ON THE VALUE OF CERTAIN PHYSICAL EFFICIENCY TESTS FOR ASSESSING ENDURANCE IN SOLDIERS.

by

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INTRODUCTION.

The present system of grading recruits for service in the various units of the army is based on the absence of deformity and organic disease, and a consideration of the "constitution". By this last element is meant a man's capacity of withstanding severe strain, or, in other words, his power of endurance. The assessment of endurance in an individual at one brief examination is difficult. At first sight one would assume the stolid phlegmatic individual to have greater stamina than the emotional mercurial type. A little thought suggests that this may not be the case. An excitable person may have enough nervous energy to drive the musculature to great exertions. Frequently persons suffering from the effects of prolonged illness will show outstanding endurance whereas the strong may soon yield to physical and mental strain. Ability in physical activity is determined by a number of factors. Ability to endure hardship and strain is determined by factors, some related to the first group and others which do not admit of comparison. A man may be a failure in physical activities demanding physical ability yet be capable

of prolonged endurance. One may stand high on the scale of physical fitness yet yield to a short period of hardship.

Physical fitness is largely a matter of the ability of the cardiovascular system to carry on under an increased burden to which it is subjected, but the will to endure, to keep going on, to force an exhausted and unwilling body to further exertions, is mental. A striking experiment illustrates in a very forcible manner the fact that the central nervous system is more easily fatigued than muscle. A person goes on lifting a weight until, under the influence of will, he is unable to lift it any more. If, without waiting for fatigue to pass off, the nerves going to the muscles are stimulated by electricity, the muscles once more contract vigorously.

A study of the primitive dances of man discloses one interesting and significant fact. These dances were often interminable affairs lasting for hours, and many were prolonged until the dancers dropped from sheer exhaustion. In all these dances no matter how primitive the people, some form of rhythmic sound was invariably produced. It may have been by the beating of drums or tom-toms, the tapping of sticks, the

clapping of hands or by vocal chanting, but without a single exception some form of auditory stimulus was supplied to the dancers. Undoubtedly the reason for its use was that it permitted the performers to carry on for a far longer period than would otherwise have been the case. It was probably evolved empirically by primitive man for the purpose of decreasing fatigue. Another example is found in troops. In marching there always comes a time when troops begin to straggle, they think they have reached their marching limits. If the band strikes up they fall into step, close up and march further. Later they begin to straggle again, and the officers go up and down the column encouraging and stimulating and again the falterers receive mental strength to keep on. If at about the time they begin to break again news comes that the enemy is just ahead and may be overcome, they will press forward once more. If then they find themselves in dangerous difficulties they will find the energy to retire and regain safety. None of these stimuli have given a man a single ounce of energy. They have merely given him the mental strength to use the physical powers he had.

The important part played by the higher cerebral function is also seen in the large increase of working

power which occurs when exercise is performed under the influence of emotional excitement or conversely in the lessened efficiency of a man who is not interested in the work he is carrying out. Athletes frequently experience a sudden emotional stimulus such as another competitor overtaking in a race, or the shouts of the spectators, which enables them to develop an unexpected reserve of strength when, apparently, they were exerting themselves to the utmost.

The amount of work done, then, depends not only on the physical condition of a man but also on the state of his mind. Morale is one of the essential factors of man power. The actual efficiency of a unit depends on what and how much each man is willing to do and this depends on the psychological state. The human machine has physical limits of function. If pushed beyond these limits it breaks down. A man tends to operate at a low rate of physiological efficiency far below the margin of safety. It can be raised only by mental stimulus such as pain, fear, enthusiasm. Under such a stimulus the human machine speeds up. An individual ordinarily exerts himself only to about 30% of his physical capacity. There is thus a reserve of power which is habitually untouched to the extent of some 70%. This reserve can only be used if the subject is in a

state of mental co-operation and is willing to make the additional effort.

What a man is mentally is dependant on two things, temperament and environment. Together they produce character. Temperament is the result of hereditary mental qualities which the individual derives from his ancestry. Environment is his surroundings to which a man attempts to adapt himself. In soldiers the environment is controlled by training. Every effort is made to influence a man's character through his environment in such a manner that he will react promptly and correctly to whatever military situation presents itself. Temperament exerts a powerful influence on morale and this quality cannot be influenced to any great extent by military training. This inconstant factor may affect greatly a man's mental co-operation and thus his power of endurance.

Ultimately, in voluntary continued effort, in spite of the will to do, the individual is forced to cease his exertions. The factor which determines whether muscular strength can be exerted to its fullest extent and which over-rides the will to do is cardio-vascular efficiency.

The physically fit man has a slow pulse rate and a powerful heart which gives him a great advantage in the

transport of oxygen both at rest and exercise. In men of comparable metabalism the heart of the fit man accomplishes its work with a wider margin of rest between beats as compared with the unfit man. The vital capacity of the lungs is likewise often greatly in excess of that of the unfit man (1, 2,) Dreyer (3) made a comparative study of the wild hare, which leads an active life, and the wild rabbit, which leads a quiet life in more or less seclusion. The wild hare was found to have double the blood volume, 30% more haemoglobin and three times more heart muscle than the wild rabbit of the same weight. The pulse rate of the wild hare is about 68 and of the wild rabbit about 200. The respiratory rate of the hare is about 18 and the rabbit about 50. It is apparent that these points of difference are relevant in a comparison of the fit and unfit man. The difference in capacity for physical endurance in these two animals is likely to be of the same order as that to be found in the fit as compared with the unfit man.

In man athletic training has been found to increase the percentage of haemoglobin and also the red corpuscles (4). Healthy subjects as compared with cases of disordered action of the heart have a slower heart rate

at rest and after exercise the rate returns to normal more rapidly (5). The size of the heart in man in relation to exercise has been studied in long distance runners (6). The hearts are larger and the pulse rate is slower than the average. Only men with hearts above average size are successful long distance runners. Orthodiagramatic measurement of the heart in athletes shows a definite enlargement of the heart in proportion to body weight. It is generally recognised that the heart is more muscular in the trained individual than in those engaged in sedentary occupations.

Endurance is related to physical fitness. A man in poor condition cannot make the prolonged effort that one physically fit will make. If endurance is directly related to physical fitness, then tests for the latter, if valid, will indicate the degree of endurance to be expected in an individual. However, individuals of equal physical fitness approach similar problems and trials with a differing psychological outlook and thus psychological aspect is one of the first importance in attempting the assessment of endurance. The weak-willed yields long before the cardiovascular system is exhausted. The determined man will press on and force his tired and unwilling body to exert its last ounce. A fit of enthusiasm at the start of an enterprise is not

is not sufficient in a soldier if the endurance to see it through to the end is lacking. The character of a man is revealed when excitement has died and hardship and obstacles multiply.

From the above consideration it appears that physical fitness and temperament are equally important. In a fatigued man an appropriate psychological stimulus will spur him on to further effort. Further, a fatigued man in poor condition may be more susceptible to the same mental stimulus than a fatigued man in a good state of physical fitness who is less impressionable. The former may thus be stimulated to make an effort greatly in excess of the latter. From the observations on athletes and animals it is obvious that certain physical characteristics are associated with the capacity for physical endurance.

The difficulty of assessing the power of endurance at a single brief examination is evident. Much depends on the intuition of the medical examiner. If physical fitness tests are valid for its assessment, then an important quality of character is measurable.

OBJECT AND METHOD.

The object of the present observation is to find a test or combination of tests suitable for application to large numbers of men, and requiring the minimum of apparatus, which will indicate a soldier's power of endurance as well as his physical efficiency. Such a test will be simple to perform; its requirements will be easily understood by the subject with a minimum of explanation from the medical examiner; the findings will be available as a figure immediately on completion of the test without calculation; its interpretation will rest with the numerical result without the necessity for explanatory notes.

For practical purposes the comparatively simple procedures in common use to estimate the physical efficiency of the healthy athlete are probably as satisfactory as the more elaborate investigations (7). Five simple tests were applied to each man.

1. Dreyer's Test.
2. Crampton's Blood Ptosis Test.
3. Breath-holding.
4. The 40 mm Test (R.A.F.).
5. Exercise Tolerance Test.

A group of 100 men were investigated. The psychological make-up and physical fitness of each subject was well known to the observer. Many of them have shown outstanding power of endurance in conditions of military stress and intense strain. Seventy three were known to be enduring. They were capable of long marches, frequently fifteen miles and often more, without exhaustion, and they were fit to perform heavy work at the end of such a march. They were muscularly strong and performed arduous manual work daily. They were not subject to minor ailments. They were as physically fit as soldiers on active service need be. This is not so fit as an Olympic athlete will be nor a professional footballer, but, nevertheless, it is a high degree of physical fitness.

The second group of twenty seven were selected for their lack of stamina. The subjects, of course, were entirely ignorant that this was the reason for their selection, for it was considered that this knowledge might influence their reactions. They were interspersed among the others during the tests. This group was comparable with the other. They had been living, dieting and working under the same conditions for many months. In general, physical appearances were similar.

Personal observation and knowledge of the character of each man revealed that he would rarely complete an arduous task, not because of physical exhaustion, but rather because of psychological weakness. Those who had been exposed to shelling and bombing carried out their duties in these circumstances less efficiently than their fellows. They lacked stamina yet were thought to be physically fit by their officers and by the writer, their medical officer. It was considered that this group was physically as fit as the other but lacked the strength of will to force their bodies to the utmost exertion.

Each man was subjected to a careful general examination of all systems. Special attention was paid to the presence of septic foci, particularly the middle ear and the teeth, sepsis of which is very common in the Army. Those with a history of recent illness or symptoms of any existing minor ailment, or with septic focus, were rejected.

Certain simple observations are useful in sizing up individuals, but they are not susceptible to standardization. They are tremor of the hands and tongue, greatly increased reflexes and poor control of the muscles in balancing.

Dreyer's Test (2) is a somatometric method correlating certain physical measurements with the vital capacity.

DREYER'S TEST. He states that it is the purpose of his tables to supply those interested with a method whereby physical fitness can be assessed on the basis of a few simple physical measurements. He claims that the method is easily learned, speedy and trustworthy. In the use of the tables no reference is made to the age of the individual because it has been found that the question of age is of little or no importance up to about 50. This agrees with the observations of other observers. The measurements are taken as follows :-

Weight; undressed.

Length; this refers to the trunk-length which is measured by sitting the subject on the floor. He places the backs of his fingers on the floor with the fingers pointing backwards, and the knees flexed, lifts the lower portion of the body backwards until the lowest bony portion of the sacrum is in contact with the front of the measuring standard. The measurement thus obtained gives the distance between the ischial tuberosities and the top of the head.

Later workers have found that there is no advantage

in using the stem length in place of the standing height. It is used in the present observation because it is the measurement referred to in the tables.

Circumference of the chest; the tape measure is placed in direct contact with the skin at the level of the nipples, the arms hanging loosely at the sides. The subject is encouraged to talk, in this way quiet natural breathing is secured, and expansion of the chest beyond the resting position is prevented. The measurement required is that of the normally breathing, not expanded, chest.

The vital capacity is estimated by a spirometer and correllated with the other findings on the tables.

Application of the Tables:-

To find out if the weight is normal:- proceed as follows:-

Having ascertained the trunk-length and the chest-circumference, find first in the appropriate table the weight corresponding to the observed trunk-length, then look up the weight for the observed chest-circumference in the following table; add the two weights together and divide by two, and the normal weight for an individual of the observed trunk-length and chest-circumference will have been obtained. This is the mean calculated weight.

This weight is now compared with the actual weight observed, and the percentage deviation above or below the normal is readily calculated. The figure derived from the Tables should always be taken as equal to 100 per cent.

If the individual represents an average type, the two weights obtained from the two measurements will be found practically identical, thus:-

EXAMPLE.

Male, aged 21 years.

Observations. Weight of the body.....157 pounds
Length of the trunk.....36 inches
Circumference of the chest.....35.5 inches

CALCULATION.

Weight derived from length of the trunk 36 inches.. 149.52 pounds (from Table).

Weight derived from circumference of the chest 35.5..... 161.76 pounds (from Table).

Averaging $\frac{149.52+161.76}{2}$ ..... 156, which is the normal weight corresponding to the observed length of the trunk and the circumference of the chest.

Subtracting the calculated from the observed weight.

157 - 156 ... 1 pound

Therefore, the person weighs one pound more than he should according to the Tables, a percentage deviation of plus 0.6.

If, on the other hand, the circumference of the chest and the length of the trunk are markedly out of proportion to each other, the weight from either one or the other may be very considerably above or below the actual weight found, although by taking the two figures toget-

her - as mentioned above - the individual will be found to have an absolutely normal weight, thus:-

EXAMPLE.

Male, aged 22 years.

Observations. Weight of the body.....162 pounds
Length of the trunk.....35⅛ inches
Circumference of the chest...36½ inches

CALCULATION.

Weight derived from the length of the trunk
35⅛ inches ..... 138.43 (from Table).
Weight derived from circumference of the chest
36½ inches..... 174.55 (from Table).

Averaging $\frac{138.43 + 174.55}{2}$ .....156 pounds, which is the normal weight corresponding to the observed length of the trunk and the circumference of the chest.

Subtracting the calculated from the observed weight
162 - 156 ..... 6 pounds.

Therefore the person weighs 3.8 per cent more than he should weigh according to the Tables.

The vital capacity is measured and the volume observed compared with the figures in the appropriate Table. The percentage deviation is calculated in a similar manner.

According to Dreyer the significant measurements are the weight calculated from the trunk-length and the chest-circumference, and the vital capacity calculated from the trunk-length, and from the trunk-length and chest-circumference. In the case records these are underlined in red.

The Tables are based on the assumption that definite relationships exist between the weight of the body, the length of the trunk and the circumference of the chest. Dreyer has shown that there exists a uniformity of their relationship to the vital capacity of the lungs, and constructed the Tables showing this relationship which enable the correct information to be gained easily and quickly.

Crampton's Blood Ptosis Test is based on the fact that vasomotor control of the splanchnic area in man undergoes a change in adjustment when the body is moved from the horizontal to the standing position. The blood ptosis test is designed to measure this function which is easily fatigued. In vigorous subjects there is a rise

of 8 - 10 mm in the systolic blood pressure in standing, while in fatigued subjects this systolic pressure will fail to rise or may fall by 10mm. Further, it was found that in strong subjects the heart rate did not increase on standing, while in the fatigued it increased by as much as 44 per minute. It was also noted that the difference in heart rate varied with the difference in blood pressure and in some cases, took the place of the blood pressure variation. In other words, the subject may show a weakness sometimes by a decrease in the systolic blood pressure and at others by an increase in the heart rate. The increase in systolic pressure is taken to indicate efficiency and the increase in heart rate deficiency.

By taking into account the systolic pressure and the changes in heart rate and by adjusting the changes of rate in terms of blood pressure variations a scale was devised.

CRAMPTON'S TABLE OF NUMERICAL STANDARDS OF FITNESS

Pulse rate increase	Systolic blood-pressure (mm) Increase						Decrease				
	10	8	6	4	2	0	2	4	6	8	10
0 - 4	100	95	90	85	80	75	70	65	60	55	50
5 - 8	95	90	85	80	75	70	65	60	55	50	45
9 - 12	90	85	80	75	70	65	60	55	50	45	40
13 - 16	85	80	75	70	65	60	55	50	45	40	35
17 - 20	80	75	70	65	60	55	50	45	40	35	30
21 - 24	75	70	65	60	55	50	45	40	35	30	25
25 - 28	70	65	60	55	50	45	40	35	30	25	20
29 - 32	65	60	55	50	45	40	35	30	25	20	15
33 - 36	60	55	50	45	40	35	30	25	20	15	10
37 - 40	55	50	45	40	35	30	25	20	15	10	5
41 - 44	50	45	40	35	30	25	20	15	10	5	0

The technique of the test is as follows. The sphygmomanometer is adjusted over the brachial artery and the patient lies down. The heart rate is counted by $\frac{1}{4}$ minutes until two successive countings are the same, this is multiplied by four and noted as the resting pulse

rate. The blood pressure is then taken by the auscultatory method. The subject stands and the heart rate is counted as before until it reaches the standing normal. The blood pressure is again taken, the differences calculated and reference is made to the scale.

Crampton says, " We can safely say that most persons in good health show an index of from 60 to 100, that a record of over 80 in a person in poor health needs explanation, and that a cause should be sought for a record below 50. A record below zero in the minus range is explicit evidence of impaired circulation, toxic state, or acute physical disturbance."

The ability to hold the breath varies with the individual. Whether this is determined by psychological factors or physiological factors is as yet uncertain. Burns(8) says breath-holding is a measure of the alkali reserve of the blood and of the determination of the subject not to give in. White (cited in 9) concluded that respiratory tests were tests of the stability of the nervous system rather than of cardiac and pulmonary conditions, and Birley found that breath-holding afforded valuable information in assessing temperament and susceptibility to shock.

In holding the breath the seated subject is instructed to expire once as deeply as possible then to inspire

fully and hold the breath as long as possible. The reason for giving up is noted. In the Royal Air Force the average time is given as sixty nine seconds, the minimum forty five. The second breath-holding is applied after exertion. When the pulse rate has recovered its normal rate after the exercise tolerance test the subject is again instructed to hold the breath as above.

THE 40 mm TEST. For this test the subject is asked to empty the lungs, take a deep breath, blow mercury in a U-tube manometer to a height of 40 mm and hold it there as long as possible without breathing. The nose is clipped and the cheeks and lips supported by one hand in such a manner that they take no part in the blowing. The average sustained time is about 40 seconds.

An important observation is the behaviour of the pulse during the time the mercury is being sustained. It is counted each period of 5 seconds. In the normal individual, starting at the 5th second, there is generally a slow, steady rise in the rate, which is sustained for the rest of the time for the hold. Stress is indicated by the marked quickening of the rate during the 5th to the 15th second, and then by a falling away in rate to normal or below. It is regarded that the efficiency of

the pulse response affords information as to the distribution of the blood within the blood vessels giving a means of estimating the degree of 'abdominal pooling' of the blood within the individual. In the fit individual there is little or no pooling, hence the maintained rise in the pulse rate. In the unfit person the return of blood to the heart is at first increased during breath holding, but later, due to pooling, it falls off.

The Exercise Tolerance Test is based on the fact that in health the heart rate is accelerated by exercise and rapidly reverts to normal after the cessation of exertion. The most easily applied form of exercise tolerance test is to make the patient step on and off a chair, this movement being performed twenty times in forty seconds. The pulse rate is noted while the patient is seated before the exercise, and again after every ten seconds till it returns to the previous figure. If during the exercise or immediately after there are signs of undue dyspnea and distress, cardiac efficiency is obviously impaired.

The above tests were carried out in sequence as follows; the general examination was made and the weight, trunk-length and chest-circumference measured.

The subject then sat at a table and exhaled into a spirometer. Five attempts were made and the best single effort was taken as the vital capacity. After a few minutes rest the first breath-holding test was performed. Crampton's test followed and then the 40 mm test. The exercise tolerance test was carried out and lastly the second breath-holding.

The results of the observations are summarised in Tables 1, 2, 3, 4, 5, Table 1 divides the subjects into two known sections, enduring and non-enduring, without relation to the tests. These qualities were known by personal acquaintance with the men. The most significant feature is that the majority who possessed endurance were fit and that the majority of those who lacked it were unfit.

In a specialised community like a battalion of A1 men the findings may not be comparable with those from a wider section of the community. It is suggested

TABLE 1

	Enduring group.		Non-enduring group.	
No. in group	73		27	
Fit.	65	89%	5	21%
Unfit.	8	11%	22	79%

TABLE 2

Group I : enduring : fit.

CASE NO.	VITAL CAPACITY c.c.	VITAL CAPACITY: % OF NORMAL (STANDING HEIGHT)	VITAL CAPACITY % OF NORMAL (DREYER)	BREATH HOLDING TEST	40mm TEST	CRAMPTON'S TEST BLOOD PRESSURE HORIZONTAL: VERTICAL: FACTOR		EXERCISE TOLERANCE. SECS. TO REGAIN NORMAL	EXERCISE TOLERANCE. O/O INCREASE IN PULSE RATE
3	4960	102%	100%	47/21	47:*	136/72:150/70	65	60	85%
4	4840	116%	105%	57/14	52:*	116/68:124/68	80	90	67%
5	4740	99%	95%	51/26	55:*	156/82:148/88	45	35	43%
6	5800	130%	112%	46/23	48:*	130/78:134/74	65	60	89%
9	4920	96%	101%	49/22	56:=	132/68:140/86	60	60	83%
10	3400	85%	78%	45/25	59:-	134/58:156/58	?	50	69%
11	4000	85%	87%	43/17	55:*	186/82:134/80	?	40	29%
12	4480	93%	90%	55/23	35:*	142/66:150/88	75	35	89%
14	5480	87%	85%	31/13	37:*	176/82:176/78	45	35	54%
15	4280	107%	101%	40/21	50:*	164/78:165/84	80	45	75%
16	5200	102%	110%	51/19	26:=	156/72:158/70	80	45	38%
17	4960	124%	102%	42/25	30:*	152/94:162/90	95	90	67%
18	5920	123%	130%	51/37	33:*	166/86:166/80	45	75	64%
22	3720	93%	86%	51/16	45:-	148/88:151/90	85	40	90%
24	5200	130%	116%	41/18	46:-	142/84:142/90	70	45	100
26	4880	122%	120%	55/18	45:*	126/76:136/96	90	50	88
27	5480	114%	105%	42/17	61:*	138/88:146/92	75	25	31%
28	5800	114%	120%	51/18	55:*	132/62:132/76	65	55	46%
29	4400	92%	97%	44/10	38:*	134/74:132/82	60	55	64%
30	4840	121%	106%	72/28	46:*	127/70:132/88	75	65	86%
32	4720	98%	103%	50/24	56;*	122/82:127/86	70	40	89%

Group I : enduring : fit.

CASE NO.	VITAL CAPACITY C.C.	VITAL CAPACITY % OF NORMAL (STANDING HEIGHT)	VITAL CAPACITY % OF NORMAL (BREYER)	BREATH HOLDING TEST	40 mm TEST.	CRAMPTON'S TEST. BLOOD PRESSURE HORIZONTAL	VERTICAL	FACTOR	EXERCISE TOLERANCE SECS. TO REGAIN NORMAL	EXERCISE TOLERANCE % INCREASE IN PULSE RATE
33	4000	83%	103%	39/21	31:-	132/82:	120/80	80	35	53%
34	4280	107%	103%	36/28	45:-	116/66:	122/66	80	5[illegible]	29%
35	4800	120%	103%	61/32	50:*	126/78:	127/80	70	85	69%
37	3400	85%	86%	65/27	38:-	146/66:	148/66	60	50	67%
38	4720	98%	104%	45/27	22:-	132/60:	144/80	70	40	89%
40	4600	115%	112%	60/46	55:*	140/78:	13678	65	40	25%
41	4880	122%	106%	47/24	46:-	150/90:	147/90	70	35	74%
42	4720	98%	101%	39/32	32:*	138/70:	136/78	65	60	54%
45	4400	110%	94%	58/31	56:*	154/74:	144/84	30	50	44%
44	3680	92%	93%	40/27	35:*	122/70:	117/70	55	35	35%
47	3800	95%	89%	39/29	41:-	134/85:	12685	45	65	85%
48	3400	85%	88%	39/31	22:*	142/82;	140/86	55	55	64%
49	3880	97%	92%	42/27	38;*	142/84:	146/80	80	50	43%
51	4580	115%	107%	56/23	37:*	142/86:	142/90	60	55	100
56	4000	100%	88%	40/24	40:-	134/84:	130/86	50	50	77%
57	5000	125%	110%	46/35	38:=	114/78:	102/80	35	45	18%
62	5000	125%	108%	38/35	40:-	145/90:	156/90	60	75	81%
59	5640	110%	107%	39/32	36:-	144/82:	152/90	70	14	58%
63	4200	105%	98%	55/26	45:*	148/80:	142/84	60	40	58%
64	4000	100%	92%	42/36	48:-	130/80:	135/80	75	40	55%
65	3920	98%	92%	38/16	35:*	138/80:	136/90	65	25	63%
67	4240	88%	97%	43/28	48:*	128/62:	132/78	80	35	53%

TABLE 2 (continued)

Group I : enduring : fit.

CASE NO	VITAL CAPACITY c.c.	VITAL CAPACITY: % OF NORMAL: (STANDING HEIGHT)	(DREYER)	BREATH HOLDING TEST.	40 mm TEST	CRAMPTON'S TEST BLOOD PRESSURE HORIZONTAL : VERTICAL	FACTOR	EXERCISE TOLERANCE. SECS. TO REGAIN NORMAL	% INCREASE IN PULSE RATE.
68	4400	110%	106%	60/41	69:*	142/90:148/90	85	35	18%
69	3720	93%	90%	39/31	34:-	142/88:144/100	75	95	40%
70	4520	94%	99%	60/39	42:*	158/84:160/84	75	75	97%
71	4400	110%	110%	47/39	57:*	148/88:158/86	100	75	88%
72	4600	96%	103%	53/24	49:-	142/76:142/80	65	60	73%
73	4400	110%	105%	42/33	45:*	154/73:150/90	65	30	29%
74	4000	100%	100%	60/58	50:*	128/86:138/94	95	80	78%
75	3400	85%	93%	39/37	35:*	144/74:140/74	55	55	60%
76	4000	125%	115%	49/35	58:*	124/62:118/82	55	100	103%
78	4340	108%	97%	59/28	42:-	148/64:148/66	60	104	114%
79	4680	117%	102%	46/30	31:*	154/82:162/88	90	65	48%
80	4920	102%	104%	40/27	40:*	138/86:147/94	95	90	51%
81	3600	90%	89%	34/30	0	170/78:180/100	85	200	94%
83	4000	100%	92%	36/27	28:*	133/74:128/70	60	75	61%
84	4000	100%	97%	30/39	40:*	167/84:166/80	65	55	55%
85	3800	90 %	96%	55/31	35:-	140/78:146/96	75	120	87%
86	4360	109%	101%	56/21	46:*	146/86:148/90	65	70	100%
92	3800	95%	86%	25/17	0	160/100:168/108	95	30	41%
93	4000	100%	100%	33/11	0	132/76:136/78	55	35	41%
98	2800	70%	60%	45/26	0	140/64:154/74	55	55	41%
8	4040	101%	101%	58/47	47:*	126/72:132/68	60	40	90%
13	4000	85%	86%	44/32	25:*	140/76:150/96	90	100	92%

TABLE 5o

Group II : enduring : unfit .

CASE NO.	VITAL CAPACITY: c.c.	VITAL CAPACITY: % OF NORMAL: (STANDING HEIGHT)	(DREYER)	BREATH HOLDING TEST	40 mm TEST.	CRAMPTON'S TEST BLOOD PRESSURE HORIZONTAL : VERTICAL :	FACTOR	EXERCISE TOLERANCE: SECS. TO REGAIN NORMAL	% INCREASE IN PULSE RATE
2	3720	95%	88%	38/22	36:*	126/84:128/84	70	70	90%
21	4600	115%	101%	65/24	48:-	148/84:145/88	65	195	91%
50	4200	105%	95%	64/25	49:=	136/80:126/84	25	40	57%
52	4180	104%	99%	46/31	36:=	154/100:150/100	65	60	91%
53	4280	107%	95%	40/17	44:*	138/66:134/60	25	30	50%
54	3720	93%	89%	35/25	17:=	150/82:146/82	50	85	38%
55	4000	100%	92%	37/26	34:=	140/90:130/90	15	40	35%
60	4400	110%	99%	33/21	49:*	132/84:144/86	85	140	35%

Group III : not enduring : fit.

CASE NO.	VITAL CAPACITY c.c.	VITAL CAPACITY: % OF NORMAL: (STANDING HEIGHT)	(DREYER)	BREATH HOLDING TEST.	40 mm TEST	CRAMPTON'S TEST BLOOD PRESSURE HORIZONTAL : VERTICAL :	FACTOR	EXERCISE TOLERANCE: SECS. TO REGAIN NORMAL	% INCREASE IN PULSE RATE
45	4480	112%	93%	34/26	56:-	120/80:118/80	70	35	42%
82	4320	90%	101%	39/36	35:*	128/80:128/74	85	65	72%
91	2400	60%	77%	14/15	0	136/76:144/90	80	30	33%
95	3800	79%	82%	35/24	28:-	156/90:137/90	70	40	50%
101	2800	70%	66%	23/13	0	172/96:182/118	95	45	56%

TABLE 5

Group IV : not enduring : unfit.

CASE NO.	VITAL CAPACITY	VITAL CAPACITY: % OF NORMAL: (STANDING HEIGHT)	(DREYER)	BREATH HOLDING TEST	40 mm TEST.	CRAMPTON'S TEST BLOOD PRESSURE HORIZONTAL : VERTICAL	FACTOR	EXERCISE TOLERANCE: SECS. TO REGAIN NORMAL	% INCREASE IN PULSE RATE
1	3600	90%	90%	29/16	20:-	144/78:140/78	45	90	50%
7	3920	98%	81%	36/17	35:*	120/62:124/70	75	115	64%
19	4080	102%	103%	54/27	33:*	140/76:138/82	65	100	90%
20	3440	86%	85%	29/23	28:*	130/76:124/76	60	60	148%
23	3840	96%	94%	35/15	24:-	140/96:146/98	90	30	73%
25	4320	90%	95%	42/25	30:*	152/78:126/84	60	50	33%
31	5000	125%	108%	40/32	57:* 52:-	122/80:125/84	70	45	67%
36	3920	98%	94%	41/16	30:*	146/90:136/86	40	60	62%
39	4880	122%	117%	64/56	28:*	130/62:132/72	75	65	57%
46	4200	105%	98%	35/26	29:*	142/90:136/86	80	50	36%
58	4200	105%	95%	39/17	38:-	122/78:144/90	85	60	109%
61	4480	112%	95%	48/35	42:=	142/64:134/76	50	170	100%
66	3800	95%	96%	31/14	23:-	134/70:130/70	60	35	74%
77	3600	90%	84%	39/27	23:=	146/88:142/96	65	85	65%
87	4400	86%	101%	39/16	32:-	138/88:138/90	60	40	40%
88	4000	100%	97%	41/24	37:*	120/104:178/100	85	90	55%
90	3400	85%	88%	37/17	15:=	148/82:140/68	50	70	53%
94	2920	73%	80%	38/20	48:-	136/80:126/82	40	52	43%
96	4080	102%	100%	46/17	24:-	128/72:124/80	55	95	75%
97	3400	85%	84%	40/25	0	152/84:142/90	45	40	35%

TABLE 3 (continued)

Group IV : not enduring : unfit.

CASE NO.	VITAL CAPACITY: c.c.	VITAL CAPACITY: % OF NORMAL: (STANDING HEIGHT)	(DREYER)	BREATH HOLDING TEST	40mm TEST	CRAMPTON'S TEST BLOOD PRESSURE HORIZONTAL : VERTICAL	FACTOR	EXERCISE TOLERANCE: SECS. TO REGAIN NORMAL	% INCREASE IN PULSE RATE
99	3000	75%	79%	14/11	0	136/68 : 128/68	30	55	33%
100	3000	75%	77%	22/20	25:*	154/80 : 144/70	35	95	94%

* = satisfactory pulse.

- = pulse volume and regularity affected.

= = (double minus) pulse volume and regularity severely affected.

that a larger proportion than 11% of enduring but unfit individualsmay be present in a group which included women. This observation is directed to the assessment of endurance in soldiers, a highly selected section so that the conclusions may not be generally applicable

The full records of each man are in the Appendix. Where no remarks are present the subject is a healthy young man, physically fit and proved to possess stamina to endure physical hardship.

DISCUSSION.

Physical fitness is functional and for its estimation the body must be tested at work. Somatometric measurements lack validity. Wide variations in physique are compatible with health and a high degree of physical efficiency. Further, fitness is relative and does not necessarily mean good physique. Dreyer's method correlates certain measurements with the vital capacity which, though generally classed as such, is not strictly a functional test.

It is measured by the largest volume of air which a person can expel from his lungs by forcible expiration after the deepest possible inspiration. This maximum volume is rarely employed, yet there is reason to believe that it bears an important relation to the functioning ability of the chest. It has to be borne in mind that the functional capacity of an organ bears little relation to its cubical capacity. Yet it appears from the evidence at hand (2, 11, 12.) that individuals of low vital capacity are by no means the physical equals of those of high vital capacity. It indicates the capacity of the chest and the tone of the musculature, but according to Burns (8) the person with a large vital capacity has no

advantage over one who has quite a small capacity provided the latter has sufficient. If the ability to provide the oxygen needed during physical exertion depended primarily on the vital capacity one would expect men of exceptional endurance to have an extraordinarily large capacity. Gordon, Levine, and Wilmaers (10) made a study of men who participated in a marathon race of 25 miles, and found that the vital capacity as based on surface area and height, was normal, indicating that prolonged vigorous training and capabilities of endurance did not increase the vital capacity. There was no important relationship between the vital capacity and the order in which the runners finished.

These observations do not agree with those of the majority of observers. Dreyer (2) found that a person living a healthy out-door life has a considerably larger vital capacity than one of the same size and weight living a sedentary life. From the evidence of Turner(11) it appears that individuals of low vital capacity are by no means the physical equals of those with a high one. She studied the physical abilities of two groups of women, one with a vital capacity of 15% below normal and the other 15% above normal. By whatever test the low capacity group was tried it appeared that it was truly at

a disadvantage. In general they complained of shortness of breath on vigorous exercise. They choose less strenuous sports like archery and quoits. The women of high vital capacity did not complain of dyspnea and choose more vigorous sports like basket ball and hockey.

That the vital capacity may have some value in assessing physical fitness is suggested by the finding that it is reduced in great physical weakness without disease by 25% (13), whereas in compensated heart disease it is normal (14).

Bainbridge (12) states that the surface area of the lungs in athletes as indicated by the vital capacity is often greatly in excess of that possessed by the untrained man. He cites the case of De Mar, an outstanding marathon runner, who has a vital capacity of about 45% greater than that of an untrained man of his own size.

Born (15) found that systematic physical exercise increases the vital capacity. He made a study of men during their course at Yale University and found that those who were active in some form of exercise gained about 600 c.c., while those who had very little physical recreation gained only about 300 c.c. in vital capacity.

Peabody and Wentworth (16) have drawn attention to the fact that cardiac patients become dyspnceic more

readily than healthy subjects largely because of their inability to increase the depth of respiration in a normal manner. This inability to breathe deeply corresponds to a diminished vital capacity. In normal persons the vital capacity is at least 85% of the standard capacity adopted for each group. They have shown that there is a close relationship between the clinical condition of cardiac patients, particularly as regards the tendency to dyspnoea, and the vital capacity. Determination of this, therefore, affords a clinical test as to the functional condition of the heart. How far this applies to individuals with normal hearts but with varying degrees of cardio-vascular efficiency is uncertain.

Table 6.

The Vital Capacity of the Lungs in Normal Males.

(Peabody and Wentworth)

No. of Group	Number Studied	Height: in feet & inches.	Normal vital capacity	No within normal limits.	Highest vital capacity	Lowest vital capacity	Highest %	Lowest %	no. below 90% of normal.
I	14	6'	5100	9	7180	5030	141	99	0
II	44	5'2½" - 6'	4500	41	5800	4560	121	90	0
III	38	5'3" - 5'8½"	4000	31	5080	5450	127	86	1

In the present observation the physique of the subjects varies widely. If the vital capacity in relation to physique is valid as a factor in the estimation of fitness and endurance one would expect the figures to bear some constant relationship. In many subjects known to be physically fit and capable of prolonged endurance the percentage deviation extends beyond the limits given by Dreyer as normal, while subjects in poor condition show deviations within normal limits. Cases 22 and 14 are examples of the former; cases 19 and 88 of the latter. Subjects 22 and 14 do not lack stamina. They are capable of anything both psychologically and physically. Cases 19 and 88 are not of the same physique as the majorityand are known to be in poor physical condition and to lack the will to endure. Their figures according to Dreyer indicate fitness.

Table 7.

% deviation from Dreyer's normal							
Group I Enduring: Fit.		Group II Enduring: Unfit		Group III Not enduring: fit		Group IV Not enduring Unfit	
within normal	below 90%	within normal	below 90%	within normal	below 90%	within normal	below 90%
48	16	6	2	2	3	14	8

A deviation from normal limits of 10% is stated to be " probably abnormal ". Table 7 indicates this statement to be erroneous. 16 subjects of 65 in Group I, known to be physically sound have vital capacities below 90% and 14 of 22 in Group IV give figures within normal limits.

In spite of its apparent simplicity the estimation of the vital capacity is sometimes impossible. Surprising though it may appear, a number of men were found to be incapable of voluntarily expelling the last few hundred cubic centimetres from the chest. These subjects were usually mentally backward. In the other respiratory tests their attempts were also poor. This group forms 10% of all those tested, a considerable proportion, much higher than one would find in the general community for a large number of men incapable of absorbing instruction in more complex subjects in other arms find their way to the infantry units. Of these 10, six are known to be lacking in endurance and are physically below the average.

Another factor which influences the tests of soldiers is the nature of their occupation. Most men are not there voluntarily. In some this induces an

antagonism to the performance of any tests. Doubtless this is a factor in the poor performance of certain individuals. In most of the investigations in the literature the subjects used are school or university students or soldiers in a peace-time army. Such types will usually be more intelligent and cooperative than conscripts. So far as possible uncooperating men were excluded and low results in this series of tests are attributed to other factors than antagonism and wilful lack of cooperation.

This suggests that, even in such a simple procedure as voluntarily exhaling to the fullest extent the mentally slow have not the same control over the respiratory musculature that the average man has, and conversely, if a subject is examined whose vital capacity is greatly below the average without evidence of disease, the fault may lie in inefficient control of the thoracic and abdominal muscles.

Table 8 indicates the extreme vital capacities of the various groups according to standing height and Dreyer. Case 98 is excluded from group I. He was fit but was of a very low grade of intelligence, and could not understand what was desired of him. It is

noticeable that the minimum vital capacity in Group III is much lower than the corresponding figure in the other groups.

Table 8

	Group I		Group II		Group III		Group IV	
	VITAL CAPACITY according to		VITAL CAPACITY according to		VITAL CAPACITY according to		VITAL CAPACITY according to	
	standing height	Dreyer	standing height	Dreyer	standing height	Dreyer	standing height	Dreyer
MINIMUM	83%	78%	93%	88%	60%	66%	73%	77%
MAXIMUM	130%	130%	115%	101%	112%	101%	125%	117%

10 subjects were below 85% of normal according to standing height and 11 according to Dreyer. These were not the same subjects in each case. No individual was suffering from any condition which could account for this except inability to expel the complete vital capacity from lack of muscular control. This appears to be on a par with with tremor of the hands and poor muscular control on balancing.

An interesting observation was made early in the experiment. Almost every individual has a larger chest circumference according to trunk length than

that given by Dreyer. At first this was thought to be due to the subjects expanding the thorax in order to improve the figures indicating their physique. Careful measuring eliminated this possibility and it appears that the soldier of the present army has a better chest development than the men observed by Dreyer twenty years ago. In many cases this causes the vital capacity according to chest circumference to fall well below the figure given in the tables, as in Cases 32 and 80, and this figure is frequently wildly at variance with the others.

In view of the statement by Peabody and Wentworth that the vital capacity affords a clinical test of the functional condition of the heart in cardiac patients a careful perusal of Tables 2, 3, 4, and 5 was made to find if there was any correlation between the vital capacity and the exercise tolerance test, Crampton's test, and breath holding. No such correlation can be read into the figures. It appears that the variations in the efficiency of normal hearts are too small to affect the vital capacity, other factors influencing it to a greater degree.

In spite of the volume of evidence indicating

that the vital capacity is a factor in athletic efficiency, the findings of the present observation do not suggest that its estimation is of value in the assessment of fitness or endurance. Athletic efficiency and physical fitness are by no means the same thing. Efficient respiration is not determined by the capacity of the chest or its mobility. Athletic training, by improving the action of the muscles of the thorax and abdomen, may increase the vital capacity, but physical fitness is relative: he who is physically fit does his work easily, whatever it may be, and his endurance is long-continued. A high degree of athletic efficiency is not necessary.

Examination of Tables 3and 5 suggests that a comprehending mind and the will to do are of more importance than physical efficiency in increasing the volume of the vital capacity. Group II, who are definitely the physical inferiors of GroupIII, have a higher average.

From the evidence in the literature the vital capacity bears a relation to physical fitness. Training and exercise produce an increase. From the evidence in this thesis single observations give no

decisive information as to the physical capabilities of a man though military training may have increased the initial capacity in each individual before the observation was made. If this is the case the increase has rarely raised it beyond average limits. A vital capacity well below the normal minimum of 85% in the absence of signs of disease suggests - but does no more than suggest - a poor degree of mental co-operation, and lack of the spirit that creates feats of endurance.

According to C. Ward Crampton, when a very fit man rises from the horizontal, acceleration of the cardiac rate should be trivial, a small rise of blood pressure is usual and these two results may be correlated into a factor of physical efficiency. A man with a very poor vasomotor tone either constitutional or after illness, will often show a fall in the blood pressure and a considerable rise in the pulse rate. Emotional factors may produce the most violent disturbances, vitiating any attempt at systematic investigation. In the results (Tables 2 - 5) only two cases were sufficiently disturbed to prevent a factor being obtained. As a rule personal acquaintance with the

Medical Officer usually eliminated this element, but not always. For the purpose of assessing endurance in soldiers in large numbers, only one estimation of the blood pressure would be possible. This limitation largely nullifies the value of this method, for usually several estimations are necessary to obtain the basal reading. Further, the pulse rate on rising from the horizontal position on the floor to the standing position is affected by the muscular exertion involved. Emotional factors affect the pulse rate as well as the blood pressure. During the investigation it was found that exertion prior to the examination affected the figures. If men indulged in mild wrestling and other exertions while waiting, or if they hurried upstairs, both pulse rate and blood pressure were affected and the results distorted.

Some workers (17) have found that there is no difference in the resting blood pressure of the trained and the untrained man, others, however, have found that the resting systolic and diastolic pressures are on the average lower in the trained especially if training was severe.

In Gillespie's series (cited in 18) of fatigued neurasthenics the systolic pressure on

rising from the recumbent position gave an average value of - 7·7 this to be compared with a value of -2.3 obtained by Schneider & Tressdell in their unselected group. The average change in diastolic pressue was + 3.5. compared with + 8.1., while the pulse pressure also fell twice as much in Schneider & Truesdell's group.

In the present group the systolic pressure in Group I is 143, recumbent and 142.4.standing, giving an average difference of -0.6. In Group II (Table III) the figures are 140.5 and 134.1 an average difference of - 6.1; In Group III (Table V) 138.4 and 141.8. average + 3.4: In Group IV (Table IV) 138.7 and 138.8. average + 0.1. These figures do not compare with those mentioned above. Moreover, average readings are of no assistance when applied to individuals.

There seems little doubt that the psychological factor always plays a very great part in these results. The rise due to psychological factors may be as large as that caused by exercise.

TABLE 9

	Number showing rise in systolic pressure.	Number showing fall in systolic pressure.
Group I (enduring & fit)	43	22
Group II (enduring: unfit)	2	6
Group III. (not enduring:fit)	4	1
Group IV (not enduring;unfit)	14	8
Fit	47	23
Unfit	10	20
Enduring	45	28
Not enduring	12	15

The majority of the men show a factor well below 100%. This is certainly not in accordance with the facts for the fit group were fit. The cause of the low factor is the increase in the pulse rate. This increase may have been influenced by the previous tests, the vital capacity and breath holding. The pulse rate taken while seated for the exercise tolerance test rarely corresponds with the recumbent pulse rate for Crampton's test. Therefore it appears that the pulse rate was affected by several factors as well as rising from the recumbent to the standing position, giving a slightly higher reading than would

otherwise have been the case. But for this Crampton's factor would certainly have been higher on the average.

There is little in the literature concerning the ability to hold the breath. It is said to be a measure of the alkali reserve of the blood. (8). Bainbridge & Dawson (cited in 8) quote the result of experiments which show that fit men carry out physical work with only a slight increase in lactic acid, while the unfit have a higher blood lactic acid content. That is, the alkali reserve of the blood of the fit is large enough to cope with the acid released as a result of muscular exercise. Recruits have on the average 5% less available base than trained soldiers. Dawson states that three months of systematic physical educationcan raisethe amount of available base by about 10%.

McCurdy & Larsen (6) found that the mean breath holding ability after exercise was 42.8. seconds in 40 Olympic swimming athletes; a mean of 32.85 for 60 other swimmers whereas the mean for untrained students was 26.5. and for hospital patients 24.

Breath holding involves the personal factor of leaving to the subject the decision when to give

up. It takes will power to withstand such sensations as " I felt my head would burst", "blood rushed to my head" or "things became blurred". Some men can hold the breath for very few seconds after the uncomfortable sensations begin while others hold on until the discomfort is very pronounced.

The statements that the alkali reserve of the blood is increased by training, and observation of McCurdy & Lawson suggested that breath holding may be of value in indicating fitness.

The ability to hold the breath varied within wide limits, before and after exertion in all groups. No relation to fitness or endurance can be detected in the figures. During the actual testing, however, one would observe the onset of discomfort. The subjects expression changed and spasm of the respiratory muscles appeared. In a determined individual this discomfort would be resisted with powerful efforts until it became irresistible, but these efforts were not related to the times of the holding. Some subjects would hold for forty or fifty seconds without apparent difficulty and then give up, Others would be forced to put forth physical efforts to hold for for the same length of time. It appears that breath holding is a test of will power or determination

rather than an easy clinical method of measuring the alkali reserve of the blood. It is not a method of estimating cardiac or pulmonary efficiency in normal subjects. It is of value in assessing a man's reaction to discomfort and affords valuable information for assessing temperament.

The 40 mm test is particularly favoured by the Royal Air Force. In a satisfactory test the pulse rate remains almost unaltered for a minute or longer; in bad results the duration is brief and the pulse rate fluctuates. It is not exactly clear what is actually tested. One explanation is that the tone of the abdominal walls is the important factor; another is that pressure on the thoracic contents impedes diastolic filling and that the state of the ventricular wall is thus tested; another that anoxia resulting from deficient circulation is the essential factor; a fourth, that good vasomotor control, which in the fit subject, prevents pooling of the blood in the splanchnic area, is the important factor.

Much depends on technique in its performance. It is far from fool proof and requires practice by the subject, and experience in the observer for its interpretation.

Both Crampton's test and the 40 mm test depend

on cardiovascular efficiency. One would, therefore expect to find a relation between the two. The results corresponded with each other in a general way but no clear parallel was noticed. Frequently they were completely at variance as in subjects 16 and 38: Crampton's 80% and 100% with poor 40 mm tests and subject 42 with 30% Crampton's and a good 40 mm.

The remarks made on the breath holding test apply. It is not a reliable test of physical fitness but a good result usually indicates determination and resolution to hold on.

The exercise tolerance test is so simple that it naturally makes a strong appeal. The reaction of the heart rate to exercise is well known and constant. During exertion it increases in rate and on the cessation it returns gradually to normal. It must be realised that all exercise tolerance tests give results that are dependent on the training of the individual. Thus a trained athlete will be able to perform with ease an exercise which would tax the capability of an untrained man. Exertion which produces violent palpitation and dyspnoea in an unfit man will hardly

change the pulse of a professional footballer. Hence in judging the exercise tolerance of an individual it is important to take into account his life and habits. In the present observation all the subjects comparable in physique and habits and variations in the results can reasonably be attributed to variations in the cardiovascular efficiency. During rest there are considerable differences in the pulse rate. The resting rate gives no indication of physical fitness, though in those accustomed to heavy muscular work it is generally slower. As in the case of blood pressure the pulse rate is influenced by many factors, particularly excitement and exertion prior to the test.

After exercise the rate depends on several factors, the physical fitness of the subject, the nature of the work and the condition under which it is performed. Cook and Pembrey (19) state that the well trained man may increase his pulse rate 2 or 3 times by running and his pulse quickly returns to its resting rate. The type of exercise is a very important factor. Running up and down stairs for about half a minute will produce a rise of about 100% whereas a long walk may not raise it above 40%. The time taken to return to the resting

rate is of more importance than the actual pulse rate. In the fit subject the return to the original level is rapid. In the unfit it remains high and often irregular for some time.

TABLE 10.

	Pulse to normal in less than 60 secs.	Pulse to normal in more than 60 sec
Group I (Enduring: Fit)	41 cases	24 cases
Group II (Enduring;unfit)	3	5
Group III (not enduring: fit)	4	1
Group IV (not enduring: Unfit)	9	13

In this series the rates of the fit groups (I and III) in a majority of cases, returned to the resting rate within a minute of ceasing the exertion. This conforms to the usual finding. The exercise tolerance test may not be an indication of the heart's efficiency but it has a distinct bearing upon the capacity for exercise. It is a useful test and a helpful guide to fitness. It bears more relation to a man's physical fitness than to his capacity for endurance. (Table 10).

Conclusions.

The vital capacity is not reliable as a test of physical fitness either alone or in conjunction with body measurements. The claims made by Dreyer are not supported by the findings. The vital capacity by Dreyer's method does not vary significantly as compared with that calculated from the standing height and the Table of Peabody and Wentworth. The labour involved in calculating the percentage deviation from the normal in Dreyer's method is considerable, even with the use of a slide rule (which was used in all the calculations here). The variations between the two methods expressed as percentages can be compared in Tables 2 - 5 Columns 3 and 4. In only 6 cases (7,10,11,13,33 77) did one method give a result below 85% while the other gave one over 85%. In general there is a fairly close correspondence and the method of choice is therefore the vital capacity according to standing height, which can be estimated more easily.

As a method of assessing the probable endurance of an individual the estimation of vital capacity is valueless. However true it may be that in endurance athletics the vital capacity is above the average, in soldiers it varies within such wide limits

that it is of no practical value.

The 40 mm test does not appear to be a test of physical fitness. Many fit men gave very poor results, though, it must be admitted, most unfit men gave poor results also. Considered in groups the unfit non-enduring types gave the worst results, but the individual variations within the whole series was so great that an observation on one individual was of little value. The manner in which it was attempted by the subject was of importance. It is a severe trial of the ability to withstand discomfort. If a man perseveres until he is fainting (case 50) he is likely to possess the will to endure. If he yields at the first appearance of discomfort this weakness is likely to be evident in larger issues.

Much the same remarks apply to breath holding. It is no test for physical fitness. There was even less relation in the fit and unfit groups than in the 40 mm test. It is, however, also a measure of a subject's resistance to discomfort. Hambley, Pembray and Warner (20) suggest that a dull man of poor physique may tolerate the discomfort far better than an athlete. It might even be argued, they say, that quickness of response is one of the safeguards and attributes

of a good athlete. The present findings do not support this argument. Almost invariably the best types gave the best results. Breath holding in normal men is more a psychological test than a test of physical fitness. The weak willed (groups III and IV) frequently yielded after a few seconds, long before any degree of discomfort could have developed. The effort made by the subject was more significant than the time of the hold.

Although the pulse rate is subject to many disturbing factors, it affords the best test for assessing physical fitness in soldiers. It fulfils the requirements mentionedin the introduction. Although easily affected by emotion, it is no index of the psychological element so important in endurance.

Crampton's test is also subject to disturbing factors, affecting both the pulse rate and the blood pressure. According to the results of the present observation it bears a relation to physical fitness and certainly deserves a place in its assessment. In performing the test the subject should not have exerted himself, even slightly, for an hour previously. The emotional element should

be eliminated if possible. Given these conditions the test is of value.

The respiratory fitness tests, like all physical fitness tests so far devised, have been subjected to a certain amount of adverse criticism. The Medical Research Council (21) have applied the Royal Air Force tests to a large group of persons in widely differing occupations and have arrived at the conclusion that the variations of the respiratory tests even in a highly selected group, are so great that the fixing of a normal standard is impossible. Many believe a similar statement should be made concerning the circulatory tests.

If endurance is not related to physical fitness, one would expect that there would be no significant difference between the enduring and the non enduring groups with regard to fitness. The Tables, however, indicate that endurance in soldiers is closely related to fitness, in spite of the examples given in the introduction indicating the importance of the psychological factor. In groups III and IV (the non enduring section) the majority show a low grade of physical fitness. One test has no significance but in several their responses were

poor, and more important, a study of their habits and working conditions indicated that their fitness was below the average.

It appears, therefore, that in soldiers the psychological factor is secondary in efforts of endurance. A sound body and a reasonable degree of fitness are the primary essentials. A parallel observation was made by Mumford (22) who studied a series of 285 boys who had gained scholarships at Oxford and Cambridge. These boys were found to show an accelerated physical growth when compared with the average and they had a slightly better physical frame and fuller breathing capacity. The greater acceleration in growth of chest girth was more marked among those who took first class honours at the university than among the seconds and thirds. The average chance of exhibiting physical excellence at school was one in ten, but one in every three of the scholarship boys had secured some degree of prowess. Moreover the greater the degree of mental excellence the greater was the physical excellence.

These investigations go far to show what the best psychological types are the best physical

types, or at least are the owners of well developed bodies. Individuals of poor mental stamina have frequently a low standard of physical development. The assessment of endurance in soldiers, then, is assisted by certain tests of physical fitness, particularly breath holding and the 40 m.m. tests, with Crampton's test and the exercise tolerance. A soldier making a poor attempt at these is likely to lack physical and mental stamina.

In recent years the search for a test for physical efficiency has led to the development of complex indices, particularly in America. These are merely extensions of fundamental principles, but they are complicated and apply several "corrections" which appear to give them an accuracy which in fact they do not possess. At the beginning of the observation several subjects were examined by these tests but their application did not lend itself to rapid use with large numbers and the results obtained did not appear to be more accurate than a careful interpretation of the simpler methods described.

From the criticism directed against them it seems that too much is expected of a single physical efficiency test . The physician does not diagnose heart

disease from an examination of the pulse, nor blood disease from the finding of secondary anaemia. The diagnosis of disease is not based in the result of one observation, but on the clinical picture as a whole with a balanced interpretation of each finding in relation to the others. This principle requires extension to the diagnosis of health and fitness.

One test will not suffice, but a consideration of all the data obtained from a general examination, observation of the body at work, and the application of the four tests suggested, will indicate to the experienced medical examiner those who are fit and will endure and those who will not.

S U M M A R Y

1. 100 soldiers were divided into two groups according to their known powers of endurance.

2. The physical fitness of each man was assessed by observation of his work and exercise.

3. Five simple physical efficiency tests were applied.

4. The results of the tests were compared with the known endurance and fitness of the men.

5. It is concluded that the psychological factor in endurance in healthy young men is related to physical fitness.

6. Physical fitness tests are not infallible, but simple and easily applied are of assistance in estimating fitness.

7. The manner in which " discomfort " tests (breath holding and 40mm test) are attempted is of value in assessing the psychological element.

8. The application of breath holding, 40 mm, Crampton's, and the exercise tolerance tests assists in the assessment of fitness and endurance.

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A P P E N D I X .

Records of the tests.

Number:- -

Age:- 38

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	137	
Trunk length	34	
Standing height	5'5''	
Chest circumference	32	
Vital Capacity	3,600	
from Tables		
Weight according to length	127.9	
" " " chest circumference	121.72	
Mean calculated weight	125	+9.6
		+ 4'1
Chest according to trunk length	32.58	−12.1
Vital capacity according to weight	4097	
" " " " trunk length	3898	−7.6
" " " " chest circumference.	3850	−6.5
" " calculated from trunk length and chest circumference.	3874	−7.1

CRAMPTON'S TEST.

45%

Pulse rate:- resting
standing

Blood pressure:- resting
standing

BREATH HOLDING

Rest:- 29

End:- 16

40 mm Test

80→96 / 20 secs. Decrease in volume. Poor result.

Exercise Tolerance Test.

Pulse rate	1. resting	80
	2. after exertion	120
	3. Time taken to return to normal	90 secs.

Physical condition poor and lacking in stamina.

Number:- 2 Age:- 26

11

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	150	
Trunk length	36	
Standing height	5'8''	
Chest circumference	36¼	
Vital Capacity	3720	
from Tables		
Weight according to length	149.52	
" " " chest circumference	174.55	
Mean calculated weight	162	-7.4
Chest according to trunk length	34.5	
Vital capacity according to weight	4373	-14.9
" " " " trunk length	4362	-14.7
" " " " chest circumference.	4877	-24
" " calculated from trunk length and chest circumference.	4120	-9.7

CRAMPTON'S TEST.

Pulse rate:- resting	48	70%
standing	60	
Blood pressure:- resting	126/84	
standing	128/	

BREATH HOLDING

Rest:- 38

End:- 22

40 mm Test

6 12 20 29 34 / 36 secs.

Exercise Tolerance Test.

Pulse rate	1. resting	60
	2. after exertion	114
	3. Time taken to return to normal	70 secs.

Out of condition due to lack of exercise but possesses the will power to force himself to endure.

Number:- 3 Age:- 27

1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	162	
Trunk length	35¼	
Standing height	5' 11''	
Chest circumference	35¼	
Vital Capacity	4960	
from Tables		
Weight according to length	143.11	
" " " chest circumference	161.76	
Mean calculated weight	152	+6.6
Chest according to trunk length	33.95	
Vital capacity according to weight	4622	+7.3
" " " " trunk length	4227	+17.4
" " " " chest circumference.	4617	+7.4
" " calculated from trunk length and chest circumference.	4422	+12.2

CRAMPTON'S TEST.

Pulse rate:- resting	54	65%
standing	78	
Blood pressure:- resting	136/	
standing	130/	

BREATH HOLDING

1st:- 47

2nd:- 21

40 mm Test

7 13 22 30 38 47 56 64 73 / 47 secs.

Pulse good, and regular throughout

Exercise Tolerance Test.

Pulse rate 1. resting		54
2. after exertion		100
3. Time taken to return to normal		60 secs.

Number:- 4 Age:- 21

1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	145	
Trunk length	33½	
Standing height	5' 7½''	
Chest circumference	35	
Vital Capacity	4640	
from Tables		
Weight according to length	119.32	
" " " chest circumference	155.6	
Mean calculated weight	138	+5.1
Chest according to trunk length	31.77	
Vital capacity according to weight	4267	+8.7
" " " " trunk length	3708	+25.2
" " " " chest circumference.	4490	+3.3
" " calculated from trunk length and chest circumference.	4565	+1.6

CRAMPTON'S TEST.

Pulse rate:- resting	68	80%
standing	82	
Blood pressure:- resting	116/66	
standing	124/	

BREATH HOLDING

1st:- 37

2nd:- 14

40 mm Test

7 16 25 34 44 54 / 32 secs.

Good steady pulse

Exercise Tolerance Test.

Pulse rate 1. resting		72
2. after exertion		120
3. Time taken to return to normal		90 secs.

Number:- 5 Age:- 34 E F 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	170	
Trunk length	$37\frac{1}{2}$	
Standing height	$5'10\frac{1}{2}$	
Chest circumference	$39\frac{1}{4}$	
Vital Capacity	4740	
from Tables		
Weight according to length	169.93	
" " " chest circumference	212.99	
Mean calculated weight	192	- 11.4
Chest according to trunk length	36.14	8.6
Vital capacity according to weight	4785	- 0.9
" " " " trunk length	4784	- 0.9
" " " " chest circumference.	5629	- 15.8
" " calculated from trunk length and chest circumference.	5206	- 9

CRAMPTON'S TEST.

Pulse rate:- resting	78	45%
standing	90	
Blood pressure:- resting	156/82	
standing	148/88	

BREATH HOLDING

1st:- 51

2nd:- 26

40 mm Test

7 15 13 7 15 25 35 44 55 65 / 35

Exercise Tolerance Test.

Pulse rate 1. resting		84
2. after exertion		120
3. Time taken to return to normal		35 secs.

Number:- 6 Age:- 23 I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	159	
Trunk length	35¼	
Standing height	5' 6	
Chest circumference	38½	
Vital Capacity	5200	
from Tables		
Weight according to length	139.98	
" " " chest circumference	202.02	
Mean calculated weight	171	- 7
Chest according to trunk length	33.67	+14.5
Vital capacity according to weight	4560	+16.2
" " " " trunk length	4160	+25
" " " " chest circumference.	5418	- 4
" " calculated from trunk length and chest circumference.	4789	+ 8.6

CRAMPTON'S TEST.

Pulse rate:- resting 42
standing 60
Blood pressure:- resting 130/78
standing 134/74

65%

BREATH HOLDING

1st:- 46

2nd:- 23

40 mm Test

6 12 20 28 36 44 50 59 67 / 48

Pulse remained regular and in good volume throughout

Exercise Tolerance Test.

Pulse rate 1. resting 54
2. after exertion 102
3. Time taken to return to normal 60 secs.

Capable of anything and physically fit. Crampton's index is too low.

Number:- 7 Age:- 20

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	155	
Trunk length	34½	
Standing height	5' 8	
Chest circumference	38	
Vital Capacity	3920	
from Tables		
Weight according to length	130.85	
" " " chest circumference	194.91	
Mean calculated weight	163	- 6.9
Chest according to trunk length	32.86	+ 15.6
Vital capacity according to weight	4477	- 12.5
" " " " trunk length	3963	- 1.1
" " " " chest circumference.	5280	- 25.8
" " calculated from trunk length and chest circumference.	4620	- 15.2

CRAMPTON'S TEST.

75%

Pulse rate:- resting 84
standing 98
Blood pressure:- resting 120/62
standing 124/70

BREATH HOLDING

1st:- 36

2nd:- 17

40 mm Test

8 16 25 33 40 / 29 7 15 22 29 37 / 25

Pulse remained regular and volume unchanged

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	138
	3. Time taken to return to normal	113 secs.

Physically and psychologically a poor type

Number:- 8 Age:- 23

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	137	
Trunk length	33¼	
Standing height	5' 7	
Chest circumference	33½	
Vital Capacity	4040	
from Tables		
Weight according to length	116.55	
" " " chest circumference	137.99	
Mean calculated weight	128	± 7
Chest according to trunk length	33.5	
Vital capacity according to weight	4096	- 1.4
" " " " trunk length	3646	+ 1.1
" " " " chest circumference.	4118	- 0.2
" " calculated from trunk length and chest circumference.	3882	± 4.1

CRAMPTON'S TEST.

Pulse rate:- resting	60	60%
standing	88	
Blood pressure:- resting	126/72	
standing	132/68	

BREATH HOLDING

1st:- 58

2nd:- 47

40 mm Test

7 13 23 32 42 50 60 69 79 / 47

Pulse volume diminished, but remained regular and fairly goo

Exercise Tolerance Test.

Pulse rate 1. resting		60
2. after exertion		114
3. Time taken to return to normal		40 secs.

Number:- 9 Age:- 20

1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	167	
Trunk length	38	
Standing height	6'	
Chest circumference	37¼	
Vital Capacity	4920	
from Tables		
Weight according to length	177.14	
" " " chest circumference	184.56	
Mean calculated weight	181	- 7.1
Chest according to trunk length	36.7	+ 1.5
Vital capacity according to weight	4724	+ 4.1
" " " " trunk length	4929	- 0.2
" " " " chest circumference.	5077	- 3.1
" " calculated from trunk length and chest circumference.	5003	- 1.6

CRAMPTON'S TEST.

60%

Pulse rate:-	resting	78
	standing	108
Blood pressure:-	resting	132/68
	standing	140/86

BREATH HOLDING

1st:- 49

2nd:- 22

40 mm Test

7 19 45 57 80 92/36 secs. 9 21 33 46 56 70 / 32 secs.

Pulse diminished greatly in volume after 5 secs. and throughout

Exercise Tolerance Test.

Pulse rate	1. resting	78
	2. after exertion	126
	3. Time taken to return to normal	60 secs.

Number:- 10 Age:- 20

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	154	
Trunk length	$35\frac{3}{4}$	
Standing height	5' 7	
Chest circumference	$35\frac{1}{2}$	
Vital Capacity	3400	
from Tables		
Weight according to length	146.3	
" " " chest circumference	161.76	
Mean calculated weight	154	0
Chest according to trunk length	34.22	+ 3.4
Vital capacity according to weight	4456	- 23.6
" " " " trunk length	4028	-15.6
" " " " chest circumference.	4617	- 26.3
" " calculated from trunk length and chest circumference.	4322	- 21.4

CRAMPTON'S TEST.

Pulse rate:- resting 68
standing 96
Blood pressure:- resting 134/58
standing 158/58

?

BREATH HOLDING

1st:- 45

2nd:- 25

40 mm Test

9 19 30 40 51 54 65 / 39 9 19 30 40 50 60 79 / 38

Pulse volume diminished 5 - 20

Exercise Tolerance Test.

Pulse rate 1. resting 72
2. after exertion 122
3. Time taken to return to normal 50 secs.

Number:- 11 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	169	
Trunk length	35½	
Standing height	5' 9	
Chest circumference	38¾	
Vital Capacity	4000	
from Tables		
Weight according to length	143.11	
" " " chest circumference	205.64	
Mean calculated weight	174	- 2.9
Chest according to trunk length	33.95	+ 14.1
Vital capacity according to weight	4765	- 16.1
" " " " trunk length	4295	- 6.9
" " " " chest circumference.	5488	- 27.1
" " calculated from trunk length and chest circumference.	4891	- 18.2

CRAMPTON'S TEST.

Pulse rate:- resting	84	EMOTION
standing	96	NO TEST
Blood pressure:- resting	186/82	
standing	134/80	

BREATH HOLDING

1st:- 43

2nd:- 17

40 mm Test

9 20 30 40 50 61 72 82 93 102 110 / 55

Exercise Tolerance Test.

Pulse rate 1.	resting	96
2.	after exertion	104
3.	Time taken to return to normal	40 secs.

Number:- 12 Age:- 22

1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	183	
Trunk length	35¾	
Standing height	5' 9	
Chest circumference	39	
Vital Capacity	4480	
from Tables		
Weight according to length	146.3	
" " " chest circumference	209 .29	
Mean calculated weight	178	+ 2.8
Chest according to trunk length	34.22	+ 14.3
Vital capacity according to weight	5046	- 11.2
" " " " trunk length	4295	+ 4.3
" " " " chest circumference.	5558	- 19.3
" " calculated from trunk length and chest circumference.	4926	- 9.0

CRAMPTON'S TEST.

Pulse rate:- resting	84	75%
standing	102	
Blood pressure:- resting	142/66	
standing	150/88	

BREATH HOLDING

1st:- 55

2nd:- 23

40 mm Test

8 16 27 36 /24 817 28 38 47 56 65 / 35

Pulse volume diminished, and remained regular

Exercise Tolerance Test.

Pulse rate 1.	resting	78
2.	after exertion	132
3.	Time taken to return to normal	35 secs.

Number:- 13 Age:- 23 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	162	
Trunk length	35½	
Standing height	5' 10	
Chest circumference	37½	
Vital Capacity	4000	
from Tables		
Weight according to length	143.11	
" " " chest circumference	187.97	
Mean calculated weight	165	- 1.2
Chest according to trunk length	33.95	+ 10.6
Vital capacity according to weight	4622	- 13.5
" " " " trunk length	4227	- 5.4
" " " " chest circumference.	5144	- 22.3
" " calculated from trunk length and chest circumference.	4685	- 14.6

CRAMPTON'S TEST.

90%

Pulse rate:- resting 84
standing 96
Blood pressure:- resting 140/76
standing 150/96

BREATH HOLDING

1st:- 44

2nd:- 32

40 mm Test

7 16 25 35 / 23 6 13 22 30 38 / 25

Pulse diminished, volume regular

Exercise Tolerance Test.

Pulse rate 1. resting 78
2. after exertion 150
3. Time taken to return to normal 100 secs.

Number:- 14 Age:- 21

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	133	
Trunk length	33¼	
Standing height	5' 7	
Chest circumference	35½	
Vital Capacity	3480	
from Tables		
Weight according to length	116.55	
" " " chest circumference	161.76	
Mean calculated weight	139	- 4.3
Chest according to trunk length	31.5	+ 12.7
Vital capacity according to weight	4010	- 13.2
" " " " trunk length	3646	- 4.5
" " " " chest circumference.	4717	- 24.6
" " calculated from trunk length and chest circumference.	4131	- 18.2

CRAMPTON'S TEST.

Pulse rate:- resting	66	45%
standing	90	
Blood pressure:- resting	176/82	
standing	176/78	Too low

BREATH HOLDING

1st:- 31

2nd:- 13

40 mm Test

8 16 27 37 47 58 / 30 7 15 26 37 47 59 70 / 37

Pulse remained regular and of good volume

Exercise Tolerance Test.

Pulse rate 1.	resting	78
2.	after exertion	120
3.	Time taken to return to normal	35 secs.

Number:- 15 Age:- 23

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	141	
Trunk length	33	
Standing height	5' 5	
Chest circumference	36¾	
Vital Capacity	4280	
from Tables		
Weight according to length	113.83	
" " " chest circumference	177.85	
Mean calculated weight	141	o
Chest according to trunk length	31.23	+ 17.7
Vital capacity according to weight	4182	+ 2.3
" " " " trunk length	3585	+ 19.4
" " " " chest circumference.	4943	- 13.5
" " calculated from trunk length and chest circumference.	4264	+ 0.4

CRAMPTON'S TEST.

Pulse rate:- resting	72	80%
standing	76	
Blood pressure:- resting	164/78	
standing	165/84	

BREATH HOLDING

1st:- 40

2nd:- 21

40 mm Test

6 15 24 32 41 50 57 65 70/49 7 17 24 31 38 45 51 59 66/ 50

Pulse volume slightly diminished. Pulse regular

Exercise Tolerance Test.

Pulse rate 1.	resting	78
2.	after exertion	132
3.	Time taken to return to normal	45 secs.

Number:- 16 Age:- 20

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	162	
Trunk length	37	
Standing height	6' 1	
Chest circumference	36½	
Vital Capacity	5200	
from Tables		
Weight according to length	162.93	
" " " chest circumference	174.55	
Mean calculated weight	169	- 4.1
Chest according to trunk length	35.59	+ 2.6
Vital capacity according to weight	4622	+12.5
" " " " trunk length	4641	+ 12
" " " " chest circumference.	4877	+6.6
" " calculated from trunk length and chest circumference.	4759	+9.3

CRAMPTON'S TEST.

80%

Pulse rate:- resting 78
standing 88
Blood pressure:- resting 156/72
standing 158/

BREATH HOLDING

1st:- 51

2nd:- 19

40 mm Test

12 21 33 45 57 / 26

Pulse disappeared after 10 secs.

Exercise Tolerance Test.

Pulse rate 1. resting 102
2. after exertion 138
3. Time taken to return to normal 45 secs.

Number:- 17 Age:- 27

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	167	
Trunk length	35	
Standing height	5' 8½	
Chest circumference	40½	
Vital Capacity	4960	
from Tables		
Weight according to length	136.89	
" " " chest circumference	232.10	
Mean calculated weight	184	- 9.4
Chest according to trunk length	33.40	+ 21.2
Vital capacity according to weight	4724	+ 5.0
" " " " trunk length	4094	+ 21.2
" " " " chest circumference.	5988	- 17.0
" " calculated from trunk length and chest circumference.	5031	- 1.4

CRAMPTON'S TEST.

Pulse rate:- resting	72	95%
standing	78	
Blood pressure:- resting	152/94	
standing	162/90	

BREATH HOLDING

1st:- 42

2nd:- 25

40 mm Test

5 13 20 28 37 45 / 30 7 21 29 35 44 / 30

Exercise Tolerance Test.

Pulse rate	1. resting	72
	2. after exertion	120
	3. Time taken to return to normal	90 secs.

Number:- 18 Age:- 22

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	154	
Trunk length	36	
Standing height	5' 9	
Chest circumference	$36\frac{3}{4}$	
Vital Capacity	5920	
from Tables		
Weight according to length	149.52	
" " " chest circumference	177.85	
Mean calculated weight	164	- 6.1
Chest according to trunk length	34.50	+ 6.5
Vital capacity according to weight	4456	+ 32.8
" " " " trunk length	4362	+ 35.8
" " " " chest circumference.	4943	+ 19.6
" " calculated from trunk length and chest circumference.	4652	+ 27.2

CRAMPTON'S TEST.

45%

Pulse rate:- resting	78
standing	106
Blood pressure:- resting	166/66
standing	166/80

BREATH HOLDING

1st:- 51

2nd:- 37

40 mm Test

9 19 29 39 50 62/ 33 10 20 30 40 50 61 / 32

Pulse regular. Volume slightly diminished

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	138
	3. Time taken to return to normal	75 secs.

Number:- 19 Age:- 21

E - F - IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	131	
Trunk length	34	
Standing height	5' 4½	
Chest circumference	33½	
Vital Capacity	4080	
from Tables		
Weight according to length	125	
" " " chest circumference	143.72	
Mean calculated weight	134	- 2.1
Chest according to trunk length	32.31	+ 3.7
Vital capacity according to weight	3966	+ 2.9
" " " " trunk length	3835	+ 6.4
" " " " chest circumference.	4118	- 0.9
" " calculated from trunk length and chest circumference.	3976	+ 2.6

CRAMPTON'S TEST.

Pulse rate:- resting	66	65%
standing	72	
Blood pressure:- resting	140/76	
standing	138/82	

BREATH HOLDING

1st:- 54

2nd:- 27

40 mm Test

7 14 22 30 39 49 / 33 6 12 20 29 35 / 26

Pulse volume slightly diminished. Pulse regular

Exercise Tolerance Test.

Pulse rate 1. resting		60
2. after exertion		114
3. Time taken to return to normal		100 secs.

His duties as a storeman enable him to avoid heavy manual work and physical training. He is unfit and psychologically lacks the strength of will to endure hardship.

Number:- 20 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	133	
Trunk length	35	
Standing height	5' 8	
Chest circumference	33½	
Vital Capacity	3440	
from Tables		
Weight according to length	136.89	
" " " chest circumference	137.99	
Mean calculated weight	138	- 3.6
Chest according to trunk length	33.40	+ 0.3
Vital capacity according to weight	4010	- 14.2
" " " " trunk length	4094	- 16.0
" " " " chest circumference.	4118	- 16.5
" " calculated from trunk length and chest circumference.	4106	- 16.2

CRAMPTON'S TEST.

Pulse rate:- resting	66	60%
standing	68	
Blood pressure:- resting	130/76	
standing	124/	

BREATH HOLDING

1st:- 29

2nd:- 23

40 mm Test

7 16 25 31 39 / 28 5 10 17 24 / 20

Exercise Tolerance Test.

Pulse rate	1. resting	54
	2. after exertion	134
	3. Time taken to return to normal	60 secs.

Physically he is below the average. his endurance is poor.

Number:- 21 Age:- 30

11

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	155	
Trunk length	36	
Standing height	5' $7\frac{1}{2}$	
Chest circumference	$35\frac{3}{4}$	
Vital Capacity	4600	
from Tables		
Weight according to length	149.52	
" " " chest circumference	164.94	
Mean calculated weight	157	− 1.3
Chest according to trunk length	34.50	+ 3.6
Vital capacity according to weight	4477	+ 2.6
" " " " trunk length	4362	+ 5.5
" " " " chest circumference.	4681	− 0.2
" " calculated from trunk length and chest circumference.	4522	+ 0.2

CRAMPTON'S TEST.

Pulse rate:- resting	80	65%
standing	84	
Blood pressure:- resting	148/84	
standing	145/88	

BREATH HOLDING

1st:- 65

2nd:- 24

40 mm Test

7 14 22 30 39 48 57 64 / 42 6 14 22 29 37 45 53 60 69 / 48

Pulse diminished and irregular towards end

Exercise Tolerance Test.

Pulse rate	1. resting	66
	2. after exertion	126
	3. Time taken to return to normal	195 secs.

Fitness below the average, but does not lack stamina.

Number:- 22 Age:- 21

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	145	
Trunk length	35½	
Standing height	5' 7	
Chest circumference	34¾	
Vital Capacity	3720	
from Tables		
Weight according to length	143.11	
" " " chest circumference	152.56	
Mean calculated weight	148	- 2.2
Chest according to trunk length	33.95	+ 2.4
Vital capacity according to weight	4267	- 12.8
" " " " trunk length	4228	- 12.0
" " " " chest circumference.	4426	- 16.0
" " calculated from trunk length and chest circumference.	4317	- 16.2

CRAMPTON'S TEST.

85%

Pulse rate:- resting 64
standing 68
Blood pressure:- resting 148/88
standing 151/90

BREATH HOLDING

1st:- 51

2nd:- 16

40 mm Test

7 15 23 34 44 55 64 73 / 40 16 26 37 46 56 67 78 88 / 45

P.V.D. slightly irregular. P.V.D. rapidly at 6 secs.

Exercise Tolerance Test.

Pulse rate 1. resting 60
2. after exertion 114
3. Time taken to return to normal 40 secs.

Number:- 23 Age:- 22

E - 1

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	141	
Trunk length	34½	
Standing height	5' 6½	
Chest circumference	33¼	
Vital Capacity	3840	
from Tables		
Weight according to length	130.85	
" " " chest circumference	137.99	
Mean calculated weight	134	+ 5.2
Chest according to trunk length	32.86	+ 1.9
Vital capacity according to weight	4182	- 8.2
" " " " trunk length	3963	- 3.1
" " " " chest circumference.	4118	- 6.7
" " calculated from trunk length and chest circumference.	4040	- 5

CRAMPTON'S TEST.

Pulse rate:- resting	60	90%
standing	60	
Blood pressure:- resting	140/96	
standing	146/98	

BREATH HOLDING

1st:- 35

2nd:- 15

40 mm Test

6 12 19 27 36 / 24

Pulse volume diminished and irregular

Exercise Tolerance Test.

Pulse rate 1.	resting	66
2.	after exertion	114
3.	Time taken to return to normal	30 secs.

Physical condition and endurance much below the average.

Number:- 24 Age:- 23

EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	147	
Trunk length	35½	
Standing height	5' 4	
Chest circumference	38	
Vital Capacity	5200	
from Tables		
Weight according to length	139.98	
" " " chest circumference	194.91	
Mean calculated weight	168	+ 12.5
Chest according to trunk length	36.70	+ 3.5
Vital capacity according to weight	4309	+ 20.6
" " " " trunk length	4160	+ 25
" " " " chest circumference.	5280	- 1.5
" " calculated from trunk length and chest circumference.	4620	+ 12.6

CRAMPTON'S TEST.

Pulse rate:- resting	58	70%
standing	64	
Blood pressure:- resting	142/84	
standing	142/90	

BREATH HOLDING

1st:- 41

2nd:- 18

40 mm Test

8 17 26 34 40 50 58 66 75/45 Central diminution of volume: restored later

8 16 24 33 40 49 58 74/46 Gradual continual diminution in volume

Exercise Tolerance Test.

Pulse rate 1. resting		66
2. after exertion		132
3. Time taken to return to normal		45 secs.

Number:- 25 Age:- 31

E - F

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	159	
Trunk length	34½	
Standing height	5' 9	
Chest circumference	37¼	
Vital Capacity	4320	
from Tables		
Weight according to length	130.85	
" " " chest circumference	184.56	
Mean calculated weight	158	+ 0.6
Chest according to trunk length	32.86	+ 13.3
Vital capacity according to weight	4560	- 5.3
" " " " trunk length	3963	+ 9
" " " " chest circumference.	5077	- 14.9
" " calculated from trunk length and chest circumference.	4520	- 4.4

CRAMPTON'S TEST.

Pulse rate:- resting	70	60%
standing	74	
Blood pressure:- resting	132/78	
standing	126/84	

BREATH HOLDING

1st:- 42

2nd:- 25

40 mm Test

7 14 21 27 34/27 7 15 21 26 33 39/30

Pulse volume diminished and remained irregular

Exercise Tolerance Test.

Pulse rate	1. resting	90
	2. after exertion	120
	3. Time taken to return to normal	50 secs.

Fitness and endurance below the average.

Number:- 26 Age:- 22

EF 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	137	
Trunk length	34	
Standing height	5' 11	
Chest circumference	32¾	
Vital Capacity	4880	
from Tables		
Weight according to length	125.00	
" " " chest circumference	129.70	
Mean calculated weight	127	+ 7.8
Chest according to trunk length	32.31	+ 1.2
Vital capacity according to weight	4096	+ 19.1
" " " " trunk length	3835	+ 27.3
" " " " chest circumference.	3938	+ 23.9
" " calculated from trunk length and chest circumference.	4000	+ 20.6

CRAMPTON'S TEST.

Pulse rate:- resting	52	90%
standing	64	
Blood pressure:- resting	126/76	
standing	136/96	

BREATH HOLDING

1st:- 55

2nd:- 18

40 mm Test

Pulse volume slightly diminished

8 17 27 37 48 58 69 80/40

Exercise Tolerance Test.

Pulse rate	1. resting	54
	2. after exertion	102
	3. Time taken to return to normal	50 secs.

Number:- 27 Age:- EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	178	
Trunk length	37	
Standing height	5' 11	
Chest circumference	38	
Vital Capacity	5480	
from Tables		
Weight according to length	162.93	
" " " chest circumference	194.91	
Mean calculated weight	179	+0.6
Chest according to trunk length	35.59	+6.7
Vital capacity according to weight	4946	+10.8
" " " " trunk length	4641	+18.3
" " " " chest circumference.	5280	+3.8
" " calculated from trunk length and chest circumference.	5460	+.4

CRAMPTON'S TEST.

Pulse rate:- resting	60	75%
standing	78	
Blood pressure:- resting	138/88	
standing	146/92	

BREATH HOLDING

1st:- 42

2nd:- 17

40 mm Test

6 14 23 32 40 49 58 66 75 86 95 103/61

Pulse volume only slightly diminished: remained regular

Exercise Tolerance Test.

Pulse rate	1. resting	78
	2. after exertion	102
	3. Time taken to return to normal	25 secs.

Number:- 28 Age:-

EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	171	
Trunk length	36½	
Standing height	6' ½	
Chest circumference	37¼	
Vital Capacity	5800	
from Tables		
Weight according to length	156.13	
" " " chest circumference	184.56	
Mean calculated weight	170	+ 0.6
Chest according to trunk length	35.04	+ 5.7
Vital capacity according to weight	4805	+ 20.8
" " " " trunk length	4500	+ 28.8
" " " " chest circumference.	5077	+ 14.2
" " calculated from trunk length and chest circumference.	4788	+ 20.8

CRAMPTON'S TEST.

65%

Pulse rate:- resting 74
standing 86
Blood pressure:- resting 132/62
standing 132/76

BREATH HOLDING

1st:- 51

2nd:- 18

40 mm Test

7 14 22 31 39 47/32 6 12 19 27 34 42 48 56 64 70 77/55

Pulse volume good and regular

Exercise Tolerance Test.

Pulse rate	1. resting	78
	2. after exertion	114
	3. Time taken to return to normal	55 secs.

Number:- 29. Age:- 29

EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	163	
Trunk length	35½	
Standing height	5' 9½	
Chest circumference	35¾	
Vital Capacity	4400	
from Tables		
Weight according to length	143.11	
" " " chest circumference	164.94	
Mean calculated weight	154	+ 5.8
Chest according to trunk length	33.95	+ 5.6
Vital capacity according to weight	4642	- 5.2
" " " " trunk length	4227	+ 4.1
" " " " chest circumference.	4681	- 6
" " calculated from trunk length and chest circumference.	4454	- 1.2

CRAMPTON'S TEST.

Pulse rate:- resting	72	60%
standing	82	
Blood pressure:- resting	134/74	
standing	132/82	

BREATH HOLDING

1st:- 44

2nd:- 10

40 mm Test

7 13 21 28 36 42 50/38

Pulse volume maintained. Regular

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	138
	3. Time taken to return to normal	55 secs.

Number:- 30 Age:- 26½

1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	162	
Trunk length	34¾	
Standing height	5' 8½	
Chest circumference	36¾	
Vital Capacity	4840	
from Tables		
Weight according to length	133.84	
" " " chest circumference	177.85	
Mean calculated weight	156	+ 3.8
Chest according to trunk length	33.13	+ 11.3
Vital capacity according to weight	4622	+ 4.7
" " " " trunk length	4028	+ 20.1
" " " " chest circumference.	4943	- 2.1
" " calculated from trunk length and chest circumference.	4490	+ 7.8

CRAMPTON'S TEST.

Pulse rate:- resting	64	75%
standing	80	
Blood pressure:- resting	127/70	
standing	132/88	

BREATH HOLDING

1st:- 72

2nd:- 28

40 mm Test

8 17 27 37 48 58 69 80/40

Pulse volume slightly diminished: remained regular

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	156
	3. Time taken to return to normal	65 secs.

Number:- 31 Age:- 31 E – F –

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	153	
Trunk length	34	
Standing height	5' 7	
Chest circumference	40	
Vital Capacity	5000	
from Tables		
Weight according to length	125	
" " " chest circumference	224.33	
Mean calculated weight	175	– 12.6
Chest according to trunk length	32.31	+ 24
Vital capacity according to weight	4435	+ 12.7
" " " " trunk length	3835	+ 30.4
" " " " chest circumference.	5843	- 14.4
" " calculated from trunk length and chest circumference.	4839	+ 3.3

CRAMPTON'S TEST.

Pulse rate:- resting	76	70%
standing	86	
Blood pressure:- resting	122/80	
standing	125/84	

BREATH HOLDING

1st:- 49

2nd:- 32

40 mm Test

8 16 27 36 45 55 65 74 85 95 106/57 P.V. diminished: rate increased: regular

8 19 30 40 52 65 77 90 104 117/52 P.V. diminished: after 25 secs. almost imperceptible

Exercise Tolerance Test.

Pulse rate	1. resting	78
	2. after exertion	126
	3. Time taken to return to normal	45 secs.

Out of condition for lack of exercise. Lacks stamina.

Number:- 32 Age:- 22

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	158	
Trunk length	34½	
Standing height	5' 9½	
Chest circumference	38	
Vital Capacity	4720	
from Tables		
Weight according to length	130.85	
" " " chest circumference	194.91	
Mean calculated weight	163	- 3.1
Chest according to trunk length	32.86	+ 15.6
Vital capacity according to weight	4539	+ 4.0
" " " " trunk length	3963	+ 19.1
" " " " chest circumference.	5280	- 10.6
" " calculated from trunk length and chest circumference.	4621	+ 2.1

CRAMPTON'S TEST.

Pulse rate:- resting	50	70%
standing	64	
Blood pressure:- resting	122/82	
standing	127/86	

BREATH HOLDING

1st:- 50

2nd:- 24

40 mm Test

6 10 16 22 28 33 38 44/40 P.V. only slightly diminished: regular

5 10 15 21 26 31 37 42 46 50 54/56 P.V. slight central diminution

Exercise Tolerance Test.

Pulse rate	1. resting	54
	2. after exertion	102
	3. Time taken to return to normal	40 secs.

Number:- 33 Age:- 22

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	150	
Trunk length	34¼	
Standing height	5' 10	
Chest circumference	34½	
Vital Capacity	4000	
from Tables		
Weight according to length	127.9	
" " " chest circumference	149.58	
Mean calculated weight	139	+ 7.9
Chest according to trunk length	32.58	+ 5.8
Vital capacity according to weight	4373	+ 8.5
" " " " trunk length	3878	+ 2.6
" " " " chest circumference.	4364	- 8.3
" " calculated from trunk length and chest circumference.	4131	- 3.2

CRAMPTON'S TEST.

Pulse rate:- resting	62	30%
standing	76	
Blood pressure:- resting	132/82	
standing	120/80	

BREATH HOLDING

1st:- 39

2nd:- 21

40 mm Test

6 13 22 32 42 51/31 P.V. diminished: slight vertigo

6 14 23 32 42 52/30

Exercise Tolerance Test.

Pulse rate	1. resting	66
	2. after exertion	138
	3. Time taken to return to normal	45 secs.

Number:- 34 Age:- 22

E T I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	142	
Trunk length	$33\frac{3}{4}$	
Standing height	$5^{\prime}\ 3\frac{3}{4}$	
Chest circumference	$34\frac{7}{8}$	
Vital Capacity	4280	
from Tables		
Weight according to length	122.13	
" " " chest circumference	154.07	
Mean calculated weight	138	+ 2.9
Chest according to trunk length	32.04	+ 8.9
Vital capacity according to weight	4203	+ 1.8
" " " " trunk length	3771	+ 13.5
" " " " chest circumference.	4458	- 4
" " calculated from trunk length and chest circumference.	4114	+ 4

CRAMPTON'S TEST.

Pulse rate:- resting	68	80%
standing	78	
Blood pressure:- resting	116/66	
standing	122/	

BREATH HOLDING

1st:- 36

2nd:- 28

40 mm Test

7 16 26 36 44 51 59 68 75/45 P.V. central diminution: slight vertigo

~~7 18 24~~

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	108
	3. Time taken to return to normal	55 secs.

Number:- 35 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	161	
Trunk length	36	
Standing height	5' 7½	
Chest circumference	37½	
Vital Capacity	4800	
from Tables		
Weight according to length	149.52	
" " " chest circumference	184.56	
Mean calculated weight	167	- 3.6
Chest according to trunk length	34.5	
Vital capacity according to weight	4601	+ 4.8
" " " " trunk length	4362	+ 8.2
" " " " chest circumference.	5077	- 4.5
" " calculated from trunk length and chest circumference.	4719	+ 1.7

CRAMPTON'S TEST.

Pulse rate:- resting	84	70%
standing	92	
Blood pressure:- resting	126/78	
standing	127/80	

BREATH HOLDING

1st:- 61

2nd:- 32

40 mm Test

7 15 22 31 38 48 56 66 76 86 /50

P.V. maintained: slightly diminished at 30 secs.

Exercise Tolerance Test.

Pulse rate 1.	resting	78
2.	after exertion	132
3.	Time taken to return to normal	85 secs.

Number:- 36 Age:- 22

E - F

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	145	
Trunk length	$35\frac{3}{4}$	
Standing height	$5'\ 10\frac{1}{2}$	
Chest circumference	$33\frac{3}{4}$	
Vital Capacity	3920	
from Tables		
Weight according to length	146.30	
" " " chest circumference	140.84	
Mean calculated weight	144	- 0.7
Chest according to trunk length	34.22	+ 2.2
Vital capacity according to weight	4267	- 8.1
" " " " trunk length	4295	- 8.7
" " " " chest circumference.	4179	- 6.2
" " calculated from trunk length and chest circumference.	4237	- 5.1

CRAMPTON'S TEST.

40%

Pulse rate:- resting 76
standing 86

Blood pressure:- resting 146/90
standing 136/86

BREATH HOLDING

1st:- 41

2nd:- 16

40 mm Test

7 14 21 30/23 P.V. slight decrease in volume
7 15 25 34 46 58/30

Exercise Tolerance Test.

Pulse rate 1. resting 78
2. after exertion 126
3. Time taken to return to normal 60 secs.

Fitness below the average; lacks stamina.

Number:- 37 Age:- 21 EF 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	130	
Trunk length	$33\frac{3}{8}$	
Standing height	5' $4\frac{1}{2}$	
Chest circumference	$34\frac{3}{4}$	
Vital Capacity	3400	
from Tables		
Weight according to length	117.93	
" " " chest circumference	148.10	
Mean calculated weight	133	+ 2.3
Chest according to trunk length	31.63	+ 9.8
Vital capacity according to weight	3945	- 13.8
" " " " trunk length	3677	- 7.5
" " " " chest circumference.	4333	- 21.6
" " calculated from trunk length and chest circumference.	4005	- 15.1

CRAMPTON'S TEST.

60%

Pulse rate:-	resting	76
	standing	96
Blood pressure:-	resting	146/66
	standing	148/66

BREATH HOLDING

1st:- 65

2nd:- 27

40 mm Test

18 16 26 36 46 58 69 /38

P.V. slight diminution in volume: slight vertigo

Exercise Tolerance Test.

Pulse rate	1. resting	72
	2. after exertion	120
	3. Time taken to return to normal	50 secs.

Number:- 38 Age:- 21

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	157	
Trunk length	36	
Standing height	5' 9½	
Chest circumference	35½	
Vital Capacity	4720	
from Tables		
Weight according to length	149.52	
" " " chest circumference	161.76	
Mean calculated weight	156	+ 0.6
Chest according to trunk length	34.5	+ 2.9
Vital capacity according to weight	4519	+ 4.4
" " " " trunk length	4362	+ 8.7
" " " " chest circumference.	4617	+ 2.2
" " calculated from trunk length and chest circumference.	4489	+ 5.1

CRAMPTON'S TEST.

Pulse rate:- resting	82	100%
standing	88	
Blood pressure:- resting	132/60	
standing	144/80	

BREATH HOLDING

1st:- 45

2nd:- 27

40 mm Test

9 19 30 41 /22 (Best) vertigo

Pulse only slightly diminished : remained regular

Exercise Tolerance Test.

Pulse rate 1. resting		~~100~~ 92.
2. after exertion		156
3. Time taken to return to normal		45 secs.

Number:- 39 Age:- 21

E F IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	159	
Trunk length	34	
Standing height	5' $7\frac{3}{4}$	
Chest circumference	35	
Vital Capacity	4880	
from Tables		
Weight according to length	125	
" " " chest circumference	155.6	
Mean calculated weight	140	+13.6
Chest according to trunk length	32.31	+ 8.4
Vital capacity according to weight	4560	+ 7
" " " " trunk length	3835	+ 27.3
" " " " chest circumference.	4490	+ 8.7
" " calculated from trunk length and chest circumference.	4162	± 17.3

CRAMPTON'S TEST.

Pulse rate:- resting	80	75%
standing	86	
Blood pressure:- resting	130/62	
standing	132/72	

BREATH HOLDING

1st:- 64

2nd:- 36

40 mm Test

19 18 29 37 44 /28 7 17 29 40 52 /25

P.V. slight diminution

Exercise Tolerance Test.

Pulse rate 1. resting		96
2. after exertion		132
3. Time taken to return to normal		65 secs.

Psychologically a poor type; fitness below the average.

Number:- 40 Age:- 24

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	140	
Trunk length	33	
Standing height	5' $6\frac{1}{2}$	
Chest circumference	$35\frac{1}{8}$	
Vital Capacity	4600	
from Tables		
Weight according to length	113.83	
" " " chest circumference	157.13	
Mean calculated weight	135	+ 3.7
Chest according to trunk length	31.23	+ 8
Vital capacity according to weight	4161	+ 10.6
" " " " trunk length	3585	+ 28.4
" " " " chest circumference.	4521	+ 1.7
" " calculated from trunk length and chest circumference.	4053	+ 13.5

CRAMPTON'S TEST.

Pulse rate:- resting	96	65%
standing	96	
Blood pressure:- resting	140/28	
standing	136/	

BREATH HOLDING

1st:- 60

2nd:- 46

40 mm Test

15 26 43 54 65 75 86 97 109 /55

P.V. diminished but regular

Exercise Tolerance Test.

Pulse rate 1. resting		96
2. after exertion		120
3. Time taken to return to normal		40 secs.

Number:- 41 Age:- 22

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	162	
Trunk length	35⅜	
Standing height	5' 7½	
Chest circumference	36½	
Vital Capacity	4880	
from Tables		
Weight according to length	138.43	
" " " chest circumference	174.55	
Mean calculated weight	156	+ 3.8
Chest according to trunk length	33.54	+ 9
Vital capacity according to weight	4622	+ 5.6
" " " " trunk length	4.27	+ 18.2
" " " " chest circumference.	4877	+ .1
" " calculated from trunk length and chest circumference.	4502	+8.4

CRAMPTON'S TEST.

70%

Pulse rate:-	resting	76
	standing	80
Blood pressure:-	resting	150/90
	standing	147/90

BREATH HOLDING

1st:- 47

2nd:- 24

40 mm Test

7 15 22 30 36 45 52 60 66 /46

Exercise Tolerance Test.

Pulse rate	1. resting	78
	2. after exertion	136
	3. Time taken to return to normal	35 secs.

Number:- 42 Age:- 31 EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	161	
Trunk length	35¾	
Standing height	5' 9	
Chest circumference	37½	
Vital Capacity	4720	
from Tables		
Weight according to length	146.3	
" " " chest circumference	184.56	
Mean calculated weight	150	+ 7.3
Chest according to trunk length	34.22	+ 8.8
Vital capacity according to weight	4601	+ 2.6
" " " " trunk length	4295	+ 9.9
" " " " chest circumference.	5077	- 7.0
" " calculated from trunk length and chest circumference.	4686	- 0.8

CRAMPTON'S TEST.

Pulse rate:- resting	78	65%
standing	86	
Blood pressure:- resting	138/70	
standing	136/78	

BREATH HOLDING

1st:- 39

2nd:- 32

40 mm Test

6 16 25 34 43 52 /32 P.V. Pulse diminished in volume: remained regular

8 18 28 37 49 /27

Exercise Tolerance Test.

Pulse rate 1. resting	78
2. after exertion	120
3. Time taken to return to normal	60 secs.

Number:- 43 Age:- 26

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	154	
Trunk length	34¾	
Standing height	5' 9	
Chest circumference	36½	
Vital Capacity	4400	
from Tables		
Weight according to length	133.84	
" " " chest circumference	174.55	
Mean calculated weight	154	0
Chest according to trunk length	33.13	+ 9.7
Vital capacity according to weight	4456	- 1.2
" " " " trunk length	4028	+ 9.0
" " " " chest circumference.	4877	- 9.8
" " calculated from trunk length and chest circumference.	4447	- 10.6

CRAMPTON'S TEST.

Pulse rate:- resting	96	30%
standing	114	
Blood pressure:- resting	154/74	
standing	144/84	

BREATH HOLDING

1st:- 58

2nd:- 31

40 mm Test

10 2^0 31 42 53 63 71 81 92 97 106 /56

P.V. Pulse unchanged

Exercise Tolerance Test.

Pulse rate 1.	resting	96
2.	after exertion	138
3.	Time taken to return to normal	50 secs.

Number:- 44 Age:- 22 EF 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	129	
Trunk length	34⅜	
Standing height	5' 6	
Chest circumference	33⅜	
Vital Capacity	3680	
from Tables		
Weight according to length	126.44	
" " " chest circumference	136.59	
Mean calculated weight	131	- 1.5
Chest according to trunk length	32.45	+ 2.8
Vital capacity according to weight	3923	- 6.2
" " " " trunk length	3866	- 4.8
" " " " chest circumference.	4088	- 10
" " calculated from trunk length and chest circumference.	3977	- 7.5

CRAMPTON'S TEST.

Pulse rate:- resting	92	55%
standing	104	
Blood pressure:- resting	122/70	
standing	117/70	

BREATH HOLDING

1st:- 40

2nd:- 27

40 mm Test

8 17 29 45 /24 9 21 30 40 50 60 73 /35

P.V. diminished 5 and gradually recovered

Exercise Tolerance Test.

Pulse rate 1.	resting	102
2.	after exertion	138
3.	Time taken to return to normal	35 secs.

Number:- 45 Age:- 21

T11

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	140	
Trunk length	34⅞	
Standing height	5' 5½	
Chest circumference	35	
Vital Capacity	4480	
from Tables		
Weight according to length	135.35	
" " " chest circumference	155.6	
Mean calculated weight	145	- 3.4
Chest according to trunk length	33.26	+ 5.1
Vital capacity according to weight	4161	+ 9.4
" " " " trunk length	4061	+ 10.3
" " " " chest circumference.	4490	- 0.2
" " calculated from trunk length and chest circumference.	4275	+ 4.8

CRAMPTON'S TEST.

70%

Pulse rate:-	resting	88
	standing	90
Blood pressure:-	resting	120/80
	standing	118/

BREATH HOLDING

1st:- 34

2nd:- 26

40 mm Test

7 17 27 /32 P.V. Pulse disappeared after 27: vertigo

9 20 30 42 54 67 /30 P.V. Pulse disappeared after 15 secs.

Exercise Tolerance Test.

Pulse rate	1. resting	102
	2. after exertion	144
	3. Time taken to return to normal	35 secs.

Psychologically a poor type who lacks stamina, but he is in fairly good physical condition.

Number:- 46 Age:- 22

E F IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	145	
Trunk length	35¼	
Standing height	5' 7½	
Chest circumference	35	
Vital Capacity	4200	
from Tables		
Weight according to length	139.98	
" " " chest circumference	155.6	
Mean calculated weight	147	- 1.4
Chest according to trunk length	32.58	+ 7.4
Vital capacity according to weight	4267	- 1.6
" " " " trunk length	4160	+ 1
" " " " chest circumference.	4490	- 6.5
" " calculated from trunk length and chest circumference.	4325	- 2.9

CRAMPTON'S TEST.

Pulse rate:- resting	76	80%
standing	86	
Blood pressure:- resting	142/90	
standing	148/	

BREATH HOLDING

1st:- 35

2nd:- 26

40 mm Test

7 14 23 32 40 49 /3I 7 14 23 32 40 49 /34

P.V. diminished and remained regular

Exercise Tolerance Test.

Pulse rate 1. resting		84
2. after exertion		114
3. Time taken to return to normal		50 secs.

Physically unfit from lack of exercise. Psychologically a poor type - lacks the will to endure.

Number:- 47 Age:- 36 EF 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	148	
Trunk length	33½	
Standing height	5' 6	
Chest circumference	35¾	
Vital Capacity	3800	
from Tables		
Weight according to length	119.32	
" " " chest circumference	164.94	
Mean calculated weight	142	+ 4.2
Chest according to trunk length	30.69	+ 16.3
Vital capacity according to weight	4331	- 12.3
" " " " trunk length	3708	+ 2.5
" " " " chest circumference.	4681	- 18.9
" " calculated from trunk length and chest circumference.	4294	- 11.5

CRAMPTON'S TEST.

Pulse rate:- resting	52	45%
standing	62	
Blood pressure:- resting	134/85	
standing	126/85	

BREATH HOLDING

1st:- 39

2nd:- 29

40 mm Test

6 12 20 28 37 46 55 64 /41

P.V. diminished

Exercise Tolerance Test.

Pulse rate	1. resting	54
	2. after exertion	102
	3. Time taken to return to normal	65 secs.

Number:- 48 Age:- 24

EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	126	
Trunk length	$34\frac{1}{8}$	
Standing height	$5'\ 8\frac{1}{2}$	
Chest circumference	$32\frac{3}{4}$	
Vital Capacity	3400	
from Tables		
Weight according to length	126.44	
" " " chest circumference	129.7	
Mean calculated weight	128	- 0.6
Chest according to trunk length	32.45	+ 0.9
Vital capacity according to weight	3857	- 11.8
" " " " trunk length	3866	- 12.0
" " " " chest circumference.	3938	- 13.6
" " calculated from trunk length and chest circumference.	3902	- 12.9

CRAMPTON'S TEST.

Pulse rate:- resting	66	55%
standing	80	
Blood pressure:- resting	142/82	
standing	140/86	

BREATH HOLDING

1st:- 39

2nd:- 31

40 mm Test

9 19 30 40 /22 (~~7 18 26~~) 7 16 27 35 /20

P.V. diminished but remained regular

Exercise Tolerance Test.

Pulse rate 1.	resting	84
2.	after exertion	138
3.	Time taken to return to normal	55 secs.

Number:- 49 Age:- 22

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	142	
Trunk length	34¾	
Standing height	5' 8	
Chest circumference	34¾	
Vital Capacity	3880	
from Tables		
Weight according to length	133.84	
" " " chest circumference	152.56	
Mean calculated weight	143	- 0.7
Chest according to trunk length	33.13	+ 4.8
Vital capacity according to weight	4203	- 7.6
" " " " trunk length	4028	- 8.6
" " " " chest circumference.	4426	- 12.3
" " calculated from trunk length and chest circumference.	4227	- 8.2

CRAMPTON'S TEST.

Pulse rate:- resting	80	80%
standing	88	
Blood pressure:- resting	142/84	
standing	146/80	

BREATH HOLDING

1st:- 42

2nd:- 27

40 mm Test

9 17 26 35 43 51 60 /38 P.V. only slightly diminished: remained

7 16 25 33 43 52 60 /37 of a good volume and regular

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	120
	3. Time taken to return to normal	50 secs.

Number:- 50 Age:- 23

11

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	137	
Trunk length	35¾	
Standing height	5' 7	
Chest circumference	35	
Vital Capacity	4200	
from Tables		
Weight according to length	146.3	
" " " chest circumference	155.6	
Mean calculated weight	151	- 8.9
Chest according to trunk length	34.22	+ 2.0
Vital capacity according to weight	4096	+ 2.6
" " " " trunk length	4295	- 2.2
" " " " chest circumference.	4490	- 6.4
" " calculated from trunk length and chest circumference.	4392	- 4.4

CRAMPTON'S TEST.

Pulse rate:- resting	74	25%
standing	96	
Blood pressure:- resting	136/80	
standing	126/84	

BREATH HOLDING

1st:- 64

2nd:- 25

40 mm Test

10 22 35 45 56 66 77 89 100 110 /49 P.V. diminished; almost imperceptible from 10 secs. remained regular.

Exercise Tolerance Test.

Pulse rate 1.	resting	84
2.	after exertion	132
3.	Time taken to return to normal	40 secs.

Can be relied on to see an arduous duty through to the end but his physical fitness is below the average.

Number:- 51 Age:- 21

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	146	
Trunk length	34	
Standing height	5' $6\frac{1}{2}$	
Chest circumference	$35\frac{3}{4}$	
Vital Capacity	4580	
from Tables		
Weight according to length	125	
" " " chest circumference	164.95	
Mean calculated weight	140	+ 4.3
Chest according to trunk length	32.31	+ 10.5
Vital capacity according to weight	4288	+ 6.8
" " " " trunk length	3835	+ 19.5
" " " " chest circumference.	4681	- 2.2
" " calculated from trunk length and chest circumference.	4258	+ 7.6

CRAMPTON'S TEST.

Pulse rate:- resting	66	60%
standing	80	
Blood pressure:- resting	142/86	
standing	142/90	

BREATH HOLDING

1st:- 36

2nd:- 23

40 mm Test

7 14 22 32 41 51 60 /37 P.V. only slightly diminished: remained fairly regular

7 15 25 35 45 52 60 /35 P.V. as above

Exercise Tolerance Test.

Pulse rate 1. resting		72
2. after exertion		144
3. Time taken to return to normal		55 secs.

Number:- 52 Age:- 23 E F - II

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	140	
Trunk length	35	
Standing height	5' 8	
Chest circumference	34 1/8	
Vital Capacity	4180	
from Tables		
Weight according to length	136.89	
" " " chest circumference	145.16	
Mean calculated weight	141	- 0.7
Chest according to trunk length	33.4	+ 2.1
Vital capacity according to weight	4161	- 0.5
" " " " trunk length	4094	+ 2.1
" " " " chest circumference.	4271	- 2.1
" " calculated from trunk length and chest circumference.	4282	- 2.4

CRAMPTON'S TEST.

Pulse rate:- resting	78	65%
standing	80	
Blood pressure:- resting	154/100	
standing	150/100	

BREATH HOLDING

1st:- 46

2nd:- 31

40 mm Hg.

7 15 23 34 45 58 69 /36 P.V. diminished: remained regular

8 On second attempt pulse disappeared after 5 secs.

Exercise Tolerance Test.

Pulse rate 1. resting		78
2. after exertion		150
3. Time taken to return to normal		60 secs.

Fitness below the average but not lacking in endurance.

Number:- 53 Age:- 26

E F II

DREYER'S TESTS.

Measurements	Recorded	% deviation
Height	153	
Trunk length	45¼	
Standing height	5' 11	
Chest circumference	36½	
Vital Capacity	4280	
from Tables		
Height according to length	139.98	
" " " chest circumference	174.55	
Mean calculated weight	152	+ 0·7
Chest according to trunk length	33.67	+ 8.3
Vital capacity according to weight	4435	- 3.5
" " " " trunk length	4160	+ 2.9
" " " " chest circumference.	4877	- 12.2
" " calculated from trunk length and chest circumference.	4568	- 6.3

CRAMPTON'S TEST.

Pulse rate:- resting	74	25%
standing	90	
Blood pressure:- resting	138/66	
standing	124/60	

BREATH HOLDING

1st:- 40

2nd:- 17

40 mm Test

7 15 23 33 43 54 66 /36 P.V. good

8 17 26 36 47 56 65 73 83 /44 P.V. good

Exercise Tolerance Test.

Pulse rate 1. resting		84
2. after exertion		126
3. Time taken to return to normal		30 secs.

Fitness below the average but does not lack stamina.

Number:- 54 Age:- 22

E F - II

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	141	
Trunk length	36¾	
Standing height	5' 8½	
Chest circumference	33½	
Vital Capacity	3720	
from Tables		
Weight according to length	159.51	
" " " chest circumference	137.99	
Mean calculated weight	149	- 5.4
Chest according to trunk length	35.32	- 5.1
Vital capacity according to weight	4182	- 8.7
" " " " trunk length	4570	-18.6
" " " " chest circumference.	4118	- 9.7
" " calculated from trunk length and chest circumference.	4344	- 14.4

CRAMPTON'S TEST.

Pulse rate:- resting	80	50%
standing	94	
Blood pressure:- resting	150/82	
standing	146/	

BREATH HOLDING

1st:- 35

2nd:- 25

40 mm Test

8 20 /13 P.V. disappeared after 5 secs. vertigo

9 20 /17 P.V. disappeared after 10 secs.

Exercise Tolerance Test.

Pulse rate 1.	resting	96
2.	after exertion	132
3.	Time taken to return to normal	85 secs.

Physical fitness low for lack of exercise, endurance 100%

Number:- 55 Age:- 23

E F II

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	147	
Trunk length	34¼	
Standing height	5'8	
Chest circumference	36¼	
Vital Capacity	4000	
from Tables		
Weight according to length	127.9	
" " " chest circumference	171.3	
Mean calculated weight	149	- 1.3
Chest according to trunk length	32.58	+ 11.4
Vital capacity according to weight	4331	- 7.6
" " " " trunk length	3898	+ 2.6
" " " " chest circumference.	4812	- 16.9
" " calculated from trunk length and chest circumference.	4355	- 8.2

CRAMPTON'S TEST.

Pulse rate:- resting	74	15%
standing	102	
Blood pressure:- resting	140/90	
standing	130/	

BREATH HOLDING

1st:- 37

2nd:- 25

40 mm Test

9 23 35 50 63 76/30 P.V. almost disappeared

10 21 34 48 60 76 /34

Exercise Tolerance Test.

Pulse rate	1. resting	~~130~~ 80
	2. after exertion	~~162~~ 108
	3. Time taken to return to normal	40 secs.

Fitness below the average, endurance good.

Number:- 56 Age:- 29 EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	158	
Trunk length	$34\frac{1}{8}$	
Standing height	5' $5\frac{1}{2}$	
Chest circumference	$37\frac{7}{8}$	
Vital Capacity	4000	
from Tables		
Weight according to length	126.44	
" " " chest circumference	193.16	
Mean calculated weight	160	- 1.2
Chest according to trunk length	32.45	+ 15.6
Vital capacity according to weight	4539	- 11.9
" " " " trunk length	3866	+ 3.5
" " " " chest circumference.	5246	- 23.6
" " calculated from trunk length and chest circumference.	4556	- 12.2

CRAMPTON'S TEST.

Pulse rate:- resting	70	50%
standing	84	
Blood pressure:- resting	134/84	
standing	130/84	

BREATH HOLDING

1st:- 40

2nd:- 24

40 mm Test

8 15 23 34 44 55 67 75 /40

P.V. slightly diminished

Exercise Tolerance Test.

Pulse rate 1. resting		78
2. after exertion		138
3. Time taken to return to normal		50 secs.

Number:- 57 Age:- 22

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	157	
Trunk length	34½	
Standing height	5' 7	
Chest circumference	37¼	
Vital Capacity	5000	
from Tables		
Weight according to length	130.85	
" " " chest circumference	184.56	
Mean calculated weight	158	- 0.6
Chest according to trunk length	32.86	+ 13.8
Vital capacity according to weight	4519	+ 10.6
" " " " trunk length	3963	+ 34.6
" " " " chest circumference.	5077	- 1.5
" " calculated from trunk length and chest circumference.	4520	+10.6

CRAMPTON'S TEST.

Pulse rate:- resting	76	35%
standing	90	
Blood pressure:- resting	114/78	
standing	102/80	

BREATH HOLDING

1st:- 46

2nd:- 35

40 mm Test

7 15 26 36 48 59 68 /38

P.V. almost disappeared : fertigo plus

Exercise Tolerance Test.

Pulse rate 1. resting		102
2. after exertion		120
3. Time taken to return to normal		45 secs.

Number:- 58 Age:- 21

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	157	
Trunk length	35	
Standing height	5' $6\frac{1}{2}$	
Chest circumference	$35\frac{1}{2}$	
Vital Capacity	4200	
from Tables		
Weight according to length	136.89	
" " " chest circumference	161.76	
Mean calculated weight	150	+ 4.7
Chest according to trunk length	33.4	+ 6.3
Vital capacity according to weight	4519	- 7.1
" " " " trunk length	4094	+ 2.6
" " " " chest circumference.	4617	- 8.7
" " calculated from trunk length and chest circumference.	4355	- 3.6

CRAMPTON'S TEST.

Pulse rate:- resting	62	85%
standing	78	
Blood pressure:- resting	122/78	
standing	140/90	

BREATH HOLDING

1st:- 39

2nd:- 17

40 mm Test

6 16 26 37 46 57 /30 **P.V.** diminished

7 16 25 36 46 57 68 /38 **P.V.** diminished

Exercise Tolerance Test.

Pulse rate 1.	resting	66
2.	after exertion	138
3.	Time taken to return to normal	60 secs.

Fitness below the average; endurance poor.

Number:- 59 Age:- 22

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	182	
Trunk length	38½	
Standing height	6' 4½	
Chest circumference	36½	
Vital Capacity	5640	
from Tables		
Weight according to length	184.55	
" " " chest circumference	174.55	
Mean calculated weight	180	+ 1.1
Chest according to trunk length	35.04	+ 4.3
Vital capacity according to weight	5026	+ 11.9
" " " " trunk length	5076	+ 11.1
" " " " chest circumference.	4877	+ 15.6
" " calculated from trunk length and chest circumference.	5477	+ 3.0

CRAMPTON'S TEST.

Pulse rate:- resting	52	70%
standing	76	
Blood pressure:- resting	144/82	
standing	152/90	

BREATH HOLDING

1st:- 39

2nd:- 32

40 mm Test

7 14 24 33 42 52 60 /36 P.V. much diminished towards end

6 14 25 36 48 59 /30

Exercise Tolerance Test.

Pulse rate	1. resting	72
	2. after exertion	114
	3. Time taken to return to normal	14 secs.

Number:- 60 Age:- 22

E F —

II

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	157	
Trunk length	35	
Standing height	5' 7	
Chest circumference	36	
Vital Capacity	4400	
from Tables		
Weight according to length	136.89	
" " " chest circumference	168.08	
Mean calculated weight	153	+ 2.6
Chest according to trunk length	33.4	+ 7.8
Vital capacity according to weight	4519	- 2.6
" " " " trunk length	4094	+ 7.5
" " " " chest circumference.	4746	- 7.3
" " calculated from trunk length and chest circumference.	4420	- 0.4

CRAMPTON'S TEST.

Pulse rate:-	resting	74	85%
	standing	88	
Blood pressure:-	resting	132/84	
	standing	144/	

BREATH HOLDING

Rest:- 33

Mod:- 21

40 mm Test

9 17 25 23 42 50 60 68 75 /49 P.V. good

8 17 25 34 43 51 /33 P.V. good and regular

Exercise Tolerance Test.

Pulse rate	1. resting	92
	2. after exertion	124
	3. Time taken to return to normal	140 secs.

Does not lack stamina but is out of training from lack of exercise.

Number:- 61 Age:- 22

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	168	
Trunk length	35½	
Standing height	5' 8	
Chest circumference	38	
Vital Capacity	4480	
from Tables		
Weight according to length	130.85	
" " " chest circumference	194.91	
Mean calculated weight	163	+ 3.7
Chest according to trunk length	33.95	+ 11.8
Vital capacity according to weight	4744	- 5.6
" " " " trunk length	4227	+ 6.0
" " " " chest circumference.	5280	- 15.2
" " calculated from trunk length and chest circumference.	4753	- 5.7

CRAMPTON'S TEST.

Pulse rate:- resting	82	50%
standing	90	
Blood pressure:- resting	142/64	
standing	134/76	

BREATH HOLDING

1st:- 48

2nd:- 35

40 mm Test

8 18 28 38 50 63 /34 P.V. disappeared 5-34 volume irregular vertigo

7 17 26 37 48 60 73 85 /42 Poor result: accelerating pulse rate and disappearing volume

Exercise Tolerance Test.

Pulse rate 1.	resting	60
2.	after exertion	120
3.	Time taken to return to normal	170 secs.

Physically unfit from lack of exercise, and of questionable endurance.

Number:- 62 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	152	
Trunk length	36½	
Standing height	5' 8	
Chest circumference	36½	
Vital Capacity	5000	
from Tables		
Weight according to length	156.13	
" " " chest circumference	174.55	
Mean calculated weight	165	-7.9
Chest according to trunk length	35.04	+4.3
Vital capacity according to weight	4414	+12.8
" " " " trunk length	4500	+11.1
" " " " chest circumference.	4877	+2.5
" " calculated from trunk length and chest circumference.	4688	+6.7

CRAMPTON'S TEST.

Pulse rate:- resting	66	100%
standing	70	
Blood pressure:- resting	145/90	
standing	156/	

BREATH HOLDING

1st:- 38

2nd:- 35

40 mm Test

9 18 30 42 54 66 75 82 /40 P.V. diminished: remained fairly regular

slight vertigo

Exercise Tolerance Test.

Pulse rate	1. resting	64
	2. after exertion	116
	3. Time taken to return to normal	55 secs.

Number:- 63 Age:- 23

E1

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	145	
Trunk length	34½	
Standing height	5' 6½	
Chest circumference	35½	
Vital Capacity	4200	
from Tables		
Weight according to length	130.85	
" " " chest circumference	161.76	
Mean calculated weight	146	- 0·7
Chest according to trunk length	32.86	+ 7.9
Vital capacity according to weight	4267	- 1.6
" " " " trunk length	3963	+ 0.9
" " " " chest circumference.	4617	- 9.0
" " calculated from trunk length and chest circumference.	4290	- 2.1

CRAMPTON'S TEST.

Pulse rate:- resting	76	60%
standing	80	
Blood pressure:- resting	148/80	
standing	142/84	

BREATH HOLDING

1st:- 55

2nd:- 26

40 mm Test

6 14 20 28 36 43 50 56 63 /45 P.V. good: slight vertigo

Exercise Tolerance Test.

Pulse rate	1. resting	76
	2. after exertion	120
	3. Time taken to return to normal	40 secs.

Number:- 64 Age:- 22

EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	142	
Trunk length	35½	
Standing height	5' 7	
Chest circumference	36	
Vital Capacity	4000	
from Tables		
Weight according to length	143.11	
" " " chest circumference	174.55	
Mean calculated weight	159	- 10.7
Chest according to trunk length	33.95	+ 5.9
Vital capacity according to weight	4203	- 4.8
" " " " trunk length	4227	- 5.4
" " " " chest circumference.	4877	- 18.0
" " calculated from trunk length and chest circumference.	5402	- 11.1

CRAMPTON'S TEST.

Pulse rate:- resting	68	75%
standing	80	
Blood pressure:- resting	130/80	
standing	135/80	

BREATH HOLDING

1st:- 42

2nd:- 36

40 mm Test

8 17 25 36 46 66 75 85 /48 P.V. regular: diminished volume 17-30

Exercise Tolerance Test.

Pulse rate	1. resting	72
	2. after exertion	112
	3. Time taken to return to normal	40 secs.

Number:- 65 Age:- 29 EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	137	
Trunk length	33½	
Standing height	5' 5	
Chest circumference	34¾	
Vital Capacity	3920	
from Tables		
Weight according to length	119.32	
" " " chest circumference	152.56	
Mean calculated weight	131	+ 4.6
Chest according to trunk length	31.77	+ 9.4
Vital capacity according to weight	4096	- 4.8
" " " " trunk length	3708	+ 5.7
" " " " chest circumference.	4426	- 11.4
" " calculated from trunk length and chest circumference.	4067	- 3.6

CRAMPTON'S TEST.

Pulse rate:- resting	56	65%
standing	64	
Blood pressure:- resting	138/80	
standing	136/90	

BREATH HOLDING

1st:- 38

2nd:- 16

40 mm Test

7 13 20 27 35 54 48 /35 P unchanged

~~7 13 20 29 37~~

Exercise Tolerance Test.

Pulse rate 1.	resting	64
2.	after exertion	104
3.	Time taken to return to normal	25 secs.

Number:- 66 Age:- 21

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	132	
Trunk length	32¾	
Standing height	5' 3	
Chest circumference	34½	
Vital Capacity	3800	
from Tables		
Weight according to length	111.15	
" " " chest circumference	149.58	
Mean calculated weight	130	+ 1.5
Chest according to trunk length	30.96	+ 11.3
Vital capacity according to weight	3988	- 4.7
" " " " trunk length	3524	+ 7.5
" " " " chest circumference.	4364	- 12.9
" " calculated from trunk length and chest circumference.	3944	- 3.7

CRAMPTON'S TEST.

Pulse rate:- resting	84	60%
standing	92	
Blood pressure:- resting	134/7	
standing	130/72	

BREATH HOLDING

1st:- 31

2nd:- 14

40 mm Test

9 18 27 36 /21 8 17 25 33 /23

Exercise Tolerance Test.

Pulse rate	1. resting	69
	2. after exertion	120
	3. Time taken to return to normal	35 secs.

Both fitness and endurance are known to be of low level.

Number:- 67 Age:- 22

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	145	
Trunk length	$36\frac{3}{4}$	
Standing height	$5'\ 10\frac{3}{4}$	
Chest circumference	$34\frac{3}{4}$	
Vital Capacity	4240	
from Tables		
Weight according to length	159.51	
" " " chest circumference	152.56	
Mean calculated weight	156	- 7
Chest according to trunk length	35.32	- 1.7
Vital capacity according to weight	4267	- 0.6
" " " " trunk length	4570	- 7.2
" " " " chest circumference.	4426	- 4.2
" " calculated from trunk length and chest circumference.	4498	- 5.7

CRAMPTON'S TEST.

Pulse rate:- resting	68	80%
standing	74	
Blood pressure:- resting	128/68	
standing	132/78	

BREATH HOLDING

1st:- 43

2nd:- 28

40 mm Test

7 13 22 30 38 46 54 6L /44 P.V. unchanged

7 14 22 29 36 43 50 56 /48 P.V. unchanged

Exercise Tolerance Test.

Pulse rate	1. resting	68
	2. after exertion	104
	3. Time taken to return to normal	35 secs.

Number:- 68 Age:- 23

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	140	
Trunk length	$33\frac{3}{4}$	
Standing height	$5'\ 5\frac{1}{4}$	
Chest circumference	35	
Vital Capacity	4400	
from Tables		
Weight according to length	122.13	
" " " chest circumference	155.6	
Mean calculated weight	139	+ 0.7
Chest according to trunk length	32.04	+ 9.8
Vital capacity according to weight	4161	+ 5.7
" " " " trunk length	3771	+ 16.7
" " " " chest circumference.	4490	- 2
" " calculated from trunk length and chest circumference.	4130	+ 6.5

CRAMPTON'S TEST.

85%

Pulse rate:- resting	66
standing	72
Blood pressure:- resting	142/90
standing	148/

BREATH HOLDING

1st:- 60

2nd:- 41

40 mm Test

6 12 18 24 30 35

14 19 24 30 36 41 46 51 57 63 69 74 69 No change in pulse

Exercise Tolerance Test.

Pulse rate	1. resting	62
	2. after exertion	72
	3. Time taken to return to normal	35 secs.

Number:- 69 Age:- 21 EF I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	134	
Trunk length	33½	
Standing height	5' 3½	
Chest circumference	36¼	
Vital Capacity	3720	
from Tables		
Weight according to length	119.32	
" " " chest circumference	171.3	
Mean calculated weight	145	- 7.6
Chest according to trunk length	31.77	+ 14.1
Vital capacity according to weight	4031	- 7.7
" " " " trunk length	3708	+ 0.3
" " " " chest circumference.	4812	- 22.7
" " calculated from trunk length and chest circumference.	4260	- 12.7

CRAMPTON'S TEST.

Pulse rate:-	resting	108
	standing	114
Blood pressure:-	resting	142/88
	standing	144/100

75%

BREATH HOLDING

1st:- 39

2nd:- 31

40 mm Test

10 20 32 44 55 /29 P.V. slightly diminished

10 20 33 48 63 76 /34 P.V. slightly diminished and slightly irregular

Exercise Tolerance Test.

Pulse rate	1. resting	100
	2. after exertion	140
	3. Time taken to return to normal	95 secs.

Number:- 70 Age:- 21

1

DREYER'S TESTS.

E F

Measurements	Recorded	% deviation
Weight	160	
Trunk length	35½	
Standing height	5' 9	
Chest circumference	36½	
Vital Capacity	4520	
from Tables		
Weight according to length	143.11	
" " " chest circumference	177.55	
Mean calculated weight	160	0
Chest according to trunk length	33.95	+ 7.4
Vital capacity according to weight	4581	- 1.3
" " " " trunk length	4227	+ 6.9
" " " " chest circumference.	4877	- 7.6
" " calculated from trunk length and chest circumference.	4552	- 0.7

CRAMPTON'S TEST.

75%

Pulse rate:- resting 72
standing 80
Blood pressure:- resting 158/84
standing 160/

BREATH HOLDING

1st:- 60

2nd:- 39

40 mm Test

7 16 27 35 46 /27 9 18 30 40 /22

8 17 28 39 50 60 71 82 /42 P.V° good, only slightly diminished

Exercise Tolerance Test.

Pulse rate 1. resting 68
2. after exertion 134
3. Time taken to return to normal 75 secs.

Number:- 71 Age:- 22

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Height	127	
Trunk length	34	
Standing height	5' 4	
Chest circumference	34½	
Vital Capacity	4400	
from Tables		
Height according to length	125	
" " " chest circumference	149.58	
Mean calculated weight	137	- 7.3
Chest according to trunk length	32.31	+ 6.8
Vital capacity according to weight	3879	+ 13.4
" " " " trunk length	3835	+ 14.8
" " " " chest circumference.	4364	+ 0.8
" " calculated from trunk length and chest circumference.	4100	+ 7.3

CRAMPTON'S TEST.

Pulse rate:- resting	66	100%
standing	70	
Blood pressure:- resting	148/88	
standing	158/86	

BREATH HOLDING

1st:- 47

2nd:- 39

40 mm ⌐ st

7 13 20 28 38 49 60 69 80 / 90 100 /57

Pulse irregular at beginning, improved in volume and rhythm later

Exercise Tolerance Test.

Pulse rate	1. resting	64
	2. after exertion	120
	3. Time taken to return to normal	75 secs.

Number:- 72 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	157	
Trunk length	35	
Standing height	5' 10	
Chest circumference	35½	
Vital Capacity	4600	
from Tables		
Weight according to length	136.89	
" " " chest circumference	161.76	
Mean calculated weight	149	+ 5.4
Chest according to trunk length	33.4	+ 6.3
Vital capacity according to weight	4519	+ 1.8
" " " " trunk length	4094	+ 12.4
" " " " chest circumference.	4617	- 0.4
" " calculated from trunk length and chest circumference.	4355	+ 5.6

CRAMPTON'S TEST.

65%

Pulse rate:- resting	54
standing	66
Blood pressure:- resting	142/76
standing	142/80

BREATH HOLDING

1st:- 53

2nd:- 24

40 mm Test

7 13 22 31 40 /27 P.V. unchanged

7 15 24 34 44 55 66 76 88 /49 P.V. slightly diminished

Exercise Tolerance Test.

Pulse rate	1. resting	60
	2. after exertion	104
	3. Time taken to return to normal	60 secs.

Number:- 73 Age:- 21

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	144	
Trunk length	33½	
Standing height	5' 5½	
Chest circumference	35	
Vital Capacity	4400	
from Tables		
Weight according to length	119.32	
" " " chest circumference	155.6	
Mean calculated weight	137	+ 5.1
Chest according to trunk length	31.77	+ 9.9
Vital capacity according to weight	4246	+ 3.6
" " " " trunk length	3708	+18.7
" " " " chest circumference.	4490	- 2.0
" " calculated from trunk length and chest circumference.	4100	+ 7.3

CRAMPTON'S TEST.

Pulse rate:- resting	56	65%
standing	60	
Blood pressure:- resting	154/73	
standing	150/90	

BREATH HOLDING

1st:- 42

2nd:- 33

40 mm Test

6 12 20 28 35 42 49 53 58 /45 P.V. unchanged: slight vertigo

Exercise Tolerance Test.

Pulse rate 1. resting	56	
2. after exertion	72	
3. Time taken to return to normal	30 secs.	

Number:- 74 Age:- 20 E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	134	
Trunk length	33	
Standing height	5' 5½	
Chest circumference	34	
Vital Capacity	4000	
from Tables		
Weight according to length	113.83	
" " " chest circumference	143.72	
Mean calculated weight	129	+ 3.9
Chest according to trunk length	31.23	+ 9.0
Vital capacity according to weight	4031	- 0.8
" " " " trunk length	3585	+ 11.6
" " " " chest circumference.	4240	- 5.7
" " calculated from trunk length and chest circumference.	3912	+ 2.2

CRAMPTON'S TEST.

Pulse rate:- resting	72	95%
standing	80	
Blood pressure:- resting	128/86	
standing	138/94	

BREATH HOLDING

1st:- 60

2nd:- 58

40 mm Test

7 15 26 37 49 61 74 86 6 15 /58 P.V. slightly diminished: little change

Exercise Tolerance Test.

Pulse rate 1. resting		68
2. after exertion		120
3. Time taken to return to normal		80 secs.

Number:- 75 Age:- 23

I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	113	
Trunk length	32	
Standing height	5' 5½	
Chest circumference	33½	
Vital Capacity	3400	
from Tables		
Weight according to length	103.36	
" " " chest circumference	137.99	
Mean calculated weight	120	- 5.8
Chest according to trunk length	30.15	+ 11.0
Vital capacity according to weight	3566	- 4.6
" " " " trunk length	3344	+ 1.7
" " " " chest circumference.	4118	- 17.4
" " calculated from trunk length and chest circumference.	3731	- 8.9

CRAMPTON'S TEST.

55%

Pulse rate:- resting 80
standing 92
Blood pressure:- resting 144/74
standing 140/

BREATH HOLDING

1st:- 39

2nd:- 37

40 mm Test

8 19 31 42 23 P.V. diminished
10 20 30 38 46 52 59 /35 Slightly diminished P.V. at end

Exercise Tolerance Test.

Pulse rate 1. resting 80
2. after exertion 128
3. Time taken to return to normal 55 secs.

Number:- 76 Age:- 21

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	144	
Trunk length	36	
Standing height	5' 7	
Chest circumference	35	
Vital Capacity	5000	
from Tables		
Weight according to length	149.52	
" " " chest circumference	155.6	
Mean calculated weight	152	- 5.3
Chest according to trunk length	34.5	+ 1.5
Vital capacity according to weight	4246	+ 17.7
" " " " trunk length	4362	+ 14.6
" " " " chest circumference.	4490	+ 11.4
" " calculated from trunk length and chest circumference.	4426	+ 12.9

CRAMPTON'S TEST.

Pulse rate:- resting	64	55%
standing	70	
Blood pressure:- resting	124/62	
standing	118/82	

BREATH HOLDING

1st:- 49

2nd:- 35

40 mm Test

7 14 22 31 40 49 56 64 71 79 84 /58

P.V. unchanged: slight vertigo

Exercise Tolerance Test.

Pulse rate	1. resting	62
	2. after exertion	126
	3. Time taken to return to normal	100 secs.

Number:- 77 Age:- 25

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	141	
Trunk length	34½	
Standing height	5' 4½	
Chest circumference	36½	
Vital Capacity	3600	
from Tables		
Weight according to length	130.85	
" " " chest circumference	174.55	
Mean calculated weight	152	- 7.2
Chest according to trunk length	32.86	+ 11.0
Vital capacity according to weight	4182	- 13.9
" " " " trunk length	3963	- 9.2
" " " " chest circumference.	4877	- 26.2
" " calculated from trunk length and chest circumference.	4420	- 18.5

CRAMPTON'S TEST.

Pulse rate:- resting	72	65%
standing	80	
Blood pressure:- resting	145/88	
standing	142/96	

BREATH HOLDING

1st:- 39

2nd:- 27

40 mm Test

6 11 18 24 /23

6 11 17 24 /23

P.V. slightly diminished: slight vertigo

Exercise Tolerance Test.

Pulse rate 1. resting		68
2. after exertion		112
3. Time taken to return to normal		85 secs.

Fitness and endurance known to be below the average

Number:- 78 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	155	
Trunk length	34	
Standing height	5' 8½	
Chest circumference	36	
Vital Capacity	4240	
from Tables		
Weight according to length	125	
" " " chest circumference	168.08	
Mean calculated weight	146	+ 6.2
Chest according to trunk length	32.31	+ 11.5
Vital capacity according to weight	4477	- 5.3
" " " " trunk length	3835	+ 10.6
" " " " chest circumference.	4746	- 10.6
" " calculated from trunk length and chest circumference.	4290	- 1.2

CRAMPTON'S TEST.

Pulse rate:- resting	68	60%
standing	86	
Blood pressure:- resting	148/64	
standing	148/66	

BREATH HOLDING

1st:- 39

2nd:- 28

40 mm Test

9 16 26 36 47 57 68 78 /42 P.V. unchanged: slight vertigo

6 14 24 35 46 56 67 /35 P.V. slightly diminished

Exercise Tolerance Test.

Pulse rate 1. resting		56
2. after exertion		120
3. Time taken to return to normal		104 secs.

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	147	
Trunk length	35	
Standing height	5' 7	
Chest circumference	39½	
Vital Capacity	4680	
from Tables		
Weight according to length	136.89	
" " " chest circumference	216.73	
Mean calculated weight	177	- 16.9
Chest according to trunk length	33.4	+ 18.3
Vital capacity according to weight	4309	+ 8.6
" " " " trunk length	4094	+ 14.3
" " " " chest circumference.	5700	- 17.9
" " calculated from trunk length and chest circumference.	4897	- 4.2

CRAMPTON'S TEST.

90%

Pulse rate:-	resting	98
	standing	106
Blood pressure:-	resting	154/82
	standing	162/88

BREATH HOLDING

1st:- 46

2nd:- 30

40 mm Test

9 20 40 11 20 28 35 40 /25 9 17 26 35 41 47 /31

P.V. unchanged

Exercise Tolerance Test.

Pulse rate	1. resting	100
	2. after exertion	148
	3. Time taken to return to normal	65 secs.

Number:- 80 Age:- 28

EF 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	157	
Trunk length	34	
Standing height	5' 10½	
Chest circumference	40	
Vital Capacity	4920	
from Tables		
Weight according to length	125	
" " " chest circumference	224.33	
Mean calculated weight	174	− 9.9
Chest according to trunk length	32.86	+ 21.7
Vital capacity according to weight	4519	± 8.9
" " " " trunk length	3835	+ 27.8
" " " " chest circumference.	5843	- 15.8
" " calculated from trunk length and chest circumference.	4839	± 1.7

CRAMPTON'S TEST.

95%

Pulse rate:- resting 62
standing 70
Blood pressure:- resting 138/86
standing 147/94

BREATH HOLDING

1st:- 40

2nd:- 27

40 mm Test

6 13 21 30 38 45 53 60 /40 P.V. no change

Exercise Tolerance Test.

Pulse rate 1. resting 60
2. after exertion 92
3. Time taken to return to normal 90 secs.

Number:- 81 Age:- 22

EFT

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	141	
Trunk length	34¼	
Standing height	5' 8½	
Chest circumference	33¾	
Vital Capacity	3600	
from Tables		
Weight according to length	127.9	
" " " chest circumference	140.84	
Mean calculated weight	134	+5.2
Chest according to trunk length	32.58	+ 3.7
Vital capacity according to weight	4182	- 13.9
" " " " trunk length	3898	- 7.6
" " " " chest circumference.	4179	- 13.8
" " calculated from trunk length and chest circumference.	4038	- 10.9

CRAMPTON'S TEST.

85%

Pulse rate:- resting 88
standing 100
Blood pressure:- resting 170/78
standing 180/100

BREATH HOLDING

1st:- 34

2nd:- 30

40 mm Test

8 16 25 31 38 /27 ~~E.F.~~ not effective ~~E.R. equal~~

9 17 25 32 39 44 52 / 40

Exercise Tolerance Test.

Pulse rate 1. resting 72
2. after exertion 140
3. Time taken to return to normal 84 in 2½ mins.

Number:- 82 Age:- 23

E - F

111

DREYER'S TESTS.

Measurements	Recorded	% deviation
Height	150	
Trunk length	35¼	
Standing height	5' 10½	
Chest circumference	33½	
Vital Capacity	4320	
from Tables		
Height according to length	139.98	
" " " chest circumference	137.99	
Mean calculated weight	139	+ 7.9
Chest according to trunk length	33.67	- 0.6
Vital capacity according to weight	4373	- 1.2
" " " " trunk length	4160	+ 3.8
" " " " chest circumference.	4118	+ 4.9
" " calculated from trunk length and chest circumference.	4139	+ 4.4

CRAMPTON'S TEST.

Pulse rate:- resting	72	85%
standing	86	
Blood pressure:- resting	128/80	
standing	128/74	

BREATH HOLDING

1st:- 39

2nd:- 36

40 mm Test

7 15 24 32 40 /30 P.V. P.R. unchanged

9 16 25 34 42 50 57 /35 P.V. P.R. unchanged

Exercise Tolerance Test.

Pulse rate	1. resting	72
	2. after exertion	124
	3. Time taken to return to normal	65 secs.

Is physically fit and performs arduous manual labour daily but he is known to lack stamina.

Number:- 85 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	151	
Trunk length	34½	
Standing height	5' 6	
Chest circumference	35½	
Vital Capacity	4000	
from Tables		
Weight according to length	130.85	
" " " chest circumference	161.76	
Mean calculated weight	146	+ 3.4
Chest according to trunk length	32.86	+ 7.9
Vital capacity according to weight	4394	- 9.0
" " " " trunk length	3963	+ 0.9
" " " " chest circumference.	4617	- 13.4
" " calculated from trunk length and chest circumference.	4290	- 6.8

CRAMPTON'S TEST.

60%

Pulse rate:- resting 72
standing 80

Blood pressure:- resting 133/74
standing 128/90

BREATH HOLDING

1st:- 36

2nd:- 27

40 mm Test

8 15 25 35 44 /28 P.R. P.V. slightly

8 17 26 35 /20

Exercise Tolerance Test.

Pulse rate 1. resting 72
2. after exertion 116
3. Time taken to return to normal 75 secs.

Number:- 84 Age:- 20

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	141	
Trunk length	33½	
Standing height	5' 5	
Chest circumference	35	
Vital Capacity	4000	
from Tables		
Weight according to length	119.32	
" " " chest circumference	155.6	
Mean calculated weight	137	+ 2.9
Chest according to trunk length	31.77	+ 10.0
Vital capacity according to weight	4182	- 4.3
" " " " trunk length	3708	+ 7.9
" " " " chest circumference.	4490	- 10.9
" " calculated from trunk length and chest circumference.	4100	- 2.4

CRAMPTON'S TEST.

65%

Pulse rate:- resting 78
standing 92
Blood pressure:- resting 167/84
standing 166/80

BREATH HOLDING

1st:- 30

2nd:- 39

40 mm Test

9 18 29 41 /20 P.R. P.V. no change

9 19 30 42 54 66 76 85 /40

Exercise Tolerance Test.

Pulse rate 1. resting 80
2. after exertion 124
3. Time taken to return to normal 55 secs.

Number:- 85 Age:- 30

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	127	
Trunk length	33	
Standing height	5' 3	
Chest circumference	35	
Vital Capacity	3800	
from Tables		
Weight according to length	113.83	
" " " chest circumference	155.60	
Mean calculated weight	135	- 5.9
Chest according to trunk length	31.23	+ 12.2
Vital capacity according to weight	3879	- 2.0
" " " " trunk length	3585	+ 6.0
" " " " chest circumference.	4490	- 15.9
" " calculated from trunk length and chest circumference.	4037	- 5.8

CRAMPTON'S TEST.

75%

Pulse rate:- resting 64
standing 80
Blood pressure:- resting 140/78
standing 146/96

BREATH HOLDING

1st:- 55

2nd:- 31

40 mm Test

7 30 40 52 64 /30 P.R. P.V. -

7 16 28 39 50 61 72 /35 P.V. - P.R.

Exercise Tolerance Test.

Pulse rate 1. resting 60
2. after exertion 112
3. Time taken to return to normal 64 in 2 mins.

Number:- 86 Age:- 20

E F I

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	136	
Trunk length	35½	
Standing height	5' 6½	
Chest circumference	36½	
Vital Capacity	4360	
from Tables		
Weight according to length	143.11	
" " " chest circumference	174.55	
Mean calculated weight	159	- 14.5
Chest according to trunk length	33.95	+ 7.3
Vital capacity according to weight	4075	+ 7.0
" " " " trunk length	4227	+ 3.1
" " " " chest circumference.	4877	- 10.6
" " calculated from trunk length and chest circumference.	4552	- 4.2

CRAMPTON'S TEST.

65%

Pulse rate:- resting 68
standing 82
Blood pressure:- resting 146/86
standing 148/90

BREATH HOLDING

1st:- 56

2nd:- 21

40 mm Test

~~7 13 22~~

6 15 22 31 39 46 53 58 63 /46 P.V. unchanged: ~~P.R.~~

Exercise Tolerance Test.

Pulse rate 1. resting 60
2. after exertion 120
3. Time taken to return to normal 70 secs.

Number:- 87 Age:- 23

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	148	
Trunk length	36	
Standing height	6' 1	
Chest circumference	34½	
Vital Capacity	4400	
from Tables		
Weight according to length	149.52	
" " " chest circumference	149.58	
Mean calculated weight	149	- 6.7
Chest according to trunk length	34.5	0
Vital capacity according to weight	4331	+1.6
" " " " trunk length	4362	+0.9
" " " " chest circumference.	4364	+0.8
" " calculated from trunk length and chest circumference.	4363	+0.8

CRAMPTON'S TEST.

60%

Pulse rate:- resting 70
standing 84

Blood pressure:- resting 138/88
standing 138/90

BREATH HOLDING

1st:- 39

2nd:- 19

40 mm Test

7 14 24 33 42 51 /31 P.R. P.V. → diminished

7 16 26 35 45 55 /32 P.V. →0 P.R.

Exercise Tolerance Test.

Pulse rate 1. resting 80
2. after exertion 112
3. Time taken to return to normal 40 secs.

Out of condition from lack of exercise and he is known to lack endurance.

Number:- 88 Age:- 24 E – F – IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	141	
Trunk length	34	
Standing height	5' 7	
Chest circumference	34½	
Vital Capacity	4000	
from Tables		
Weight according to length	125	
" " " chest circumference	149.58	
Mean calculated weight	137	+ 2.9
Chest according to trunk length	32.31	+ 6.8
Vital capacity according to weight	4182	- 4.3
" " " " trunk length	3835	+ 4.3
" " " " chest circumference.	4364	- 8.3
" " calculated from trunk length and chest circumference.	4100	- 2.4

CRAMPTON'S TEST.

Pulse rate:- resting	74	85%
standing	86	
Blood pressure:- resting	170/104	
standing	178/100	

BREATH HOLDING

1st:- 41

2nd:- 24

40 mm Test

~~7 12 18 24 29 34 41 46/ (Nose breathing)~~ ~~7 14 20 /17~~

7 14 21 27 32 /27 P.V. P.R. unchanged

Exercise Tolerance Test.

Pulse rate	1. resting	80
	2. after exertion	124
	3. Time taken to return to normal	90 secs.

Physically and psychologically a poor type.

Number:- 30 Age:- 22

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	157	
Trunk length	35	
Standing height	5'9"	
Chest circumference	36¼	
Vital Capacity	3400	
from Tables		
Weight according to length	136 89	
" " " chest circumference	171 3	
Mean calculated weight	154	+ 1·9
Chest according to trunk length	33 4	+8·5
Vital capacity according to weight	4519	-20·4
" " " " trunk length	4094	-16·9
" " " " chest circumference.	4812	-29·4
" " calculated from trunk length and chest circumference.	4453	-23·6

CRAMPTON'S TEST.

Pulse rate:- resting 84
standing 92

Blood pressure:- resting 148/82
standing 140/68

50%

BREATH HOLDING

1st:-

37/17

2nd:-

40 mm Test

0-19/10 : 10 19 30/15 ;

Pulse dissappeared after 5 seconds. Slight distress.

Exercise Tolerance Test.

Pulse rate	1. resting	88
	2. after exertion	126
	3. Time taken to return to normal	70 secs

Physically unfit, psychologically poor, endurance doubtful.

Number:- 31 Age:- 21

III

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	134	
Trunk length	32¾	
Standing height	5' 6""	
Chest circumference	35 6	
Vital Capacity	2400	
from Tables		
Weight according to length	111 15	
" " " chest circumference	139 41	
Mean calculated weight	125	+ 7·2
Chest according to trunk length	30 96	+ 7·1
Vital capacity according to weight	4031	- 24·8
" " " " trunk length	3943	- 39
" " " " chest circumference.	4148	- 42
" " calculated from trunk length and chest circumference.	4046	- 41

CRAMPTON'S TEST.

Pulse rate:- resting	75	80%
standing	90	
Blood pressure:- resting	136/76	
standing	144/90	

BREATH HOLDING

1st:- 14

2nd:- 15

40 mm Test

Unable to hold mercury. No test

Exercise Tolerance Test.

Pulse rate	1. resting	yp60	60
	2. after exertion	80	80
	3. Time taken to return to normal		30

Physically fit. Comprehension poor.
He is known to lack stamina.

Number:- [illegible] Age:- [illegible] 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	152	
Trunk length	36"	
Standing height	5' 8"	
Chest circumference	35½	
Vital Capacity	3800	
from Tables		
Weight according to length	149 52	
" " " chest circumference	161 76	
Mean calculated weight	156	- 2·6
Chest according to trunk length	34 5	+ 2·9
Vital capacity according to weight	4414	-13·9
" " " " trunk length	4362	-12·9
" " " " chest circum-ference.	4617	-17·7 -17·7
" " calculated from trunk length and chest circumference.	4489	-15·3

CRAMPTON'S TEST.

Pulse rate:- resting	60	95%
standing	80	
Blood pressure:- resting	160/100	
standing	168/108	

BREATH HOLDING

1st:- 25

2nd:- [illegible] 17

40 mm Test

No test

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	114
	3. Time taken to return to normal	30

The blood pressure was affected by emotion. He is physically fit and does not lack endurance. He could not comprehend the requirements of the expiratory tests.

Number:- 06 C5 Age:-C5 1

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	171	
Trunk length	33½"	
Standing height	5' 6½"	
Chest circumference	41¾"	
Vital Capacity	4000	
from Tables		
Weight according to length	119 32	
" " " chest circumference	252 25	
Mean calculated weight	133	+ 29
Chest according to trunk length	31 77	+ 31
Vital capacity according to weight	4805	+ 16·8
" " " " trunk length	3708	- 7·7
" " " " chest circumference.	5771	- 30·6
" " calculated from trunk length and chest circumference.	4739	- 15·6

CRAMPTON'S TEST.

Pulse rate:- resting	74	85%
standing	78	
Blood pressure:- resting	132/76	
standing	136/76	

BREATH HOLDING

1st:-	33
2nd:-	11

40 mm Test

Unable to hold mercury more than 10 seconds.
No test.

Exercise Tolerance Test.

Pulse rate	1. resting	72
	2. after exertion	120
	3. Time taken to return to normal	45 seconds

Physically fit, and capable of endurance. Mentally below the average.

Number:- [illegible] Age:- 25

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	114	
Trunk length	32¾"	
Standing height	5' 2"	
Chest circumference	32¾"	
Vital Capacity	2920	
from Tables		
Weight according to length	108 51	
" " " chest circumference	129 7	
Mean calculated weight	119	- 4·2
Chest according to trunk length	30 96	+ 5·8
Vital capacity according to weight	3589	- 18·6
" " " " trunk length	3524	- 17·2
" " " " chest circumference.	3938	- 25·8
" " calculated from trunk length and chest circumference.	3731	- 21·7

CRAMPTON'S TEST.

Pulse rate:- resting	88	40%
standing	98	
Blood pressure:- resting	136/80	
standing	126/82	

BREATH HOLDING

1st:- 38

2nd:- 20

40 mm Test

8 15 25 32 40 48 56 64 72 / 48
Pulse volume diminished between 5 and 20 seconds

Exercise Tolerance Test.

Pulse rate	1. resting	84
	2. after exertion	120
	3. Time taken to return to normal	32 seconds

A man of low intelligence, he is physically unfit his co-operation was poor. He has low power of endurance

Number:- 65 Age:- 21

III

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	161	
Trunk length	36"	
Standing height	5' 9"	
Chest circumference	37½"	
Vital Capacity	3800	
from Tables		
Weight according to length	149 52	
" " " chest circumference	184 56	
Mean calculated weight	167	− 3·6
Chest according to trunk length	34 5	+ 6·5
Vital capacity according to weight	4601	−17·4
" " " " trunk length	4362	−12·9
" " " " chest circumference.	5077	−25·2
" " calculated from trunk length and chest circumference.	4719	−19·5

CRAMPTON'S TEST.

Pulse rate:- resting	74	70%
standing	80	
Blood pressure:- resting	136/90	
standing	137/90	

BREATH HOLDING

1st:- 35

2nd:- 24

40 mm Test

7 15 22 30 / 20: 8 16 24 31 39 / 28
Pulse disappeared 5 - 15 seconds

Exercise Tolerance Test.

Pulse rate 1. resting	72	
2. after exertion	108	
3. Time taken to return to normal	40 seconds	

Considered to be a good soldier, but yields easily in the face of difficulties. He lacks stamina.

His cooperation is doubtful. He has no endurance.

Number:- [illegible] Age:- 27

IV

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	134	
Trunk length	35"	
Standing height	5'6"	
Chest circumference	34 1	
Vital Capacity	4080	
from Tables		
Weight according to length	136 89	
" " " chest circumference	145 16	
Mean calculated weight	141	− 5
Chest according to trunk length	33 4	+ 2·4
Vital capacity according to weight	4031	+ 1·2
" " " " trunk length	4094	− 0·3
" " " " chest circumference.	4271	− 4·5
" " calculated from trunk length and chest circumference.	4182	− 2·4

CRAMPTON'S TEST.

Pulse rate:- resting	68	55%
standing	80	
Blood pressure:- resting	128/72	
standing	124/80	

BREATH HOLDING

1st:- 46

2nd:- 17

40 mm Test

7 15 24 31 / 20: 5 13 23 34 / 24
Pulse diminished after 5 seconds.

Exercise Tolerance Test.

Pulse rate	1. resting	72
	2. after exertion	126
	3. Time taken to return to normal	95 seconds

His physique is poor and his fitnessis of a low grade. His cooperation was poor. He is not a good soldier being full of excuses for avoiding work. There is no stamina here

Number:- 37 Age:- 22

DREYER'S TESTS.

Measurements	Recorded	% deviation
Weight	130	
Trunk length	35½"	
Standing height	5' 4"	
Chest circumference	35 6	
Vital Capacity	3400	
from Tables		
Weight according to length	139 98	
" " " chest circumference	139 41	
Mean calculated weight	140	− 7·1
Chest according to trunk length	33 54	+ 0·3
Vital capacity according to weight	3945	−13·8
" " " " trunk length	4127	−17·6
" " " " chest circumference.	4148	−18·0
" " calculated from trunk length and chest circumference.	4142	−17·9

CRAMPTON'S TEST.

Pulse rate:- resting	88	45%
standing	94	
Blood pressure:- resting	152/84	
standing	142/90	

BREATH HOLDING

1st:- 40

2nd:- 25

40 mm Test

8 17 28 / 18: 7 15 25 36 45 56 / 30
Pulse volume diminished, vertigo.

Exercise Tolerance Test.

Pulse rate	1. resting	78
	2. after exertion	104
	3. Time taken to return to normal	40 Seconds

In poor condition.
Endurance low.

DREYER S TESTS.

Measurements	RECORDED	% DEVIATION
Weight	152	
Trunk length	34¼"	
Standing height	5' 8"	
Chest circumference	35½:	
Vital capacity	3000	
from tables		
Weight according to length	127 9	
" " " chest circumference	161 76	
Mean calculated weight.	145	+ 4·8
Chest according to trunk length	32 58	+ 8·9
Vital capacity according to weight	4414	- 32
" " " " trunk length	3898	- 23
" " " " Chest circumference	4617	- 35
" " calculated from trunk length and chest circumference	4257	- 29·6

CRAMPTON S TEST

Pulse rate resting	82	
standing	104	
Blood pressure resting	136/68	30%
standing	128/68	

BREATH HOLDING

1st	14
2nd	11

40 mm TEST

No test

Exercise tolerance Test

Pulse rate 1 resting	66
2 after exertion	88
3 time taken to return to normal	55 secs

His physical fitness is poor and he is well-known to lack stamina.

Measurements	DRYER S TESTS RECORDED	% DEVIATION
Weight	139	
Trunk length	33½"	
Standing height	5'5"	
Chest circumference	32½"	
Vital capacity	3000	
from Tables		
Weight according to length	119 32	
" " " chest circumference	127	
Mean calculated weight	123	+ 13
Chest according to trunk length	31 77	+ 2·2
Vital capacity according to weight	4139	− 27·5
" " " " trunk length	3463	− 13·8
" " " " chest circumference	3879	− 22·6
" " calculated from trunk length and chest circumference	3671	− 18·3

CRAMPTON S TEST

Pulse rate resting	66	
standing	80	
Blood pressure resting	154/80	35%
standing	144/70	

Breath holding

1st	22
2nd	20

40 mm 53S5

9 15 24 31 / 23No change in pulse

EXERCISE TOLERANCE TEST

Pulse rate 1 resting	64	
2 after exertion	124	
3 time taken to return to normal	95	seconds

Physical fitness poor, intelligence low, endurance lacking.

Number 101 Age 22

DREYER'S TESTS

Measurements	RECORDED.	% DEVIATION.
Weight	145	
Trunk length	34"	
Standing height	5' 8½"	
Chest circumference	35"	
Vital capacity	2800	
from Tables		
Weight according to length	125	
" " " chest circumference	155 6	
Mean calculated weight	140	+ 3.5
Chest according to trunk length	32 31	+ 11.5
Vital capacity according to weight	4267	- 34.4
" " " " trunk lehgth	3835	- 27.
" " " " chestcircum-ference	4490	- 37.6
" " calculated from trunk length and chest circumference	4262	- 34.4

CRAMPTON'S TEST

Pulse rate	resting	90
	standing	96
Blood pressure	resting	172/96
	standing	182/118

95%

BREATH HOLDING

1st	23
2nd	13

40 m TEST

No test

EXERCISE TOLERANCE TEST

Pulse rate	1	resting	82
	2	after exertion	128
	3	time taken to return to normal	45 seconds

Physical condition poor, endurance low, comprehensionof requirements poor.