THE ARM REFLEXES

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FOR many years the presence of decreased or absent tendon reflexes of the arm in healthy persons has been recognized, and the late Dr. Kinnier Wilson suggested that a study of these reflexes might assist in showing the frequency with which the variations occurred. For this investigation, the triceps, biceps, and supinator reflexes were examined bilaterally once in 466 persons and repeatedly, up to 324 times, in seven persons.

Objects and Methods

As the object of the study was to determine the conditions met with in ordinary clinical work, it was decided that clinical and not laboratory methods should be used. It was considered that if the results were to be of assistance in diagnosis, a simple method which could be used at the bedside should be employed. Consequently the reflexes were examined with Vernon's percussors. The whalebone handles were 8 in. in length and the round, circular heads were surrounded by rubber. Although, presumably, all would agree upon marked deviations from the normal extent of response, differences of opinion might be expressed by different observers over lesser changes. Consequently, several observers took part in this study, four assisting in the examination of the 466 persons who were examined once. One observer examined each person tested on more than one occasion, so that the variations in any one individual were based on one standard. The four observers of the 466 persons were included amongst those of the individuals examined on more than one occasion. It is hoped that average and not personal results have been obtained by this arrangement.

The subjects examined varied from 13 months to 70 years in age ; the males from 13 months to 63 years and the females from 16 months to 70 years (Table 1). They were all healthy.

Results

Persons examined once.—Of the 466 persons, 17 (3·6 per cent.) showed an absence of one or more reflexes. Of the 2,762 responses examined, 34 (1·23 per cent.) were found to be absent (Table 2). There appears to be little variation with sex or age, except that absence is more common over the age of 20 years.

TABLE 1.—SUBJECTS EXAMINED ONCE

AGE IN YEARS	NO.	
	M.	F.
0-9½	113	71
10-19½	131	61
20-80	41	49
	285	181

TABLE 2.—REFLEXES PRESENT OR ABSENT BY AGE, GROUP, AND SEX

AGE (YEARS)	SEX	L.			R.		
		T.	B.	S.	T.	B.	S.
0-9½	M.	111	112	112	111	112	112 P
	F.	2	1	1	2	1	1 A
10-19½	M.	71	71	70	71	71	71 P
	F.	0	0	0	0	0	0 A
20-80	M.	131	131	131	131	131	131 P
	F.	0	0	0	0	0	0 A
20-80	M.	60	61	61	60	60	61 P
	F.	1	0	0	1	1	0 A
20-80	M.	41	40	39	41	37	40 P
	F.	0	1	2	0	4	1 A
20-80	M.	45	49	44	47	49	46 P
	F.	4	0	5	2	0	3 A

L=left ; R=right ; T=triceps ; B=biceps ; S=supinator ; P=present ; A=absent.

The observations made by the four observers on 100 subjects were divided into four groups. Fifteen persons showed an absence of one or more responses. This figure is nearly five times as great as that for the whole series of 466 persons. The difference is largely accounted for by the fact that only 12 of the 100 persons were below the age of 20 years, and, as seen in Table 2, absence of response is more frequent in those above this age.

Of the 600 reflexes examined, 445 (74·1 per cent.) normal responses were obtained, 81 (13·5 per cent.) increased responses, 41 (5·8 per cent.) diminished and 33 (5·5 per cent.) absent responses.

The variations from the normal were bilateral in many subjects (Table 3).

Of the total of 33 absent responses, 66 per cent. were bilateral ; of 41 diminished responses, 58 per cent. were bilateral, and of 81 increased responses, 68 per cent. were bilateral. Two-thirds is the proportion expected by chance, so that there is no biological significance in these somewhat similar figures.

Table 4 shows the results obtained according to individual reflexes. About

75 per cent. of reflexes gave a normal response, and of the variations, about 50 per cent. were increases of response.

Table 5 shows the time of day when variations occurred in the 100 cases examined once. There is a slight tendency for absent and increased responses to occur more frequently in the morning than the evening.

Persons examined many times.—The finding of so many variations from the normal during single examinations suggested that, perhaps, in all people the responses vary from time to time. Seven healthy subjects (6 males from 20 to 30 years of age and 1 female 20 years old) were examined in the morning from 7.30 a.m. to 11.30 a.m. and evening from 7.30 p.m. to 12.30 a.m. over periods of from 7 to 51 days (Table 6.)

On comparing Table 6 with Table 4, the percentages of normal responses from each table will be found to be not greatly different, 68·2 per cent. and 74·15 per cent., but the remaining percentages vary considerably. It is possible that the markedly higher rate of increased responses amongst subjects examined once, might be due to a heightened tone of the nervous system from anticipation. As the normal responses are in the same proportion, it follows that the absent and diminished responses must be less.

Two subjects were examined when shivering from cold. In one, all reflexes were increased ; in the other, two previously absent and one previously diminished became normal.

In one subject no change was observed after a walk, but in another all reflexes were increased after a strenuous day's work. In the same subject, the right triceps and right biceps were increased and the right supinator absent when this arm was tired after playing tennis. Twenty-four hours later, the triceps and biceps still gave increased responses, but the supinator gave a normal result. A further 24 hours later, all reflexes were normal. After doing a large amount of writing, one subject showed absence of the right biceps and supinator responses, whilst the other reflexes were normal. Ten hours later, all reflexes gave normal responses.

Observations made immediately on waking in the morning on two subjects

TABLE 3.—NUMBER OF SUBJECTS SHOWING BILATERAL DEVIATIONS FROM NORMAL RESPONSE

REFLEX	A.	D.	I.
All six	1	—	7
Both triceps	4	5	4
Both biceps	1	3	1
Both supinators	3	4	2
	9	12	14

A=absent ; D=diminished ; I=increased.

TABLE 4.—EXAMINATION OF 100 SUBJECTS ONCE

REFLEX	NO. OF EXAM.	A.	D.	I.	
L. Triceps	100	7	6	16	=29
L. Biceps	100	2	9	13	=24
L. Supinator	100	8	4	13	=25
R. Triceps	100	5	7	12	=24
R. Biceps	100	6	9	13	=28
R. Supinator	100	5	6	14	=25
Totals	600	33 (5.5%)	41 (6.84%)	81 (13.5%)	=155 (25.85%)

TABLE 5.—TIME OF DAY OF VARIATIONS

TIME	NO. OF EXAM.	A.	D.	I.
Morning	103	8 (7.76%)	1 (.97%)	18 (17.45%)
Evening.. ..	494	17 (3.44%)	40 (8.1%)	51 (10.3%)

TABLE 6.—EXAMINATION OF SEVEN SUBJECTS REPEATEDLY

SUBJECT	SEX	NO. OF EXAM.	NORMAL	ABSENT	DIMINISHED	INCREASED
1	M.	102	65 (63.7%)	7	7	23
2	M.	54	34 (63%)	0	20	0
3	M.	102	63 (61.7%)	20	19	0
4	M.	107	84 (77.8%)	3	15	5
5	M.	107	59 (55.1%)	12	36	0
6	M.	90	56 (62.2%)	1	3	30
7	F.	324	243 (75%)	42	36	3
Totals		886	604 (68.2%)	85 (9.6%)	136 (15.3%)	61 (6.89%)

TABLE 7.—BILATERAL DEVIATIONS FROM NORMAL IN SEVEN PATIENTS

REFLEXES	1	2	3	4	5	6	7	
All six	0 0 2*	0 0 0	0 0 0	0 1 0	0 3† 0	0 0 4	1† 0 0	A D I
Both triceps	0 0 1	0 0 0	0 2 0	0 1 1	1 0 0	0 1 0	0 1 1	A D I
Both biceps	0 0 1	0 7 0	1 3 0	0 2 0	1 0 0	0 0 0	2† 1 1	A D I
Both supinators	0 1 0	0 0 0	7 1 0	1 0 1	2 4 0	0 0 0	4† 2 0	A D I

* Once when shivering. Once after hard work.

† Once on waking.

showed absence of all reflexes on two occasions in one of the subjects. In the other, all reflexes were diminished on one occasion, and four were absent, one diminished, and one normal on a second occasion.

The bilateral deviations from the normal are seen in Table 7.

Of a total of 85 absent responses, 47.1 per cent. were bilateral ; of 136 diminished 44.1 per cent. were bilateral ; and of 61 increased 39.4 per cent. were bilateral. These percentages are from 19 to 26 per cent. below what would have been expected by chance. Therefore some cause is increasing the unilateral variations in this series of observations at the expense of the bilateral, for the normals remain constant.

Some of the deviations occurred in series over certain time periods, but the majority were isolated as regards time. The isolated responses were so numerous as compared with those in series that the latter would be unlikely to have significance of any kind.

Table 8 shows the time of day at which the deviations occurred. The slight tendency for absence of response to be frequent in the morning in the 100 subjects examined once is apparent also in these seven cases, but a similar tendency for the increased responses is not apparent.

The individual responses are summarized in Table 9.

The proportion of variations from the normal, 31.2 per cent., approaches that of the variations obtained in the 100 subjects examined once, 25.8 per cent. These two figures tend to confirm one another.

Of interest is the observation that variations are more common in both arms in the biceps response than in the triceps and in the supinator than in the biceps.

Conclusions

1. In a series of 466 healthy persons examined once, absence of one or more arm reflexes was found in 3.6 per cent. of persons and of 1.23 per cent. of reflexes tested. Absence was more common over the age of 20 years than under this age.
2. Of 600 responses grouped into four types, 74.1 per cent. gave normal, 5.5 per cent. absent, 5.8 per cent. diminished, and 13.5 per cent. increased responses.
3. Each reflex, individually, gave about 75 per cent. of normal responses.
4. A slight tendency was observed for a greater proportion of absent responses to occur early in the day.
5. The reflexes in seven persons were examined repeatedly, from 54 to 324 observations being made on each subject. Normal responses were recorded in 68.2 per cent. of reflexes, confirming the figure of 74.15 per cent. found in single examinations. The variations in single examinations in healthy subjects are, therefore, probably of a temporary nature only.
6. Cold and exercise appeared to increase the responses in some subjects. Extreme exercise was followed by absence of response in two subjects. Observations made immediately on waking in two subjects showed absence or diminished responses.

7. From 40 to 47 per cent. of the variations from the normal were simultaneously bilateral. No cause has been found for this proportion in these subjects examined repeatedly.

TABLE 8.—TIME OF DAY OF VARIATIONS FROM NORMAL IN SEVEN PERSONS EXAMINED REPEATEDLY

TIME	NO. OF EXAM.	A.	D.	I.
Morning	443	49 (11·05%)	68 (15·3%)	20 (4·5%)
Evening	443	36 (8·12%)	68 (15·3%)	41 (9·3%)

TABLE 9.—RESPONSES IN SUBJECTS EXAMINED FREQUENTLY

REFLEXES	NO. OF EXAM.	A.	D.	I.	
L. triceps	147	5 (3·38%)	14 (9·46%)	14 (9·46%)	= 29
L. biceps	147	5 (3·38%)	23 (15·5%)	9 (6·08%)	= 37
L. supinator	148	26 (17·54%)	24 (16·2%)	9 (6·08%)	= 59
R. triceps	148	5 (3·38%)	18 (12·15%)	10 (6·75%)	= 33
R. biceps	148	8 (7·45%)	30 (20·2%)	11 (7·44%)	= 49
R. supinator	148	35 (23·6%)	24 (16·2%)	7 (4·72%)	= 66
Totals	886	84 (9·46%)	133 (14·96%)	60 (6·82%)	= 277 (31·2%)