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Defence Science and Technology Group

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Military Training Strategies for Achieving and Maintaining PES

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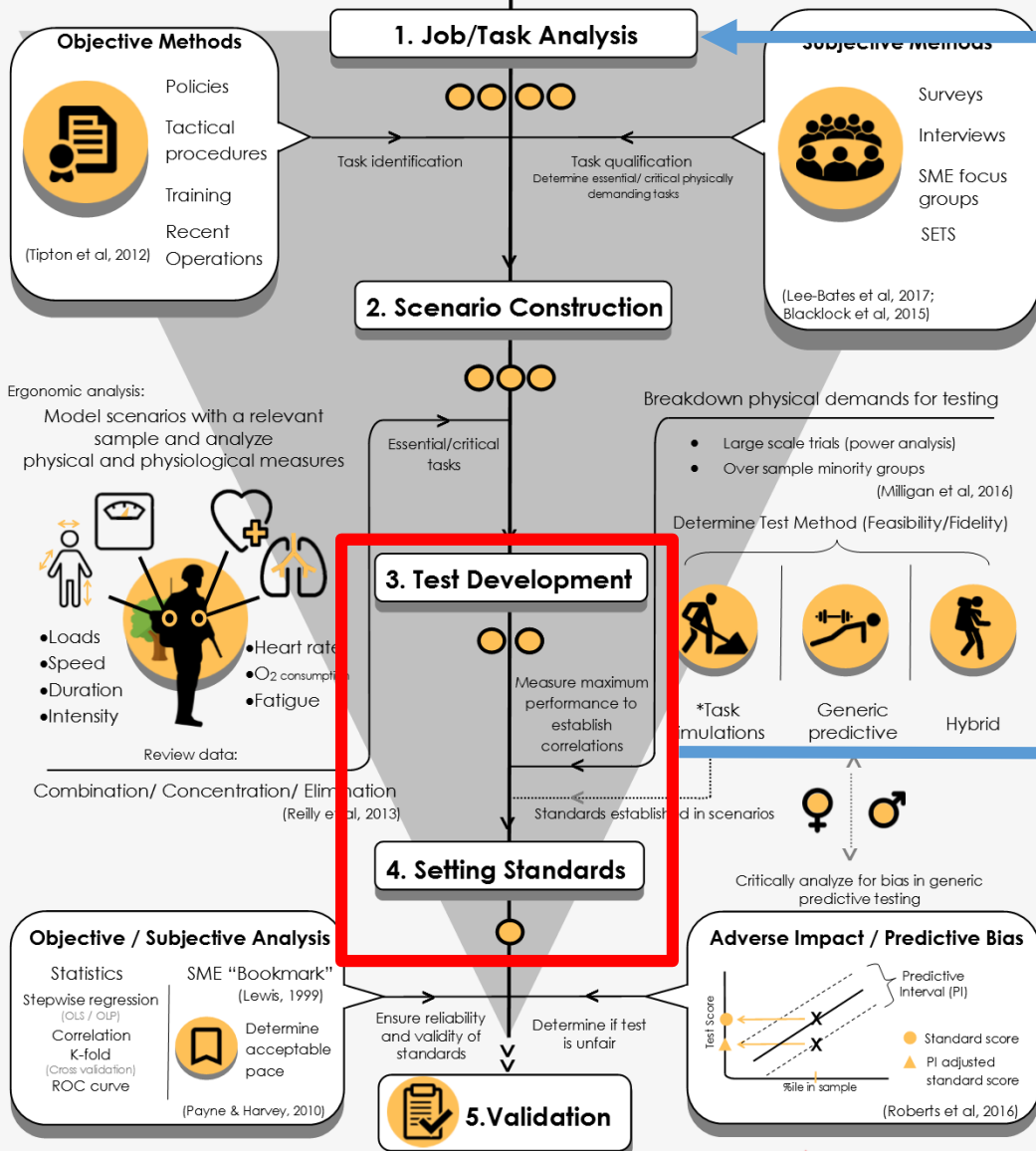
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PES Development Process

(Reilly et al, 2018)

Project Management Team/ Military Judgement Panel — Employment Law — Strategy & Training — Employment Equity



Enhance Role-Related Physical Fitness & Improve Job Task Performance and/or Reduce MSKI Incidence (Better Job-Person Fit)

Optimize Physical Training to Develop the Components of Fitness for PES

Consider:

- Baseline Fitness
- Resources
- Competing Training Demands

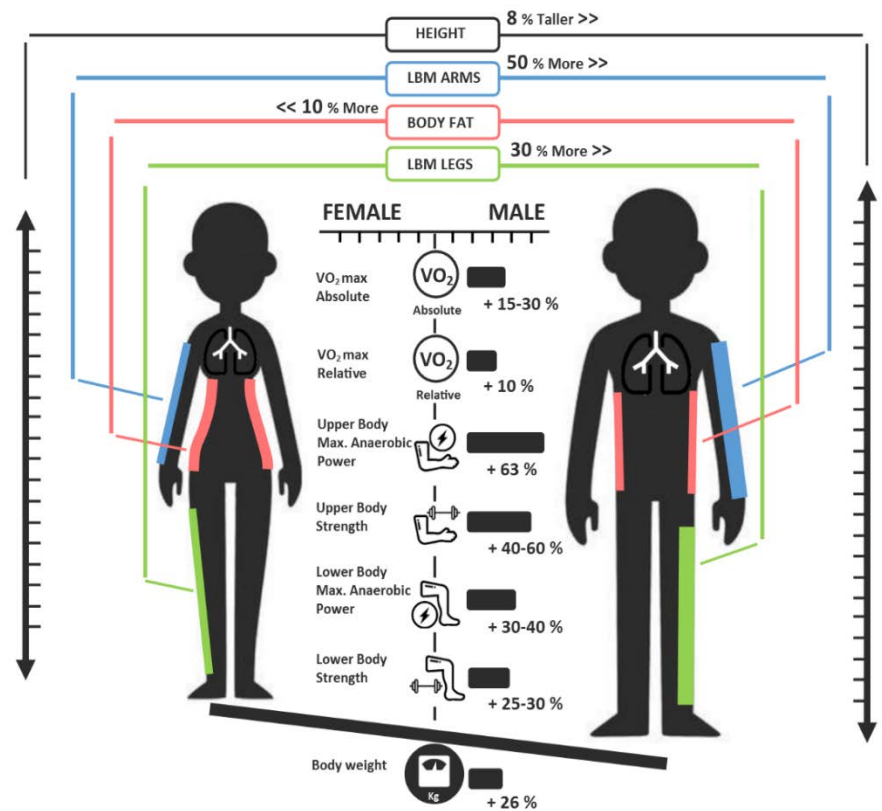
Military Occupational Demands



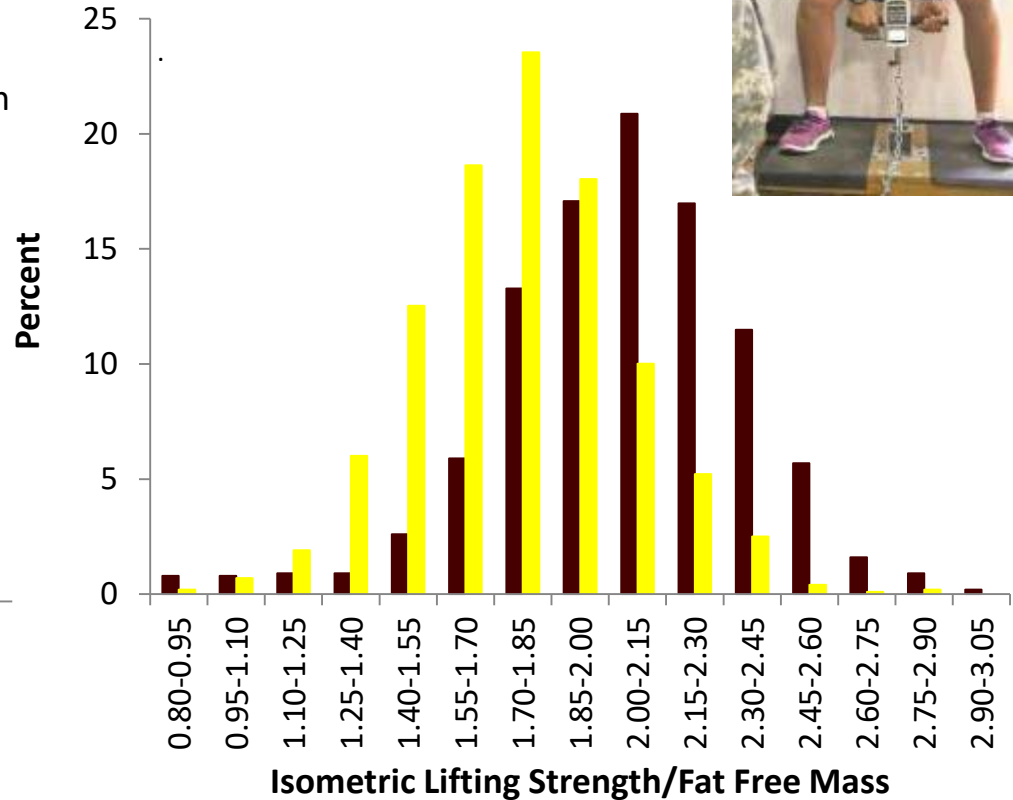
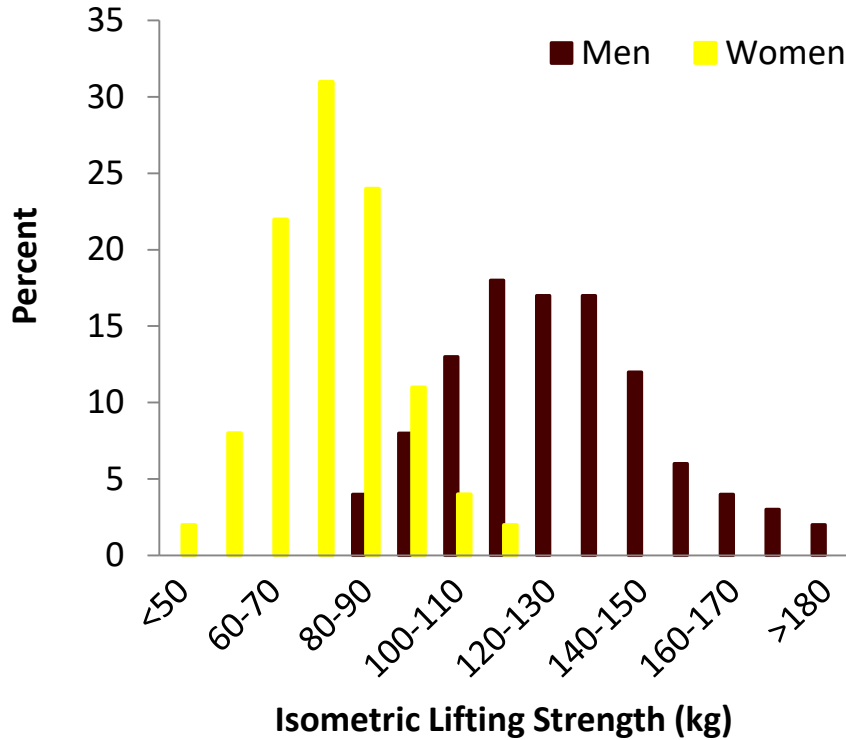
Components of Fitness and Sex Differences

NATO HFM RTG 269 Combat Integration: Implications for Physical Employment Standards

Fitness	Fitness Component	Definition	Example Activities
	Aerobic Capacity	Ability to sustain sub-maximal low-to-moderate/high intensity activity for a sustained period of time (minutes to hours), typically involving dynamic whole-body activities	Sustained patrolling carrying load (e.g. ≥ 30 kg) or digging a fire trench
	Anaerobic Capacity	Ability to sustain intermittent or continuous near maximal or maximal efforts for a short period of time (seconds to minutes), typically involving dynamic whole-body activities	Fire and movement task or a break contact task
	Muscular Strength	Ability of a muscle group to exert maximal force in a single voluntary contraction (< 5 seconds)	Lifting objects, e.g. a casualty, equipment onto a vehicle. Standing up from kneeling while carrying a heavy load
	Muscular Endurance	Ability of a muscle group to repeatedly generate an intermittent or continuous moderate-to-high absolute force for a more prolonged period of time (seconds to minutes)	Repetitively lifting and carrying stores or a stretcher casualty evacuation
	Muscular Power	Ability to exert maximal external force in the shortest possible time (typically less than 1 second)	Breaking down a compound/building door or jumping over a ditch or low wall
	Flexibility	The ability to voluntarily stretch, flex or lengthen parts of the body as far as possible i.e. the range of motion around a joint	Lifting a leg over a fence or bending down to pass under a low obstacle
	Balance	Maintenance of equilibrium while stationary or moving	Maintenance of a stable firing position
	Speed	Ability to perform movements in a short period of time	Rapid movement between fire positions
	Agility	Ability to change the position of the entire body in space with speed and accuracy	Hurdling a fence or rapidly changing running direction (e.g. fire and movement task)
	Coordination	Ability to synchronise the senses (e.g. sight/hearing) with body parts to move smoothly and accurately	Bringing weapons systems to bear and accurately engaging with the enemy



Distribution of Male and Female Soldier Isometric Lifting Strength



There is overlap in strength between the weakest men and strongest women (F/M=63%)

(Sharp, Work 4:80,1994)

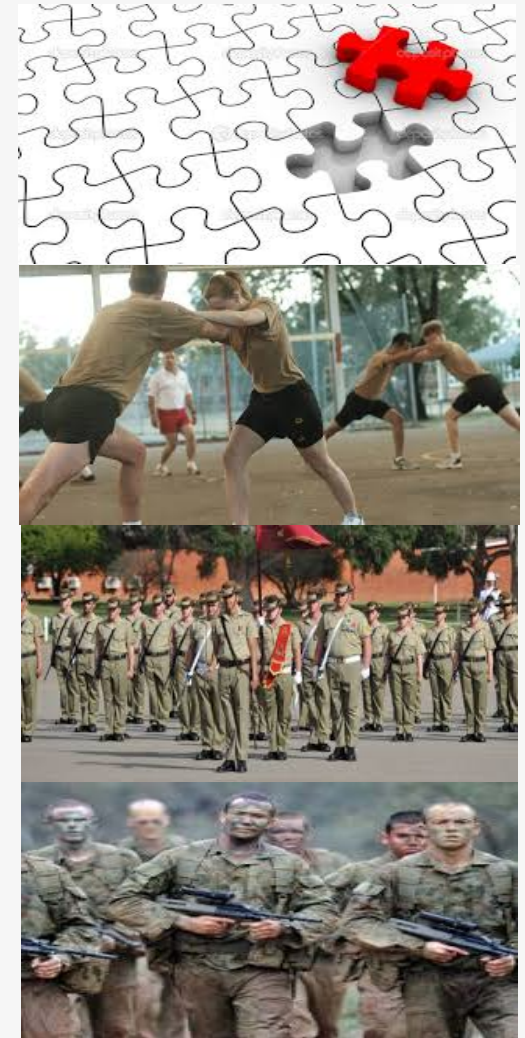
Considerations for Integration of Physical Training

Physical training only one piece of the puzzle when optimising physical training outcomes and performance

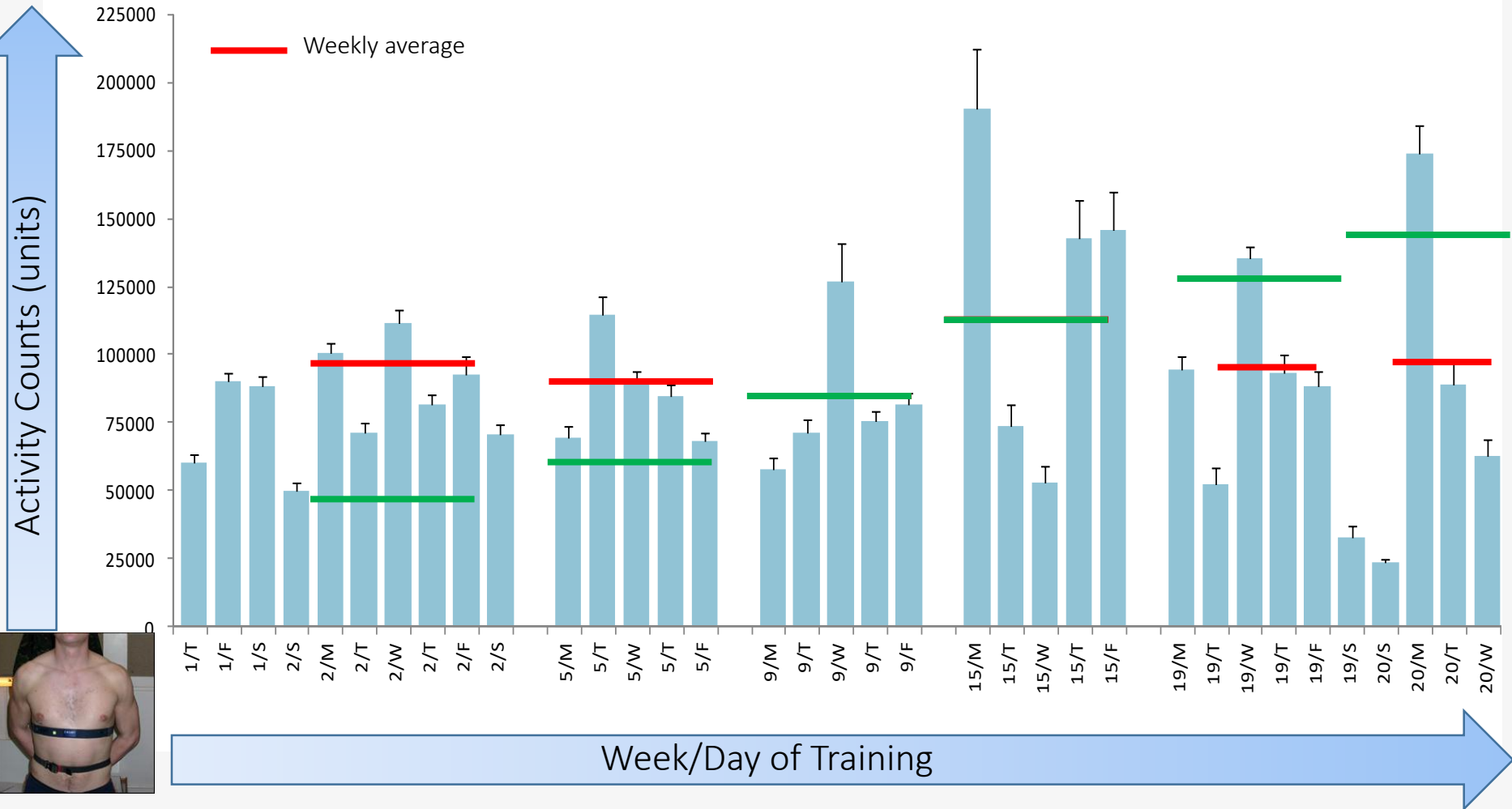
Consider other training activities :

→ May influence training adaptations

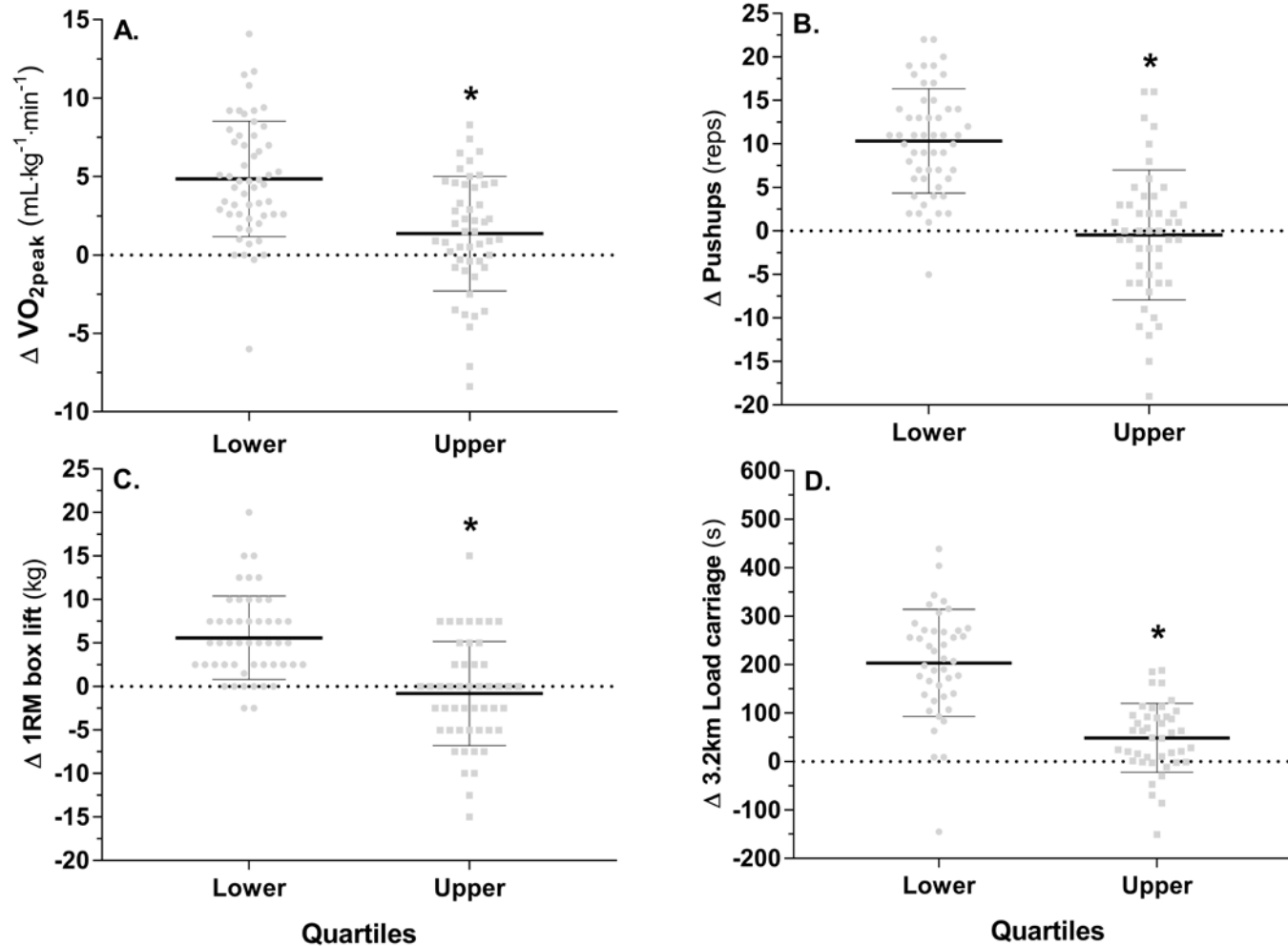
- Military drill (Carden et al, 2015)
 - Peak vertical impact forces > loaded marching
- Movement mileage (Trank et al., 2001, MSSE)
 - 177-325 km/7 weeks
 - Typical speed 4.8-6.4 km/h
- Cognitive/psychological stress
- Sleep deprivation
- Nutrition



Example Total Training Load During Basic Training

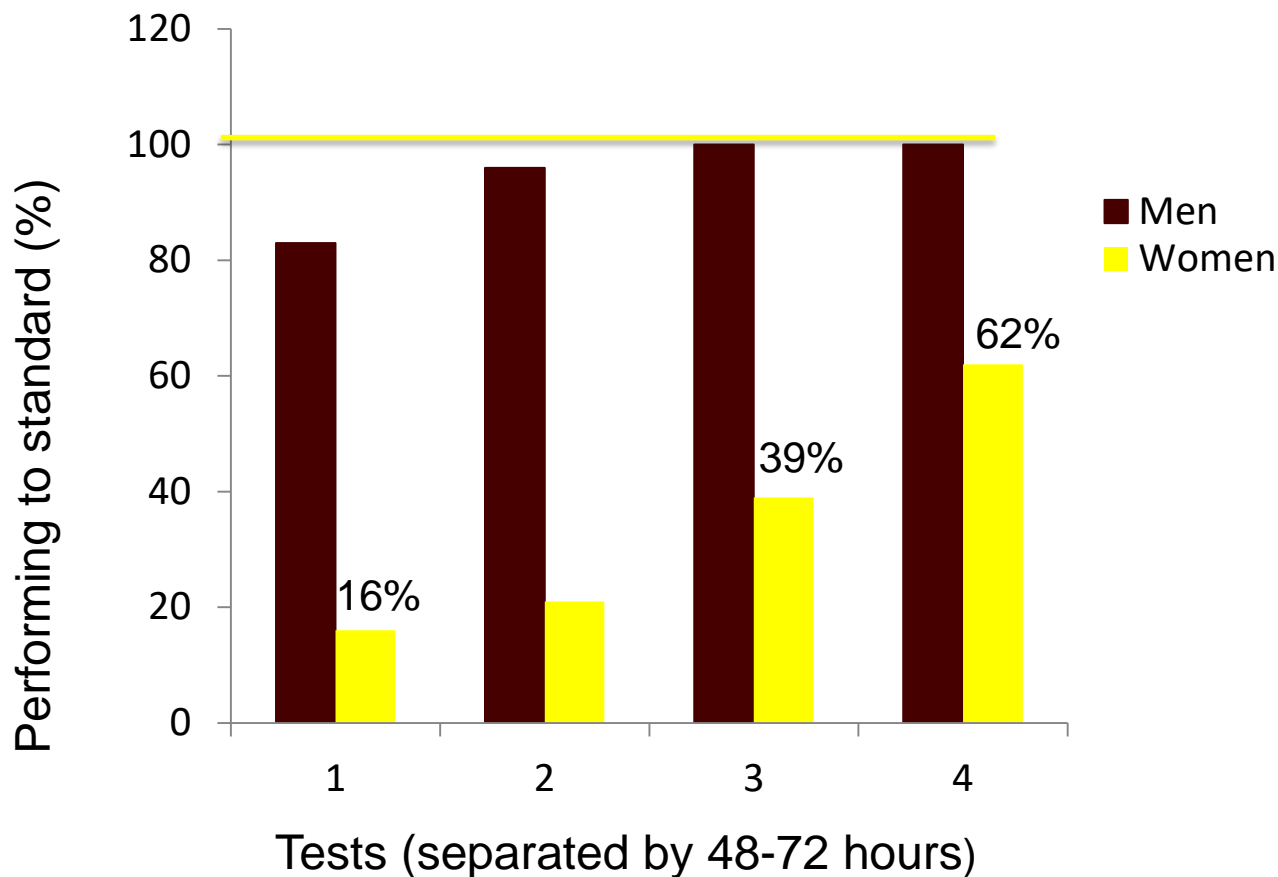


Avoid focusing only on 'average' responses



Grey dots represent individual data points with mean \pm standard deviation, * denotes significantly different ($p < 0.05$) from lower quartile (Burley et al, 2018, JSAMS).

Effect of Practice on Performance of a Very Heavy Repetitive Lifting and Carrying Task



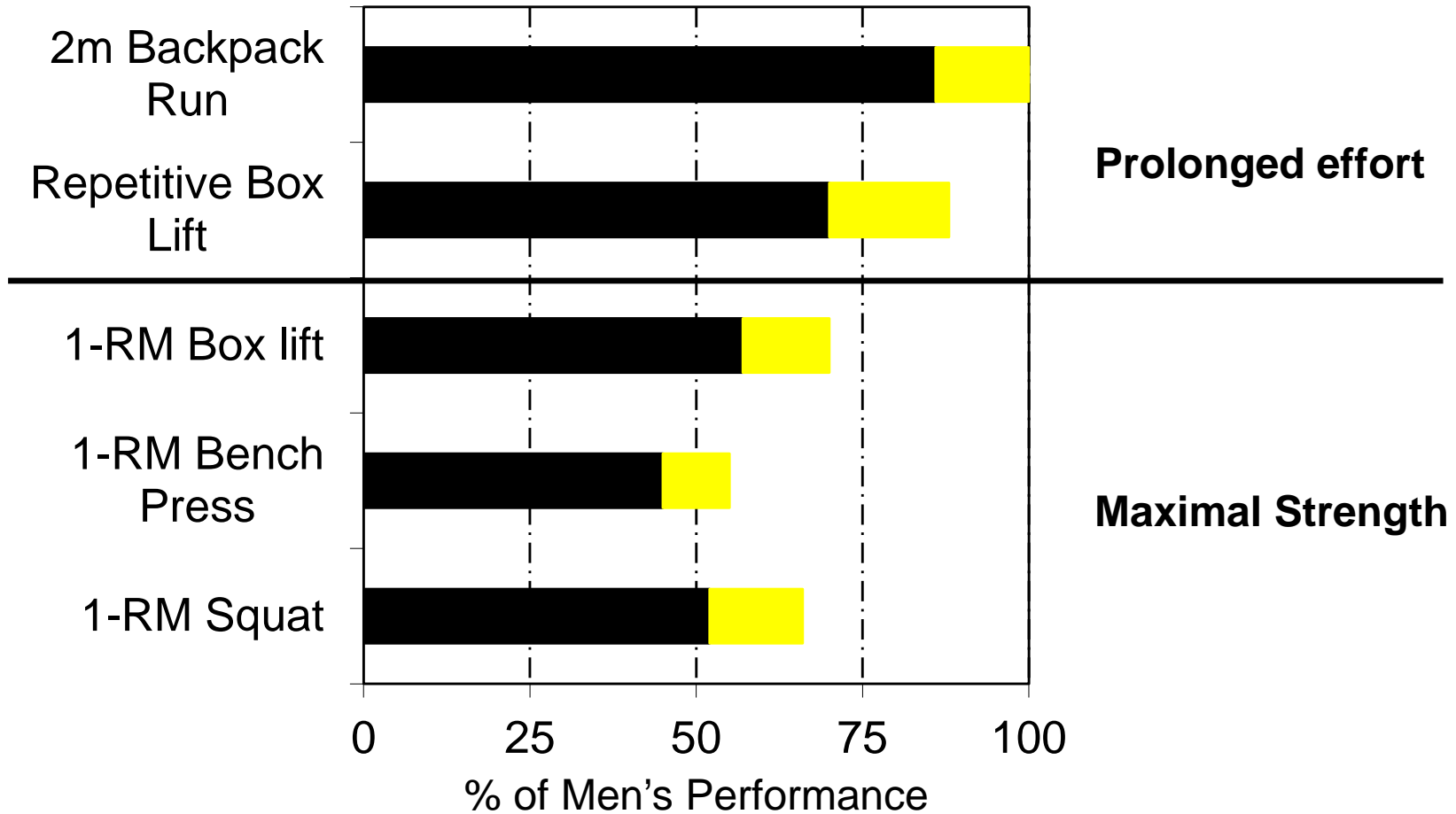
Practice allows women to acquire and adapt technique to improve their performance



Comparison of Trained Women to Untrained Men



■ Pre ■ Post



PRT reduced sex differences

Comparison of Physical Training, Practice and Familiarization on Performance of a Firefighter PESA

	PESA Baseline-Trial 6 (%Δ time)	% Pass Baseline	% Pass Trial 6
Women			
PRT+PESA	31%	9	80
PESA x 6	23%	28	72
Control	12%	0	26
Men			
PRT+PESA	28%	58	100
PESA x 6	19%	95	100
Control	10%	78	91



Five weeks of physical training and practice allowed women to 'overcome' adverse impact

Summary

- Once a PES has been established physical training should be optimized to develop the components of fitness required to achieve the PES.
- Completing the array of military job tasks requires a combination aerobic and anaerobic capacity, muscular strength, endurance and power and mobility. On average, men demonstrate higher levels of these physical attributes (less mobility), but there is overlap between individual men and women.
- Women and men respond similarly to training (% improvement) from their pre-training baseline levels (Kraemer et al., 2001)
- Physical training can enhance a female applicant's ability to pass a physical employment standard assessment (Gumeniak et al., 2018)
- A six-month resistance training program emphasizing upper body strength will prepare women for combat arms occupations (Nindl et al., 2017)
- Once hired, job task performances may provide the necessary training stimulus to ensure continued physical capacity
- For infrequently performed job tasks, or with aging additional fitness training may be necessary to maintain physical capacity
- All military personnel would benefit from well-designed resistance and endurance training