



2022  
NSCA

**TACTICAL ANNUAL TRAINING**

#NSCATactical22

# ***CONFLICT OF INTEREST STATEMENT***

I have no actual or potential conflict of interest in relation to this presentation.



John Hofman, MS, CSCS\*D, TSAC-F\*D  
*Everyone Loses when.....*

**2022 NSCA TACTICAL  
ANNUAL TRAINING**



Everybody loses  
when....

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- Current Director of Tactical Strength and conditioning Southern California University Health Systems
- 10 years TSAC-F for Sacramento Fire Department
- 2018 NSCA TSAC Practitioner of the Year
- Master of Kinesiology
- BA Economics
- Athlete of the Month – May 2002, Olympic training center, Lake Placid
- USA Canoe Kayak Team (Sprint Kayaking)
- USA Track & Field, FMS, USA Sports Performance Coach
- 2021 Emmy Award Winner: Branding Content



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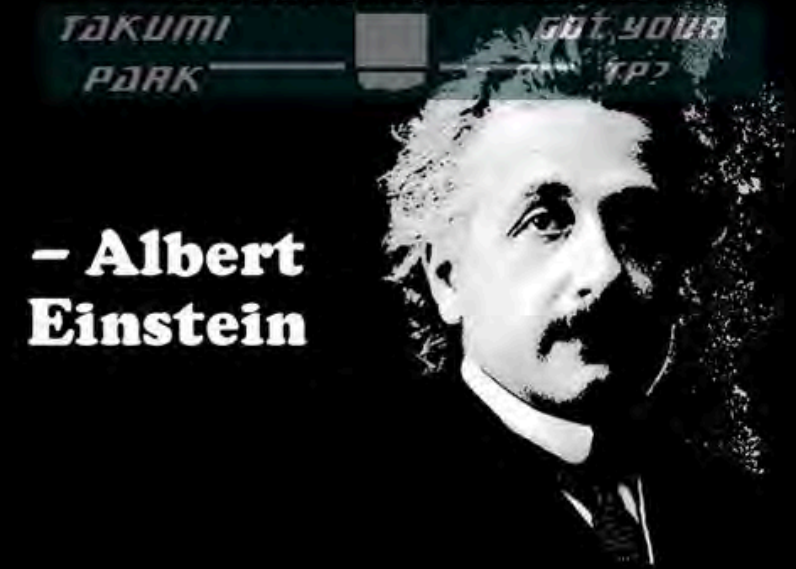
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# Over the years.....

- We always seek out “Fit for Duty” .....but never seem to find it.
- We always think “standards” will solve the problem.....but it never does.
- We often look at one aspect without looking at the whole picture
- We often confuse fitness with specific job tasks and vice versa.

# Insanity:

Doing the same thing  
over and over again  
and expecting  
different results.



– **Albert  
Einstein**

# What is currently used

- Candidate Physical Ability Test (CPAT): is a new minimum requirement for the position of Firefighter.
  - Eight critical physical tasks that simulate actual job duties on the fire ground
- Biddle Test / Physical Agility Test: is designed to examine the physical ability of the individual when it comes to performing the functions or tasks of a Firefighter.
  - The test is composed of 11 different events in which the candidates must pass in a time of 9 minutes and 34 seconds or less

Steps for Developing a Validated Work  
Sample Physical Ability Test (PAT)  
Using Content Validity

*BCGi: Adverse Impact & Test  
Validation Book Series*



# What are we trying answer?

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- Who can do the job?
  - Who has a good level of fitness?
  - Who has a higher incidence of injury?
  - All the above?
- 



# Lets start with the basics.....

- The economic consequences of injuries go beyond the costs associated with direct medical expenses and workers compensation.
- Significant indirect costs include lost productivity and diminished quality of life.
- Focusing on the economic costs of injuries, as oppose to the number of injuries, should provide insight into the value of risk reduction efforts that do not eliminate, but reduce injury severity and downtime.

# Costs associated with injury

- Both direct and indirect costs into account, found that firefighter injuries cost between **\$1.6 billion** and **\$5.9 billion** each year.
- Total direct and indirect costs to hire each new firefighter is **\$4,353** (1)
- Firefighter injuries result in a loss equivalent to **\$197 860** per fire department per year. (2)
- **\$5412** per firefighter per year
- **\$170** per call per year.
- The average lost per injury is **\$95 031**.

(1) Early, S (2001). An Analysis of the utilization of overtime vs hiring additional personnel. National Fire Academy

(2) Butry, D, (2019). The Economics of Firefighter Injuries in the United States . NIST

# What causes injuries in the fire academy?

- Functional movement quality may be associated with injuries.
- Elevated levels of obesity are associated with increased risk.
- Poor Cardiovascular conditioning: anaerobic and aerobic
- Poor muscular strength, power, and endurance: upper and lower
- Poor core strength and endurance from different vectors

# #1. Movement quality

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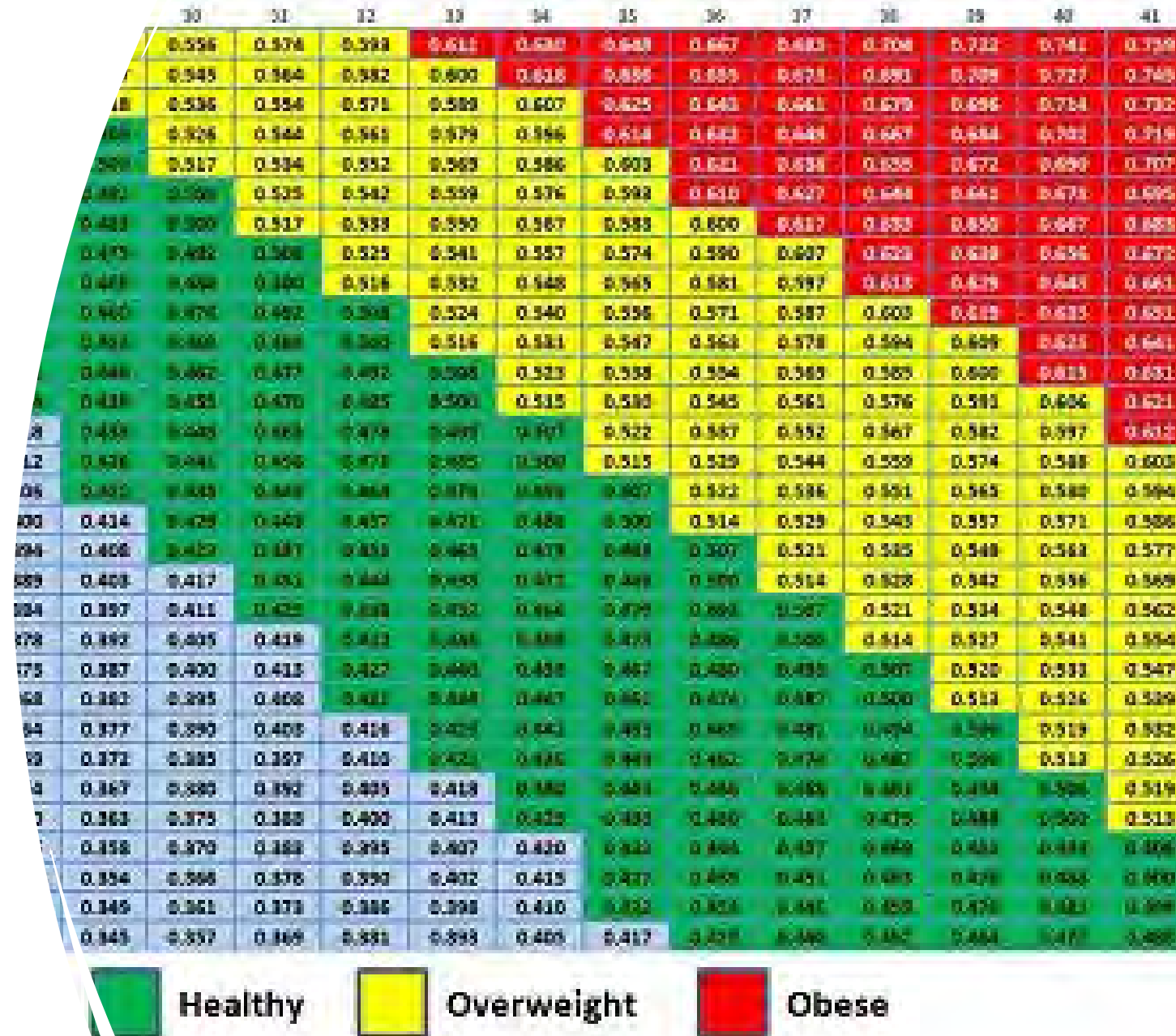
- FMS: a score of 14 was the appropriate cut off point for elevated injury risk.
- The Deep Squat (DS) and trunk stability push up (TSPU) were both strong predictors of injury.
- A score of score of 1 in the DS and TSPU showed an elevated risk of injury again with poor performance.
- Larger body mass, waist circumference and hip width were correlated with poorer Total Movement Score.



## Waist Circumference (in inches)

# #2. Body Composition: Waist to Height

- Body mass index (BMI) has been shown to be a poor discriminator for cardiovascular risk factors.
- Waist-to-height ratio (WHtR).
- WHtR identifies more people at 'early health risk' than does a more complex 'matrix' using traditional boundary values for BMI and Waist Circumference
- The average firefighter weight gain is 1.2lbs per year on the force





## #3. Cardiovascular: Anaerobic

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- High levels of anaerobic power have been significantly correlated to job-specific tasks.
  - Hose operation, structure ventilation, stair climbing, and rescue operations all require a high amount of anaerobic output.
- Power generated during an anaerobic cycling test and maximal oxygen uptake – a measure of overall cardiovascular fitness – was significantly higher in recruits who passed the CPAT, compared to those who failed.
- Wingate performance and maximal oxygen uptake (VO<sub>2</sub>max) are significantly higher amongst successful CPAT performers.

# #3. Cardiovascular: Aerobic

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- The International Association of Firefighters (IAFF) and National Fire Protection Agency (NFPA), it is recommended that fire recruits entering into a recruit academy have a  $VO_2$  of  $45 \text{ ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ .
- IAFF Wellness Fitness Initiative recommends the Gerkin Treadmill protocol for Aerobic Capacity testing,
  - overestimate values for less fit firefighters
  - under estimate among more physically fit firefighters,
  - **creating inaccurate results.**



# #4 Muscular Strength / Power / Endurance

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- According to research by Lindberg, **maximal hand grip strength**, bench press, **chin ups**, **standing broad jump**, and **barbell shoulder press** were strongly correlated with firefighter work capacity and are therefore recommended for evaluating firefighters work capacity
- Grip Strength: has been utilized as a possible predictor of overall strength.
- The Journal of Occupational and Environment, showed that strength and muscular endurance standards are easily replicable gym-based exercises commensurate with minimum acceptable performance requirements for essential tasks in United Kingdom firefighting.



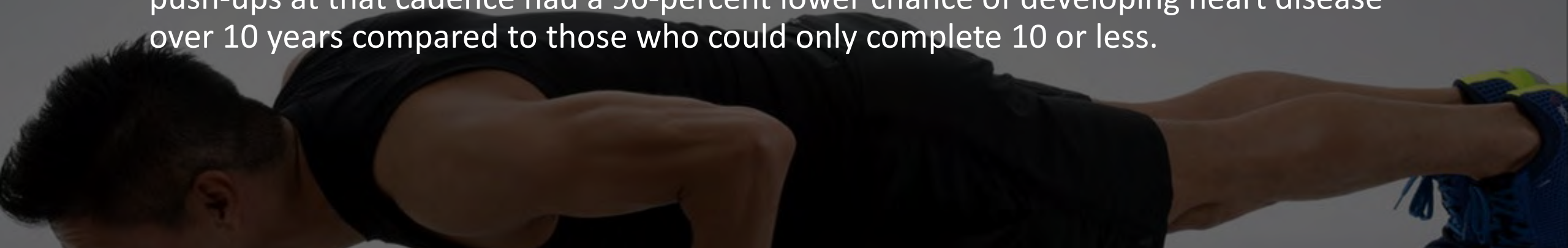
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# #4 Muscular Endurance

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- **Ladder Extension:** 23 Reps of 28kg (61.7lbs) on seated repeated rope pull
  - 70 beats per minute (the minimum performance requirement identified by the technical panel), which equated to 35 downward pulls per minute.
  - Corresponds with the criterion ladder extension task
- **Push Up with metronome (80bpm):** Firefighters who were able to perform at least 40 push-ups at that cadence had a 96-percent lower chance of developing heart disease over 10 years compared to those who could only complete 10 or less.



# #4 Muscular Power / Strength

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- **Ladder lift:** 35kg (77.1lbs) Seated Shoulder Press
  - Participants are required to perform a 1RM overhead press while maintaining proper posture in an upright, seated position.
- **Pull Ups:** Age and poor posture are two other contributing factors to shoulder pain. Ratio 2:1 on pull to push
- **Vertical Jump** significantly correlated with charged hose advance and rescue mannequin drag tasks.
  - Firefighters able to achieve 17 inches were more likely to achieve a passing rate. It has also been shown to be related to motor performance
- **Standing broad jump** was considered a valid neuromuscular performance measure in relation to job specific task within the fire service.



# #5. Core Strength

- **Prone plank** is a valid, reliable, and practical method for assessing global core muscles.
  - Canadian Firefighters: average time was 118 seconds - firefighters who can maintain a solid plank for 2 minute or longer have a reduced chance of injury vs. those who are unable to maintain it.
- **Side plank** assessment was identified as optimizing the challenge to the QL while minimizing load on the lumbar.
  - Difference between left side and right would be a predictor who is at a greater risk of back injuries.
  - Discrepancy of over 5% in ratio would suggest unbalanced ends.
  - The side bridge has been justified as an ideal training exercise to challenge the quadratus lumborum and the abdominal wall with minimal spinal loading



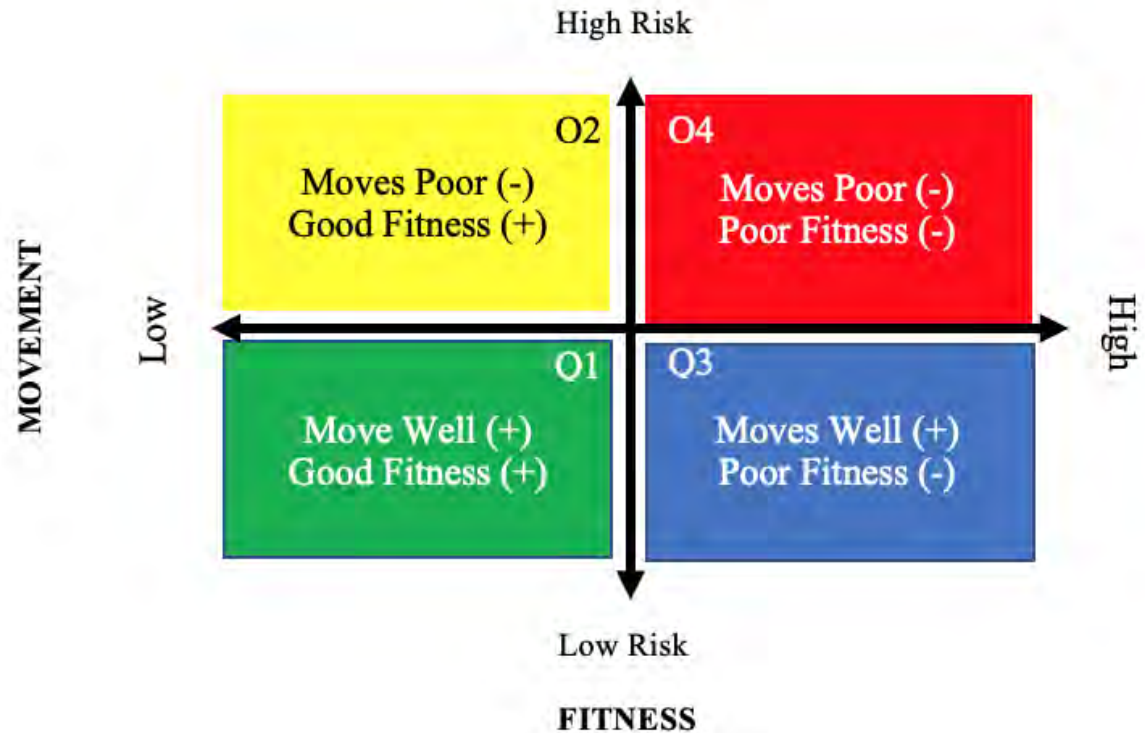
What now?

# 4 Quadrant Program

The goal of our 4 quadrant program applies

1. Specific movement criteria
2. Performance assessments

Within a risk management model to help identify the probability on injury and illness.



Q1: Probability of injury is **LOW**, but severity of the injury will be **LOW**

Q2: Probability of injury is **HIGH** but the severity will be **LOW**.

Q3: Probability of injury is **HIGH** and the severity will be **HIGH**

Q4: Probability of injury is **LOW**, but the severity is **HIGH**

ASSESSMENT	Q4	Q3	Q2	Q1
Movement Screen	<b>11 or less</b>	<b>12-13</b>	<b>14-15</b>	<b>16 or higher</b>
Side Plank (L v R) (5% dif)	<60 sec	60 – 74 sec	75 – 89 sec	>90
Prone Plank	M: 77 – 106 F: 62 - 90	M: 77 – 106 F: 62 - 90	M: 107 – 129 F: 91- 119	M: > 130 sec F: > 120 sec
VO2 Max	< 39	42	45	48
Vertical Jump	< 12 inches	13 – 16	17-19	>20 inches
Broad Jump	Height or less	Height + 10%	Height + 15%	Height + 20%
Seated Shoulder Press (35kg)	1	3	5	7
28kg Seated Rope Pulldown	<17	20	23	25
Push / Pull Ratio	<0:1	1:1	2:1	3:1
WHtR	Red	Yellow	Brown	Green

# Scoring System

# Quad 1: Moves Well, Good Fitness

Moves Well / Good Fitness (Q1)	
COACHING	DESCRIPTION
<ul style="list-style-type: none"><li>- Maintain Optimal Strength through hips and core (anterior &amp; lateral).</li><li>- Mix up Bilateral vs Unilateral to maintain symmetry</li><li>- Even vs Uneven Loads to maintain symmetry.</li><li>- Variety of training stimulus</li></ul> <p><b>Approved:</b></p> <ul style="list-style-type: none"><li>• High Intensity Power Training</li><li>• Powerlifting</li><li>• Olympic Lifting</li><li>• Conditioning: ie Running / Sprinting, Bike</li></ul>	<p>Moves well, good fitness are clients who typically are good at everything and motivated towards fitness and healthy lifestyles.</p> <p>Work on developing a progressive program that encompasses different movement patterns (linear, lateral) while utilizing both bilateral movements and unilateral movements.</p>

# Quad 2: Moves Poor / Good Fitness

Moves Poor / Good Fitness (Q2)	
<ul style="list-style-type: none"><li>- Basic movement patterns: Squat, Hinge, Pull, Push, Core</li><li>- Focus on Bilateral movements with unilateral loads</li><li>- Focus on Correctives to eliminate poor movement</li></ul> <p><b>Approved:</b></p> <ul style="list-style-type: none"><li>- Dumbbells, Kettlebells, Suspension training</li><li>- High Intensity Interval Training</li></ul> <p><b>Not Approved:</b></p> <ul style="list-style-type: none"><li>- High Intensity Power training</li><li>- Circuit training</li><li>- Power training</li></ul>	<p>Moves poor, good fitness are clients who generally eat well and exercise on a regular basis, but have imbalances or asymmetries from performing repetitive movements. These clients generally perform the same exercises or workouts.</p> <p>Focus on providing exercises to correct their muscular imbalance to reduce injuries.</p>

# Quad 3: Moves Well / Poor Fitness

## Moves Well / Poor Fitness (Q3)

- Develop overall core strength. (hips and core)
- Build proximal stability for optimal mobility and power.

### Approved:

Basic Resistance Training Progressions  
Conditioning: ie. running, sprinting, swimming, etc...  
Bodyweight – Dumbbells / KB – Barbell progression

### Not Approved:

- High Intensity Power Training
- Olympic Lifting
- Power lifting

Moves well, poor fitness are clients who generally exercise on a limited basis but are able to maintain good movement. They tend to be younger in age and not familiar with strength and conditioning concepts.

Focus on exercise to develop their overall fitness.



# Quad 4: Moves Poor / Poor Fitness

## Moves Poor / Poor Fitness (Q4)

- Focus on the fitness and health before starting with movement.
- Nutrition strategies
- Type 2: High Protein / Low Carb
- Heart Disease: Vegetable
- Conditioning: Intervals / light circuit training
- Corrective exercise focusing on core development.

Moves poor / Poor Fitness are generally people who tend to not exercise and eat poorly. These individuals tend to be overweight and unmotivated.

Focus on building consistency while keeping things simple.

# Breakdown

- Nov 2020:
  - 73 candidate were assessed
  - 11 did not make the cut off score
  - ALL 47 Recruits graduated (first time for the depart)
- March 2021:
  - 58 candidates were assessed
  - 12 did not make the cut off
  - All selected for academy graduated with no injuries
- Nov 2021 (Lateral Academy)
  - 67 candidates were assessed
  - 14 did not make the cut off
  - All selected for academy graduated with no injuries
- March 2022
  - 92 candidates were assessed
  - 7 did not make the cut off
  - Graduated: TBD

- Based on research and experience we have identified the most appropriate fitness assessments specific to the fire service
- Within these assessments our team has created a priority system that includes both movement and fitness to properly identify the recruits strengths and weaknesses.
- Creating a more valid ranking system to help identify those who are “strongest” and those who are “not well prepared”.
- *“Your assessment legitimized the readiness of candidates. If we didn’t do the assessment I think we would have allowed at least 5 candidates into the academy who had a high risk of injury or who just weren’t physically prepared. Basically, the pre-academy fitness exam worked.”*

# SUMMARY



# Thank you

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