Touchscreen-Based Assessment of Cognitive Impairment in Alzheimer's Disease Mouse Models

PRESENTER:
Artemis Kohanfekr

BACKGROUND: Alzheimer's disease is characterized by progressive impairments in learning and memory. Sensitive, translatable cognitive tasks are essential for accurate preclinical assessment. Touchscreen-based testing addresses this need through automated, standardized and translationally valid task designs.

METHODS

Trazodone 60mg/kg administered daily for 60-130d via voluntary ingestion.

Cognitive Testing 14 month old APP NL-F mice (n=32), Bussey-Saksida touchscreen chambers.

- **Paired Associates Learning (dPAL):** Assesses associative memory — the ability to pair images with spatial locations.
- **Location Discrimination (LD):** Assesses spatial memory, pattern separation & cognitive flexibility — the ability to encode stimulus locations, discriminate similar inputs, and adapt to switching difficulty levels. Mice undergo LD Train (LDT) followed by LD Probe (LDP), with reward contingencies switching upon 7/8 consecutive correct responses.

RESULTS

- Trazodone-treated males showed higher dPAL accuracy and faster session times compared to untreated control males
- LDT accuracy improved over time; LDP accuracy was analyzed across easy and difficult separation levels

DISCUSSION

- Associative memory may be improved by trazodone in AD mouse models
- Results support touchscreen testing as a translational tool for evaluating trazodone's cognitive effects in preclinical AD research

Fig.1

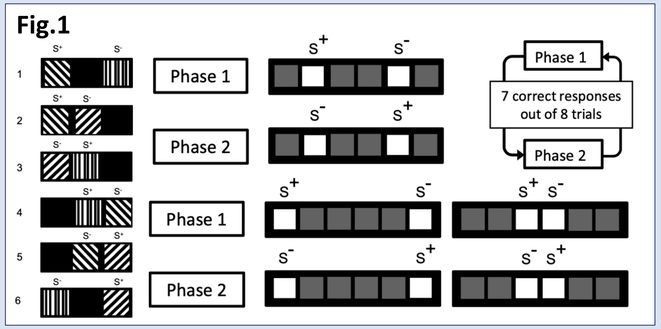


Fig.2

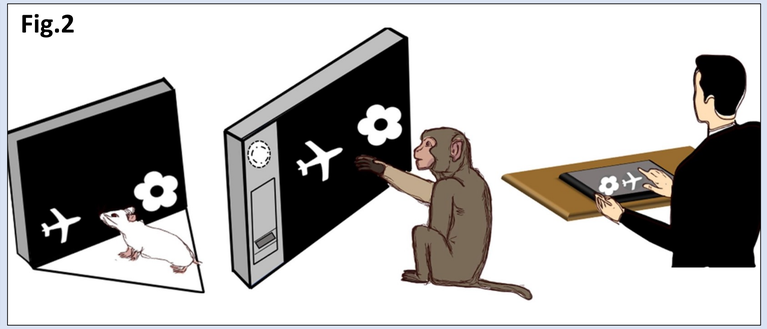


Fig.3A dPAL Accuracy

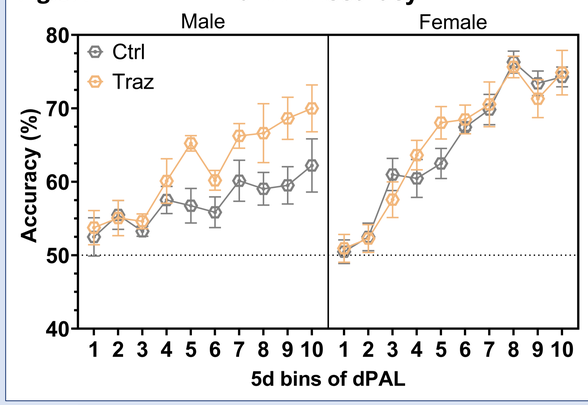


Fig.3B dPAL Session Time

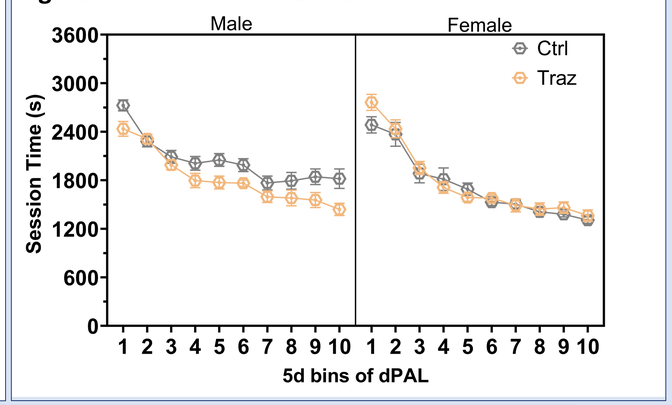


Fig.4A LDT Accuracy

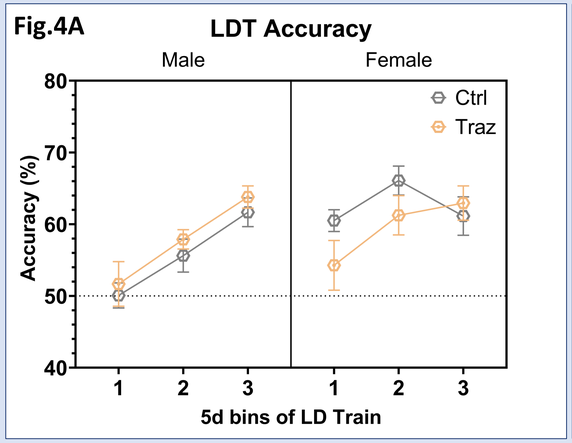


Fig.4B LDT Trials to Criterion

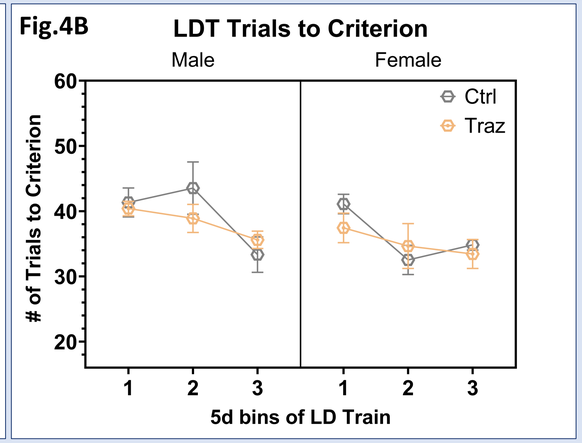


Fig.5A LDP Accuracy

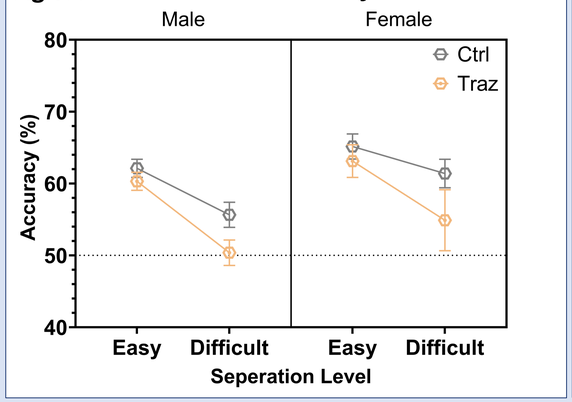
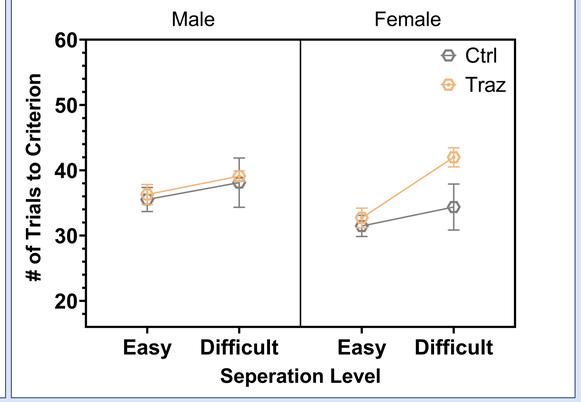


Fig.5B LDP Trials to Criterion



Figures

Fig. 1 - Schematic of dPAL and LD touchscreen tasks. In dPAL, incorrect responses trigger correction trials, where the same stimulus configuration repeats until a correct response is made.

Fig. 2 - Touchscreen tasks are directly analogous across species, enabling direct translation to human clinical assessment.

Fig. 3A & 3B - dPAL (N=32, Ctrl Male=8, Traz Male=9, Ctrl Female=8, Traz Female=8). Bins of 5d, mixed-effects (Time x Sex x Treatment). Correct %: time ($p<0.0001$), sex ($p=0.0013$), time x sex ($p=0.0028$). Session Time: time ($p<0.0001$), sex ($p=0.0015$), time x sex ($p=0.0001$), sex x treatment ($p=0.0104$).

Fig. 4A & 4B - LD Train (N=32, CM=8, TM=9, CF=8, TF=8). Bins of 5d, mixed-effects (Time x Sex x Treatment). Correct %: time ($p<0.0001$), sex ($p=0.0054$), time x sex ($p=0.0477$). Trials to Criterion: time ($p=0.0096$).

Fig. 5A & 5B - LD Probe (N=24, CM=6, TM=7, CF=5, TF=6). Average of 10d, mixed-effects (Difficulty x Sex x Treatment). Correct %: difficulty ($p=0.0003$), sex ($p=0.0164$), treatment ($p=0.0191$). Trials to Criterion: difficulty ($p=0.0073$).

REFERENCES:

Saifullah, M.A.B., Komine, O., Dong, Y. et al. Touchscreen-based location discrimination and paired associate learning tasks detect cognitive impairment at an early stage in an App knock-in mouse model of Alzheimer's disease. Mol Brain 13, 147 (2020). https://doi.org/10.1186/s13041-020-00690-6

ACKNOWLEDGEMENTS

Supervised by Dr. Brianne Kent, In collaboration with Robert Gibson and Taha Yildirim

We would like to thank the Natural Sciences and Engineering Research Council of Canada Discovery Grant (RGPIN/03909-2021, BAK), Canada Research Chair (CRC-2020-00047, BAK), Canada Foundation for Innovation (CFI-41428, BAK) and Canada Graduate Scholarship-Master's program (NSERC CGSM-02065600741666).

Artemis Kohanfekr, artemis_kohanfekr@sfu.ca

undergraduate research symposium