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PHYSICAL CAPABILITIES IN A GROUP OF MENTALLY RETARDED ADULTS

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ABSTRACT. A group of young mentally retarded persons consisting of 39 men and 24 women of ages 19–39 years, undergoing habilitational industrial training under the ALA Council of the National Association for Mentally Retarded Children, were studied with bicycle ergometry, muscle strength evaluation and anthropometric measurements, and compared with a normal population. The data concerning physical work capacity were related to measures of industrial work achievement. The results are presented in table form and discussed.

For almost three years, through the initiative of the National Association for Mentally Retarded Children, a Council, ALA, has been active in Uppsala. The name ALA stands for the Swedish "Anpassning till liv och arbete" (adaptation to life and work), and one of its aims has been to decide the possibilities of habilitating young mentally retarded persons (of low intelligence level, mostly selected from schools for the educable mentally retarded) to working life. The degree of handicap of the group in question has to be first determined and the potentialities and limitations for development and habilitation are then studied. By the creation of workshops and hostels with special staffs, suitable conditions have been obtained for carrying out such a project over a long period of time (up to several years for the same group).

The investigation presented in this paper comprised a study of the physical capabilities of a group of mentally retarded persons undergoing such training in the special workshops at present. From the point of view of handicap the group was fairly homogeneous. The investigation included a study of the correlation between measures of physical capability and achievements in industrial work.

METHODS

I. *Determination of physical work capacity*

1. *Bicycle ergometry* (according to Wahlund (7)), with an electrically braked bicycle ergometer as described by Holmgren & Mattsson (4) comprised a submaximal work test with progressively increased loads (after periods of 6 min). For men, loads of 300, 600 and 900 kpm/min were usually used, and for women 200, 400 and 600 kpm/min. The loads at heart rates of 150 (W_{150}) and 170 (W_{170}) beats/min were calculated by extra- and interpolation. The heart rate, ECG, blood pressure and respiratory frequency were recorded routinely, as well as the subjective reactions of the subjects at the work test (such as tiredness, breathlessness, discomfort or pain).

On the same occasion but before the test with the bicycle ergometer, an *orthostatic test* was carried out. This consisted of recordings of changes in the heart rate, ECG, blood pressure and subjective reactions on changeover from the supine to the standing position (free standing, no support). The duration of the standing period was 8 min.

2. *Muscle strength evaluation* (according to Bäcklund & Nordgren (1)) comprised testing of the maximal isometric muscle strength. The examination was performed in standardized body positions with fixation of the examination subject so that he was given support in order to develop maximal power. Each test component was performed at least 3 times and the muscle strength was allowed to develop for at least 3–5 sec. Further tests of the same component were performed if the greatest strength was developed in the last test. The aim was thus to attain a maximal level of strength development by repeated attempts. The highest value was then recorded. Each test component was performed first on the right and then on the left side. In examining this group, special care was taken to instruct each subject on how each test component was to be done. This took considerable time, but experience has shown this to be necessary for measurements of maximal strength in persons of low intelligence. The examination routine included testing of *the upper extremities, lower extremities* and *trunk* (including the posterior trunk muscles). The different test components involve the following: *Upper extremity:* On

pulling and *pushing* (with the forearm at an angle of 90° with the upper arm), the muscles of the shoulder girdle also participate. *Handgrip* measures mainly the flexor muscles of the forearm. *Volar flexion* and *dorsal extension* involve flexion of the wrist. In the *lower extremity* the strength was tested with the knee joint flexed at 90° and the foot fixed with straps to a moveable bar, which is connected to the measuring apparatus. The *strength of the trunk* is measured by fixation with a belt at the level of the nipples, and support against a plate at the level of the lumbar region. By the fact that the same muscle groups were partly involved in several test components and that comparison could thus be made both between different test components and between the same component on the right and left sides, an assessment could be made of the motivation and cooperation of the subject.

II. *Anthropometric measurements*

The following measurements were made: *Height* (cm); *weight* (wearing a gymnastic suit; to the nearest 0.1 kg); *skinfold thickness* (to the nearest 0.1 cm), measured with calipers at the following sites: 1) on the posterior side of the right upper arm, 2) on the back at the right shoulder blade and 3) on the abdomen at the umbilicus; *skeletal widths* (right and left sides, to the nearest 0.1 cm), at the humeral epicondyles, at the wrist (radio-ulnar) at the femoral condyles, at the ankle (medial to lateral malleolus); *skeletal lengths* (to the nearest 0.5 cm)—the humerus (from the acromion to the lateral humeral epicondyle), the radius (from the capitulum radii to the styloid processes of the radii), the femur (from the greater trochanter to the knee joint), the tibia (from the knee joint to the lower margin of the tibial malleolus); *circumferences* (cm)—chest (measured above the breasts after expiration with the arms dependent), abdomen (measured at the umbilical level), extremities (cm), right and left sides with muscles relaxed, upper arm, lower arm, calf (greatest circumferences) and thigh (15 cm above the patella with the knee extended).

These examinations (bicycle ergometry, muscle strength evaluations and anthropometric measurements) were performed at the start of the period at the ALA workshops, and thus comprised initial values before training for habilitation to industrial work.

Methods for assessment of industrial work achievements

Different measures of the capacities of the trainees for productive work have been described (6). Such relative measures are: A. *Wage class.* According to their achievements in industrial work, the trainees are grouped into 4 wage classes, 1–4, with the lowest wages in wage class 1. The workshops have several departments representing a selection of ordinary work tasks, and the trainees move around these different departments. The decision on the wages of a trainee is based on the mean of the assessments of the trainee by the different work leaders. A wage class assessment of each individual trainee is made at least once a month and the wages can thus be changed monthly with variations in his work achievements. As an assessment of the industrial work achievements for the present study the mean of the wage classes of the trainee during a period of 10 months was used. (In cases where the trainee had spent less than 10 months at the workshop, the mean of the time spent there was used.)

The following values for wage classes were obtained for men (6): $\bar{X}=2.77$, $S=0{,}78$, $n=39$; and for women: $\bar{X}=2.33$, $S=0.96$, $n=24$. A histogram of the distribution of the male group showed similarity to the normal distribution curve, but the corresponding histogram for the female group showed no such similarity.

B. *Prognosis group.* Each trainee is allocated prognostically to different types of occupation: (1) pure occupational therapy, (2) work therapy, (3) industrial therapy, (4) sheltered workshop for the mentally retarded, (5) ordinary sheltered workshop, or (6) work on the open labour market; thus with better adaptation to working life with increasing figures. This assessment is made by the seven work leaders, one psychologist and one occupational therapist, by ballot voting. The assessment is made at a time point when each work leader has had the trainee so long in his department at the workshop that he has had time to judge his or her practical potentialities for these different types of occupation. These types are referred to as prognosis groups (6). In the present group of trainees this assessment was repeated on two further occasions with good agreement.

The following values for prognosis groups were obtained: $\bar{X}=3.97$, $S=1.14$, $n=39$ for men and for women $\bar{X}=3.63$, $S=1.06$, $n=24$. The histogram in this case showed a similarity to the normal distribution curve for both men and women.

In allocating a trainee to a particular prognosis group, consideration is taken of several complex functions, for example not only purely industrial work achievement but also his capacity for social adaptation, which means that high correlations with physiological measures such as physical work capacity at bicycle ergometry or muscle strength tests are not to be expected.

Correlation between the above two variables (wage class and prognosis group) gave a correlation coefficient of $r=0.76$ for men and $r=0.68$ for women.

It is particularly stressed to the work leaders that, for example, somewhat troublesome trainees should not for this reason be given a lower figure in the assessments. The possibility of using these measures of productive work for the present study was based on the advantage that the same work leaders were able to assess the group of trainees over a long period of time.

MATERIAL

The group consisted of 39 men (aged 19–39 years) and 24 women (20–31 years) who were working full-time in workshops run by the ALA Council with different work tasks and with a working time system as according to the current norms for workshop industries. Two-thirds of the pupils had previously attended schools for the educable mentally retarded, while the others did not attend such schools. Tests of their intellectual function showed an IQ variation of 30–70 (Terman & Merrill). The majority of the group lived in hostels run by the ALA Council,

Table I. *Maximal isometric muscle strength in young mentally retarded persons (men, $n=39$), in absolute values and in per cent of normal values*

$\bar{X}$ = mean value: S = standard deviation

		Right		Left		Right	Left
		$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$ %	$\bar{X}$ %
Upper extremities							
Horizontal pull	kp	33.3	9.2	31.9	7.9	80 ($p<0.0005$)	79 ($p<0.0005$)
Horizontal push	kp	27.7	6.9	26.2	7.3	71 ($p<0.0005$)	74 ($p<0.0005$)
Vertical pull downwards	kp	37.7	10.5	38.6	10.7	72 ($p<0.0005$)	76 ($p<0.0005$)
Vertical push upwards	kp	20.4	5.4	18.8	4.2	81 ($p<0.0005$)	85 ($0.0025<p<0.0005$)
Handgrip	kp	37.4	12.5	33.9	10.7	64 ($p<0.0005$)	66 ($p<0.0005$)
Volar flexion, hand	kpcm	67.8	21.8	63.9	20.2	83 ($0.025<p<0.0125$)	84 ($0.05<p<0.025$)
Dorsal extension, hand	kpcm	83.8	22.6	77.9	24.4	72 ($0.0025<p<0.0005$)	76 ($0.005<p<0.0025$)
Lower extremities							
Knee flexion	kp	19.6	4.7	18.0	4.9	68 ($p<0.0005$)	64 ($p<0.0005$)
Knee extension	kp	48.3	13.9	47.6	14.8	74 ($p<0.0005$)	74 ($p<0.0005$)
Trunk							
Forward flexion of trunk	kp	$\bar{X}=44.8$		$\bar{X}=14.0$		70 ($p<0.0005$)	
Backward extension of trunk	kp	$\bar{X}=49.6$		$\bar{X}=14.7$		66 ($p<0.0005$)	

but several trainees lived in their own homes in Uppsala.

The group investigated was fairly homogenous in so far as that their mental retardation was, as a rule, the main handicap. Only a few had other handicaps in addition, e.g. spasticity or organic heart disease.

In selecting the trainees for the ALA Council project, an attempt was made to choose a representative sample of mentally retarded persons. For this purpose a study was made of the characteristics of mentally retarded persons working in sheltered workshops in Sweden (5). The trainees selected by the ALA Council thus show essentially the same sex and age distribution, except that there are no pupils in the highest age groups. The school background of the ALA trainees also reflects, on the whole, that of the mentally retarded persons in the sheltered workshops. Most trainees are registered in the county of Uppsala or Stockholm.

Table II. *Maximal isometric muscle strength in young mentally retarded persons (women, $n=24$) in absolute values and in per cent of normal values*

		Right		Left		Right	Left
		$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$ %	$\bar{X}$ %
Upper extremities							
Horizontal pull	kp	19.8	4.0	20.5	3.3	77 ($p<0.0005$)	84 ($p<0.0005$)
Horizontal push	kp	16.4	3.4	15.3	3.6	85 ($0.0025<p<0.0005$)	85 ($0.005<p<0.0025$)
Vertical pull downwards	kp	23.0	4.1	24.0	4.8	83 ($p<0.0005$)	87 ($0.0025<p<0.0005$)
Vertical push upwards	kp	13.4	2.7	12.0	2.9	93 ($0.10<p<0.05$)	91 ($0.10<p<0.05$)
Handgrip	kp	19.8	5.7	19.2	6.5	64 ($p<0.0005$)	67 ($p<0.0005$)
Volar flexion, hand	kpcm	40.5	11.7	36.7	11.4	71 ($p<0.0005$)	72 ($p<0.0005$)
Dorsal extension, hand	kpcm	46.1	15.1	44.2	13.2	71 ($p<0.0005$)	74 ($p<0.0005$)
Lower extremities							
Knee flexion	kp	13.3	3.6	12.6	5.5	69 ($p<0.0005$)	73 ($p<0.0005$)
Knee extension	kp	30.1	10.6	30.5	10.4	59 ($p<0.0005$)	62 ($p<0.0005$)
Trunk							
Forward flexion of trunk	kp	$\bar{X}=27.9$		S = 9.4		70 ($p<0.0005$)	
Backward extension of trunk	kp	$\bar{X}=34.1$		S = 12.8		65 ($p<0.0005$)	

Table III. *Anthropometric data in mentally retarded persons (men, n = 39) in absolute values and in per cent of normal values. Body weight in kg, other values in cm*

	Right $\bar{X}$	Right S	Left $\bar{X}$	Left S	Right $\bar{X}$ %	Left $\bar{X}$ %
Medio-lateral width of						
humerus at epicondyles	7.0	0.4	7.0	0.4	97 ($0.05 < 2p < 0.025$)	97 ($0.05 < 2p < 0.025$)
wrist	5.8	0.4	5.8	0.4	95 ($0.005 < 2p < 0.001$)	97 ($0.05 < 2p < 0.025$)
femur at condyles	9.4	0.5	9.4	0.5	96 ($2p < 0.001$)	96 ($2p < 0.001$)
ankle	7.4	0.5	7.5	0.5	97	99
Length of						
humerus	32.7	2.0	32.5	2.1	97	96 ($0.05 < 2p < 0.01$)
radius	26.5	1.7	26.2	1.6	98	97 ($0.05 < 2p < 0.025$)
femur	45.3	3.2	45.4	3.3	94 ($2p < 0.001$)	94 ($2p < 0.001$)
tibia	39.2	2.7	39.2	2.6	95 ($2p < 0.001$)	95 ($2p < 0.001$)
Circumference of						
upper arm	28.5	3.3	28.4	3.2	104	106 ($0.05 < 2p < 0.025$)
forearm	26.5	2.1	26.7	3.0	101	103
thigh	47.1	4.7	47.1	4.9	98	98
calf	35.7	3.0	35.9	3.0	99	101
chest		90.4 ± 6.2			98	
abdomen		77.4 ± 9.1			103	
Thickness of skin fold						
right upper arm		1.3 ± 0.5			144 ($2p < 0.001$)	
abdomen		1.2 ± 0.6			150 ($0.005 < 2p < 0.001$)	
back		1.1 ± 0.5			138 ($0.01 < 2p < 0.005$)	
Body height		174.1 ± 7.5			95 ($2p < 0.001$)	
Body weight		68.1 ± 11.0			97	

RESULTS

Bicycle ergometry

Sixteen of the trainees (8 women and 8 men) are reported separately, since the physical work test could not be carried out satisfactorily in these persons, for the following reasons. Four were unable to keep the number of pedallings/min within the limits required for the relevant work load to be obtained, and 5 managed only one work load, which rendered impossible extra- or interpolation to a work load at a certain heart rate. Of the pupils who only managed one work load, the circulatory capacity in 3 was $\leqslant$ the mean value and in 2 $\geqslant$ the mean value. Several trainees reported different subjective symptoms which they considered to be limiting, e.g. tiredness of the legs, general exhaustion or breathlessness. Objective measures such as heart rate, respiratory frequency, degree of work load on pedalling on the bicycle and observation of the person often showed in these cases that three was no high degree of strain. The increase in heart rate on working against a load was thus usually registered as farily normal (indicating a normal circulatory functional capacity), while the subjective experiences of the trainee constituted a limitation even on clearly submaximal effort, as measured objectively. Two trainees had signs of organic heart disease. One was unable to bicycle adequately on account of a previous operation on one foot. One exhibited marked spasticity. Two trainees were so frightened of the test that it was not possible to carry it through satisfactorily. One person hyperventilated voluntarily so strongly that the work test was affected.

The results for the remaining trainees are expressed in the conventional way as calculated work load in kpm/min at a heart rate of 170 beats/min (W_{170}) or 150 beats/min (W_{150}).

The values obtained for men ($n = 31$) were:

W_{170}: $\bar{X} = 1025$, $S = 256$ kpm/min
W_{150}: $\bar{X} = 816$, $S = 229$ kpm/min

and for women ($n = 16$):

W_{170}: $\bar{X} = 752$, $S = 120$ kpm/min
W_{150}: $\bar{X} = 595$, $S = 118$ kpm/min

Table IV. *Anthropometric data in mentally retarded persons (women, n = 24) in absolute values and in per cent of normal values. Body weight in kg, other values in cm*

	Right		Left		Right	Left
	$\bar{X}$	S	$\bar{X}$	S	$\bar{X}$ %	$\bar{X}$ %
Medio-lateral width of						
humerus at epicondyles	6.1	0.5	6.1	0.5	100	100
wrist	5.1	0.4	5.1	0.4	98 ($0.025 < 2p < 0.02$)	98
femur at condyles	8.7	0.6	8.8	0.6	99	101
ankle	6.5	0.4	6.5	0.4	97	97
Length						
humerus	29.8	2.2	29.8	2.2	99	97
radius	23.8	1.8	23.6	1.8	98	99
femur	41.9	2.6	41.8	2.7	95 ($0.005 < 2p < 0.001$)	95 ($0.005 < 2p < 0.001$)
tibia	36.0	2.6	35.9	2.7	98	98
Circumference of						
upper arm	27.2	2.9	26.9	3.0	101	100
forearm	23.8	1.5	23.6	1.6	101	101
thigh	49.1	5.1	49.2	5.0	102	103
calf	35.1	3.4	35.3	3.5	97	97
chest		84.4±6.0			101	
abdomen		73.4±9.3			105	
Thickness of skin fold						
right upper arm		1.8±0.5			100	
abdomen		1.7±0.7			107	
back		1.5±0.8			94	
Body height		160.4±6.9			97 ($0.005 < 2p < 0.001$)	
Body weight		59.1±9.4			103	

The *orthostatic test* gave the following results after 8 min of standing. *1*) Increase in heart rate, $\bar{X} = 11.2$ beats/min (range = −35 to +37); *2*) Change in systolic blood pressure, $\bar{X} = -6.4$ mm Hg (range = −50 to +25); *3*) The ECG reactions were as follows: In 54 cases there was no appreciable change, in 8 cases there was a marked change of the ST–T region (with flattening corresponding to the posterior and lateral wall, of the sympathicotonic type), and in 1 case there was preexciation, which made it difficult to assess ST–T changes.

Muscle strength

The results of tests of the maximal isometric muscle strength are given in Tables I and II for men and women, respectively (mean value $\bar{X}$ and standard deviation *S*). Tables I and II give the same values expressed in per cent of mean values for a normal series (1, Nordgren, unpublished data).

Test components: the methods for volar flexion and dorsal extension have been standardized further since the normal values for men were compiled, which explains the lower scatter of the results in the male group of the present study compared with the normal persons. For the remaining test components the scatter is considerably greater between these mentally retarded trainees than between the normal persons. A *t*-test and a significance analysis of the degree of muscle strength reduction were performed. The assumption that the muscle strength of the trainees was lower was verified throughout (Tables I and II.

The *anthropometric values* in the group of trainees (Tables III and IV) showed percentually very little deviation from the normal series, compared with the muscle strength reduction which was found throughout. As regards skeletal length, the femur was, similarly, significantly shorter, and the percentual difference from the normal values was approximately the same as for the body height. The tibia was also shorter; the difference in the women was not significant, however. On

Table V. *Muscle strength measurements as a prognostic instrument in young mentally retarded persons*

$r=0.32$ ($p=0.05$). $r=0.41$ ($p=0.01$)

	Wage class		Prognosis group	
	Right	Left	Right	Left
Horizontal pull (kp)	0.47	0.50	0.58	0.58
Horizontal push (kp)	0.38	0.40	0.47	0.49
Vertical pull downwards (kp)	0.37	0.34	0.51	0.52
Handgrip (kp)			0.49	0.48
Knee extension (kp)			0.39	0.38

the average, the long bones (including the humerus and radius) were less than 100% in length, compared with the normal values, but the differences were small and only in some cases were they significant. Only the skinfold thickness in the male trainees showed any essential percentual deviation (138–150%). The *t*-test with the hypothesis $\mu_1-\mu_2=0$ showed 2 $p\leqslant 0.05$ (Tables III and IV).

In order to find out whether the results of the bicycle ergometry or muscle strength measurements showed any correlation to the work achievements of the trainees, the correlation coefficient between these respective results and the values for both wage class and prognosis group were calculated. Table V shows that in the men, the muscle strength in the upper extremities was correlated with both wage class and prognosis group. For the other muscle strength results no correlation was found. The results of the bicycle ergometry tests showed no statistical correlation either with the wage class or the prognosis group values. In the female group no correlation was found.

DISCUSSION

Several investigations have been reported on the physical achievements of mentally retarded persons. When testing these achievements it is of great importance that the actual examination procedure is explained and gone through slowly and thoroughly. Compared with normal persons, the examinations thus take a considerably longer time, especially if the cooperation of the subject is required to obtain a correct result. The subject must understand how the movement is to be carried out, so that he utilizes his physical resources to the full extent. When time is short falsely low values can be obtained, for example for muscle strength. This may explain a number of the divergent findings that have been made in different investigations of mentally retarded persons.

Bicycle ergometry. In a series of healthy men ($n=67$), Frisk et al. (3) found values for W_{170} of $\bar{X}=1050$, $S=125$ kpm/min, and in healthy women ($n=58$), $\bar{X}=750$, $S=100$. In the circulatory function tests with bicycle ergometry in the present group of trainees, the mean values obtained for physical work capacity did not deviate essentially from those of the normal series, either for men or women. On the other hand, the interindividual scatter (*S*) was large, especially in the male group. Furthermore, bicycle ergometry was not possible in all trainees.

The group of trainees thus exhibited considerably varying circulatory functional capacities (as manifested by the scatter value), which may constitute a sign of varying constitutional conditions and varying degrees of physical fitness at the time of the test. In so far as a relatively low circulatory functional capacity is an expression of physical unfitness, suitable physical activity can obviously improve the circulatory resources of the trainees. The fact that the difference in circulatory functional capacity between different trainees was considerable implies that it is essential to determine the capacity with bicycle ergometry in the individual case.

In this study the bicycle ergometry is a work test with only submaximal work loads. This means that a person who for different reasons cannot carry out this test in reality has a lowered maximal work capacity. Even though the mean value for the group that carried out the test was fairly normal, the inability in some of the persons to carry out the test must be considered when evaluating the physical work capacity of the whole group.

In many cases the previous attendance at school (and participation in gymnastics and sports) was very unsatisfactory. Further, many of the trainees had an abnormal appearance as well as behaviour pattern, which can often give rise to teasing by other school pupils, especially in gymnastics or sports when such abnormalities are more evident. Several of this group of trainees showed a direct aversion to physical training for such reasons.

This points to the possibility that the state of physical fitness in the group of trainees may be lower than in a normal population and thus there would seem to be good reason to increase their physical work capacity. Preliminary studies with gymnastic training of this group (Nordgren, unpublished data) indicate that their circulatory capacity can be increased considerably.

Several of the trainees reported limiting subjective symptoms while at the same time objective measurements (e.g. of the heart rate) indicated only a moderate degree of effort. There can be several reasons for this. The degree of motivation for making physical effort can vary. The subjective symptoms can be experienced more strongly than in normal persons. Possibly the method described by Borg (2), where the examinee estimates subjective degrees of effort, might give information in this respect. The reduced capacity of these trainees to understand spoken instruction comprises a handicap here, however. Plenty of encouragement, with praise and appeals to their competitive instinct, was given throughout the study, which made the tests easier. No evidence appears to have been reported that mentally retarded persons have a lower maximal heart rate.

The results of the *orthostatic test* showed no appreciable deviations from those of a normal population; thus indicating normal control via the vegetative (especially the sympathetic) nervous system, as demonstrated here in association with a change in body position.

The *muscle strength* was found to be lower, in all test components and in both men and women, than in the normal series (Tables III and IV). The difference was of the same order of size for both sexes. The lower muscle strength would seem to support the above assumption of a low degree of physical fitness among these trainees. In contrast to the increase in pulse rate at bicycle ergometry, the results of the muscle strength measurements are dependent upon the cooperation of the examinee. Apart from biological variation varying degrees of cooperation among the trainees in the tests of muscle strength may have contributed both to the lower mean values and to the larger scatter of the results. Several different factors thus probably contribute to the findings in these tests.

The *anthropometric measurements* (Tables III–IV) revealed, on the average no remarkable difference in skeletal lengths compared with normal values. The skeletal thickness (at the humeral epicondyles, wrist, femoral condyles and ankle) showed, similarly, no major deviations from the normal. A less well developed skeleton with poorer possibilities of attachment of the muscles cannot therefore explain the reduction in muscle strength. The skeletal development in this group of trainees thus comprised no constitutional barrier to training of the muscle strength. Measurement of the circumference of the extremities (upper arm, lower arm, thigh and calf) revealed no atrophy.

Skinfold measurements (upper arm, back and abdomen) showed in the men (but not in the women) a considerable and significant increase. The trunk circumference (chest and abdomen) did not differ significantly from the normal values, and neither did the body weight. Thus, apart from the increased skinfold thickness in the men, which cannot be explained, there were no anthropometric signs of increased body fat.

The *industrial work* of the trainees did at no stage demand great physical effort. The physical work capacity was therefore not expected to be a determining factor for the industrial work achievement. This fits also with the finding that there was no correlation between the assessment of the industrial work (wage class and prognosis group) and the results of the bicycle ergometry tests. Neither did the work in the workshops involve heavy lifting, so that this would depend upon the coarse muscle strength. Nevertheless, in the men, but not in the women, the muscle strength, especially in the upper extremities, showed a distinct correlation with both the wage class and prognosis group, a higher correlation coefficient being found for the latter (Table V). The data presented here do not allow a close analysis of these relationships.

SUMMARY

A group of young mentally retarded persons consisting of 39 men and 24 women of ages 19–39 years, were studied with bicycle ergometry, muscle strength evaluation and anthropometric measurements, and compared with a normal population. The results of the bicycle ergometry showed considerably varying circulatory capacities. Sixteen of the trainees could not perform the test satisfactorily. The muscular strength was throughout

lower than in the normal series. Except for the thickness of skinfold in man the anthropometric data revealed no big differences. The data concerning physical work capacity were related to measures of industrial work achievement.

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