



## Police Officer Physical Abilities Requirements and Determination

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### Proposed Use of Time

- Occupational testing in North America
- Types of tests
  - Component, Simulation, Hybrid
- Process of test development
  - Structured approach
- Data we have for tests in Canada
  - Lessons learned
- Beer?



## Occupational Testing in Canada

### Historical Overview

- Occupational fitness - a relatively new term
- there are physical capabilities that are prerequisite to successful completion of job-related tasks in many physically demanding occupations
- Dorthand v Rawlinson (1977)
- encouraged the development of physical agility (abilities) tests



## Fit for Duty

- Assessing “occupational fitness” common in physically demanding occupations
- Bona Fide Occupational Requirement (BFOR): “a condition of employment that is imposed in the belief that it is necessary for the safe, efficient, and reliable performance of the job which is objectively, reasonably necessary for such performance”



## Fit for Duty

- Failure to screen out individuals who can not perform the physical duties may jeopardize the safety of the officer, their fellow officers, and the general public



## CHRA Bona Fide Occupation Requirements

### Guidelines (1985)

1. identify essential job-related tasks
2. identify skills and abilities required to complete job-related tasks
3. develop a screening protocol to ensure recruits could carry out essential tasks
4. establish standards that reflect ones ability to meet the min job requirements



## Meoirin v Govt BC

- Supreme Court Challenge in 1999
- Employer must justify standard:
  - Standard is rationally connected to job performance
  - Adopted in an honest and good faith belief it was necessary
  - Show the standard is reasonably necessary, and impossible to accommodate without undue hardship



## The Sweden Landscape

- Present practice for selection and retention of police officers
  - Any tests? In other occupations?
- Legal considerations in test development and implementation
  - Human rights act?
  - Bona fide occupational requirements?
  - Unions (applicant v incumbent)?



## Occupation Physical Abilities and Fitness Testing

## Occupational Testing

- Types of tests:
  - Content Validity Testing
  - Construct Validity Testing
  - Hybrid (Blended)



## Content Validity Tests

- Simulations of police work
- Critical elements identified and included
- Mimic activities and demands of critical incidents
- Candidates compensate for one element by performing another well



## Task Simulation Testing

Strength	Weakness
Content validity	Limited value in health related education
Measure essential and critical elements of tasks	Learning curve must be factored in to procedures
Evaluates motor abilities	Adverse impact to smaller individuals
Flexibility in execution allows candidates to compensate	Tests result in near maximal physical exertion
Must manipulate external resistance	Weighting of elements is impossible (timed)
Candidates acceptance of test is high (represents job demands)	Construct validity difficult to establish



## Task Simulation Examples

- Wilkie, 1974 (California)
- Davis & Wilmore, 1979 (California)
- Jordan & Schwartz, 1986 (New York)
- Farenholtz & Rhodes, 1988 (BC)
- Gaul & Wenger, 1992 (RCMP)



## Construct Validity Tests

- Measure the underlying physiological demands of police work using standardized tests (ie. Push up, etc)
- Base minimal criteria on weighted combination of these
- Stepwise multiple regression, canonical regression, and/or principal component analysis (fitness test to performance measure)



## Fitness Component Testing

Strength	Weakness
Construct validity	Tests are twice removed from reality
Educational	Predictive power of each test is reduced
Well understood protocols and norms	Low face validity
Each test element in battery can be weighted to reflect reality of job	Motor abilities are rarely evaluated while essential to performance
Tests are easy and safe to administer	Dynamic strength difficult to measure



## Fitness Component Examples

- Booth & Hornick, 1989 (Colorado)
- Collingwood et al., 1989 (Quebec)
- Palmer, 1984 (Utah)
- Serra, 1984 (Washington State)



## Hybrid Tests

- Combine items designed for both content- and construct validity tests
- Add important constructs not evaluated in task simulations



## Hybrid Examples

- Gledhill et al., 1988 (Ontario)
- Jamnik et al., 2010 (Ontario)
- Vancouver City Police



## Occupational Fitness Tests

- procedures are time consuming
- field tests have large standard error of the estimate
- hard to link to job-related duties
- used to monitor, motivate, and facilitate individualized program design



## Physical Abilities Tests

- can be more directly related to specific occupational demands
- measure job-related motor abilities
- stress the physiological systems
- can form basic entrance or exit criteria



## PARE

- [http://www.viuvideos.com/video/xafC5DhD\\_-M/the-pare-test/](http://www.viuvideos.com/video/xafC5DhD_-M/the-pare-test/)



## Other Considerations

- Incumbent v applicant
- Applicant entrance v exit
- Learning curves



## Entrance Criteria vs. Exit Criteria

Entrance criteria need to be more global, with less skill. Trainable components should be measured in exit criteria (i.e. take-downs)





## Process for Test Development

### Canadian Human Rights Act Bona Fide Occupation Requirements

**Guidelines (1985)**


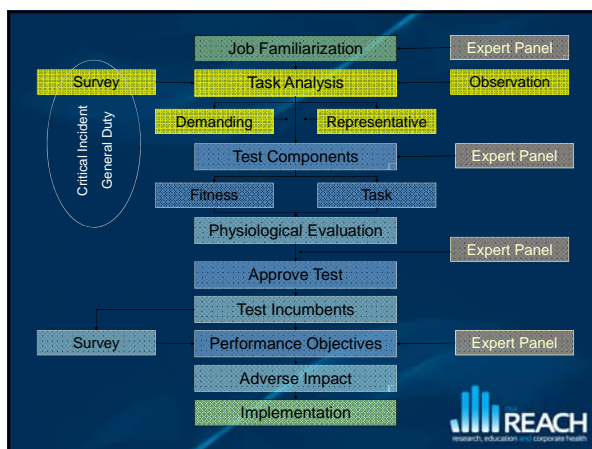
1. identify essential job-related tasks
2. identify skills and abilities required to complete job-related tasks
3. develop a screening protocol to ensure recruits could carry out essential tasks
4. establish standards that reflect ones ability to meet the minimum job requirements



## JIBC and RCMP

**Purpose:**

- To determine whether the physical abilities tested through the POPAT or PARE continue to be bona fide occupational requirements of police work.
- ... a core of essential job-related physical abilities that must be performed in the regular course of duties

## Task Analyses:

There are a core set of physical abilities required in order to function as a police officer, regardless of age, gender, race or geographic location.



## Task Analysis (3 prong)

- Developed two self-report instruments for data collection
  - general duty
  - critical incidents
- N=278; 96% response rate (267)
- ride along validation using 50% of sample
- performed 139 ride-alongs during which activities were recorded



## General Duty Survey

- Necessity of Physical Activities
- Frequency of Physical Activities
- Time Spent Performing Physical Activities
- Effort Required



## Critical Incident Survey

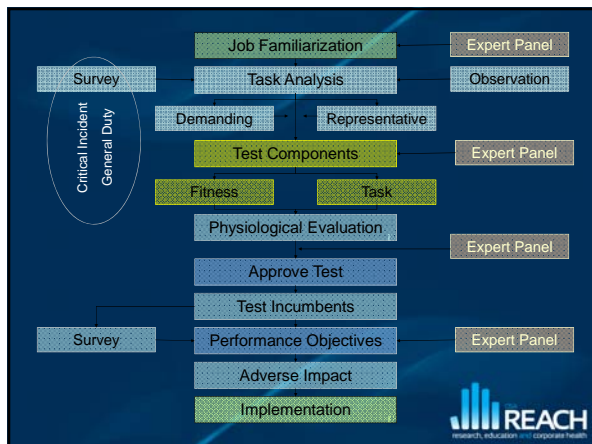
- Most demanding Physical Activities
- Effort Required
- List of activities in:
  - Getting to the problem
  - Controlling the problem
  - Removing the problem





## Direct Observation

- 139 shifts or 1540 hours of direct observation
- two research assistants
- minute-by-minute data, including HR
- up to nine activities per minute
- representative number of hours in shifts, days and months to validate surveys



## Simulation Test Development Approach

- **Getting to the Problem**
  - Chase, run, jump, change direction, stairs
- **Solving the Problem**
  - Physical arrest, push, pull, twist/turn
- **Removing the Problem**
  - Lifting, carrying



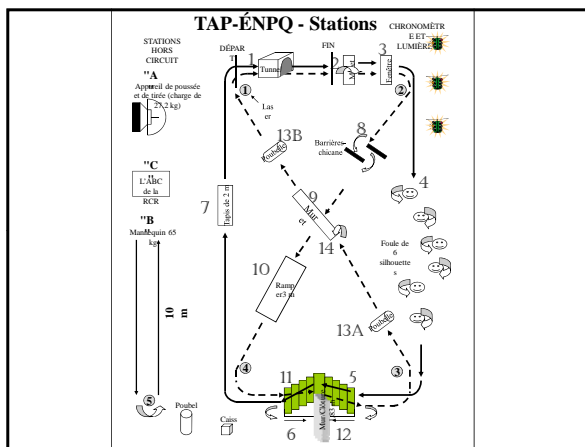
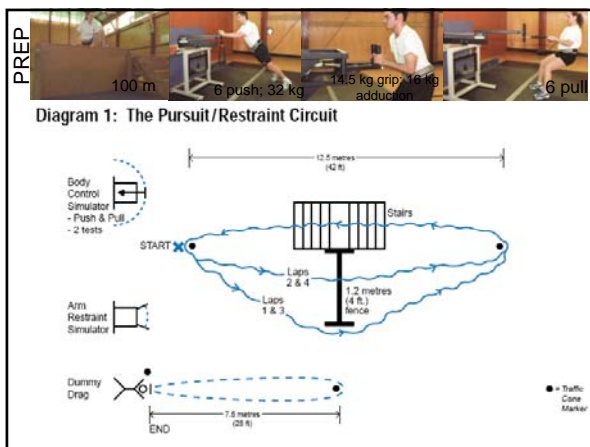
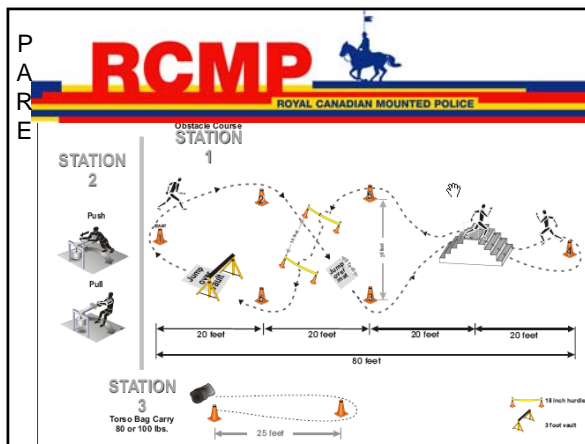
## POLICE FITNESS TESTS IN CANADA

- **BRITISH COLUMBIA:** POPAT (Police Officer Physical Abilities Test)
- **RCMP:** PARE (Physical Ability Readiness Evaluation)
- **ONTARIO:** PREP (Physical Readiness Evaluation for Police)
- **QUEBEC:** TAP-ENPQ (Test d'Aptitude Physique-École Nationale de Police du Québec)



### POLICE FITNESS TESTS IN CANADA

	FORMAT	
	SESSION 1	SESSION 2
POPAT		<ul style="list-style-type: none"> <li>• Timed obstacle course</li> <li>• 1x Pass/Fail station</li> </ul>
B. C.		
PARE		<ul style="list-style-type: none"> <li>• Timed obstacle course</li> <li>• 1x Pass/Fail station</li> </ul>
RCMP		
PREP		<ul style="list-style-type: none"> <li>• Timed obstacle course</li> <li>• 20m Shuttle run</li> </ul>
Ontario		
ENPQ	<ul style="list-style-type: none"> <li>• 20m Shuttle run</li> </ul>	<ul style="list-style-type: none"> <li>• Timed obstacle course</li> <li>• 3x Pass/Fail stations</li> </ul>
Québec		



TIMED OBSTACLE COURSE					
	Equipment	Length	Laps	Passing time	Obstacle type/ number
		m	N	s	
POPAT B. C.		400	• 6x O	255	5/28
PARE RCMP		350	• 6x O	285 in 240 out	6/27
PREP Ontario	• 4.5 kg belt	100	• 4x O	162	6/13
ENPQ Québec	• 4.5 kg belt • 2 kg jacket	350	• 3x O • 2x X	392	13/48

	CHARACTERISTICS			
	POPAT B. C.	PARE RCMP	PREP Ont	ENPQ Qc
Obstacle number	Few	Few	Few	Many
Obstacle type	Few	Few	Few	Many
Length	Long	Long	Short	Long
Specificity & task simulation	Lower end	Lower end	Lower end	Higher end
Number of testing sessions	1	1	1	2
Organisation	Simple	Simple	Simple	Complex
Clients	Police/Student	Police/Student	Students	Students
Validation				
Task analysis	Yes		Yes	Yes
Task simulation	Yes		Yes	Yes
Expert judgment + Likert scale	(partial)		Yes	Yes
VO <sub>2</sub> requirement	Yes	Yes	Yes	Yes
Strength requirement	Yes	Yes	Yes	
Female/Male success rate	Lower	Lower	Lower	Higher

Part 1	TIMED OBSTACLE COURSE ITEMS			
	POPAT B. C.	PARE RCMP	PREP Ont	ENPQ Qc
• 72.5 cm (28.5 in) inside Ht tunnel				5x
• 91 cm (3 ft) barrier	9x 91cm	6x 91cm		5x 90 cm
• 65.5Wx95H cm window at 16 cm from floor				5x
• zig-zag run in 6 human dummy crowd				3x
• stair up & down: Nx N steps	6x 5st.		4x 5st.	10x 6step
• 183 cm (6 ft) flat fence				3x
• Horizontal garbage can obstacle, 61 cm (24 in) Ht				4x
• jump mat : Nx N cm	6x 183cm			3x 200cm
• In & Out fence		6x152cm		2x
• Jersey barrier: Nx Ncm			4x 101	2x 106cm
• 3 m (9.8 ft) long crawling station, Ht: 40 cm (16 in)				2x
• 6.64 m (21 ft) long x 25 cm (9.84 in) wide 106 cm elevated (42 in) passage				2x
• 183 cm (6 ft) wire fence				2x

Part 2	TIMED OBSTACLE COURSE ITEMS			
	POPAT B. C.	PARE RCMP	PREP Ont	ENPQ Qc
• 2x 45 cm (18 in) vertical jumps with 3 m (10 ft) between	6x	6x		
• 6x 180' Pulls with N kg load	36.4 kg	36.4 kg*	31.8 kg	**
• 1x 2 arm adduction with 16,8 kg (37 lb) each arm			1x	
• 6x 180' Pushes with N kg load	36.4 kg	36.4 kg*	31.8 kg	**
• 1x 2 arm adduction with 16,8 kg (37 lb) each arm	10x		1x	
• 10x Modified squat thrusts (alternate touch of floor with back and chest) with 0.91 m (3 ft) barrier in between				
• 68 kg (150 lb) dummy pull over 15 m back & forth course	1x		1x	**
• HR measure after the course				

\*\* Untimed items for ENPQ

	PASS/FAIL UNTIMED STATIONS			
	POPAT B. C.	PARE RCMP	PREP Ont	ENPQ Qc
<ul style="list-style-type: none"> <li>• 6x 180" Pulls with N kg load</li> <li>• 6x 180" Pushes with N kg load</li> <li>• 66 kg (150 lb) dummy pull over 15 m back &amp; forth course</li> <li>• 45,5 kg (100 lb) bag to lift and carry over 10,6 m (50 ft) back and forth</li> <li>• CPR in fatigue state</li> </ul>	1x	1x*		29.5 kg 29.5 kg 1x  1x

\* 36.4 kg (80lb) at entrance of academy


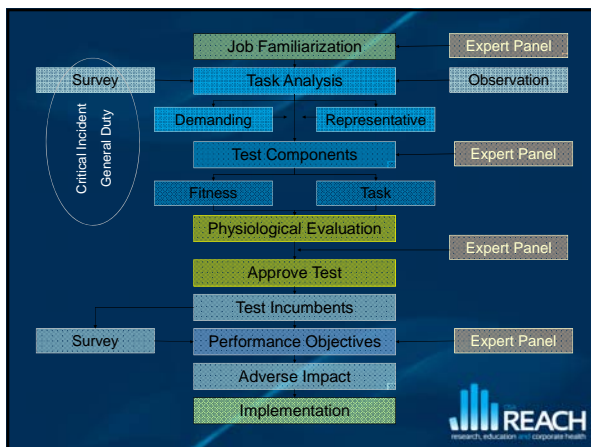
## Fitness Test Development Approach

- **Criterion Measure**
  - A series of simulated job tasks?
- **Fitness Component Testing**
  - Aerobic capacity, anaerobic capacity, strength, endurance, etc
- **Correlation, Regressions**
  - Most representative group of tests




## Re-invent the Wheel?

- What can be used from others and adapted to the Swedish environment?

## Min. Aerobic Contribution?

- US National Institute of Occupational Safety and Health – “action limit”
- Energy expenditure > 14.6 kJ/min or oxygen consumption > 0.7 L/min
- Max permissible is 3X > action limit
- Between action limit and max is undesirable, may require specific selection and/or training



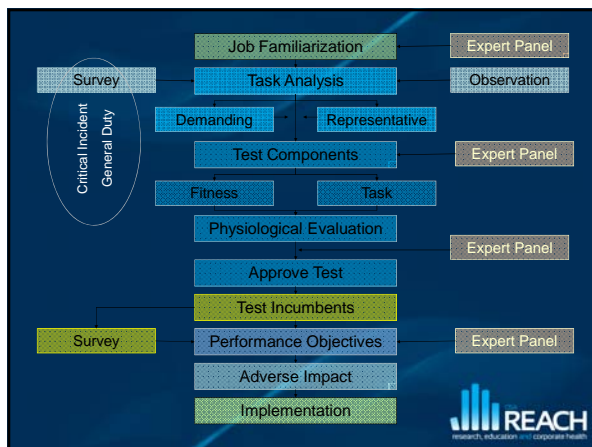
## Min. Aerobic Contribution?

- Employment at the “action limit” for an 8 hour shift required a max VO2 of 1.74 L/min
- Common requirement expressed for public safety is 45 ml/kg/min
- Some test this component separately



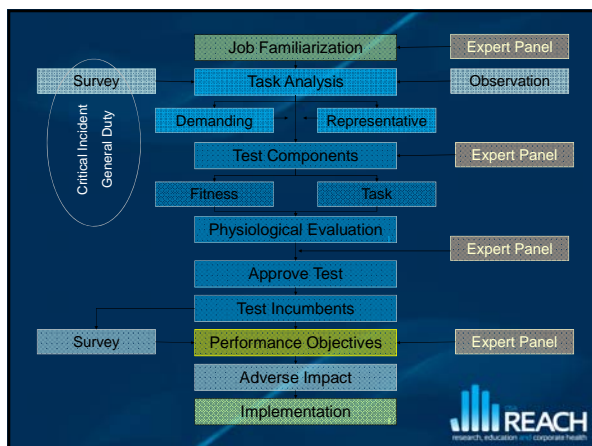
## Physical Characteristics

- R= -0.61 POPAT and VO2
- R= -0.72 POPAT and Anaerobic Capacity
- R= -0.36 POPAT and Pull Ups
- R= -0.40 POPAT and Sit Ups
- R= -0.43 POPAT and Push Ups
- R= -0.34 POPAT and Grip Strength



## Representative Sample

- True representative sample
- Matching the age and gender of present force
- Ideal representative sample
- Remove those with lower than X ml/kg/min
- Gender mix
- 50/50 will make different criterion



## Setting **THE** Criterion

- True representative sample
- Analyze for gender and ethnicity effects
- Set criteria as?
  - The lowest score of incumbent? (NO)
  - 2 or 3 st dev away from mean?
    - Exclude 16.7 or 2.5% of incumbents
    - Can pass with training?
- Impact of sample...



## PREP Example

- PREP, standard cut-point was calculated from the mean + 1 SD criterion, was a BFOR
- Rationale: deriving criterion-based standards from the on-the-job applications of female police officers; Self-selected force or speed based on their perception of the urgency
- Likely that the 16.7% of participants who fell beyond the PREP cut-point of the mean + 1 SD would fall within this cut-point
- Ontario Human Rights Commission, 2002



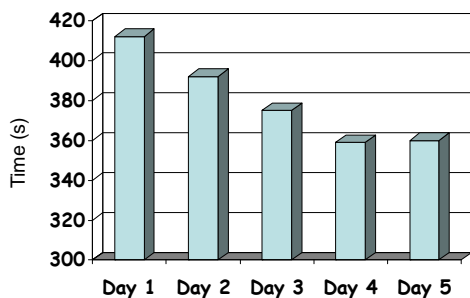
## Correctional Officers

- Female mean + 1sd for criterion score
- Assumption that the 16.7% would pass with heightened urgency
- Jamnik et al., Appl. Physiol. Nutr. Metab. **35**: 59–70 (2010)



## A firefighter example

Stewart Petersen, PhD,  
University of Alberta



Effect of practice on completion time of the CF/DND FF Test in 21 Canadian Forces firefighters, *familiar* with the test. Day 2 – 5% improvement over Day 1; Day 3 – 4% improvement over Day 2; Day 4 – 4% improvement over Day 3; Day 5 – no improvement over Day 4

## Methods for Establishing a Minimum Standard on Task Simulation Tests

- Statistical analysis of data from representative sample?
- Average performance time plus 2 SD?
- Natural break?
- Slowest performance of an incumbent?
- Subject Matter Expert feedback?



### Methods utilized to set pass-fail score for *SCREENING*

1. Descriptive statistics on incumbent test scores (normal distribution?)
2. Set potential cut-points (e.g., mean + 2 SD)
3. Use subject matter expert evaluation to confirm cut-point (transition between acceptable and unacceptable)



### “Sampling” the Workforce

Normal method for establishing performance standards

BUT...

What constitutes a representative sample?  
Volunteers?

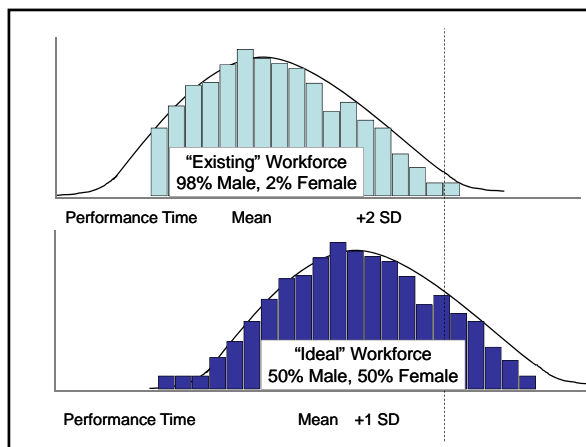
Should we “over-sample” for age, gender, ethnicity, etc? (e.g., Sothmann et al, 2004)



### Effects of “oversampling”

Next slide (graphic) is a hypothetical illustration of the potential outcome

Following slide shows actual data from FF Test performance





### Example of "Over-Sampling"

Male and female performance times on the CF/DND FireFit Test

Male only (n=30)  
Mean Time + 2 SD = 467 s

Combined male and female  
Mean Time + 1 SD = 468 s

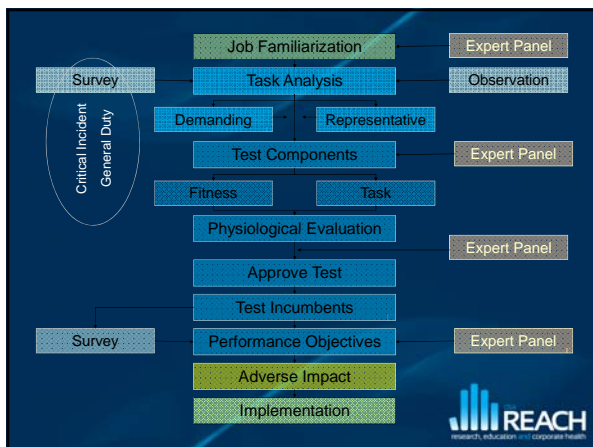
Female only (n=23)  
Mean Time + 0.5 SD = 474 s

1 s

8 s

### SME / Video

- It is common to use video tapes of persons completing the test at the cut-off, and 0.5 st dev increments in both directions
- SMEs view tapes and rank them as acceptable pacing or unacceptable
- Southmann et al., 2004 Ergonomics



### Does the test Discriminate?

- Cause adverse impact to any group?
  - Women
  - Ethnicity (typically size related)
- Is the criterion within the possibility of the majority of that group passing with training

## Trainability?

- Training as accommodation for adverse impact; Can a group, with training pass?
- Present fitness a limiting factor?
- Is it reasonable a person of either gender or any ethnicity pass?
- Increase 5-12% with repeated exposure
- Female RCMP recruit (n=209) PARE = 4:10
- Leave academy PARE = 3:36
- Improve 13.6% (10.6 in males)



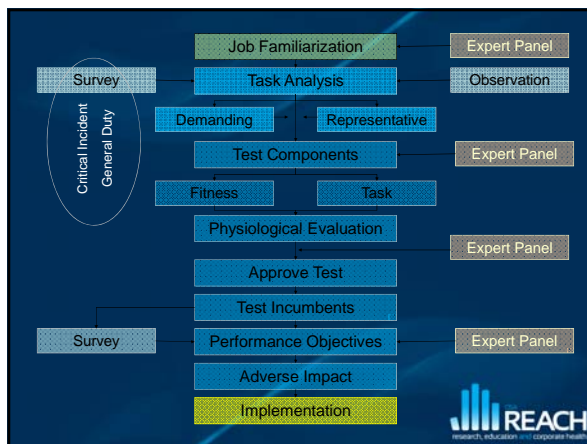
## Real data

		Applicant		Incumbent	
		Pass	Fail	Post	Pre
MALE	Pass	92	8	98	68
	Fail	8	8	2	32
FEMALE	Pass	69	31	94	16
	Fail	31	31	6	84



## Canadian Courts

- Prima facie case for adverse impact discrimination where disparity is > 5%
- Researchers use an 80% rule
- Discriminate if the pass rate of a specific group is less than 80% of the majority group
  - I.e. 80% men pass; < 64% of women pass – adverse impact on women



## Who, When and How

- Incumbents or applicants or both
- Time frame for implementation
  - If fail, time frame for training
- Punitive in nature for incumbents?
- Unions?



## Results and Lessons

## PARE 2007-2009

- Grew out of the POPAT
- Obstacle course retained with vault embedded
- Push/Pull 36kg, 4 controlled falls (not 10)
- 1 min 10 sec on average
- Lift and carry retained



1. How necessary it is that they be able to perform selected physical activities;
2. How frequent they perform these selected physical activities;
3. How much time they spend doing these selected physical activities during an average shift, and;
4. How much effort they feel is required to perform these selected physical activities.



## Frequency

- **Table 19.** Comparing self-report ratings of how frequently various physical activities are performed during duty.
- p. 36



## Effort

- **Table 20.** Comparing self-report ratings of how much effort they use in performing various physical activities during duty.
- p. 37



Comparison of previous Canadian findings with respect to "getting to the problem".

	2007 (UCFV)		1999 (UCFV)		1988 (RCMP)		1986 (JIBC)	
	Freq.	Med	Freq.	Med	Freq.	Med	Freq.	Med
Running (m)	44%	50	54%	125m	21%	161 m	1.4%	138 m
Stairs (#)	11%	25	3%	3	69%	54	36%	64
Vaulting (m)	16%		13%	1.5	6%	1.4	2.9%	1.5
Jumping (m)	6%	1.3	9%	1.5	7%	1.5	2.7%	1.5

Recommend:

- Maintaining the total distance at or near 340m
- Maintaining the time frame portion of the obstacle course at or near 2 min. 30 sec.



Recommend:

- Maintaining the total distance at or near 340m
- Maintaining the time frame portion of the obstacle course at or near 2 min. 30 sec
- Removing the six controlled falls from the obstacle course section
- To replace the 0.9 m (3 feet) barrier by a 1.5 – 1.8m (5 - 6 feet)
- barrier/wall, which would be better aligned with the reported data



## Controlling the Problem

- **Table 21.** Activities performed by officers in controlling the problem.
- p. 38



## Controlling the Problem

- **Table 21.** Activities performed by officers in controlling the problem.
- p. 38



## Controlling the Problem

- **Table 22.** Types of resistance used by subjects in critical incidents reported.
  - p. 39
- Recommend:
- Including two controlled falls (instead of four) between the push and pull activities.



Comparisons of previous Canadian findings with respect to "Pushing and Pulling".

	2007 (UCFV)		1999 (UCFV)		1988 (RCMP)		1986 (JIBC)	
	Freq.	Median	Freq.	Median	Freq.	Median	Freq.	Median
Pushing	23 %	81 kg	36 %	80 kg	7.5 %	61 kg	3.3 %	41 kg
		8 m		2 m		4.6 m		3 m
Pulling	24 %	87 kg	40 %	80 kg	16 %	61 kg	4.6 %	60 kg
		6 m		3 m		9.1 m		3 m

Recommendation:

- To investigate the resistance that can be exerted by both young male and female subjects (RCMP applicants, cadets, and/or Police officer) or prisoners using the push/pull unit.



Comparison of previous Canadian findings with respect to lifting, carrying, and dragging.

	2007 (UFV)	1999 (UCFV)	1988 (RCMP)	1986 (JIBC)
	Freq. Median	Freq. Median	Freq. Median	Freq. Median
Lift/Carry	24 % 76 kg 17 m	46 % 75 kg 5 m	34 % 31 kg 15 m	13 % 27.3 kg 7.6 m
Dragging	11 % 83 kg 6 m	22 % 80 kg 5 m	4.6 % 60 kg 3 m	

Recommendation:

- To replace the Weight Carry section by a Dummy Drag using a value comparable to the average weight of male suspects



We recommend:

- To add a Handcuffing Section in PARE, using the same simulator, protocol and weight as for the PREP;
- To include the Handcuffing Section immediately after the Push/Pull and included the time in the final PARE



- Manipulating an object: Manipulation of an object requiring the use of a flashlight to trigger a photo-cell that initiates and concludes the timing of the run. This task demonstrates fine motor control in a rested and fatigued state.



## Discrete Item Analysis

- 20 Subject Matter Experts (SMEs), and
- 900 regular member surveys
- a representative sample across Canada



Regular members' ratings of the ability of *individual elements of the obstacle* portion of the PARE to realistically represent the tasks required of police officers in the field.

	Too...	Percentage of responses						Too...
The matt jumps	Short	2.2	13.3	73.9	7.9	2.8	Long	
The stairs	Few	3.4	17.1	71.2	6.6	1.7	Many	
The low hurdles	Low	2.7	14.9	76.8	4.5	1.1	High	
The vault	Low	4.5	16.1	74.8	3.6	1.1	High	
The controlled falls	Few	0.8	10.5	70.7	11.5	6.5	Many	
The run length	Short	3.9	13.9	74.2	6.2	1.8	Long	



Regular members' opinion as to whether elements of the obstacle portion of the PARE should be retained 'as is' or modified.

	Retain as is (%)	Modify (%)
The matt jumps	85	15
The stairs	87	13
The low hurdles	85	15
The vault	85	15
The controlled falls	82	18
The run length	89	11



Regular members' ratings of the ability of the push/pull portion of the PARE to realistically represent the tasks required of police officers in the field.

	Percent of Response				
	VR	R	I	VI	
The push segment	<b>32.3</b>	<b>52.5</b>	12.5	1.9	0.8
The pull segment	<b>30.3</b>	<b>52.7</b>	14	2.2	0.8
The controlled falls	<b>21.9</b>	<b>23.4</b>	23.5	8.9	2.4
Duration	<b>26.5</b>	<b>54.1</b>	15.7	3	0.7



Regular members' ratings of the ability of *individual elements of the push/pull* portion of the PARE to realistically represent the tasks required of police officers in the field.

	Too...	Percentage of responses						Too...
The matt jumps	Short	2.2	13.3	73.9	7.9	2.8	Long	
The stairs	Few	3.4	17.1	71.2	6.6	1.7	Many	
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The vault	Low	4.5	16.1	74.8	3.6	1.1	High	



Regular members' opinion as to whether elements of the push/pull portion of the PARE should be retained 'as is' or modified.

	Retain as is (%)	Modify (%)
The push segment	87	13
The pull segment	87.5	12.5
The controlled falls	82.7	17.3



Regular members' ratings of the ability of the lift and carry portion of the PARE to realistically represent the tasks required of police officers in the field.

	Percent of Response				
	VR	R	I	VI	
Length of carry	<b>20.6</b>	<b>50.9</b>	19.5	7.7	1.3
Weight of carry	<b>21.0</b>	<b>51.3</b>	17.7	8.4	1.6
Rest time provided	<b>20.1</b>	<b>50.1</b>	19.5	8.1	2.3
Technique of carry	<b>18.8</b>	<b>46.0</b>	21.1	11.1	2.9



Regular members' ratings of the ability of *individual elements of the* push/pull portion of the PARE to realistically represent the tasks required of police officers in the field.  
(wt of carry = 71% retain as is)

	Too...	Percentage of responses						Too...
The matt jumps	Short	2.2	13.3	73.9	7.9	2.8	Long	
The stairs	Few	3.4	17.1	71.2	6.6	1.7	Many	
The low hurdles	Low	2.7	14.9	76.8	4.5	1.1	High	
The vault	Low	4.5	16.1	74.8	3.6	1.1	High	



## Final

	Police		SME	
	Support	Retain	Support	
Length of obstacle course	89%	88%	95%	Retain
The controlled falls	80%	83%	42%	Modify
The vault	80%	85%	91%	Too low
The push/pull	77%	73%	100%	Retain
The weighted carry	77%	54%	53%	Change
Manipulate object				Flashlight
Arm restraint / handcuff				Addition?





