THE BUSHFIRE FIGHTING TEST: Quantifying a safe standard of fitness and health in CFA volunteers.

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A potential problem

In Victoria alone:
- 58,000 volunteer fire fighters
- 400 career fire fighters
- Mandatory testing for career fire fighters in recruit course
- Minimum fitness for entry
- No mandatory testing or standards for volunteer

Same fires
A POTENTIAL PROBLEM

Environmental conditions
(fuel load, terrain, temp., humidity)

Demands of bushfire

Physiological capability

Considerations
- Fitness
- Health
- Experience
- Fatigue
- Nutrition

Over exertion injury

Successful, safe bushfire suppression

Overexertion related injury

Fire ground injury caused by physical demands exceeding physical capability.
- Sudden cardiac death
- Heat illness
- Muscle strain/tear

- Traditionally measured in
  - lost man hours
  - compensation costs
  - mortality rate

- Overexertion injury risk unknown in Aus volunteer FF. Risk may be high.

- Risk mediated by operational readiness tests

Is this a good place to stand?
Existing operational readiness tests

- Predictive tests of productivity & safety during fire suppression
  - USFS pack test
  - Multistage 20m shuttle run (beep test)
  - CFA challenge test
  - Bushfire fighting test

Program D2.1 problems summarised

1. Physical demands of tanker based bushfire suppression unknown

2. Physical capabilities of volunteer bushfire fighters involved in tanker based bushfire suppression are unknown

3. Current operational readiness tests may not be appropriate for tanker based bushfire suppression
**Bushfire test development process**

**Invention**
- Physical demands
- Test creation
- Test reliability
- Operational readiness comparisons
- Test sensitivity
- Operationally viable

**Industry consultation**

- Relevance through fire fighting literature
- Input of fire fighters, instructors and operational people
- Input of emergency services industry & other academics
- Test has to be valid, simple and useful to have real world application
Assessing Physical Demands

Prescribed burn job by job task analysis:
- Mucking up / rake hoe
- Hose spraying
- Equipment carry
- Hose advance (through terrain)
- Fireline walking (varied terrain)

- Expired air sample analysis, HR, physical activity monitors
- Frequency & duration
- Maximal & stratified levels obtained

Test creation

1. Relevance: literature, current tests - bushfire
2. Good science: robust, valid test

Prospective test

- Durability
- Test-task specificity
- Idiot proof
- Practicality

Industry input
The proposed bushfire fighting test

1) Hose advance Phase
2) Arm Crank Phase
3) Repeat

Factors to consider:
- Resistance mechanism
- Practical distance
- Modality changes
- Dexterity component
- Reliability

Operational Readiness Comparison

Operational readiness
- Pack test
- Beep test
- CFA challenge test
- Bushfire fighting test

Aerobic capacity
- Treadmill VO$_{2\text{max}}$
  (lab)

- Correlation data between all tests
- Importance of aerobic capacity in bushfire suppression
- Additional health and fitness testing
  - Grip strength
  - Lung function
  - Health
Association between BMI and health characteristics (indexed to age)

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Associations in fire fighters with CVD risk factors:
- Systolic BP
- Diastolic BP
- Total cholesterol
- Cholesterol/ HDL ratio

Adapted from Clark et al., 2002
Establishing a standard/guideline

1. Bushfire tasks
2. Test
3. Reserve

Physical Demand

Test Intensity

Real world

Test

Metabolic equivalent of most arduous job task + Reserve level (%max) = Guideline

- Protocol design.... Time until exhaustion Vs level
- Durational component
- CFA HQ decision
  - People Vs productivity per person
Does the test detect skill?

- Does the bushfire test detect fire fighting specific skill?
- Does the bushfire test pick up fire fighting performance increase independent of increased aerobic capacity?

Does the test detect fatigue?

- Conducted in CFA volunteer fire fighters
- Important as bushfire suppression is intermittently demanding over long durations
- Can the bushfire test be used to pick up common operational related fatigue?
- Model can also be used to test intervention strategies in the future
Outcomes

1. Understanding of the physiological demands and operational readiness needs of bushfire fighting in Australia

2. Understanding of the physiological capacity and operational readiness of Australian volunteer fire fighters

3. Validated and reliable operational readiness test for bushfire agencies

4. Some ability to mediate risk of overexertion injury in volunteer fire fighters

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