THE EFFECT OF MUSIC DISTRACTION UPON READING RATE AND COMPREHENSION

CECIL M. FREEBURNE and MURRAY S. FLEISCHER
Bowling Green (Ohio) State University

A question of some importance in education and psychology is that of the effects of distraction upon human performance. In the educational field, this question takes the form of whether various distractions adversely affect the student's efforts to learn. Of the distractions to which a student may be subject, one of the most common appears to be radio listening. Cantril and Allport[2] report that a substantial majority of students study while listening to their radios (68 per cent). Reading and study experts such as McCullough, Strang and Traxler[11] and Robinson[16] feel that unless the radio is kept very low in volume it serves as a distractor, adversely affecting speed and comprehension in study.

Published studies concerning the effects of supposedly distracting influences upon intellectual tasks such as reading, problem-solving, and test-taking present conflicting conclusions. Whitley,[19] Fendrick,[4] Liepold,[8] Henderson, Crews and Barlow,[6] and Mitchell,[13] among others, report that some of their subject groups show the effects of one or more kinds of distractors, in terms of poorer performance on intellectual tasks. However, Morgan,[14] Hovey,[7] Obata, Morita, Hirose, and Matsumato,[15] and Miller,[12] find the presence of various distractors no hindrance to such performance. Morgan, in fact, reports facilitation, as do Obata, Morita, Hirose and Matsumato. Some studies, such as that of Tinker,[18] find no significant differences either way. Some studies (e.g., Tinker, Liepold, Mitchell) suggest that the amount of distraction differs for different levels of intelligence. Others (e.g., Hovey) disagree. Most investigators in this area agree that verbal radio programs are more distracting than musical programs. However, there is some disagreement as to the actual effects of distractors upon such intellectual tasks as those mentioned above. In other words, the presence of these distractors may not be disturbing.

Perhaps one reason for the seeming disagreement among the studies cited lies in the fact that some investigators used only one kind of distractors. For example, Tinker used electric bells.

Fendrick used semi-classical music only. On the other hand, some investigators used more than one form of distraction with the same experimental groups. For example, Morgan used bells, buzzers, and phonograph records of music and humorous monologue. Hovey used bells, buzzers, spotlights, phonograph records, whistles, and a buzz saw. Henderson, Crews and Barlow used both vocal and nonvocal music. Liepold played radio programs varied from newscasts to soap operas to his subjects.

Perhaps another reason for the apparent disagreement lies in the difficulty of achieving adequate sampling. Tinker advised caution in interpreting his results because of the small numbers of subjects used. Fendrick's study, included in a recent book by Hartley, Birch and Hartley,[5] apparently is considered to be one of the best of its kind by these authors, and it is also cited by Robinson.[16] Even so, Fendrick used two consecutively-taught classes in Introductory Psychology as subjects. The equation of his groups has been criticized by Henderson, Crews and Barlow.[6] These latter authors, in extending Fendrick's study, used fifty freshmen women as subjects, divided into three equated groups.

It was the intent of the present study particularly to extend Fendrick's study and that of Henderson, Crews and Barlow by way of improved sampling and analysis. In addition, where Fendrick used only semi-classical music, and Henderson, Crews and Barlow used only classical and popular music, the present study involves four types of music. These are: classical, semi-classical, popular and jazz. The present study is restricted to the use of nonvocal music, thereby avoiding a complication noted in the study of Henderson, Crews and Barlow.

Two questions are raised in the present study. First, does listening to specific types of nonvocal music (classical, semi-classical, popular and jazz) have any significant effect upon rate of reading and reading comprehension? Second, are rate of reading and reading comprehension in the presence of music a function of the subject's intelligence?

MATERIALS AND PROCEDURE

Reading Material and Reading Test.—The reading material used in the present study was expanded from the Robinson-Hall Test for Reading Ability (History: Form—Russia).[17] As

published, this test has a time allowance of ten minutes. Enough material was added from the section on Russian history in the 1950 edition of *Compton's Pictured Encyclopedia*[9] to make up a selection containing 1315 lines, or approximately 11,500 words. To test the assumption that the subjects would be unlikely to finish this selection in thirty minutes, five graduate students in psychology read the selection and were unable to finish in thirty minutes.

The material was offset-printed in the University's printing shop. It was similar to many college texts in type and general form, with titles for each major section. The lines were numbered, and rate of reading was determined by having the subjects mark the line being read when time was called.

The reading comprehension test consisted of fifty mimeographed true-false questions. True-false items were used because of time limitations. Twenty-five questions were over the first third of the material, fifteen were over the second third, and ten were over the last third. It was assumed that few subjects would read far enough to answer many questions over the last third of the selection, and that having relatively more questions over the first two-thirds would yield a more reliable comprehension score. The questions were numbered to correspond with the lines from which they were taken. Subjects were instructed to answer only questions over lines which they had read, as indicated by the numbers. The comprehension test was scored by subtracting the number wrong from the number right, as recommended by Lindquist, Hawkes and Mann.[10]

Music.—The music used in the present study was chosen after consultation with members of the University's music faculty as being representative of the types of music desired. The writers acknowledge the subjective nature of this procedure. The music was played on a Webster three-speed automatic changer playing through a Bell high-fidelity amplifier with a suitably baffled ten-inch speaker. The following selections were played.

Group II: (Classical music) *Symphony No. 3 in E-flat Major*, Beethoven

Group III: (Popular music) *You Made Me Love You, Music Makers, The Flight of the Bumble Bee, Concerto for Trumpet, Ciribiribin, Sleepy Lagoon, One O'Clock Jump*, all played by

Harry James and his orchestra; *I've Got My Love To Keep Me Warm, Dardanella, Just One of Those Things, Sophisticated Swing*, all played by Les Brown and his orchestra.

Group IV: (Semi-classical music) *Mississippi Suite, From The Land of the Sky-Blue Water, By The Waters of Minnetonka*, all played by Andre Kostalanetz and his orchestra, and *Grand Canyon Suite* from another album by the same artist.

Group V: (Jazz music) *Jazz Me Blues, Panama, Tin Roof Blues, High Society, Struttin' With Some Barbecue, Chimes Blues, Muskrat Ramble, South Rampart Street Parade*, all played by Jimmy Dorsey and his orchestra; *The Girls Go Crazy About The Way I Walk*, played by Kid Ory and his Creole Band; *Tishomingo Blues*, played by Bunk Johnson and his New Orleans Band.

Subjects.—Two hundred eighty-three students in eight classes of Introductory Psychology were randomly assigned to the five groups used in the study. As was expected, some students in each group failed to keep their appointments. However, a total of two hundred eight subjects completed the study, with approximately forty in each group. The parent population, of course, comprises the two hundred eight subjects who finished the study.

Motivation.—In a study of this kind, it is desirable to conceal the true nature of the experiment from the subjects, as indicated by Baker.[1] Many investigators have not observed this precaution. The subjects used in the present study were told that the study involved reading speed and comprehension, to last not more than one hour, and that their scores would be made available to them upon completion of the study. No mention was made of the music, which was played from an adjoining room, as described below. All subjects were informed that there were other activities going on in the building at the time the reading took place, but they were asked to study as they usually do under such circumstances. The music was playing when the subjects entered the room, and for a brief time after the conclusion of the thirty-minute reading period. When asked to indicate on their question forms, after reading was completed and the comprehension test had been taken, whether anything going on in the building was annoying to them while studying, a majority (one hundred fourteen) of the subjects said that the music was annoying. However, it is thought that no particular set with

regard to the music was aroused prior to the reading. Only one or two subjects in each experimental group asked if the music was part of the experiment, and these were told that it was not. Since not all the reading sessions took place on the same evening, it is possible that some discussion of the study took place between subjects who had participated and subjects who had not, although the subjects were asked not to discuss the study outside their own groups until all groups had participated.

Experimental Setting.—All reading sessions took place in a regular classroom of the Psychology Department. This room is twenty-four feet long, nineteen feet wide, and ten feet high. The door to this room was closed during the reading. Illumination came from six fluorescent fixtures hanging from the ceiling at regular intervals, each with two 40-watt tubes. The subjects sat in classroom armchairs, with the lights at a height of sixty inches above the arms of the chairs. The reading sessions took place in the evening, to avoid conflicts with class schedules.

The phonograph was in an adjoining room, from where the music was clearly audible in the reading room. Since the walls were quite thin, and since a high-fidelity amplifier was used, there was a minimum of distortion. Extent of distortion and optimal volume settings were subjectively predetermined by the writers. The volume was not 'low,' that is, it was not near masking level, or threshold level, but was at about the volume level at which one would have it if his intention were to listen to the music. McCullough, Strang and Traxler[11] and Robinson[16] have stated that music at a very low volume level may not be distracting. It was the intention of the writers to have the volume very much louder than this, without being so loud that distortion would result.

The reading selection was placed, closed, on the chair arms before the subjects arrived. When the subjects in a given group were seated, oral directions were read to them. Just before the subjects began to read, the door to the experimental room was closed as a signal to the phonograph operator in the next room to change from the music which had been playing to the list of selections chosen for the group which was present. Subjects were told ahead of time not to enter the experimental room if the door was closed when they arrived. Despite this, two subjects in the jazz group did enter the reading room a few minutes late.

While their scores were not included in the computations, the effect on other subjects in the jazz group cannot be evaluated.

RESULTS

Does Listening to Specific Types of Nonvocal Music, Classical, Popular, Semi-Classical, and Jazz, Have a Significant Effect on Rate of Reading and Reading Comprehension?

In Table I, it can be seen that the mean rates of reading of the experimental groups were somewhat higher than that of the control group. However, a simple analysis of variance yielded

TABLE I.—MEAN RATE AND COMPREHENSION SCORES FOR THE CONTROL AND EXPERIMENTAL GROUPS

	I control n-43	II classical n-46	III popular n-42	IV semi-classical n-40	V jazz n-37
Mean No. Lines	648.23	696.54	704.05	695.25	716.59
SD	112.11	159.65	159.83	148.27	111.45
Mean Comprehension	13.40	13.57	13 62	12.95	12.22
SD	5.81	8.95	6.40	5.09	7.68

an F-ratio of 1.37, which would indicate that in general there were no significant differences among the groups. A t-test shows that the mean rate of the jazz group is significantly higher than the mean rate of the control group (five per cent level of confidence). No other mean differences were significant. Morgan[14] suggested that extra effort is put forth to compensate for distraction. It may be that the marked and regular rhythm of the jazz music aided in making extra effort. Fendrick,[4] in fact, estimated that fifteen per cent more of his distracted group finished reading than of his non-distracted group. However, Henderson, Crews and Barlow[6] have pointed out that Fendrick's groups were not actually well equated in the first place.

Table I also contains the comprehension scores for the groups used in the present study. A simple analysis of variance yielded an F-ratio of .78, which is not a significant figure. Furthermore, a subsequent t-test indicated no significant differences between any two comprehension score means. This is not in agreement with Fendrick, who obtained a statistically significant difference favoring his non-distracted group. It does, however, agree with the general conclusions of Henderson, Crews and Barlow.

There is here no reason to reject the null hypothesis that there are no significant differences in the reading rates and reading comprehension scores of the groups involved in this study.

Is the Rate of Reading and Reading Comprehension in the Presence of Music a Function of the Subject's Intelligence?

The subjects in each group were divided into three levels of intelligence on the basis of their ACE percentile rankings. These levels were: from the first to the thirty-third percentile, inclusive, from the thirty-fourth to the sixty-seventh percentile, inclusive; and from the sixty-eighth to the one hundredth percentile, inclusive. Table II contains the mean rate and comprehension scores for the subjects so classified.

TABLE II.—MEAN RATE AND COMPREHENSION SCORES FOR CONTROL AND EXPERIMENTAL GROUPS, BASED UPON THREE INTELLIGENCE LEVELS

	I	II	III	IV	V
	control	classical	popular	semi-classical	jazz
ACE percentile	n-40*	n-41	n-40	n-37	n-37
1–33					
Mean no. lines	605.38	647.73	656.36	634.31	674.14
Mean comprehension	8.25	8.18	9.27	10.62	5.43
	n-8	n-11	n-11	n-13	n-7
34–67					
Mean no. lines	627.94	658.40	656.75	677.21	727.53
Mean comprehension	12.69	11.67	11.17	12.50	13.18
	n-16	n-15	n-12	n-14	n-17
68–100					
Mean no. lines	668.44	774.20	777.35	760.40	721.31
Mean comprehension	15.81	20.33	18.12	15.30	16.54
	n-16	n-15	n-17	n-10	n-13

* These n's differ from those in Table I because the ACE scores were not available for five of the two hundred eight subjects who completed the study.

Factorial analyses of variance for rate of reading and for reading comprehension separately were undertaken upon the data in Table II, with corrections for differences in group sizes being made in accordance with Lindquist.[9] For rate of reading, insignificant F-ratios were obtained both for conditions (F = .31) and for level of intelligence (F = .33). A subsequent t-test, made from the data of the factorial analysis of variance, showed

no significant mean differences. The interaction variance was significant beyond the one per cent level (F = 45.35).

Factorial analysis of variance of the comprehension scores in Table II yielded an insignificant F-ratio for conditions (F = .24), while the F-ratio for intelligence level was significant beyond the one per cent level (F = 25.87). The interaction variance was not significant (F = 1.64). A subsequent t-test verified the absence of significant mean differences.

There is thus no indication that rate of reading or reading comprehension in the presence of music are functions of intelligence as classified in the present study, under the conditions described. This conclusion agrees with that of Hovey,[7] but is in disagreement with Mitchell,[13] Tinker,[18] and Fendrick[4] on this point.

SUMMARY

Two hundred eighty-three students in introductory psychology classes at Bowling Green State University were assigned at random to one control and four experimental groups, to test the influence of music upon reading rate and reading comprehension. The study was completed by two hundred eight subjects, with approximately forty in each group. Four types of music were played, classical, semi-classical, popular and jazz, one type for each of the four experimental groups, while they read a prepared selection in Russian history for thirty minutes. The control group read without musical accompaniment. A fifty-item comprehension test followed the reading for all groups. The data were analyzed by means of analysis of variance, factorial analysis of variance, and the t-test. These analyses revealed no significant differences in the performance of the groups, except that the jazz group read significantly faster than the control group ($P < .05$). It should be noted that the analysis of variance yielded an insignificant F-ratio for the same data. This significant *t*, then, may be suggestive, but in the present analysis it would be a mistake to attach much importance to it. No significant relationship was found between level of intelligence and the influence of music distraction upon either rate of reading or reading comprehension.

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