some of the visual information that mediates apparent size should be reduced. Under these conditions assumptive effects might be expected to increase. The Objects by Distance interaction failed to reach the .05 level ($F = 3.0, df = 2/76$; required $F = 3.12$), but the data suggest that underestimation of the chair relative to the control object did tend to increase with increasing distance. The abstract-chair mean differences were 1.32, 1.92, and 2.42 in. for the 10-, 20-, and 40-yd distances, respectively.

Small Objects

The analysis for the small stimuli revealed a significant main effect of objects ($F = 4.8$, $df = 1/38$, $p < .05$); however, contrary to transactional predictions, the small chair was *underestimated* relative to the control object. Neither the Illumination by Objects nor the Objects by Distance interactions were significant. The interaction of Illumination by Objects by Distance was significant ($F = 26.7$, $df = 2/76$, $p < .01$), and individual tests suggested that it was probably due to a significant increase in judged chair size at the 40-yd night condition. The relatively large estimate of the chair in this most degraded condition appears to be the only evidence for the effect of assumptions in the small-object data.

The disparate findings of the large and small objects suggested to us that the two off-size chairs may have differed in some unexpected but important way. Fillenbaum et al (1965) proposed that if a familiar object is grossly off-size, an O might recognize a nonrepresentative stimulus and avoid using familiar size assumptions. This hypothesis was offered as a possible explanation for their failure to replicate the results of Slack's investigation. Both the reduced and enlarged chairs of the present experiment were 25% off-size. Because rather strong evidence for an effect of familiar size was obtained with one chair and not with the other, a supplementary study was conducted to determine whether the two objects appeared equally distorted in size.

Twelve Ss judged either the large or small chair from a distance of 20 ft on a large, flat lawn under unrestricted daylight conditions. First, S reported whether the chair appeared normal size, smaller than normal, or larger than normal. If an off-size judgment was obtained, S estimated the percentage of enlargement or reduction from normal size. All 12 Ss judged the reduced chair to be undersize, and 11 of 12 Ss judged the enlarged chair to be oversize. The mean off-size estimates were 39.5% (SD = 16.5) and 21.1% (SD = 11.1) for the reduced and enlarged chairs, respectively ($t = 3.12$, $df = 22$, $p < .01$, two-tail). Although we have been unable to determine why the apparent distortion of the small chair was almost twice that of the large chair, the fact that it was recognized as grossly off-size may have inhibited the influence of familiar size assumptions.

Familiar size assumptions were found to influence the apparent size of the large chair despite the availability of visual information about its actual size. This finding is not in accord with Gibson's psychophysical theory but speaks for the transactional analysis of perception. The results of the present investigation suggest, however, that the apparent size of a familiar object is determined by both visual and assumptive information, and that their relative effects depend upon the viewing conditions and upon the representativeness of the object.

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On Rock's one-trial learning controversy[1]

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One group of Ss (DOC) learned a PA list by a method requiring one-trial learning. Unlearned items were replaced by new pairs on every trial. Another group (C1) learned the PA list by the repetition method, retaining unlearned items. A third group (C2) learned a list by the same repetition method, but the list learned by a given S in this group was composed of items finally learned by an S in the one-trial learning group. In all groups, learned pairs were removed from the list after having been correctly associated once. An analysis of the number of errors to one correct trial found that C1 differed from neither C2 nor DOC, but C2 and DOC differed significantly. Analysis of the number of associations correctly recalled 1 min after the list had been learned, however, found significant differences between DOC and both repetition groups. This was interpreted as support of an incremental hypothesis.

In a series of studies of paired-associate (PA) learning, Rock (1957; Rock & Heimer, 1959; Rock & Steinfield, 1963) reported data which were interpreted as supporting a one-trial learning hypothesis as opposed to an incremental learning hypothesis. In Rock's paradigm, the experimental group learned a list of PA items. After each trial, unlearned pairs were replaced by new and unfamiliar pairs. No significant difference was found between the number of trials required for the experimental group and the number required by Ss who saw the same pairs on every trial (repetition method). Rock proposed that an incremental hypothesis would predict differences between these two groups in favor of the repetition group, while an all-or-none, or a one-trial hypothesis, would predict no differences. These results were subsequently supported by Clark, Lansford, & Dallenbach (1960).

Underwood, Rehula, & Keppel (1962) and Postman (1962) replicated Rock's paradigm, but added a second control group to determine whether or not the insertion of new pairs (and the dropping of unlearned or missed pairs) for Rock's one-trial group facilitated the performance of this group. They suggested that the one-trial group could have been learning a set of pairs that were easier than those pairs learned by the control group. This could occur since difficult pairs might be missed, deleted from the list and subsequently replaced by pairs more representative of the general pool which, therefore, would be easier than the dropped pairs. Such item selection would effectively result in easier lists. The control group

introduced by Underwood et al (1962) and Postman (1962) learned, by the repetition method, lists composed of items finally learned by Ss in the one-trial group. Both studies reported that this control group learned the PA list in significantly fewer trials than did the one-trial group. These results were interpreted as supporting the hypothesis that the one-trial group had learned easier items.

The data reported by Underwood et al (1962) and Postman (1962) do not, however, disprove Rock's results. They only indicate that there is at least one plausible explanation for the failure of the incremental hypothesis to have been supported. The purpose of this study was to use another dependent variable, a measure of retention, in Rock's task to test the incremental learning hypothesis. It was hypothesized that, after an intervening task, Ss learning the PA list under the repetition condition would recall a greater number of pairs learned to a criterion of one correct association than would Ss learning under the one-trial condition.

SUBJECTS

The Ss were 51 student volunteers, 31 males and 20 females, from North Texas State University. There were 17 Ss in each of the three groups.

APPARATUS

The stimuli consisted of a pool of 84 pairs of CVCs of 47% to 54% Glaze (Hilgard, 1951) associational value. All pairs were randomly constructed with the restriction that no letter appeared more than once in either of the two syllables. The syllable pairs were typed on white 3 x 5 in. cards and were presented to the Ss through the use of an opaque projector. On the opposite side of the card, the stimulus term was typed. All groups were required to learn a list of 10 pairs.

PROCEDURE

All groups were given one practice trial on a four-pair list. Seventeen different lists of 10 pairs each were drawn from the pool of 84 CVC pairs. Every pair was used in at least two different lists. The method of presentation was that of alternate study and test trials. The Ss were required to say aloud both the stimulus and response terms. As soon as one pair had been pronounced, a new pair was presented. At the end of study trials the cards were shuffled and a test trial was given during which each stimulus term was presented and the S allowed 5 sec to respond. All items which were *correctly* associated during a test trial were removed from the list and set aside. Thus, individual pairs were learned by all groups to a criterion of one correct overt association and then immediately removed from the list. The interval between study and test trials was 15 sec. The interval required to prepare stimuli between test and study trials was 30 sec. Both during intertrial intervals and after the 10 pairs had been correctly associated, all Ss were given a filler task, irrelevant to the primary learning task, which consisted of marking in all the answer slots on a machine-scored answer sheet.

Each of the Ss in the standard repetition control group (C1) learned one of the Lsts of 10 pairs of CVCs. The same unlearned pairs were presented until all 10 pairs had been learned. Each S in the one-trial learning group, the drop-out condition (DOC), was given, on the first trial, one of the lists used by an S in C1. In addition to removing correctly associated pairs, all unlearned pairs were replaced by new pairs from the pool. If this pool were exhausted before an S reached a criterion of 10 learned pairs, replacement pairs were drawn from those pairs first missed by the S. In the second control group (C2), the Ss learned a 10-pair list in exactly the same manner as C1. The list of items, however, was composed of 10 pairs on which an S in DOC had reached the criterion of 10 correctly associated pairs. For all groups, 1 min after criterion had been reached, a recall test was given over all items that the S had learned. The stimulus term of a pair was presented for 5 sec. A record was kept of all correctly recalled associations.

RESULTS

A simple analysis of variance was computed to determine if there were significant differences between the three groups on the number of errors to a criterion of 10 correctly associated pairs. An F of 3.87 (df = 2/48) was found to be significant at $p < .05$. The mean number of errors for C1, C2, and DOC was 36.00, 26.41, and 41.94, respectively. The results of a Newman-Keuls procedure over these data indicated that C2 differed significantly from DOC ($p < .001$) but that C1 differed neither from C2 nor DOC.

An analysis of variance was also computed on the recall test scores. An F of 3.27 (df = 2/48), significant at $p < .05$, was obtained. The means of C1, C2, and DOC on this dependent measure were 5.71, 5.35, and 3.55, respectively. To determine simple effects, a Newman-Keuls was computed for these data also. Groups C1 and C2 were found to differ significantly from DOC at $p < .001$ and $p < .05$, respectively.

DISCUSSION

The results of the analysis over number of errors to a criterion of 10 correct associations are in agreement with Rock's (1957; Rock & Heimer, 1959; Rock & Steinfield, 1963) and Clark, Lansford, & Dallenbach's (1960) findings. No differences were found between the one-trial learning group (DOC) and the standard repetition control group (C1). Comparison of the item-selection control group (C2) with the DOC group, however, supports the findings of Underwood, Rehula, & Keppel (1963) and of Postman (1963) that selection of easy items by DOC did occur.

The analysis of the recall test scores showed that both repetition groups (C1 and C2) retained a significantly greater number of pairs learned to a criterion of one correct association than did the DOC group. This is interpreted as support for an incremental learning theory as opposed to a one-trial learning theory such as that proposed by Rock (1957; Rock & Heimer, 1959).

An opponent of the incremental position might argue that the presentation of new pairs creates greater retroactive inhibition for the retention of previously learned pairs for DOC Ss than does presentation of previously seen but unlearned pairs for the repetition groups. It is equally feasible to argue, however, that it is probable that for the repetition groups there is intralist inhibition as well as retroactive inhibition. These, however, are arguments that would more likely be offered by a proponent of the incremental position since within the context of a one-trial theory there should be no difference between the associative strength of a new pair and an unlearned pair. It would follow, then, from a one-trial position that intralist or retroactive inhibition would be equivalent for both groups.

It would appear that the utilization of results based on the number of errors to criterion for Rock's two groups (1957) to support a one-trial theory is not warranted since this support is based upon a failure to reject the null hypothesis. On the basis of the data reported in this study, where a measure of retention is used, support of an incremental learning theory is evidenced.

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