Work and Driving Rehabilitation

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Content

• Introduction of Work rehabilitation

• Assessment and rehabilitation of professional drivers
Work rehabilitation

• is a structured program of graded physical conditioning/strengthening exercises and functional tasks in conjunction with real or simulated job activities.

• treatment is designed to improve the individual's cardiopulmonary, neuromusculoskeletal (strength, endurance, movement, flexibility, stability, and motor control) functions, biomechanical/human performance levels, and psychosocial aspects as they relate to the demands of work.

(AOTA, 1998)
Collection of Job Information

- From workplace visit:
  - Costly and manpower-driven
Workplace Visit

Squatting

Climbing

Standing

Squatting

Stooping

Overhead lifting
Work simulator
Work simulator
Valpar CWS
Work Stations
<table>
<thead>
<tr>
<th>PHYSICAL DEMAND LEVEL</th>
<th>OCCASIONAL 0 - 33% of the workday</th>
<th>FREQUENT 34 - 66% of the workday</th>
<th>CONSTANT 67 - 100% of the workday</th>
<th>Typical Energy Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>SEDENTARY</td>
<td>10 lbs.</td>
<td>Negligible</td>
<td>Negligible</td>
<td>1.5 - 2.1 METS</td>
</tr>
<tr>
<td>LIGHT</td>
<td>20 lbs. and/or Walk/Stand/Push/Pull of Arm/Leg controls</td>
<td>Negligible and/or Push/Pull of Arm/Leg controls while seated</td>
<td>2.2 - 3.5 METS</td>
<td></td>
</tr>
<tr>
<td>MEDIUM</td>
<td>20 to 50 lbs.</td>
<td>10 to 25 lbs.</td>
<td>10 lbs.</td>
<td>3.6 - 6.3 METS</td>
</tr>
<tr>
<td>HEAVY</td>
<td>50 to 100 lbs.</td>
<td>25 to 50 lbs.</td>
<td>10 to 20 lbs.</td>
<td>6.4 - 7.5 METS</td>
</tr>
<tr>
<td>VERY HEAVY</td>
<td>Over 100 lbs.</td>
<td>Over 50 lbs.</td>
<td>Over 20 lbs.</td>
<td>Over 7.5 METS</td>
</tr>
</tbody>
</table>
Measurement of work tolerance
Referral to OT, TMH for driver assessment and rehabilitation (2008-2011)
Professional drivers

- Professional drivers, i.e., people whose job is driving.

- A number of studies show that professional drivers are at higher risk of road traffic accidents than the general driving population because of their high occupational exposure to the hazardous road environment. (Broughton et al., 2003; Öz et al., 2010)

- In Hong Kong, the number of road traffic accident in 2014 was 21,729 in which 54.72% involved professional drivers. (Transport Deportment of Hong Kong, 2015)

- Work-related motor vehicle incidents represent a substantial emotional and financial cost to the community. (Broughton et al., 2003; Health Saf. Exec. 2003)
Service needs

- Large portion of commercial vehicle drivers suffered from *musculoskeletal related condition*, having temporary impairment and/or physical disability

- Increased *variety* of cases with other medical conditions (e.g., neurological, chronic disease)
Driving is...
Driver Assessment

Off-road Assessment
- Vision Screen
- Physical Screen
- Cognitive / Perceptual Screen

On-road Assessment
Off-road assessment

• To ascertain the effects that certain dysfunctions may have on the performance of the driving tasks

• A prelude to the on-road driver assessment
Standard requirement:
- With one eye or both eyes at least 6/12 (uncorrected or corrected visual acuity)
Vision screen

- Examiner compares what the client sees against his or her own normal visual field
**Vision screen**

**Binocular Eye Movements**  (Do the eyes move equally, smoothly, and accurately?)

<table>
<thead>
<tr>
<th>Slow: (without glasses)</th>
<th>Y / N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast: (with glasses)</td>
<td>Horizontal Y / N</td>
</tr>
<tr>
<td></td>
<td>Vertical Y / N</td>
</tr>
<tr>
<td></td>
<td>Distance Y / N to near</td>
</tr>
</tbody>
</table>

**Any delays, overshoots or inaccurate movements?**
Eye-tracking

Eye tracking is a technique which attempts to determine where a person is looking

What does eye-tracking show?

- Among other things eye-tracking shows on what users pay attention
- In which sequence they notice an offer
- Which contents they ignore.
- How long they fix one point.
- How good they can orientate themselves
Difference in visual search

Accident-free motorcyclist

Accident-involved motorcyclist
Physical and functional screen

- To assess the impact of physical or functional deficits on driving capability
  - Active ROM
  - Muscle tone
  - Strength
  - Coordination
  - Balance
Brake reaction time

Car braking reaction tester
Cognitive / perceptual screen

Digit Vigilance Test (sustained attention)
Cognitive / perceptual screen

Color Trails Test-1
(sustained attention)

Color Trails Test-2
(selective attention)
Cognitive / perceptual screen

Symbol Digit Modalities Test
(divided attention)
Cognitive / perceptual screen

• DriveSafe

“There is a person...... on the right...... in roundabout...... away from us......”

“There is a car...... in roundabout...... on the left...... coming towards us......”
Cognitive / perceptual screen

• DriveAware
  – Intersection diagram test

• To indicate the correct order that the vehicles should proceed
When the participants see the road signage for their exit appear, as indicated by the eye tracker, their corresponding responses within 1500 ms will be captured for analysis. This interval is selected following a pilot study that measured the response time of 15 motorcyclists.
Hazard perception test

- The time that the hazard appeared is recorded as $T_h$, and the time that the hazard is first seen by the driver as $T_f$.

- Hazard perception is calculated as the time difference between hazard presence and the first hazard fixation time (i.e. $T_f - T_h$).
Hazard perception test

How to score

• Click the mouse buttons when seeing the developing hazard
• The sooner the officer clicks the higher the score
Hazard perception test

• When the officers correctly identify the hazard and presses the button, the video clip will be paused.

• Officers will be asked what they think about the likelihood and severity of a crash using a 5-point Likert-type scale ranging from “very unlikely” (1) to “very likely” (5) and “very mild injury” (1) to “fatal injury” (5), respectively.

• A head-mounted eye tracker system is used to capture driver’s eye movements on different traffic scenarios to check: (1) the accuracy of hazard identification and (2) the efficiency of visual search strategy.
Hazard perception test
Hazard perception test
Driving simulator

- Alternative for observing patient's driving capacity and implementing driving training

- Provide a safe and controlled environment for assessment and training

- Wide range of simulated road situations
  - Night time, foggy environment, slippery road after raining, etc…….

- Simulator performance is correlated with on-road performance
  (Freund et al., 2002; Huchler et al., 2002; Schultheis et al., 2003; Lee et al., 2003)
Driving simulator
<table>
<thead>
<tr>
<th>Functional skills</th>
<th>Rating <em>(A/U/FT)</em></th>
<th>Performance Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vehicle positioning</strong></td>
<td>A</td>
<td>demonstrates proper vehicle position before, during and after turns</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>avoids positioning in blind spots</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>maintains appropriate following distance</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>yields right-of-way when appropriate</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>positions to separate risks</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>maintains adequate lateral space cushion</td>
</tr>
<tr>
<td></td>
<td>I/F</td>
<td>adequate for turning</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adequate for negotiating intersections</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adequate for lane changes</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adequate for passing</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adequate for backing</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adequate for parking</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adequate for following</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adequate for merging</td>
</tr>
<tr>
<td><strong>Time and space judgment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Vehicle response</strong></td>
<td>A</td>
<td>demonstrates adequate brake control</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>demonstrates adequate accelerator control</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>demonstrates adequate steering control</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>responds appropriately to traffic signs, signals and markings</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>operates vehicle smoothly and efficiently</td>
</tr>
<tr>
<td><strong>Speed adjustment</strong></td>
<td>A</td>
<td>adjusts to environmental conditions</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adjusts to intersections</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adjusts to passing</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adjusts to traffic flow</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>adjusts to roadway surfaces and configuration</td>
</tr>
</tbody>
</table>

*A* = Acceptable, *U* = Unacceptable, *FT* = Further investigation by on-road test is needed
On-road assessment

• To determine if……
  – the client’s medical condition impacts on their ability to drive
  – any equipment, modifications or driving technique will assist the client to meet safe and legal driving standard
On-road assessment

• Role of OT

  – To identify the impact of medical / physical condition on client’s ability to drive safely and legally

  – To inform driving instructor the relevant information about client’s condition and possible impacts of driving ability

  – To identify the client’s ability to compensate for the condition and plan appropriate remediation program
On-road assessment

• Role of driving instructor

  – To facilitate a suitable driving situation / location
  – To maintain safety
  – To report to OT on the standard of driving from a instructor’s viewpoint
  – To provide remediation for the problems identified, together with the guidance from OT
Instructor’s action Indicator:
- to show instructor’s intervention during assessment and training
Driving Instructor controls: Dual brakes and accelerators
On-road assessment

- Assessment route selection
  - standardized route
  - consideration of different road traffic situations
Thank you!