

Clinical cognitive assessments to predict on-road outcome - An Australian prospective cohort study

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Disclosures:

- All DSDA credits used in this study were purchased from Pearson Australia with funds from the Sam Ryan Memorial grant.
- OT-DORA battery was purchased with private funds.
- BJJ has a commercial interest in a new version of DSDA but not the version used in this study.



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SYDNEY



Project Team

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Australian National
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Setting the Scene

- Good functional cognition is vital for driving a motor vehicle
- Drivers may be required to have a formal driving assessment
- Fitness-to-Drive Medical Clinic (Canberra, Australia)
 - Specialist medical review
 - Occupational therapy in-clinic & on-road assessment



Canberra Fitness to Drive Cohort Study

AIMS

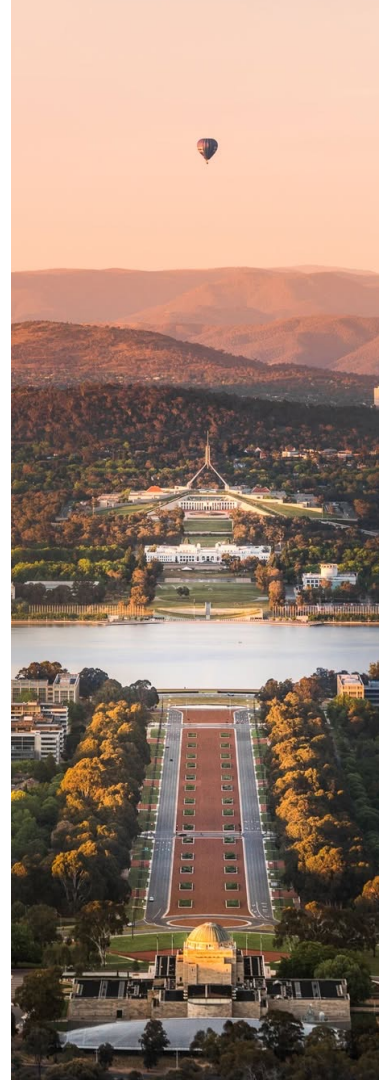
Do the results of clinical cognitive assessments:

- Predict the outcome of an on-road assessment?
- Assist in determining whether drivers need on-road assessments &/or guide licence decisions?

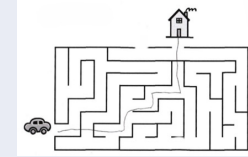
POPULATION

Drivers referred for assessment with:

- Progressive/ stable neurological condition
- Any driver over the age of 70 years of age



Clinical Assessments



OT-DHMT

Addenbrooke's Cognitive Examination-III (ACE-III)

($n = 131$) (Ferreira et al., 2012)

Pen & paper/ iPad
Score: **0-100**

ACE-III Classification:

- **Not impaired** (88-100)
- **Possibly impaired** (82-87)
- **Definitively impaired** (0-81)

DriveSafe DriveAware (DSDA)

($n = 138$) (Cheal et al., 2023)

iPad
Score:

- DriveSafe (DS subtest) /**84**
- DriveAware (DA subtest) /**17**

DS & DA combine for Classification:

- **Likely to pass**
- **Further testing**
- **Likely to fail**

OT-Drive Home Maze Test (OT-DHMT)

($n = 136$) (Unsworth et al., 2011)

Pen & paper
Score: completion time (seconds)

No pre-defined classifications

Predictive Validity – to predict pass/ fail with continuous scores

Assessment Tool	AUC	Predictive Value	Optimal Cut-off score	Youden's Index
OT-DHMT (secs)	.74	Fair	38.5	.45
ACE-III /100	.81	Good	82	.40
DS subtest /84	.96	Excellent	72	.77
DA subtest /17	.95	Excellent	12	.76

Key:

Area under the curve (AUC) interpretation: .51-.59=Fail, .60-.69=poor, .70-.79=fair, .80-.89=good, **.90-1.00=excellent** (Nahm, 2022)

Predictive Validity – to predict accuracy of categorical outcomes

ASSESSMENT TOOL	Sensitivity %	Specificity %	Accuracy %
ACE-III CLASSIFICATION <i>Definitely Impaired, Possibly Impaired, Not Impaired †</i>	81*	75*	79*
DSDA CLASSIFICATION <i>Likely to Fail, Further Testing, Likely to Pass †</i>	85	100	93
OT-DHMT <i>Below 38.5 seconds (fail), Above 38.5 seconds (pass) ‡</i>	72	70	71

*Values decreased further when three drivers with communication difficulties (e.g. dysphasia) were added to analysis & scored 0: Sensitivity 77%; Specificity 65%.

† Pre-specified trichotomisation

‡ Based on optimal cut-off (Youdens index).



Test strengths and limitations



Addenbrooke's Cognitive Examination-III (ACE-III)

Strengths

- fair clinical utility
- not resource intensive
- no cost

Limitations

- poor face validity
- fair predictive validity
- needs language skills
- education bias



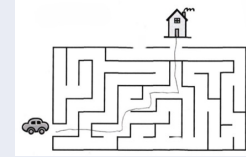
DriveSafe DriveAware (DSDA)

Strengths

- good clinical utility
- good face validity
- good-excellent predictive validity

Limitations

- cost to purchase



OT-DHMT

OT-Drive Home Maze Test (OT-DHMT)

Strengths

- good clinical utility
- good face validity
- good for observations

Limitations

- fair predictive validity
- cost to purchase
- Errors not counted in the score

Suggested protocol

OT-Drive Home Maze Test (OT-DHMT)

Initial screening tool

Planning - Judgement - Errors - Impulsivity



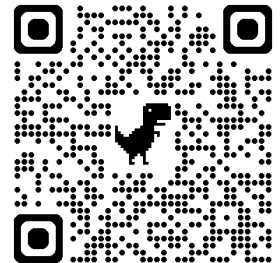
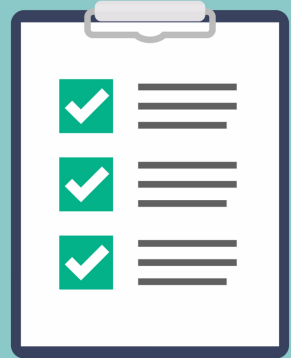
DriveSafe DriveAware (DSDA)

- Review subtest scores
- Consider overall prediction



Cognitive impairment assessment (optional)

- Use only if required



Clinical take-home messages



- Cognitive screening can meaningfully support fitness-to-drive decisions — but not all tools perform equally
- DriveSafe DriveAware showed the best prediction of on-road outcomes
- The OT-DHMT (maze) works well as a quick screening tool when errors are considered
- ACE-III has important limitations for driving assessment
- Clinical judgement remains critical — no test should be used in isolation

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Thank you

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