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Program D2.1 Firefighter health, safety, and wellbeing on the fireground

CHARACTERIZATION OF THE PHYSICAL DEMANDS & FITNESS FOR PURPOSE IN AUSTRALIAN TANKER BASED BUSHFIRE FIGHTERS

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Fire ground Stress and Strain

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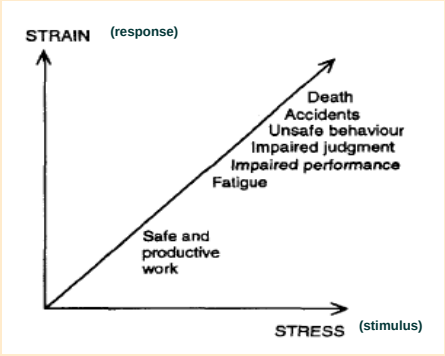

Budd, Brotherhood et al. (1997). Project Aquarius

What is the best way to identify individuals at risk on the fire ground?

Fitness for purpose (operational readiness) testing

Project Outline

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Project Goals

1. Identify the physical demands of common bushfire tasks
2. Quantify the hardest fire fighting tasks
3. Validate a method to ensure bushfire fighters are operationally fit for purpose

Deliverables for Agencies

1. Quantified data on simulated bushfire suppression tasks
2. A reliable and valid fit for purpose protocol for tanker based bushfire fighting

PART 1: Physical demands of fire fighting?

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Physical demands of tanker based fire fighting

- Simulated Vs Real
  - Operational assistance
  - Compared to real time bushfire data
  - Reproducible
- Variety of physiological measures:
  - Heart rate
  - Physical activity
  - GPS (speed, elevation & distance)
  - Task Duration
  - Expired air (gold standard)

Subject Characteristics

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- Greendale and Blackwood brigades (Region 15)
- Multiple participations May – September 07
- Temp ranges between 4.5 & 16.9ºC

	Value ± SD	Range
N	25	19M, 6F
Age (yrs)	43.8 ± 14.5	16 - 67
Height (cm)	170.0 ± 8.6	151.3 - 183.6
Weight (kg)	81.0 ± 14	51.2 - 103.9
BMI	28.1 ± 3.4	20.3 - 31.1
Years of Service	10 ± 9.2	0.5 - 30

Individual task demands

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Ten major tasks included with positional, gradient & operational variations

Fireground task	Position	Oxygen Consumption (L/min)	Duration (sec)
Static hose spray (n = 7)	Solo	**0.81 ± 0.26**	120.20 ± 0.26
Blacking out with hose (n = 14)	Lead position	**1.57 ± 0.33**	127.45 ± 30.42
Charged hose advance on flat ground (n = 9)	Lead position	**1.88 ± 0.69**	46.06 ± 6.81
Spot fire rake hoe work (n = 14)	Solo (75 strokes)	**2.32 ± 0.56**	100.75 ± 16.48
Hose advance uphill (n = 9)	Second position	**2.55 ± 0.48**	68.65 ± 14.44
Prolonged rake hoe work (n = 10)	Solo	**2.56 ± 0.31**	121.06 ± 12.51

* 40-49 year old Australian men have an average maximum oxygen consumption of 2.88 L/min OR 89% of max for hose advance uphill

* Gore & Edwards (1996). Australian Fitness Norms.

Task demand: Intensity Vs. Duration

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Physical demands of tanker based fire fighting

Men

Classification ↓

	<50 sec	50-100 sec	100+ sec
Light			Static hose spray
Moderate	Quickfill pump carry Charged hose advance (75m)	Hose advance 80m flat	Quickfill pump trailer set up
Heavy	Charged hose advance (75m)	Manual hose retraction 75m	Blacking out (hose)
Very Heavy	Charged hose advance (75m)		Spot fire rakehoe Knapsack hiking Blacking out (rakehoe) Knapsack spraying
Unduly Heavy		Hose advance 80m uphill	Prolonged rakehoe

Duration →

Women

Classification ↓

	<50 sec	50-100 sec	100+ sec
Light			
Moderate	Quickfill pump carry		Static hose spray
Heavy	Charged hose advance (75m)	Hose advance 80m flat	Quickfill pump trailer set up
Very Heavy	Charged hose advance (75m)		Blacking out (hose)
Unduly Heavy	Charged hose advance (75m)	Hose advance 80m uphill Manual hose retraction 75m	Knapsack spraying Prolonged rakehoe Spot fire rakehoe Knapsack hiking Blacking out (rakehoe)

Intensity Classifications from: McArdle WD, Katch FI and Katch VL (1996). **Exercise Physiology.** Fourth edition.

PART 2: Developing a fit for purpose test

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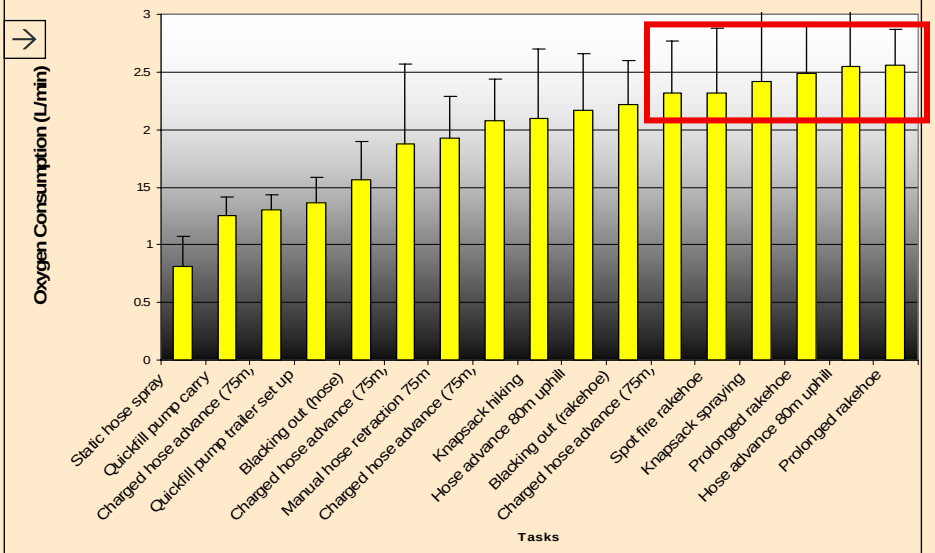
Developing a fit for purpose standard



Developing a fit for purpose test

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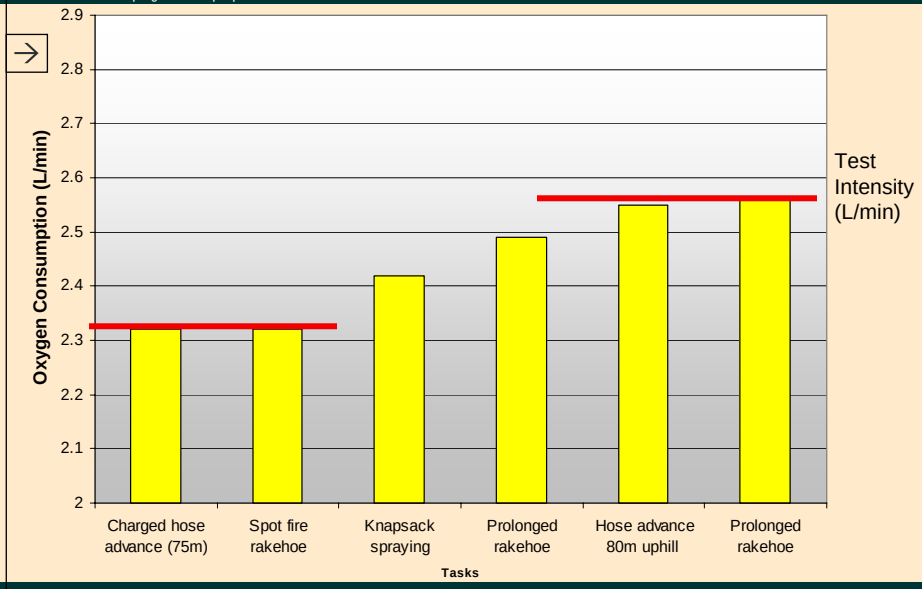
Developing a fit for purpose standard



The Fit for Purpose Test

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Developing a fit for purpose standard

1. Hose Advance
   - Obstacle negotiation
   - Weighed branch

2. Arm Cranking

3. Repeat numerous 'laps' in set time at an intensity matched to metabolic level

" Designed for firefighters, developed with firefighters, and tested by firefighters "

This time next year…..

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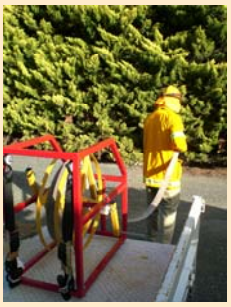
Program D2.1 The king of programs

1. ‘Fit for purpose’ prototype:
   - Speed
   - Weighted branch
   - Duration
   - Reliability
   - Sensitivity



2. Extensive fire fighter data on:
   - Fitness
   - Health
   - Operation job test performance
3. The standard
   - Validated screening protocol for bushfire fighters

Important considerations for fire agencies:

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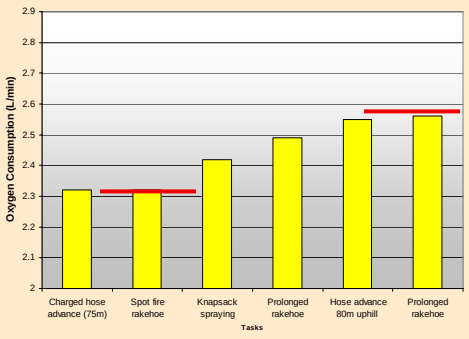
- Implementation of a fit for purpose standard
  - Safety standard Vs Productivity standard
    - Safety reserves
  - Retention
  - Redistribution into specific roles
  - Campaign fire deployment
  - Who administers the test?



- Increased agency participation in development of standard
  - Standard most valid to states that participate

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