



EXERCISE-BASED MSD PREVENTION

DEVELOPING A DAILY MOVEMENT PRACTICE

Dr. Dave Frost and Dr. Tyson Beach



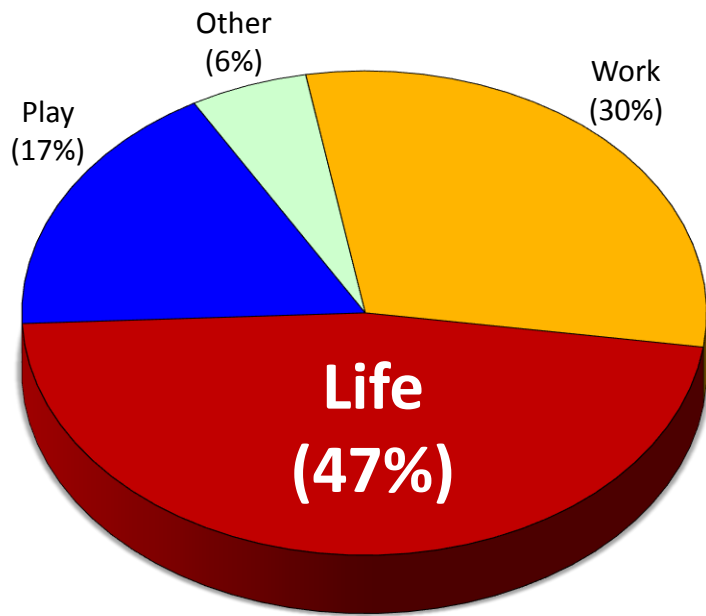
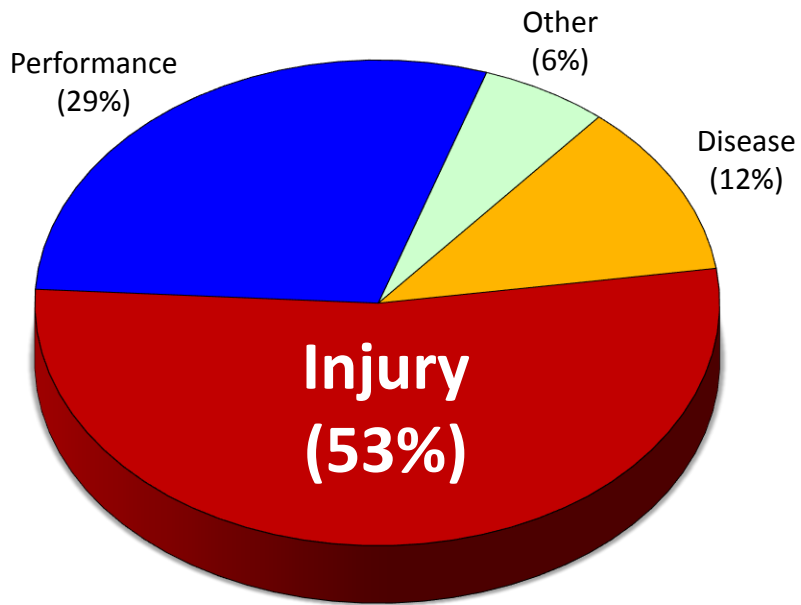






“What’s in it for ME...”

Need to understand the needs and wants of those involved

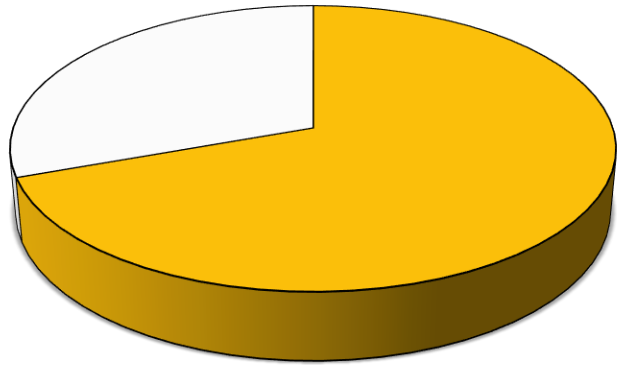


How do injuries actually happen...

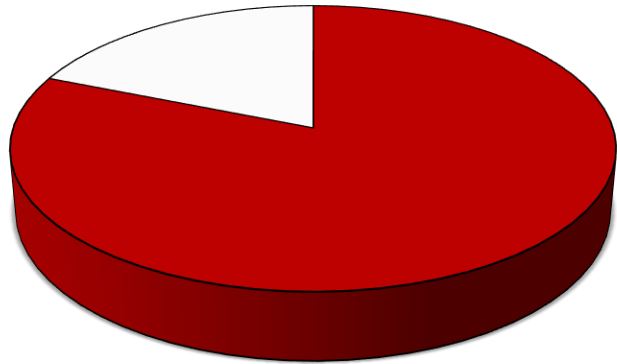
QUESTION

What do we need to know about injuries to prevent them from happening in the first place?

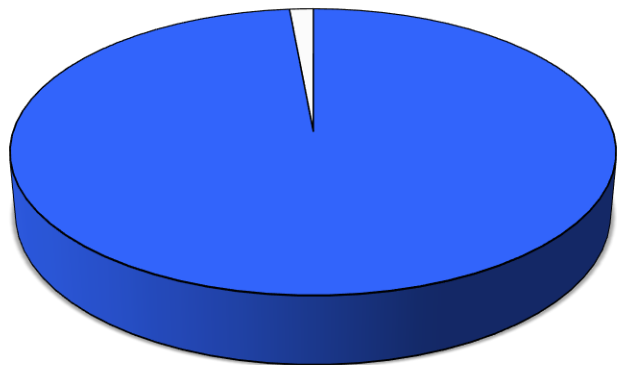




LOW BACK
(70% Lift/Squat)

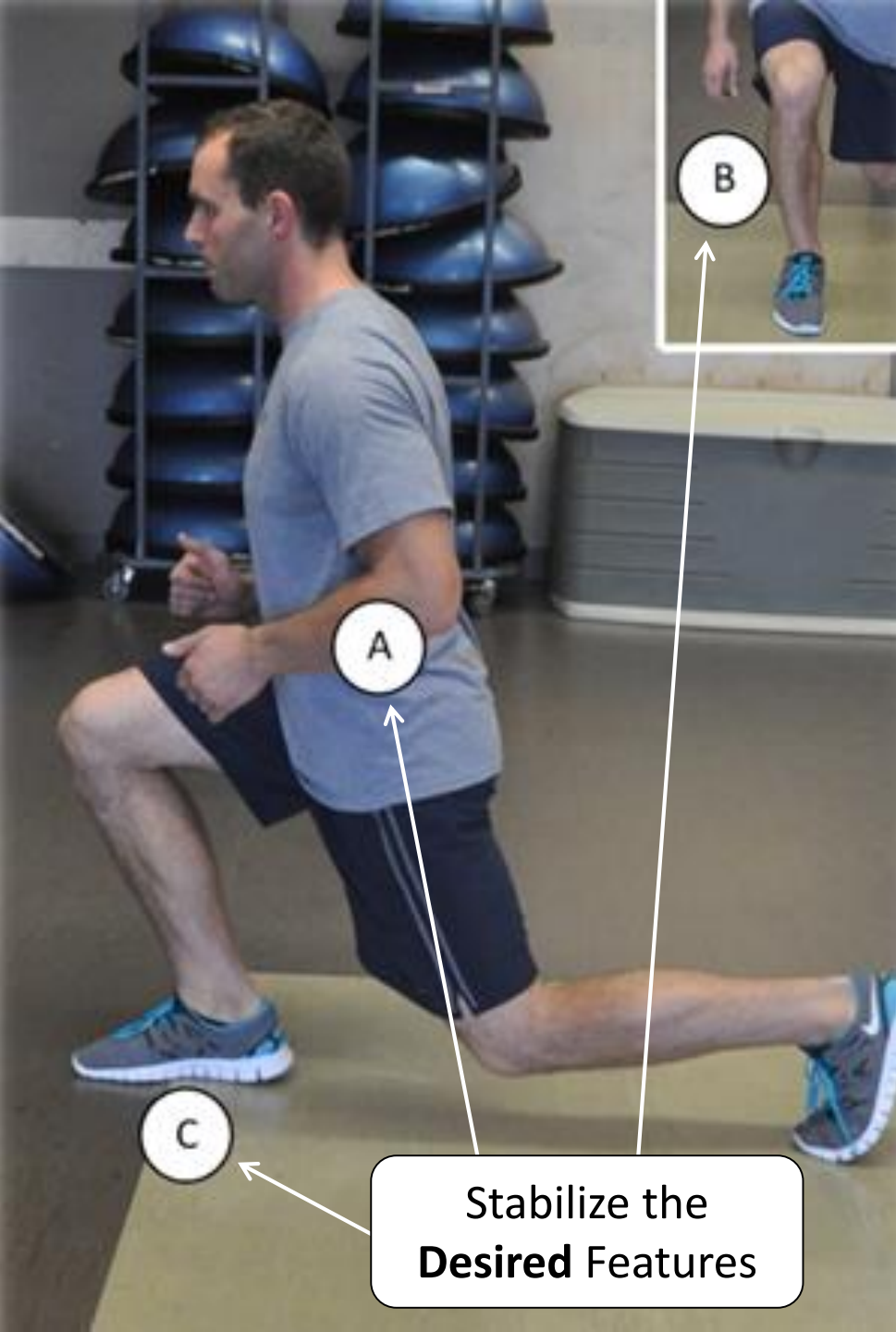


KNEES
(81% Lunge)



SHOULDERS
(99% Push/Pull)





Stabilize the
Desired Features

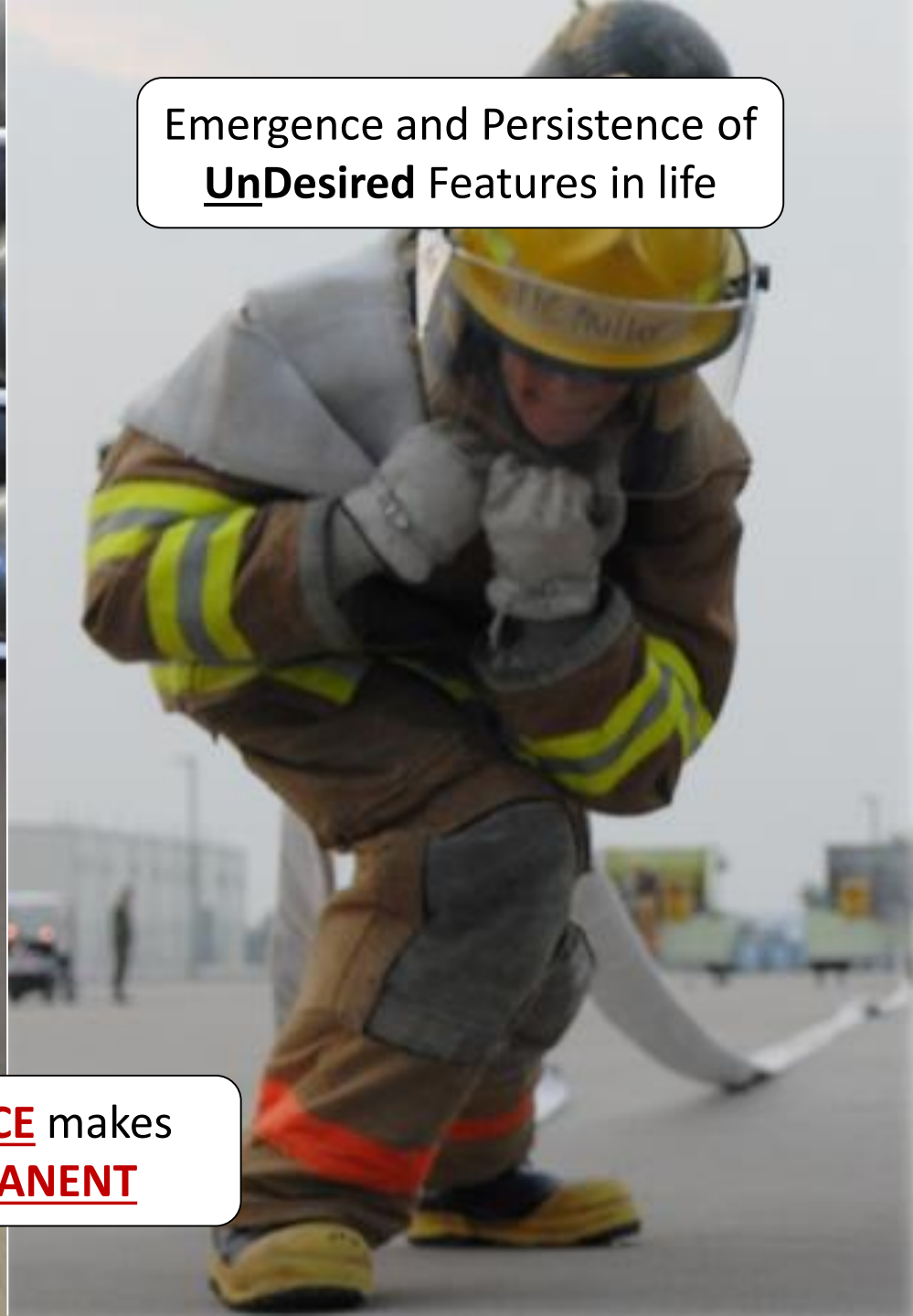


Emergence and Persistence of
Desired Features in life

Stabilize the
UnDesired Features



Emergence and Persistence of
UnDesired Features in life



PRACTICE makes
PERMANENT

Minimizing injuries and maximizing life...

QUESTION

What information do we need to create an exercise-based
MSD prevention program?

REFLECT ON YOUR NEEDS

In *my* organization...

1. Management support
2. Labor support
3. Member interest
4. Wellness team (PFTs, PTs, etc)
5. Money for health and wellness
6. Equipment and facilities
7. On duty exercise time
8. WFI history
9. Number of members
10. Number of stations
11. Call volume and intensity
12. Shift schedule
13. Minimum staffing
14. Training requirements
15. Structure of training curriculum





Assessment

Collect Relevant Information

My (Worker's) Needs

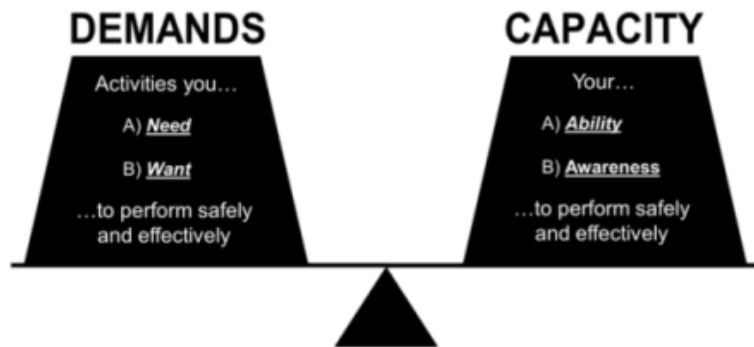
What information do I need?

1. Demands

(What do you want/need to do?)

2. Capacity

(What can you do now?)





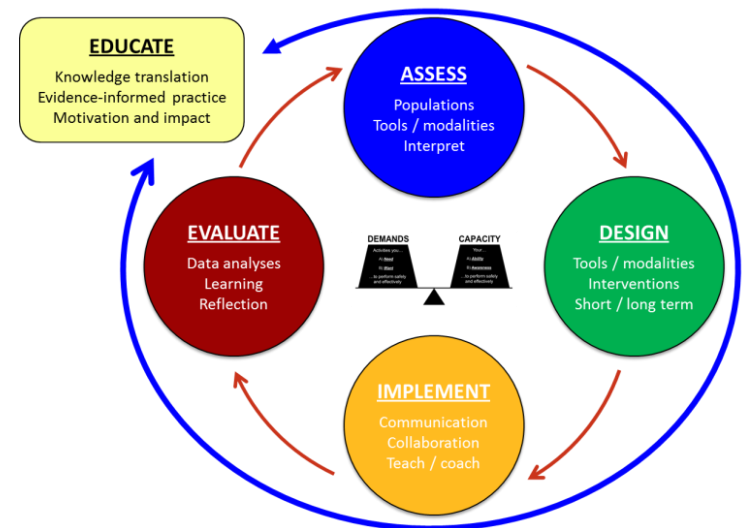
Assessment Demands

Needs and Wants

What activities does the worker perform – work, life and play?

You will also need to consider:

- Movement patterns
- Energy Systems (F.I.T.)



Assessment Capacity

Movement Patterns

What patterns are relevant?

1. Knee Control

In-line and mid-foot

2. Low Back Control

Straight and aligned

3. Shoulder Control


Down and back

MOVEMENT MATTERS!

- THE 7 'KEY' FEATURES -



KNEES




1 IN LINE
(Knee in line with hip/foot)

What to Look For

1. Body from the front
2. Line from hip to toes
3. Position of knee in relation to line
 - Medial to the line
 - **On the line**
 - Lateral to the line

Coaching Tips

- Grip the floor with the toes
- Push the knees out
- Point knees in direction of toes



2 MID-FOOT
(Bodyweight over mid-foot)

What to Look For

1. Body from the side
2. Line through middle of foot
3. Position of weight in relation to line
 - In front of the line (toes)
 - **On the line (arch)**
 - Behind the line (heel)

Coaching Tips

- Push through the floor
- Grip the floor with the toes
- Hinge at hips, lean forwards

LOWER BACK



3/4 STRAIGHT
(Normal low back curve)

What to Look For

1. Body from the front, back or side
2. Two lines through hips/upper back
3. Distance between the two lines
 - Closer than standing
 - **Same as standing**
 - Farther apart than standing

Coaching Tips

- Stiffen trunk
- Let trunk move with hips
- Dowel touches head, back, hips



5 ALIGNED
(Hips and shoulders aligned)

What to Look For

1. Body from the front, back or side
2. Two lines through hips/upper back
3. Alignment of the two lines
 - Shoulders rotate more than hips
 - **Shoulders in line with hips**
 - Hips rotate more than shoulders

Coaching Tips

- Use upper/lower body together
- Rotate with hips
- Practice with one hand

SHOULDERS



6 DOWN
(Shoulders away from ears)

What to Look For

1. Body from the front, back or side
2. Two lines through ears/shoulders
3. Distance between the two lines
 - Closer than standing
 - **Same as standing**
 - Farther apart than standing

Coaching Tips

- Elbows down/close to body
- Treat motions as push and pull
- Hold shoulders back



7 BACK
(Elbow and shoulder together)

What to Look For

1. Body from the front, back or side
2. Line from shoulder to elbow
3. Movement at both ends of the line
 - Move in opposite direction
 - **Move in same direction**
 - Only one end moves

Coaching Tips

- Rotate thumbs out when pulling
- Pull shoulder blades together
- Limit how far elbows pulled back

Assessment Capacity

Fitness

What F.I.T. are relevant?

1. **Extended Durations**

Control of ...motion with...

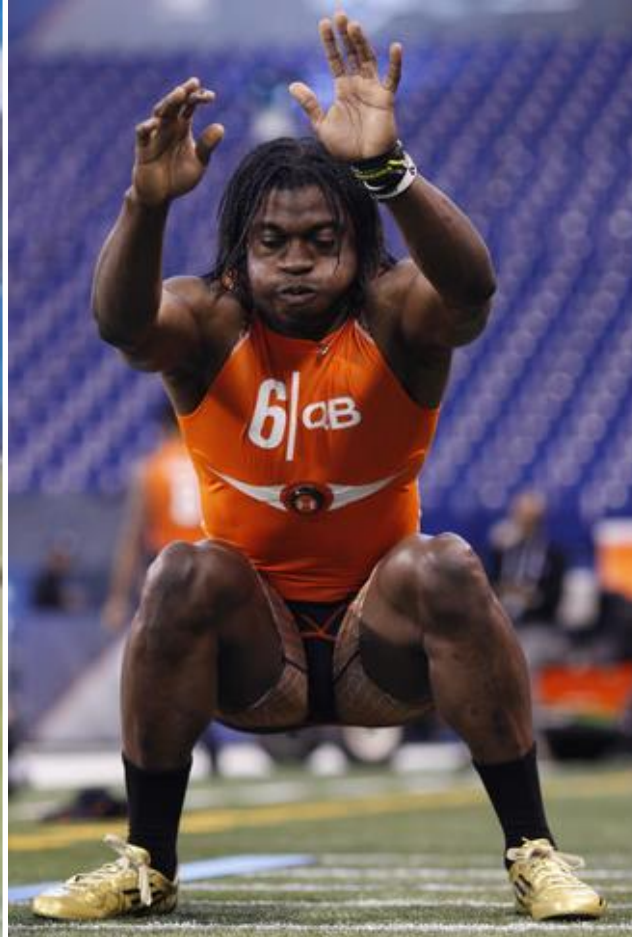
2. **Elevated Loads**

Control of ...motion with...

3. **Increased Speeds**

Control of ...motion with...





Movement is a behavior...

...So we need a process to identify mobility and control needs



Potential Workers

Worker 1



✓ Mobility, ✓ Control

Worker 2



✓ Mobility, ✗ Control

Worker 3



✗ Mobility, ✗ Control

SQUAT PATTERN SCREEN

Ankle, Hip, Shoulder Mobility



WHAT TO LOOK FOR

Ankle Mobility

- A. Knees in line with toes (MOBILITY)
- B. Knees aligned with hips and feet (CONTROL)

Hip Mobility

- A. Thighs parallel with floor (MOBILITY)
- B. Normal low back curve (CONTROL)

Shoulder Mobility

- A. Torso aligned with upper arms (MOBILITY)
- B. Shoulders down and away from ears (CONTROL)



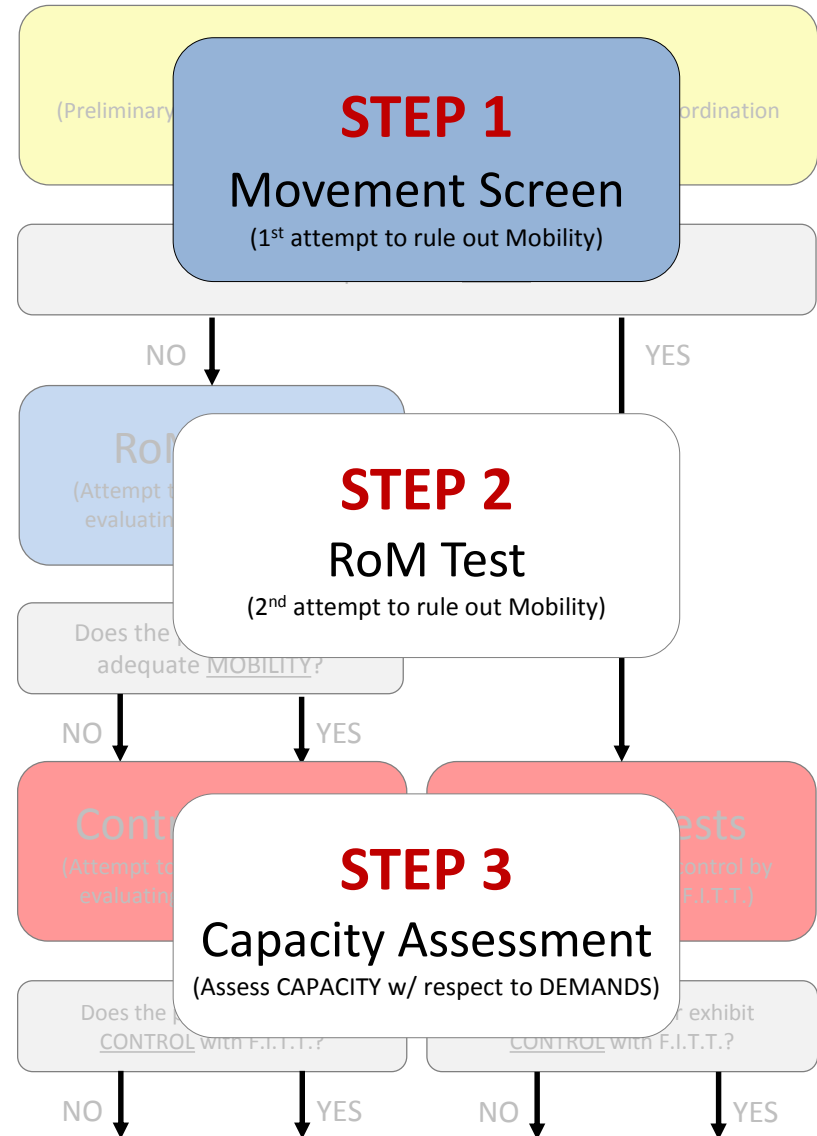
SQUAT PATTERN VARIATIONS

- Heels down arms down (HIPS and ANKLES)
- Heels raised arms up (HIPS and SHOULDERS)
- Heels raised arms down (HIPS)

SECONDARY SCREENING TASKS (RoM)

<p>SPLIT SQUAT (Ankle Mobility, Knee Control)</p> <p>A. Knees in line with toes (MOBILITY) B. Knees aligned with hips and feet (CONTROL)</p>	<p>ANKLES</p>	<p>DEADLIFT (Hip Mobility, Low Back Control)</p> <p>A. Hands in line with middle of shins (MOBILITY) B. Normal low back curve (CONTROL)</p>	<p>HIPS</p>	<p>OVERHEAD PRESS (Shoulder Mobility, Shoulder Control)</p> <p>A. Torso aligned with upper arms (MOBILITY) B. Shoulders down and away from ears (CONTROL)</p>	<p>SHOULDERS</p>
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PERFORMANCE **REDEFINED.**



Self Assessment Movement Screen

Assess Movement (general)

‘Rule out’ potential problems

- Perform the following movement screening tasks (for lifting):
 - Bodyweight squat (heels down)
 - Bodyweight squat (heels up)
- Use the following criteria to identify what **IS NOT** a problem
 - Hip mobility
 - Hip range of motion
 - Low back control
 - Ankle mobility
 - Ankle range of motion
 - Knee control



APPENDIX(B)

SCREENING(AND(ASSESSMENT)

MOBILITY(SCREEN -(RECORDING(FORM(-



Use(the(screening(protocol(to
'rule(out'(potential(ankle,(hip
and(shoulder(mobility(issues

PRELIMINARY(MOVEMENT(SCREEN

(1st Attempt to Rule Out Mobility - Active)

SQUAT

	Overhead(Heels(Down	Overhead(Heels(Up	Front(Heels(Down	Front(Heels(Up
	ASSESS	NO ASSESS	ASSESS	NO ASSESS
ROM				
CONTROL				

SECONDARY(MOVEMENT(SCREEN

(2nd Attempt to Rule Out Mobility - Active)

LUNGE	HINGE	PUSH
Split(Squat(Short(Stance	Bilateral(Lower	Bilateral(Overhead
ASSESS	NO ASSESS	NO ASSESS

RANGE(OF(MOTION(TEST

(3rd Attempt to Rule out Mobility - Passive)

ANKLE	HIP	SHOULDER
Dorsiflexion(Knee(Flexed	Flexion(Knee(Extended	Flexion(Elbow(Flexed
ASSESS	NO ASSESS	NO ASSESS

SCREENING(CRITERIA((RoM and Control)

ANKLE(DORSIFLEXION(MOBILITY

ROM Ankle(Dorsiflexion(RoM(
(E.g. Knee past toes)

CONTROL Knee(Control(
(E.g. Knees, hips, toes in line)

HIP(FLEXION(MOBILITY

ROM Hip(Flexion(RoM(
(E.g. Thighs to parallel)

CONTROL Low(Back(Control(
(E.g. Normal curvature)

SHOULDER(FLEXION(MOBILITY

ROM Shoulder(Flexion(RoM(
(E.g. Trunk and arms parallel)

CONTROL Shoulder(Control(
(E.g. Down and back)

ASSESS ASSESS ASSESS ASSESS

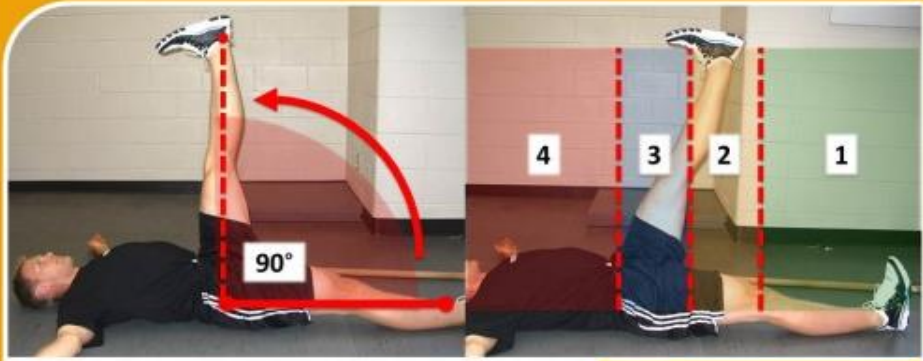
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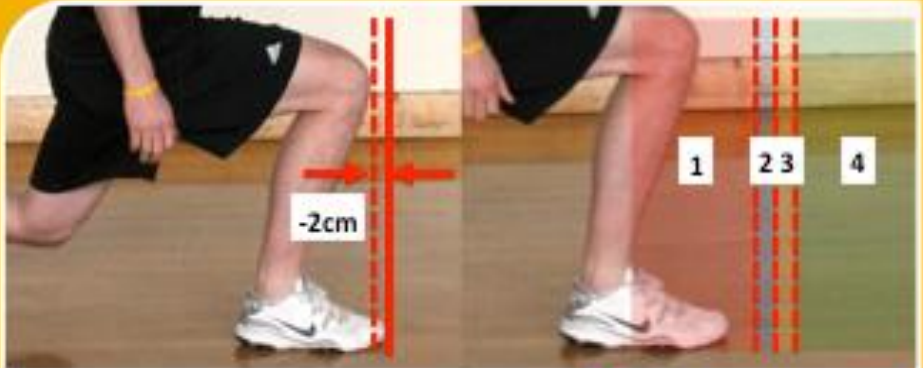
STRAIGHT LEG RAISE
(Hip Flexion Angle)

BACK



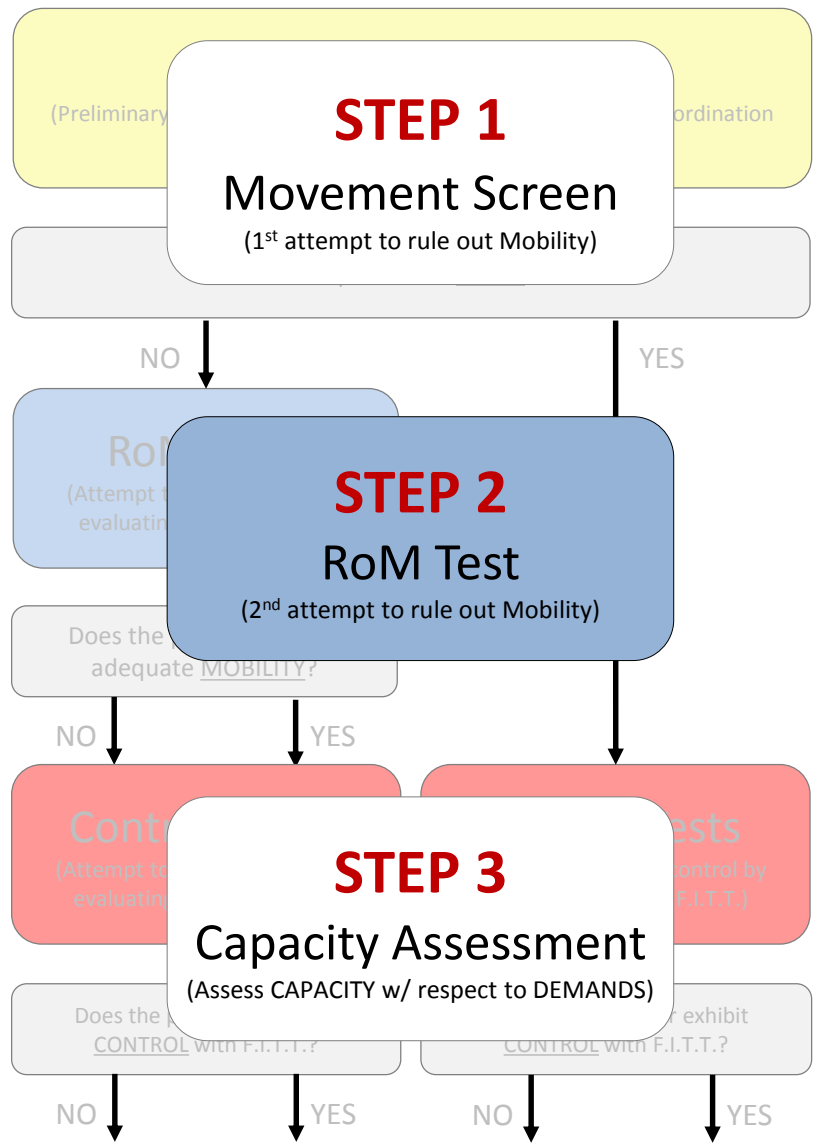
SHOULDER MOBILITY
(Shoulder Reach Distance)

BACK / SHLD



ANKLE RANGE OF MOTION
(Knee to Toe Distance)

KNEES

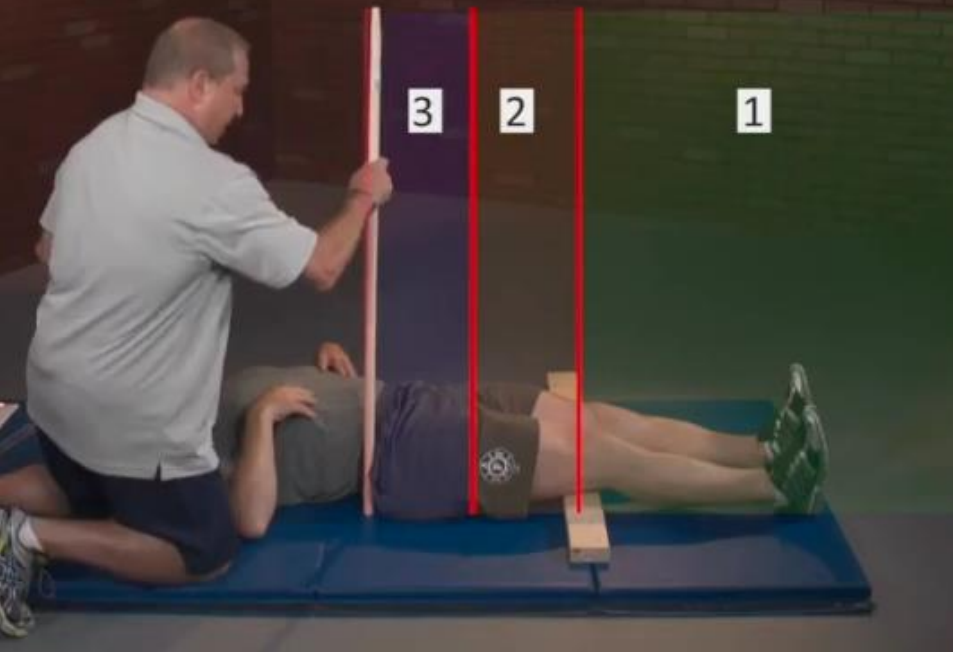


Self Assessment RoM Test

Assess Mobility (passive)

‘Rule in’ potential problems

- Perform the following RoM tests (for lifting):
 - Straight Leg Raise (Hip flexion)
 - Weight Bearing Lunge (Ankle dorsiflexion)
- Use the 1 to 4 scale to identify what **IS** a problem
 - Score of 4 = good
 - Score of 3 = good
 - Score of 2 = needs improvement
 - Score of 1 = needs improvement



ANKLE RANGE OF MOTION

(Knee to Toe Distance)



KNEES

Instructions

1. Front foot flat, push knee forwards (wall)
2. Heel on floor, opposite knee bent
3. Pause at end range for 3s (no bounce)

Evaluation Criteria (Distance)

- Distance from knee to toe
- Knee alignment
- Arch of foot (maintained)

Evaluation Criteria (Score)

- Distance knee forward (4 to 1)
- Knee alignment
- Arch of foot (maintained)

APPENDIX(B)

SCREENING(AND(ASSESSMENT)

MOBILITY(SCREEN -(RECORDING(FORM(-



Use the screening protocol to 'rule out' potential ankle, hip and shoulder mobility issues

PRELIMINARY(MOVEMENT(SCREEN

(1st Attempt to Rule Out Mobility - Active)

SQUAT

	Overhead(Heels(Down)	Overhead(Heels(Up)	Front(Heels(Down)	Front(Heels(Up)
	ASSESS	NO ASSESS	ASSESS	NO ASSESS
ROM				
CONTROL				

SECONDARY(MOVEMENT(SCREEN

(2nd Attempt to Rule Out Mobility - Active)

LUNGE	HINGE	PUSH
Split(Squat(Short(Stance)	Bilateral(Lower)	Bilateral(Overhead)
ASSESS	NO ASSESS	NO ASSESS

RANGE(OF(MOTION(TEST

(3rd Attempt to Rule out Mobility - Passive)

ANKLE	HIP	SHOULDER
Dorsiflexion(Knee(Flexed)	Flexion(Knee(Extended)	Flexion(Elbow(Flexed)
ASSESS	NO ASSESS	NO ASSESS
NO ASSESS	ASSESS	NO ASSESS
NO ASSESS	NO ASSESS	ASSESS

SCREENING(CRITERIA (RoM and Control)

ANKLE(DORSIFLEXION(MOBILITY)
ROM Ankle(Dorsiflexion(RoM (E.g. Knee past toes)
CONTROL Knee(Control (E.g. Knees, hips, toes in line)

HIP(FLEXION(MOBILITY)
ROM Hip(Flexion(RoM (E.g. Thighs to parallel)
CONTROL Low(Back(Control (E.g. Normal curvature)

SHOULDER(FLEXION(MOBILITY)
ROM Shoulder(Flexion(RoM (E.g. Trunk and arms parallel)
CONTROL Shoulder(Control (E.g. Down and back)

ASSESS	ASSESS	ASSESS	ASSESS

NO ASSESS	ASSESS	NO ASSESS

ASSESS	ASSESS	NO ASSESS	NO ASSESS

NO ASSESS	NO ASSESS	ASSESS



WFI FITNESS ASSESSMENT



- TESTING PROTOCOLS -

AEROBIC CAPACITY AND RECOVERY



TREADMILL
(Time, Heart Rate) **KNEE / BACK**

- Instructions**
- 3 min, 3 mph @ 0% grade,
 - 1 min, 4.5 mph @ 0% grade
 - 1 min, up 0.5% grade OR 0.5 mph
- Evaluation Criteria**
- Time to fatigue
 - RPE after each minute
 - HR @ 1, 2, 3 min recover



STEPMILL
(Time, Heart Rate) **KNEE / BACK**

- Instructions**
- 2 min, level 4 @ 46 steps/min
 - 1 min, level 5 @ 53 steps/min
 - 3 min, up level begin at 7:05/min
- Evaluation Criteria**
- Time to fatigue
 - RPE after each minute
 - HR @ 1, 2, 3 min recover

SPEED AND POWER



VERTICAL JUMP
(Height, Power) **KNEE / BACK**

- Instructions**
- Squat to knee angle 90°, pause
 - Jump as high as possible, with arms
 - Test of three max effort jumps
- Evaluation Criteria**
- Jump height
 - Power (using body mass)
 - Knees @ take-off/land

STRENGTH AND ENDURANCE



PUSH-UP
(Repetitions) **BACK / SHLD**

- Instructions**
- Cadence of 80 bpm (up and down)
 - Lower to 5" depth (chin must touch)
 - Body remains straight (head to toes)
- Evaluation Criteria**
- Maximum repetitions
 - Number and type warnings
 - Shoulder position



HOR. PULL-UP
(Repetitions) **BACK / SHLD**

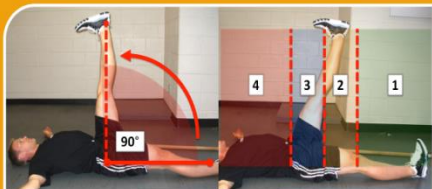
- Instructions**
- Bar height - off floor when arms straight
 - Knees bent, feet flat on floor
 - Raise to 5" distance (chest must touch)
- Evaluation Criteria**
- Maximum repetitions
 - Number and type warnings
 - Shoulder position



SIDE PLANK
(Time) **BACK / SHLD**

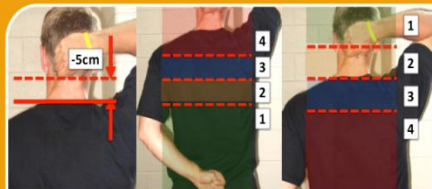
- Instructions**
- Bridge on elbow, both feet (top front)
 - Elbow under shoulder, forearm on floor
 - Body remains straight (head to toes)
- Evaluation Criteria**
- Time to fatigue
 - Number and type warnings
 - Shoulder position

MOBILITY AND FLEXIBILITY



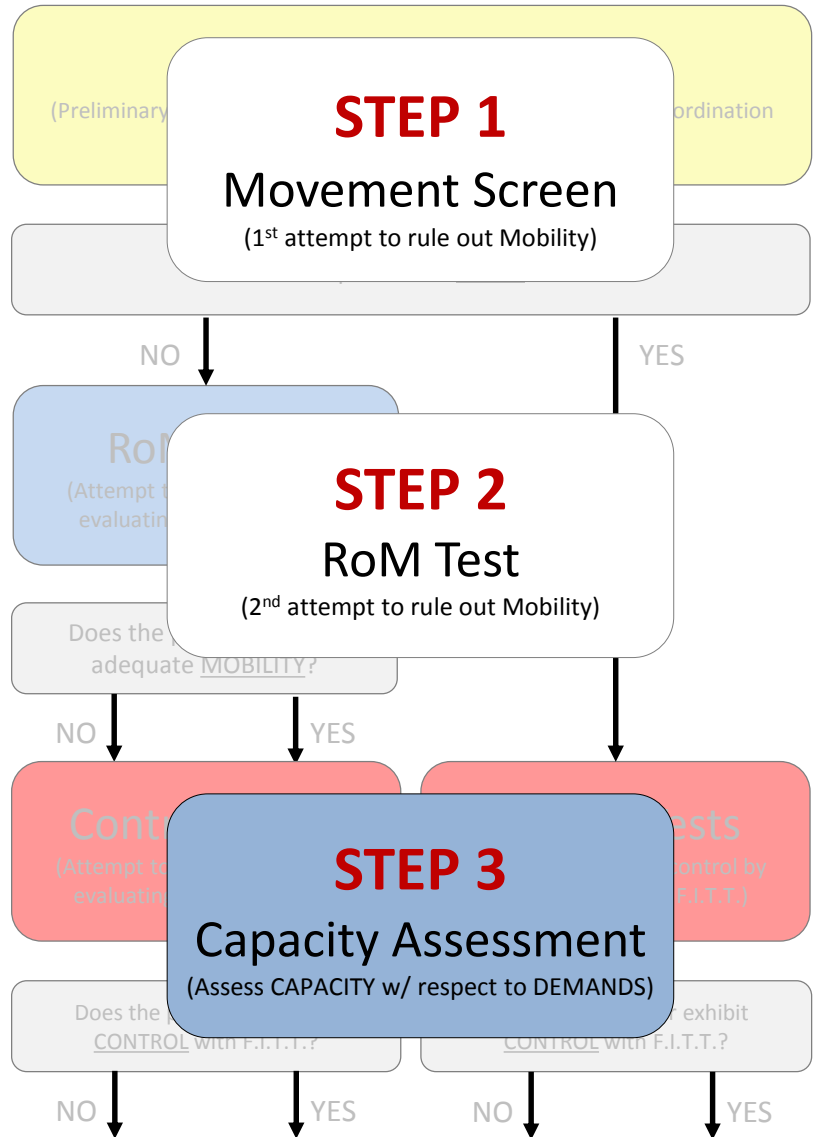
STRAIGHT LEG RAISE
(Hip Flexion Angle) **BACK**

- Instructions**
- Flat on floor, raise one leg high as possible
 - Raised leg straight, opposite on floor
 - Pause at end range for 3s (no bounce)
- Evaluation Criteria (Angle)**
- Angle between the thighs
 - Back alignment
 - Position of foot on floor (up)
- Evaluation Criteria (Score)**
- Distance leg raised (4 to 1)
 - Back alignment
 - Position of foot on floor (up)



SHOULDER RANGE OF MOTION
(Shoulder Reach Distance) **BACK / SHLD**

- Instructions**
- Make fist with both hands, thumbs inside
 - Reach over shoulder (R and L separately)
 - Reach under shoulder (R and L separately)
- Evaluation Criteria (Distance)**
- Fist - shoulder distance (over)
 - Fist - shoulder distance (under)
 - Back alignment
- Evaluation Criteria (Score)**
- Fit - shoulder distance (over)
 - Fit - shoulder distance (under)
 - Back alignment



Self Assessment Capacity Assessment

Assess Fitness

‘Rule out’ potential problems

- Perform the following assessments:
 - Push-up, squat, pull-up, rest
 - 30s x 5 sets
 - Deadlift, overhead press
 - 6 reps x 3 sets
- Use the following criteria to establish baseline capacity
 - Low back control
 - Knee control
 - Reps
 - RPE



APPENDIX(B)

SCREENING(AND)ASSESSMENT

ENDURANCE ASSESSMENT

– RECORDING FORM –



EXERCISE
(Perform in Sequence)

PUSH-UP

KNEES (Knees Aligned)			LOW BACK (Normal Curvature)			SHOULDERS (Back and Down)		
1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9
10	11	12	10	11	12	10	11	12
13	14	15	13	14	15	13	14	15

Repetitions (Consecutive without resting)			RPE (1-10) (Perceived intensity at end of set)		
1	2	3	1	2	3
4	5	6	4	5	6
7	8	9	7	8	9
10	11	12	10	11	12
13	14	15	13	14	15

SQUAT

1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9
10	11	12	10	11	12	10	11	12
13	14	15	13	14	15	13	14	15

1	2	3	1	2	3
4	5	6	4	5	6
7	8	9	7	8	9
10	11	12	10	11	12
13	14	15	13	14	15

INVERTED PULL-UP

1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9
10	11	12	10	11	12	10	11	12
13	14	15	13	14	15	13	14	15

1	2	3	1	2	3
4	5	6	4	5	6
7	8	9	7	8	9
10	11	12	10	11	12
13	14	15	13	14	15

JUMPING JACK

1	2	3	1	2	3	1	2	3
4	5	6	4	5	6	4	5	6
7	8	9	7	8	9	7	8	9
10	11	12	10	11	12	10	11	12
13	14	15	13	14	15	13	14	15

1	2	3	1	2	3
4	5	6	4	5	6
7	8	9	7	8	9
10	11	12	10	11	12
13	14	15	13	14	15

Potential Workers

Worker 1



✓ Mobility, ✓ Control

BUILD CAPACITY

Worker 2



✓ Mobility, ✗ Control

IMPROVE CONTROL

Worker 3



✗ Mobility, ✗ Control

IMPROVE MOBILITY

Design

Use Relevant Information

Address my (Worker's) Needs

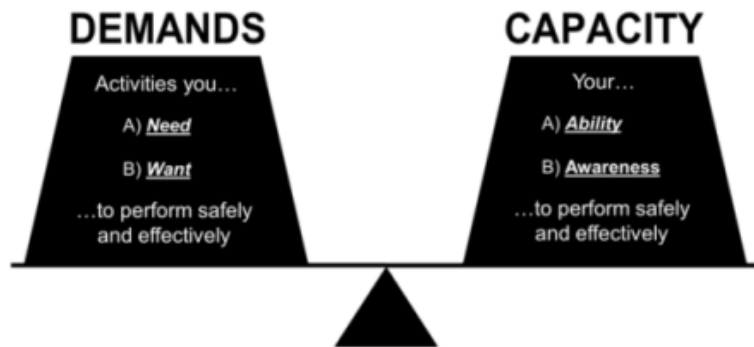
Balance demands and capacity

1. Demands

(What do you want/need to do?)

2. Capacity

(What can you do now?)





Exercise **REDEFINED**



IMPROVE **MOBILITY**

Design Considerations

- **JOINTS** of Interest
 - Passive RoM of **ANKLE**
 - Passive RoM of **HIP**
 - Passive RoM of **SHOULDER**
- **MOTIONS** of Interest
- **FITNESS** Parameters

Building a Daily Movement Practice

Ankle Mobility



Dorsiflexion (Knee flexed)
Dorsiflexion (knee extended)
Plantar flexion (knee flexed)
Squat or lunge pattern

2 x 30s
5 min total
No equipment

Hip Mobility



Extension (knee flexed)
Flexion (knee flexed)
Rotation (knee flexed)
Squat, lunge or hinge pattern

2 x 30s
5 min total
No equipment

IMPROVE **CONTROL**

Design Considerations

- **JOINTS** of Interest
- **MOTIONS** of Interest
 - Control of **LOW BACK**
 - Control of **KNEE**
 - Control of **SHOULDER**
- **FITNESS** Parameters



IMPROVE **FITNESS**

Design Considerations

- **JOINTS** of Interest
- **MOTIONS** of Interest
- **FITNESS** Parameters
 - Extended **DURATIONS**
 - Increased **LOADS**
 - Elevated **SPEEDS**



PRIORITIZE IMPLEMENTATION

Build a program to...

1. **INPSIRE** – change attitudes
 - Small steps
 - Work, life play
 - Engage all parties
2. **INFORM** – change perceptions
 - Evidence-informed ideas
 - Learning styles
 - Ambassadors
3. **EMPOWER** – change behaviours
 - Autonomy
 - Ownership
 - Deliberate practice
4. **CHALLENGE** – change lives
 - Community
 - Culture
 - Mindset

