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EFFECTS OF VISUAL IMAGERY ABILITY ON HYPERMNESIA FOR PICTURES AND WORDS

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ABSTRACT

Subjects who scored high or low on a measure of visual imagery ability (VVIQ of Marks, 1973) completed three forced recalls of intentionally learned pictures and, on a separate occasion, of incidentally learned words differing in imageability. Recall of pictures increased over trials (i.e., was hypermnesic) comparably for high and low imagery subjects. Similarly, neither recall level nor hypermnesia for words was affected by imagery ability, although for all subjects, probability of recall was a positive function of the item's imageability rating. These findings cast doubt on any critical role for imagery processes in standard tests for hypermnesia.

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The demonstration of incremental multitrial recall (hypermnesia) for pictures, but not for words, suggests a potential role for mental imagery processes in hypermnesia (Erdelyi & Becker, 1974; Yarmey, 1976). Indeed, studying word lists using imagery coding can successfully transform these normally inert multiple recall functions into hypermnesic ones (Erdelyi et al., 1976). On the other hand, some researchers (Belmore, 1981; Erdelyi et al., 1977) have noted that pictorial stimuli may also spontaneously foster deeper processing than words during acquisition; processing depth for the latter being generally more dependent upon idiosyncratic features, such as meaningfulness and familiarity. Although both processes may contribute to the phenomenon, and perhaps are empirically indistinguishable, the present study focused on the putative role of imagery, taking as its hypothesis the reasonable assumption that the magnitude of hypermnesia for words or pictures should vary as a function of individual differences in imagery ability.

METHOD

Subjects

Twenty-four female undergraduates between 18 and 34 years of age were selected on the basis of scores on the Vividness of Visual Imagery Questionnaire (VVIQ of Marks, 1973). They constituted two groups of twelve subjects each, designated as High Imagery Ability (*HIA* -- *M* = 25.8) and Low Imagery Ability (*LIA* -- *M* = 45.3; $t(22) = 6.98$, $p < .001$).

Procedure

All subjects received the picture phase first. The stimuli were 40 line drawings of common objects from the set used by Erdelyi and Becker (1974). The pictures were presented via slide projector for 4 s each in

an intentional-learning paradigm where subjects were free to adopt any mnemonic strategy they wished. Three minutes after the last slide was presented, subjects were given a response sheet with 40 blank spaces and were instructed to write down the names of as many of the pictures as they could recall. They were further told that when they felt that they could not remember any more pictures they should draw a line after the last item recalled and continue trying, guessing if necessary, until all 40 spaces were filled. Five minutes were allowed for this "forced-recall" test (cf. Erdelyi & Becker, 1974), after which the response sheets were collected and the subjects were instructed to quietly think about the pictures for 2 min. This was followed by two additional forced-recall tests separated by another 2-min think interval.

Twenty-three days later the word-learning phase of the experiment occurred. Subjects were presented with a mixed list of 40 words selected for high and low imageability (20 each) from the norms of Paivio, Yuille, and Madigan (1968). High and low words differed reliably on imageability ($\underline{M}$ = 6.42 and 2.87 for high and low, respectively; $\underline{t}(38) = 47.53$) and concreteness ($\underline{M}$ = 6.67 and 2.49 for high and low, respectively; $\underline{t}(38) = 20.32$), but not in terms of meaningfulness ($\underline{M}$ = 5.64 and 5.55; $\underline{t}(38) = .77$) or frequency (all A or AA). All words were presented twice, aurally, followed by an 8-s interstimulus interval, during which subjects rated on a 7-point scale the ease with which each word evoked an image, following the identical instructions used in the normative study of Paivio et al. (1968). Thus, the imagery orienting task was designed to assess the concordance between sample ratings and the norms and to provide an incidental learning opportunity. Three forced-recall tests were then administered in the manner described for the picture stimuli.

RESULTS

Figure 1 depicts the mean number of correctly recalled pictures across the three recall trials as a function of imagery ability. Whereas both groups of subjects recalled an increasingly greater number of items over successive trials (i.e., hypermnesia), $F(2,38) = 7.99$, $p < .01$, they differed neither in the amount recalled nor in the magnitude of hypermnesia (both Fs < 1).

Insert Figure 1 about here

Figure 2 shows mean correct recall of high- and low-imageable words on each of the three tests for HIA and LIA groups. It is again evident that subjects' imagery ability did not influence recall level or hypermnesia. Furthermore, although recall increased reliably across tests, $F(2,44) = 15.6$, $p < .001$, the magnitude of this hypermnesia was comparable for high- and low-imageable words, $F(2,44) = 1.9$, $p > .10$. Nevertheless, word imageability was a significant determinant of recall level, $F(1,22) = 89.8$, $p < .001$, with high imageability words showing a greater probability of recall than low imageability words.

Insert Figure 2 about here

Figure 3 portrays the normative imageability values of new words recovered on each trial. Subjects' imagery ability had a significant influence on item retrieval, $F(1,22) = 4.9$, $p < .05$, such that HIA subjects were more likely to recall low imageability words than were LIA subjects. In addition, both groups exhibited an increase followed by a substantial decrease in retrieval of high imageability words over trials,

$F(2,44) = 4.0$, $p < .05$. Analysis of the subjects' own imageability ratings for the same new items recalled on each trial, however, failed to differentiate HIA and LIA subjects, nor did these ratings vary appreciably over trials.

Insert Figure 3 about here

For all subjects, imageability ratings for words recalled on Trial 3 were significantly higher than for words not recalled on that trial, $t(23) = 5.1$, $p < .001$, although these differences were somewhat less pronounced for Group HIA ($M = .69$) than for Group LIA ($M = 1.34$), $t(22) = 3.0$, $p < .10$. These findings suggest that the superior ability of the HIA group facilitated imagery coding of low imageability words, thereby increasing the likelihood that they would be recalled.

DISCUSSION

The present study found little support for the hypothesis that imagery is critical to the phenomenon of hypermnesia. Neither the level of recall for pictorial stimuli nor the increment in recall over trials varied with imagery ability. Furthermore, using typically inert verbal stimuli differing in imageability, and instructions that encouraged imaginal coding, high and low imagery subjects achieved comparable hypermnesia functions. Rather than affecting hypermnesia, word imageability influenced only the level of recall, with a significantly greater proportion of high than low imageable words being recalled on each trial. Imagery ability accounted for selective word imageability differences in retrieval, but hypermnesia for high and low imagery groups was associated with a gradual tendency to recall more low-imageable words over trials. Indeed, the pool of nonrecalled items on the final recall

trial was distinguished by its significantly poorer imageability as rated by the subjects themselves.

These data also identify a methodological problem in determining the contribution of imagery to memory and hypermnesia by manipulating the imagery value of stimuli. The average correlation ($\underline{r}$ = .75) between the normative imageability values and subject ratings of imageability was significantly less than unity ($\underline{z}$ = 5.44, $\underline{p}$ < .01), and the range of correlations was substantial (.28 to .96). This indicates that stimuli selected for low imageability on the basis of published norms may, nonetheless, be submitted to imaginal processing, as was the case in the present study, particularly among subjects with high imagery ability. Unfortunately, the number of low imageability ratings given by subjects was often so few as to preclude any meaningful analysis based on proportions of low or high imageability items recalled.

Finally, the present results suggest that encoding operations, such as imaginal or semantic processing, determine the strength of information in memory and, therefore, an item's "recallability" or "resistance to forgetting". Apparently, hypermnesia does not accrue from the direct effects of such "input" variables, but instead, may depend upon the cueing during retrieval of items that were poorly registered during acquisition. How this cueing is accomplished -- whether by interitem associations, retrieval organization, or some other process -- remains to be elucidated. The advantage of pictorial and imagistic memory codes in supporting hypermnesia is possibly related to their superiority to words in recall generally. Whatever the property or process is that makes pictures easier to recall than words, might also make them better retrieval cues.

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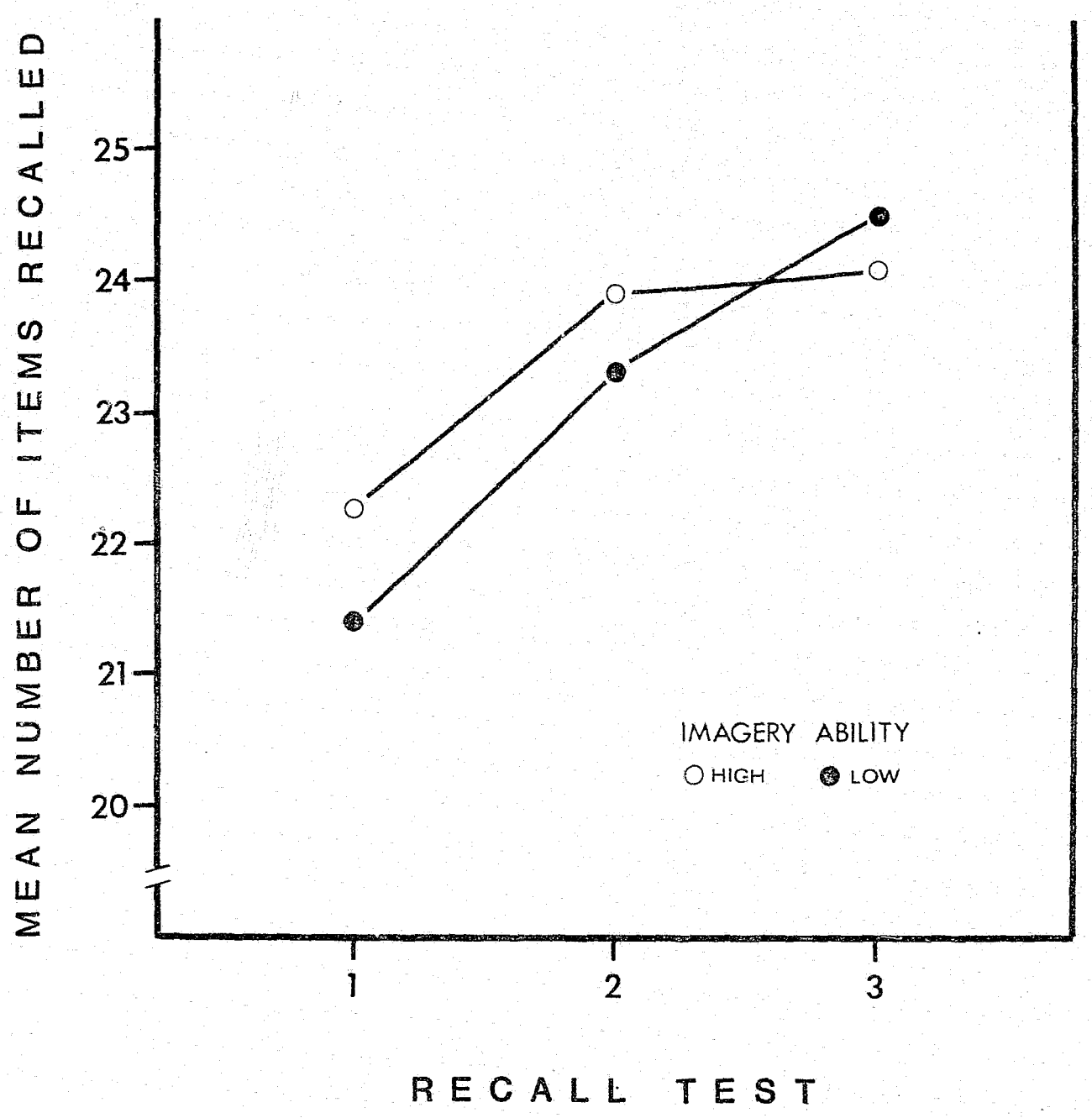
MEAN NUMBER OF ITEMS RECALLED
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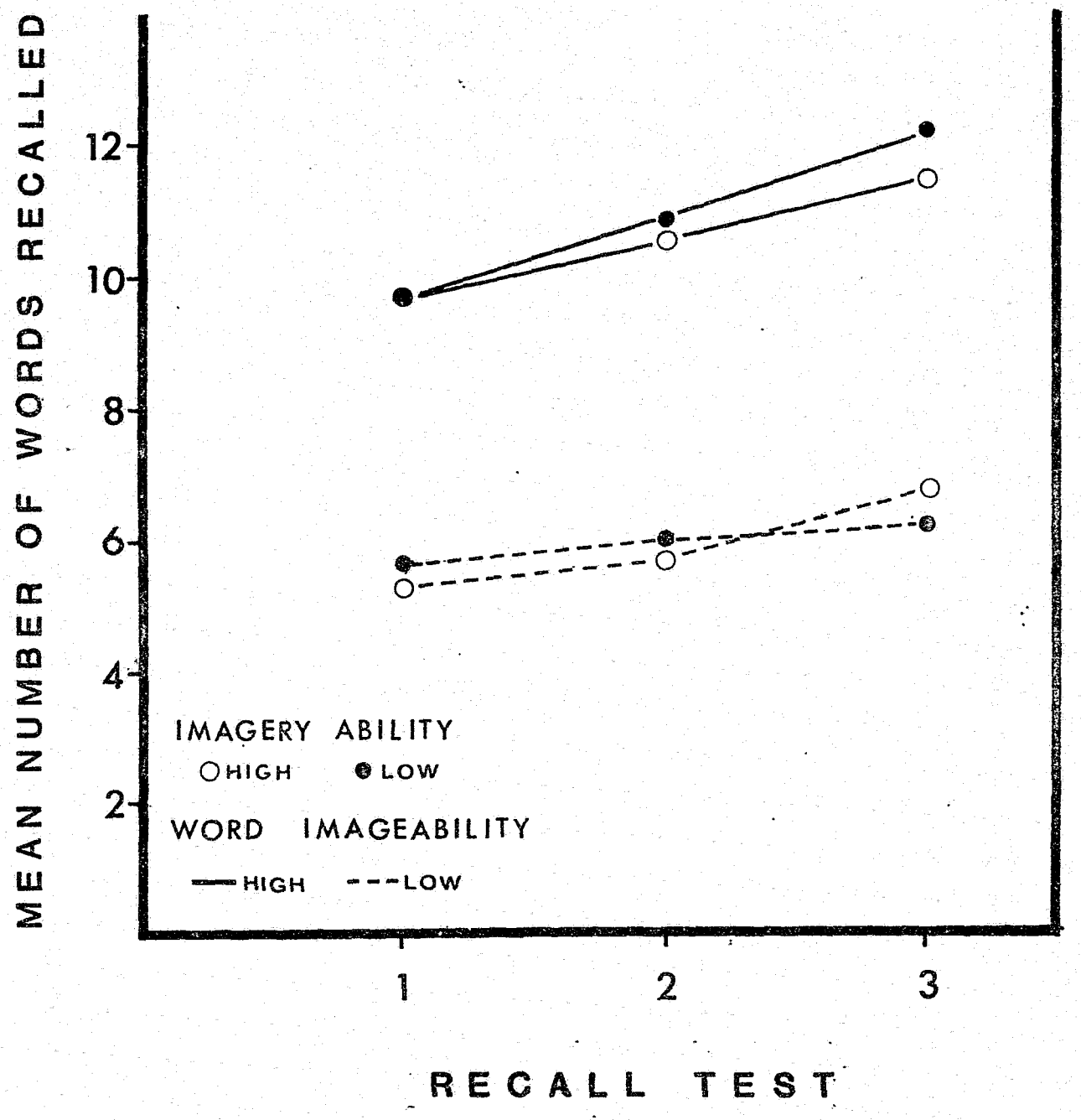
24
23
22
21
20
1
2
3
RECALL TEST
IMAGERY ABILITY
HIGH
LOW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10
8
6
4
2
IMAGERY ABILITY
HIGH
LOW
WORD IMAGEABILITY
HIGH
LOW
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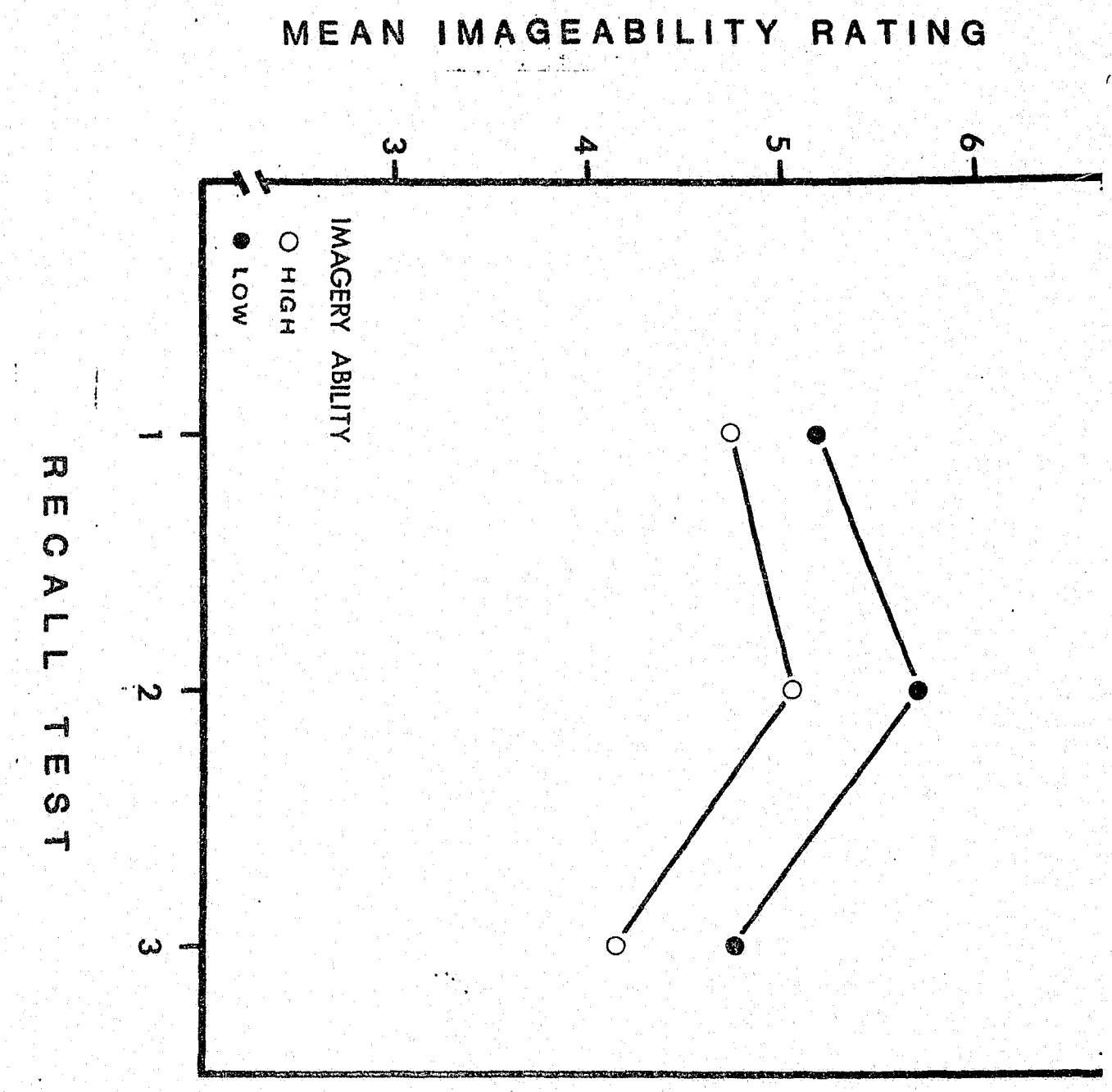
RECALL TEST


MEAN IMAGEABILITY RATING
3
4
5
6
IMAGERY ABILITY
○ HIGH
● LOW
1
2
3
RECALL TEST