Reliability of looking time

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Twenty-eight college students viewed two sets of 30 color photographs each under instructions to look at each picture for as long as they wished. Equal thirds of the stimuli in each set were selected from high, middle, and low complexity levels. The sets were presented 7-10 weeks apart. The results indicated significant between- and within-session correlations that were not dependent on stimulus complexity. It was suggested that the findings were indicative of a consistency in either the rate at which Ss process information or the amount of information they process or both.

A recently published bibliography (Leckart & Faw, 1968) indicates that in the last 10 years over 100 studies have appeared in the literature which have used free looking time as the dependent variable. In these studies free looking time is defined as the amount of time S spends looking at a stimulus when he is free to look at it for as long as he wishes. And, despite the fact that these studies have been conceived of as investigations of orienting behavior, exploratory behavior, attention, and perceptual development they indicate that looking time is a function of stimulus as well as subject variables (e.g., Bakan & Leckart, 1966; Berlyne, 1958; Brown & Farha, 1966; Day, 1966; Leckart, 1966; McReynolds, 1963; Nunnally & Faw, 1968; and Zamansky, 1958).

The purpose of the present study was to determine the reliability of the looking time measure. Accordingly, it was decided to give Ss two similar looking time tests separated by a few weeks and note any consistency in looking times between and within sessions.

METHOD

Subjects

The Ss were 30 undergraduate volunteers of both sexes selected from an introductory psychology course. The data from two Ss was incomplete because of their unavailability for the second session.

Apparatus

The stimuli were 60 color slides of landscapes, single objects, and arrays of objects which were rated on a 7-point complexity scale and used in previous experiments (e.g., Leckart, 1966; Leckart, 1967). On the basis of the mean complexity ratings the stimuli were divided into two sets of 30 each. Within each set of 30 there were 10 stimuli selected from the high, middle, and low complexity range. The means for these stimuli were: Set 1—high = 2.60, middle = 4.12, and low = 6.09; and Set 2—high = 2.62, middle = 4.12, and low = 6.11. The stimuli in Set 1 were used for the first free looking session and the stimuli in Set 2 were used for the second free looking session.

The stimuli were projected on a white screen by a Kodak Carousel 700 projector placed 8 ft from the screen. Ss sat in a chair placed 5 ft from and facing the screen on which a 20 x 30 in. image was projected.

The stimuli were changed with a manual switch provided the Ss. Looking times were automatically recorded to the nearest .1 sec with an Esterline-Angus event recorder. Neither the recorder nor the supporting electronics could be seen or heard by S.

Procedure

Subjects were instructed to view the stimuli one at a time, looking at each for as long as they wished. Finger electrodes were attached to the first and second fingers of S's left hand and S was told that the purpose of the experiment was to monitor his galvanic skin responses to visual stimuli. In both sessions all Ss viewed the stimuli in the same random order. The instructions were tape recorded to minimize E effects. Immediately after the first viewing session the Ss were told that the experiment was over, thanked for their participation, and given a course credit slip. They were not informed of the second part of the experiment until approximately 7-10 weeks later when a second E solicited their participation in an "unplanned follow-up study." The procedure for the second session was the same.

RESULTS

Two scores were obtained for each S: mean looking time per picture for Set 1 and Set 2. In order to determine the relationship between these scores a Pearson product-moment correlation coefficient was calculated. A correlation of +.44 was obtained ($t = 2.50$, $df = 26$, $p < .05$). As it was possible that the correlation between sessions was dependent upon stimulus complexity three additional between-session correlation coefficients were calculated, one for each of the three levels of complexity. Between-session coefficients for the high, middle, and low complexity stimuli were: +.46, +.50, and +.35, respectively. The correlations for high and middle complexity stimuli are significant ($t = 2.64$, $df = 26$, $p < .05$, and $t = 2.94$, $df = 26$, $p < .01$) but the correlation for low complexity stimuli is not significant ($t = 1.90$, $df = 26$, $p > .05$).

In order to determine the consistency in looking times within sessions two scores were obtained for each S for each session—mean looking time per picture at the odd numbered stimuli and mean looking time per picture at the even numbered stimuli. In order to determine the relationship between these scores a Pearson product-moment correlation was calculated for each session. Correlations of +.99 were obtained for both sessions ($t = 36.07$, $df = 26$, $p < .01$).

Since it is possible that the within-session correlations may be dependent upon complexity three additional correlation coefficients were calculated for each session, one for each of the three levels of complexity. For each S for each session six scores were obtained: the mean looking times at the odd and even numbered stimuli in each of the three classes of high, middle, and low complexity. For the first session the correlation coefficients for the high, middle, and low complexity stimuli were +.91, +.95, and +.98, respectively. For the second session the correlation coefficients for the high, middle, and low complexity stimuli were +.83, +.98, and +.98, respectively.

Since stimulus complexity was controlled for between sessions it was decided to determine if there was any between-session decrement in looking time. The results of a t test comparing the mean looking time in the first session with the mean looking time in the second session indicated that there was a significant decrease in looking time ($t = 3.05$, $df = 27$, $p < .01$). The actual decrease in mean looking time per picture was from 6.95 sec to 4.80 sec.

DISCUSSION

The finding of a significant correlation between the two sessions indicates that there is stability in the looking time measure extending over a period of some 2½ months. This suggests that there is some subject variable influencing looking time that remains constant over time. One possible explanation is based on the conception of looking as information processing (Gibson, 1966). Accordingly, Ss that look for relatively long periods of time may be (a) processing more information, (b) processing the same amount of information at a slower rate, or (c) both, processing more information at slower rates. Consistent tendencies in either the rate or amount of information processed despite the intervening passage of 2 or more months would account for the consistencies in the length of looking.

It should be noted, however, that although the correlation was statistically significant it was in fact only +.44. A correlation this small accounts for only a little more than 19% of the variation in scores between the two sessions. But, it is unlikely that the low correlation is due to inadequate item sampling between sessions as the within-session correlations are almost +1.00 and the stimuli for the two sessions were drawn from the same stimulus pool and balanced on the crucial variable of stimulus complexity. A more likely explanation is that no attempt was made to control for a number of factors which might be relevant to looking time. For example, no attempt was made to control for time of testing, state of arousal, acquisition of knowledge about psychological experimentation, and changes in attitudes to and perception of the task.

A variable which might contribute to the low test-retest reliability is the fact that looking time changes occur between sessions. The reliability coefficient may be influenced by differential amounts of change in looking time between sessions. Thus, for example, if some Ss show greater reductions in looking times between sessions than others then a smaller reliability coefficient would be expected. Most tests with high reliability (e.g., intelligence) are not characterized by significant differences over time.

The finding of +.99 odd-even correlations indicates that the consistency in looking times within a session was extremely high. The finding of similarly high positive correlations within sessions for the three levels of complexity suggests that there is little difference in the consistency of the scores as a function of stimulus complexity. One suggestion that this finding indicates is that the number of stimuli sampled in future experiments can be reduced to at least five per level of

complexity without appreciably reducing the reliability of the measurement.

Although decrements in looking time as a function of the number of previous stimuli viewed have been found (Leckart, 1967) there do not appear to be any studies investigating decrements over periods as long as two months. The present finding of a decrease in looking time between the two sessions is therefore somewhat interesting. One possible interpretation of this finding is that the Ss have learned something in the first session, perhaps to process information at more rapid rates, or that all the information need not be processed as there is no use for it, and that this learning transfers to the second session producing shorter looking times. However, it should be noted that although the stimuli in the two sessions were similar and have elicited approximately equal looking times in previous studies any interpretation of these data should be cautiously made as the possibility of stimulus-order confounding does exist.

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