

Driving after stroke - practical tips

Mobility and driving after stroke

Driving in Europe: rules, regulations and research

Driving after stroke: clinical practice

The image shows the exterior of the Uddevalla Sjukhus Huvudentrie building. The building is a multi-story structure with a red brick facade and white window frames. A large tree with bright green leaves is on the left side of the frame. In the foreground, there are tall grasses and a flower bed with pink flowers. The text 'UDDEVALLA SJUKHUS HUVUDENTRIE' is mounted on the building's facade.

UDDEVALLA SJUKHUS
HUVUDENTRIE

MOBILITY AND DRIVING AFTER STROKE

NU-sjukvården, Uddevalla

Driving after stroke

**European Life After Stroke Forum
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No conflict of interest

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Sweden



Internal use



- 5th largest country in Europe
- 2000 km from north to south
- Small population: 10 millions



Gothenburg



Mobilitetscenter

- In practice since 2004
- Founded and run by organizations of persons with mobility impairments
- An independent non-profit company

A mobility centre providing assessment of fitness to drive and assessment of need for vehicle adaptations

- Cognitive and/or mobility impairment
- 500-600 assessments/year
- All ages, 3-100 years





THE SWEDISH NATIONAL ROAD AND TRANSPORT RESEARCH INSTITUTE (VTI)

- Traffic analysis
- Traffic safety
- Transport economics
- Transport system
- Road and track engineering



- Vehicle performance
- Road design
- Driver behaviour
- Human – machine interaction
- Effects of fatigue, alcohol and medication
- Effects of vibrations and noise

www.vti.se

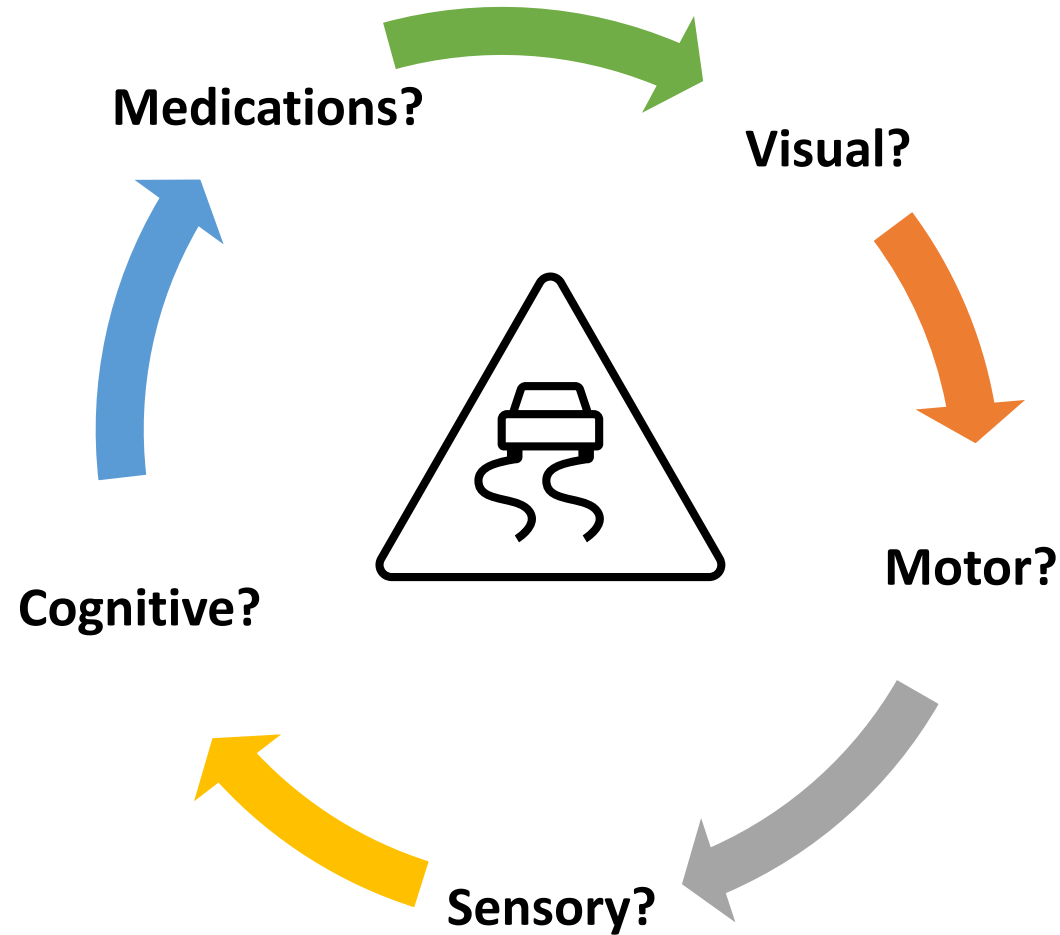
DRIVING - ENABLE AN ACTIVE LIFE!

- The car symbolises freedom and competence
- Important for coping with all everyday activities!
- Part of rehabilitation – being able to resume driving again!
- 5 years post stroke; 67 % were active drivers
(Persson & Selander, "Transport mobility 5 years after stroke in an urban setting", 2018)



Increased risk of a crash?

- Impairments?
- Other conditions?



New study: Road traffic accidents among motor vehicle drivers with Stroke or epilepsy

Retrospective national register- based study (2010-2019)

- Frequencies?
- What types of accidents?

Pettersson S, Selander H, Persson H. *Road traffic accidents among motor vehicle drivers with Stroke or Epilepsy*, Unpublished data

National registries:



Strada




National Patient
Registry



Swedish Population
Registry

Study population

Involved in road traffic accidents from 2010-2019

 Ulcerative colitis
(UC)

	Stroke n = 2788	Epilepsy n = 2134	Comparison group n = 1964
Driver characteristics			
Age, years, <i>mean (min-max)</i>	65 (18-94)	41 (18-97)	45 (18-89)
Sex, n (%)			
Male	2183 (78)	1473 (69)	1276 (65)
Female	605 (22)	661 (31)	688 (35)

Characteristics of the road traffic accidents

Variable	Stroke n = 2788	Epilepsy n = 2134	Reference n = 1964
Crash type, n (%)			
Single	699 (25.1)	859 (40.3)	476 (24.2)
Collision	2032 (72.9)	1235 (57.9)	1446 (73.6)
Unspecified	57 (2.0)	40 (1.9)	42 (2.1)
Location, n (%)			
Urban	1356 (48.6)	992 (46.5)	903 (46.0)
Rural	1249 (44.8)	1028 (48.2)	950 (48.4)
Unknown	183 (6.6)	114 (5.3)	111 (5.7)
Injury severity, n (%)			
Uninjured	1116 (40.0)	631 (29.6)	671 (34.2)
Minor (ISS 1-3)	1211 (43.4)	1194 (56.0)	1060 (54.0)
Moderate (ISS 4-8)	244 (8.8)	193 (9.0)	126 (6.4)
Major (ISS ≥ 9)	86 (3.1)	42 (2.0)	38 (1.9)
Fatal	53 (1.9)	18 (0.8)	12 (0.6)
Unknown	78 (2.8)	56 (2.6)	57 (2.9)
Hospital evaluation, n (%)			
	1036 (37.2)	1019 (47.8)	890 (45.3)

MALE AND FEMALE PERSPECTIVE

Women and men travel differently

- Public transportation users and pedestrians - more females
- Car drivers - more males
- Women drive less when they get older
 - *dependent on the men's driving ability and health?*
- Women's reduced driving experience can result in a significant loss of mobility
 - *important to maintain women's driving ability!*



Question:

In your family, who drives most often:

1. A woman (myself/my wife)
2. A man (myself/my husband)

When travelling together?



Photo from Volvo Cars Corporation

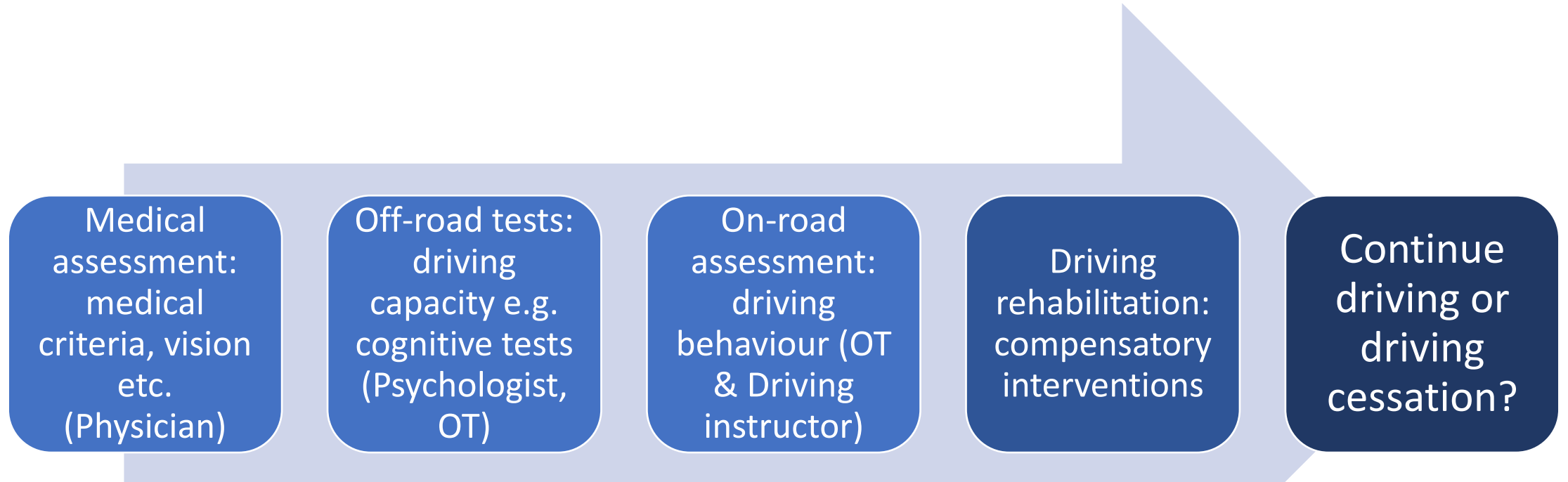
Driving after stroke in EU



Image: GETTY

- Stroke and medical conditions that may impact upon safe driving?
- Risk factors such as visual, cognitive and physical impairments
- Different requirements and regulations in EU

Standards for the evaluation of medical fitness to drive – *in Sweden*



Medical fitness to drive - after stroke – national regulations



Visual field – defects?



Risk factors – taken care of?

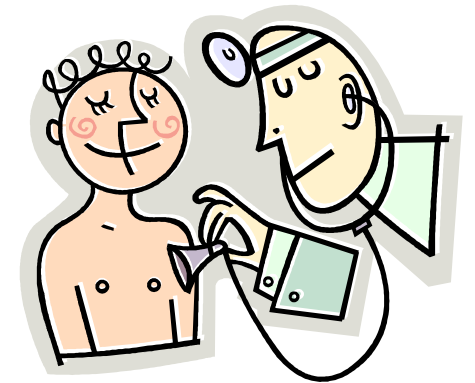


Seizures/epilepsy?

Neglect?

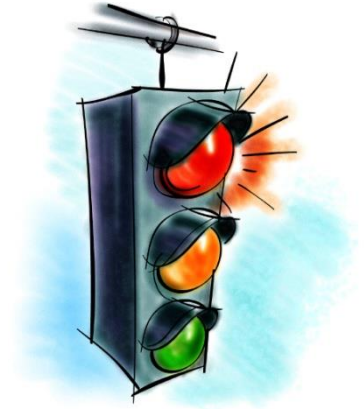


Comorbidity – other health issues?

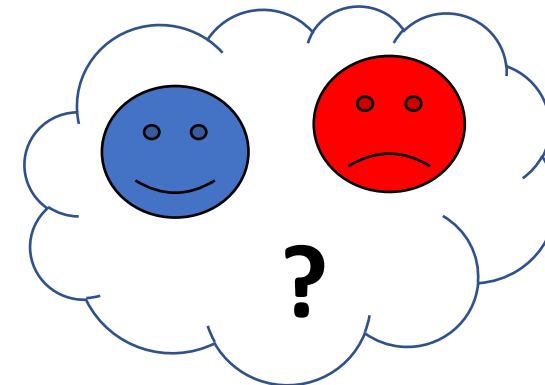


Evidence based methods of assessment

- Off-road assessment – cognitive abilities
- On road assessment – driving behaviour



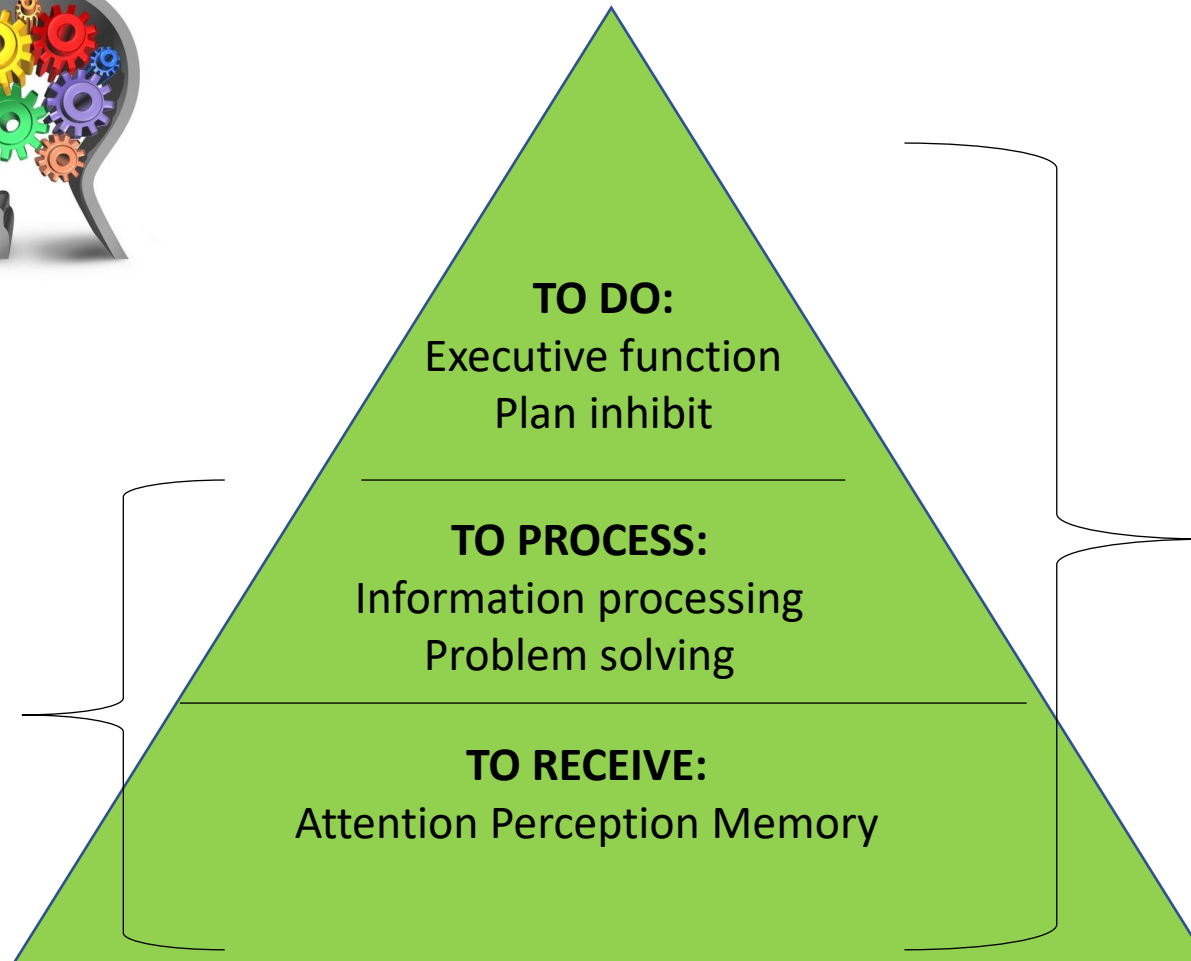
Outcome information – and explanation – to the client



Cognitive abilities



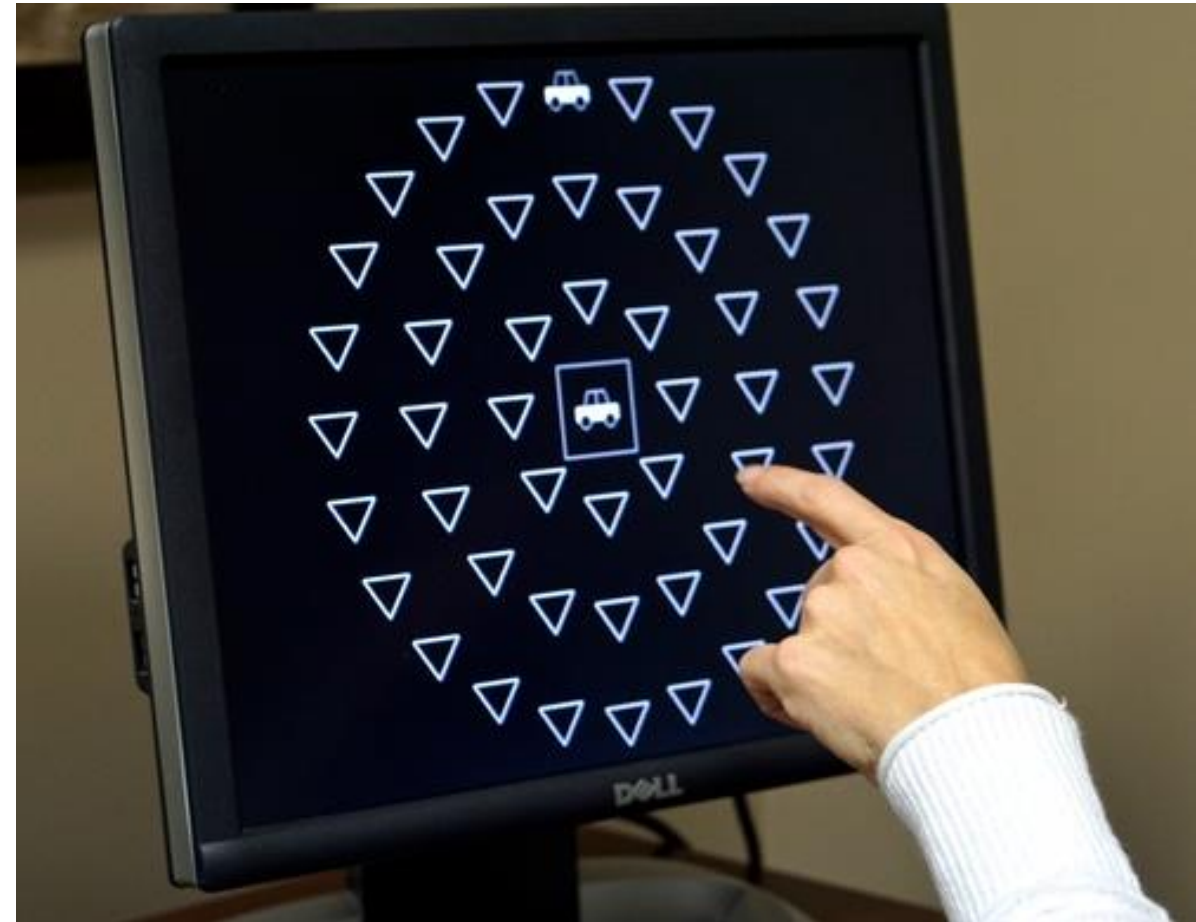
Off road assessment
Cognitive resources
and challenges



On road assessment
Performance and
behaviour - traffic safety

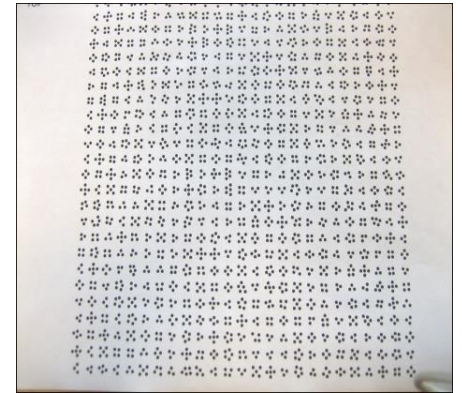
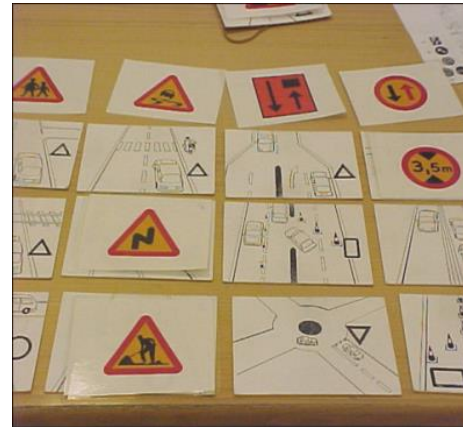
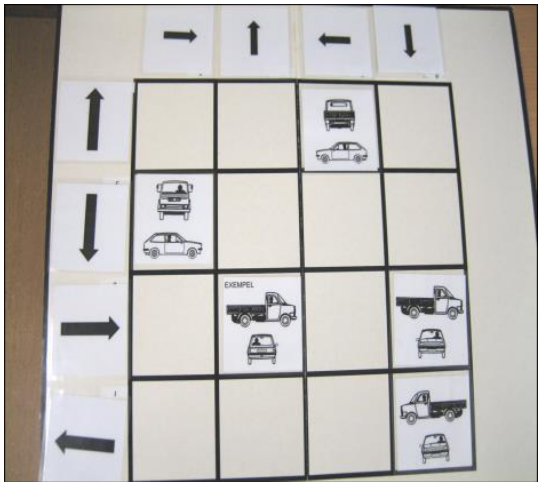
Off road assessment

- Useful field of view UFOV
- Trailmaking tests



Off road assessment

- Stroke Driver Screening assessment



Off road assessment

Cybersim

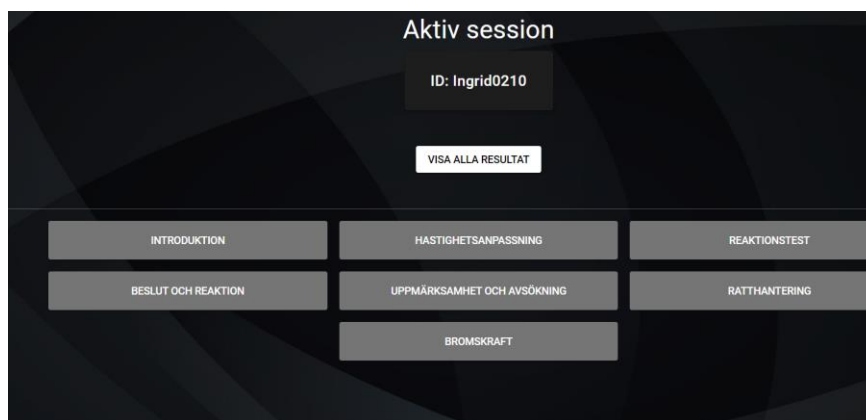
- Attention
- Neglecting information from affected side?



New tool for assessment – DriveCap development in progress....

A toolbox of tests of cognitive and motor abilities

- Attention
- Reaction time
- Information processing
- Visual scanning



Resultat - Reaktionsid

Id: Ingrid0210
2023-02-10
Hjälpmedel: Fotpedaler standard pedalställ höger fot

Total genomsnittlig reaktionstid 0.66 sekunder (Gränsvärde: 1.5)
Motorisk genomsnittlig förflyttningstid 0.21 sekunder (Gränsvärde: 0.75)
Genomsnittlig tanketid 0.45 sekunder (Gränsvärde: 0.75)
Felaktiga pedaltryck 0

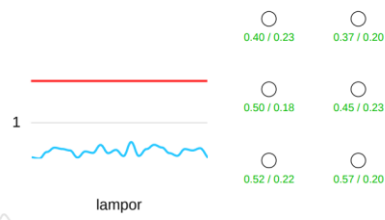
0.43 / 0.23 0.50 / 0.20 0.40 / 0.20

0.44 / 0.20 0.48 / 0.22 0.45 / 0.20

0.52 / 0.22 0.40 / 0.20 0.48 / 0.18

0.37 / 0.22 0.40 / 0.20 0.37 / 0.22

reaktionstid



0.40 / 0.23 0.37 / 0.20

0.50 / 0.18 0.45 / 0.23

0.52 / 0.22 0.57 / 0.20

0.52 / 0.18 0.47 / 0.18 0.42 / 0.25

Genomsnittlig reaktionstid vänster

Reaktionstid 0.64 s. (Gränsvärde: 1.50)
Motorisk förflyttningstid 0.21 s. (Gränsvärde: 0.75)
Tanketid 0.44 s. (Gränsvärde: 0.75)
Antal missar 0

Genomsnittlig reaktionstid höger

Reaktionstid 0.67 s. (Gränsvärde: 1.50)
Motorisk förflyttningstid 0.21 s. (Gränsvärde: 0.75)
Tanketid 0.46 s. (Gränsvärde: 0.75)
Antal missar 0

On road assessment

- Driving school instructor AND occupational therapist
- Vehicle manual/automatic with dual control
- Designed route
- Observation tools of behaviour - frequencies of mistakes, lapses, interventions control of vehicle
- Assessment of safe/unsafe driving



After a stroke – what is the most important factor to pass an on-road assessment?

On road assessment

Love to see:

- Good and early attention and planning
- Considerate towards fellow road users, pedestrians and cyclists
- Proper speed adjustment
- Smooth manoeuvring
- Safe positioning
- No violations
- No interventions



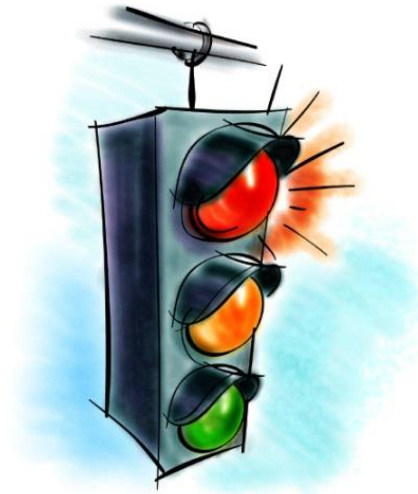
Seldom an issue:

- Motor impairment – but might consume energy and focus from attention and might affect driving behaviour
- Age

On road assessment: Driving not safe

Failing mostly due to:

- Lack of attention
- Lack of visual scanning
- Poor positioning/lane keeping
- Lack of planning



Motor impairment after stroke

Coordination

Range of motion

Spasticity

Strength

Vehicle modifications compensate for motor impairment – but require:

- Good cognitive abilities
- Ability to learn
- Practise driving



Driver assistance system

- Automatic wipers
- Parking sensor - cameras
- Blind spot monitoring
- Adaptive cruise control
- Lane keeping
- Collision avoidance system

Useful - always reliable?

Left foot accalerator

Left accelerator footpedal

<https://www.youtube.com/watch?v=tGX7VNlnbxl>

Getting into the car...



I long to get back to normal life and start working – how long do I need to wait after my stroke before I resume driving?

On-road driving test

- Aim with on-road assessments: to verify the off-road tests results, i.e. the impairments exists on-road
- Normal driving behaviour or due to stroke?
- The driving tests – is it always valid and reliable?
- “Low cost” simulators to assess specific functions → increased accessibility for many clinicians





Simulator?

Pros and cons with simulators

- Safe!
- Real driving...?

- Simulator sickness...
- Young vs old clients...

- “Low cost” simulators for reaction time and attention right/left

This is Sweden – darkness and light

