

研究業績報告  
Technical Report

# 慢性アルコール中毒症患者に対する リクリエーション療法の統計学的評価

Statistical Evaluation of Recreation Therapy  
in Chronic Alcoholics and Schizophrenics  
—A study on effects of basketball games—

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STATISTICAL EVALUATION  
OF RECREATION THERAPY IN ALCOHOLICS

A Study on Effects of Basketball Games

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## Abstract

Basketball game therapy was introduced to chronic alcoholics and schizophrenics as one of the daily guidances. The period of the program was one year. The data obtained were statistically analyzed. There was an improvement in instantaneous output of strength in the alcoholics, but no change was observed in the schizophrenics. The recovery from inferior state of health which can be promoted by the introduction of basketball movement function is remarkably fast in alcoholics.

## 1. Introduction

The sudden increase in chronic alcoholics during recent years has created a grave social issue. Not only the establishment of a definite diagnosis, but also the administration of appropriate care and treatment are great matters of concern to those who are specialist in the field and are actually charged with their day-to-day care. At the same time, there are other major problems to be resolved, such as how to approach the chronic alcoholic so that he will accept to undergo treatment and how to sustain his interest (1).

Many chronic alcoholics have problems in maintaining a still posture, have disturbance of coordinated movement and suffer multiple neuritis in the lower extremities, and those in severe stages present clinical symptoms of ataxia identical to patients with tabes dorsalis. Further, cerebellar symptoms can be observed in those with acute ebriety. The decline of physical fitness in chronic alcoholics with such neurological physical disturbances (3), induces their low self-regard and self-acceptance. Lack of physical fitness and drinking behavior which causes physical disturbance are closely interrelated (mutual complementary relationship) (1). However, any suitable method of treatment is not established, yet. It is hoped that this study may serve as a step toward the solution to these problems.



On the other hand, chemotherapy for chronic cases of schizophrenia has made great progress during recent years which has resulted in early discharge from the hospital and rehabilitation. Thus, much attention is being focussed upon improvements in daily guidance (4-7). However, because of the emphasis in opening the ward using daily guidance, a tendency develops in society toward directing interest upon those who are comparatively close to attaining remission. That is, directing unpretentious efforts toward chronic patients whose personality and intelligence have become markedly devastated as a result of repeated recurrences. If the patient's life is a repetition of the daily routine day after day, the patient's symptoms will become fixed and hospitalism will be promoted. Therefore, daily guidance must always be an active system. Further, the items under daily guidance should not have partiality to passive ones, and a treatment schedule that gives consideration to the patient's condition should be prepared.

One of the aims of this study was to activate the chronic schizophrenics who tend to be strongly autistic and prefer to spend the whole day in bed, while for the chronic alcoholics, the purpose was to increase physical fitness so as to enhance self-regard and self-esteem and at the same time to alleviate their neurological complaints. Basketball chosen for this study includes the three basic movements of running, jumping and throwing, and serves not only to increase the basic physical strength, but also requires

coordination of agility, flexibility and delicacy. Further, this sport demands individual skills as well as team cooperation, and it also provides the players an opportunity to know others.

The subjects were alcoholics and schizophrenics hospitalized at the Senogawa Hospital, Hiroshima, Japan. With the purpose of enhancing their basic physical fitness and qualities such as agility, basketball was introduced for a period of about one year from September of 1975. The subjects first underwent such tests as EEG, ECG and tests for blood sugar, liver function and blood pressure, and were found to be free of any diseases that could be detected by these tests. The schizophrenics who participated in the games were those (35 males and 19 females) who had been hospitalized for more than 5 years and at least 90 alcoholics who had spent a long period of time in the ward. However, in this study only those who had undergone at least three basic physical fitness examinations provided at a regular schedule of once every two months were used as subjects of the study. The number of examinations by disease group are shown in Table 1, and the age distribution at the time of the first examination is presented in Table 2.

The method of basketball therapy consists of playing three one-hour games a week on the court. The therapy began with the training of basic skills of the game. Originally, it was assumed that 6 months of basic training would be sufficient, but actually 9 months were required. A total of 9 teams including two teams

## 2. Methods and Samples

The subjects were alcoholics and schizophrenics hospitalized at the Senogawa Hospital, Hiroshima, Japan. With the purpose of enhancing their basic physical fitness and qualities such as agility, basketball was introduced for a period of about one year from September of 1975. The subjects first underwent such tests as EEG, ECG and tests for blood sugar, liver function and blood pressure, and were found to be free of any diseases that could be detected by these tests. The schizophrenics who participated in the games were those (35 males and 19 females) who had been hospitalized for more than 5 years and at least 90 alcoholics who had spent a long period of time in the ward. However, in this study only those who had undergone at least three basic physical fitness examinations provided at a regular schedule of once every two months were used as subjects of the study. The number of examinations by disease group are shown in Table 1, and the age distribution at the time of the first examination is presented in Table 2.

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composed of hospital staff were organized. The patient teams represented their respective wards. The games were played under a tournament system. In order to evaluate the effects of the games on patients was conducted every other month, covering the following nineteen items.

Body build: Height, sitting height, chest circumference, weight, skinfold thickness and ventral girth,

Basic physical strength: Grip strength (bilateral), dorsal muscle strength, vital capacity, forward bend and chinning exercise (number of times or duration),

Agility: Standing broad jump, vertical standing jump, vertical running jump, burpee test (modified), Harvard step test (modified), side step test and zigzag dribble.

In addition to the above, the teams of nurses in charge evaluated the clinical, livelihood and technical aspects of the subjects on the basis of 16 items and assigned them a score of 1 to 5 at the end of each month.

The burpee test, side step test and Harvard step test were modified so that they could be applied to subjects at our hospital. The burpee test was modified so that the subjects assumed standing and push-up positions alternatively, and a count of the number of times achieved was made during a 15 second period of time. The



modified side step test required the subjects to jump side-ways left-right alternatively between two parallel lines (100 cm apart for males and 90 cm for females) and the number of times completed during a 15 second period was counted. The modified Harvard step test consists of a 2-foot high platform which the subject ascends and descends and the number of times accomplished in 15 seconds is recorded.

These data were fed and stored on magnetic disks of an electronic computer for analysis after screening the data. The computer used was the large scale and high speed HITAC 8700 of the Hiroshima University Computing Center.

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### 3. Results of Statistical Analysis

Skinfold thickness and chinning exercise are excluded for analysis because the method of measurement used were not uniform. The sample size was not large enough to extract common factors for 17 out of 19 test items selected, but an attempt was made to apply the principal component analysis and factor analysis. The values obtained were analyzed each time. The alcoholic group presented an almost identical tendency for inter-dependency among test items for each examination, but this was not necessarily the case for those with chronic schizophrenia. For example, the number of factors with eigenvalues of sample correlation matrices greater than or equal to 1.0 is 4 in the alcoholics for each examination. Table 3 contains the varimax rotated factor matrix obtained from the data of the third examination of the alcoholics, and Table 4 shows the eigenvalues of sample correlation matrix being greater than or equal to 1.0 for each examination. When the independent internal factors shown in Table 3 are interpreted from the standpoint of medicine, they may be expressed as follows.

<u>Factors</u>	<u>Interpretation</u>
1 st	Instantaneous output of strength-coordinated movement
2 nd	Somatotype I (Obesity)

3 rd           Somatotype II (Size)

4 th           Muscular strength

When a similar analysis was made on the chronic schizophrenic group, the number of factors with eigenvalues of sample correlation matrices greater than or equal to 1.0 was five for the data of the third examination and was four for the other examination as in the alcoholics. The common factors being common for alcoholics and schizophrenics are the second to fourth factors, that is, somatotypes and muscular strength. On the other hand, the first factor for alcoholics which represents instantaneous output of strength-coordinated movement are corresponding to two independent factors, that is, instantaneous output of strength factor and coordinated perservance factor in schizophrenic males.

When factor analysis for alcoholics and schizophrenics combined was performed, the number of factors with eigenvalues being greater than or equal to 1.0 was four for each examination. These four factors were the same for the alcoholics, but the third and fourth factors were interchanged. When both groups are combined, the proportion of contribution of the variance value to the total variance was about 75 percents.

The test items being greatly affected by instantaneous output of power and coordinated movement will be discussed in detail at the rest of paper which are standing broad jump, vertical jumps, burpee test, side step test, Harvard step test and zigzag dribble.

Table 5 shows the mean, standard deviation and correlation coefficient by disease and examination number where correlation coefficient is between the first and the corresponding examination. For example, the mean of zigzag dribble at the third examination for the alcoholics was 15.2 seconds, the standard deviation was 7.6 seconds and the correlation coefficient between the first examination was 0.76. Table 6 shows the correlation coefficient between the various test items based upon the results of the second examination. The \* mark given in the right upper corner show the level of significance in relation to the null hypothesis  $\rho = 0$ . As can be seen, all 7 test items have high single correlation coefficient, and Table 7 shows the partial correlation matrix when the effects of vertical running jump were removed. When the partial correlation coefficient between test items removing standing broad jump (H) are estimated for each examination and common tendencies for each examination are sought, it was found that the partial correlation coefficient  $r_{RS \cdot H}$  between vertical running jump (R) and vertical standing jump (S) only were significant for both alcoholics and schizophrenics at the time of each examination. When the  $r_{RS \cdot H}$  value is estimated from Table 6, the alcoholics should figure of 0.6685 and the schizophrenics 0.6647, and both were significant at the 0.1% level. The partial correlation coefficients between standing broad jump, vertical running jump and vertical standing jump after the effect of each remaining test item is removed singly



were generally significant. When the effects of vertical standing jump or vertical running jump was singly removed and the partial correlation coefficients between the remaining test items were sought, no item which presented a significant correlation common to each examination could be found for either group.

When the effects of zigzag dribble, burpee test, side step test, Harvard step test etc. were removed respectively, the partial correlation coefficients between vertical standing jump, vertical running jump and standing broad jump only were significant for each examination, and no other definite findings could be observed. Zigzag dribble of the alcoholics seemed to demonstrate a slightly different correlation from the six other test items. On the other hand, when the effects of the burpee test, side step test and Harvard step test are removed individually in the schizophrenics and the partial correlation coefficients between standing broad jump, vertical jumps and zigzag dribble are considered they were all significant for each examination. The other partial correlation coefficients failed to demonstrate a definite relationship in any of the examination.

*Standing broad jump:* It appears that the distance increases with each jump in the alcoholics, but no definite change in tendency can be observed in the schizophrenics. Both the mean and median distances of standing broad jump are significantly greater in the alcoholics (excluding the first and fifth examinations).

*Vertical standing jump:* Both the alcoholics and schizophrenics showed a tendency for the distance  $y$  cm to increase with examination. When  $x$  is the elapsed time in weeks from the the first examination, the regression line may be obtained by the following.

$$\text{Alcoholics: } y = 29.6 + 0.064 x$$

$$\text{Schizophrenics: } y = 26.8 + 0.036 x$$

No significant differences in both the slope and the  $y$ -axis intercept could be observed between the two groups. Further, although there was no statistically significant difference between the two groups in the mean and median, there was a tendency for the alcoholics to jump a greater distance (excluding the sixth examination).

*Vertical running jump:* The distance jumped by the alcoholics increased with each examination and both the mean and median values were greater than the schizophrenics, but the differences were not statistically significant.

*Side step test:* Both groups showed an increase in number of side steps with each examination, particularly the increase demonstrated by the alcoholics was remarkable. Comparison of the two groups showed that at the time of the first examination, there were no statistically significant differences in the means and medians.

However, with each examination the differences gradually increased, (Figure 1) and by the fourth examination they were statistically significant.

That is, the alcoholics recover quicker in coordination, perseverance

and agility than the schizophrenics. The regression line based on the number of side steps and the elapsed time in weeks can be obtained from the following.

$$\text{Alcoholics: } y = 8.60 + 0.047 x$$

$$\text{Schizophrenics: } y = 7.94 + 0.015 x$$

*Burpee test:* Both groups showed increase in the values (number of times) with each examination. The means and medians for the alcoholic group were low for the first two examinations, but from the third and subsequent examinations, the alcoholics persistently had a higher score than the schizophrenics. The linear regression lines based upon number of burpee test and the elapsed time in weeks were obtained from the following. (Figure 2)

$$\text{Alcoholics: } y = 5.82 + 0.050 x$$

$$\text{Schizophrenics: } y = 6.43 + 0.010 x$$

Further, the linear regression lines for amount of variation (z) as compared to the first examination over elapse of time (x) in weeks were sought from the following.

$$\text{Alcoholics: } z = 0.89 + 0.028 x$$

$$\text{Schizophrenics: } z = 0.16 + 0.007 x$$

*Harvard step test:* Both groups indicated an increase in score (number of times) with each examination. Although there was no

significant differences in means and midians between the two groups during the first two examinations, the differences became significant from the third to fifth examinations. Further, as can be seen from the following regression lines, the alcoholics showed a tendency of earlier improvement than the schizophrenics. The regression lines based upon number of times and elapsed time in weeks can be drawn from the following.

Alcoholics:  $y = 8.43 + 0.042 x$

Schizophrenics:  $y = 7.69 + 0.028 x$

*Zigzag dribble:* The time required gradually decreased with each examination in both groups, the mean and median times required for the fourth to sixth examinations were significantly lesser than those for the first two examinations. Although no significant differences between the two groups could be observed for the means and medians, the alcoholics tended to required 1 to 2 seconds more than the schizophrenics. The linear regression lines plotted from the time required (y) and elapsed time (x) in weeks was sought from the following.

Alcoholics:  $y = 17.1 - 0.090 x$

Schizophrenics:  $y = 15.6 - 0.065 x$



#### 4. Discussion

Daily guidance is said to be an indispensable treatment measure for psychiatric cases and has a long history. For example, movement activities may be a role in the preliminary stages of psychiatric rehabilitation. However, there is a lack in a convincing theory on its actions and mechanism of its effects as well as a great paucity in scientific data.

Levy (8) postulated that severely disorganized and chronic schizophrenic patients function at a primal learning stage, which takes place through movement, and that this primitive cognitive level must be transcended before higher-level thought processes can evolve. This postulate may be applied to the developmental treatment of the chronic psychiatric cases whose mental function is severely disorganized. That is, recognition of both thought and facts in adult mental cases are similarly promoted by action.

When certain movement responses had become habits before the development of mental disorder in psychiatric patients, it is reported that such movements are particular by effective in bringing about recovery of the patients disease state. Levy has pointed out that basic sports are most suited for this type of movement. Gary (3) has reported hospitalized alcoholics who jogged a mile a day for 20 days improved their cardiovascular fitness and their self-esteem, and slept better. Fransel et al (9) recognized the importance of physical fitness in the treatment of chronic alcoholics and suggested to introduce various types of exercise into his therapy.

This is part of preliminary report on the effectiveness of basketball games introduced as a supplementary measure for daily guidance of chronic alcoholics and schizophrenics. That is, the findings on schizophrenic female and other test items will be released in a subsequent report, and review was limited in this paper to several test items which required instantaneous output of strength and coordinated movement in males. The results of evaluation thus far indicate that the 16 items for evaluation from the standpoint of one providing care, are not highly sensitive, and that there is a need to revise the evaluation sheet. In the future, it is felt it will be necessary to give consideration to the patient's self-concept, self-regard, personality and other objective views. Further, a control group was not established for this study because of the small sample size, but it is felt that such a group should be formed when carrying out studies on the relationship between drinking behavior, diminished physical fitness and neurological disturbances, and basketball therapy.

If the 17 test items, those which presented a pattern for common factors are the same for both groups. These independent internal common factors are instantaneous output of strength-coordinated movement, somatotype I (obesity), somatotype II (size) and muscular strength.

Of the various test results, zigzag dribble presents findings markedly different from the others. Standing broad jump, vertical

standing and running jumps which require instantaneous output of strength showed gradual increase in values with each examination in the alcoholics, but they were no significant. On the other hand, changes could not be observed in the schizophrenics.

These were improvement in both groups for side step test, burpee test and Harvard step test. Particularly, the alcoholics demonstrated marked improvement over the schizophrenics. In the burpee test, the alcoholics were inferior to the schizophrenics during the first two examinations, but from the third examination on their values were better. As for zigzag dribble, the schizophrenics had better results, but the time required in both groups has decreased.

From the above, it has been found that since the introduction of basketball therapy, the instantaneous output of strength has improved in the alcoholics, but there was not so in the schizophrenics. In movements of perseverence which require coordination, the alcoholics appear to recover much quicker. Generally although various functions in both groups are decreased, the alcoholics are more superior in physique and physical fitness than the schizophrenics. A few obesity indices of both groups were compared, but they failed to demonstrate any significant difference. It appears evident that basketball therapy does promote the recovery of decrease in function. Also, the recovery of function of coordinated movement in the alcoholics is remarkable.

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 Table 1: Number of Physical Fitness Examination Received  
 . (Japanese).

Disease	Total	Number of Examinations			
		6	5	4	3
Chronic Alcoholism	25	8	10	16	25
Chronic Schizophrenia	26	9	17	25	26

Test Items	Factor 1	Factor 2	Factor 3	Factor 4	Communality
17. Sidzad quipple	-0.24213	0.12212	-0.52312	-0.42434	0.20118
18. Haulvarg step test	0.12222	0.11042	-0.11122	0.11082	0.21113
19. Ziqe step test	0.12223	-0.13020	0.01520	0.50855	0.21252
20. Bubbles test	0.12223	-0.13020	0.01520	0.50855	0.21252
21. Running jump	0.12223	0.03822	0.12144	-0.00018	0.25884
22. Vertical step jump	0.12223	0.03822	0.12144	-0.00018	0.25884
23. Forward jump	0.12223	0.03822	0.12144	-0.00018	0.25884
24. Back jump	0.12223	0.03822	0.12144	-0.00018	0.25884
25. Chronic	0.12223	0.03822	0.12144	-0.00018	0.25884
26. Alcoholism	0.12223	0.03822	0.12144	-0.00018	0.25884
27. Chronic Schizophrenia	0.12223	0.03822	0.12144	-0.00018	0.25884
28. Height	0.12223	0.03822	0.12144	-0.00018	0.25884
Total	25	2	4	9	2
Age	26-30	31-35	36-40	41-45	46-50
51+	21-25	26-30	31-35	36-40	41-45

Table 3: Varimax Rotated Factor Matrix -- At third examination of chronic alcoholics

Table 3: Varimax Rotated Factor Matrix -- At third examination of chronic alcoholics

Test Items	Factor 1	Factor 2	Factor 3	Factor 4	Communality
1. Height	-0.18386	-0.07166	0.96944	-0.13921	0.99813
2. Chest circumference	-0.12074	0.77486	0.18927	0.33183	0.76092
3. Sitting height	0.04225	0.14654	0.83622	0.06391	0.72661
4. Weight	0.04574	0.84266	0.03433	0.22979	0.76615
5. Ventral girth	-0.01795	0.90162	-0.09020	-0.15269	0.84470
6. Grip strength, right	0.19146	0.40829	0.48975	0.49310	0.68636
7. Grip strength, left	0.23552	0.35580	-0.07570	0.66119	0.62497
8. Vital capacity	0.26012	-0.01874	0.39143	0.15466	0.24515
9. Back strength	0.13679	0.41818	0.06366	0.46737	0.41608
10. Forward bend	0.54907	-0.01565	0.04102	0.50966	0.56316
11. Standing broad jump	0.83207	-0.08256	0.09013	0.31876	0.80888
12. Vertical standing jump	0.94852	0.02677	0.22268	-0.06539	0.95427
13. Running jump	0.89514	0.03865	0.16144	-0.00078	0.82884
14. Burpee test	0.75538	0.21647	-0.28742	0.22317	0.74987
15. Side step test	0.78653	-0.13090	0.01260	0.20822	0.67929
16. Harvard step test	0.76669	0.17046	-0.17795	0.17085	0.67773
17. Zigzag dribble	-0.54913	0.15675	-0.26315	-0.45434	0.60178

Table 4: Eigenvalues of Sample Correlation Matirx  
Being Greater Than or Equal to 1.0  
(Chronic Alcoholics)

Examination Number	Factor 1	Factor 2	Factor 3	Factor 4
1	4.48881 26.4	3.86466 49.1	2.15257 61.8	1.41450 70.1
2	5.63077 33.1	3.69391 54.9	2.02733 66.8	1.25798 74.2
3	6.08360 35.8	3.25679 54.9	2.46872 69.5	1.13761 76.2
4	8.38850 49.3	2.74381 65.5	1.59512 74.9	1.31932 82.6
5	7.45031 43.8	3.00576 61.5	2.32468 75.2	1.52619 84.2

Upper: Eigenvalues

Lower: Percents of eigenvalues



Table 5: Means and Standard Deviations of  
Agility Test Results

Examination Number	Alcoholics			Schizophrenics		
	Mean	S. D.	Corr. Coef.	Mean	S. D.	Corr. Coef.
Zigzag Dribble (Unit: Second)						
1	18.0	6.6	-	17.0	7.0	-
2	15.7	8.0	0.80	14.9	5.0	0.61
3	15.2	7.6	0.76	13.5	5.1	0.77
4	13.8	4.7	0.72	12.4	2.7	0.63
5	12.9	4.2	0.60	13.9	4.0	0.45
6	13.6	3.8	0.81	11.8	2.9	0.13
Standing Broad Jump (Unit: cm)						
1	181.6	32.0	-	168.6	43.1	-
2	183.9	31.9	0.90	165.3	33.6	0.81
3	189.2	35.1	0.94	159.3	36.3	0.82
4	191.0	25.1	0.71	164.4	35.0	0.83
5	184.5	29.7	0.87	166.1	34.2	0.71
6	191.8	23.4	0.81	163.7	27.4	0.74

Table 5 (Continued): Means and Standard Deviations of  
Agility Test Results

Examination Number	Alcoholics			Schizophrenics		
	Mean	S. D.	Corr. Coef.	Mean	S. D.	Corr. Coef.
Vertical Standing Jump (Unit: cm)						
1	29.6	8.4	-	27.4	10.3	-
2	29.2	7.7	0.90	26.1	8.4	0.76
3	30.9	8.3	0.91	26.2	10.5	0.66
4	34.1	7.6	0.87	26.3	11.3	0.58
5	31.9	5.6	0.78	28.8	8.7	0.52
6	31.5	5.4	0.72	31.7	9.8	-0.36
Vertical Running Jump (Unit: cm)						
1	31.0	10.3	-	29.8	10.8	-
2	32.0	7.6	0.86	27.4	9.5	0.69
3	33.5	9.4	0.78	28.6	9.6	0.77
4	35.6	8.9	0.66	29.0	11.9	0.68
5	35.1	5.5	0.67	30.0	11.9	0.54
6	34.7	5.6	0.65	27.2	9.1	0.29

Table 5 (Continued): Means and Standard Deviations of  
Agility Test Results

Examination Number	Alcoholics			Schizophrenics		
	Mean	S. D.	Corr. Coef.	Mean	S. D.	Corr. Coef.
Harvard Step Test (Unit: Time)						
1	8.5	2.0	-	7.4	2.8	-
2	8.3	1.9	0.79	8.0	2.9	0.89
3	9.3	2.8	0.28	9.1	3.5	0.81
4	10.1	1.8	0.41	8.4	2.5	0.63
5	10.0	1.6	-0.17	8.2	2.4	0.38
6	11.0	1.5	0.36	9.7	2.7	0.65
Side Step Test (Unit: Time)						
1	8.1	2.0	-	7.8	2.4	-
2	8.8	2.1	0.80	7.9	2.7	0.51
3	9.9	2.4	0.62	8.7	2.1	0.30
4	10.9	2.6	0.51	8.4	2.4	0.53
5	10.7	2.8	0.44	8.4	1.7	0.36
6	10.1	2.2	0.89	8.8	2.0	0.06

Table 5 (Continued): Means and Standard Deviations of  
Agility Test Results

Examination Number	Alcoholics			Schizophrenics		
	Mean	S. D.	Corr. Coef.	Mean	S. D.	Corr. Coef.
Burpee Test (Unit: Time)						
1	5.4	1.3	-	6.5	3.1	-
2	5.9	1.3	0.62	6.4	2.3	0.53
3	7.2	1.5	0.50	6.9	1.7	0.72
4	7.8	1.2	0.22	7.0	1.8	0.65
5	8.3	0.8	0.18	6.2	1.8	0.50
6	8.1	1.6	0.71	7.4	1.1	0.62

Note: See the footnote of Table 1.

Table 5: Correlation Coefficients between Tests Requiring  
Instantaneous Output of Strength-Coordinated Movement

Table 6: Correlation Coefficients between Tests Requiring  
Instantaneous Output of Strength-Coordinated Movement

	Vertical standing jump	Vertical running jump	Zigzag dribble	Burpee test	Side step test	Harvard step test
Vertical standing jump	0.7976 ***	0.7882 ***	-0.5081 **	0.4109 *	0.5761 **	0.7981 ***
	0.7226 ***	0.7753 ***	-0.6678 ***	0.4683 **	0.4918 **	0.4968 **
Vertical standing jump		0.9106 ***	-0.7452 ***	0.5313 **	0.7471 ***	0.6654 ***
		0.8504 ***	-0.4976 **	0.3807 *	0.4904 **	0.2267 **
Vertical running jump			-0.6772 ***	0.3644 *	0.7502 ***	0.6243 ***
			-0.5300 ***	0.5068 **	0.5278 **	0.3957 *
Zigzag dribble				-0.5650 **	-0.7021 ***	-0.5348 **
				-0.4784 **	-0.3551 *	-0.4968 **
Burpee test					0.5728 ***	0.4453 *
					0.3790 *	0.3623 *
Side step test						0.6088 ***
						0.3981 *

Note: See the footnot of Table 7.

Table 7: Partial Correlation Coefficients between Tests Requiring  
Instantaneous Output of Strength-Coordinated Movement  
(Excludes Effects of Vertical Running Jump)

	Vertical standing jump	Zigzag dribble	Burpee test	Side step test	Harvard step test
Standing broad jump	0.3598 0.1905	-0.2990 -0.4797*	0.3719 0.1385	0.1876 0.1541	0.6365*** 0.3276
Vertical standing jump		-0.5731*** -0.1051	0.5344** -0.1109	0.2667 0.0931	0.3143 -0.2272
Zigzag dribble			-0.4868* -0.2870	-0.3227 -0.1047	-0.3747 -0.3686
Burpee test				0.4761* 0.1523	0.3901 0.2043
Side step test					0.3647 0.2426

Notes: Upper and lower figures are, respectively, chronic alcoholics and schizophrenics.  
The \* is level of significance for the null hypothesis  $H_0: \rho = 0$ .  
\*  $0.01 < p \leq 0.05$ , \*\*  $0.001 < p \leq 0.01$ , \*\*\*  $p \leq 0.001$ .

\*  $0.01 < b < 0.02$ ,  
 the \* is level of significance:  $b = 0$ .  
 notes: higher and lower values are, respectively, chronic alcoholics and schizophrenics.

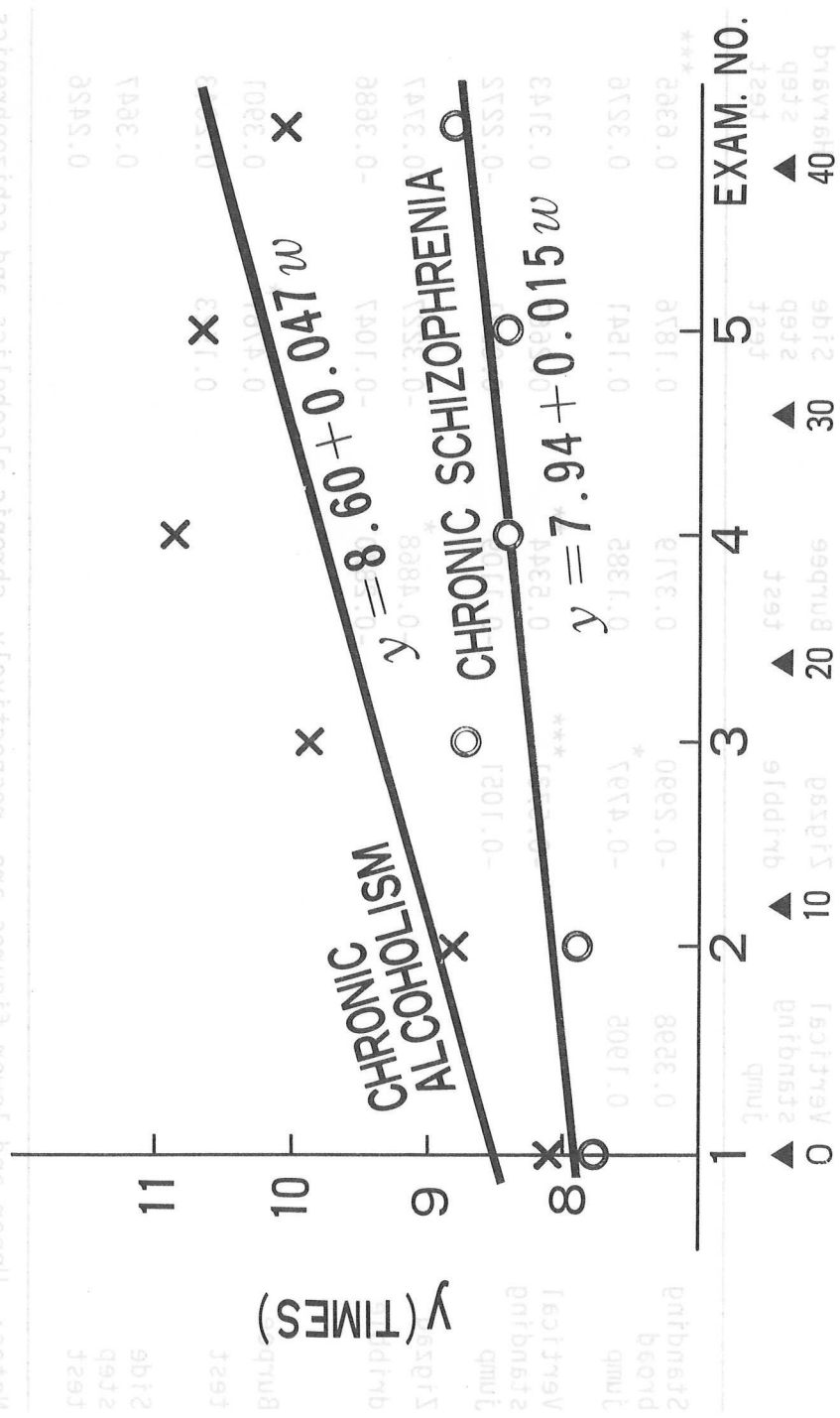


FIGURE 1: SIDE STEP TEST



# BURPEE TEST

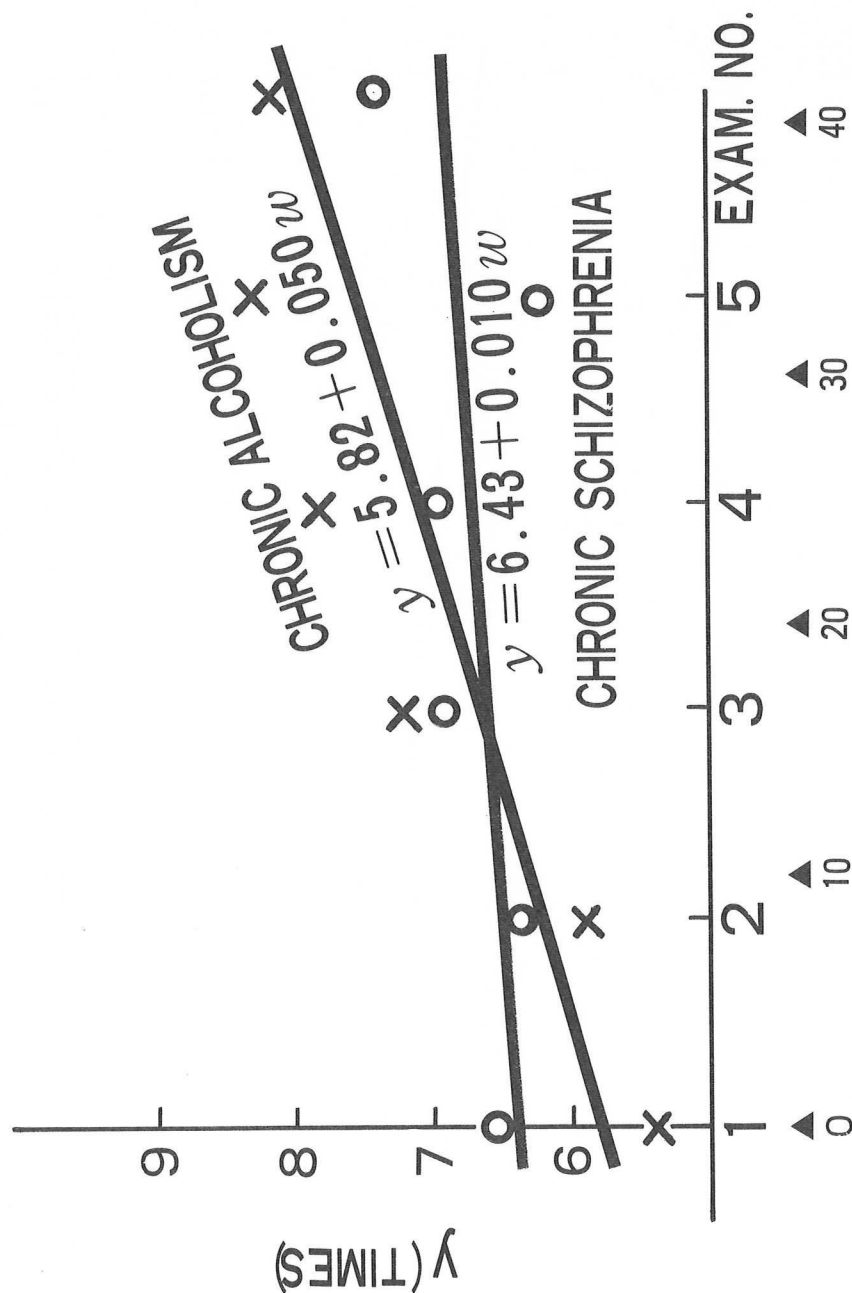


FIGURE 2: BURPEE TEST

ICAA 1977

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