Functional Work Capacity and Female Novice Candidates

Presented by Daleen Schoombee
The AngloGold Ashanti /Anglo Platinum approach

Medical surveillance

Medical Fitness

a) Satisfactory health, determined by a general medical examination
b) The absence of critical contraindications or impairments as determined by a risk-based medical examination i.e. medical surveillance

Fitness for work

a) age
b) anthropometry and physique
c) heat tolerance

Functional Work Capacity Assessment

Overall fitness
Physical and Functional Work Capacity Testing

- Development: Research
  - Multidisciplinary approach
  - Communication
• FWC is an objective assessment of an employee’s capacity to undertake specific tasks of a physical nature and to execute them in a safe and productive manner, without undue fatigue or adverse health consequences
Individual’s Work Capacity

FUEL (FOODSTUFFS)
- intake
- storage
- utilization
Pulmonary ventilation
Cardiac output
Oxygen use

Somatic Factors
- Gender
- Age
- Body size

Conditioning
- Health
- Training
- Fitness

Psychological Factors
- Attitude
- Motivation

Environment
- Climate
- Altitude

Physical Performance Capability

Functional work
- Type
- Intensity
- Duration
- Schedule
- Skill
- Body posture
- Tools, Equipment

Ergonomics: How to design for ease and efficiency
Two-fold approach

**Physical Work Capacity Test**

*Aim:* To determine the inherent aerobic capacity to perform manual work

*Consists of:* A 10 minute step test

**Functional Work Capacity Test**

*Aim:* To assess functional abilities necessary to perform a specific task

*Consists of:* 18 simulated work activities and environmental obstacles
Objective

AHS

Anglo Gold Health Service (PTY) Ltd

Healthy and physically competent worker

Safe work procedures and environment

Productive labour force
Goal of Functional Work Capacity Test Battery

Employee’s physical capabilities = Job requirements
Novices

Definition:

Person with no previous exposure to work in the mining industry
Test procedures

• Collection of information on past medical history
• Induction on test procedures and equipment used
• PWC Test
• Initial oral temperature measured
• Anthropometric data collection:
  - BMI: mass/height^2
• FWC Test: based on general manual work requirements
Physical Work Capacity Assessment
### PWC Test Interpretation

<table>
<thead>
<tr>
<th>Heart rate</th>
<th>Category</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 120 bpm</td>
<td>A</td>
<td>Fit for any physical work (Cool environments only)</td>
</tr>
<tr>
<td>120-150 bpm</td>
<td>B</td>
<td>Acceptable; Strenuous work allocation requires OMP discretion</td>
</tr>
<tr>
<td>&gt; 150 bpm</td>
<td>C</td>
<td>Unfit for any full shift work, of physical nature.</td>
</tr>
</tbody>
</table>
Anthropometric data

Body Mass Index: male and female novices

<table>
<thead>
<tr>
<th>BMI</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>22.7 (Males)</td>
</tr>
<tr>
<td>Normal</td>
<td>77.3 (Males)</td>
</tr>
<tr>
<td>Overweight</td>
<td>0 (Males)</td>
</tr>
<tr>
<td>Obese</td>
<td>0 (Males)</td>
</tr>
</tbody>
</table>
PWC Test results

PWC Test results: male and female novices

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>58</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>C</td>
<td>6.4</td>
<td>0.2</td>
</tr>
<tr>
<td>D</td>
<td>76</td>
<td>0</td>
</tr>
</tbody>
</table>
Physical Work Capacity Test Data: Female transfers

PWC Test Results of females (in service)

PWC Test Results \( (n = 31) \)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21</td>
<td>39</td>
<td>39</td>
</tr>
</tbody>
</table>

AHS
Anglo Gold Health Service (PTY) Ltd
The test battery is designed to evaluate functional work abilities:

**Environmental**
- Restricted
  - stoop walking
  - crawling
- Unrestricted
  - Climbing different steps
  - ladders and inclines
  - uneven surfaces
  - environmental obstacles

**Mobility**
- Restricted
- Unrestricted

**Job specific tasks**
- Work positions
  - Effort ability
    - Restricted
    - Unrestricted
  - Impact activity
  - Vibration exposure
  - Dynamic posturing and dexterity
Mobility in restricted work areas
Lifting capacity
Lashing

Unrestricted work area

Restricted work area
Load handling in restricted work areas
Functional Climbing
Pushing / Pulling
Dynamic posturing and dexterity
Basic principle

• Basic principle of assessment is that normal healthy individuals should be able to sustain a full-shift work rate at levels corresponding to about 30-40 per cent of maximal aerobic power or VO₂ max without undue fatigue.

(Astrand and Rodahl, 1977)
Assessment of FWC

\[
\text{Work output} = \frac{\text{Physiological effort}}{\text{Production}}
\]
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
<th>Work Output</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>Eminently fit: excellent potential</td>
<td>Work output achieved within the limits of self-paced work, negligible risk of fatigue</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Average; no restrictions</td>
<td></td>
</tr>
<tr>
<td><strong>C-upper</strong></td>
<td>Endurance limitation identified: will not be productive</td>
<td></td>
</tr>
<tr>
<td><strong>C-lower</strong></td>
<td>Marked endurance limitation: safety risk</td>
<td>Work output not achievable by means of self pacing; risk of early fatigue</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>Unacceptable: review/consider alternatives</td>
<td></td>
</tr>
</tbody>
</table>
Multi-level application of FWC assessments

Level 1
- In-service employees
- Job Allocation or Re-allocation
- Outcome

Level 2
- New/prospective employees
- Screening
- Rehabilitation

Level 3
- Entry level for rehabilitation
- Rehabilitation
FWC Test results

Barring test results: male and female novices

<table>
<thead>
<tr>
<th>FWC Test results</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0%</td>
</tr>
<tr>
<td>B</td>
<td>12.5%</td>
</tr>
<tr>
<td>C upper</td>
<td>50%</td>
</tr>
<tr>
<td>C lower</td>
<td>12.5%</td>
</tr>
<tr>
<td>D</td>
<td>25%</td>
</tr>
</tbody>
</table>

Males | Females

18 | 32
12.5 | 50
50 | 0
12.5 | 0
0 | 0
FWC Test results

Frequent lifting test results: male and female

- **Percentage**
  - **A**: 12.5 for Males, 1.22 for Females
  - **B**: 16.5 for Males, 9.8 for Females
  - **C upper**: 71.68% for Males, 0% for Females
  - **C lower**: 15.9% for Males, 0% for Females
  - **D**: 0% for Males, 4.9% for Females

**FWC Test results**

- **Males**: Green bars
- **Females**: Pink bars
FWC Test results

Maximum lifting (25 kg) test results: male and female novices

- **Males**: 78.3%
- **Females**: 67.1%

![Bar chart showing comparison between males and females for maximum lifting test results.](chart.png)
Limitations recorded in female worker’s capacity to perform manual work

FUEL (FOODSTUFFS)
- Intake
- Storage
- Utilization
- Pulmonary ventilation
- Cardiac output
- Oxygen use

Somatic Factors
- Gender
- Age
- Body size

Conditioning
- Health
- Training
- Fitness

Psychological Factors
- Attitude
- Motivation

Environment
- Climate
- Altitude

Physical Performance Capability

Functional work
- Type
- Intensity
- Duration
- Schedule
- Skill
- Body posture
- Tools, Equipment

Kroemer and Kroemer (1994)
Ergonomics: How to design of ease and efficiency
Literature review

- Differences in muscle mass, body composition and size between male and females
- Differences in load handling attenuate with training
Placement of females

- Individualised basis – avoid excluding females from certain jobs

- Communication between Human Resources and Occupational Health essential

- Individualised work capacity profile based on PWC/FWC Test results: serves as a guideline in placement
Application of test outcomes

Physical occupations (surface and underground)

- Very heavy
- Heavy
- Moderate
- Light

Criteria

PWC/FWC Requirements

Reference to ACGIH (American Conference of Governmental Industrial Hygienists)
Functional job analysis

**Functional Job Requirements**

**Occupation**

<table>
<thead>
<tr>
<th>Occupation</th>
<th>STOPE MULTI-TASK CREW MEMBER</th>
</tr>
</thead>
</table>

**The purpose of the job:** To assist the miner in carrying out his duties.

**Primary tasks of the job:**
- Drilling, sweeping.
- Scraper winch operation – install mono rope system.
- Assisting with mining construction – install timber and backfilling.
- Miners assistant, Waterjet operator.
- Making safe: Install stick support, install and remove mechanical props, Barring, Strata control and install ventilation control.

**Work environment**

<table>
<thead>
<tr>
<th>Surface</th>
<th>Underground</th>
<th>Restricted</th>
<th>Unrestricted</th>
<th>Boxholes</th>
<th>Incline shafts</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Interpretation of the score system**

**Level of priority:**
- 3: High level of priority/ > 66% exposure per work shift
- 2: Medium priority/ 34-66% exposure per work shift
- 1: Low priority/ less than 34% of the work shift = occasional exposure
- 0: No exposure

**Functional Analyses of the Occupation**

<table>
<thead>
<tr>
<th>Functional requirements</th>
<th>Level of priority</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A) Functional Mobility</strong></td>
<td></td>
</tr>
<tr>
<td>Walking – even surface</td>
<td>3</td>
</tr>
<tr>
<td>Walking – uneven surfaces</td>
<td>3</td>
</tr>
<tr>
<td>Walking up and down inclines</td>
<td>0</td>
</tr>
<tr>
<td>Climbing – stairs/ ladders 45 degrees Incline</td>
<td>2</td>
</tr>
<tr>
<td>Climbing – vertical ladders &gt;50 degrees</td>
<td>0</td>
</tr>
<tr>
<td>Climbing by means of a climbing chain – inclines more than 55 degrees</td>
<td>0</td>
</tr>
<tr>
<td>Climbing over environmental obstacles</td>
<td>3</td>
</tr>
<tr>
<td>Mobility in restricted work areas, stoop walking and crawling</td>
<td>3</td>
</tr>
<tr>
<td><strong>B) Work tasks /Manual Material Handling</strong></td>
<td></td>
</tr>
<tr>
<td>Making safe: barring</td>
<td>3</td>
</tr>
<tr>
<td>Handling of loads by means of lifting</td>
<td>3</td>
</tr>
<tr>
<td>Max load handling 25 - 30kg</td>
<td>3</td>
</tr>
<tr>
<td>Handling loads -pushing/pulling</td>
<td>3</td>
</tr>
<tr>
<td>Handling loads -pushing/pulling vertical</td>
<td>1</td>
</tr>
<tr>
<td>Lashing</td>
<td>3</td>
</tr>
<tr>
<td>Pack building or load handling in restricted work areas.</td>
<td>3</td>
</tr>
<tr>
<td>Work with a hammer</td>
<td>3</td>
</tr>
<tr>
<td>Work with a spanner to loosen and fasten nuts and bolts</td>
<td>1</td>
</tr>
<tr>
<td><strong>C) Work positions</strong></td>
<td></td>
</tr>
<tr>
<td>Squat / kneeling</td>
<td>3</td>
</tr>
<tr>
<td>Stoop</td>
<td>3</td>
</tr>
<tr>
<td>Work above head</td>
<td>3</td>
</tr>
<tr>
<td>Standing on a ladder scaffold</td>
<td>1</td>
</tr>
<tr>
<td>Supine</td>
<td>0</td>
</tr>
</tbody>
</table>

**Physical demand rating:** Very Heavy
# Communication of test results

## Job placement guideline

<table>
<thead>
<tr>
<th>Name of employee:</th>
<th>Company number:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The employee may work in the following environment:

### A) General

1. Wet conditions: Yes [ ] No [ ]
2. Vibration: Yes [ ] No [ ]
3. Other: Yes [ ] No [ ]

**Comments:**

### B) Underground

1. Stopes: Yes [ ] No [ ]
2. Haulages: Yes [ ] No [ ]
3. Boxholes: Yes [ ] No [ ]
4. Raises: Yes [ ] No [ ]
5. Incline shafts: Yes [ ] No [ ]
6. Stairs/ Ladders: Yes [ ] No [ ]

**Comment:**

### C) Surface

1. Unrestricted work area: Yes [ ] No [ ]
2. Restricted work area (goldplant -mills /ventilation pipes/ inside roofs of buildings etc.): Yes [ ] No [ ]
3. Even surfaces: Yes [ ] No [ ]
4. Uneven surfaces: Yes [ ] No [ ]
5. Stairs: Yes [ ] No [ ]

**The employee may perform the following:**

### D) Work tasks

1. Barring: Yes [ ] No [ ]
2. Handling loads -pushing: Yes [ ] No [ ]
3. Handling loads: Yes [ ] No [ ]
4. Pack building: Yes [ ] No [ ]
5. Work with a hammer: Yes [ ] No [ ]
6. Work with a spanner to loose or to fasten nuts/bolts: Yes [ ] No [ ]
7. Lashing: Yes [ ] No [ ]

**Comments:**

### E) Work positions

1. Squat: Yes [ ] No [ ]
2. Stand: Yes [ ] No [ ]
3. Stoop: Yes [ ] No [ ]
4. Work above head –LOW EXPOSURE: Yes [ ] No [ ]
5. Standing on a ladder or scaffold: Yes [ ] No [ ]

Recommended job category: [Blank]

Please do not hesitate to contact the RFA Centre for further assistance.

**Occupational Therapist (sign and print name):**

**Date:**

---

Note: The document contains a form with checkboxes for different environmental and work-related conditions. The employee's name and company number are not filled in. The form also includes comments sections and job position options.
We are not looking for supermen/women underground - only safe workers!!