

CONCLUSIONS

Festinger et al (1967) have shown that efference plays a crucial role in adaptation. The hypothesis specifying a role for efference derives from considering visual perception as a process in which efference and afference become correlated. The present study tends to show that the effect of efference may be increased or decreased, depending on the degree to which contour-specific efferent feedbacks from the arm diverge from the normally visual expected local signs. Both the experiments of Festinger et al and this study show, moreover, that efference, rather than proprioception, is required for visual adaptation, at least in this kind of experimental setting. It may thus be the

case that theories claiming the dominance of vision over touch (Harris, 1965; Rock, 1966) are correct as far as proprioception is concerned but may not apply when efference is involved.

REFERENCES

- FESTINGER, L., BURNHAM, C. A., ONO, H., & BAMBER, D. Efference and the conscious experience of perception. *Journal of Experimental Psychology Monograph*, 1967, 74, 1-37.
- GIBSON, J. J. Adaptation after-effect and contrast in the perception of curved lines. *Journal of Experimental Psychology*, 1933, 16, 1-31.
- HARRIS, C. S. Perceptual adaptation to inverted, reversed, and displaced vision. *Psychological Review*, 1965, 72, 419-444.
- ROCK, I. *The nature of perceptual adaptation*. New York: Basic Books, 1966.

instructions and peg list abstractness depends on whether a PA or one-bun technique is used.

Paivio (1969) notes that manipulating imagery instructions (imagery vs verbal mediation) for PA learning has little influence on performance, but imagery instructions facilitate performance when a one-bun technique is used (cf. Paivio, 1968). Since the two approaches to the study of mnemonic systems do not yield comparable results, Paivio questions the feasibility of using the PA technique to study mnemonics. Yet, the evidence Paivio cites to support the importance of imagery instructions with a one-bun technique is less than convincing.

Paivio (1968) found that Ss told to use "mental images" to link memorized peg words with the to-be-recalled words were superior to the "nonimagery" controls. However, since the control Ss were instructed to study the words by repeating the peg word along with the to-be-recalled word, it can be argued that the control Ss received verbal repetition instructions instead of verbal mediation instructions. If Paivio compared imagery and verbal repetition instructions, the effect of type of instruction yields comparable results with a PA and a one-bun technique, since verbal repetition instructions also result in lower PA learning than verbal mediation or imagery instructions (Paivio & Yuille, 1969). Thus, there is a lack of evidence for Paivio's assertion that the one-bun and PA techniques do not yield comparable results regarding the effectiveness of imagery instructions. The purpose of Experiment 1 was to test Paivio's view by assessing the effect of type of instruction with a one-bun technique.

EXPERIMENT 1

Method

The design was patterned after the Paivio (1968) study. Three groups were given the one-bun technique and imagery, verbal mediation, or repetition instructions. A control group was not given the one-bun technique. All Ss were given one study and test trial on each of the two 10-item lists. The experimental manipulations were made after Ss had completed List 1 recall. The two 10-item lists to be recalled were constructed by selecting 20 nouns having relatively high concreteness and imagery ratings from the Paivio, Yuille, & Madigan (1968) norms. The words were divided randomly into two lists of 10 words each, and a number from 1 to 10 was assigned to each word such that each number was used only once for each list.

A total of 52 students from undergraduate psychology courses at Michigan State University, who were not

Type of instruction, abstractness, and mnemonic system*

GORDON WOOD and MARTIN BOLT†

Michigan State University, East Lansing, Mich. 48823

Two experiments were conducted to determine if the effect of manipulating imagery instructions and peg list abstractness depends on whether a paired-associate or one-bun technique is used. It appears that the paired-associate and one-bun techniques yield comparable results regarding the effectiveness of imagery instructions and peg list abstractness.

Mnemonic systems have been investigated by using two different techniques. For the one-bun approach Ss are asked to memorize a series of pegs. Generally, words are used as pegs and each word is numbered, with associations between numbers and words (e.g., one-bun, two-shoe). Following the memorization of the pegs, new words can be memorized by associating each new word to a peg word (cf. Bugelski, Kidd, & Segmen, 1968; Berla,

Persensky, & Senter, 1969; Senter & Hauser, 1968). For the PA technique, Ss are provided with a list of peg words for both the study and the recall trials (cf. Paivio, 1969; Wood, 1967). Both approaches, in effect, convert a free-recall task into a paired-associate (PA) task for the experimental Ss. The approaches differ in that the experimental Ss have to memorize the stimuli (pegs) with the one-bun technique but not with the PA technique. Although numerous studies indicate that the use of a mnemonic technique has a facilitory effect on the recall of concrete nouns, it is not clear if the effect of manipulating imagery

*This research was supported by Grant MH 16991 from the National Institute of Mental Health. Thanks are due to Joyce Pennington. †Now at Calvin College, Grand Rapids, Michigan 49506.

familiar with the one-bun technique, were assigned to the four groups, such that there were 13 Ss in each group. All Ss were run individually. Following the general instructions, the Ss were read the List 1 number-word pairs at a 4-sec rate. For the test trial the numbers were read in a random order, and Ss were given 5 sec to recall each word. Following List 1 learning, three groups were given the one-bun technique. Each S was given alternating study and test trials until they gave five successive correct recitations of the one-bun peg list. The number-word pairs (e.g., one-bun, two-shoe) were read at a 1-sec rate, and Ss were given 20 sec to recall all the pairs. The imagery group was instructed to learn List 2 by forming images; each image was to include a peg word and a List 2 word. The verbal mediation group was told to make a verbal connection between the peg word and the List 2 word, perhaps by including both words in the same sentence. The repetition group was told to repeat each peg word along with the word to be recalled. In addition to the instructions, each S who was given the one-bun technique received an example appropriate to his instruction condition. The control Ss received the same instructions for List 2 that they received for List 1. After the Ss assured E that they understood their instructions, List 2 was presented. The List 2 procedure was identical to the List 1 procedure.

Results and Discussion

The mean number of List 1 words recalled was 4.62, 5.00, 4.31, and 4.31 for the imagery, verbal mediation, repetition, and control groups, respectively. The mean number of List 2 words recalled was 7.23, 7.31, 1.38, and 4.00 for the imagery, verbal mediation, repetition, and control groups, respectively. A comparison of the verbal mediation and imagery conditions for the two lists revealed a significant improvement from List 1 to List 2, $F(1,24) = 24.24$, $p < .001$, but the main effect of instructions (imagery vs verbal mediation) and the interaction of Lists by Instructions were not significant, $F < 1$. That is, presenting Ss with the one-bun technique and verbal mediation or imagery instructions facilitated performance, but imagery instructions were not superior to verbal mediation instructions. A comparison of the repetition and control conditions for the two lists revealed a significant decrease from List 1 to List 2, $F(1,24) = 21.47$, $p < .001$. The control Ss were superior to the repetition Ss, $F(1,24) = 7.15$, $p < .01$, and the Lists by Conditions (control vs repetition) interaction was significant, $F(1,24) = 14.07$, $p < .001$.

The results of Experiment 1 do not support Paivio's contention that manipulating imagery instructions produces better performance than verbal mediation instructions when a one-bun technique is used. Thus, the one-bun and PA approaches to the study of mnemonic systems appear to yield the same results regarding the effectiveness of imagery instructions. The purpose of Experiment 2 was to assess the effectiveness of peg list abstractness with a one-bun and PA technique. Paivio (1968) found that peg list abstractness had little effect when a one-bun technique was used. Since the abstractness of the stimuli has a strong effect when a PA technique is used (cf. Paivio, 1969), the effectiveness of peg list abstractness may depend on whether a one-bun or a PA technique is used. Yet, peg list abstractness (concrete vs abstract) and technique (PA vs one-bun) have not been manipulated in the same experiment.

EXPERIMENT 2

Method

A 2 by 2 factorial design was used. Peg list abstractness was manipulated by using the concrete (e.g., bun, shoe, tree) and abstract (e.g., fun, true, free) lists from the Paivio study. Two groups received the PA technique and two groups received the one-bun technique. The two 10-item lists to be recalled were constructed by using the same procedure that was used for the Experiment 1 lists.

A total of 56 students from undergraduate psychology courses at Michigan State University, who were not familiar with the one-bun technique, were assigned to the four groups, such that there were 14 Ss in each group. All Ss were run individually. Following the general instructions, the Ss were read the List 1 number-word pairs at a 3-sec rate. For the test trial, the numbers were read in a random order, and Ss were given 5 sec to recall each word. Following List 1 learning, the Ss were given PA instructions or the one-bun (one-fun) technique. The one-bun Ss were required to give four successive correct recitations of the one-bun or one-fun peg list before proceeding to List 2. All the Ss were instructed to use images to connect the peg words or stimuli (PA Ss) with the to-be-recalled words. After the Ss assured E that they understood their instructions, List 2 was presented. The List 2 procedure for the one-bun and one-fun Ss was identical to the List 1 procedure. The same procedure was used for the PA Ss, except that for the study trial a peg word (e.g., bun or fun) was read with each word. For the test trial, the Ss were read the peg word and asked to recall the list word.

Results and Discussion

The scoring procedure of Bugelski, Kidd, & Segman (1968) was used. Two points were scored if the Ss responded with the correct list word. One point was scored if the Ss responded with a list word but did not pair the word with the correct stimulus. The mean scores for List 1 were 10.36, 9.79, 9.93, and 10.00 for the concrete-PA, abstract-PA, one-bun, and one-fun conditions, respectively, $F < 1$. Thus, the groups did not differ prior to the experimental manipulations. The mean scores for List 2 were 15.21, 13.21, 12.50, and 11.79 for the concrete-PA, abstract-PA, one-bun, and one-fun conditions, respectively. The only effect which approached significance was the type of technique, $F(1,52) = 3.55$, $p > .05$. Thus, there is no evidence that the effect of peg list abstractness is different with a one-bun technique than with a PA technique.

The results of both experiments fail to support Paivio's assertion that the two approaches to the study of mnemonic systems yield different results regarding the effectiveness of peg list abstractness and imagery instructions. Paivio's (1968) finding that imagery instructions influence recall when a one-bun technique is used appears to be attributable to the use of an "inappropriate" control group. Also, the failure of peg list abstractness to influence recall when a one-bun technique was used is unconvincing, because the same materials did not produce an effect on recall when a PA technique was used. In short, it appears that the PA and one-bun techniques yield comparable results.

REFERENCES

- BERLA, E., PERSENSKY, J. J., & SENTER, R. J. Learning time with a mnemonic system. *Psychonomic Science*, 1969, 16, 207-208.
- BUGELSKI, B. R., KIDD, E., & SEGMAN, J. Image as a mediator in one-trial paired-associate learning. *Journal of Experimental Psychology*, 1968, 76, 69-73.
- PAIVIO, A. Effects of imagery instructions and concreteness of memory pegs in a mnemonic system. *Proceedings of the 76th Annual Convention of the American Psychological Association*, 1968, 3, 77-78.
- PAIVIO, A. Mental imagery in associative learning and memory. *Psychological Review*, 1969, 76, 241-263.
- PAIVIO, A., & YUILLE, J. C. Changes in associative strategies and paired-associate learning over trials as a function of word imagery and type of learning set. *Journal of Experimental Psychology*, 1969, 79, 458-463.
- PAIVIO, A., YUILLE, J. C., & MADIGAN, S. Concreteness, imagery, and meaningfulness values for 925 nouns. *Journal of Experimental Psychology*, 1968, 26 (1, Pt. 2), 1-25.
- SENER, R. J., & HAUSER, G. K. An experimental study of a mnemonic system. *Psychonomic Science*, 1968, 10, 289-290.
- WOOD, G. Mnemonic systems in recall. *Journal of Educational Psychology*, 1967, 58, (6, Pt. 2), 1-27.