Driving → autonomy

ASD: Difficulties with autonomy

Driving contributes to independence
Driving allows development/maintenance of social and work-related contacts
People with ASD depend highly on friends and family for their transportation

Driving: complex & goal-oriented

Different tasks
- Parallel
- Switching
- E.g., shifting, steering, changing lanes, ...

In a dynamic environment

With risk of distraction
- Passenger
- Phone
- ...

Driving: complex & goal-oriented

Unknown routes and complex driving environments

Driving: complex & goal-oriented

Sudden changes in the environment
E.g., traffic density, weather conditions

Driver error

Driver error → driver crashes

Errors → by-products of EF (e.g., information processing)

Young novice drivers → more driver errors
### Driver error taxonomy

<table>
<thead>
<tr>
<th>Underlying mechanism</th>
<th>Example</th>
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<td>Action</td>
<td>Press the accelerator instead of brake, following too close</td>
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<td>Cognition and decision-making</td>
<td>Wrongly assume a vehicle will not enter path, misjudge speed of oncoming vehicle</td>
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### Executive functioning

Executive functions (EFs) enable to flexibly perform goal-directed actions.

**Objectives**

- Increased driver errors in ASD?
- EF difficulties in driving-related EF in ASD?
- Relation driving-related EF and driver errors?

**Participants**

- 19 novices with ASD
- 21 typically developing novices
- Aged 17-25
- Maximum 2 years of driving experience

**Driving simulator**

![Driving simulator image]
Driver error taxonomy

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Example: road hazards

Exhibit images of road hazards with annotations.

14 Driving measures

- Collisions (number)
- Brake reaction time
- Mean time to collision
- Speed exceedance (number, value, time)
- Centre line crossings (number, value, time)
- Red-light running (number)
...

Covariates/predictors

- Sex
- Driving experience
- Inhibition
- UFOV
- Working memory

Executive functioning tasks

Exhibit tasks and metrics for attention (UFOV), response inhibition (RI: Stop signal task), and working memory (WM: Span tasks).

Differences in performance

- Little for driving
  - Only sum of collision → marginal p,09; ASD worse
- EF
  - Inhibition → no difference
  - UFOV → p,02; ASD worse
- WM → p,01; ASD worse
Underlying mechanisms ASD group

TTC (RT)  
Experience (+)  
WM (+)  
R²,39  
P < ,01

Speed (Nb exc)  
WM (+)  
R²,19  
P < ,01

CLC (M)  
Experience (-)  
R²,33  
P < ,01

CLC (L)  
SSRT (-)  
R²,20  
P < ,01

Underlying mechanisms control group

Hazard (RT)  
Experience (-)  
R²,34  
P < ,01

TTC (M)  
WM (-)  
R²,19  
P < ,01

CLC (R)  
Sex (+)  
R²,20  
P < ,01

Speed (Nb exc)  
Sex (-)  
R²,21  
P < ,01

Speed (% dist)  
Sex (-)  
R²,25  
P < ,01

Speed (% t)  
Sex (-)  
R²,27  
P < ,01

Limitations

Small N → could have lowered significance levels
Driving simulation validity and fidelity
Not able to distinguish workload/stress

Conclusions and implications

No obvious differences in driving performance
Dual processes
   Reliance on EF differs (and more in ASD)
   Less risk in ASD males!?  
Despite limitations, interesting preliminary results

THE RELATION BETWEEN DRIVING ERRORS AND EXECUTIVE FUNCTIONING

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Framed in a larger UHasselt (IMOB & REVAL) project aimed to improve the independence of youth with ASD

Questions