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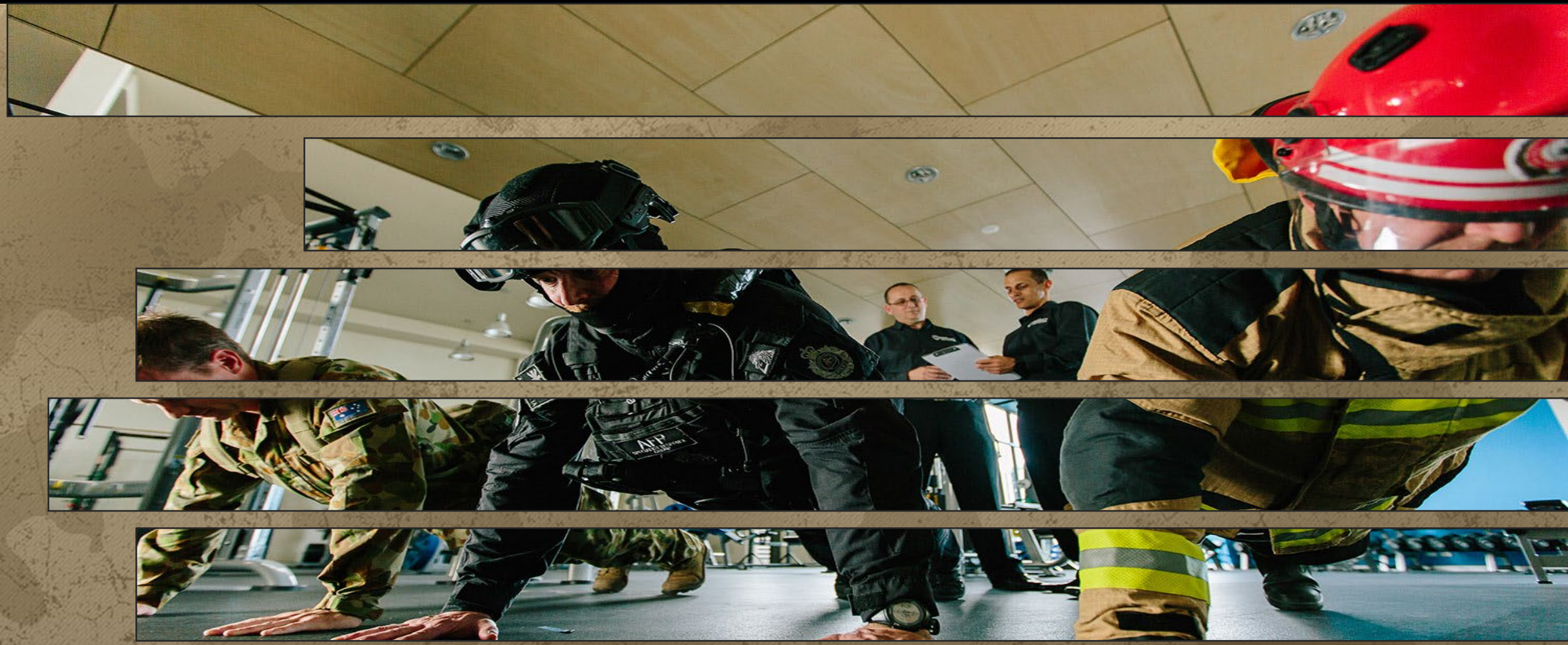
PHYSICAL FITNESS ASSESSMENTS & EVIDENCE-BASED TRAINING IN TACTICAL POPULATIONS



Prof Rob Orr

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UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

What is the purpose?

- Purpose of the testing
  - Injury / Attrition Risk Identification
  - Occupational capability
  - General health
  - Training validation / research

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

What is the purpose?

- Purpose of the testing – Setting standards
  - Male scores – 22 Repetitions
  - Female scores – 15 Repetitions

What if the PASS score was 20 Repetitions?

- Would that account for differences in sex strength levels?

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

What is the purpose?

- Purpose of the testing – Setting standards
  - Male scores – 22 Repetitions
  - Female scores – 15 Repetitions

What if the PASS score was 15 for Females and 25 for Males?

- What if below 20 Repetitions was associated with an increased risk of injury – Would that increase the risk of injury to the female? (What is the duty of care?)
- Would that be fair for two people who had to do the same job regardless of sex?

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

What is the purpose?

- Purpose of the testing – Setting standards
  - Male scores (38 years old)– 22 Repetitions

What if the PASS score was 25 for Males?

- Would that account for differences in age related strength levels?

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

What is the purpose?

- Purpose of the testing – Setting standards
  - Male scores (38 years old)– 22 Repetitions

What if the PASS scores were:

under 25 years of age – 30 Repetitions

25-30 years of age– 25 Repetitions

31-39 years of age – 20 Repetitions

- Would that be fair for two people who had to do the same job regardless of age?

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

What is the purpose?

- Purpose of the testing – Setting standards
  - What about Rank? Do all ranks do the same job?
  - What about trade? Do all police / firefighter / military personnel do the same job?

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UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

What is the purpose?

NB: The purpose of the testing must be clearly understandable

Use of Physical Fitness Assessments in Tactical Populations

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ABSTRACT

Physical fitness assessments for tactical occupations (e.g., military, law enforcement, and emergency services) can include predictive tests of anaerobic power, cardiovascular fitness, muscular endurance, muscular power, strength, agility, and/or simulated occupational tasks. Not only can these tests be used to assess the ability of someone to undertake the job role but they can be used to determine injury risk, training failure, and/or general health. This review discusses different uses for physical fitness assessments and considerations for their use in tactical populations.

INTRODUCTION

Physical fitness assessments are widely used in public safety organizations where there is a high physical demand. These organizations include the military (2,30,95), law enforcement (66,67), firefighter (7,83), and other rescue services, such as beach lifeguards (77). These professions often perform tasks that are highly physical in nature, and as such, physical assessments are often used at all stages of career progression to ensure that applicants (11,51), trained personnel (2), and those seeking specialist selection (30,70) have the necessary physical fitness to meet their specific training or employment obligations. Occupational physical fitness assessments can include tests of

- *sustained anaerobic power*, for example, a 75-yard pursuit (11,51) and 300-yard pursuit (87);
- *aerobic power*, for example, shuttle run assessments (2,17,73) and 2.4 km (2,12,47) and 3.2 km (30,87) distance runs;
- *muscular endurance*, for example, push-ups (14,27,30,37,38,43,47,78,100), sit-ups (14,27,30,37,38,43,47,100), and grip endurance (59);
- *muscle strength*, for example, grip strength (68,78,82), leg/back dynamometers, that is, a midthigh pull (17,18), and one or three repetition maximum tests (72,79);
- *muscular power*, for example, vertical (27,43,46,66,72) and broad (27,72) jumps;
- *agility*, for example, a change in direction test and T test (4,13); and
- *simulations of occupational tasks*, for example, Work Sample Battery Test (WSBT) (47), the Physical Employment Standards–Army (19), and the Royal Air Force (RAF) COMBAT-T (96).

Assessments of physical fitness can be used as a measure of injury risk (73,84,94), to provide information on general health and well-being (16), or to ensure job-task capability and employability (19,47,96). As physical fitness assessments can be used for different purposes, it is important for employers to understand the purpose of the tests they are using. This understanding will mitigate against lawsuits (6) and ensure validity of the tests results (60). In understanding the use of an assessment, consideration also needs to be given to how the cut score (i.e., minimally acceptable standard) is derived. Much debate of whether cut scores for physical fitness assessments should, or should not, account for age and sex is presupposed by their application. If a test is meant for selection (i.e., a physical employment standard), it is argued it should be age and sex free (93) because the nature of the task does not change. However, if the test is being

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KEY WORDS:
military; law enforcement; fire and rescue; army; police

Injury / Attrition Risk Identification ?

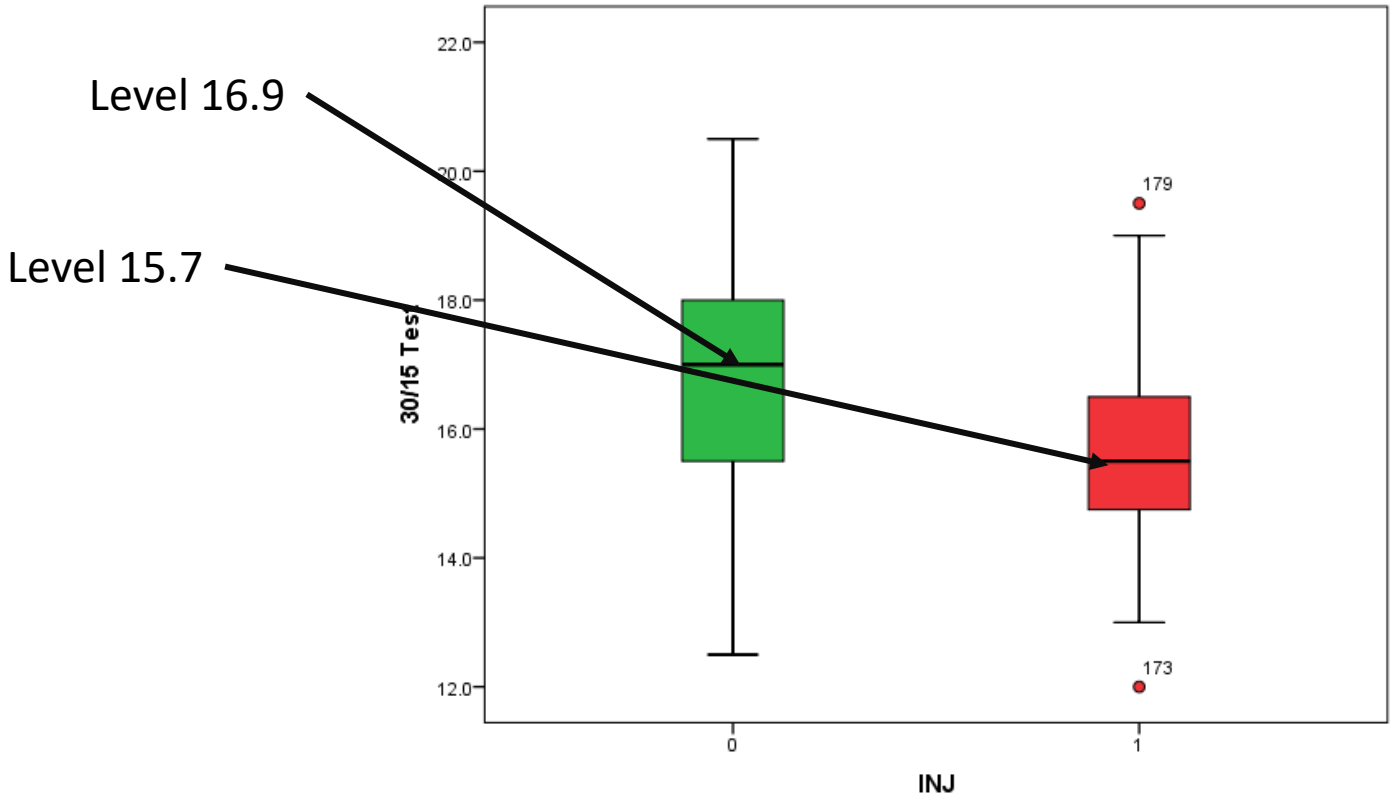
- Entry standards:
  - Research has shown, police, firefighters, and military personnel with lower fitness standards more likely to be injured in training

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure was 30-15 IFT

Orr et al., (2013)

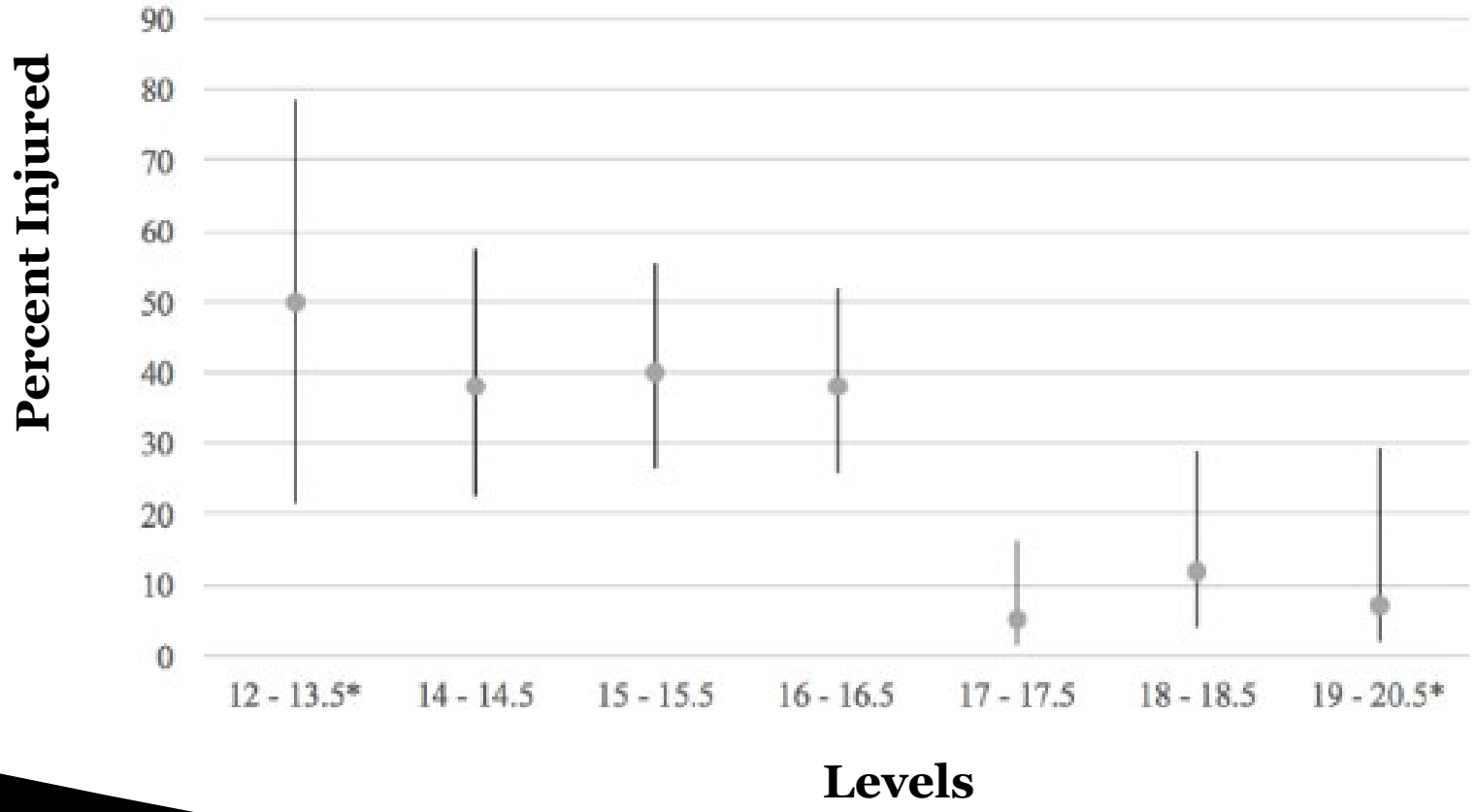


UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure was 30-15 IFT

(Orr et al., 2020)



UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

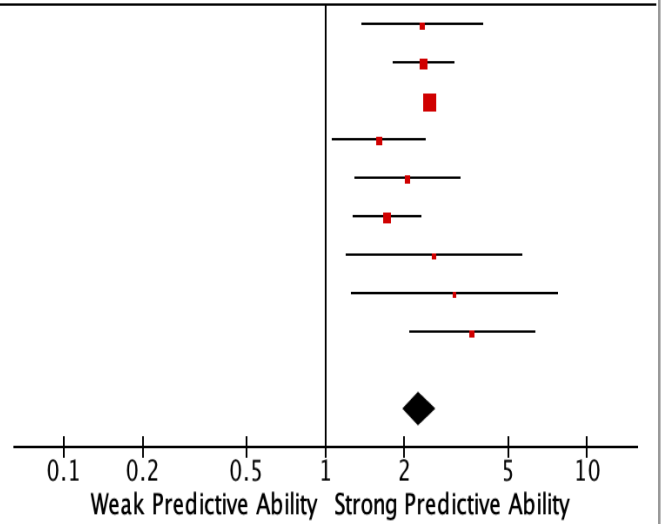
Injury / Attrition Risk Identification ?

- Meta Analysis

Studies reporting categorical, fixed-distance timed run events indicate unequivocally that poor metabolic fitness carries an elevated risk of injury during initial tactical training.

Study or Subgroup	log[Risk Ratio]	SE	Lowest Performers Total	Highest Performers Total	Weight	Risk Ratio IV, Random, 95% CI
Blacker 2008	0.8502	0.2697	2688	2664	6.3%	2.34 [1.38, 3.97]
Hall 2017	0.8629	0.1347	610	302	16.3%	2.37 [1.82, 3.09]
Jones 2017	0.9163	0.0208	28393	28713	34.1%	2.50 [2.40, 2.60]
Knapik 2001	0.47	0.2069	169	161	9.5%	1.60 [1.07, 2.40]
Knapik 2011	0.7227	0.2349	106	108	7.8%	2.06 [1.30, 3.26]
Lisman 2013	0.5423	0.1505	430	428	14.4%	1.72 [1.28, 2.31]
Rauh 2006	0.9555	0.3945	204	204	3.2%	2.60 [1.20, 5.63]
Shaffer 1999	1.1346	0.4599	272	267	2.4%	3.11 [1.26, 7.66]
Shaffer 2006	1.2892	0.2792	696	686	5.9%	3.63 [2.10, 6.27]
Total (95% CI)			**33568**	**33533**	**100.0%**	**2.27 [1.96, 2.63]**

Heterogeneity: $Tau^2 = 0.02$; $Chi^2 = 13.42$, df = 8 (P = 0.10); $I^2 = 40\%$
Test for overall effect: Z = 11.01 (P < 0.00001)



(Tomes et al., 2020)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

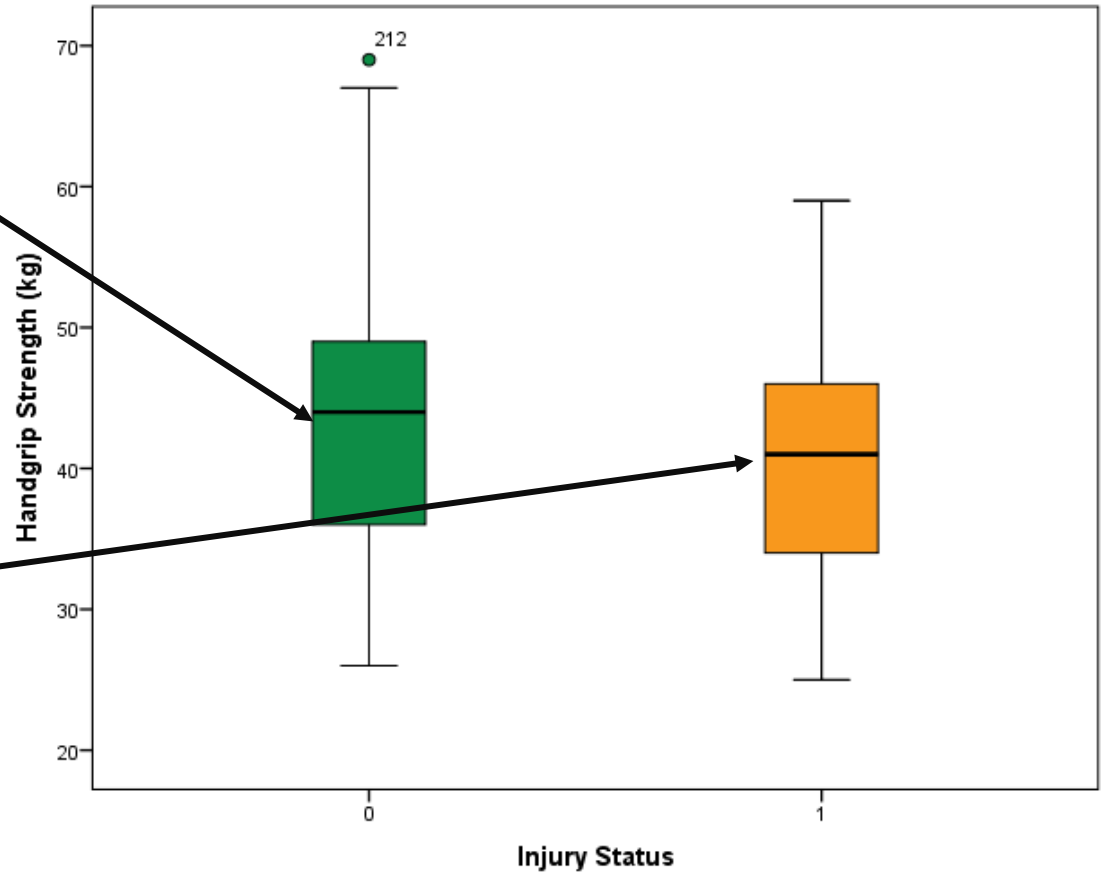
Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure Grip Strength

(Orr, et al., 2017)

42.80 ± 8.23 kg

39.28 ± 8.92kg

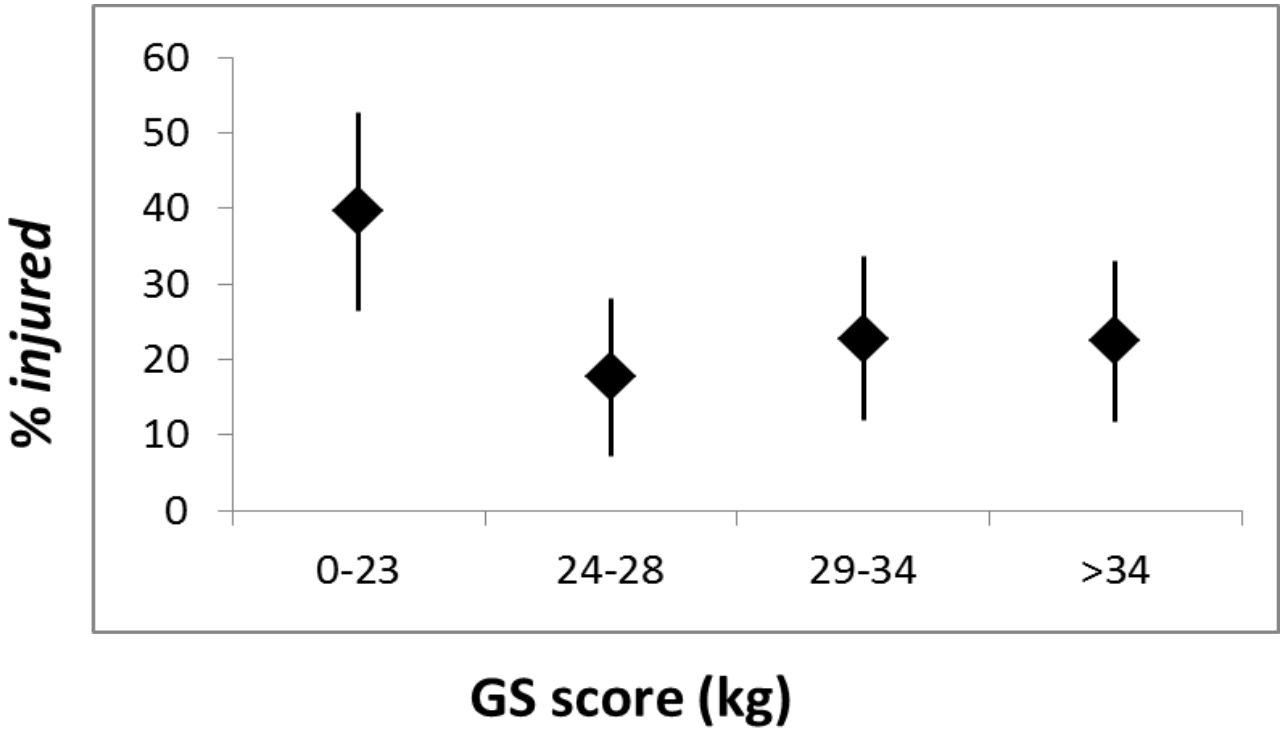


UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure Grip Strength
  - Percentage of Recruits injured by GS score

(Orr, et al., 2017)

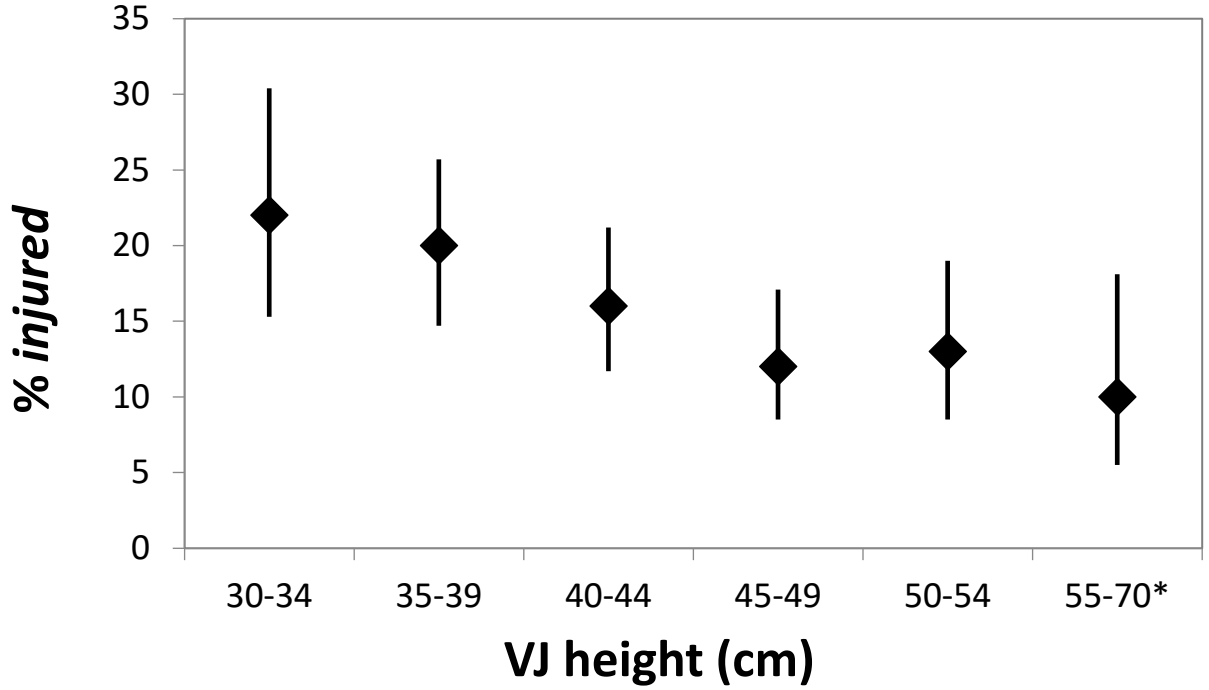


UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure was Vertical Jump
  - Percentage of Recruits **injured**, by VJ height

(Orr, et al., 2016)

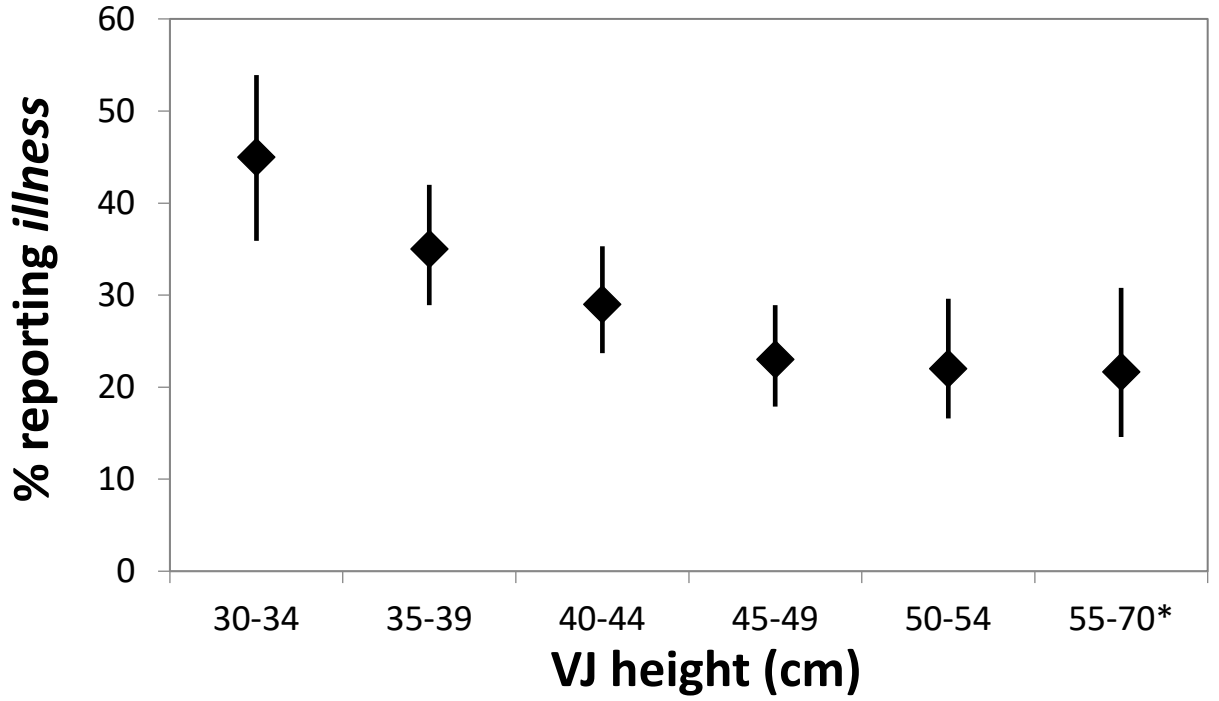


UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure was Vertical Jump
  - Percentage of Recruits reporting **illness**, by VJ height

(Orr, et al., 2016)

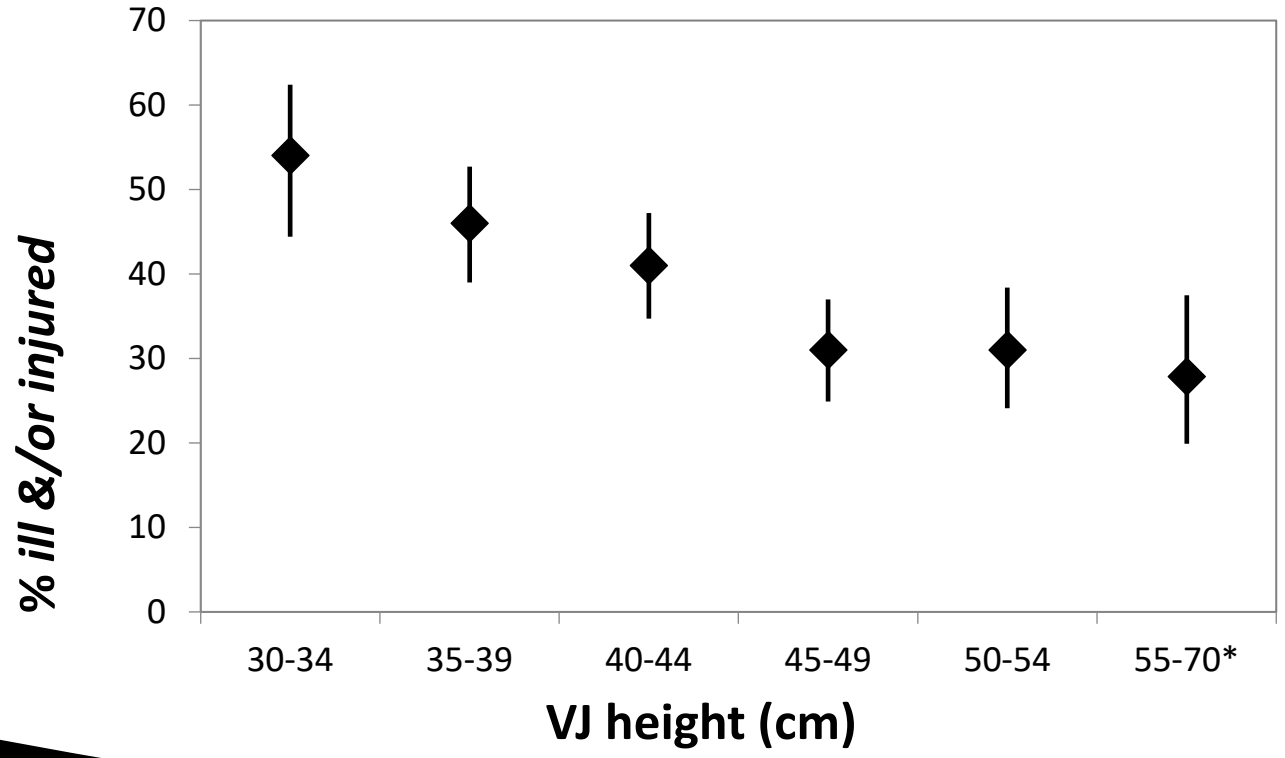


UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure was Vertical Jump
  - Percentage of Recruits reporting **illness &/or injury**

(Orr, et al., 2016)

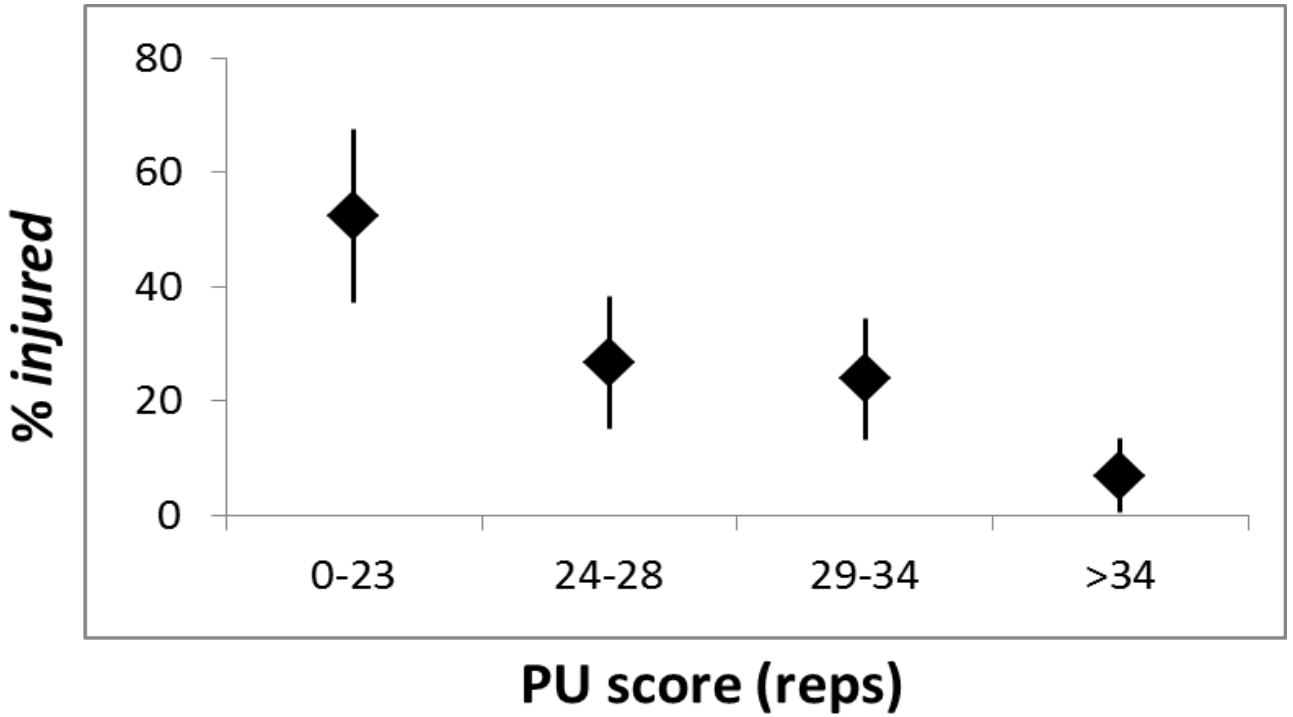


UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure was Push Ups
  - Percentage of Recruits injured, by PU score

(Orr, et al., 2017)

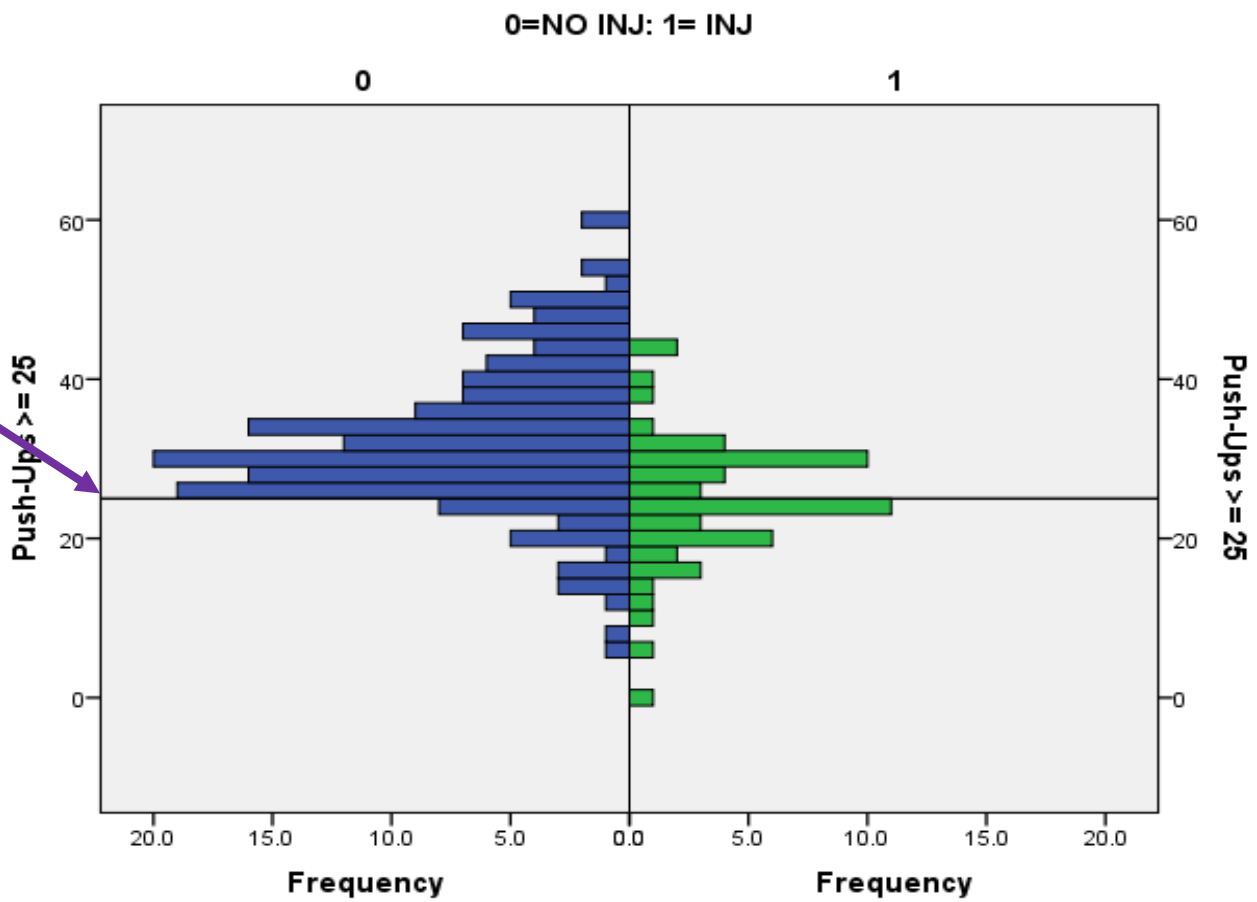


UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Police Officer Recruits
  - Measure was Push Ups

- Pass rate for police recruits = 25 PU
- 25.6% did not achieve 25 PU (n=56)
- Of those 53.7% sustained injury

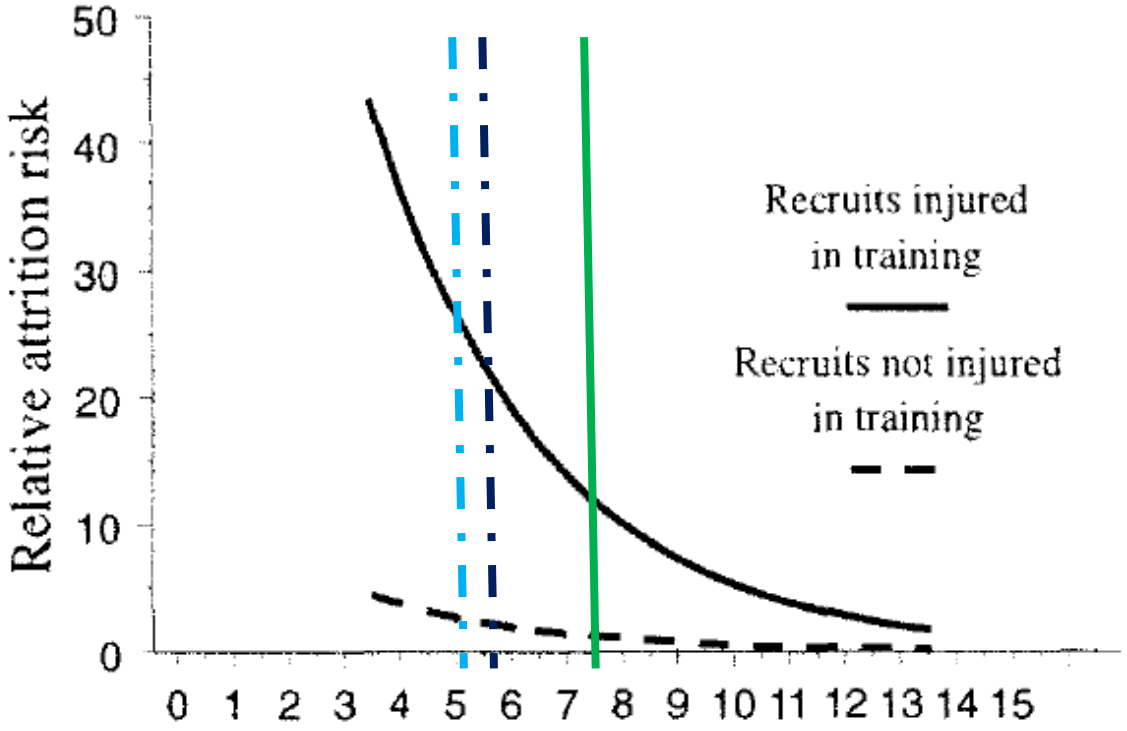


(Orr, et al., 2017)

Injury / Attrition Risk Identification ?

- Army Recruits
  - Measure was 20m Shuttle Run
    - Army = L7-5
    - Navy = L5-5
    - Air Force = L5-1

(Pope et al., 1999)



UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Firefighter Recruits
  - Measures were IAT; push-ups; pull-ups; leg tucks; MSFT, BOMBT; 10RM deadlift; and a 91.44-m farmers carry with 18-kg kettlebells
    - Raw scores

	Graduated (n = 255-261)	Released (n = 42-44)	*p*	*d*
IAT (s)	18.43 ± 1.46	18.51 ± 1.18	0.754	0.06
Push-ups (repetitions)	64.68 ± 22.67	44.50 ± 17.44*	<0.001	1.00
Pull-ups (repetitions)	12.12 ± 6.39	9.20 ± 5.88*	0.005	0.48
BOMBT (m)	9.52 ± 1.66	9.54 ± 1.98	0.949	0.01
Leg Tuck (no.)	12.46 ± 5.88	8.88 ± 4.27*	<0.001	0.70
Estimated $\dot{V}O_{2max}$ ($ml \cdot kg^{-1} \cdot min^{-1}$)	46.20 ± 5.88	44.78 ± 5.89	0.139	0.24
10RM Deadlift (kg)	143.72 ± 15.20	142.41 ± 15.09	0.599	0.09
Farmer's Carry (s)	28.77 ± 4.13	29.69 ± 4.21	0.183	0.22

* Significantly ($p < 0.05$) different from the graduated group.

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Firefighter Recruits
  - Measures were IAT; push-ups; pull-ups; leg tucks; MSFT, BOMBT; 10RM deadlift; and a 91.44-m farmers carry with 18-kg kettlebells
    - Scored out of 800

	Graduated (n = 261)	Released (n = 44)	*p*	*d*
IAT	19.70 ± 34.42	1.57 ± 10.40*	<0.001	0.56
Push-ups	44.08 ± 41.07	30.09 ± 39.57*	0.018	0.34
Pull-ups	66.89 ± 30.99	49.93 ± 37.37*	0.003	0.53
BOMBT	78.63 ± 8.84	59.86 ± 28.08*	<0.001	1.41
Leg Tuck	71.91 ± 25.15	59.07 ± 36.42*	0.014	0.48
Estimated $\dot{V}O_{2max}$	45.77 ± 38.05	21.95 ± 32.72*	<0.001	0.64
10RM Deadlift	96.97 ± 5.75	77.75 ± 35.09*	<0.001	1.35
Farmer's Carry	64.71 ± 27.65	50.59 ± 33.95*	0.006	0.49
Total Points	488.59 ± 132.71	349.45 ± 146.38*	<0.001	1.03

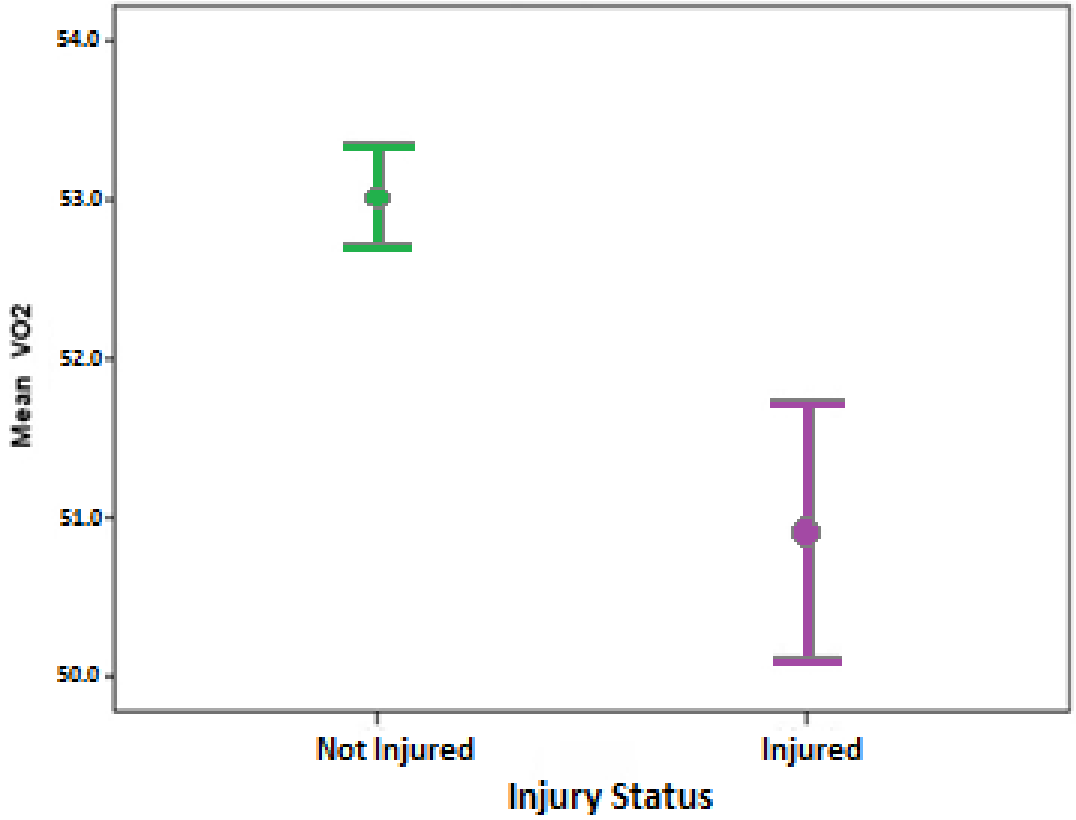
* Significantly ($p < 0.05$) different from the graduated group.

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Army Officer Recruits
  - Measure was 20m Shuttle Run

(Meigh et al. 2012)



UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Australian Army Special Forces Entry Test

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Australian Army Special Forces Entry Test

	Pass	Fail (All Candidates)	Fail (Excluding 20-km March Fails)
n	39	65	38
SFET Assessments			
Maximal Aerobic Capacity ($mL \cdot kg^{-1} \cdot min^{-1}$)	55.1 ± 3.3	54.2 ± 2.8	54.8 ± 3.3
5-km March (Minutes)	45.2 ± 2.4	45.9 ± 2.2	45.2 ± 1.6
Push-ups (Repetitions)	69 ± 12	63 ± 12*	63 ± 14*
Sit-ups (Level)	4.6 ± 1.3	4.2 ± 1.4	4.4 ± 1.3
Heaves (Repetitions)	12 ± 2	12 ± 2	12 ± 2
Agility (Seconds)	8.1 ± 0.6	8.0 ± 0.7	7.9 ± 0.8
Swim (Minutes)	8.6 ± 1.2	8.9 ± 1.2	8.9 ± 1.2
Flexibility (cm)	31.2 ± 5.9	30.3 ± 5.6	30.5 ± 6.0
Jump Height (cm)	55.7 ± 7.1	55.6 ± 6.8	55.9 ± 6.6
Barrier Assessments			
3.2-km Battle Run (Minutes)	15.0 ± 0.7	15.5 ± 1.1*	15.1 ± 0.7
20-km March (Minutes)	182.9 ± 9.0	192.0 ± 9.6*	187.6 ± 7.3*

*Significantly different from the pass group, $p < 0.05$.

(Hunt et al., 2013)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

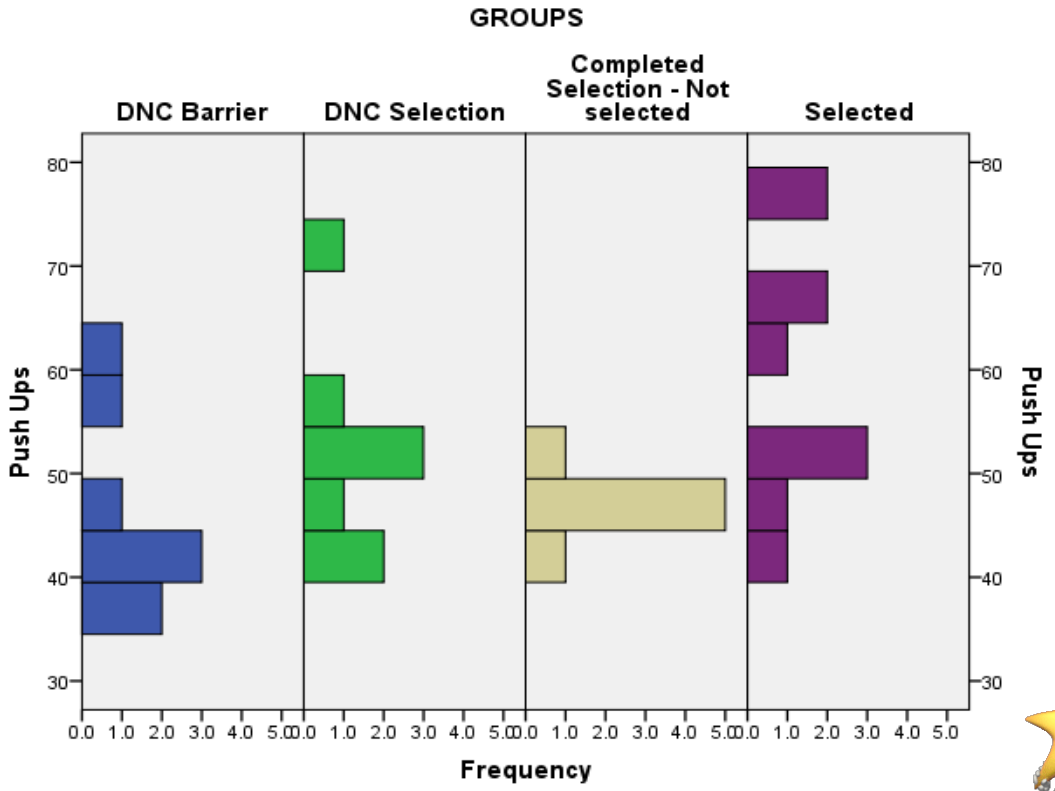
Injury / Attrition Risk Identification ?

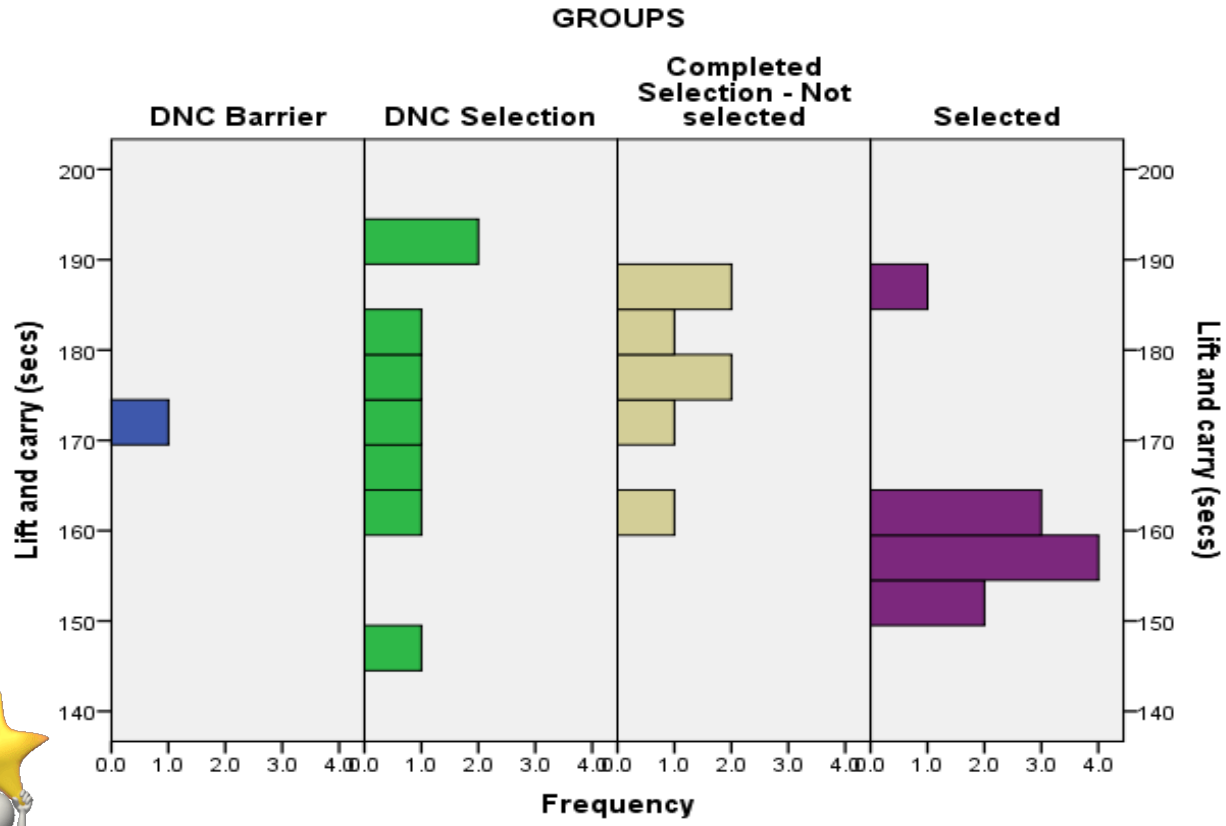
- Special Weapons and Tactics Teams

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Special Weapons and Tactics Teams
  - Measure was Push Ups / Lift and Carry





(Orr et al., 2018)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

- Based on capability rather than sex or age

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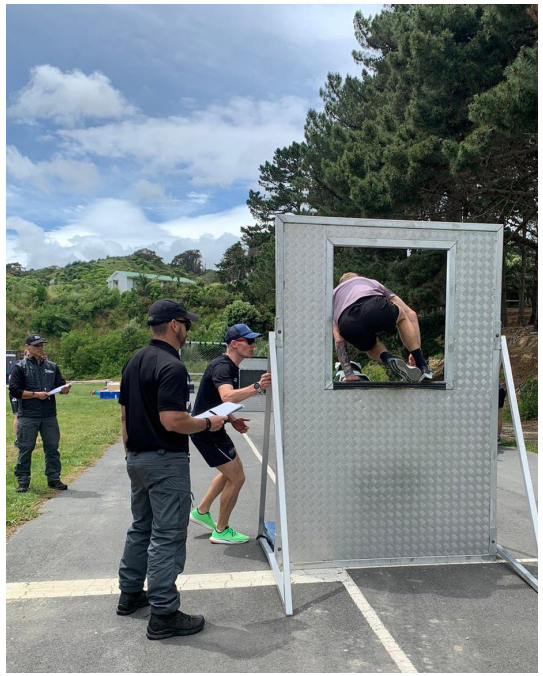
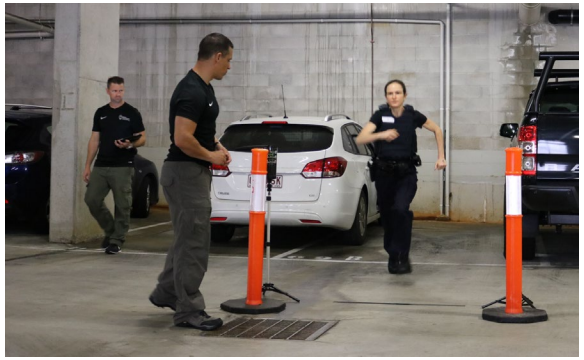
UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

- Based on capability rather than sex or age
- What is needed to complete key tasks





UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

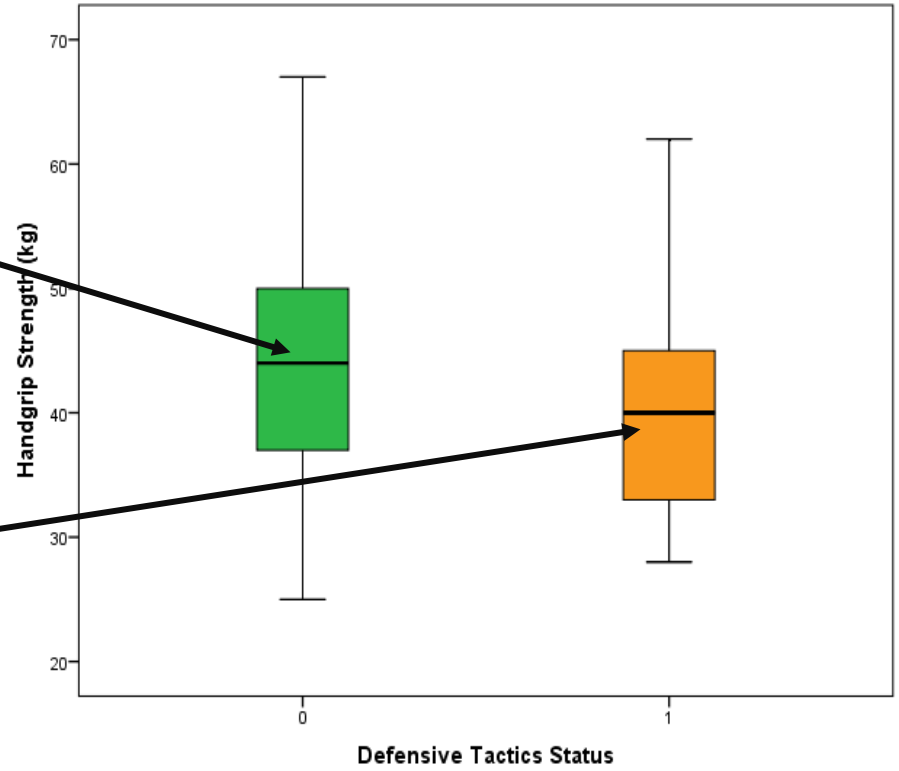
Occupational Capability?

- Police Officer Recruits
  - Measure Grip Strength
  - Defensive Tactics

(Orr et al., 2017)

43.68 ± 8.36 kg
(25-67)

40.00± 7.73kg
(28-62)



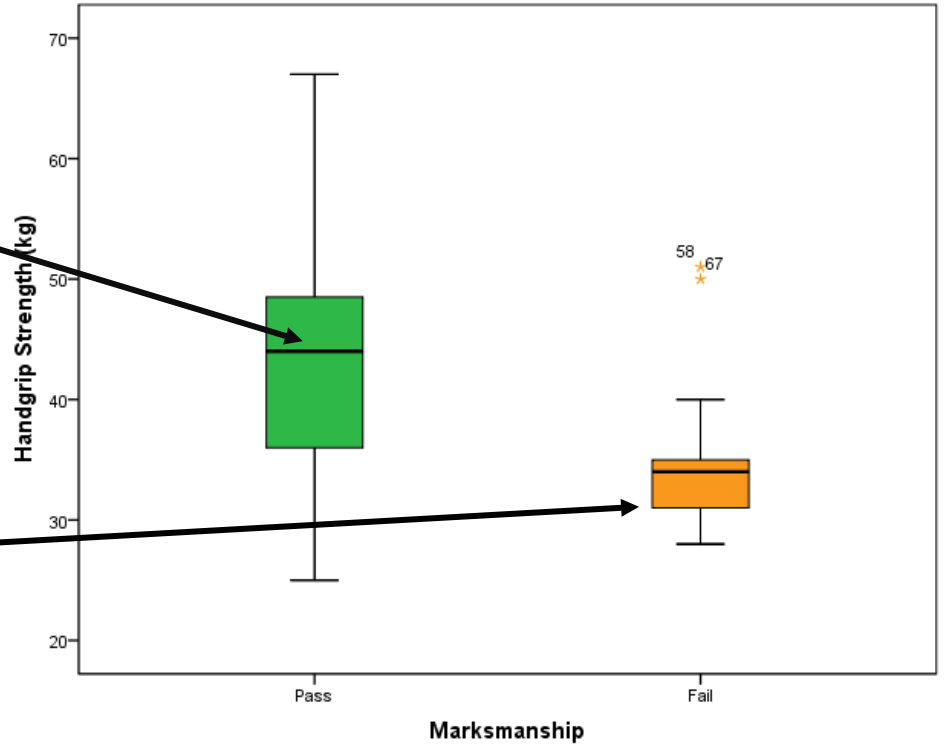
UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

- Police Officer Recruits
  - Measure Grip Strength
  - Marksmanship / Shooting

43.22 ± 8.04 kg
(25-67)

34.67± 5.94kg
(28-51)



(Orr, et al., 2017)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

	Shuttle Run	Vertical Jump (cm)	Grip Strength (kg)	Leg Dyno (kg)
Static Score	0.528**	0.322	-0.001	0.343
Dynamic Scenario	0.170	-0.022	-0.367*	-0.069
Positive ID Scenario	0.009	0.221	0.040	0.344*
Scenario Combined	0.062	0.181	-0.153	0.286
Total Score	0.220	0.255	-0.129	0.350*

(Muirhead et al., 2019)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

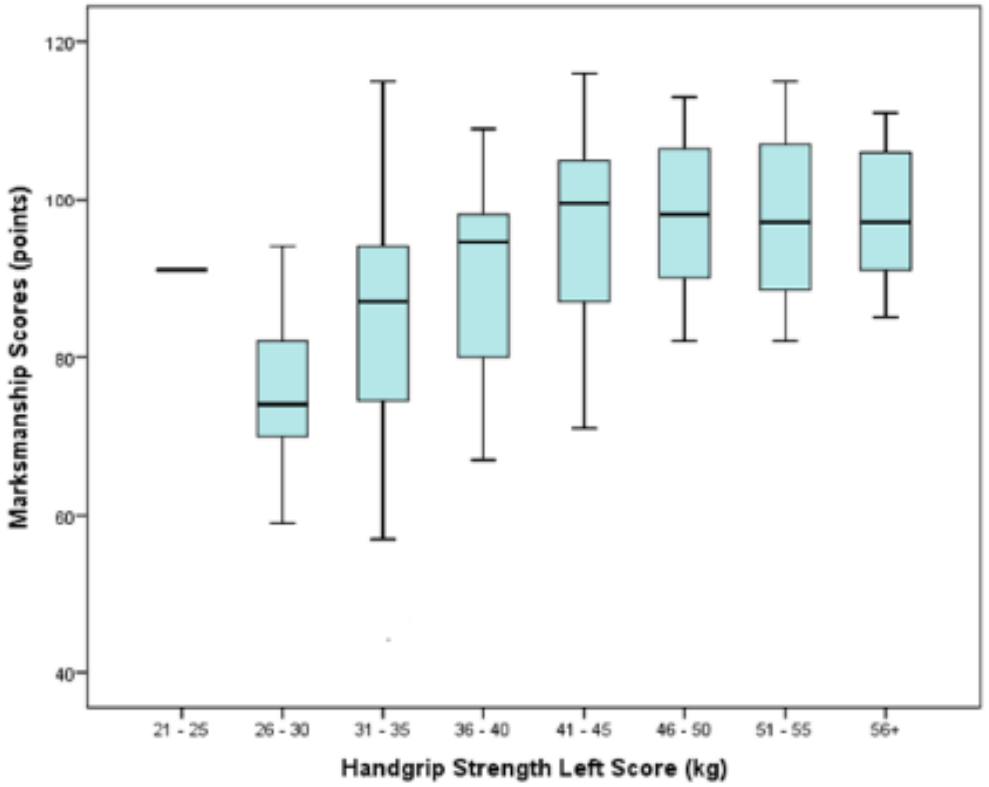
	Static Score	Dynamic Scenario	Positive Identification Scenario
Static Score	-	0.314	0.281
Dynamic Scenario	0.314	-	0.177
Positive Identification Scenario	0.281	0.177	-

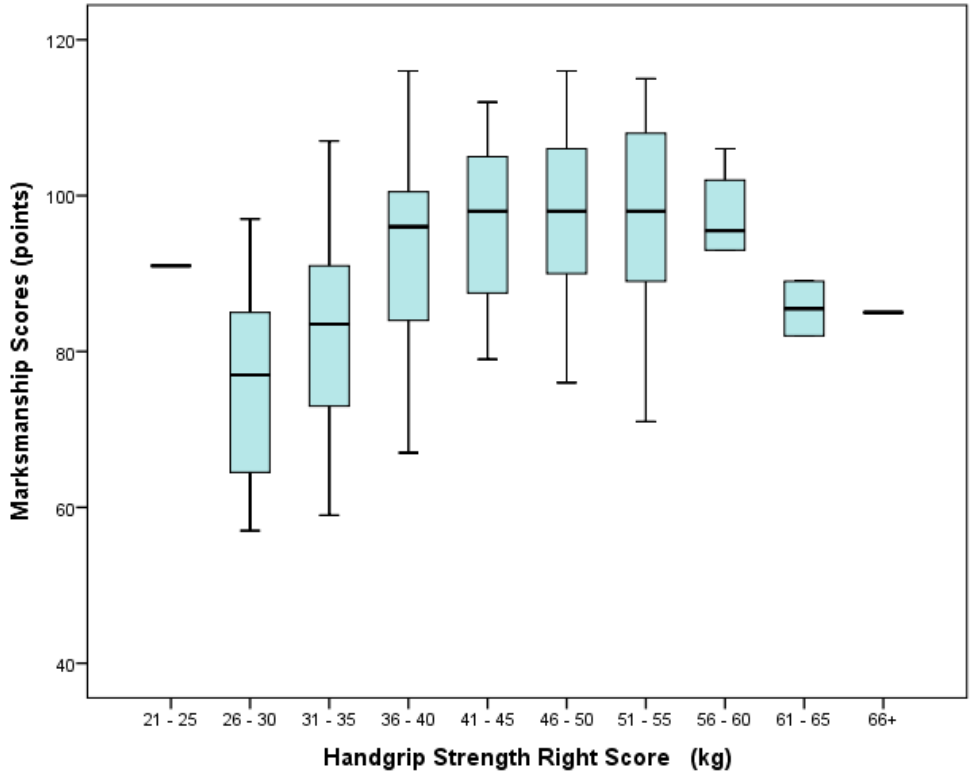
(Muirhead et al., 2019)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

- Different between sides



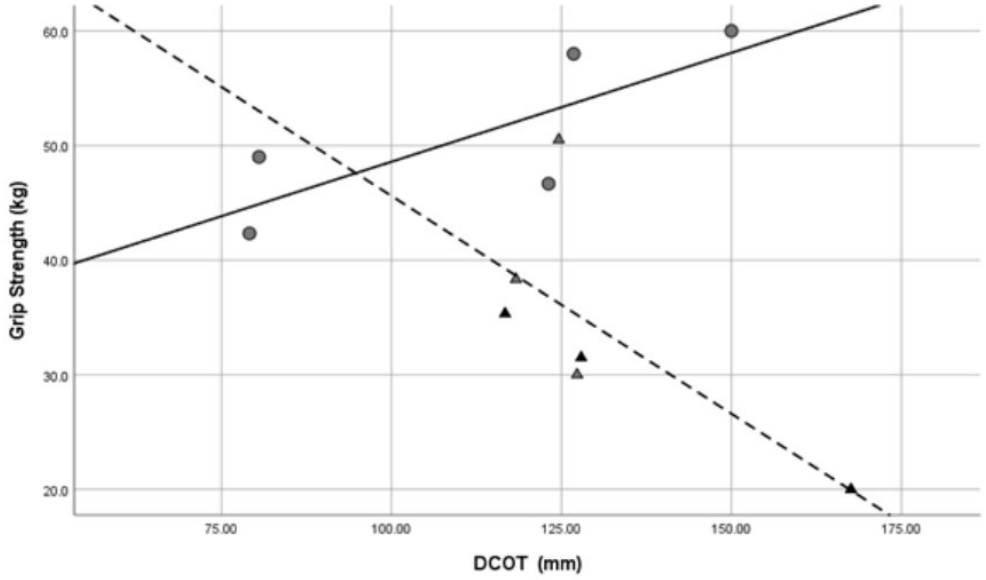


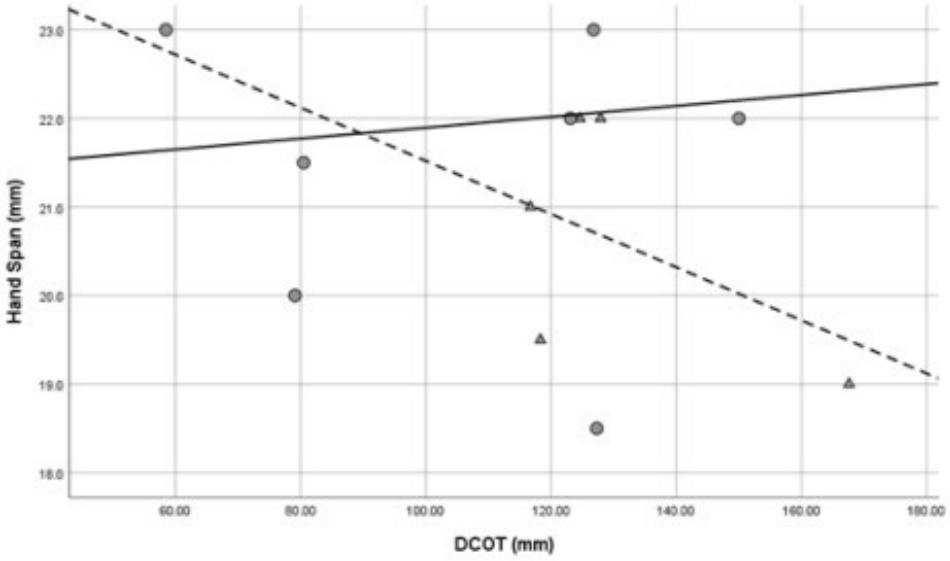
(Orr et al., 2017)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

- More than just physical?



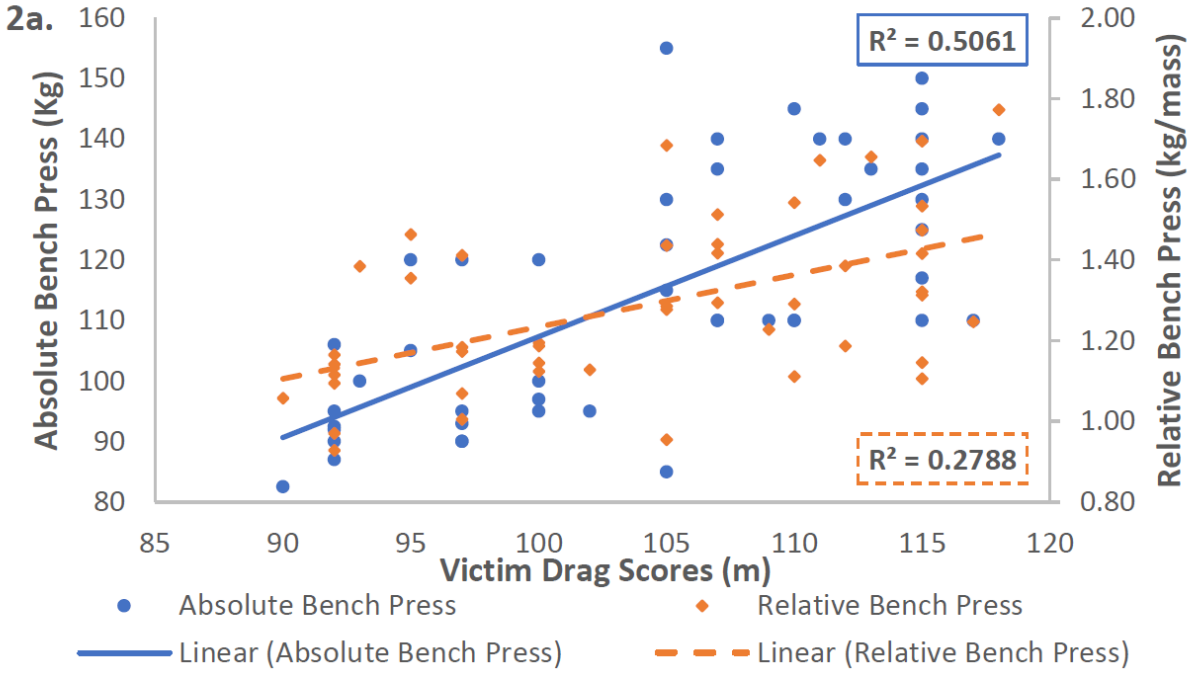


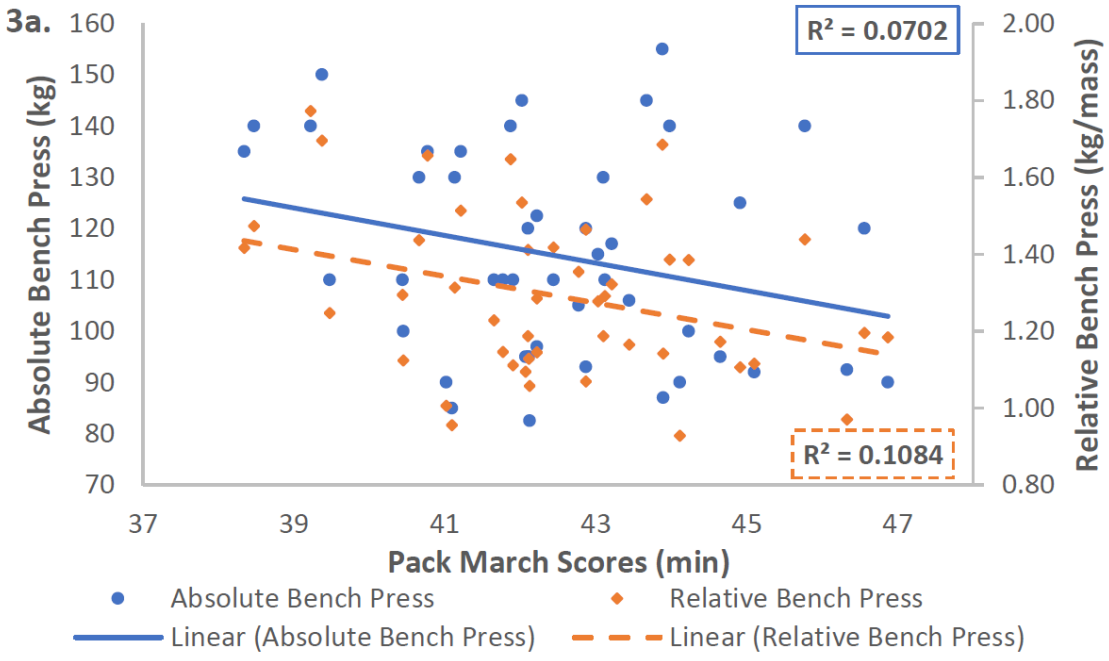
Orr et al., (2021)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

- More specific types of fitness elements





(Orr et al., 2022)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

- Australian Army - Physical Employments Standards Army (PESA)

Assessment	Overview	AC PESA	CA PESA	Infantry PESA
Weight Load March	March with load at a rate of 5.5km/h (11min per km)	5km – 22kg load Time: 50-55 minutes	10km – 38kg load Time: 100-110 minutes	15km – 45kg load Time: 150-165 minutes

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

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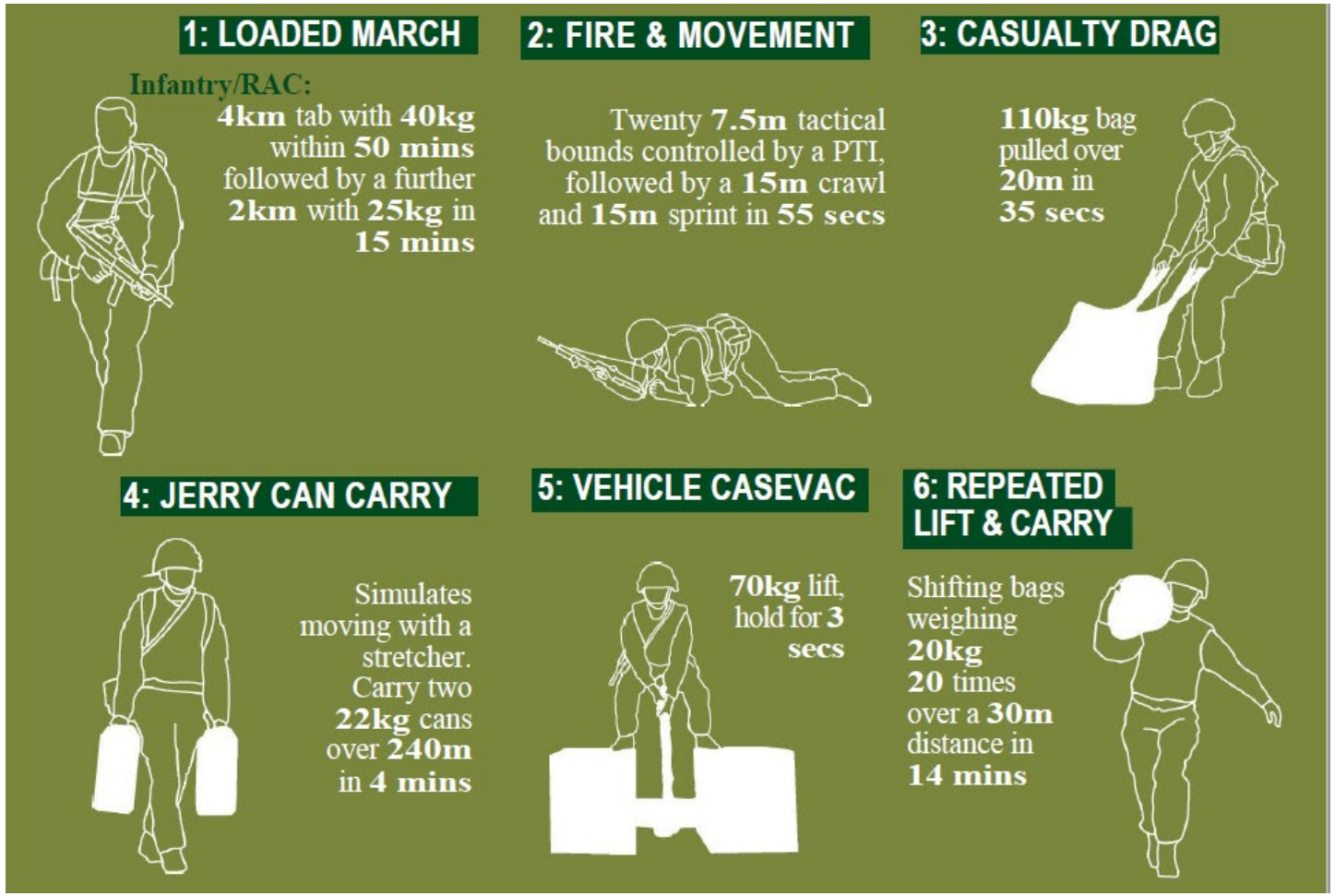
Weight Load March	March with load at a rate of 5.5km/h (11min per km)	5km – 22kg load Time: 50-55 minutes	10km – 38kg load Time: 100-110 minutes	15km – 45kg load Time: 150-165 minutes
Fire & Movement Simulation	Complete 6m bounds (every 20 secs) to a cadence track (pers have 5 secs to reach 6m mark with 15 sec rest)	12 x 6m bounds	16 x 6m bounds + 18m leopard crawl	1km move with 22kg load in 8 minutes + 16 x 6m bounds + 18m leopard crawl
Casualty Drag	Drag casualty dummy (approx 82kg) 10m in 10 secs	N/A	N/A	Drag casualty dummy 10m in 10 secs
Lift & Carry	Carry 2 x 22kg jerry cans in 25m legs to a cadence track (20 sec per 25m with 5 sec rest)	6 x 25m legs	11 x 25m legs Artillery only - Carry 1 x 43kg inert round 10 x 10m legs to a cadence track	11 x 25m legs
Box Lift & Place	Lift a weighted box from the ground to a 1.5m high platform using a prescribed lifting technique	25kg	30kg Combat Engineer only – 40kg	35kg

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?



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UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Occupational Capability?

1: LOADED CARRIAGE

(Ph 1) 4km or 2km tab*
(Ph 2): 2km or 1km tab*.

2: TACTICAL MOVEMENT

30m or 90m of 7.5 m tactical bounds controlled by a PTI followed by a 7.5m timed crawl and a 7.5m timed sprint*.

3: CASUALTY DRAG

110kg casualty simulation dragged over 15 or 10m*.

4: STRETCHER CARRY

120m or 240m simulated stretcher carry, carrying 2 x 22kg water cans*.

5: VERTICAL LIFT

60kg lift and hold for 3 seconds.

6: REPEATED CARRY

Repeatedly moving various items over a 30m course for a duration up to 10 mins*.

7: INCREMENTAL LIFT

Lifting various weighted items to a 1m platform, up to the shoulder and then to an overhead press*.

* See table overleaf for specific cap badge/role group standards.

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

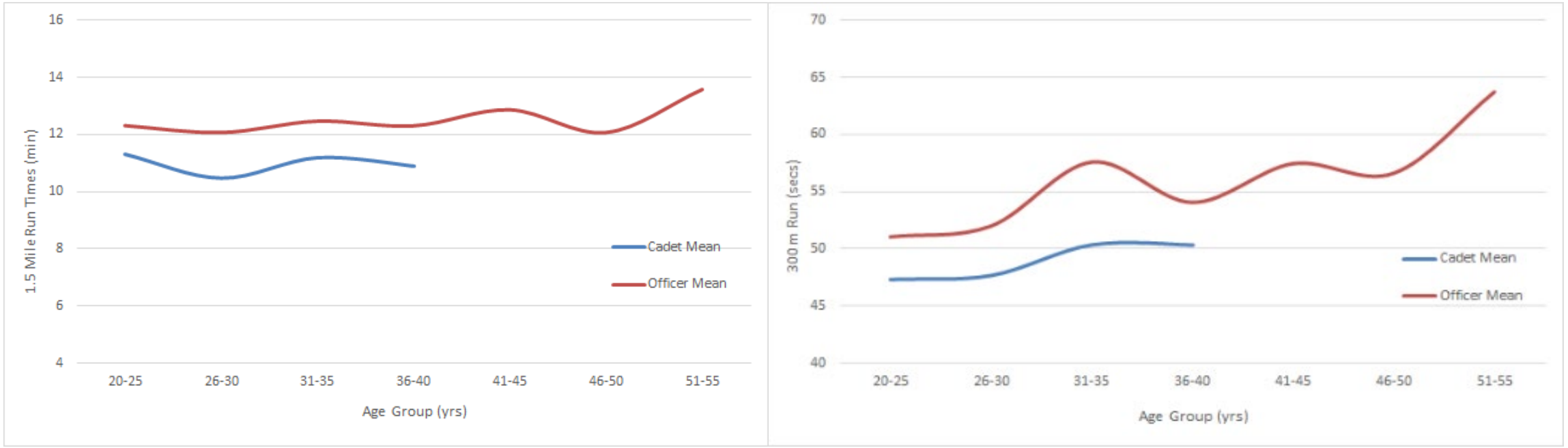
Health?

- Considers sex and age
- Predictor of mortality / measure of general health

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Health?

- Why are screening and assessment tools for health important?



(Orr et al., 2018)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Health?

- Considering participant's sex

Percentile Rank	Range ($mL \cdot kg^{-1} \cdot min^{-1}$)	Males (n = 231)	Females (n = 29)
90–100	53.8–61.2	29	0
80–89	50.8–53.5	25	0
70–78	49.2–50.6	27	1
60–69	48.0–48.9	24	1
52–58	46.2–47.7	19	2
41–49	44.9–45.9	18	3
32–39	44.0–44.6	20	4
21–29	41.9–43.7	25	4
10–19	38.5–41.5	25	5
0–9	20.2–38.1	19	9

(Lockie et al., 2022)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

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21–29	41.9–43.7	25	4
10–19	38.5–41.5	25	5
0–9	20.2–38.1	19	9

(Lockie et al., 2022)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Health?

- Considering participant's sex

Measure	Female officers	Male officers
Age (yrs) ♀ = 34 ♂ = 597	36.21 ± 8.45	39.52 ± 8.09
Weight (kg) ♀ = 31 ♂ = 587	67.49 ± 25.62	91.99 ± 19.54[a]
Height (cm) ♀ = 33 ♂ = 588	164.65 ± 29.82	177.98 ± 23.13[a]
Vertical Jump (cm.) ♀ = 33 ♂ = 588	36.80 ± 5.69	50.74 ± 8.89[a]
Leg/Back Dynomometer (kgk ♀ = 33 ♂ = 592	116.53 ± 20.85	170.68 ± 37.46[a]
Grip (Kg) ♀ = 32 ♂ = 589	37.875 ± 5.34	55.04 ± 7.77[a]
Push-ups (repetitions) ♀ = 29 ♂ = 582	24.24 ± 11.63	39.09 ± 15.61[a]
Sit-ups (repetitions) ♀ = 33 ♂ = 583	31.06 ± 9.52	34.46 ± 10.29
Shuttles (number) ♀ = 31 ♂ = 550	26.19 ± 10.86	38.04 ± 19.87[a]

[a]Significantly different from female officers at ≤ .001

(Dawes et al., 2017)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Health?

(Dawes et al., 2017)

- Considering participant's age

Age	Measure	Group population	Female officers	Male officers
20–29 Group 1	Weight (kg) $n = 89$: ♀ = 6: ♂ = 83	83.82 ± 16.38	69.55 ± 15.69*	84.85 ± 16.03
	Height (cm) $n = 89$: ♀ = 6: ♂ = 83	179.14 ± 7.78	167.64 ± 7.18*	179.97 ± 7.17
	Vertical Jump (cm.) $n = 88$: ♀ = 6: ♂ = 82	57.25 ± 9.68	40.46 ± 8.13*	58.47 ± 8.79
	Grip (kg) $n = 87$: ♀ = 6: ♂ = 81	53.53 ± 8.49	37.67 ± 5.57*	54.67 ± 7.47
	Push-ups (repetitions) $n = 88$: ♀ = 6: ♂ = 82	46.52 ± 15.07	30.50 ± 9.95*	47.70 ± 14.74
	Sit-ups (repetitions) $n = 89$: ♀ = 6: ♂ = 83	40.98 ± 8.35	38.33 ± 10.56	41.17 ± 8.22
	Leg/Back Dynomometer (kg) $n = 89$: ♀ = 6: ♂ = 83	169.50 ± 42.27	109.85 ± 26.69*	173.81 ± 39.94
	Shuttles (number) $n = 86$: ♀ = 6: ♂ = 80	54.07 ± 21.00	33.33 ± 6.41	55.63 ± 20.90
30–39 Group 2	Weight (kg) $n = 218$: ♀ = 16: ♂ = 202	89.32 ± 19.73	63.50 ± 28.87*	91.37 ± 17.35
	Height (cm) $n = 218$: ♀ = 16: ♂ = 202	177.83 ± 22.46	159.23 ± 43.07*	179.30 ± 19.40
	Vertical Jump (cm) $n = 215$: ♀ = 16: ♂ = 199	51.49 ± 9.02	36.00 ± 5.82*	52.73 ± 8.03†
	Grip (kg) $n = 214$: ♀ = 15: ♂ = 199	54.65 ± 9.40	37.20 ± 4.51*	55.97 ± 8.30
	Push-ups (repetitions) $n = 213$: ♀ = 15: ♂ = 198	39.44 ± 15.44	25.13 ± 13.05*	40.52 ± 14.96†
	Sit-ups (repetitions) $n = 212$: ♀ = 16: ♂ = 196	36.04 ± 9.93	28.81 ± 10.51*	36.63 ± 9.67†
	Leg/Back Dynomometer (kg) $n = 201$: ♀ = 16: ♂ = 200	166.56 ± 38.86	113.35 ± 12.22*	170.81 ± 37.08
	Shuttles (number) $n = 201$: ♀ = 15: ♂ = 186	40.98 ± 19.84	25.93 ± 12.57*	42.19 ± 19.85†

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Health?

- The Australian Army Basic Fitness Assessment

Age	Push-ups (number)	Sit-ups (number)	2.4 km Run (minutes)
25 and under	40	70	11:18
26-30	35	65	11:48
31-35	30	57	12:18
36-40	25	50	12:42
41-45	20	30	13:12
46-50	10	20	13:48
51 and over	6	15	14:30

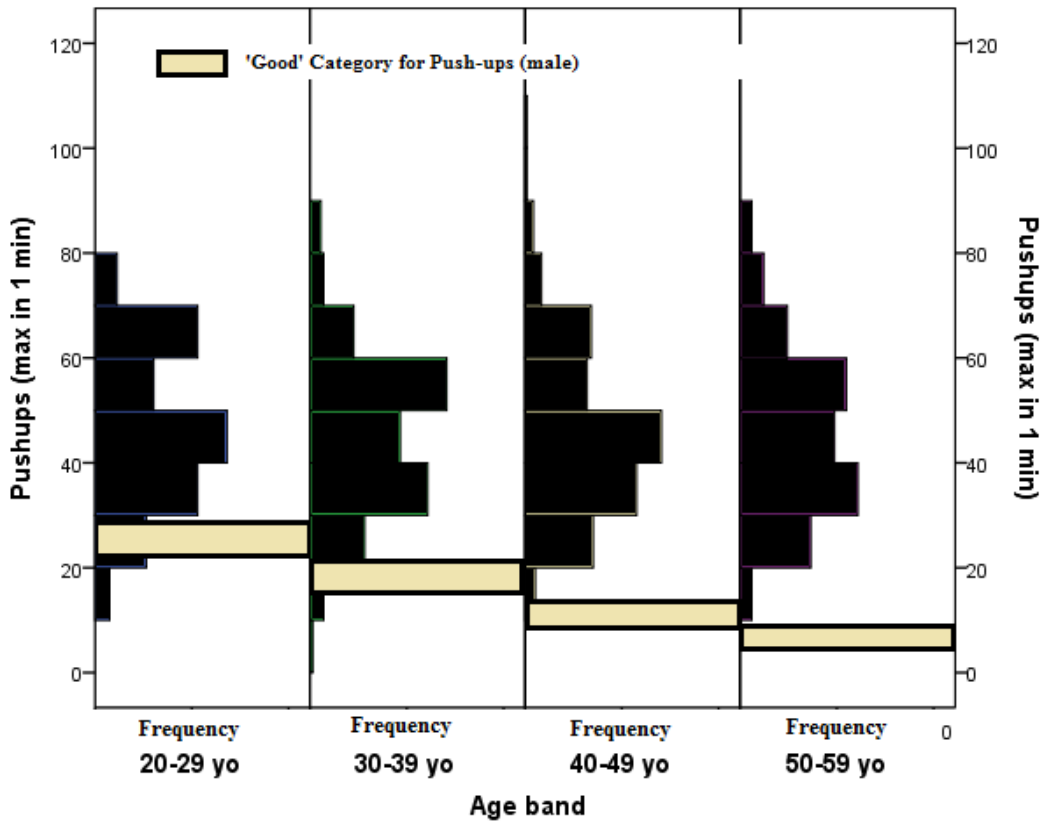
Push-ups (number)	Sit-ups (number)	2.4 km Run (minutes)
21	70	13:30
18	65	14:00
15	57	14:30
10	50	15:00
7	30	15:30
3	20	16:00
3	15	16:30

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Health?

- The normative population?
  - Is the tactical population the same?

Push Up performance of male police officers



(Dawes, et al., 2016)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Injury / Attrition Risk Identification ?

- Predictive Equations

Estimating Equations for calculating $\dot{V}O_2max$.*

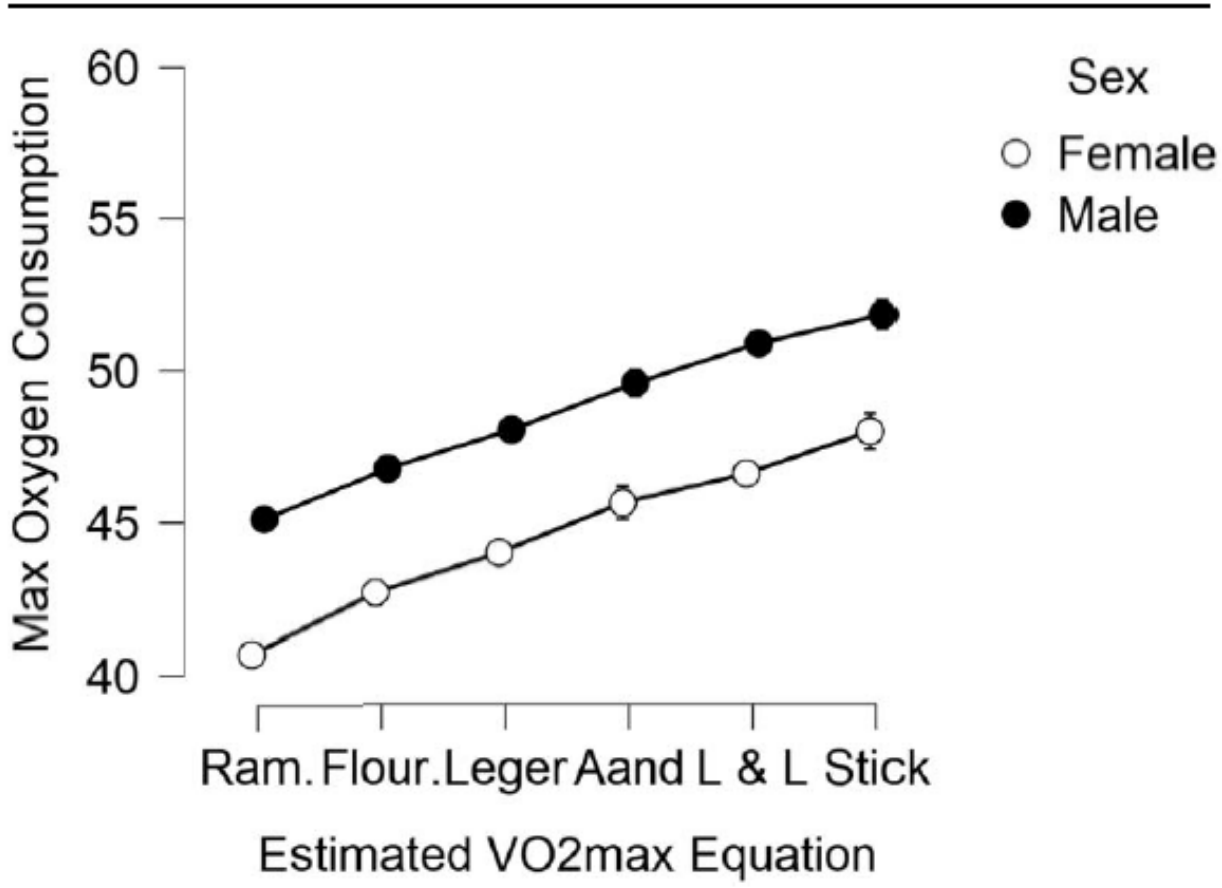
Reference	Equation
Leger and Lambert (20)	$y = 5.857x - 19.458$
Leger et al. (21)	$y = 6.0x + (-27.4)$
Ramsbottom et al. (38)	$y = 3.48x + 14.4$
Stickland et al. (42)	Female: $y = 2.85x + 25.1$ Male: $y = 2.75x + 28.8$
Flouris et al. (17)	$y = (6.65x - 35.8) \times 0.95 + 0.1282$
Aandstad et al. (1)	$y = 2.71x + 26.5$

(Campbell, et al., 2023)

UNDERSTANDING PHYSICAL ASSESSMENT TOOLS

Health?

- Predictive Equations



(Campbell, et al., 2023)

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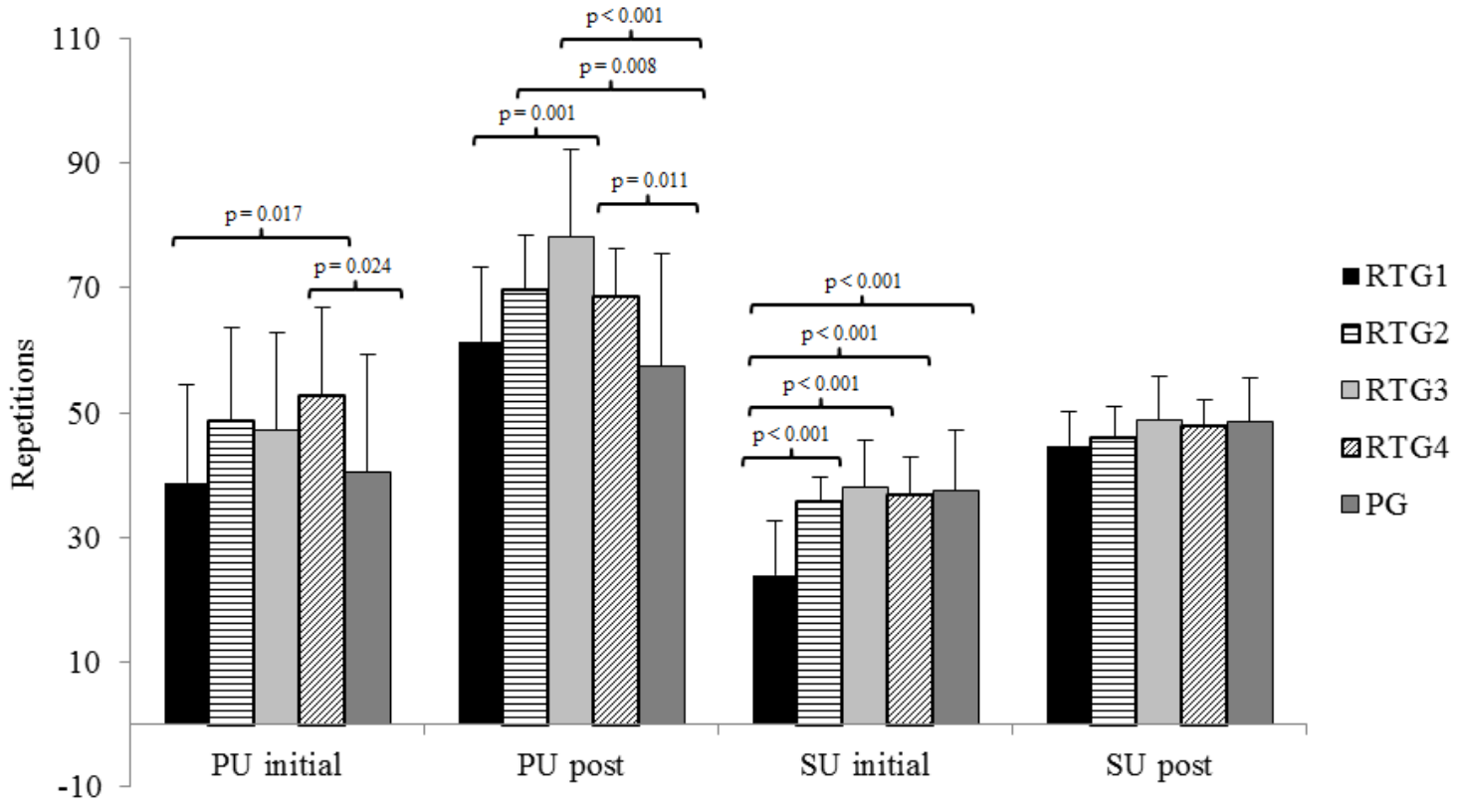
USING PHYSICAL ASSESSMENT TOOLS

Training validation / research?

USING PHYSICAL ASSESSMENT TOOLS

Training validation / research?

- To review the effectiveness of training through evidence-based research



(Cocke et al., 2016)

USING PHYSICAL ASSESSMENT TOOLS

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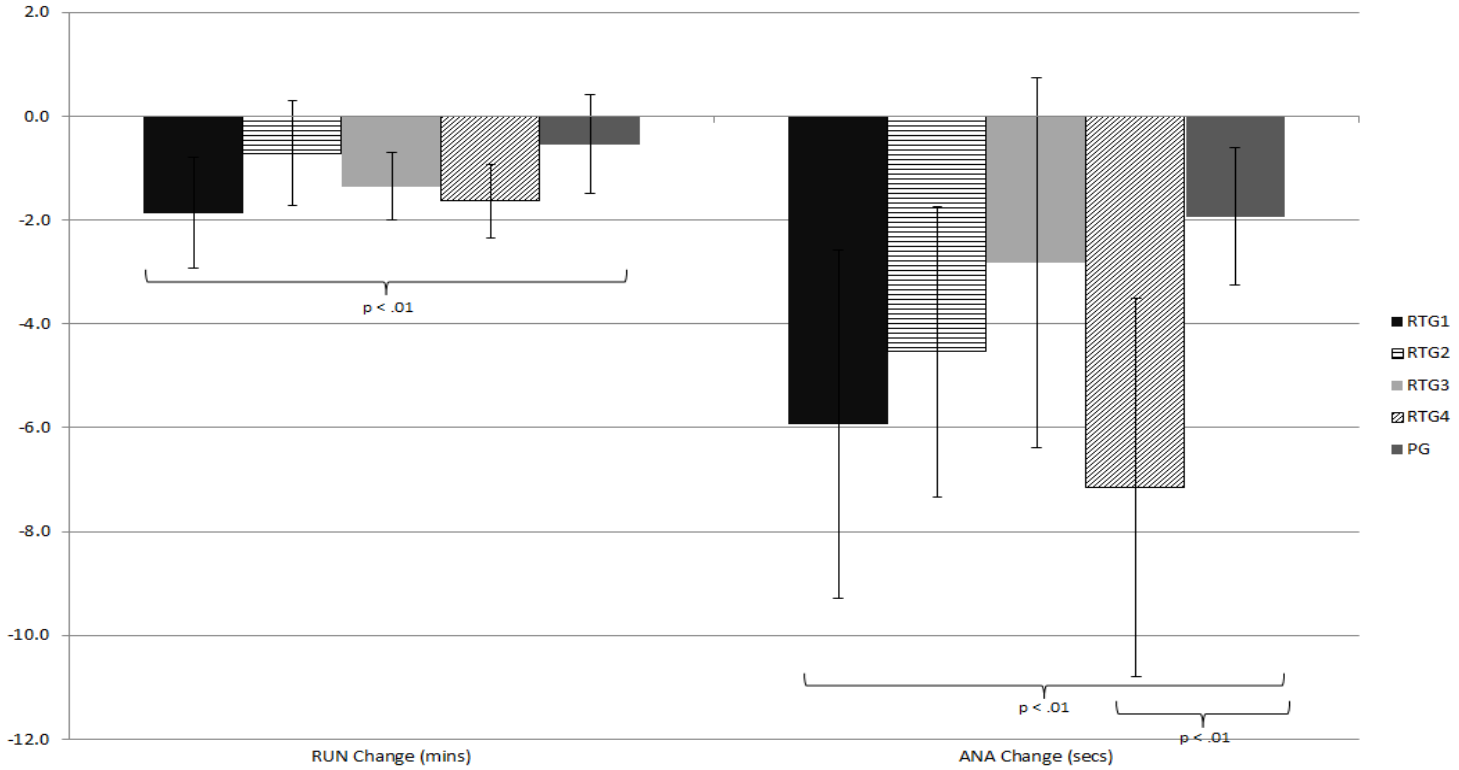


(Cocke et al., 2016)

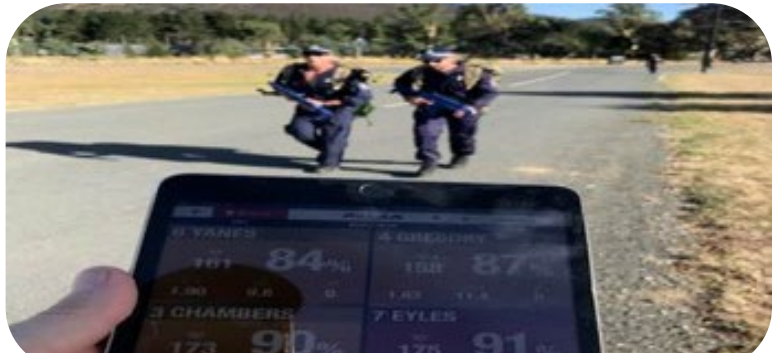
USING PHYSICAL ASSESSMENT TOOLS

Evidence-Based Training

Measure	Pack March 1 (mins:sec)	Pack March 2 (mins:sec)	Pack March 3 (mins:sec)
1RM Bench Press (kg)	-.360*	-.318*	-.295*
Bench Ratio (%)	-.465**	-.365*	-.379**
1RM Squat (kg)	-.401**	-.335*	-.316*
Squat Ratio (%)	-.500**	-.381**	-.396**
1RM Deadlift (kg)	-.288*	-0.248	-0.215
Deadlift Ratio (%)	-.403**	-.294*	-.305*
1RM Pull-up (kg)	-.452**	-.439**	-.416**
Pull-up Ratio (%)	-.607**	-.512**	-.541**

** Correlation is significant at the 0.01 level (2-tailed).

(Robinson et al., 2018)



USING PHYSICAL ASSESSMENT TOOLS

Evidence-Based Training

- To review the effectiveness of training through evidence-based research

	TP 1	TP 5
Bodyweight (kg)	88.8 ± 8.3	89.5 ± 8.7
Absolute Bench Press (kg)	109.7 ± 19.8	118 ± 19
Relative Bench Press (ratio‡)	1.23 ± 0.20	1.32 ± 0.19
Absolute Squat (kg)	125.8 ± 24.5	136.7 ± 25.1
Relative Squat (ratio‡)	1.42 ± 0.25	1.53 ± 0.26
Absolute Deadlift (kg)	151.6 ± 26.3	162.6 ± 29
Relative Deadlift (ratio‡)	1.71 ± 0.25	1.82 ± 0.28
Absolute Pull-up (kg)	121.4 ± 14.9	126.7 ± 15.6
Relative Pull-up (ratio‡)	1.37 ± 0.15	1.42 ± 0.14

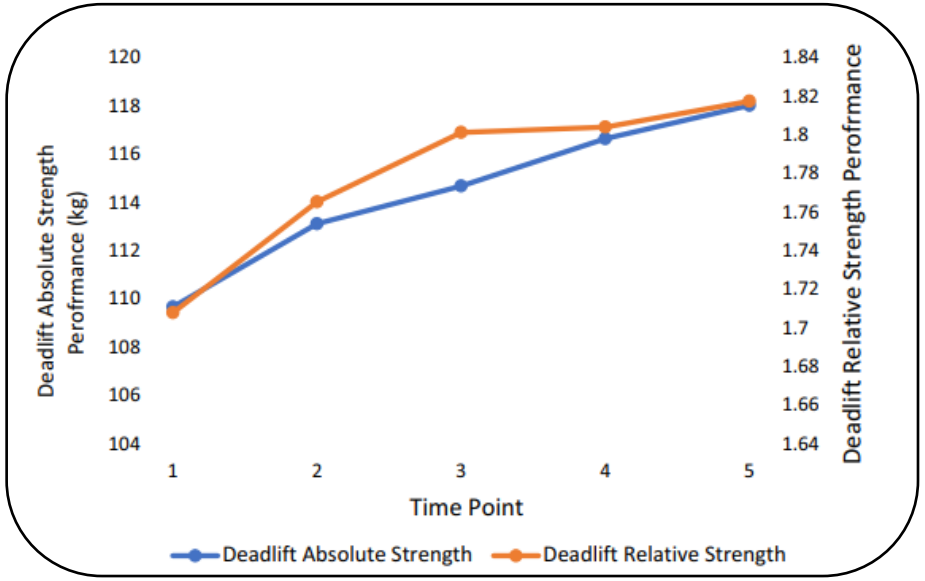
(Talaber et al., 2022)

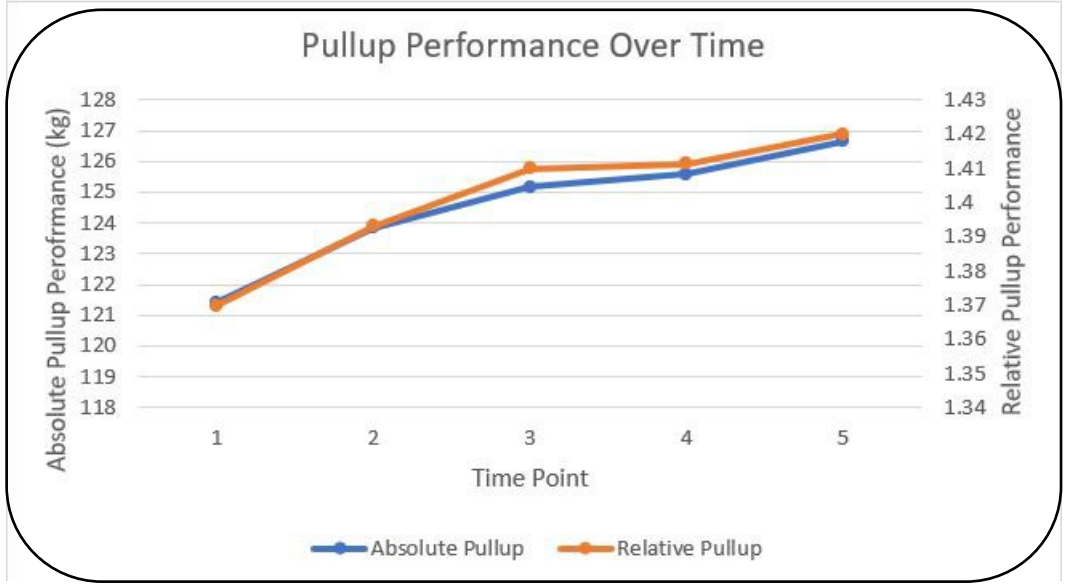
USING PHYSICAL ASSESSMENT TOOLS

Evidence-Based Training

- To review the effectiveness of training through evidence-based research

(Talaber et al., 2022)






POLICE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USING PHYSICAL ASSESSMENT TOOLS

Evidence-Based Training

- Purpose of the testing must be understood
- Relationships between different general fitness and injury risk / task performance / health factors need to be considered in context.
- The research can be used to inform evidence-based training as well as a means of quality control

References or further information please contact the Tactical Research Unit at tru@bond.edu.au

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PHYSICAL FITNESS ASSESSMENTS & EVIDENCE-BASED TRAINING IN TACTICAL POPULATIONS

Prof Rob Orr