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ARMY MEDICAL RESEARCH LABORATORY

FORT KNOX, KENTUCKY

REPORT NO. 140

10 June 1954

EVALUATION OF THE HARVARD STEP TEST WITH RESPECT TO FACTORS OF HEIGHT AND WEIGHT

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*Subtask under Human Engineering Studies, AMRL Project No. 6-95-27-001, Subtask, Relation of Physical Training to Operational Performance.



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RESEARCH AND DEVELOPMENT DIVISION
OFFICE OF THE SURGEON GENERAL
DEPARTMENT OF THE ARMY

REPORT NO. 140

EVALUATION OF THE HARVARD STEP TEST WITH RESPECT
TO FACTORS OF HEIGHT AND WEIGHT

by

Jack D. Reedy, Capt, M. C. and George L. Saiger, Capt, M. C.

from

ARMY MEDICAL RESEARCH LABORATORY
FORT KNOX, KENTUCKY
10 June 1954

*Subtask under Human Engineering Studies, AMRL Project No. 6-95-20-001, Subtask, Relation of Physical Training to Operational Performance.

Report No. 140
Project No. 6-95-20-001
Subtask AMRL S-4
MEDEA

ABSTRACT

EVALUATION OF THE HARVARD STEP TEST WITH RESPECT TO FACTORS OF HEIGHT AND WEIGHT

OBJECT

To determine whether or not factors of height and weight are important in regard to a man's scoring ability on the Harvard Step Test.

RESULTS AND CONCLUSIONS

According to methods of analysis employed in this study, results would seem to indicate that scoring is not dependent on a combined height-weight factor or the height factor, but scoring may be influenced by the weight factor - relatively heavy men tending to show slightly lower scores.

RECOMMENDATIONS

None.

Submitted 15 February 1954

by

Jack D. Reedy, Capt., M. C.

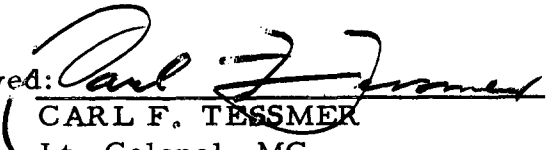
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EVALUATION OF THE HARVARD STEP TEST WITH RESPECT TO FACTORS OF HEIGHT AND WEIGHT

I. INTRODUCTION

A modified form of the Harvard Step Test (1,2) was employed as one of the tests of physical condition in studies conducted to evaluate the effectiveness of the physical training program during the basic infantry training cycle (3). During the course of these studies, the question arose as to whether or not the height and weight of an individual significantly altered his scoring ability.

The availability of pertinent data on 1126 test subjects offered an opportunity to evaluate the influence of height and weight factors on Harvard Step Test scores.

II. EXPERIMENTAL PROCEDURE

A. Test Subjects

The test subjects* were Army inductees or enlistees who had been assigned to Fort Knox for basic infantry training. They were a non-select group in that they included the entire range of physical profiles which is currently acceptable for military service.

B. Method of Collecting Data

The Step Test was run twice on each subject, once at the beginning of the basic training cycle and again during the eighth week, at the end of training. For purposes of this evaluation, only the scores made on the final test were used. The subjects were weighed and measured for height (wearing only socks and shorts) prior to being given the Step Test. The test was administered and scored in accordance with outlined methods (1).

C. Methods of Analysis

Since extremes of weight are somewhat limited by height, it was decided to classify the subjects according to a scheme that would permit an evaluation of the test scores in relation to height-weight factors taken in combination with each other. All of the 1126 individuals were classified according to the height and weight scales given in the correlation table

*For detailed information see (3)

(Table 1). The height scale was partitioned into equal thirds, then the weight scale was divided into equal thirds, (separately for each height category) as shown by the lines on the distribution table and the 9 categories shown in Table 2. The range for each central group of both height and weight was small as compared to that of the other groups due to the normal distribution of the data. The division into thirds and the limits for each category do not necessarily reflect any accepted standards for height and weight. They were merely arbitrarily made in order to render the data suitable for comparing relative differences in scoring.

The Step Test scores were distributed in a skewed fashion as shown in Figure 1. For purposes of classification by scores, the group median was selected as the division point. The two test score categories were 75 and below, and 80 and above. These categories are referred to as low and high scoring.

III. RESULTS AND CONCLUSIONS

As can be seen from Table 2, the percentages of high scores for each of the height-weight categories were not markedly different. The obtained chi square of 10.210 with 8 degrees of freedom was not significant at the .05 level.

When the height factor was analyzed separately (Table 3) it was found not to be a significant factor in scoring (chi square was 0.159 with 2 degrees of freedom).

Inspection of the last column in Table 2 indicates that heavy men had relatively fewer high scores than the light men. Analysis of the weight factor separately (Table 4) showed that the lighter men did score significantly higher on the average than the heavier men (chi square was 6.920 with 2 degrees of freedom). This difference, although statistically significant is not marked (maximum average difference of only 9.5%).

It may be stated that for the type of subject used (young Army trainees) and according to the methods of analysis presented, combined height-weight factors or the height factor alone have no significant influence on scoring on the Harvard Step Test. However, the weight factor per se does have a statistically significant influence on scoring. For practical purposes, it might be advisable to interpret with caution any relatively low scores on extremely heavy men. The low score may be due in part to weight as well as some specific condition being tested.

V. BIBLIOGRAPHY

1. Schneider, E. C., and P. V. Kapovich, Physiology of Muscular Activity. (3rd Ed.), Philadelphia, Pa., W. B. Saunders Co., 1948.

2. Broucha, L., The Step Test: A Simple Method for Measuring Physical Fitness for Muscular Work in Young Men, Research Quart., 14: 131, 1943.
3. Reedy, J.D., Evaluation of the Effectiveness of the Physical Training Program During the Basic Infantry Training Cycle, AMRL Report No. 137, 5 February 1954.

TABLE 1
DISTRIBUTION OF 1126 TEST SUBJECTS ACCORDING TO HEIGHT IN INCH
WEIGHT

HEIGHT	WEIGHT																			
	107½	112½	117½	122½	127½	132½	137½	142½	147½	152½	157½	162½	167½	172½	177½	182½	187½	192½	197½	202½
78½																				
77½																				
76½													2							
75½												3	1	1	2	1	1			
74½												3		4	2	1				
73½							1	2	3	2	1	5	1	5	3	3	1	1	1	
72½							1	1	4	3	7	10	6	8	3	9	2	1	3	
71½					1	1	3	3	5	9	5	14	5	6	5	8	11	1	2	
70½					1	3	5	6	16	18	11	18	14	11	7	4	2	1	3	
69½						7	16	13	22	20	25	18	12	11	10	6	6	1	1	
68½			1	1	4	8	13	17	7	26	23	25	10	9	7	4		3		
67½			1	6	5	18	15	21	17	24	19	15	11	13	5	1	1	2		
66½			1	2	8	11	20	17	26	11	14	4	5	3	2	1				
65½	2	1		4	7	10	13	9	8	5	3	4	1	2					1	
64½			2	2	8	10	5	5	5	6	3	2		1						
63½		1	1	3	3	4	3	2	2				3			1				
62½		1	3		1	3	1	3	1		1									
61½			1																	
60½					1				1											
TOTALS	2	3	10	18	39	75	96	99	127	124	112	121	71	74	46	39	24	10	11	

TABLE 1
S ACCORDING TO HEIGHT IN INCHES AND WEIGHT IN POUNDS

WEIGHT																				TOTALS
167½	172½	177½	182½	187½	192½	197½	202½	207½	212½	217½	222½	227½	232½	237½	242½	247½	252½	257½		
							1												1	
2																			2	
1	1	2	1	1			2												11	
	4	2	1				2												12	
1	5	3	3	1	1	1				2									31	
6	8	3	9	2	1	3		1		1		1				1			62	
5	6	5	8	11	1	2		2										1	82	
14	11	7	4	2	1	3			1					2					123	
12	11	10	6	6	1	1	3				2								173	
10	9	7	4		3						1								169	
11	13	5	1	1	2			1											175	
5	3	2	1																125	
1	2					1				1									71	
	1																		49	
3			1																23	
																			14	
																			1	
																			2	
71	74	46	39	24	10	11	8	4	1	4	3	1		2	1		1	11	26	

TABLE 2
DISTRIBUTION OF 1126 TEST SUBJECTS ACCORDING TO HEIGHT-WEIGHT CATEGORIES AND TEST SCORES ON THE HARVARD STEP TEST

Height-Weight Categories	Scores		Totals	% of Scores 80 and Above
	75 and Below	80 and Above		
67 3/4 Inches and Below				
138 3/4 Pounds and Below	61	67	128	52.3
139 - 151 1/2 Pounds	63	59	122	48.4
151 3/4 Pounds and Above	58	59	117	50.4
			367	
68 - 70 Inches				
150 1/4 Pounds and Below	57	76	133	57.1
150 1/2 - 162 3/4 Pounds	59	70	129	54.3
163 Pounds and Above	73	57	130	43.8
			392	
70 1/4 Inches and Above				
160 3/4 Pounds and Below	53	69	122	56.6
161 - 175 1/4 Pounds	60	70	130	53.8
175 1/2 Pounds and Above	65	50	115	43.5
			367	
Total	549	577	1126	51.2

$$X^2 = 10.210$$

$$d.f. = 8$$

$$.39 > P > .20$$

TABLE 3
DISTRIBUTION OF 1126 TEST SUBJECTS ACCORDING TO HEIGHT AND TEST SCORES.

Height	Scores		Totals	% of Scores 80 and Above
	75 and Below	80 and Above		
67 3/4 Inches and Below	182	185	367	50.4
68-70 Inches	189	203	392	51.8
70 1/4 Inches and Above	178	189	367	51.5
Total	549	577	1126	51.2

$$X^2 = 0.159$$

$$d.f. = 2$$

$$.95 > P > .90$$

TABLE 4
DISTRIBUTION OF 1126 TEST SUBJECTS ACCORDING TO WEIGHT AND TEST SCORES

Weight	Scores		Totals	% of Scores 80 and Above
	75 and Below	80 and Above		
Light*	171	212	383	55.4
Medium**	182	199	381	52.2
Heavy***	196	166	362	45.9
Total	549	577	1126	51.2

* Includes lightest third of each height category. Limits vary as in Table 2.

** Includes medium third of each height category. Limits vary as in Table 2.

*** Includes heaviest third of each height category. Limits vary as in Table 2.

$$X^2 = 6.920$$

$$d.f. = 2$$

$$.05 > P > .02$$

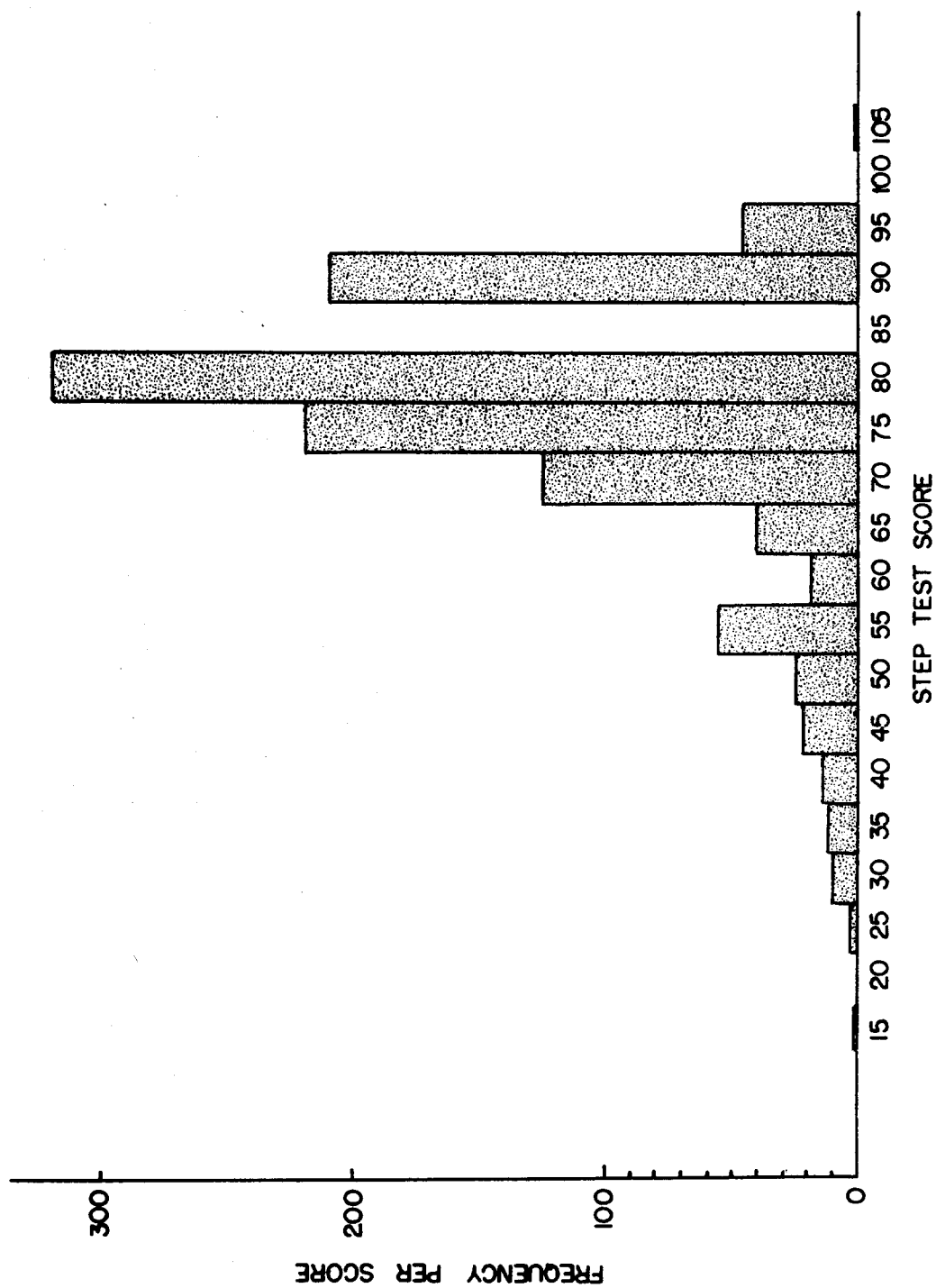


FIG. 1 - FREQUENCY DISTRIBUTION OF 1126 SCORES ON THE HARVARD STEP TEST.

Army Medical Research Lab. Project No. 6-95-20-001 Report No. 140

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15 February 1954
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This report is concerned with the relationship between height and weight factors and scoring on the Harvard Step Test. Results of studies on Army trainees would seem to indicate that test scores are not appreciably affected by a combined height weight factor or the height factor alone, but may be affected by the weight factor. Low scores in relatively heavy men may be due in part to the weight factor.

1. Physical Condition Measurement
2. Harvard Step Test.
3. Physical Training