



Geriatric Education &
Research Institute

Functional Power Training

Exercise Manual

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1 Background

Functional decline and mobility impairment is a prominent issue that affects older adults. However, the neuromuscular system has the ability to adapt to appropriate exercise stimulus, regardless of age, to reverse or slow down this decline.

Physical activity guidelines for adults aged 65 years and older emphasize regular resistance training to improve strength and function, manage frailty, and reduce dependency. While resistance training engages low-velocity contractions at 50%–80% of maximal strength, power training is characterized by performing the concentric phase at high velocity (i.e., as fast as possible) with a slow eccentric phase to achieve the greatest benefit of muscular power and strength.

Power training is effective and has emerged as an alternative modality to resistance training to preserve activities of daily living that require quick, forceful motions, even in the most vulnerable group of institutionalized adults aged 85 years and more. Power producing capabilities compared to muscle strength in older adults have been shown to be strongly associated with performance of daily tasks, such as getting up from a chair, avoiding oncoming traffic, climbing stairs, and the ability to recover from a loss of balance. Hence, the Functional Power Training (FPT) Program is developed to place greater emphasis on improving muscular power in older adults.

2 Introduction to Functional Power Training

The Functional Power Training (FPT) Program was developed in Singapore for pre-frail and frail older adults (determined based on the 5-item FRAIL scale). It was jointly developed by trained researchers from the Geriatric Education and Research Institute (GERI) and exercise physiologists from Empower Ageing.

The objective of the FPT Program is to improve the physical abilities of strength, endurance, balance, functional ability and frailty status of pre-frail and frail older adults. This manual provides a practical implementation of the FPT Program.

The FPT Program comprises a total of 37 exercises, distributed into three categories:

- A – Lower body Power (LBP)
- B – Upper body Power (UPP)
- C – Balance (B)

3 Components of Fitness

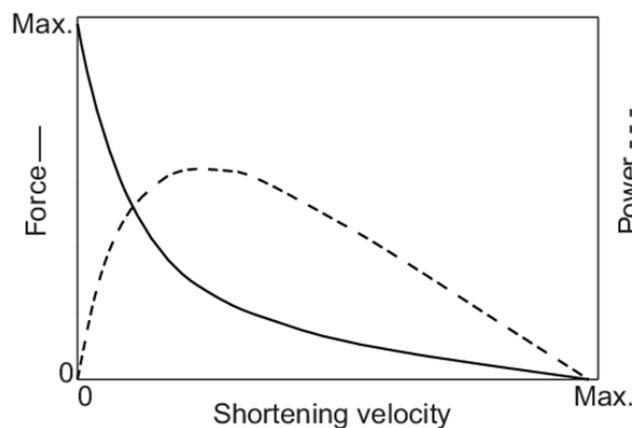
Before delving into the benefits of power training, we will first explore what is generally known about fitness training and exercise, starting with the different components of physical fitness.

Components	Description
1. Cardio-respiratory Endurance	Ability of the lungs and heart to take in and transport adequate amounts of oxygen to the working muscles, and the ability of the working muscles to extract and use the oxygen efficiently during sustained physical activity.
2. Muscular Strength	Ability of a skeletal muscle or group of muscles to contract and exert force against a resistance.
3. Muscular Endurance	Ability of a skeletal muscle or group of muscles to repeatedly contract and exert force over a long period of time without fatiguing.
4. Flexibility	Ability to move body joints through a full range of motion.
5. Body Composition	Ratio of fat to muscle, bone and other tissues in the body.
6. Agility	Ability to change direction accurately and quickly.
7. Balance	Ability to maintain the body's equilibrium while standing still (static) or moving (dynamic).
8. Speed	Ability to cover distances in a short time.
9. Reaction Time	The time required to initiate a response to a given stimulus.
10. Coordination	The integration of the nervous and muscular systems to produce correct, graceful, and harmonious body movements.
11. Power	Ability to generate maximum force in the shortest time.

3.1 Background and Benefits of Power

Power is a fitness component that combines speed and strength, i.e., $\text{Power} = \text{Force} \times \text{Velocity}$. However, power increases with force only up to a certain point, after which velocity is compromised such that any further increase in force will not lead to an increase in power.

The Force-Velocity Curve illustrates this inverse relationship between force and velocity. 'Velocity' can represent muscle contraction velocity or the velocity of movement, while 'Force' can represent muscle contractile force or the reaction force produced against an external load. In essence, maximal power is generated when an individual is able to generate the maximum amount of force required to move a sub-maximal load with the maximum velocity possible. Therefore, in order to optimally train for power, submaximal loads of 50-80% maximal strength (force) should be used.



Of the eleven components of fitness, the FPT directly and/or indirectly targets nine of them: cardio-respiratory endurance, muscular strength, muscular endurance, flexibility, body composition, balance, speed, coordination, and power.

Components	Evidence
1. Cardio-respiratory Endurance	Resistance training has been shown to improve cardio-respiratory endurance, especially in untrained subjects, as long as the training elevates heart rate and oxygen consumption sufficiently to tax the cardio-respiratory system.
2. Muscular Strength	Power training has been shown to improve not just power, but muscular strength as well. Conversely, training for strength may not improve power.
3. Muscular Endurance	The moderate-high number of sets and reps in the program serve to improve muscular endurance.
4. Flexibility	The standardized warm-up and cool-down procedures serve to improve flexibility by bringing joints through a full range of motion.
5. Body Composition	Resistance training can increase muscle mass and decrease fat mass, altering body composition.
6. Balance	The balance exercises serve to improve both static and dynamic balance.
7. Speed	Power training has been shown to improve speed of movement.
8. Coordination	The FPT exercises can directly improve the integration of different muscle groups to achieve specific movement outcomes.
9. Power	Power training can directly improve muscular power.

4 Principles of Training

Effective training programs to improve physical function require implementation of the following principles: individuality, adaptation, specificity, overload, progression, reversibility, rest & recovery, and variation.

Components	Description
1. Individuality	<p><i>Unique genetic, physiological and physical factors.</i></p> <p>Keeping individual differences in mind, including injuries and medical conditions, those partaking in the FPT may engage in varying difficulties of the same exercise, depending on their individual abilities.</p>
2. Specificity	<p><i>Training should replicate the movement outcome (i.e., specifically involve the muscles and systems that the individual is training to improve) to see the greatest improvement.</i></p> <p>The focus of the FPT is on improving an individual's performance on activities of daily living, i.e., functional tasks such as getting up from a chair, avoiding oncoming traffic, and climbing stairs. Therefore, the exercises included are specific in targeting and improving these functions (sit-to-stand, speed walks, balance tasks).</p>
3. Adaptation	<p><i>Process of adjusting to a stress or stimulus (i.e., exercise loads).</i></p> <p>Adaptation to external stimulus occurs during recovery, after the training session has been completed. With the FPT, individuals will undergo two training sessions a week, with at least 48-72h rest between sessions. This allows adaptation and super-compensation to occur, bringing the individual's fitness level to a new and higher baseline.</p>
4. Overload	<p><i>The demands placed on a system should be increased systematically and progressively over time to cause continuous physiological development.</i></p> <p>In addition to varying the sets, reps and exercises, the FPT follows the FITT principles to achieve overload in order to increase the external stimulus and continually challenge the body to adapt:</p> <ul style="list-style-type: none"> • Frequency How often / How many times a week • Intensity How challenging / what percentage of maximum heart rate or maximum strength • Type How long / how many sets / how many repetitions (sets and reps can influence the duration spent on training) • Time Mode of exercise (focus based on components of fitness)
5. Progression	<p><i>There is an optimal level of overload within a timeframe for improvement to occur.</i></p>
6. Variation	<p><i>One or more parts of a training routine should be changed over time to allow for training effects to be maintained at an optimal level.</i></p>
7. Reversibility	<p><i>Improvements from training can be reversed and lost if training is stopped or significantly reduced.</i></p>

8. Rest & Recovery *Enough time should be given between workouts to allow the body to repair broken tissues and subsequently make physiological adaptations.*

6 Equipment

All exercise equipment are low-cost and portable:

Components	Description
1. Sturdy Chairs	
2. Resistance bands	
3. Cones	
4. Water Bottles	
5. Tissue Boxes	
6. Stopwatch / Timer	

7 Exercise List

Exercises in this program are progressed according to the difficulty of the starting position, or the addition of resistance. According to the individual’s capabilities, have participants start the exercise program at their highest level possible, i.e. independent standing position.

Level	Starting Position	Variation	Resistance / Load
1	Seated	A	Body weight
2	Standing with Support	B	Resistance Band
3	Independent Standing	C	Ankle Weight

Components of each 1-hour exercise session is listed below:

For Each Session:	
Frequency	2x / week
Duration	1.5 hours – 30min Set-up / pack up, 1 hour exercise program <ul style="list-style-type: none"> • Warm up 10 min • Exercise 40 min • Cool down 10 min
Warm Up	
Exercises	4-5
Sets	2
Repetitions	10
Functional Power Training	
Exercises	4-5
Sets	3
Repetitions	10-15 (Progressive to 20 reps for some exercises)
Balance and Mobility	
Exercises	1-2
Sets	3
Repetitions	30-60 seconds / 12-15 Reps
Cool Down	
Exercises	4-5
Sets	1
Repetitions	30-60 seconds

Movements are performed with the concentric phase “As fast as possible”, coupled with a 3-second eccentric phase. Throughout the performance of each exercise, ensure proper technique and posture through the full range of motion (as appropriate).

General Guidelines

Posture

Seated Posture	Standing Posture
<ol style="list-style-type: none">1. Sit with foot flat on the floor, towards the end of the chair2. Sit tall with spine straight3. Position knees ~ hip-width apart on top of ankles (forming 90° angle)4. Feet pointing forward and symmetrical<ul style="list-style-type: none">– Slight outward pointing of toes (~10°) is acceptable5. Arms across chest or on thigh6. Keep head up and look forward	<ol style="list-style-type: none">1. Sit tall, imagine that the top of your head is being pulled to the ceiling by a string2. Keep feet hip-width apart / together, pointing forward and symmetrical<ul style="list-style-type: none">– Slight outward pointing of toes (~10°) is acceptable3. Ensure plumb line<ul style="list-style-type: none">– Ear – Shoulder – Hip – Knee – Ankle4. Hands' grip are soft when "holding on" to chair for support

Breathing

Exhale	Inhale
<ol style="list-style-type: none">1. Perform movements AS FAST AS POSSIBLE during the exhalation phase2. Quicker exhalation unless otherwise stated at 1-sec tempo	<ol style="list-style-type: none">1. Slow, long inhalation (3-sec tempo) as the limb goes back to the starting position2. Ensure controlled movement of limb

7.1 Lower Body Exercises

7.1.1 Sit to Stand / Squat

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture <ul style="list-style-type: none"> – Sit with foot flat on the floor, towards the end of the chair – Sit tall with spine straight – Position knees ~ hip-width apart on top of ankles (forming 90° angle) – Feet pointing forward and symmetrical – Arms across chest or on thigh – Look ahead 2. Warm-up Activation <ul style="list-style-type: none"> – With proper posture, have participants gently squeeze the buttock muscles – Regulate breathing with movement 3. Sit to Stand <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) <p>Warm-up Activation</p> <ol style="list-style-type: none"> 4. Sitting in place, try to squeeze your buttock muscles 5. As you breathe out, squeeze as fast as possible 6. As you take a deep breath in, relax your muscles slowly <p>Movement Cue</p> <ol style="list-style-type: none"> 7. Sit tall, imagine that the top of your head is being pulled to the ceiling by a string 8. Lean body forward slightly, exhale and stand up AS FAST AS POSSIBLE 9. As you inhale, SLOWLY sit back down
Progression	
<ol style="list-style-type: none"> 1. Level 1A – Sit to Stand Seated, Bodyweight 	<ol style="list-style-type: none"> 1. Rest hands on legs for support 2. Arms raised in front for balance 3. Arms clasped in front of chest <p>Variation</p> <ol style="list-style-type: none"> 4. One foot forward (walking stance)
<ol style="list-style-type: none"> 2. Level 1B – Sit to Stand Seated, Resistance band 	<ol style="list-style-type: none"> 5. Feet stepping on resistance bands, taut with hands by the side
<ol style="list-style-type: none"> 3. Level 2A – Squat Standing with support, Bodyweight * Ensure proper posture <ul style="list-style-type: none"> – Feet slightly wider than hip-width – Straight back with slight forward lean – Hips move back and down – Knees does not collapse inwards nor move forward beyond toes 	<ol style="list-style-type: none"> 6. Hand full grasp on chair 7. Fingers touching chair for balance
<ol style="list-style-type: none"> 4. Level 3A – Squat Independent standing, Bodyweight 	<ol style="list-style-type: none"> 8. Arms raised in front for balance 9. Arms clasped in front of chest <p>Variation</p> <ol style="list-style-type: none"> 10. Feet Together: narrow base of support 11. Wide-stance: wide base of support
<ol style="list-style-type: none"> 5. Level 3B – Squat Independent standing, Resistance band 	<ol style="list-style-type: none"> 12. Feet stepping on resistance bands, taut with hands by the side

7.1.2 *Knee Ups (Hip Flexion)*

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Knee Ups <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) <p>Movement Cue</p> <ol style="list-style-type: none"> 4. Sit tall 5. Place hands at 90-90°, palms facing down 6. As you exhale, bring your knees to touch your hands AS FAST AS POSSIBLE 7. As you inhale, SLOWLY bring your leg down
Progression	
<ol style="list-style-type: none"> 1. Level 1A Seated, Bodyweight 2. Level 1C Seated, Ankle weight 	<ol style="list-style-type: none"> 1. Place hands at 90-90°, palms facing down
<ol style="list-style-type: none"> 3. Level 2A Standing with support by side, Bodyweight * Ensure proper posture <ul style="list-style-type: none"> – Feet close together – Standing upright (plumb line) – Head in neutral position, facing ahead – Regulate breathing with movement – <i>Be aware of forward / backward compensation of movement!</i> 4. Level 2C Standing with support by side, Ankle weight 	<ol style="list-style-type: none"> 2. Hand full grasp on chair, raise leg to 90-90° 3. Fingers touching chair for balance, raise leg to 90-90°
<ol style="list-style-type: none"> 5. Level 3A Independent standing, Bodyweight 6. Level 3C Independent standing, Ankle weight 	<ol style="list-style-type: none"> 4. Arms raised in front for balance, raise leg to 90-90° 5. Arms clasped in front of chest, raise leg to 90-90°

7.1.3 Calf + Toe Raises

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Calf / Toe Raises <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) <p>Movement Cue</p> <ol style="list-style-type: none"> 4. Sit tall 5. As you exhale, lift your heels / toes up high AS FAST AS POSSIBLE 6. As you inhale, SLOWLY bring your leg down
Progression	
<ol style="list-style-type: none"> 1. Level 1A Seated, Bodyweight 2. Level 1B Seated, Resistance band 	<ol style="list-style-type: none"> 1. Heels on floor, plantarflexion with resistance band
<ol style="list-style-type: none"> 3. Level 2A Standing with support, Bodyweight * Ensure proper posture <ul style="list-style-type: none"> – Standing upright (plumb line) – Head in neutral position, facing ahead – Regulate breathing with movement – <i>Be aware of forward / backward compensation of movement!</i> 4. Level 3A Independent standing, Bodyweight 	<ol style="list-style-type: none"> 2. Feet hip-width apart, hand full grasp on chair 3. Feet hip-width apart, fingers touching chair for balance <p>Variation</p> <ol style="list-style-type: none"> 4. Feet Together 5. Single-leg

7.1.4 *Knee Extension*

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Knee Extension <ul style="list-style-type: none"> - Use movement cues - Regulate breathing with movement 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, with back firmly against the backrest 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) <p>Movement Cue</p> <ol style="list-style-type: none"> 4. Sit tall, and all the way back into the chair 5. As you exhale, push your toes up towards the ceiling as fast as possible till straight AS FAST AS POSSIBLE 6. As you inhale, SLOWLY bring your leg down 7. Repeat on opposite leg
Progression	
<ol style="list-style-type: none"> 1. Level 1A Seated, Bodyweight 2. Level 1C Seated, Ankle weight 	<ol style="list-style-type: none"> 1. Place hands on lap 2. Attach ankle weights

7.1.5 Seated Heel Drag / Hamstring Curl (Knee Flexion)

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Seated Heel Drag / Hamstring Curl <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) <p>Movement Cue (Seated)</p> <ol style="list-style-type: none"> 4. Sit tall 5. As you inhale, bring your foot as far forward as comfortable 6. As you exhale, pull your heel back towards the chair AS FAST AS POSSIBLE 7. Repeat on opposite leg <p>Movement Cue (Standing)</p> <ol style="list-style-type: none"> 8. Stand tall 9. Shift body weight over to one side, keeping knees soft 10. As you exhale, bend the other knee backwards to 90-degree angle (<i>do not allow the thigh of flexed knee to move behind the other thigh</i>) 11. As you inhale, slowly bring the leg down
Progression	
<ol style="list-style-type: none"> 1. Level 1A – Heel Drag Seated, Bodyweight 2. Level 1B – Heel Drag Seated, Resistance band 	<ol style="list-style-type: none"> 1. Place hands on lap 2. Attach resistance band to partner’s chair
<ol style="list-style-type: none"> 3. Level 2A – Hamstring Curl Standing with support, Bodyweight * Ensure proper posture <ul style="list-style-type: none"> – Feet shoulder-width apart – Standing upright (plumb line) – Head in neutral position, facing ahead – Regulate breathing with movement – <i>Be aware of forward / backward trunk compensation of movement!</i> 	<ol style="list-style-type: none"> 3. Hand full grasp on chair 4. Fingers touching chair for balance
<ol style="list-style-type: none"> 4. Level 3A – Hamstring Curl Independent standing, Bodyweight 	<ol style="list-style-type: none"> 5. Arms raised to the side for balance 6. Arms clasped in front of chest

7.1.1 Hip Extension

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Hip Extension <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Be aware of forward / backward trunk compensation of movement! 	<p>Posture</p> <ol style="list-style-type: none"> 1. Stand tall 2. Feet shoulder-width apart 3. Head in neutral position, facing ahead <p>Movement Cue (Standing)</p> <ol style="list-style-type: none"> 1. Shift body weight over to one side, keeping knees soft 2. As you exhale, squeeze your butt muscles and extend the leg backward 3. As you inhale, slowly bring the leg down
Progression	
<ol style="list-style-type: none"> 1. Level 2A Standing with support, Bodyweight 2. Level 2B Standing with support, Resistance band <i>* Can combine with Knee Flexion</i> 3. Level 2C Standing with support, Ankle weight <i>* Can combine with Knee Flexion</i> 	<ol style="list-style-type: none"> 1. Hand full grasp on chair 2. Fingers touching chair for balance
<ol style="list-style-type: none"> 4. Level 3A Independent standing, Bodyweight 5. Level 3B Independent standing, Resistance band 6. Level 3C Independent standing, Ankle Weight 	<ol style="list-style-type: none"> 3. Arms raised to the side for balance 4. Arms clasped in front of chest

7.1.1 Hip Abduction

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Hip Abduction <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Be aware of sideways trunk compensation of movement! 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) <p>Movement Cue (Seated)</p> <ol style="list-style-type: none"> 4. Sit tall 5. As you exhale, move your feet towards a 45-degree angle (2 or 10 o'clock direction) AS FAST AS POSSIBLE 6. As you inhale, slowly bring your foot back to the start 7. Repeat on opposite leg <p>Movement Cue (Standing)</p> <ol style="list-style-type: none"> 8. Shift body weight over to one side, keeping knees soft 9. Keeping your upright posture as you exhale, extend your leg to the side AS FAST AS POSSIBLE 10. As you inhale, slowly bring the leg down
Progression	
<ol style="list-style-type: none"> 1. Level 1A Seated, Bodyweight 2. Level 1B Seated, Resistance band 	<ol style="list-style-type: none"> 1. Place hands on lap 2. Attach resistance band to chair
<ol style="list-style-type: none"> 7. Level 2A Standing with support, Bodyweight 8. Level 2B Standing with support, Resistance band 9. Level 2C Standing with support, Ankle weight 	<ol style="list-style-type: none"> 5. Hand full grasp on chair 6. Fingers touching chair for balance
<ol style="list-style-type: none"> 10. Level 3A Independent standing, Bodyweight 11. Level 3B Independent standing, Resistance band 12. Level 3C Independent standing, Ankle Weight 	<ol style="list-style-type: none"> 7. Arms raised to the side for balance 8. Arms clasped in front of chest

7.2 Upper Body Exercises

Warm-up Exercises: Shrugging, protract/retract shoulder blades, arm rotations (circular motion)

7.2.1 Bicep Curl

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Bicep Curl <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Be aware of compensation from upper trapezius muscles (<i>shrugging</i>) 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) 4. Keep your shoulders down 5. Palms facing forward <p>Movement Cue</p> <ol style="list-style-type: none"> 6. Sit/stand tall 7. Keeping your shoulders down you exhale, bring your palms towards your shoulders AS FAST AS POSSIBLE 8. As you inhale, slowly bring your palms back to the start
Progression	
<ol style="list-style-type: none"> 1. Level 1A Seated, Bodyweight 2. Level 1B Seated, Resistance band 	<ol style="list-style-type: none"> 1. Place hands on lap 2. Step on resistance band
<ol style="list-style-type: none"> 3. Level 3B Independent standing, Resistance band 	<ol style="list-style-type: none"> 3. Feet hip-width apart 4. Feet together

7.2.1 Chest Press

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Chest Press <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Be aware of compensation from upper trapezius muscles (<i>shrugging</i>) 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) 4. Place resistance band around the back of chair and under the armpits 5. Keep your shoulders down 6. Fist (knuckles) facing forward 7. Keep your elbows up like a “T” <p>Movement Cue</p> <ol style="list-style-type: none"> 8. Sit/stand tall 9. Pretend you are punching a bag 10. As you exhale, push both hands forward AS FAST AS POSSIBLE 11. As you inhale, slowly bring your hands back to the start close to your chest 12. Keep elbows up like a “T”
Progression	
<ol style="list-style-type: none"> 1. Level 1B Seated, Resistance band 	
<ol style="list-style-type: none"> 2. Level 3B Independent stand, Resistance band 	<ol style="list-style-type: none"> 1. Hip-width 2. Split stance

7.2.1 *Shoulder Press*

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Shoulder Press <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Be aware of compensation from upper trapezius muscles (<i>shrugging</i>) 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) 4. Place resistance band around the bottom of chair and in front of shoulders 5. Keep your shoulders down, elbows tucked in close to body 6. Fist (knuckles) facing upwards <p>Movement Cue</p> <ol style="list-style-type: none"> 7. Sit/stand tall 8. Pretend you are punching the sky 9. As you exhale, push both hands upwards AS FAST AS POSSIBLE 10. As you inhale, slowly bring your hands back to the start position
Progression	
<ol style="list-style-type: none"> 1. Level 1B Seated, Resistance band 	
<ol style="list-style-type: none"> 2. Level 3B Independent stand, Resistance band 	<ol style="list-style-type: none"> 1. Hip-width

7.2.1 Seated Low Row

Instructions For Tester	Instructions For Participant
<p>1. Ensure Proper Seated Posture</p> <p>2. Seated Low Row</p> <ul style="list-style-type: none"> - Use movement cues - Regulate breathing with movement - Be aware of compensation from upper trapezius muscles (<i>shrugging</i>) <p>* Arrange chairs in circular direction</p>	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) 4. Place resistance band around the bottom legs of partner's chair 5. Keep your shoulders down, elbows tucked in close to body 6. Thumb facing upwards <p>Movement Cue</p> <ol style="list-style-type: none"> 7. Sit/stand tall 8. Pretend you are snatching your bag back from a thief 9. As you exhale, pull both hands backwards AS FAST AS POSSIBLE 10. As you inhale, slowly bring your hands back to the start position
Progression	
<p>1. Level 1B Seated, Resistance band</p>	
<p>2. Level 3B Independent stand, Resistance band</p>	<p>1. Hip-width</p>

7.2.1 Upright Row / Side Raises

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Upright Row <ul style="list-style-type: none"> - Use movement cues - Regulate breathing with movement - Be aware of compensation from upper trapezius muscles (<i>shrugging</i>) 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall, halfway out of the chair with your feet on the floor 2. Keep your knees in line with your hips 3. Place your feet below your knees, pointing forward (slightly outward ~10° is fine) 4. Step on the resistance band 5. Keep your shoulders down, 6. Knuckles facing down, with thumbs facing inwards <p>Movement Cue</p> <ol style="list-style-type: none"> 7. Sit/stand tall 8. Pretend you are a scarecrow, by forming a “T” with your arms (straight / bend elbows) 9. Keep your elbow up high without shrugging your shoulders 10. As you exhale, pull both hands upwards AS FAST AS POSSIBLE 11. As you inhale, slowly bring your hands back to the start position
Progression	
<ol style="list-style-type: none"> 1. Level 1B Seated, Resistance band 	<ol style="list-style-type: none"> 1. Bent-elbow wide upright row 2. Lateral side raises
<ol style="list-style-type: none"> 3. Level 3B Independent stand, Resistance band 	

7.3 Balance Exercises

7.3.1 Standing Balance

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Standing Posture 2. Standing 4-Conditions <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Participants with good balance can start with the tandem stand 	<p>Posture</p> <ol style="list-style-type: none"> 1. Stand tall 2. Keep your eyes directed forward <p>Movement Cue</p> <ol style="list-style-type: none"> 1. Stand tall, imagine that the top of the head is being pulled towards the ceiling by a string 2. Keep your head up and looking forward 3. Take a deep breath in, and now slowly exhale
Progression	
<ol style="list-style-type: none"> 1. Level 2A Standing with support, body weight 	<ol style="list-style-type: none"> 1. Side by side 2. Semi-Tandem Stand 3. Tandem Stand 4. Single-Leg Stand 5. Eyes closed 6. Draw letters with single-leg
<ol style="list-style-type: none"> 2. Level 3A Independent stand, body weight 	<ol style="list-style-type: none"> 7. Semi-Tandem Stand 8. Tandem Stand 9. Tandem Stand 10. Single-Leg Stand 11. Eyes closed 12. Draw letters with single-leg

7.3.1 Seated Side Reach

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Seated Posture 2. Seated side reach <ul style="list-style-type: none"> – Regulate breathing with movement – Teach activation of trunk control and not purely rely on back muscles – Start with side bends, and progress to include a reaching task 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit tall with feet flat on the floor 2. Keep your eyes directed forward 3. Hands out to form a “T” <p>Movement Cue</p> <ol style="list-style-type: none"> 4. Sit tall, imagine that the top of the head is being pulled towards the ceiling by a string 5. Keep your head up and looking forward 6. Put your hands up by the side and imagine you are an aeroplane 7. Take a deep breath in, and as you exhale, bend your trunk to the side 8. As you inhale, come back to the centre
Progression	
<ol style="list-style-type: none"> 1. Level 1A Seated, body weight 	<ol style="list-style-type: none"> 1. Eyes closed
<ol style="list-style-type: none"> 2. Level 3A Independent stand, body weight 	<ol style="list-style-type: none"> 2. Feet hip-width apart 3. Feet together

7.3.1 Clock Tapping

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Posture 2. Clock Tapping <ul style="list-style-type: none"> - Use movement cues - Regulate breathing with movement 	<p>Posture</p> <ol style="list-style-type: none"> 1. Sit / stand tall 2. Keep your eyes directed forward <p>Movement Cue</p> <ol style="list-style-type: none"> 1. Stand tall, imagine that the top of the head is being pulled towards the ceiling by a string 2. Keep your head up and looking forward 3. Imagine you are standing in the middle of a clock 4. Take a deep breath in 5. As you exhale, place your right foot at “2 o’clock” AS FAST AS POSSIBLE 6. As you inhale, bring your feet back to the centre
Progression	
<ol style="list-style-type: none"> 1. Level 2A Standing with support, body weight Chair by the side 	
<ol style="list-style-type: none"> 2. Level 3A Independent stand, body weight 	

7.3.1 *Marching with Side Step*

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Standing Posture 2. Marching with Side Step <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Ensure high-knee lifts – Start off with marching on the spot – Include a side-step with every 5th step (L-R-L-R-SL, R-L-R-L-SR) 	<p>Posture</p> <ol style="list-style-type: none"> 1. Stand tall 2. Keep your eyes directed forward <p>Movement Cue</p> <ol style="list-style-type: none"> 1. Stand tall, imagine that the top of the head is being pulled towards the ceiling by a string 2. Keep your head up and looking forward 3. Imagine you are standing in the middle of a clock 4. Follow this 5-step sequence: <ol style="list-style-type: none"> a. Left – Right – Left – Right – Side Left b. Right – Left – Right – Left – Side Right 5. Now, let’s try to take a deep breath in slowly over 5 counts, and exhale slowly in 5, 4, 3, 2, 1 6. As you take a deep breath in, we will complete the 5-step sequence: <ol style="list-style-type: none"> a. Left – Right – Left – Right – Side Left 7. Now as you exhale: <ol style="list-style-type: none"> b. Right – Left – Right – Left – Side Right
Progression	
<ol style="list-style-type: none"> 3. Level 2A Standing with support, body weight Chair in front 	<ol style="list-style-type: none"> 1. Start off with 1-sec tempo in first set 2. Increase speed with each set
<ol style="list-style-type: none"> 4. Level 3A Independent stand, body weight 	<ol style="list-style-type: none"> 3. Start off with 1-sec tempo in first set 4. Increase speed with each set

7.3.1 Mini-Lunges

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Standing Posture 2. Mini-Lunges <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Move through greatest Range of Motion (ROM) whenever possible 	<p>Posture</p> <ol style="list-style-type: none"> 1. Stand tall 2. Keep your eyes directed forward <p>Movement Cue</p> <ol style="list-style-type: none"> 1. Stand tall, imagine that the top of the head is being pulled towards the ceiling by a string 2. Keep your head up and looking forward 3. As you inhale, I want you to take a bigger step forward (one foot space between feet) 4. Keep your body vertical, do not lean forward 5. As you exhale, push off with your front foot and return to an upright starting position
Progression	
<ol style="list-style-type: none"> 1. Level 2A Standing with support, body weight Chair at side 	<ol style="list-style-type: none"> 1. One hand on chair for balance
<ol style="list-style-type: none"> 2. Level 3A Independent stand, body weight 	<ol style="list-style-type: none"> 2. Arms on hips for balance

7.3.1 Quick Feet

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Standing Posture 2. Quick Feet <ul style="list-style-type: none"> - Use movement cues - Regulate breathing with movement - Do not need to lift knees too high 3. Put different coloured “Post-It” on the ground for easier identification for foot placement (6 different colours) 	<p>Posture</p> <ol style="list-style-type: none"> 1. Stand tall 2. Keep your eyes directed forward <p>Movement Cue</p> <ol style="list-style-type: none"> 1. Stand tall, imagine that the top of the head is being pulled towards the ceiling by a string 2. Keep your head up and looking forward 3. Remember to regulate your breathing, take a deep breath in and out (~2-sec tempo) 4. Now, tap your feet on the floor with every 4 counts like this: <ol style="list-style-type: none"> a. Right – Left – Right – Left b. [Clock Face] 2 – 7 – Right – Left c. [Clock Face] 4 – 10 – Right – Left d. [Clock Face] 3 – 9 – Right – Left e. [Clock Face] 12 – 6 – Right – Left f. [Clock Face] 6 – 12 – Right – Left 5. Repeat each 4-step count twice, and the whole sequence 2 times to form one set 6. Alternate to start with left leg on next set <ol style="list-style-type: none"> a. Left – Right – Left – Right b. [Clock Face] 7 – 2 – Left – Right c. [Clock Face] 10 – 4 – Left – Right d. [Clock Face] 9 – 3 – Left – Right e. [Clock Face] 12 – 6 – Left – Right f. [Clock Face] 6 – 12 – Left – Right
Progression	
<ol style="list-style-type: none"> 1. Level 3A Independent stand, body weight 	<ol style="list-style-type: none"> 1. Start with a 4-step in 4-sec tempo <ul style="list-style-type: none"> - 2-step inhale - 2-step exhale 2. Progress to 4-step in 2-sec tempo <ul style="list-style-type: none"> - 4-step inhale - 4-step exhale

7.3.1 *Semi-tandem / Tandem Walk*

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure Proper Standing Posture 2. Walk <ul style="list-style-type: none"> – Use movement cues – Regulate breathing with movement – Keep head up and looking forward – Start with Tandem Walk, and only recommend semi-tandem for those with poorer balance 3. Line up a row of chairs for support <ul style="list-style-type: none"> – Encourage participants NOT to hold the chair, but lift arms by the side for balance instead 	<p>Posture</p> <ol style="list-style-type: none"> 1. Stand tall 2. Keep your eyes directed forward <p>Movement Cue</p> <ol style="list-style-type: none"> 1. Stand tall, imagine that the top of the head is being pulled towards the ceiling by a string 2. Keep your head up and looking forward 3. Remember to regulate your breathing, take a deep breath in and out (~2-sec tempo) 4. Walk from the start to the end <ul style="list-style-type: none"> – Heel to toe
Progression	
<ol style="list-style-type: none"> 1. Level 3A Independent stand, body weight 	<ol style="list-style-type: none"> 3. Start with a 4-step in 4-sec tempo <ul style="list-style-type: none"> – 2-step inhale – 2-step exhale 4. Progress to 4-step in 2-sec tempo <ul style="list-style-type: none"> – 4-step inhale – 4-step exhale

7.3.1 Zig-zag / Speed Walk / Obstacle Course / Farmer's Walk

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none"> 1. Ensure safety of participants 2. Zig-Zag Walk <ul style="list-style-type: none"> – Place markers on the floor – Have participants side shuffle towards the markers – Ensure bended knees in a slight squat position 3. Speed Walk <ul style="list-style-type: none"> – Have 2 to 4 lines (if space permits) to reduce waiting time for participants – Single-task walking alone – Dual-task activity <ul style="list-style-type: none"> • Spoon and ping-pong ball • Balance bean bag on head • Carrying food tray with cup of water 4. Obstacle Course <ul style="list-style-type: none"> – Have 2 lines (if space permits) to reduce waiting time for participants – Place obstacles on the floor – Keep knee high when crossing obstacles 5. Farmer's Walk <ul style="list-style-type: none"> – Have 2 lines (if space permits) to reduce waiting time for participants – Prepare bags of varying weights using 500ml water bottles (4 sets) 	<p>Zig-Zag Walk</p> <ol style="list-style-type: none"> 1. Stand in a mini-squat position by bending at your knees and hip 2. Side-step towards the marker on the left, and to the next marker ahead on the right 3. Keep your head up and looking forward 4. Remember to regulate your breathing, take a deep breath in and out (~2-sec tempo) <p>Speed Walk</p> <ol style="list-style-type: none"> 1. Keeping your head up and looking ahead, walk as fast as possible to the other side 2. Walk as fast as possible while balancing this object 3. Place your heel on the ground, keeping your toes up and roll your feet flat on the ground 4. Push off your step from your toes <p>Obstacle Course</p> <ol style="list-style-type: none"> 1. Keeping your head up and looking ahead step across obstacles of varying heights and width until you get to the other side 2. Couple with Speed Walk for return to starting side <p>Farmer's Walk</p> <ol style="list-style-type: none"> 1. Carrying the bags with regular grip or by the fingers for greater difficulty 2. Keeping your head up and looking ahead, walk as fast as possible to the other side 3. Ensure upright posture 4. Keep shoulders back and down (squeeze armpits)

7.3.1 *Crossing Creek*

Instructions For Tester	Instructions For Participant
<ol style="list-style-type: none">1. Ensure safety of participants2. Crossing Creek<ul style="list-style-type: none">– Place 2 lines of tape with increasing distance starting at 20cm to 70cm– Participants start from the narrower end and progressively “leap” across the creek– Take a side-step after each successful leap forward and back to increase difficulty	<p>Crossing Creek</p> <ol style="list-style-type: none">1. Start from the narrow end of the creek2. Take a step from this side to “cross” to the other side5. Change your lead leg when we return to the starting side

8 Exercise Intervention

The Functional Power Training intervention program will be conducted by EmPower. An un-blinded study team member will be on-site during the exercise session to ensure safety and monitoring of the training program.

The trainer to participant ratio will be 1:8. Should there be less than 10 participants in the exercise class, only 1 lead trainer will be engaged. A maximum of 16 participants will engage in the exercise program for each SAC batch.

Below is an outline of each exercise session. The total estimated duration of each session is 2 hours. A GERI team member will be down at the SAC 30 minutes before the start of the exercise class to take the participants' blood pressure and O₂ readings.

Additionally, ask if the participant has had any acute event in the last week, or if they do not feel well on the day of exercise. Should they be feeling unwell, find out the cause and determine if the participant should continue or be excused from the session. Record all information on the "Exercise Log" sheet.

8.1 12-Week Exercise Prescription

Below is an overview of the list of exercises that will be conducted over the 12-week intervention period.

Plan 1 (4 Sessions)	Weeks 1 & 2				Sets	Reps/Sec
	LB Pwr	1	Sit to Stand		3	10,12,12
		2	Standing Knee Ups (Hip Flexion)		3	10,12,12
		3	Standing Calf Raises		3	10,12,12
	UB Pwr Bal	4	Bicep Curl (with bands)		3	10,12,12
		5	Side-to-side/ Semi-tandem	Clock-Tapping	3	60, 60, 60
		6	Side Reach	Zig-zag walk	3	-

Plan 2 (4 Sessions)	Weeks 3 & 4				Sets	Reps/Sec
	LB Pwr	1	Sit to Stand		3	10,12,12
		2	Hip Extension		3	10,12,12
		3	Standing Toe Up	Seated Heel Drag (with bands)	3	10,12,12
	UB Pwr Bal	4	Chest Press (with bands)		3	10,12,12
		5	Side-to-side + Reach	Marching with Side Step	3	60, 60, 60
		6	Semi-tandem walk	Semi-tandem / Tandem walk	3	-

Plan 3 (4 Sessions)	Weeks 5 & 6				Sets	Reps
	LB Pwr	1	Squats		3	12,12,15
		2	Hip Extension		3	12,12,15
		3	Calf Raises with Toe Ups		3	12,12,15
	UB Pwr Bal	4	Seated Low Row		3	12,12,15
		5	Clock-Tapping / mini-lunges	Obstacle Course (side-step)	3	12,12,15
		6	Speed walk	Tandem Walk	3	-

Plan 4 (4 Sessions)	Weeks 7 & 8				Sets	Reps
	LB Pwr	1	Sit to Stand (with bands)		3	12,15,15
		2	Standing Knee Ups (Hip Flexion)		3	12,15,15
		3	Hip Abduction		3	12,15,15
	UB Pwr Bal	4	Seated Heel Drag (with bands)	Knee Flexion + Hip Extension (weights)	3	12,15,15
		5	Chest Press (with bands)	Shoulder Press (with bands)	3	12,15,15
		6	Speed + Zig-zag walk relay		3	-

Plan 5 (4 Sessions)	Weeks 9 & 10			Sets	Reps	
	LB Pwr	1	Sit to Stand + Swap Seats		3	15,20,20
		2	Seated Knee Extension (with bands)		3	12,15,15
		3	Calf Raises with Toe Ups		3	12,15,15
	UB Pwr Bal	4	Bicep Curl (with bands)		3	12,15,15
		5	Quick Feet		3	40,30,30
6		Mini-lunges		3	12,15,15	

Plan 6 (4 Sessions)	Weeks 11 & 12			Sets	Reps	
	LB Pwr	1	Squats (with ball between legs)		3	12,16,16
		2	Hip Extension (with bands)		3	12,15,15
		3	Standing Knee Ups (Hip Flexion)		3	12,15,15
	UB Pwr Bal	4	Standing Row	Shoulder Press (with bands)	3	12,15,15
		5	Quick Feet	Crossing Creek	3	-
6		Obstacle Course + Speed Walk	Farmer's Walk	3	-	