Invited Commentary

Recently, there has been growing recognition of falls and immobility as problems in community-living old persons. This has prompted the need for the development of methods for assessing and treating community-living old persons for falls and immobility. In their article, Koch and colleagues present such an assessment and intervention protocol and examine interrater reliability and the feasibility of both the assessment and intervention components of the protocol. The epidemiological comments in their introduction are selected to fit their goal: to emphasize the need for both assessment and intervention. Nothing is mentioned about the literature on which the assessments and the interventions are based. Thus, we consider their study preliminary based on several issues related to assessment and intervention protocol development and interrater reliability testing.

Assessment Protocol Development

When assessing falls and immobility in old individuals, several factors need to be considered: ecologic inputs or environmental factors that contribute to falls and immobility; biomedical inputs or the medical events (eg, acute or chronic disease, drug side effects, infections, electrolyte imbalances) that contribute to falls and immobility; physiologic inputs or sensory (visual, vestibular, and somatosensory systems), central processing, and effector (strength, range of motion [ROM], biomechanics, flexibility, endurance) components of the postural control system; and functional inputs or the identification of routine movements that old persons have difficulty performing. In their assessment protocol, Koch and colleagues evaluate two effector components (strength, ROM) of the postural control system, functional inputs, and ecologic inputs. They state that the assessment techniques were chosen based on present usage in clinical practice, on purported interrater reliability, and on feasibility of use in the home setting.

A discussion of the assessment techniques chosen by the authors is warranted.

**Strength Testing**

Manual muscle testing (MMT) is insensitive in quantifying the strength of muscles with higher grades. Koch et al recognize this limitation in their discussion and suggest that additional strength testing such as one repetition maximum (1 RM) or hand-held dynamometry may be necessary. In addition, for strength increases to occur in muscle, the principles of overload and specificity must be applied during resistance testing and training. The optimal training load for an individual cannot be determined from a MMT. There is also a lack of specificity between the authors' assessment technique (MMT) and resistance training techniques (Thera-Band®). Although it is laudable to attempt to make strength testing simple, standardized, and feasible, application of correct exercise physiology principles must occur or the assessment is inappropriate.

There are additional limitations of MMT as it relates to the assessment of falls and immobility in old persons that suggest that this technique is questionable. First, for various MMT grading schemes, the amounts of resistance applied to individuals of different ages, sizes, gender, and exercise history have not been determined. This lack of data could affect interrater reliability measurements. Second, in balance, stabilization as well as large displacements and fast, forceful movements are required of muscles. Thus, an isometric strength test or torque measurements at different speeds of movement may be more appropriate than MMT for determining muscle strength in an assessment of falling.

**Range of Motion**

Measurement of ROM using goniometric techniques is considered to be a factor that needs to be evaluated when assessing falls in old individuals. It should be recognized, however, that the extent to which limited ROM in joints such as the elbow contribute to loss of balance and falling may be small. An old individual can have good balance despite having limited ROM of the elbow joint.

**Balance, Transfers, Position Change**

Functional (eg, position changes, gait) and environmental assessments are performed in this section of the protocol. Balance is "observed" by the examiner during these assessments. Specific clinical tests (Sensory Integration Test, Postural Stress Test) that assess the components of the postural control system are not performed during the assessment protocol. Thus, caution must be exercised so that conclusions about the sensory or central-processing components of the postural control system are not inferred from the assessment.
Intervention Protocol Development

Progressive Resistance Strength Exercises

To obtain a training effect in muscle, an exercise overload must be applied.9 Significant gains in force-generating capacity occur when high-resistance loads (eg, 10 RM) are applied to old muscle.10−11 To our knowledge, there is no information as to how Thera-Band® correlates to maximal muscle loading. In addition, heterogeneity in aging must be considered when designing strength training programs.

To produce significant increases in muscle strength in old individuals, training at a high intensity, individualized to the muscle being trained, must be performed and maximum training loads need to be reestablished on a regular basis. It has been shown that frail persons up to 90 years of age can tolerate this type of program.12 Additionally, when old or frail individuals are performing any type of resistance exercise program, physiological variables (heart rate, blood pressure) should also be monitored periodically.

Finally, the authors state, "If the muscle weaknesses are roughly equivalent, the more proximal muscle group is selected [to strengthen]." Recurrent falling in old persons, however, is associated with lower-extremity weakness, especially at the ankle and knee.13,14 Again, although there is a desire to make strength training procedures simple, standardized, and feasible in community-living old persons, application of correct exercise physiology principles must occur or effectiveness of the intervention is compromised.

Progressive Balance Exercises

There is little evidence that balance training carries over to improved function. Balance appears to be task specific. If one accepts these premises, the balance exercises performed should be task specific and based on deficits noted in the functional assessment.

Interrater Reliability Determination

As stated by the authors in their discussion of the results, interrater reliability testing should be performed on a greater number of subjects, using a diverse and larger number of therapists. Even if two experienced physical therapists come to a similar result, there is no guarantee that they are not biased. Also, if a group of people who need some form of intervention is selected, the probability that agreements on intervention strategy will be reached should be high. Finally, the agreements are dominated by simple function tests where the agreements are expected to be close. Disagreements concern very important activities of daily living crucial to the evaluation of the risk of falling.

Before a method can be evaluated, results of assessment and intervention should be available. Only when expanded interrater reliability and the effectiveness of the protocol, as demonstrated by a reduction in falls and an improvement in the mobility of old persons, has been shown can the potential of this tool be assessed.

Jane F Hopp, PhD, PT
Assistant Professor
Department of Physical Therapy and
Section of Geriatric Medicine,
Department of Medicine
University of Illinois at Chicago
1919 W Taylor St, m/c 898
Chicago, IL 60612

Alvar Svanborg, MD, PhD
Professor and Chief of
Geriatric Medicine
Department of Medicine
University of Illinois at Chicago
840 S Wood St, m/c 787
Chicago, IL 60612

References