

# Just What the Doctor Ordered

## A Guide to Robust Assessment and Exercise Prescription in Older Adults

by Jeffrey A. Schlicht, Ph.D.; Michael Inskip, Ph.D.; and Maria Fiatarone Singh, M.D.

### Apply It!

- Screening for frailty, cognitive impairment, depression, malnutrition, inappropriate medications, and falls risk provides important information for your client's portfolio.
- Proper exercise modalities and progression are key to creating a safe and effective exercise prescription.
- High-intensity strength training is safe and should be prescribed to even the most frail older adults.

**Key words:** Older Adult, Geriatric Assessment, Sarcopenia, Falls Risk, Exercise Prescription

### PART I: NEEDS ASSESSMENT

Training older adults requires unique skills not normally used with younger clients. Physicians who work with people 65 years and older, known as geriatricians, call their initial patient intake session a comprehensive geriatric assessment (CGA). This differs from a typical personal training or physical therapy intake in that a CGA is a multidimensional exploration of a person's physical, cognitive, social, environmental, medical, and medication history. Although some aspects of a CGA are beyond the scope of practice of personal trainers, exercise physiologists, or physical therapists, there are ways you can structure your intake protocol that will give you a better understanding of the challenges and limitations your older clients face while trying to initiate and maintain physical activity. Many aspects of a CGA can be performed during your exercise intake session, as well as during training, allowing a skillful exercise professional to make important contributions to a client's ongoing health care.

### THE COMPREHENSIVE GERIATRIC ASSESSMENT

CGA combines a semistructured interview with physical examination, similar to a primary care physician intake, but broader in scope. During the interview, geriatricians review past and present illness, current medications and social supports, and reason for referral. They then ask clients about symptoms they may be having anywhere in the body. Questions might include, "How are you sleeping?" and "Are your feet okay?" The aim is to identify trouble spots that warrant follow-up during the physical exam. For example, if a client is feeling short of breath, the geriatrician would assess cardiopulmonary function.

At the conclusion of the assessment, the geriatrician provides recommendations for treatment. These often include changing medications (deprescribing excess or duplicate medications if polypharmacy [ $\geq 5$  medications/day] is detected, substituting



for potentially inappropriate or hazardous medications, or starting new medications), improving nutritional intake through changes in dietary intake or meal support, improving social support, investigating neuropsychological issues, and prescribing exercise/rehabilitation, all with the goal of optimizing functional independence and quality of life while enhancing the opportunity to age in place.

However, the number of tests geriatricians can complete during a consultation may be limited if they see the patient only once a year. Exercise professionals typically engage with clients over longer periods of time, which means they can provide valuable longitudinal insight into a client's health history by adopting a holistic approach to assessment. Structuring your client intake session like a CGA allows you to provide data to your client's physician, making you an important part of the health care team, while improving the safety and effectiveness of your exercise prescription.

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## PUTTING IT INTO PRACTICE

A holistic older adult assessment appropriate for exercise professionals to conduct includes, but is not limited to, screening for stability of chronic conditions, evidence of undiagnosed diseases or geriatric syndromes, frailty, cognitive impairment, depression, nutritional abnormalities, polypharmacy, and falls risk. The ultimate aim is to collect sufficient data to clearly articulate where further testing and treatment are needed, as well as design an appropriate exercise prescription to address modifiable risk factors or improve disease management. A brief summary of important assessment domains and tools is given below.

### Frailty and Sarcopenia Assessment

The prevalence of frailty and sarcopenia increases with age and chronic disease burden; however, they are not inevitable. Frailty

is an umbrella term that describes a modifiable condition of increased vulnerability to life's stressors that predisposes individuals to an elevated risk of adverse events, morbidity, and mortality. Sarcopenia is a muscle disease involving deficits in strength, lean muscle mass, and physical function that also increases the risk of adverse outcomes. They are separate from chronic disease, but both exacerbate, and in turn are exacerbated by, underlying disease.

The typical presentation of frailty consists of weight loss, slowness, weakness, sedentariness, and fatigue. Current guidelines for both frailty (1) and sarcopenia (2) recommend screening followed by more detailed assessment to identify and treat potentially modifiable causes. Robust progressive resistance training is the core exercise treatment recommended for both conditions (3–6) (Figure 1).

### Cognition, Delirium, and Depression Screening

For older clients who report or present with memory concerns, it is important to identify baseline cognition and affect to help guide exercise prescription and treatment. There is a bidirectional relationship between cognitive impairment and frailty: Cognitive decline significantly increases the risk of becoming frail, and frailty increases the risk of dementia in older adults. Additionally, assessing cognition in your intake provides a baseline measure that may highlight subtle cognitive improvements resulting from exercise.

Depression also can affect cognition. Older adults with mild depression or mild dementia can have similar scores on cognitive screening measures (formerly known as the "pseudo dementia of depression"), and it is now recognized that hippocampal atrophy occurs in both conditions and is reversible with treatment of depression. Both conditions may result in reduced appetite, increased falls risk, and decreased engagement in physical activity and social interactions.

Knowledge of baseline cognition and depression can help identify reasons for poor exercise adherence or progression, worsening neuropsychological symptoms, and even the onset of delirium during or outside of training. Delirium is an acute state of confusion, inattention, and disorientation that has many possible causes (*e.g.*, dehydration, constipation, polypharmacy, and acute illness), and it is a contraindication to exercise that, if left untreated, can lead to serious deterioration in health and cognition (Figure 2) (7–10).

#### Box: Recommended Dietary Allowance for Protein

The recommended dietary allowance for protein in an adult is 0.8 g/kg/day, but it increases to at least 1.2 g/kg/day in older adults to mitigate onset of sarcopenia and optimize related health outcomes.

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**Figure 1.** Frailty and sarcopenia screening.

1. SCREENING TOOLS	
Tool	Important information
FRAIL Scale (3)	The FRAIL Scale and SARC-F screen for signs of frailty and sarcopenia, respectively. Scoring $\geq 1/5$ on the FRAIL scale indicates the presence of frailty. Scoring $\geq 4/10$ on the SARC-F is associated with sarcopenia.
SARC-F (4)	
2. FURTHER ASSESSMENT	
Tool	Important information
Short Physical Performance Battery (SPPB) (5)	The degree of frailty and sarcopenia can be assessed through the use of the SPPB and grip strength.  The SPPB includes repeated chair stand, habitual walking speed, and static balance tests. Grip strength is a proxy measure for overall muscle strength. The total score and subcomponents of the SPPB, and highest grip strength value, are used to assess frailty and sarcopenia. Both measures have a strong correlation with falls risk, malnutrition and cognition as well as mortality and need for institutional care.  <u>Frailty:</u> The 'weakness' criterion can be defined by grip strength of $<29$ - $32$ kg for males and $<17$ - $21$ kg for females depending on BMI. The 'slowness' criterion is defined by a walking speed below $0.65 - 0.76$ m/s depending on height & sex.  <u>Sarcopenia:</u> The 'low strength' primary criterion can be defined by either Five Repeated Chair Stand time $>15$ seconds or grip strength $<27$ kg for males, and $<16$ kg for females. The 'low function' criterion can be defined by a total SPPB score $\leq 8/12$ or gait speed $\leq 0.8$ m/s, respectively. The term 'probable sarcopenia' is often used unless low muscle mass can be confirmed by dual-energy X-ray absorptiometry or bioelectrical impedance analysis.
Grip strength (6)	

## Nutritional Screening: Malnutrition

Older adults are at increased risk of inadequate macronutrient, micronutrient, and fluid intake because of reduced appetite (anorexia of aging), social isolation, and functional impairments that may affect shopping, meal preparation, and/or eating and swallowing. Reduced dietary intake also may be exacerbated by frailty, side effects from medications, cognitive or mobility impairments, sedentariness, depression, and disease (e.g., Parkinson's disease and ulcerative colitis).

A dietitian is responsible for comprehensive dietary assessment, intervention, and identification of potential drug–nutrient or disease–nutrient interactions. However, screening for the risk of malnutrition is a responsibility shared by both allied health and medical professionals alike, to ensure other treatments such as exercise work as intended. Exercise prescription can be affected by malnutrition as the anabolic effects of strength

exercise may be attenuated if the client is not getting enough energy or protein to fuel strength gains (Figure 3) (11).

## Overnutrition

With aging, body fat centralizes around the waist and internal organs. Although the risk of mortality related to obesity decreases with age and is not readily apparent until a body mass index (BMI) of  $>35$  kg/m<sup>2</sup>, obesity is associated with significant morbidity in older adults, including:

- coronary artery disease
- depression
- insulin resistance
- hypertension
- systemic inflammation
- endocrine and other cancers

**Figure 2.** Cognition, depression, and delirium screening.

1. SCREEN	
Tool	Important information
Montreal Cognitive Assessment (MoCA) (7)	The MoCA is free, quick and can be administered once online training is complete. It is sensitive enough to detect mild cognitive impairment, which is indicated by a score $\leq 26/30$ .
Geriatric Depression scale – short form (GDS 15) (8)	The GDS-15 is validated in older adults and should be performed with cognitive testing. Scores $\geq 6/15$ suggest depression may be present.
Rapid Clinical Test for Delirium (4AT) (9)	The 4AT, used in conjunction with cognitive and affect testing and clinical note taking, can help identify delirium. Scores $\geq 4$ indicate possible delirium and/or cognitive impairment, and should result in referral to a primary physician.
2. FURTHER ASSESSMENT	
Tool	Important information
Walking While Talking Test (WWTT) (10)	<p>Dual-task cost (DTC) is the decrement seen in one task (walking speed) while performing another task (naming task), compared to performance of both tasks separately. Older adults who are frail, cognitively impaired, and/or have underlying neurological deficits have a higher DTC than their peers and it is a known predictor of falls and dementia risk.</p> <p>Using usual walking speed from the SPPB and category naming (e.g. words starting with 'B') from the MoCA, you can assess DTC in clients by having them perform both tasks at the same time.</p> <p>DTC in older adults varies greatly, but normally a 30-40% decrease in walking speed is observed. This measure can track improvements in handling complex dual-task situations following your exercise prescription as well as flag individuals who may be at risk of falls.</p>

- obstructive sleep apnea
- lower extremity arthritis
- gout

Because BMI does not examine body composition, and with aging fat accumulates around the waist and vital organs, waist circumference should be used as an index of excess central adiposity in older clients (Figure 4) (12).

### Medication Screening

Older clients are more susceptible to medication-related adverse events because of the higher prevalence of polypharmacy and hazardous or potentially inappropriate medications. Exercise improves many physiological functions, which may change the effect of prescribed medications. An astute exercise professional can provide valuable information to the physician by documenting adverse adaptations or events

potentially attributable to recent changes in medications (Figure 5) (13,14).

### Falls Risk Screening

Approximately one-third of adults older than 65 years will fall annually, and of that proportion 20% will sustain a serious injury (15). The greatest predictor of a future fall is a history of falling within the last year, and while many risk factors for falls are physical (poor visual acuity, muscle weakness, and analgesic, or pain-avoiding, gait), it is important to screen for neurological (delirium and cognitive impairment) and physiological risk factors (orthostasis, sedation, drowsiness, and hyperglycemia). Many of these factors can change suddenly; thus, it is important to not only assess for falls risk but also communicate this risk effectively to the physician to aid timely treatment. There is no single physical assessment that best identifies falls risk; therefore, a holistic screening tool should be used to identify areas needing further assessment (Figure 6) (16).

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**Figure 3.** Malnutrition screening.

1. SCREEN	
Tool	Important information
Mini-Nutritional Assessment (MNA) (11)	<p>The MNA is a simple, well-validated tool that screens for risk of malnutrition by assessing psychological, physical, behavioral and anthropometrical risk factors. A score &lt;24/30 indicates the client is at-risk of being malnourished. A score &lt;17/30 indicates malnutrition.</p> <p>The full version of the MNA requires some physical assessments, including calf (CC) and mid arm circumference (MAC). A MAC &lt;22 cm and CC &lt;31 cm are sub-optimal and indicate a greater risk of malnutrition.</p> <p>As a quick, reliable and validated alternative in clinical practice, the <a href="#">Mini-Nutritional Assessment - Short Form (MNA-SF)</a> (11), a subset of the full version and scored out of 14 points can be utilized. A score &lt;12 and &lt;8 points indicates the client is likely at-risk of malnutrition, and currently malnourished, respectively.</p>

### Final Thoughts on Needs Assessment

It is probable you will be exposing your clients to physiological effort beyond their normal daily activity. To ensure optimal safety and client care during exercise, you should be knowledgeable of domains that are typically outside the standard operating model of exercise professionals. Adopting a geriatrician's holistic approach to client assessment improves understanding of your

clients' health and makes you an important part of the medical and allied health treatment team.

### PART II: EXERCISE PRESCRIPTION

Exercise progression for older adults at falls risk follows the Get Up, Stay Up, Move rubric. First, clients must have adequate strength to stand up. Next, they need balance that allows them

**Figure 4.** Waist circumference screening.

1. SCREEN	
Tool	Important information
Waist Circumference (cm) (12)	<p>There are a variety of methods for measuring waist circumference that vary between populations and guidelines. Reliability is highly dependent on the skill of the observer and use of the same method over time.</p> <p>The International Diabetes Federation (IDF) method for waist circumference uses reliable landmarks such as the lowest rib and top of the iliac crest (pelvis bone) to provide a consistent point of reference for repeated measures of waist circumference over time.</p> <p>In most European countries an average waist circumference (3 trials) exceeding the cut point of <math>\geq 94</math> cm (males) and <math>\geq 80</math> cm (females) indicates an increased risk of many cardiovascular and metabolic conditions, while in the United States a cut point of <math>\geq 102</math> cm (males) and <math>\geq 88</math> cm (females) is commonly used in clinical practice. Asian norms are lower but have not been internationally accepted yet, so the above thresholds may be used.</p>

**Figure 5.** Polypharmacy and orthostatic blood pressure screening.

1. SCREEN	
<i>Tool</i>	<i>Important information</i>
Screening Tool for Older Persons Prescriptions (STOPP) Criteria (13)	The STOPP criteria support the clinician with an evidence-based consensus on PIMs in older adults to flag medications that may pose a risk to the client and need further review. Common PIMs that present at intake are duplicate medications in the same class, medications where there is no clear indication for use, and medications that increase falls risk due to altered blood pressure, alertness, worsening depression, cognitive impairment or nutritional risk.
2. FURTHER ASSESSMENT	
<i>Tool</i>	<i>Important information</i>
Orthostatic Blood Pressure (OBP) (14)	<p>Orthostatic hypotension that occurs while moving from a lying/seated to a standing position is a common side effect of medications that alter blood pressure and/or alertness. The resulting dizziness, faintness, and/or blurred vision can lead to loss of consciousness or increased risk of injurious falls. Evaluating OBP can indicate whether orthostasis is present and support the need to review suspect medications, screen for other fall risk factors, and provide appropriate balance exercises.</p> <p>A systolic drop of 20 mmHg or diastolic drop of 10 mmHg in blood pressure, or heart rate increase of less than 10 beats/min within three minutes of standing indicates the presence of orthostatic hypotension or abnormal autonomic nervous system function.</p>

**Figure 6.** Falls risk screening.

1. SCREEN	
<i>Tool</i>	<i>Important information</i>
<a href="#">Falls Risk Assessment Tool (FRAT)</a> (16)	<p>FRAT is a falls risk tool that can quantify areas that need further attention and identify acute changes in clinical status that require urgent medical review.</p> <p>Scores <math>\geq 12/20</math> suggest moderate to high risk of falls. The presence of delirium, changes in functional status and/or medications that affect safe mobility, and orthostatic hypotension/dizziness are automatically considered high risk.</p>

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to move without falling. When strength and balance are sufficient, movement and aerobic exercise can proceed safely (Figure 7).

**Exercise progression for older adults at falls risk follows the Get Up, Stay Up, Move rubric. First, clients must have adequate strength to stand up. Next, they need balance that allows them to move without falling. When strength and balance are sufficient, movement and aerobic exercise can proceed safely.**

### Get Up

In a frail person, the ability to stand from a chair begins with adequate triceps strength needed to shift center of gravity from the chair to the feet and to assist the legs with rising (Figure 8). Gluteus maximus and quadriceps muscles then do the bulk of the work to extend the hips and knees (Table).

The ACSM strength training guidelines (17) for older adults are the same guidelines used with adults of any age (Figure 9). The FITT prescription includes 2 to 3 days/week, 2 to 3 sets, 8 to 12 reps, at a vigorous intensity of 8 out of 10 on a rating of perceived exertion (RPE) scale.

Because Type II (fast twitch) muscle fibers are disproportionately lost during aging, power training that emphasizes a rapid (1 to 2 seconds) concentric phase and a slow (3 to 4 seconds) eccentric phase is recommended as long as it is not contraindicated by underlying joint pathology, as it preferentially recruits this fiber type (Figure 9) (18).

In addition to training the triceps, gluteus maximus, and quadriceps, muscle groups that assist with stability and gait should be targeted. Core stabilizers include the rectus abdominis and erector spinae. Balance recovery muscles include the hip abductor muscle group that allows for rapid lateral leg movement needed to recover from a potential fall. Important gait

muscles include the tibialis anterior for adequate dorsiflexion that prevents toes from catching and the iliopsoas group for hip flexion to provide adequate leg lift during ambulation.

It is important to note that high-intensity progressive resistance training is safe and effective in older adults (note the 8/10 RPE target from ACSM). Rapid and important strength gains occur when high-intensity resistance is used and relative intensity is maintained over time by increasing resistance as clients gain strength.

### Stay Up

Once a person is able to stand up, balance becomes important for preventing falls. A frail individual may have difficulty controlling body sway in a narrow stance. Figure 10 illustrates the progression from easiest to most challenging stance (19).

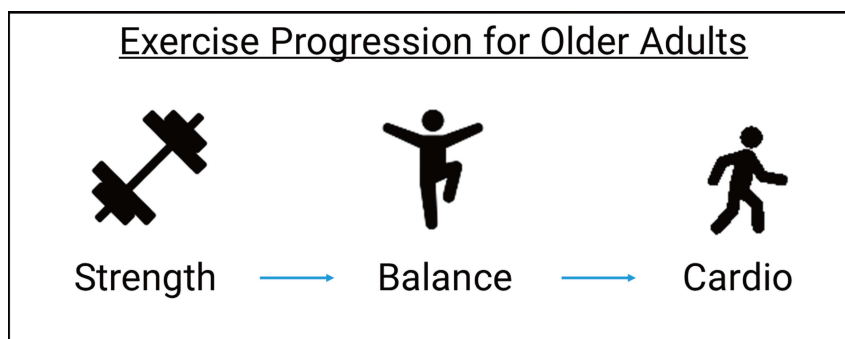
If your client is able to stand on each foot separately without losing balance, closing eyes, adding arm movements (placing a peg in a board, spelling words with magnetized letters), or challenging proprioception with an unstable surface can add additional levels of difficulty.

Balance training is a form of neuromotor training. The ACSM guidelines for neuromotor training include 2 to 3 days/week, 20 to 30 minutes/bout, 60 minutes/week (17). As with any mode of exercise, the overload principle applies: Improvement results when the body is challenged beyond its normal limits. For balance training, this means working at a level of difficulty that has not yet been mastered (*i.e.*, almost losing one's balance but not falling).

### Move

Someone with stable gait should be encouraged to practice functional movements that challenge neuromotor skills, such as walking up and down stairs or maneuvering around objects. Clients who can handle these tasks easily can progress to standard cardiorespiratory training, such as walking/hiking/jogging. Weight-bearing modalities are preferable to cycling or swimming because they target balance, ambulation, and bone health more directly. The ACSM FITT prescription includes 150 minutes/week of moderate-intensity or 75 minutes/week of vigorous-intensity cardio (17).

**Figure 7.** Exercise progression.



**Figure 8.** Triceps push down. Photo reprinted with permission from source trial “Maintain Your Brain,” which is funded by a National Health and Medical Research (NHMRC) Dementia Research Team Grant (APP1095097), as well as the participant.



**TABLE: Important Training Muscles for Older Adults**

Get Up		
Triceps brachii		
Gluteus maximus		
Quadriceps		
	Stay Up	
	Rectus abdominus	
	Erector spinae	
	Hip abductors	
		Move
		Tibialis anterior
		Hip flexors

Someone with stable gait should be encouraged to practice functional movements that challenge neuromotor skills, such as walking up and down stairs or maneuvering around objects. Clients who can handle these tasks easily can progress to standard cardiorespiratory training, such as walking/hiking/jogging. Weight-bearing modalities are preferable to cycling or swimming because they target balance, ambulation, and bone health better than non-weight-bearing exercises.



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Figure 9. ACSM resistance training guidelines.

## Resistance Training for Health

People of all ages and abilities who regularly participate in resistance exercise reduce risk of numerous diseases, improve quality of life and reduce mortality.

### Key Physiological Benefits of Resistance Exercise

- Muscle strength, endurance and power
- Bone, muscle and connective tissue growth and durability
- Communication between brain and muscle
- Growth hormones
- Blood glucose regulation
- Aerobic fitness

### Resistance Exercise Can Help Manage and Treat Many Conditions Including:

- Arthritis
- Cancers
- Cardiovascular disease
- Dementia
- Depression
- Diabetes
- Fall risk
- Frailty
- Hypertension
- Insomnia
- Low back pain
- Mental health
- Movement disorders
- Obesity
- Osteoarthritis
- Osteoporosis
- Pulmonary disorders
- Peripheral vascular disease
- Stroke

### Training can be time efficient and effective for health benefits:

For health benefits, muscles need to be challenged with a combination of weight lifted, repetitions and speed of lifting. The addition of resistance training to aerobic programs can also enhance other health gains throughout the life span from childhood to old age.

#### Exercise Plan:

- Free weights, machines and/or bands can be used
- Perform 8-10 multi-joint exercises that stress the major muscle groups
- Perform 2-3 sets of 8-12 repetitions with good form
- Lift and lower the weight in a controlled manner (2 seconds each up and down)
- The last repetition should be difficult to complete
- Perform exercise 2-3 times per week
- Progress weight lifted over time so that it feels like an 8 out of 10 difficulty (where 0 = no effort, 10 = hardest effort you can give)

Authors: Fiataroone Singh, Maria; Hackett, Daniel; Schoenfeld, Brad; Vincent, Heather K.; Wescott, Wayne. 2019

## Final Thoughts on Exercise Prescription

It is important to remember that prescribing cardio is the last stage in exercise progression for older adults who have mobility impairment or frailty. Telling your older clients to go for a walk before they have sufficient strength and balance to do so safely is

a recipe for potential disaster, as walking in the natural environment provides multiple opportunities for falls.

Across the life span, as your focus on disease prevention shifts to include treatment of chronic disease, disability, and age-related changes in physiology, the rationale and the evidence

Figure 10. Standing balance progression.

- ① Stand with your feet side-by-side.
- ② Place the instep of one foot so it is touching the big toe of the other foot.
- ③ Tandem stand: Place one foot in front of the other, heel touching toe.
- ④ Stand on one foot.

base for strength and balance training relative to aerobic exercise grow stronger with each decade of life.

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**Disclosures:** *The authors declare no conflict of interest and do not have any financial disclosures.*



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## BRIDGING THE GAP

Older adults often have complicated medical histories. Enhanced prescreening that evaluates more than blood pressure, body fat, and exercise history provides important information for proper exercise prescription that should follow the Get Up, Stay Up, Move rubric. Adding tests to your usual battery of intake exams enhances your value to clients and their medical teams.