Proceedings of the Iowa Academy of Science

Volume 64 | Annual Issue Article 66

1957

Further Study on the Comparison of the Ream Motility Test with the Rotary Activity Test

Gerald G. Meier
Iowa State College

Further Study on the Comparison of the Ream Motility Test with the Rotary Activity Test[1]

By Gerald G. Meier

Introduction

The primary purpose of this study was to determine the degree of relationship, if any, between two different methods of measuring motility. Seashore (4) and others have used motility as a means of measuring skill such in musical performance. Ream's technique (3) for measuring motility has been criticized on the grounds that it is possible for a subject to tense his muscles and thus obtain a spuriously high score from involuntary tremor under certain conditions. Similarly some subjects tend to tense themselves and thus to introduce hindrances in function which seems to lower their score. It is thought that these discrepancies indicate a fault in the measurement of motility when using the Ream method.

It is considered possible that rotary tests of activity might give a truer index of the motility function than does the Ream technique. This study was designed to explore the possibility of obtaining a more valid measure of basic activity which is not subject to extraneous effects as described. These influences might consist of (a) tensing of the reciprocally enervated muscles to produce tremor, and (b) restriction of the extensity of muscle utilization due in part to the subject's interpretation of the problem. It was hypothesized that a rotary activity device, such as used here, might be an improvement over the Ream technique.

Earlier Pement (2) described a preliminary experiment designed to test this hypothesis. The present study is an attempt to explore the general hypothesis which we will state in the null form as follows: There is no relationship between the activity as by the Ream technique and that of the rotary activity test as described here.

Apparatus

Two testing devices were selected for the study. One was the conventional motility test as described by Ream (2) in which a telegraph key is used to measure ten-second samples of maximum rate of activity called tapping. A standard telegraph key set with a throw of 3 millimeters and a resistance of 50 milligrams is used.

[1] This study was made possible through a grant to the Driving Research Laboratory by the American Automobile Association.

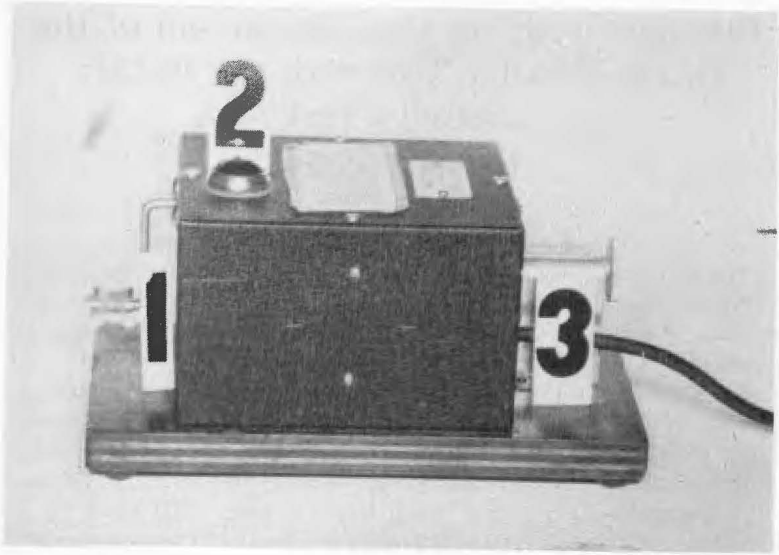

Figure 1.
Legend: 1 = crank
2 = signal light
3 = reset counter

The other device used was the rotary activity apparatus, shown in Figure 1, developed by Allgaier and Lauer. It was constructed by the Allgaier Shops in Arlington, Virginia. This is the second model developed in the Allgaier Shops to eliminate some of the undesirable features found in the original model described last year by Pement.

The rotary apparatus is used as follows: The subject places one hand on top of the instrument and turns a crank as rapidly as possible for a period of ten seconds. The test starts when a red light appears at the top. It is terminated when the red light goes off.

Comparable intervals of time were used on both instruments through the use of electric time clocks. Suitable electronic counters were used for recording the score.

The tests were given in this order for each subject and the trials were made as described in the following paragraphs.

Method and Procedure

In the use of the Ream technique, the subject is usually given four trials with the preferential hand. In the present study two trials were made with each hand. A practice trial for each hand was allowed prior to the test runs. Each trial score was tabulated on a data sheet.

In using the rotary activity device, a total of eight trials was given. The order of procedure was as follows: Two with the subject turning the crank clockwise with the right hand; two while rotating the crank counter-clockwise with the left hand; two with the subject rotating

the crank counter-clockwise with the right hand; and finally, two trials rotating the crank in a clockwise motion with the left hand. At least one practice trial was also given with each hand prior to the test.

Since it was thought that using the two hands separately might give a better index of relationship, three sets of scores were used. On the rotary apparatus it is easier to do a clockwise motion with the right hand and counter-clockwise with the left hand. Therefore this was thought necessary in order to equate the trials and make them comparable.

Results

We shall only report at this time the results obtained from the following analysis: (a) Reliabilities of each type of test in order to attenuate for the expected reationships which might be found on a full-length test. (b) Correlation between two trials with right hand on the Ream device with two trials of the right hand clockwise rotary activity. (c) Correlation between two trials with the left hand of the Ream device with two trials of the rotary activity left-hand counter-clockwise. And finally (d) Correlations of the means of two right and left hand trials of the Ream motility test with the combination of clockwise and counter-clockwise trials of both hands on the rotary activity apparatus. These are shown in Tables 1 and 2.

Eighty subjects in all were used. Only 68 were considered definitely right handed from inspection of the data obtained. Of these there were 58 men and 10 women. Their ages ranged from 18 to 57

Table 1

Reliabilities of components after correction for length by the Spearman-Brown formula	
Ream—R.H.	.96
Ream—L.H.	.93
Rotary—R.H. cw	.90
Rotary—L.H. cc	.92

Table 2
Correlations Obtained

Correlations	Raw r	Attenuated r
$r_{AA'}$	.41	.44
$r_{BB'}$	.30	.32
$r_{CC'}$	.24	*

Legend: A′ = Ream, right hand mean of 2 trials
A = Rotary, right hand, clockwise mean of 2 trials
B′ = Ream, left hand mean of 2 trials
B = Rotary, left hand, counter-clockwise mean of 2 trials
C′ = Ream, right and left hand mean of 4 trials
C = Rotary, right and left hand, clockwise and counter-clockwise mean of 8 trials
* This was not calculated because of confounding due to clockwise and counter-clockwise motions employed

years with a mean of 23.4 years. Of the 80 subjects taking part in the experiment three were ambidextrous, five were definitely left handed, and four showed some inconsistency in results obtained and were not used in the correlations. The scores of the remaining 68 subjects were used and the correlations were computed by the Pearson Product-Movement method. Tables 1 and 2 show the correlations obtained between the three various combinations of trials with reliabilities and attenuated r's for each.

Table 3 shows a comparison of means of the various set of trials analyzed.

Table 3

Means Compared—Considering Right-Handed Persons

	Mean	Differences
Ream—R.H.	67.8	——
Ream—L.H.	59.1	8.7
Rotary—R.H. cw	59.9	——
Rotary—L.H. cc	46.9	13.0
Rotary—R.H. cc	48.4	——
Rotary—L.H. cw	39.8	8.6

Conclusions

Within the limitations of the method used, number of cases studied and other sources of variance the following tentative conclusions may be stated:

1. The hypothesis that there is no relationship between the Ream test and the rotary activity test as used is rejected at the 5 per cent level of confidence and above altho they are in no sense measuring the same neuro-muscular function. With the preferential hand they have only about 20 per cent common variance.
2. The reliabilities of the two tests are approximately the same, the Ream test being slightly higher. Both were high.
3. In future validation studies it would seem that trials with both hands may be used without confounding the data so far as reliability is concerned.
4. The highest relationship was found between the two tests when using the preferential hand.
5. These tests might be used in some combination as measures of handedness. More study needs to be done on this observation.

References

1. Edwards, Allen L., Statistical Analysis for Students in Psychology and Education. New York, Rinehart and Company, Inc., 1946.
2. Pement, Howard B., Rotary Activity and Motility as Related to Hand Strength. (Paper given before the Iowa Academy of Science, 1956.)
3. Ream, Merril J., The Tapping Test. A measure of motility. Psychol. Monog., 1922, 31, 26, 293-319.
4. Seashore, Carl E., Psychology of Musical Talent. New York, Silver Burdett and Company, 1919, pp. 288.

Driving Research Laboratory
Iowa State College
Ames, Iowa

