

Memory for Visual, Auditory, and Visual-Auditory Material

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The rapid advance of radio and the growing promise of television lend renewed interest to the question of the relative efficiency of visual, auditory, and visual-auditory materials in the memory and learning process. The question is one which has an immediate practical interest for educators and advertisers, since they are constantly using both modes of communication to their students and their buyers. The question is one which has had repeated attention from¹ psychologists since the early visual-auditory experiments of Münsterberg and Bigham in 1892-3 at Harvard.

The present laboratory experiment is the outgrowth of a series of field investigations with several thousand subjects in the life situation. In one series it was observed that 30,277 Indiana high school seniors made the inquiry response, in proportion to numbers stimulated, about five times as often when they were provided literature and a speaker as when they were provided only literature. Likewise, about two and one-half times as many students made the enrollment response when furnished literature and speaker as when furnished merely literature. Another series of field studies showed that about 27,000 Indiana State Fair visitors gave attention to an exhibit in the following percentages: When the exhibit was accompanied by no explanatory advertising, 19.9%; when presented with poster advertisement, 25.4%; when shown with the same advertising presented by radio loud speaker, 32.1%; and when shown with poster and radio advertising simultaneously, 33.4%. Memory tests with 179 subjects showed least memory for details of the exhibit with the poster presentation and approximately the same memory with either the radio or the combined poster-radio types of presentation.

The problem was transferred in 1935 to the psychology laboratories of Columbia University for a laboratory check on the field results. Thirty-six short fictitious advertisements were prepared, of which the two following advertisements are examples:

RESTWELL MATTRESS

For the rest of your life. All tired out? Needing a perfect night's rest? Then go to bed on a *Restwell Mattress*.

POLAND LAMPS

For your home. You will have to see these new lamps to appreciate them. See our new line of *Poland Lamps*.

¹A historical survey will be found in the following reference: Elliott, Frank R. Memory for Visual, Auditory and Visual-Auditory Material. Arch. Psychol. No. 199. 1936.

These advertisements were presented in rotation by three modes: (1) on a screen, (2) by radio, and (3) by screen and radio simultaneously. To equalize position advantages, practice effects, association values of materials, and memory capacity of the subjects, the following rotation order of presentation was observed:

Sets of Advs.	Subjects of Section I	Subjects of Section II	Subjects of Section III
Nos. 1-12	Visual	Auditory	Vis.-Aud.
Nos. 13-24	Auditory	Vis.-Aud.	Visual
Nos. 25-36	Vis.-Aud.	Visual	Auditory

The subjects were asked to classify each advertisement as descriptive or non-descriptive, depending upon whether or not the trade name described the product and the body was descriptive of it. Restwell Mattress, for instance, was regarded as a descriptive advertisement and Poland Lamps a non-descriptive advertisement. The purpose of this classification was (1) to separate the 36 advertisements into two groups for comparative purposes later, and (2) to mask the memory tests which followed.

The tests were for recall and recognition. In the recall test, the commodity name was presented and the subject was asked to fill in on a score sheet the appropriate trade name. In recognition, the subject

TABLE I. COMPARISON OF MODES
(Composite of Recall and Recognition)

Superiority of Mode	TEST SITUATIONS*			
	No. 1	No. 2	No. 3	No. 4
Auditory Surpasses Visual	24.9%	12.3%	23.6%	5.0%
Chances in 100 of a Reliable Diff.	100	99.4	99.9	79
Vis.-Aud. Surpasses Visual	41.0%	24.6%	36.5%	25.0%
Chances in 100 of a Reliable Diff.	100	100	100	100
Vis.-Aud. Surpasses Auditory	12.9%	13.3%	10.4%	16%
Chances in 100 of a Reliable Diff.	100	100	96	100

*The test situations were as follows: No. 1—all of Group X and Sections 1 and 3 of Group Y, with section 2 eliminated due to faulty experimental conditions; No. 2—All of Group X and Group Y; No. 3—Group X only (non-college); No. 4—Group Y only (college).

was asked to identify the real trade names in a list of 36 real and 36 fictitious names.

Two groups participated in the tests: Group X—made up of 67 federal relief workers in New York City, 38 men and 29 women, which is referred to as the non-college group since none of them were in college at the time of the test; and Group Y—consisting of 76 Columbia University Extension class students, 38 men and 38 women, which will be referred to as the college group. Members of Group Y averaged about 22½ years of age, while members of Group X were a little more than ten years older.

From the foregoing general information, it will be noted that these tests offered four bases of comparison: (1) comparison of modes, (2) comparison of groups, (3) comparison of sexes, and (4) comparison of materials (descriptive vs. non-descriptive advertisements). A brief summary of results, which may be noted in full detail from the author's monograph in the Archives of Psychology, is shown in Table I.

This table shows the percentage by which the average score following one mode surpassed the average score following the other modes. The indication is that visual presentation always resulted in a lower memory score than either auditory or visual-auditory mode produced. Visual-auditory presentation brought the highest score, auditory the next highest, and visual the lowest in each one of the four groupings of data. In all but one case, the reliability of the differences was high.

TABLE II. COMPARISON OF GROUPS
(Composite of Recall and Recognition)

Comparison	Visual Av.	Auditory Av.	Vis.-Aud. Av.
Group Y (College).....	13.66	14.34	17.08
Group X (Non-College).....	10.01	12.37	13.66
Diff. in Favor Group Y.....	3.65	1.97	3.42
Percent Diff. in Favor Group Y..	36%	16%	25%

From Table II it will be seen that the college group always surpassed the non-college group in memory for each mode and that this advantage was highest for visual mode and lowest for auditory mode. Stated another way, this means that the non-college group responded better by auditory mode than by visual mode. Note from Table I that the auditory average was 12.37, as compared with a visual average of 10.01 for the non-college group; and that the difference was much less in the college group, namely, auditory 14.34 vs. visual 13.66.

The college group was less variable by each mode than the non-college group, thus indicating a more consistent performance than the non-college group demonstrated. Likewise, the college group guessed

less in the recognition test than the non-college group, as shown by score reductions when the crude recognition scores were corrected for guessing.

TABLE III. COMPARISON OF SEXES
(Composite of Corrected Recognition and Recall)

Comparison	Women (Groups X and Y)	Men (Groups X and Y)
Aud. Av.....	12.80	14.16
Vis. Av.....	10.06	13.68
Diff. by Which Aud. Surpasses Vis....	2.74 (27.2%)	.48 (3.5%)
D/Sigma D; Chances in 100 of Real Diff.....	3.28 (100)	.64 (74)
Vis.-Aud. Av.....	15.70	15.79
Vis. Av.....	10.06	13.68
Diff. by Which Vis.-Aud. Surpasses Vis....	5.64 (56.1%)	2.11 (15.4%)
D/Sigma D; Chances in 100 of Real Diff.....	8.57 (100)	2.88 (99.8)
Vis.-Aud. Av.....	15.70	15.79
Aud. Av.....	12.80	14.16
Diff. by Which Vis.-Aud. Surpasses Aud....	2.90 (22.7%)	1.63 (11.5%)
D/Sigma D; Chances in 100 of Real Diff.....	3.69 (100)	2.44 (99.3)

It will be noted first that men somewhat excel women in memory scores, a result contrary to the general finding but similar to that of Dietze.² A more important observation for the present study is that women show a far greater advantage for auditory over visual mode and visual-auditory over visual mode than do men.

Another finding is that women are less variable than men for auditory and visual-auditory modes but more variable than men for visual mode. Further, women are shown, in the detailed analysis of data not permissible here, to do more guessing than men, particularly following visual presentation.

One measure of the difficulty of material is the frequency with which it is remembered. On this basis, Table IV shows that for all modes descriptive trade names were 5.7 times as easy to recall as non-descriptive trade names, and particularly easy by the auditory mode; i.e., a ratio as high as 10.07 to 1 in favor of descriptive material. This is another way of saying that it is harder to remember the more difficult material, the non-descriptive trade names, by radio than by screen.

²Dietze, Alfred G., 1932. Some sex differences in factual memory. Amer. Jour. Psychol., 44:319-321.

This finding appears to justify the efforts of radio program managers to keep their material simple and easy to comprehend. Radio is not the medium for involved, academic, difficult material.

TABLE IV. COMPARISON OF MATERIALS

(Comparison of Descriptive vs. Non-Descriptive Trade Names by Method of Frequency Ratios)

RATIO OF RECALL FREQUENCY; DESCRIPTIVE TO NON-DESCRIPTIVE NAMES

Group	Visual Mode	Aud. Mode	Vis.-Aud. Mode	All Modes
Group X	6.01 to 1	10.07 to 1	5.28 to 1	5.70 to 1
Group Y	4.30 to 1	7.15 to 1	4.59 to 1	
Both	4.88 to 1	8.12 to 1	4.84 to 1	

RATIO OF RECOGNITION FREQUENCY; DESCRIPTIVE TO NON-DESC. NAMES

Group	Visual Mode	Aud. Mode	Vis.-Aud. Mode	All Modes
Group X	1.27 to 1	1.18 to 1	1.26 to 1	1.26 to 1
Group Y	1.42 to 1	1.22 to 1	1.26 to 1	
Both	1.32 to 1	1.20 to 1	1.26 to 1	

Another deduction from the above comparison is that descriptive material has an advantage over non-descriptive material, particularly for the less schooled population of Group X and for the radio mode.

It will be noted that the ratio of descriptive to non-descriptive trade names is not high (1.26 to 1) in the recognition tests, obviously due to the ease of recognition compared with that of recall.

Summary and Conclusions

In summarizing the results of this study, the conclusion is reached that it provides a laboratory verification of the author's field studies ranking modes of presentation in the following order: most efficient, visual-auditory; next in efficiency, auditory; and least effective, visual.

Group comparisons show that the college group excelled in amount of material remembered by any mode and that this advantage was highest for visual and lowest for auditory mode.

Sex comparisons show that women demonstrated a far greater advantage for auditory over visual mode than did men, though both men and women remembered more by the auditory mode than by the visual mode. The visual-auditory mode resulted uniformly in the highest scores for both men and women.

Comparison of materials shows that descriptive trade names were recalled between five and six times as frequently as non-descriptive trade names and that descriptive names lent themselves particularly well to auditory presentation; the frequency ratio in favor of descriptive names was highest by auditory mode, and higher for the less schooled population of the non-college group than for the college group.

The general excellence of visual-auditory mode may be explained on the ground of summation of stimuli, facilitation, intersensory heightening effects through the simultaneous stimulation of two receptor systems, improved clarity, and certainty of reception.

The superiority of auditory over visual mode may be explained on the basis of (1) the non-directional character of sound which permits clear reception without the direct fixation required in vision; (2) the social significance which the sound of the human voice has in comparison with the "coldness" of type and other visual materials; (3) undisturbed repetition of the trade name when presented orally as compared with conflicting elements of the body of advertising copy presented on the screen, and (4) the role of habituation to increasing auditory stimulation through the nation's radio sets for 78,000,000 people through the 60,000 public address systems in the schools, and through the millions of hours spent annually at sound movies.

The author advances the hypothesis of *visual-auditory shift* to explain the results of DeWick, Wilke, Stanton, Cantril, Carver, Allport, and the present writer, generally showing an advantage for auditory over visual mode and thus reversing the general trend of experimental results prior to 1930 in favor of visual mode. The author's theory is that a shift may be taking place from visual to auditory dominance. Such shifts take place in children, as Löwenfeld and Hetzer and others have demonstrated; children remember better that which they hear up to the age of eight or ten years, when they acquire the reading habit; after that they remember better what they read. Why cannot a similar shift take place in the adult; why cannot he change from visual to auditory dominance, since there has been such an enormous increase of listening during the years since the advent of radio, public address systems, and sound films?

Two findings in the present studies tend to support the *visual-auditory shift* hypothesis. One is that women show a greater advantage for auditory over visual mode than men, which is what could be expected from the theory, in view of the fact that surveys have shown that women listen to radio about 22% more than men. Another finding is that non-college people do much better by auditory mode compared with visual mode than college subjects; this is in line with surveys showing that non-college people listen more than twice as much to radio as college people. Habituation to auditory mode may be the explanation. Capacity to adapt to changed environment is everywhere evident in life, and this may be the cause of our recent findings in favor of auditory over visual mode in apparent contradiction to the results of most experimenters prior to 1930.³

³For detailed references to surveys and results cited here, see the author's previously mentioned monograph in the Archives of Psychology, No. 199.