WHAT IS A FUNCTIONAL CAPACITY EVALUATION?

A Functional Capacity Evaluation (FCE) is a systematic process of measuring an individual’s capacity to perform meaningful tasks on a safe and dependable basis in response to broadly defined work demands (Matheson 1996). 

An intensive, short term (usually one day) evaluation that focuses an individual’s major physical tolerances and abilities related to musculoskeletal strength, endurance, speed and flexibility. Testing includes a wide range of test activities and utilizes standardized, peer-reviewed and peer-accepted test procedures.

Practice Hierarchy – Safety, Reliability, Validity, Practicality and Utility

Best Practices Approach
COMPONENTS OF AN FCE

CASE FACTS

PHYSICAL EFFORT

FCE

ABILITIES / LIMITATIONS
PAIN RESPONSE
FATIGUABILITY

RELIABILITY

WHAT DO WE RELY ON?

- Medical opinions:
  - Diagnosis
  - Prognosis
  - Causation

- Work demands of pre- or post-injury or illness employment and work history:
  - Employer supplied work demands analysis or job demands analysis
  - Individual’s reported duties
  - NOC (Canadian) or DOT (USA)

NATIONAL OCCUPATIONAL CLASSIFICATION

- The authoritative resource on occupational information in Canada, it is used daily by thousands of people to understand the jobs found throughout Canada’s labour market.
- It organizes over 40,000 job titles into 500 occupational group descriptions.
- The NOC provides a standardized framework for organizing the world of work in a coherent system. It is used to manage the collection and reporting of occupational statistics and to provide understandable labour market information throughout the private and public sectors.
- Employment and Social Development Canada (ESDC), in partnership with Statistics Canada (STC), update the NOC according to 5-year Census cycles.
- Determines Job Title, Physical Abilities required, exposure to Environmental Conditions, Educational Requirements and a Description of the Job
- http://www5.hrsdc.gc.ca/NOC/English/NOC2011
EXAMPLE:

- Effort refers to an individual’s level of physical effort during test procedures.
- The level of effort demonstrated helps determine if the data obtained is an accurate representation of the individual’s maximum abilities.
- What factors are considered in this analysis?
  - Cardiovascular/Biophysical
  - Isometric
  - Behavioural

WHAT INFORMATION DOES THE FCE OFFER TO THE PHYSICIAN?

- Defines function
- Effort level put forth
- Reliability of pain and disability reports
- Comparison of abilities to job demands
- Does the individual meet the demands of their occupation and what, if any, accommodations are needed to facilitate a durable return to work.

PHYSICAL EFFORT – IS HE DOING HIS BEST?

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CARDIOVASCULAR

What do we expect to see if the individual is putting forth full effort?

- Research to support that activity that involves recruitment of large muscle groups causes heart rate to increase.

There was a direct relationship between the size of the active muscle mass and the magnitude of the increases in V02, HR, and MAP. Even though all subjects were positioned at the same relative intensity.

It was concluded that the same percentage of maximal voluntary contraction is directly influenced by the size of the contracting muscle mass.


"The leg left with the [largest] 15.4-kg weight produced the greatest physiologic stress."


CARDIOVASCULAR

What do we expect to see if the individual is putting forth full effort?

- Research to support that heart rate of 50% is definitive of high effort.

Methods. Subjects consisted of 41 volunteers (age 22 to 58 years) with a previously diagnosed musculoskeletal pathology of the spine or extremities...

Results. Overall accuracy in identifying participants' level of effort was 86.84%. The indicators of valid effort exhibited high positive (94.44%) and negative (80.00%) predictive values...

Conclusions. Through use of standardized indicators of sincere effort, certified EPIC Lift Capacity test evaluators were able to predict sincerity of effort with a high degree of reliability and validity...

"Further, the greater the increase above 50%, the easier it becomes to determine sincerity of effort."


ISOMETRIC – COEFFICIENT OF VARIATION (i.e. JAMAR)

What do we expect to see if the individual is putting forth full effort?

- Low variance in repeat tests indicates high effort – Coefficient of Variation that is not more than 15% indicates high effort, definitive for high effort at 10% or less.

AMA (American Medical Association) Guides 5th Edition indicate that if there is a 20% variation in 3 different readings, they are not reliable.

NIOSH (National Institute of Occupational Safety and Health) uses a different cut point [based upon Caldwell study].

"During the sampling period, strength variations within +/- 10% of the mean score should be tolerable."

Matheson LN. How do you know he tried his best? The Reliability Crisis. Industrial Rehabilitation Quarterly, Volume 1, Number 1, NMA Publication, Spring, 1988.
What do we expect to see if the individual is putting forth full effort?

- Bell curve distribution when graphing readings on the five-rung grip tests
- Standard deviation of less than 3.4kgs indicates possible low effort


“The present study results suggest that identification of low-effort patients can be significantly improved through examination of several different performance measures.

First, the patient’s SD score on the five-rung test should be calculated. We recommend using an SD score of 7.5lbs or less as a possible indicator of low effort.”


Rapid grip will be less than maximal grip in position two or three

Test administration technique is important

... The REG was positive on the fake side 100% of the time.


Competitive test performance – behavioural observations such as preparing for the test, wiping hands before grip or dexterity tests, asking the test is time, asking for their score

RELIABILITY OF PAIN AND DISABILITY REPORTS

- The assessment of the dependability and accuracy of an individual's subjective reports of pain and/or disability completed through the administration of a battery of tests. A comparison of what the individual says against what is observed (demonstrated ability) during functional testing.

- What factors are considered:
  - Subjective questionnaires (internal reliability check points, is the individual's perception of their abilities similar to their demonstrated abilities?)
  - Spinal and hand function sorts, MTAP – how accurately do they perceive their capacity?
  - Oswestry Questionnaire, Neack Disability Index, DASH
  - Functional Pain Scale - defines how pain affects function

DETERMINATION OF ABILITIES AND LIMITATIONS

Measuring current level of function:
- Musculoskeletal screen (ROM, flexibility)
- Strength – lift, carry, push, pull
- Handling and dexterity
- Reaching
- Hand grip strength and pinch grip strength
- Whole body motion (crouch, kneel, stoop, crawl)
- Gait/ walking
- Stair or ladder climbing
- Balance
- Tolerance for sustained postures (sit, stand, stoop)
- Speed, quality and ease of movement
- Cardiovascular fitness and response
- Work simulation tasks

REACHING, HANDLING, DEXTERTY

Whole Body Reaching, Dexterity and Body Positional Tolerance

Fine Manual Dexterity
Medium Manual Dexterity
STRENGTH = LIFTING, CARRYING, PUSHING, PULLING

Sitting and standing:
- Casual sitting versus work intensive sitting
- Static standing versus dynamic standing
- Prolonged postures versus intermittent

What is the biomechanical effect of prolonged static postures?
- Prolonged work intensive sitting and computer work reinforces the biomechanical pattern of thoracic convex curvature, protruding chin, protracted shoulder blades and consequent tightness of the superficial shoulder and neck musculature.

Reasoning behind fatigue in the presence of injured tissue:
- Static positions including sitting (computer or office work) or standing (dishwasher, chef or kitchen hand) impose prolonged loads on soft tissues, when not well balanced with postural control muscles, leads to fatigue.

POSTURAL TOLERANCE

Fatigability is measured in a number of ways:
- Response to repeated and prolonged activity over time.
- Failure of postural musculature to support the spine or shoulder girdles in a neutral position.
- Frequency of breaks from static position (sitting break from standing or vice versa).
- Changes in quality of movement (speed, use of accessory muscles, compensatory patterns) are more informative than quantitative measures (range of motion).

Signs of fatigue in testing:
- Increasing frequency of position changes over time such as sitting upright, taking hands off the desk or keyboard, stretching arms or shoulders, shifting hips and lower back in the chair or voluntarily standing from sitting.
- More subtle signs include continuing the task but making smaller changes in position.
- Inability to maintain position — e.g. task in stooped standing, individual is noted to lift his/her head rather than remain in a looking down position, stands upright from a bent over position or lowers body down to the task by bending at the knees.
- Increasing frequency of sitting breaks during or between tasks performed in standing or increasing frequency of standing breaks during a prolonged sitting task.

FATIGUE

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FUNCTIONAL PAIN SCALE

- Pain is subjective
- Functional pain scale ties pain to function
- Assessor observes pain response such as postural shifting, holding/holding/stretching painful area, taking micro-breaks, asking for mobility or seated breaks for postural relief, leaning on equipment to off-load lower limbs or low back, rising on toes to reach at upper levels, switching hands, looks straight ahead to avoid neck flexion or extension

FUNCTIONAL PAIN SCALE (KYI, MATHESON)

0
No pain or disability.

0.25
Mild discomfort from which it is easy to distract yourself. If you were busy, you would not notice this area of discomfort.

0.50-2.75
Pain-related discomfort, increasing in intensity, as the numbers escalate, but not yet at a level which limits you from performing your current activity.

3.00-4.75
Pain-related discomfort, which affects your function. Any levels of 3.00 or higher not only hurt, but also affect your ability to perform your current activity. Such levels will result in observable changes to speed, range of movement, productivity, gait pattern, micro-breaks, pauses, etc. You can still complete the current activity, but from an observable standpoint, it is clear that you are beginning to have difficulty.

5.00-6.75
Pain-related discomfort, which renders you incapable of completing the current activity. The body region in question has been assessed as non-functional. You must stop or halt your current activity immediately.

7.00-9.75
At this level, you are nearing the need for hospitalization. Pain-related tearfulness is common. You are having difficulty speaking. You are seeking to lie down to rest and recover.

10.00
Immediate Emergency Hospitalization is required.

QUANTIFY FINDINGS

- Compare performance at start of day to end of day
- Changes to ease, speed and range of movement of spine or extremities
- Observation of swelling
- Gait changes, changes to weight bearing patterns
- Changes to grip strength
- Changes to speed of movement
- Changes to productivity or postural tolerance
- Increased pain behaviours/pain coping strategies
- Norms and Industrial Standards (MTM)
Repetitive Movement Testing
Research indicates no change or improvement in performance of activities tested prior to and after work.
Assists in objectively determining response to work-like tasks and durable capacity for work.


QUANTIFY FINDINGS
- Compare to normative data for age, gender or group.
- Compare to industrial standards – methods time measurement (MTM).
- Frequency – rare or unable, occasional, frequent, constant.
- Metabolic endurance testing.

KEYS

<table>
<thead>
<tr>
<th>FREQUENCY KEY</th>
<th>% OF SHIFT</th>
<th>HOURS PER 8 HR DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Occasional</td>
<td>1 - 33%</td>
<td>0.1 - 2.6</td>
</tr>
<tr>
<td>Frequent</td>
<td>34 - 66%</td>
<td>2.7 - 5.3</td>
</tr>
<tr>
<td>Constant</td>
<td>67 - 100%</td>
<td>5.4 - 8.0</td>
</tr>
</tbody>
</table>

Table ST1: Physical Demand Characteristics of Work

- Sedentary: 0-33% of the workday
- Light: 34-66% of the workday
- Medium: 67-100% of the workday
- Heavy: Over 100% of the workday

- Sedentary: 0-33 lbs. Negligible
- Light: 34-66 lbs. 1-10 lbs. and/or walk/stand/push/pull
- Medium: 67-100 lbs. 11-25 lbs. and/or push/pull of arm/leg controls while seated
- Heavy: Over 100 lbs. Over 10 lbs. and/or push/pull of arm/leg controls
MEASURING THE INDIVIDUAL'S RESPONSE TO TEST ACTIVITIES

- Repetitive movement testing (i.e. 50 foot walk test, velocity of trunk movement)
- Repeat testing (i.e. hand dexterity test)
- Repeat ROM testing - Is there a change in the range of movement?
- Observation of changes in speed and quality of movement over time (i.e. slow to rise or mobilize, using support to rise after prolonged periods of low level work)
- Tolerance to prolonged static postures (i.e. do they display compensatory strategies after a shorter time frame later in the day)

Observation of changes in pain behaviours/observed response to testing
- Grimacing, facial expressions
- Painful guarding
- Postural shifting
- Increased frequency of positional changes
- Increased frequency or duration of breaks

COMPARING ABILITIES TO WORK DEMANDS: FUNCTIONAL MATCH?

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Physical Function</th>
<th>Environmental Conditions</th>
<th>Ability</th>
<th>Functional Match</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lawyer (National Occupational Classification 4112)</td>
<td>V2, C0, H2, B1, L0, S1</td>
<td>L1</td>
<td>Total visual field (normal)</td>
<td>Partial functional match with limited tolerance to prolonged periods of work-intensive sitting, including static neck flexion and static upper body posture</td>
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<tr>
<td></td>
<td>V4- Total visual field (normal)</td>
<td></td>
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<tr>
<td></td>
<td>C1- Color vision (normal)</td>
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<td></td>
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<td></td>
<td>H3- Other sound discrimination (normal)</td>
<td></td>
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<tr>
<td></td>
<td>L1- Upper Limb Coordination (normal range handgrip strength compared to population averages for age group, average fine manual dexterity, able to reach at all levels)</td>
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<tr>
<td></td>
<td>L2- Multiple Limb Coordination (satisfactory balance, able to safely negotiate stairs)</td>
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<tr>
<td></td>
<td>B1- Sitting (symptom limited work intensive sitting necessitating regular postural breaks and optimal ergonomics)</td>
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<td></td>
<td>B2- Standing +/or Walking (walks with an even reciprocal gait without limitations for occasional walking, no observed limitations to standing)</td>
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<tr>
<td></td>
<td>B4- Other Body Positions (able to crouch, kneel, crawl, stoop on an occasional basis, limited tolerance to sustained neck postures of flexion or looking down and extension or looking up)</td>
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<tr>
<td></td>
<td>S2- Light 5-10kg to S3- Medium (up to 30lbs)</td>
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</table>

FUNCTIONAL CAPACITY EVALUATION CONCLUSIONS:

- It is the analysis of the physical, subjective, behavioural and cognitive responses to physically demanding activity over time and with repetition.
- It measures the response to individual tasks and repeated or prolonged activity.
- It determines current functional abilities and limitations.
- It determines if there is a functional match to job demands and if accommodations are required.
- It determines durable work capacity.
- It provides recommendations for treatment, for adaptive or ergonomic equipment needs and for facilitating return to work.