lengthening effect is present in all four conditions (see Fig. 1).

DISCUSSION

The presence of a significant lengthening trend in all conditions supports Treisman's model of the internal clock. An extension of the model might predict that in environments which lead to an increase in the activities of the specific arousal center time estimates should be shorter. This would be manifested in this study if darkness was the least arousing of the conditions in this study, with IPSD, IPSA, and SI leading to greater and greater activity in the specific arousal system. Except for the lack of any significant trend differences between SI and IPSA, the above proposal was supported here. While other authors (Falk & Bindra, 1954; Eson & Kaffka, 1952) have reported linear lengthening, none have sought to determine the extent of the phenomenon. Treisman found lengthening highly irregular, sometimes greater in the beginning, sometimes greater later on in a series of trials. In the present study, lengthening seems to advance more rapidly in the first 15 or 16 trials in D, IPSD, and IPSA conditions (see Fig. 1). Indeed, those values seem to level off at that point and remain fairly stable. In SI conditions, greater lengthening effects seem to occur between the 15th and 29th trials. It should be noted that overall means in SI are less than in any other condition.

The leveling-off phenomenon could be attributed to some adaptation on the part of the S to the "new" experimental environment. The Ss were taken immediately into the experimental environment upon showing up for the experiment. It took about 8 or 9 min to complete 15 trials, and it might be reasoned that it took them that long to settle down. Falk & Bindra (1954), Rosenzweig & Koht (1933), Hawkes, Joy, & Evans (1961), and Thor (1962) have all indicated that time estimates are shorter under conditions leading to greater arousal.

The present study has shown that time estimates are affected differentially by differing temporal patterns of visual light stimulation, and that lengthening in time estimates fits a model of an arousal system influencing time productions.

Previous studies indicated that time estimates lengthen over a series of trials. Treisman (1963) postulated a model of an internal clock in which lengthening was related to decreased activity in a specific arousal system in the CNS. The present study identified differential lengthening trends in varying temporal patterns of light stimulation, and accounted for those differences using Treisman's model.

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NOTE

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two components of the modeling stimulus, one group of 5-year-olds observed a model manipulate stimulus objects and then was given an opportunity to play with those objects; a second group played with the same objects after observing the model manipulate different objects. A significant modeling effect and a significant enhancement effect were obtained. Although the magnitude of the enhancement effect was small, the results indicate that a precise assessment of the modeling effect requires an enhancement control condition.

The term, imitation, may be applied when an O emits responses previously performed by a model and which occur as a function of observing those responses. Observation of the model's performance includes both the observation of specific responses and observation of a person behaving in an environmental setting. Observation of a behaving person could increase the response rate of S and the number of ways in which S manipulates the available stimulus objects. Such performance would increase the likelihood of S performing the imitative responses. If an increase in imitative responses occurred, it could be called an enhancement effect. Bandura, Ross, & Ross (1963) have indicated the need to determine the enhancement effect; without a control for enhancement it is not possible to attribute S's matching responses to observation of the modeled responses. Studies which have attempted to control for the enhancement effect have used a control procedure in which S could exhibit both the responses exhibited by the behaving person and those responses defined as imitative responses (Bandura, Ross, & Ross, 1961, 1963; Walters & Willows, 1968). Under such a condition, the enhancement effect could be concealed to the extent that the Ss in the enhancement condition performed the responses exhibited by the behaving person.

The aim of this study was to determine whether a modeling effect, i.e., imitation, could be obtained after partialling out any possible enhancement effect. In a model condition, Ss had the opportunity to play with the same set of stimulus materials they observed the model manipulate. Ss in the enhancement condition played with the same set of stimulus materials, but they previously observed the model manipulate a different set of stimulus materials. In another condition, the no-model condition, Ss were not exposed to a model but to a cartoon film. The modeling effect can be assessed by comparing the difference in the number of matching responses in the model and enhancement conditions. The enhancement effect can be assessed by comparing the difference in the number of

Imitation: Modeling and enhancement effects¹

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The observation of a model performing

responses may facilitate the reproduction of those responses by Ss as a function of observing those specific responses (a modeling effect) or as a function of simply observing a performing model (an enhancement effect). To investigate these

Table 1
Mean Frequency and Mean Number of Different Kinds of Imitative Responses

Condition	n	Mean Imitation		Number of Ss Exhibiting One of More Responses
		Frequency	Different Kinds	
Model	20	22.1	2.8	20
Enhancement	20	3.8	0.5	7
No Model	20	0.2	0.0	1

matching responses in the enhancement and no-model conditions.

SUBJECTS AND MODEL

Sixty preschool children, mean age of 53 months, were assigned to the experimental groups so that 4 or 5 of the 10 Ss in each group were girls. The model was a 10-year-old male.

PROCEDURE

In the Model A film the model sat behind a 22 x 48 in. table, maintained a serious facial expression, and exhibited four distinct behaviors with his right hand: (a) a pickup stick was pushed through a sheet of paper; (b) a disk was placed onto a dowel mounted in a board; (c) a large paper clip was placed into an alley maze; and (d) a block was dropped into a hole on the top of a box. There was a pile of 25 stimuli for each behavior, and each behavior was performed six times.

The Model B film was identical to the Model A film except that the following behaviors were performed: (a) a bottle cap was placed into a hole in an inclined board; (b) a rubber band was stretched over a strip of wood; (c) a jack, from a ball and jacks game, was hung on a staple; and (d) a paper cup was hung on a dowel.

In the no-model condition Ss viewed a cartoon.

In the experimental room S viewed one of the video-tape presentations with a male E present. Each tape was 6.5 min in duration and was accompanied with symphonic music. At the end of the video tape, screens were removed which had concealed a table and the appropriate set of play materials. Half of the Ss in each of the three film conditions were allowed to play with the set of materials presented in the Model A film and the remainder with the toys presented in the Model B film. Ss who played with the set

of materials they observed the model manipulate comprised the model condition, and Ss who played with a set of materials different from the materials they had observed constituted the enhancement condition. S was told to play with the materials in any way he liked while E left the room. The E returned 6 min later and accompanied S back to his preschool group.

While S was alone in the room, his behavior was rated in terms of predetermined categories for 72 consecutive 5-sec intervals by two trained Os. Each imitative response was defined in terms of the stimulus object occupying a specific physical position. For example, a response was recorded if a disk was placed on a dowel no matter how it was placed. Interjudge reliability for the frequency measure was high; the product-moment coefficient was 1.0, and Judge 2 reported a matching response on 95% of the 485 observation intervals on which Judge 1 reported a matching response.

Another measure, number of different responses, was obtained by counting how many of the four responses (i.e., the four imitative responses designated for the stimulus materials available to S) were exhibited by S.

RESULTS AND DISCUSSION

Inspection of the frequency of imitation scores revealed comparable performance under the two sets of stimulus materials and a skewed distribution for the total sample (median and mode were zero). These data characteristics justified a nonparametric analysis and collapsing the factor of type of stimulus material. The mean frequency of imitation and mean number of different kinds of imitative responses are presented in Table 1 according to experimental groups. An overall analysis (extension of the median χ^2 test) was performed for each dependent variable (frequency and different kinds). Each test was significant at less than the .05 level. The significance of the comparisons within each of these analyses was assessed by use of the median χ^2 test. All of the comparisons were significant at less than the .05 level. The enhancement condition resulted in more imitation than the no-model condition, and the imitation condition produced more imitation than either the enhancement or no-model condition; thus, both an imitation and enhancement effect were obtained.

The magnitude of the enhancement effect was not large. It can be suggested, therefore, that past studies which have reported a sizeable imitation effect cannot be accounted for in terms of an enhancement effect. It is possible, however, that more pronounced enhancement effects occur in studies dealing with socially disapproved or inhibited responses. In such cases, observing a disinhibited model could increase the enhancement effect. Such an effect would be quite similar to what has been called a disinhibitory effect of a model (Bandura, 1965). In any case, it seems worthwhile to employ a condition to control for enhancement effects in the study of imitation.

The procedure of using simple game-like tasks shows promise for determining the influence of the stimulus components of the human model on the matching behavior of children. The investigation of imitation, like other psychological processes, may be burdened by the interindividual variability introduced by the use of stimuli for which Ss have dissimilar learning histories, e.g., stimuli that elicit aggressive responses in some Ss. The tasks used in this study involved stimulus objects which probably have not been associated with different learning histories in the Ss and were objects which allowed the exhibition of responses which were novel for young children. These two factors apparently contributed to the large modeling effect obtained in this study.

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NOTE

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