossed, as it were, to sweep the screen over with the side of his straight lined body, without moving his hands at all. (He was slim, not stout.)

It was impossible for *E* to cross it below 100 msec of the interruption time, whatever fast he walked. When the interruption time exceeded 450 msec, the *S* came to notice the crossing as an intentional one. Consequently, the interruption time was distributed within this range.

Data Analysis: After experiment, video recordings were reproduced audio-visually and the two *E*s checked all observable behaviors the *S*s showed when their line of view was interrupted. The positions of the ball and the racket at each crossing were also checked, utilizing stop motions and slow-video.

After the data of all *S*s were checked in this way, only the pictures taken by Camera I were reproduced again without audio and the three *E*s judged the occurrence of the looking-in response without noticing the timing of the crossings. This way of checking was adopted to investigate how distinctively the looking-in responses were identified and to test the reliability of the previous analysis by utilizing the pictures taken by Camera II.

Results and Discussion

The salient responses observed at the crossings were binking, vocalization, and the looking-in response.

Fig. 6 presents the relationship between the occurrence rate of blinking and the interruption time. The occurrence rate at each range of the interruption time was obtained from the data of all *S*s, by calculating the percentage of the responses elicited

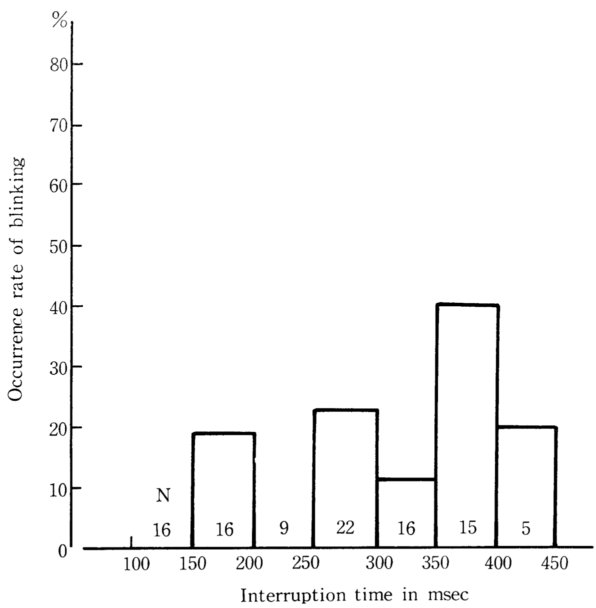


Fig. 6. Occurrence rate of blinking as a function of interruption time. The figures on the abscissa signify the number of crossings made within the range of interruption time.

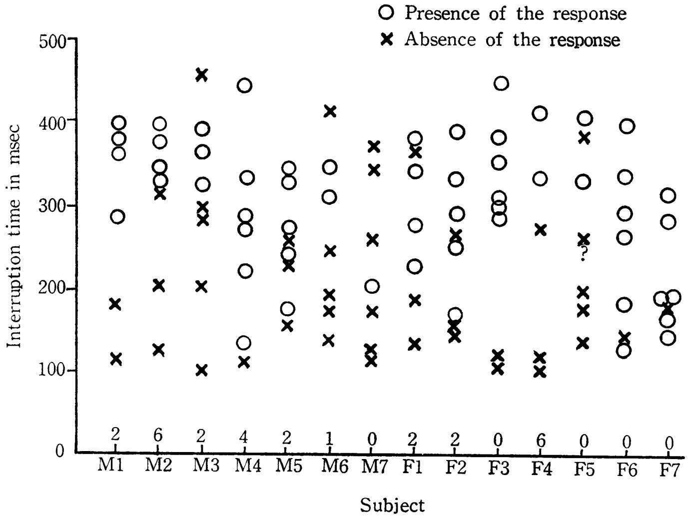


Fig. 7. Presence or absence of the looking-in response at each crossing. The figures on the abscissa denote the number of "false alarm" judgements for each *S*.

when the crossings were made. Fig. 6 indicates that the blinking tended to appear more frequently at the longer interruption time. However, as can be seen from its low occurrence rate, the blinking did not show sufficient contingency to the crossing.

Vocalizations, such as saying "Oh!" or making a complaint, were observed only 4 times in total, at the relatively long interruption time.

As was expected, the looking-in response was common to every *S* and evoked with good contingency to the crossing. Fig. 7 depicts the presence or absence of the looking-in response at each crossing in every *S*.

As described before, the occurrence of the looking-in response was judged by the *E*'s direct observations. With a little training, the detection of the looking-in response became easier than that of the blinking.

The judgements by the three observers without utilizing the pictures take by Camera II showed fairly good agreement with those by two observers with the pictures. Among 100 crossings in total, the judgements in the two ways of checking entirely agreed with each other in 81 crossings. The complete disagreement was found only as to one crossing and there were diversities of the observers' judgements as to remaining 18 crossings. In these cases, the recordings were reproduced again and the agreements were obtained after discussions by the three observers. The point marked with a question mark in Fig. 7 signifies the case in which the agreement could not be obtained.

These results indicated that the looking-in response could be identified fairly distictively and that it was elicited in an all-or-none fashion as well.

However, some *S*s showed only slight head tiltings and the judgements became equivocal. In just such cases, the observations without the pictures by Camera II were available for reducing the ambiguity of the judgements.

But, while checking in this way, the observers sometimes judged the looking-in response to be elicited even when no crossing was made. The error of this kind corresponds to so-called "false alarm". The number of these "false alarm" judgements, for each S was shown on the abscissa of Fig. 7. In total 27 " false alarm " judgements the number of the cases in which all three observers made the error altogether was only 9. These "false alarm" judgements were derived from mistaking the other head inclinations which the *S*s revealed while playing TV game. Most of these head inclinations were the expression of puzzlements when they failed in the game.

Most of the data of individual *S*s in Fig. 7 indicate that there was a certain critical interruption time in the occurrence of the looking-in response. At the crossings beyond the time, the response was elicited with few exceptions. However, the data of a few *S*s, like M (male) 7, do not accord with this tendency. And some *S*s, like F (female) 7, were so sensitivty that they showed the response at the crossings of the very short interruption time.

The critical interruption time seemed to be different among the individual *S*s. Throughout the data of all *S*s, the looking-in response began to appear just above 130 msec of the interruption time and not a single response was elicited below this level. It might be possible to interpret this finding in the context of the psychological moment hypothesis (Stroud, 1955). The loss of information within the range might not have any psychological meanings.

When the interruption time approaches 350 msec, the looking-in response appeared in every *S*, except M 7. By 8 to 10 crossings crossings within about 10 minutes, no habituation seemed to be observed.

However, a few crossings beyond 350 msec did not evoke the response. In these cases, another explanation must be considered. It is highly probable that the *S*s had noticed the ineffectiveness of the looking-in response at such slow crossings. If so, the *S*s had grasped the speed of the interceptor at each crossing before their line of view was actually interrupted. Such a feedforward-like aspect of this behavior shall be investigate in future.

It may be seen from the further inspection of Fig. 7 that the male *S*s were not less sensitive to the interruption than the female *S*s, except M 7 and F 7.

From the data of Fig. 7, the occurrence rate of the response was calculated at every range of 50 msec, and the obtained function is presented in Fig. 8. In calculation, the data of M 7 and F 7 were excluded. A response of F 5 marked with a question mark and a point beyond 450 msec in M 2's data were also excluded from calculation. The number of the crossings made within the range of the interruption time is depicted on the bascissa of Fig. 8.

As is clear from Fig. 8, the occurrence rate of the looking-in response shows a linear increase with the interception time. And the occurrence rate at the range from

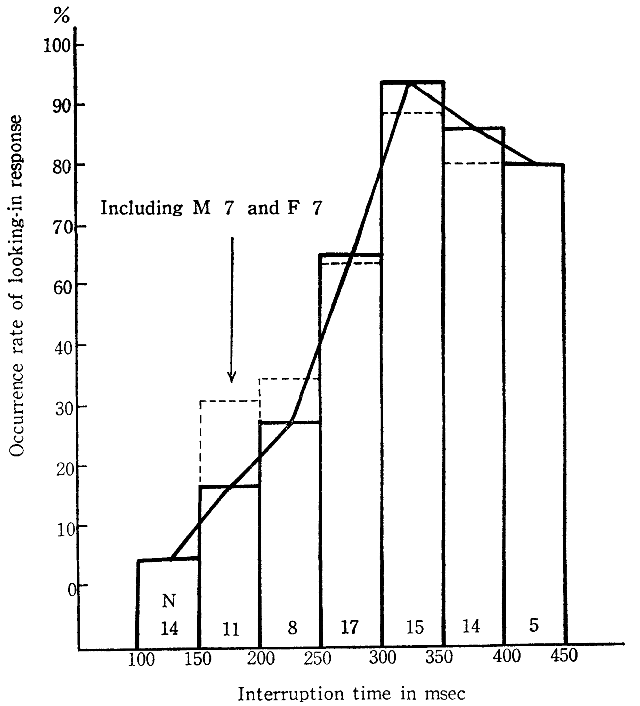


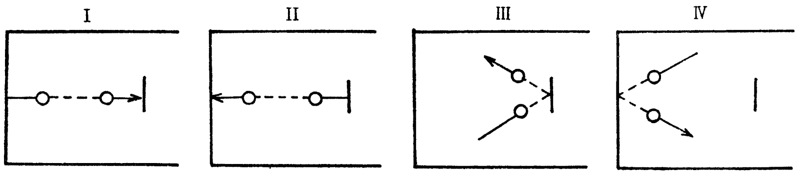
Fig. 8. Occurrence rate of looking-in response as a function of interruption time. (The data of M 7 and F 7 are excluded.)

300 msec to 350 msec approaches 100%. The decrease of the occurrence rate beyond the range indicates that the response was not elicited at some slow crossings. The reasoning for this point was already discussed.

The authors first assumed that the looking-in response is closely related to the process of iconic memory. The findings that the response began to appear just above 130 msec of the interruption time and showed a high occurrence rate (near 100%) at the range from 300 msec to 350 msec correspond exactly to the duration of iconic memory measured by ordinal experimental procedures. By Haber and Hershenson (1973), estimations of iconic memory duration in most studies center around 250 msec. In the present experiments the interception time at which the looking-in response shows the occurrence rate of 50 % was about 250 msec. Although further studies are necessary before concluding that the looking-in response is triggered by fading of iconic memory, such an assumption is tenable at least in the present study.

If the validity of this response as a correlate of iconic memory fading is fully checked in further studies, it would be possible to adopt this non-verbal response as a behavioral psychophysical procedure for measuring iconic memory and studying the icon of infants, old people and animals.

Finally, the relationship between the occurrence rate of the response and the



	I	II	III	IV
Occurrence rate	72.2%	58.5%	41.7%	57.1%
N	18	40	12	29

Fig. 9. Positions of the ball at crossings and occurrence rate of looking-in response. The number of the crossings categorized in each case is depicted below.

position of the ball at the crossing was investigated. The positions of the ball at each crossing were categorized in four and the occurrence rate was calculated at each case. These results are presented in Fig. 9. The occurrence rate of the case I is highest, but it is not possible to accept this tendency as significant one, because the interruption times between the cases were not homogeneous.

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