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AUTHOR Ausburn, Floyd B.

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ABSTRACT

A study was made to determine whether different methods of visual presentations would affect the retention rate of individuals with two distinct types of perception--visual and haptic. The visual type, according to a study by Viktor Lowenfeld in 1957, is marked by the following characteristics: (1) ability to see wholes, break them into visual details, and then recombine them into visual wholes; (2) tendency to visualize kinesthetic and tactile experiences; and (3) ability to hold visual images mentally. The haptic type is marked by the following characteristics: (1) inability to discriminate fine visual detail; (2) inability to visualize tactile experiences; and (3) inability to hold visual images mentally. The experimental task was designed to test the ability of subjects to view three pictures of a piece of equipment. One group received a sequential linear presentation of three pictures, and a second group received a multiple image presentation of the task. The findings of the study suggest the following: (1) Visuals performed better over-all than haptics on a task which required the apprehension, retention, and utilization of visual cues; (2) A simultaneous multiple image presentation of visual stimuli resulted in better over-all performance on such a task than a linear presentation; and (3) Haptics benefited more than visuals from the use of multiple images. Therefore, changing methods of presentation may increase other aptitudes in which haptics are weak. (KKC)

A Comparison of Multiple and Linear Image Presentations of a Comparative Visual Location Task with Visual and Haptic College Students

Floyd B. Ausburn

University of Oklahoma

The multi-image presentation (the simultaneous presentation of visual images) is replacing the linear image presentation (the sequential presentation of single images) in many educational situations. While there is not much empirical data relating to multi-imagery as opposed to linear imagery as an instructional tool, it appears to be assumed by some, and with some support, that multi-imagery functions better than linear imagery in situations where immediate visual comparisons are desirable. The primary characteristic of multiple imagery in these situations is its simultaneity of visual image. This simultaneity might be expected to be more effective for some learners on some types of tasks than for other learners and other tasks. Research in which the three major components of (1) stimuli, (2) psychological task requirements, and (3) individual learner characteristics interact is ideal for the media field as it attempts to build a solid empirical base and theory framework. The uniting tie in this type of interactive research is the psychological function that is necessary for a certain learning task and which is accomplished by particular methods of stimulus presentation.

Media research of this nature is inherently tied to psychological studies in individual styles of cognition and perception. One cognitive style variable which appears intuitively to be of interest to researchers working with the effectiveness of multiple imagery is a variable which can be called <u>perceptual type</u>. The concept of perceptual type was introduced by Viktor Lowenfeld. Lowenfeld identified two distinct types of individuals with two distinctly different styles of perception. He called these two distinct type the <u>visual type</u> and the <u>haptic type</u>.

The visual type was defined by Lowenfeld (1957) as a person who reacts to his environment as a spectator and whose main sensory intermediaries are his eyes. The visual is also marked by the following characteristics:

1. ability to see wholes, break them into visual details, and then recombine them into wholes,

2. tendency to visualize kinesthetic and tactile experiences, and

3. ability to hold visual images mentally.

The haptic individual was defined by Lowenfeld (1957) as a normally-sighted person who uses his eyes only when he is compelled to do so. The haptic is a subjective type who "feels" his environment physically and emotionally and who uses not his eyes, but rather muscular sensations, kinesthetic experiences, and tactile impressions as his principal sensory intermediaries. The haptic is marked by the following characteristics:

1. inability to discriminate fine visual detail,

2. inability to visualize tactile experiences, and

3. inability to hold visual images mentally.

In an extensive study in which he tested over 1100 subjects from various subpopulations, Lowenfeld (1945) discovered that, although most people fall between the extremes of the two perceptual types, about 75% show apprediable tendency toward one or the other, with about 50% showing visual perception and about 25% showing haptic perception. He reported that these figures matched those established by W. G. Walter in a completely independent study based on brain alpha waves. Thus, it would appear that approximately one person in four is of the haptic type and therefore may react to and learn from visual stimuli quite differently from others of the visual type.

A consideration of the lack of ability of the haptic to hold visual image mentally and to make quick mental note of visual cues raises the possibility of research on multiple images presented simultaneously. It seems reasonable that multiple simultaneous images used in a task requiring apprehension, retention, and utilization of visual cues might accomplish a process of supplantation, a process which occurs when a mental process is executed explicitly for a learner which he is unable to perform for himself.

The process of supplantation can also be called a compensatory model of instruction. A compensatory model is a treatment which compensates for a learner's deficiency by providing the mode of representation which he cannot provide for himself. Thus, the treatment circumvents the weakness; it does for the learner that which he is unable to do.

Providing supplantation, or a compensatory model, is theoretically exactly what simultaneous multiple image presentation could be expected to do for haptic individuals in a task which involves rapid discrimination, assimilation, and retention of visual cues and the making of visual comparisons. In a linear image presentation, a visual image and its details and relationships would have to be retained mentally by the learner from image to image. This is a difficult process, especially for haptics. It could be expected to be supplanted by a multiple image presentation. With multiple imagery, there is no need for mental retention of visual images and details; all necessary information can be viewed simultaneously. Thus, the image retention process is completely supplanted by the medium of presentation. This should be advantageous to all learners in a task which requires visual comparison and location, but it should be of particular benefit to haptic individuals.

This study was designed to see if such advantages actually do occur; that is, if performance on a comparative visual location task is affected by linear or simultaneous multiple image presentation.

The hypotheses under consideration are as follows:

H_1: Visual subjects make higher scores than haptic subjects on a comparative visual location task.

H_2: Scores are higher on a comparative visual location task under a multiple image presentation than under a linear image presentation.

H_3: There is no interaction of aptitude and treatment on scores on a comparative visual location task under multiple and linear image presentations.

H_4: Visual subjects make lower mean latencies than haptic subjects on a comparative visual location task.

H_5: Mean latency scores are lower on a comparative visual location task under a multiple image presentation than under a linear one.

H_6: There is no interaction of aptitude and treatment on latency scores on a comparative visual location task under multiple and linear image presentations.

H_7: Haptic subjects make higher scores on a comparative visual location task under a multiple image presentation than under a linear one.

H_8: Haptic subjects make lower mean latency scores on a comparative visual location task under a multiple image presentation than under a linear one.

Method

Subjects. The subjects for the study were a group of 50 undergraduate students enrolled in Education 4160, Media and Technology in Teaching.

Procedures. The 50 subjects (Ss) were administered a battery of three tests based on those developed by Lowenfeld (1945) for identifying individuals with visual and haptic perceptual styles. The first test administered to the Ss was Successive Perception Test I (SPT1) (U.S. Air Force, 1944). This test, which is in motion picture form, was refined for military use from a similar test developed by Lowenfeld (1945). It consists of 35 items in which S is shown a pattern a small section at a time behind a moving slot. He is then shown five similar variants from which he must select the one which matches the pattern he saw behind the slot. Figure 1 shows an item of the type used in STP1.

The second and third tests given to the 50 Ss were also based on test concepts developed by Lowenfeld (1945). One was a word association test in which S was given a list of 20 words and told to react to each word with the first association which came to mind . A visual association was defined as one (such as climb/mountain) in which a visual object was given. A haptic association was defined as one (such as climb/hard) in which a muscular, physical, kinesthetic, or emotional word was given as the association. The third test was a simple drawing task in which S was asked to draw a chessboard on a table.

Ss were identified as visual, haptic, or indefinite in perceptual type on each of these three tests according to procedures developed by Lowenfeld (1945). Ss who scored 60% or more items correct on SPT1 were classified as visual on that instrument; Ss who scored 60% or more items incorrect were classified as haptic. Ss who gave at least 12 visual responses on the word association test were classified as visual on that instrument; Ss who gave at least 12 haptic responses were classified as haptic. Ss were classified as visual or haptic on the drawing instrument according to the nature of their response. A visual drawing was defined as objective, with the table drawn from the side view and complete with legs. A haptic drawing was defined as subject, with emphasis on the chessboard as seen from above by one playing chess. Figure 2 shows examples of typical visual and haptic drawings.

Ss who were classified as visual on all three instruments were identified as visuals (N=23). Ss who were classicied as haptic on all three instruments

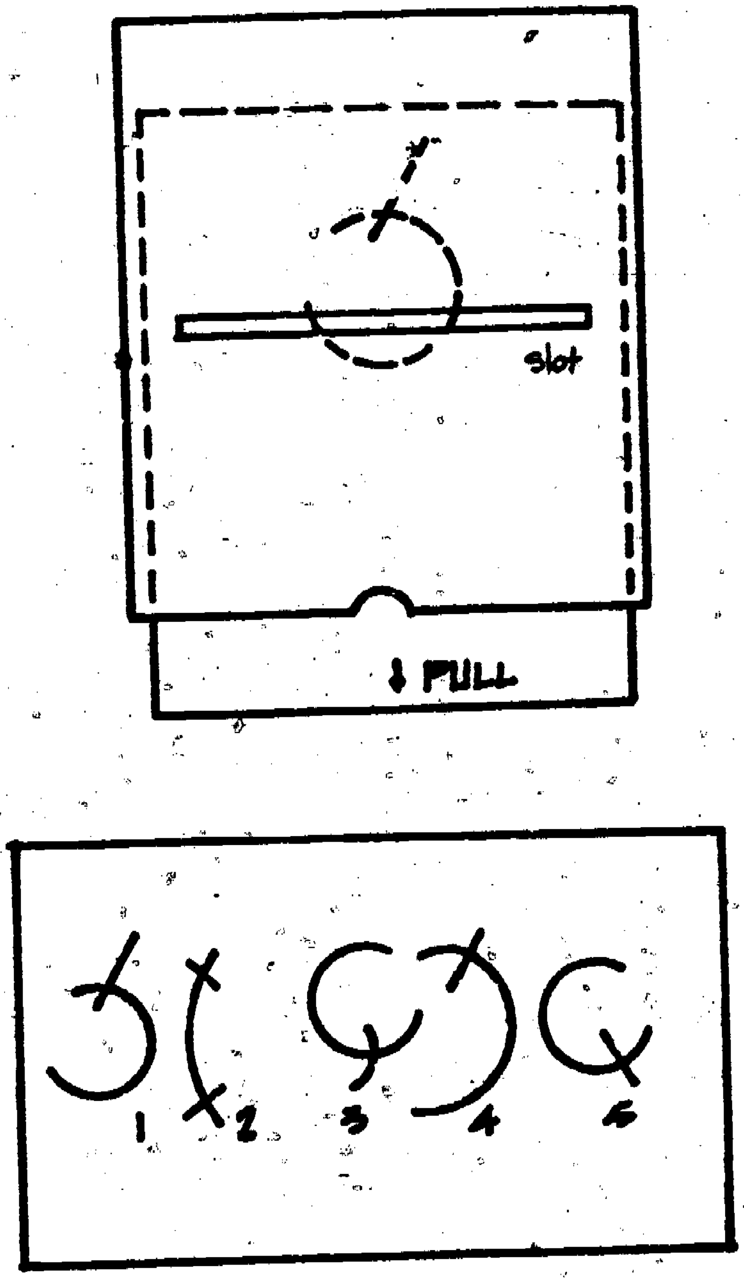

Figure 1. Sample item of the type used in SPT1

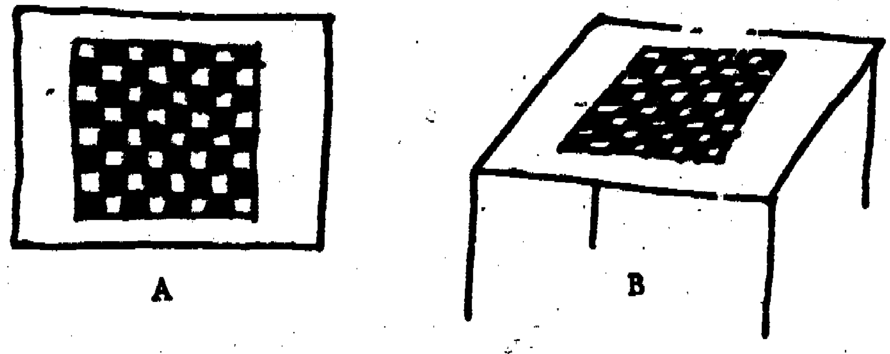

Figure 2. Examples of typical haptic (A) and visual (B) responses on the drawing task

were identified as haptics (N=12). From the visual and haptic groups, ten visuals and ten haptics were selected at random. Each group of ten was then randomly split into two groups of five. One group of five visuals and one group of five haptics (E_1) was then randomly selected to receive linear image treatment. The other two groups of five visuals and five haptics (E_2) were designated as the recipients of a multiple image treatment.

The experimental task was named a comparative visual location task. The task was designed to duplicate a procedure frequently used as a step in teaching equipment operation. It was designed to test the ability of S to view three pictures of a piece of equipment. The pictures were an extreme close-up, a medium shot, and an over-all shot. S then had to locate on a fourth over-all picture (a black-and-white print) a specific item (button, knob, etc.) which had been identified by a red arrow on the first (close-up) picture. All equipment used in the pictorial stimuli was judged to be unfamiliar to the sample used for the study. The task required S to compare the visual location cues found in each picture in order to make the required location identification response on the fourth picture.

E_1 received a sequential linear presentation of the three pictures. The pictures were presented as colored 35mm photographic slides. The first slide of each piece of equipment showed a tight close-up of the critical item on the equipment which was identified by a red arrow. This arrow was present only in this first close-up slide for each item. The second slide showed a medium shot of the equipment, and the third showed an over-all shot of the entire piece of equipment. Each slide was displayed on the screen for three seconds, making a total of nine seconds of viewing time for each series of slides. The entire test consisted of ten items, each requiring three separate slides. After the three slides for each item were viewed, the projector was turned off, and S was given an over-all black-and-white print of the piece of equipment he had seen in the slides. He was asked to point to the item on the equipment which had been identified in the first close-up slide by the red arrow.

E_2 received a multiple image rather than a linear image presentation of the task. Each S was shown exactly the same slides as were shown to E_1, but the slides were presented simultaneously rather than sequentially. All three slides for each item were shown together for nine seconds. After viewing the slides for each item, S was given the photograph and asked to point to the appropriate mechanism on the equipment.

For Ss in both E_1 and E_2, record was made of both the number of correct location identifications made and a mean response latency, derived from a latency recorded for each individual item.

Data Analysis. All data analysis was performed using one-way and two-by-two factorial analyses of variance. H_1, H_2, and H_3 were tested in a two-by-two ANOVA; H_4, H_5, and H_6 were tested in a second two-by-two ANOVA; and H_7 and H_8 were tested in separate one-way ANOVA's.

Results and Discussion

A two-by-two factorial analysis of variance supported H_1, H_2, and H_3. These results are summarized in Table 1. They indicate that, as hypothesized, visuals made higher scores over-all than haptics. This could be expected, since the task required utilization of visual cues. Results also indicate that the multiple image treatment was more effective than the linear one. This was expected since it was theorized that the multiple treatment would supplant the process of holding a mental image of the visual cues and result in improved performance, especially among the haptics. The lack of any

Table 1
Analysis of Variance for Scores on Experimental Task

SOURCE	Mean Square	df	F	$\hat{\omega}^2$
Perceptual Type	11.250	1	6.164*	.18
Treatment	22.050	1	12.082**	.35
Type x Treatment	1.250	1	<1	.02
Error	1.825	16		.45

*p = .025
**p < .005

significant interaction of perceptual type and treatment further indicated the over-all superiority of the multiple image treatment. While the visual group which received multiple treatment ($\bar{X}_M = 9.8$) made gains over the visual group which received linear treatment ($\bar{X}_L = 8.2$) which approached the .05 level of significance, it was the haptics which were most benefited by the multiple treatment. This was expected since the process of supplantation of image retention is more necessary for haptics than for visuals. A one-way analysis of variance was performed on the scores made by haptics under linear ($\bar{X}_L = 6.2$) and multiple ($\bar{X}_M = 8.8$) treatments to formally test H_7. This test was significant (MS=16.9; df=1,8; F=7.682; p=.025; $\hat{\omega}^2$=.49), which suggests that the multiple treatment did perform supplantation for the haptics and result in better performance. Under the linear treatment the difference between visuals ($\bar{X}_V$ = 8.2) and haptics ($\bar{X}_H$ = 6.2) approached the .05 level of significance. Significance at that level would possibly have been achieved had the within-group variance been smaller ($\hat{\omega}^2$ for error = .64), which would probably be the case if a larger sample was used. Under the multiple image treatment, however, the difference between visuals ($\bar{X}_V$ = 9.8) and haptics ($\bar{X}_H$ = 8.8) is insignificant.

A second two-by-two factorial analysis of variance was used to test H_4, H_5, and H_6. The results are summarized in Table 2.

Table 2
Analysis of Variance of Mean Latencies on Experimental Task

SOURCE	Mean Square	df	F	$\hat{\omega}^2$
Perceptual Type	10.571	1	2.112	.08
Treatment	48.485	1	9.685*	.34
Type x Treatment	2.858	1	<1	.02
Error	5.006	16		.56

*$p < .025$

These results call for the rejection of H_4. It was expected that visuals would find the task easier than haptics and would therefore have lower mean latencies. The difference between the two groups, however, ($\bar{X}_V$ = 3.081; $\bar{X}_H$ = 4.535) was not significant. There are two possible reasons for this result:

1. a rather large within-group variance ($\hat{\omega}^2$ for error=.67) among the latencies, and

2. the very large decreases in latency made by haptics under the multiple image treatment.

The hypothesis that latencies are lower under the multiple image treatment than under the linear one (H_5) was strongly supported. This, along with the finding of no interaction between perceptual type and treatment (H_6), suggest that the use of simultaneous images made the task generally easier to perform. Again, the principal gains were made by the haptics for whom the supplantation process was most necessary. While a one-way analysis of variance indicated that the difference between the latencies of visuals under the two treatments ($\bar{X}_L$ = 4.26; $\bar{X}_M$ = 1.902) was positive but not significant (probably due to large within-group variance; $\hat{\omega}^2$ for error=.67), the difference between the haptics under the two treatments ($\bar{X}_L$ = 6.47; $\bar{X}_M$ = 2.251) was significant in a one-way analysis of variance (MS=37.442; df=1,8; F=5.742; $p < .05$; $\hat{\omega}^2$=.42). These results supported H_8.

In summary, the findings of this study suggest the following:

1. Visuals performed better over-all than haptics on a task which required the apprehension, retention, and utilization of visual cues.

2. A simultaneous multiple image presentation of visual stimuli resulted in better over-all performance on such a task than a sequential linear image presentation.

3. Haptics benefited more than visuals from the use of multiple images.

The findings suggest that multiple image presentation did supplant the mental process of retaining visual images for comparison. Both visual and haptic subjects, but especially the haptic ones, made gains in scores and cuts in latency, both of which indicate that the task was easier for them under conditions of multiple image presentation. It is suggested that further programmatic research be conducted on larger samples, on other populations, and with different tasks in order to attempt to establish definite patterns of relationships between learner perceptual types, psychological demands of tasks, and supplantations possible through the use of multiple image treatments. It is possible that such treatments can compensate for more than one aptitude on which haptics - approximately one in four students - are weak. Such a discovery could result in important new emphases in instructional media utilization strategies.

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