ABSTRACT

PROGRESSIVE LIFTING CAPACITY WITH MASKED WEIGHTS: RELIABILITY STUDY.

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Introduction - The evaluation of lifting capacity has received much attention in recent years. A "Progressive Isoinertial Lifting Evaluation" (PILE) is a brief test of frequent lifting that has been developed by Mayer and his colleagues. Unfortunately, the PILE allows evaluees to visually appraise the objects that are lifted. That is, the weight that the evaluee lifts is incremented by placing a greater number of weights in the lift container. For this reason a "blind" evaluation, in which the evaluee is kept naive of the load, is not possible. As an alternative, the Progressive Lifting Capacity (PLC) test has been developed. The PLC utilizes weighted cannisters which weigh either 5 pounds, 10 pounds, or 20 pounds. All cannisters are the same size, regardless of weight. While, as with the PILE, the evaluee can visually appraise the number of cannisters in the lift container, the cannisters and evaluation record are color-coded so that the evaluee is able to be kept naive of the load lifted. With this scheme, three cannisters in the container can range from 25 pounds to 70 pounds. Procedures and instructions were developed for the PLC to allow it to be used safely in a wide variety of settings, using "off the shelf" materials which cost less than $400. Safety of the PLC is enhanced by utilizing continuous heart rate and blood pressure monitoring to limit cardiovascular work load to 70% of age-predicted maximum heart rate and by calculating a "time-tension index" (heart rate x systolic blood pressure). Additionally, performance is limited to no more than 60% of ideal body weight, based on height and gender. The present study was designed to assess the reliability of the PLC on a "blind" basis over a 7-day interval with a sample of healthy female adults.

Methods - This study measured performance reliability in an dynamic test of healthy normal females (n = 30) aged 20 years to 44 years (mean=30 years). After appropriate cardiovascular, musculoskeletal, and general health screening, demographic data were collected, including activity level. A test - re-test reliability study with a seven day interval was undertaken. Subjects were tested over two vertical ranges of motion, from floor to 30 inches, and from 30 inches to 54 inches from the floor with a brief rest period in between.

Results - The test - re-test reliability study of the PLC test resulted in statistically significant correlations. Pearson correlation coefficients were $r = .77$ for the PLC from the floor to 30 inches ($p<.05$) and $r = .80$ for the PLC from 30 inches to 54 inches ($p<.05$). Maximum load ranged from 20 pounds to 80 pounds over both the lower range (mean=42, SD=15) and the upper range (mean=37, SD=13).

Discussion - The test - re-test correlation coefficients for the PLC are not as high as those obtained in a previous study reported by Mayer with the PILE. The latter test demonstrated correlation coefficients of $r=.87$ over the lower range and $r=.93$ over the upper range. However, the PILE used a one-day re-test interval and did not visually mask the weight of the container, thus allowing the subject to conceivably remember the number of weights from the previous test which would artificially inflate the correlations. Additionally, the PILE reliability study was conducted with only 10 subjects, generally recognized to be an insufficient sample size for a reliability study. With the advantage that the PLC offers in terms of visually masking the load in a lifting task, it may be superior to the PILE while the reliability of the PLC is adequate.