

A Study of High and Low Cognitive Demand in FMRP KO mice to Model ASD

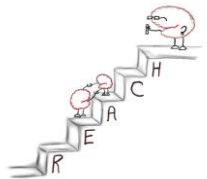
Alexander Jackson, Alana Watt, Elizabeth Ogundare

Arthur Ashe Institute of Urban Health, Office of Diversity, Education, and Research

Dr. Juan Marcos Alarcon and Natasha Bobrowski- Khoury, PhD Student

REACH Program

SUNY Downstate Medical Center



Overview

- What is Autism Spectrum Disorder?
- Introduction to ASD Research
- Aim
- Hypothesis
- Methodology
- Data Analyses
- Results
- Concluding Remarks
- Acknowledgements



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What is Autism Spectrum Disorder?



Introduction to ASD Research

- FMRP KO to model fragile X syndrome characteristic is ASD individuals
 - Absence of FMRP protein
- Impaired Cognitive Function
- Learning Task
 - Cognitive Demand



Aim

The purpose of our research is to obtain a greater understanding of behavioral learning strategies in ASD individuals.



Hypothesis

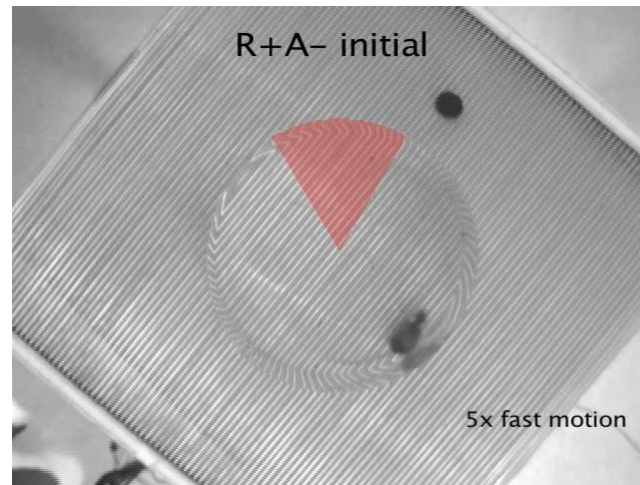
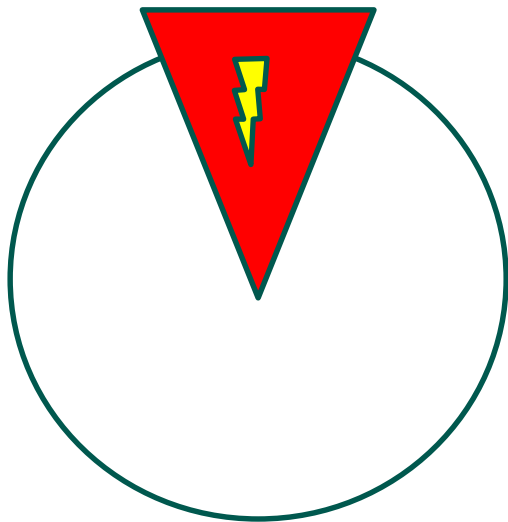
FMRP KO mice will perform better in a low cognitive demand setting than a high cognitive demand setting.



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Methodology

Passive Place Avoidance (PPA) vs Active Place Avoidance (APA)



Burghart et al (2012); Pavowsky et al (2016)

Day to Day Procedure

Day 1 - Habituation/Pretraining (PT) (30 min)

Day 2 - Exposure Training (T1&T2) (2x 30 min)

Day 3 - Retention Test (RT1) (10 min)

Day 4 - Conflict Training (CT) (30 min)

Day 5 - Retention Test (RT2) (10 min)



Day to Day Procedure

Day 1 – Novel Exploration

Day 2 – Initial and Final Learning

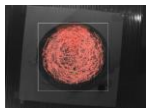
Day 3 – Long Term Memory Recall

Day 4 – Updated Learning

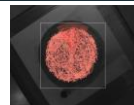
Day 5 – Updated Long Term Memory Recall



PT APA



Data Analyses



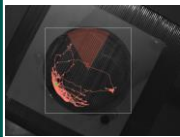
PT PPA

T2

WT

PPA

KO

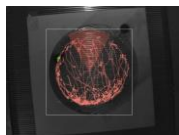
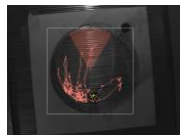


RT1

WT

PPA

KO

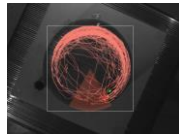
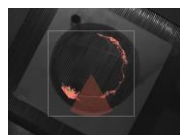


CT

WT

PPA

KO



RT2

WT

PPA

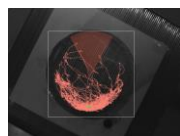
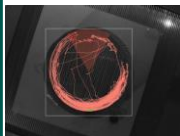
KO



WT

APA

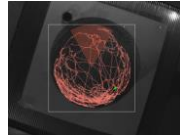
KO



WT

APA

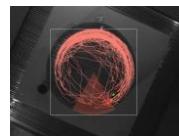
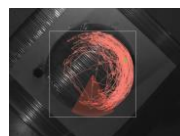
KO



WT

APA

KO



WT

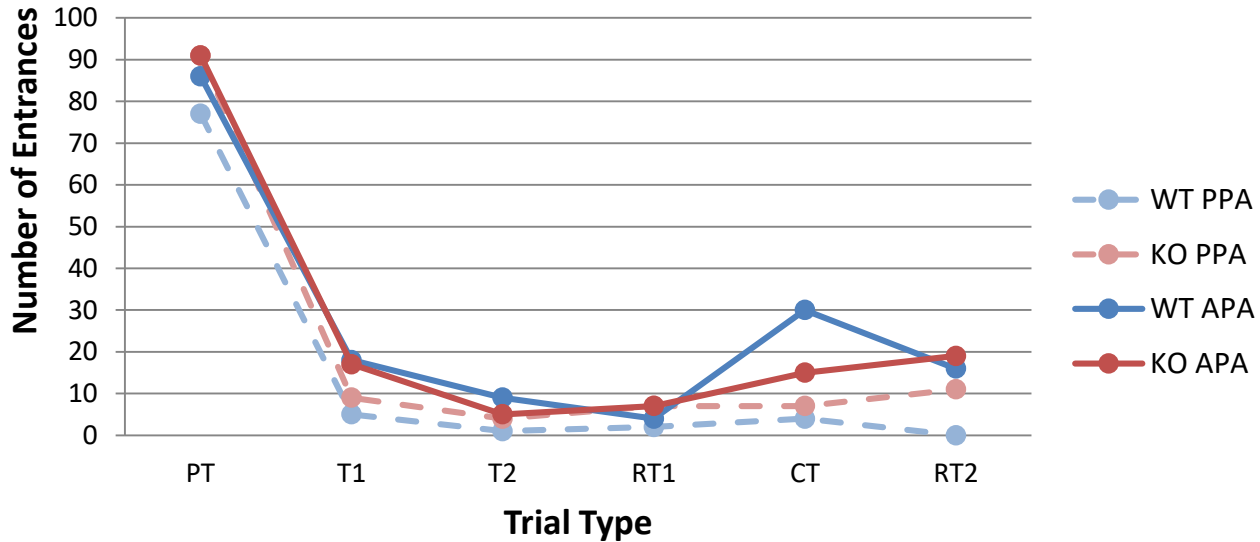
APA

KO



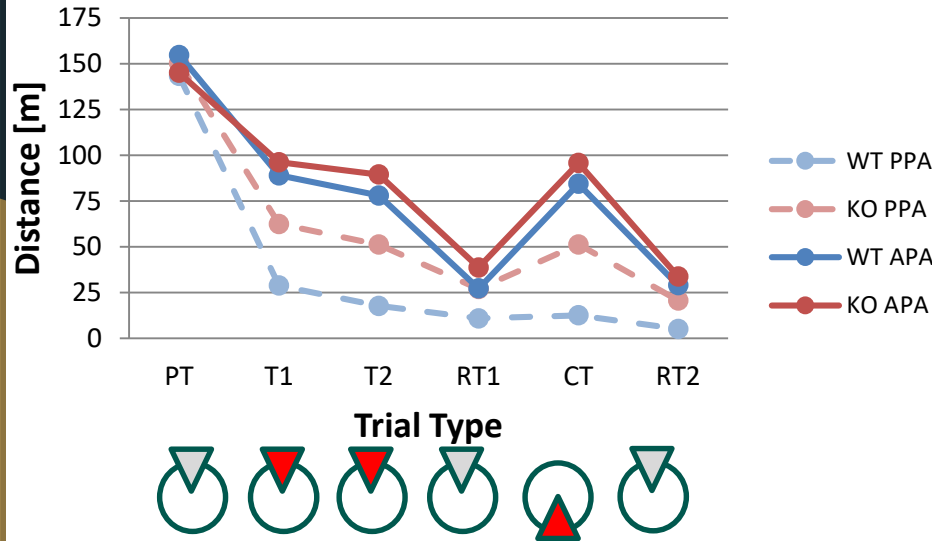
Results for Learning of Aversive Stimuli

Total Number of Entrances

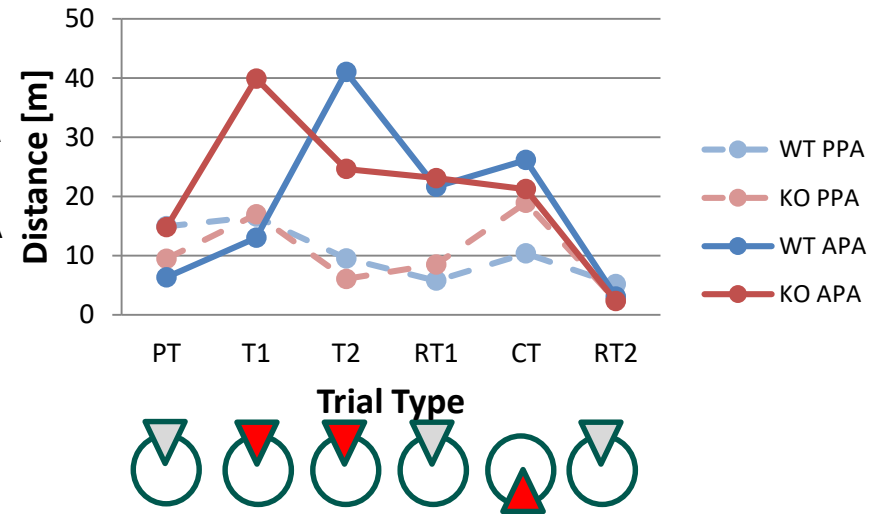


Results for Learned Strategy to Move Away from Aversive Stimulus Zone

Total Distance Traveled

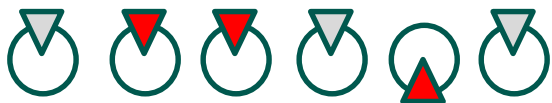
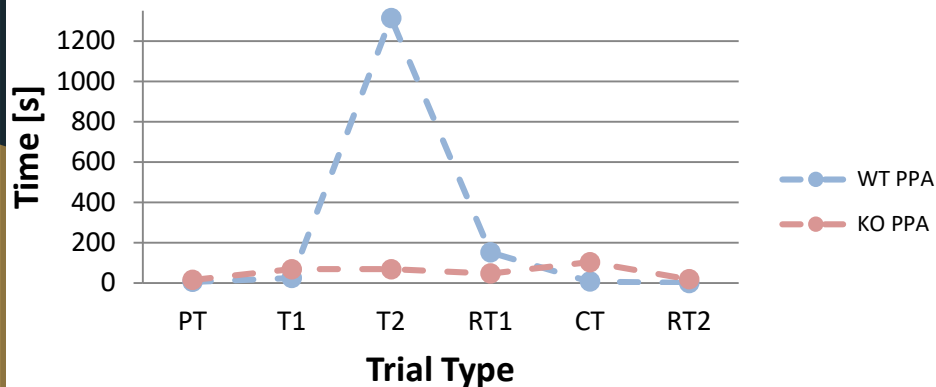


Maximum Path of Avoidance

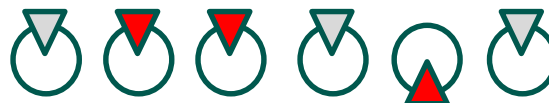
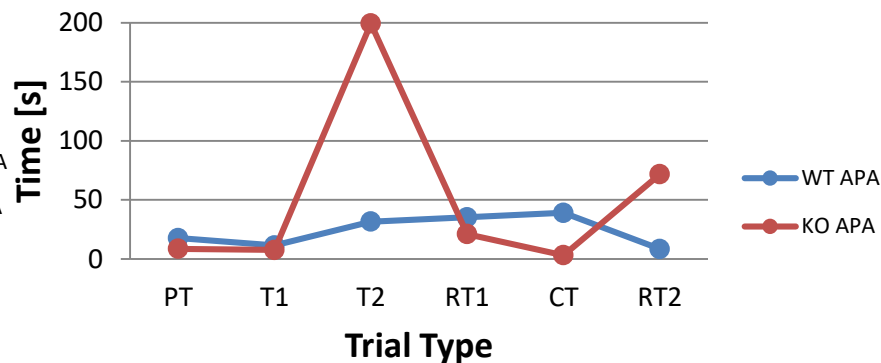


Results for Learned Avoidance of Aversive Stimuli

Difference Between 1st & 2nd Entrances Low Cognitive Demand



Difference Between 1st & 2nd Entrances High Cognitive Demand



Concluding Remarks

Hypothesis: FMRP KO mice will perform greater in a low cognitive demand setting than a high cognitive demand setting.

Was our hypothesis supported?

The KO's learning strategy differed from WT
WT adapted well to initial learning, but KO adapted better to updated learning (short term vs. long term memory)

Why not?

Lack of KO Cognitive Flexibility
Personality differences
Limitations (i.e., Stress, number of n)

What's next?

More mice in different environments (i.e., isolated vs socialization)





Acknowledgements



Dr. Harris Huberman

Dr. Boutin-Foster

Dr. Juan Marcos Alarcon

Natasha Bobrowski-Khoury PhD Candidate

Dr. Jenny M. Libien

Dr. John Kubie

Dr. Anika Daniels-Osaze

Director Kathy McCormick, MS