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The Effect of Controlled Distractions upon the Minnesota Clerical Test Results of Eighth Graders in Charleston, Illinois

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THE EFFECT OF CONTROLLED DISTRACTIONS UPON THE MINNESOTA CLERICAL

TEST RESULTS OF EIGHTH GRADERS IN CHARLESTON, ILLINOIS

(TITLE)

BY

George Steigelman

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CHAPTER I

INTRODUCTION

The Problem

The problem confronting the educational system which pertains to the distractions involved when administering a standardized test is suitably stated by Schopenhauer:

"I have long held the opinion that the amount of noise which anyone can bear undisturbed stands in inverse proportion to his mental capacity and may therefore be regarded as a pretty fair measure of it. Although there has been considerable experimentation with the effects of distraction upon simple processes, nothing, to my knowledge, has been done to determine the effects of distraction upon the higher thought processes except by Tinker, who gave an intelligence test to fifty-six students under standard conditions, and also during the intermittent ringing of two bells. He found that the distraction neither aided nor hindered average performance, but that the better students seemed to be more hindered than the poorer ones."¹

Because distractions are commonly present during the administration of standardized tests, the effects of these distractions should be studied and realized by the educators involved so that they may properly evaluate students' achievement. The teacher should also realize the imprint which distractions during

¹Tinker, M. A., "Intelligence in an Intelligence Test with an Auditory Distractor," American Journal of Psychology, XXXVI, (1925), pp. 467-468.

one test may have upon the mind of the student when he is involved in future tests. If a child has an unpleasant experience during the test, he may associate this unpleasant experience with future tests. An example of this could be a child's nose bleeding during the test and the teacher refusing to let him leave the room.

If the results obtained from standardized tests are to be of any use in the students' education, the administration, scoring, and evaluation of these tests should be undertaken properly. This should be done by creating as pleasant an atmosphere as possible for the student while taking the test and by keeping informed on the latest and most effective methods of administering the test.

PURPOSE

The aim of this study was to determine to what extent distractions affect the child during the administration of a standardized test. More research should be done in this field so that counselors and those who administer standardized tests to children in the lower grades have information which may help the counselors understand what distractions can do to a child at this age. With such information the counselor or teacher can administer tests to children in the best possible manner and with the least amount of distractions.

There was evidence from past research that music may help students comprehend material. There also has been research on various noises and their effects on students. As stated on page 1, by Finker, distractions neither aided nor hindered average performance,

but that the better students are more affected than the poorer students. Then could it be true that better students are more affected than the poorer students? Does background music help the student to achieve more because it increased the basic capabilities of the individual?

CHAPTER II

Related Research

Much research has been done on the subject of distractions, but little research has been done on the effect of distractions on a person taking such tests. M. A. Tinker of the University of Oregon and Jody C. Hall of the University of Texas are among those who have done research on the subject. Tinker gave an intelligence test to fifty-six students under standard conditions and also during the intermittent ringing of two bells. He found that: "The distraction neither aided nor hindered average performance, but that the better students seemed to be more hindered than the poorer students."² Hall did research on "The Effect of Background Music on the Reading Comprehension of 278 Eighth and Ninth Grade Students."³ He found that the background music did not increase the basic capabilities of the individual, but it did aid him to perform to the full extent of such capabilities. The major portion of the aid

²Tinker, M. A., "Effects of General Distractions on the Higher Thought Processes," American Journal of Psychology, XL, (October, 1928), pp. 585-591.

³Hall, Jody C., "The Effects of Background Music on the Reading Comprehension of 278 Eighth and Ninth Grade Students," Journal of Educational Research, XLV, (May, 1952), pp. 451-458.

given by background music was an increase in accuracy. Those students who were below average in both intelligence and achievement received more benefit from musical background than those above average. Student reaction to the use of background music in the schools was favorable.

Research on "The Effects of Radio Programs on Silent Reading Achievement of 91 Sixth Grade Students"⁴ was done by Adelle H. Mitchell of State Teachers College, Indiana, Pennsylvania. It was found that the reading achievement of the whole group was adversely affected by the variety radio program. The variety program consisted of a combination of conversation and music. The reading achievement of those with IQ's between ninety and one hundred was affected adversely by the variety radio program, but was affected adversely to a lesser degree by the musical radio program. The reading achievement of those who were more or less conditioned to the sounds of a radio was affected not less, but rather more adversely by the variety radio program and the same was true of the achievement during the musical radio program although to a lesser degree. The reading achievement of those who were not conditioned was slightly better during the variety radio program, although the difference was not statistically significant. The reading achievement of this group was somewhat greater during the musical radio program, but this difference was not statistically significant.

⁴Mitchell, Adelle H., "The Effects of Radio Programs on Silent Reading Achievement of 91 Sixth Grade Students," Journal of Educational Research, XLII, (May, 1949), pp. 460-470.

"The Influence of Music Distraction upon Reading Efficiency"⁵ was a research project of Paul Fendrick of Washington State College. He found that phonograph record distractions were sufficiently pertinent to question the advisability of their use if maximum study efficiency is to be obtained. Evidence was also found to indicate that the influence of music as a potential distractor more seriously affects students functioning at higher intellectual levels.

From the past research mentioned above it may be concluded that background distractions such as music seem to have a more adverse effect on students of higher intelligence than on those of a lower intelligence, and, also, background distractions helped students to perform to the full extent of their capabilities. This also increased accuracy.

⁵Fendrick, Paul, "The Influence of Music Distraction upon Reading Efficiency," Journal of Educational Research, XXXI, (May, 1938), pp. 264-271.

CHAPTER III

Procedure in Administration of the Minnesota Clerical Test

For this research two hundred and twenty-nine eighth graders from the community of Charleston, Illinois, were given a standardized test at specified time intervals without distractions and at specified time intervals with controlled distractions. Forty-five students from the Bussard Laboratory School at Eastern Illinois University and one hundred and eighty-five students from Jefferson Junior High School, Charleston, Illinois, were used for this study. These students were tested twice on the number checking section of the Minnesota Clerical Test. The number checking section was chosen to reduce the familiarity factor and the chance of discussion of possible correct answers among the students after the test. The test was given during the afternoon because this was the only convenient time available during the school day.

At the first testing all of the students from Jefferson Junior High School took the test in the school cafeteria. At Bussard Laboratory School all of the students were in one classroom. At both schools as many distractions as possible were eliminated by closing all doors.

Before the test started, the teachers who were to assist were instructed as to the nature of the test. They were also told

to check for correct procedure of the students as they were taking the test.

Prior to the second administration of the test, the students were divided into three groups. The members of these groups were chosen by random sampling. The table of random numbers which was used was taken from Hubert M. Blalock's book on Social Statistics.⁶ Each student at Jefferson Junior High School was given a number from one through one hundred and ninety. Then sixty-three students were chosen by the use of the random number table. The same procedure was used to choose members of the other two groups. The same procedure was used for the students at Buzzard Laboratory School, except that there were only seventeen students in each of three groups. These groups included one control group and two experimental groups.

For the second testing at the Buzzard Laboratory School, each group took the test alternately in the same room and under physical conditions which were as similar as possible to the first testing.

At Jefferson Junior High School the second testing was given in the cafeteria. The first group took the test a second time without any distractions, except for uncontrollable ones, such as occasional coughing. This group was the control group to which the other groups were compared. When the test was completed

⁶Blalock, Hubert M., Social Statistics, (New York: McGraw-Hill Book Co., Inc., 1960). pp.437-440.

the first group returned to their classes and the second group was seated. The purpose of this procedure was to eliminate any discussion of the test which might occur between groups. This method of exiting and entering was used by all three groups.

During the testing of the second group all conditions were the same except for the sound of rock and roll music in the background. The conditions for the third group were the same as those for the original testing except for the sound of soft music in the background. The same procedure was used by Buzzard Laboratory School in their second testing.

The materials used were five hundred copies of the Minnesota Clerical Test, a chart showing examples of the exercise in large form, a stop watch, a tape playing twenty minutes each of rock and roll music and soft music, and a Wollensak tape recorder which was set at 3.5 for both soft and loud music for both schools.

Definitions

The Minnesota Clerical Test is a vocational test for clerical workers written by Dorothy M. Andrew, Donald G. Peterson, and Howard P. Longstaff. It was published by the Psychological Corporation, New York.

This test is for students, grades eight through twelve. It is designed to test speed and accuracy in performing tasks related to clerical work. It has been found useful for selecting employees and for advising persons who wish to seek training in the clerical field. The test consists of two parts, number checking and name

checking. In order to reduce the familiarity factor and also discussion among the students only the number check section was given.

The following are sample questions taken from the test.

Samples done correctly of pairs of numbers

79542	_____	79524
5794367	✓ _____	5794367
66273894	_____	66273984
527384578	✓ _____	527384578

Controlled Distractions—Noise factors administered to the group by the tester during the test.

Soft music—Jackie Gleason album, "Today's Romantic Hits," such tunes as "Midnight San," "Fly Me to the Moon," and "Fisty."

Rock and Roll music—"Walking," "Batman," and various popular records.

Administration and Scoring of the Test

The following procedure, as described in the testing manual, was used as it has been proven successful and scientifically valid through past testings.

The test folders were distributed to the students, and they were told not to open them. When the tests were distributed, the examiner said, "Write your name on the first page." When this was done, he said, "Now read the instructions and work the sample as directed at the bottom of the page, eliminating the matching of words."

Each subject's work was checked to make sure he had completed the samples and understood the directions. The correct answers to the samples were then read and the students asked any questions about the test at this time. The examiner then said, "Be ready to open the folder, and when I give the signal, start. Begin checking those that are the same; those that are different leave blank. When I give the signal to stop, stop immediately and draw a line under the last one that you are looking at."

The examiner then said, "Now open your folder and start."

At the end of exactly eight minutes he said, "Stop and draw a line under the last one you were looking at. Close your folder and pass them forward." The students left in the manner which was discussed previously.

The scoring was done with a cardboard "strip." The score is the number of items correct minus the number wrong, up to the line drawn by the examinee. Items beyond the line were not scored. The correct items are those in which the "sames" have been checked and the "differents" left blank. Incorrect items include "sames" which have not been checked and "differents" which have been checked. The maximum score on the test is two hundred.

To summarize briefly, the test was given to all students during the first testing under normal conditions. The students in both schools were then divided into three groups. One group took the test again under normal conditions and served as a control group. The second group took the test with loud music, and the third group took the test with soft music in the background. The procedure for administration and scoring was taken directly from the test manual.

CHAPTER IV

Analysis of Results

The students of Jefferson Junior High School in the experimental group with soft music had higher scores than the students in the loud music and no music groups.

Table I shows the comparison of the achievement of all three groups from Jefferson Junior High School on the Minnesota Clerical Test administered without distractions, with rock and roll music, and with soft music. The difference between the means of the difference was 4.67 for groups one and two and 6.01 for groups one and three in favor of the test administered with distractions. There was not enough difference in the standard errors to justify conclusions of the difference. The critical ratio was 3.49 for groups one and three. This is significant beyond the one per cent level.

Table I

Comparison of the Minnesota Clerical Test
with Eighth Grade Students without Distractions
and with Rock and Roll and Soft Music
at Jefferson Junior High School

Group	Form	Mean	Standard error	Critical ratio
			of Difference	
I	Test without distractions	14.13	1.90	7.43
II	Test with rock and roll music	13.80	2.12	6.56
III	Test with soft music	20.14	1.86	10.82

The students of Buzzard Laboratory School in the experimental group with soft music had higher scores than the students in the loud music and no music groups.

Table II shows the comparison of the achievement of all three groups from Buzzard Laboratory School on the Minnesota Clerical Test administered without distractions and with rock and roll music and soft music. The difference between the means of the difference was 3.41 for groups one and two and 6.41 for groups one and three in favor of the test administered with distractions. Again standard errors are so similar as to prohibit conclusions as to difference. All critical ratios are significant beyond the one per cent level, however.

Table II

Comparison of the Minnesota Clerical Test
with Eighth Grade Students
of Buzzard Laboratory School
without Distractions and with Rock and Roll and
Soft Music

Group	Form	Mean	Standard error of Difference	Critical ratio
I	Test without distractions	16.71	3.24	5.15
II	Test with rock and roll music	19.12	3.16	6.05
III	Test with soft music	22.12	4.41	5.01

Interpretation of Results

It has generally been believed that if individuals are disturbed by distractions, they would make scores lower than they would make without these distractions. Distraction, as we know it, is something which diverts one's attention from what he is doing. In the related research, music was indicated as being a distraction. It was found that music was not a distraction, but an aid.

The mean of the difference of the scores of the two testing of the control groups of the Minnesota Clerical Test given under identical, quiet conditions was 16.71 for the Laboratory School and 14.13 for Jefferson Junior High School. When rock and roll music was played, the mean of the difference of the scores, compared to the control groups, were raised to 19.12 for the Laboratory School and 18.80 for Jefferson Junior High School. When soft music was used, the mean of the difference of the scores raised to 22.12 for the Laboratory School and 20.14 for Jefferson Junior High School. With soft music there was an improvement of 6.41 for the Laboratory School and 6.01 for Jefferson Junior High School.

Thus, the experimental groups did better than the nondistracted groups. This difference may or may not be important, but it is not susceptible to statistical interpretation. It shows that distraction was not a serious handicap to the group as a whole during eight minutes of concentrated thinking. (Eight minutes were spent in actual work on the test problems.) A longer and more exacting examination might, however, show much greater effects. Practice and familiarity may be a causative factor in all of the cases.

These results bring out another fact which is interesting. Quiet and freedom from disturbance are supposed to be necessary features of good test procedure because voluntary attention is an important factor in all so-called intelligence tests. If there are no disturbing effects of distractions, there is little need of guarding against them in mental testing procedure. If there are effects, they must, of course, be considered in the testing technique. Therefore, it can be said that perhaps testing under distractions in this experiment approached the measurement of true ability to a greater extent than testing under standard conditions.

CHAPTER V

Summary

Distractions are commonly present during the administering of standardized tests. The effects of these distractions should be studied and realized by the educators involved so that they may properly evaluate the students' grades. Research should be done in this field so that guidance counselors and those who administer tests to children in the lower grades have information which will help them understand what distractions can do to a child at this age.

Some effects of general distractions on higher mental processes have already been experimentally investigated.

Two hundred and twenty-nine eighth grade students from the community of Charleston, Illinois, were used for this study. These students were tested twice on the number checking section of the Minnesota Clerical Test. At the first testing, as many physical distracting conditions as possible were eliminated.

The test was given again in five weeks. This span of time was chosen to reduce the factor of test familiarity. Prior to the second administration of the test, the students were divided into three groups. The members of these groups were chosen by random sampling. The first group took the test over with conditions as identical as possible to the first testing. During the testing of the second and third groups all conditions were the same except

for rock and roll music and soft music respectively being played in the background.

It was previously believed that if individuals were disturbed by distractions, they would not concentrate to the best of their abilities. With the results of this study, this writer found that there is a possibility that musical distractions may aid the student in performing to the best of his ability. The results of this study tend to lean toward musical distractions being a helping hand.

Conclusions

In view of the foregoing findings the following conclusions would seem to be justifiable:

1. In the scores of the experimental groups which had soft music as a distraction there was a significant difference but not enough to draw any precise conclusions. Jefferson Junior High School had an increase of 6.10 and Buzzard Laboratory School increased 6.41.

2. The scores of the experimental groups which had rock and roll music as a distraction differed slightly but not enough to make any significant conclusions. It is believed that many students study with the radio, television, or phonograph playing. This could have some bearing on this study. Being conditioned to musical distractions could be a controlling factor.

3. With past research on musical distractions researchers have found that the intelligence quotient could be a main factor concerning the effect of distractions on students. With this thought in mind, could intelligence quotients be a factor in this study? If soft music did help the students to perform to their true capabilities, this might be a pathway to better learning in our schools. Perhaps soft music would be an asset to libraries. Would the students with the high, low, or average intelligence quotient be more affected? More research should be done in this area.

APPENDIX

GROUP I

Control Group, Jefferson Junior High School

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x ²
A	113	114	1	-13.13	172.39
B	68	64	-4	18.13	328.69
C	89	104	15	.87	.75
D	112	133	21	6.87	47.19
E	78	76	-2	16.13	260.17
F	90	104	14	-00.13	.01
G	83	101	18	3.87	14.97
H	68	67	-1	-15.13	228.91
I	103	106	3	-11.13	123.87
J	83	94	11	- 3.13	9.79
K	84	119	35	20.87	435.55
L	120	130	10	- 4.13	17.05
M	80	93	13	- 1.13	1.27
N	102	123	21	6.87	47.19
O	94	92	-2	16.13	260.17
P	52	65	13	- 1.13	1.27
Q	120	118	28	13.87	192.37
R	93	99	6	- 8.13	66.09
S	74	74	0	00.00	0000.00
T	111	117	6	- 8.13	66.09
U	80	96	16	1.87	4.93
V	76	79	3	-11.13	123.87
W	82	87	5	- 9.13	83.35
X	100	99	-1	15.13	228.91
Y	92	86	-6	20.13	405.21
Z	75	124	49	34.87	1215.91
A1	93	98	5	- 9.13	83.35
B1	73	84	11	- 3.13	9.79
C1	72	125	53	38.87	1510.87
D1	79	75	-4	18.13	328.69
E1	71	86	15	00.87	0000.75
F1	97	114	17	2.87	8.23
G1	107	113	6	- 8.13	66.09
H1	104	108	4	-10.13	102.61
I1	63	68	5	- 9.13	83.35

GROUP I - CONTINUED

Student	First Administration of Clerical Tests	Second Administration of Clerical Tests	D(x)	x	x ²
J1	62	71	9	- 5.13	26.31
K1	68	85	17	2.87	8.23
L1	67	96	29	14.87	221.11
M1	79	78	-1	15.13	228.91
N1	79	113	34	19.87	394.81
O1	110	118	8	- 6.13	37.57
P1	72	83	8	- 6.13	37.57
Q1	74	99	24	9.87	97.41
R1	108	119	11	- 3.13	9.79
S1	80	94	14	-00.13	0000.01
T1	100	108	8	- 6.13	37.57
U1	83	92	9	- 5.13	26.31
V1	125	129	4	-10.13	102.61
W1	98	130	32	17.87	319.33
X1	63	69	6	- 8.13	66.09
Y1	101	115	14	-00.13	0000.01
Z1	86	136	50	35.87	1286.65
A2	108	137	29	14.87	221.11
B2	106	100	-6	20.13	405.21
C2	96	140	44	19.87	435.55
D2	111	156	45	30.87	952.95
E2	85	104	19	4.87	23.71
F2	116	117	1	-13.13	172.39
G2	107	149	42	27.87	776.73
N=59			334		12417.61

Mean of the Difference 14.13

Standard Error of Difference 1.70

Critical Ratio 7.43

$$\text{mean}_d = \frac{D(x)}{N}$$

$$\text{Se}_{MD} = \frac{SD^D}{N}$$

$$\text{CR} = \frac{(\text{mean}_d - 0)}{\text{Se}_{MD}}$$

D(x) --- The difference of the scores of the first administration and of the second administration of the clerical test.

x --- The mean of the difference subtracted from the difference of the two scores.

GROUP II

Experimental Group, Jefferson Junior High School

Loud Music (Rock and Roll)

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x^2
A	74	77	3	-15.80	249.64
B	86	58	12	- 6.80	46.24
C	84	96	12	- 6.80	46.24
D	51	57	6	-12.80	163.84
E	73	83	10	- 8.80	77.44
F	87	98	11	- 7.80	60.84
G	86	119	33	14.20	201.64
H	92	108	16	- 2.80	7.84
I	94	112	18	-00.80	0000.64
J	86	128	42	23.20	538.24
K	78	85	7	11.80	139.24
L	100	136	36	17.20	295.84
M	100	103	3	-15.80	249.64
N	67	99	32	13.20	174.24
O	110	107	-3	-15.80	249.64
P	66	81	15	- 3.80	14.44
Q	81	98	17	- 1.80	3.24
R	87	98	11	- 7.80	60.84
S	87	102	15	- 3.80	14.44
T	68	78	10	- 8.80	77.44
U	76	78	2	-16.80	282.24
V	70	81	11	- 7.80	60.84
W	109	117	8	-10.80	116.64
X	76	93	17	- 1.80	3.24
Y	61	68	7	-11.80	139.24
Z	64	76	12	- 6.80	46.24
A1	61	95	34	15.20	231.04
B1	63	54	-9	27.50	772.84
C1	87	90	3	-15.80	249.64
D1	69	91	22	3.20	10.24
E1	71	100	29	10.20	104.04
F1	81	112	31	12.20	148.84
G1	145	193	48	19.20	368.64
H1	68	95	27	8.20	67.24
I1	77	92	15	- 3.80	14.44
J1	84	102	18	-00.80	0000.64
K1	83	100	17	- 1.80	3.24
L1	100	128	28	9.20	84.64

GROUP II - CONTINUED

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x ²
K1	83	123	40	21.20	449.44
K2	120	107	-13	31.80	1011.24
Q1	58	107	49	30.20	912.04
F1	103	137	34	15.20	231.04
Q1	68	79	11	- 7.80	60.84
R1	104	123	19	-00.20	0002.04
S1	154	194	40	21.20	449.44
T1	80	98	18	-00.80	0000.64
U1	91	120	29	20.20	408.04
V1	115	125	10	- 8.80	77.44
W1	99	131	32	13.20	174.24
X1	91	129	38	19.20	368.64
Y1	81	103	22	3.20	10.24
Z1	99	117	18	-00.80	0000.64
A2	115	136	21	2.20	4.84
B2	107	139	32	13.20	174.24
C2	110	147	7	-11.80	139.24
D2	94	104	10	- 8.80	77.44
N=56			1053		13612.40

Mean of the Difference 18.80

Standard Error of Difference 2.12

Critical Ratio 8.86

$$\text{mean}_D = \frac{D(x)}{N}$$

$$SE_{MD} = \frac{SD_D}{N}$$

$$CR = \frac{(\text{mean}_D - 0)}{SE_{MD}}$$

GROUP III

Experimental Group, Jefferson Junior High School

Soft Music

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x^2
A	96	95	-1	21.14	446.89
B	100	115	15	- 5.14	26.41
C	114	134	20	-00.14	0000.01
D	76	92	16	- 4.14	17.13
E	98	129	31	16.86	117.93
F	87	91	4	-16.14	260.49
G	83	120	37	16.86	117.93
H	101	135	34	13.86	192.09
I	136	163	27	6.86	47.05
J	76	80	4	-15.14	260.49
K	89	108	19	- 1.14	1.29
L	100	121	21	00.86	0000.73
M	109	123	14	- 6.14	37.69
N	108	134	26	5.86	34.33
O	101	114	13	- 7.14	50.97
P	68	79	11	- 9.14	83.53
Q	97	117	20	-00.14	0000.01
R	63	63	0	00.00	0000.00
S	87	105	18	- 2.14	9.15
T	91	109	18	- 2.14	9.15
U	82	117	35	14.86	220.81
V	68	107	39	18.86	355.69
W	73	95	22	1.86	3.45
X	69	128	59	36.86	1510.09
Y	76	109	33	12.86	165.37
Z	82	99	17	- 3.14	9.85
A1	114	140	26	5.86	34.33
B1	85	101	16	- 4.14	17.13
C1	81	117	36	15.86	251.53
D1	68	75	7	-13.14	172.65
E1	74	85	11	- 9.14	83.53
F1	62	90	28	7.86	61.77
G1	82	83	1	-19.14	366.33
H1	83	87	5	-15.14	229.21
I1	59	75	16	- 4.14	17.13
J1	67	68	1	-19.14	366.33

GROUP III - CONTINUED

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x ²
K1	89	104	15	- 5.14	26.41
L1	85	107	22	1.86	3.45
M2	83	89	6	-14.14	199.93
N1	112	115	3	-17.14	293.77
O1	108	114	6	-14.14	199.93
P1	109	115	6	-14.14	199.93
Q1	76	88	12	- 8.14	66.25
R1	74	79	5	-15.14	229.21
S1	107	158	51	30.86	952.33
T1	103	123	20	-00.14	0000.01
U1	119	163	44	23.86	569.29
V1	96	131	35	14.86	220.81
W1	67	95	28	7.86	61.77
X1	105	123	28	- 2.14	4.57
Y1	109	135	26	5.86	34.33
Z1	84	95	11	- 9.14	83.53
A2	115	133	18	- 2.14	4.57
B2	103	169	63	42.86	1836.97
N=54			<u>1088</u>		<u>9996.24</u>

Mean of the Difference 20.14

Standard Error of Difference 1.86

Critical Ratio 10.82

$$\text{mean}_D = \frac{D(x)}{N}$$

$$SE_{MD} = \frac{SD_D}{N}$$

$$CR = \frac{(\text{mean}_D - 0)}{SE_{MD}}$$

GROUP I

Control Group, Buzzard Laboratory School

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x ²
A	85	104	18	1.29	1.66
B	130	159	29	12.29	151.04
C	76	90	14	- 2.71	7.34
D	100	103	3	-13.71	187.96
E	109	133	24	7.29	53.14
F	102	126	24	7.29	53.14
G	66	90	24	7.29	53.14
H	111	113	29	12.99	151.04
I	86	102	16	-20.71	0000.50
J	34	114	30	13.29	176.62
K	105	115	10	- 6.71	45.02
L	101	118	17	00.29	0000.08
M	114	99	-15	-31.71	1005.52
N	67	78	11	- 5.71	32.60
N=14			<u>234</u>		<u>1918.80</u>

Mean of the Difference 16.71

Standard Error of Difference 3.24

Critical Ratio 5.15

$$\text{Mean}_d = \frac{D(x)}{N}$$

$$S_{e_{\text{MD}}} = \frac{SD_D}{N}$$

$$CR = \frac{(\text{Mean}_d - 0)}{S_{e_{\text{MD}}}}$$

GROUP II

Experimental Group, Buzzard Laboratory School

Loud Music (Rock and Roll)

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x ²
A	97	92	-5	24.12	581.77
B	77	86	9	-10.12	102.41
C	111	130	19	-00.12	0000.01
D	105	116	11	- 8.12	65.93
E	102	107	5	-14.12	199.37
F	68	75	7	-12.12	146.89
G	83	105	22	2.88	8.29
H	66	106	40	20.88	435.97
I	115	145	30	10.88	118.37
J	99	114	15	- 4.12	16.97
K	97	119	22	2.88	8.29
L	76	114	38	18.88	356.45
M	115	136	21	1.88	3.50
N	71	87	16	- 3.12	9.73
O	64	82	18	- 1.12	1.25
P	80	118	38	18.88	356.45
N=16			368		2410.68

Mean of the Difference 19.12

Standard Error of Difference 3.16

Critical Ratio 6.05

$$\text{Mean}_D = \frac{D(x)}{N}$$

$$SE_{HD} = \frac{SD_D}{N}$$

$$CR = \frac{(\text{Mean}_D - 0)}{SE_{HD}}$$

GROUP III

Experimental Group, Buzzard Laboratory School

Soft Music

Student	First Administration of Clerical Test	Second Administration of Clerical Test	D(x)	x	x ²
A	88	99	11	-11.12	123.65
B	99	129	30	7.88	62.09
C	78	87	9	-13.12	172.13
D	134	183	49	26.88	722.53
E	89	110	21	- 1.12	1.25
F	105	119	14	- 8.12	65.93
G	76	69	-7	21.12	847.97
H	95	147	52	29.88	892.81
I	97	132	35	12.88	165.89
J	132	174	42	19.88	395.21
K	67	95	28	5.88	34.57
L	98	101	3	-19.12	365.57
M	43	55	12	-10.12	102.41
N	104	131	27	4.88	23.81
O	98	129	31	8.88	78.85
P	94	91	-3	24.12	631.01
N=16			354		4685.68

Mean of the Difference 22.12

Standard Error of Difference 4.41

Critical Ratio 5.01

$$\text{Mean}_D = \frac{D(x)}{N}$$

$$SE_{MD} = \frac{SD_D}{K}$$

$$CR = \frac{(\text{Mean}_D - 0)}{SE_{MD}}$$

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