advantage of the strengths of her staff and by making them aware of their standing in the total picture, her staff will obtain a higher degree of job satisfaction. The therapist who enjoys her work is a far more productive therapist who frequently applies a more inquiring attitude. This, again, leads to further development in the department to the mutual benefit of all.[5]

Performance is the key word in the appraisal programme and it is necessary that all concerned understand that it is performance only that is being rated and not personality. The therapist should be aware of her evaluation, her strengths and weaknesses, and how she can improve her performance – the emphasis should always be positive. Good communication techniques are of paramount importance to the overall programme.

Summary

In conclusion the writer has attempted to show that therapist evaluation is necessary. The appraisal format, frequency, and utilisation have been discussed. All participants must have complete understanding of the reasons, aims and objectives of the staff appraisal and these must be clearly defined at the beginning of the programme. The successful implementation and continuance of the staff evaluation programme is dependent upon the existence of open channels of communication.

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REFERENCES

1. Heyel, C. (1962). "Management for Modern Supervisors", American Management Association.
2. Hofkosh, J. M. "Organisational Behaviour", *J. Amer. Phys. Ther. Assoc.*; Vol. 50, **8** (1157-1161).
3. Lister, M. J. "Performance Evaluation of the New Staff Member", *J. Amer. Phys. Ther. Assoc.*; Vol. 46, **4** (387-390).
4. Logan, Spencer. "Communication", *J. Amer. Phys. Ther. Assoc.*; Vol. 50, **8** (1153-1156).
5. Luck, Thomas. (1955). "Personnel Audit and Appraisal" McGraw-Hill, New York.
6. McDaniel, L. V. "The Critical Incident Method in Evaluation", *J. Amer. Phys. Ther. Assoc.*; Vol. 44, **4** (235-242)
7. McGibony, John R. "Principles of Administration", C. P. Putnam and Sons, New York, 2nd edition.
8. Paulsen, F. R. "Communication in the Improvement of Professional Performance", *J. Amer. Phys. Ther. Assoc.*; Vol. 43, **9** (650-655).
9. Sayles, L. R., and Strauss, G. (1966). "Human Behaviour in Organisation", Prentice-Hall Inc., Englewood Cliffs, New Jersey.
10. Taylor, J. H. (1959). "Personnel Administration", McGraw-Hill Book Co. Ltd., New York.
11. Weimer, E. W. "Keynote Address to Institute on Administration, Supervision and Consultation – American Physical Therapists Association", *J. Amer. Phys. Ther. Assoc.*; Vol. 50, **8** (1145-1147).
12. Wood, Martin. "Appraisal of Professional Performance – One Aspect of Physical Therapy Administration", *J. Amer. Phys. Ther. Assoc.*; Vol. 42, **9** (565-569).
13. Yoder, D. (1957). "Personnel Management and Industrial Relations", Prentice-Hall, Inc., Englewood Cliffs, New Jersey; 4th edition.
14. Zimmerman, J. P. "The Physical Therapists Stake in Administration Proficiency", *J. Amer. Phys. Ther. Assoc.*; Vol. 48, **3** (223-227).

DYNAMIC MUSCLE TESTING and PROGRESSIVE RESISTANCE EXERCISES

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AVERAGE REPETITION MAXIMUMS IN YOUNG WOMEN

During the last four years the University of Stellenbosch has carried out dynamic muscle tests on all physiotherapy students entering their third year of training.

Since we have been unable to trace tables for women in the available literature, it was thought that the results of these tests might be of interest to other physiotherapists. The tables have been found to be of use when training students in techniques of progressive resistance exercises as well as when estimating the required repetition maximum in patients.

METHODS

Eight major muscle groups were tested. The starting positions chosen were basically those advocated by Daniels, Williams and Worthingham[1] for manual testing of muscles capable of producing movement against gravity. The exceptions were the quadriceps and the hip extensors, the starting positions for which are shown below (Figs. 1 and 2).

Fig. 1. Starting position for quadriceps testing.

Table I. Average ten repetition maximum (10 R.M.) and on repetition maximum (1 R.M.) of major muscle groups in young women.

Muscle Group	1969		1970		1971		1972		Average	
	1 R.M.	10 R.M.	1 R.M.	10 R.M.	1 R.M.	10 R.M.	1 R.M.	10 R.M.	1 R.M.	10 R.M.
Rectus abdominis . . .	43	22	48	22	44	23	57	32	48	25
Middle deltoid	12	10	13	9	13	8	14	10	13	9
Triceps (with anconeus)	19	14	20	14	20	13	25	19	21	15
Biceps (with brachialis) .	30	22	25	17	24	19	26	17	26	19
Gluteus max. (c hamstrings) . . .	35	20	42	25	33	21	34	26	36	23
Gluteus medius & minimus	28	20	31	21	27	17	29	21	29	20
Quadriceps	53	40	44	33	47	31	61	50	51	39
Hamstrings	42	32	41	27	44	32	33	29	40	30

Fig. II. Starting position for testing the hip extensors.

The ten repetition maximum and one repetition maximum were tested according to the definition given by Gardiner[2]. Each test was preceded by light "warming up" exercises for the respective muscle group. In the first year under review sandbags were used for testing purposes; in the following three years a de Lorme boot was used. There was no significant difference between the results obtained by the two methods.

There appeared to be reasonably good correlation between the results obtained over the four-year period (Table I). The average age of the students was 20 years 8 months, ranging from 19 years to 22½ years. Only a relatively small proportion of the students actively participated in sport.

In addition to the dynamic tests, static tests were carried out on three muscle groups: the quadriceps, the erector spinae and the finger flexors (in a power grip). The first two were tested by means of a Salter spring balance with the joints positioned about 10° short of the fully shortened position for the respective muscle groups. Grip was tested by means of a dinamometer which acted on a similar principle. The results are shown in Table II. The poor correlation between the four results for the quadriceps cannot be explained.

Table II. Average values for static muscle tests.

Muscle Group	1969	1970	1971	1972	Average
Quadriceps . .	47	110	48	78	71
Erector spinae	145	124	118	131	130
Grip	20	24	23	22	22

BIBLIOGRAPHY

1. Daniels, L., Williams, M., and Worthingham, C. (1964). "Muscle Testing, Techniques of Manual Examination". Philadelphia and London. W. B. Saunders Co.

2. Gardiner, M. D. (1960). "The Principles of Exercise Therapy". London. G. Bell and Sons, Ltd.