Reversal of environmental conditions in adult Wistar rats

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Animal Behavior Society 2020 Virtual Meeting


Video: Gabrielle Vachon
4 x 300 ML
Baumans et al., 2010; Nithianantharajah & Hannan, 2006; Simpson & Kelly, 2011

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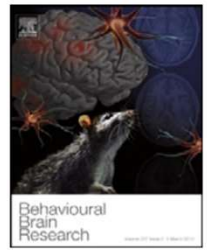

Review

The impact of environmental enrichment in laboratory rats—Behavioural and neurochemical aspects☆

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Table 6
The effects of EE in common behavioural tests.

Attribute	Consequences of enriched housing			
	Compared to SC		Compared to IC	
Body Weight	↓ (males)	[40,107]	↓ (adolescent males)	[108]
	– (females)	[66]	↓ (females)	[66]
General Behaviour	↑ habituation, ↓ activity	[39,52]	↑ habituation, ↓ activity	[39,52,60]
	↑ grooming, ↓ rearing	[39,52]	↑ grooming, ↓ rearing	[39,52,100]

Question

- The present research aims to investigate how reversing between conditions can affect the exploratory behavior of male Wistar rats using the open field test.

Methods

GROUP (PND 25)	Test 1	Reversal	Test 2
SOC n=9	OFT1	SOC-SOC	OFT2
EE n=9	OFT1	EE-ISO	OFT2
ISO n=9	OFT1	ISO-EE	OFT2
Test day (PND)	94	121	190

Isolated group

Individually housed

Physical objects included:

Water Dispenser

Cage Dimensions:

33 cm long x 23 cm width x 15 cm height.

Volume: 11 385 cm^3

Area: 2 358 cm^2

Animal density:

Volume: 11 385 cm^3/subject

Area: 2 358 cm^2/subject

Social group

Socially housed: 9 conspecifics

Physical objects included:

8 fixed wall mounted feeders

4 water dispenser (one x corner)

Cage Dimensions:

80 cm long x 80 cm width x 50 cm height.

Volume: 320 000 cm^3

Area: 20 800 cm^2

Animal density:

Volume: 35 555 $\mathrm{cm}^3/\mathrm{subject}$

Area: 2 311 $\mathrm{cm}^2/\mathrm{subject}$

Enriched Group

Socially housed: 9 conspecifics

Physical objects included: (rotated)

- 2 Running wheels
- 6 platforms/bridges
- 12 wooden chews
- Swings, ropes and chains
- H-shape pipes
- E-shape pipes
- U-shape pipes
- 6 water dispensers

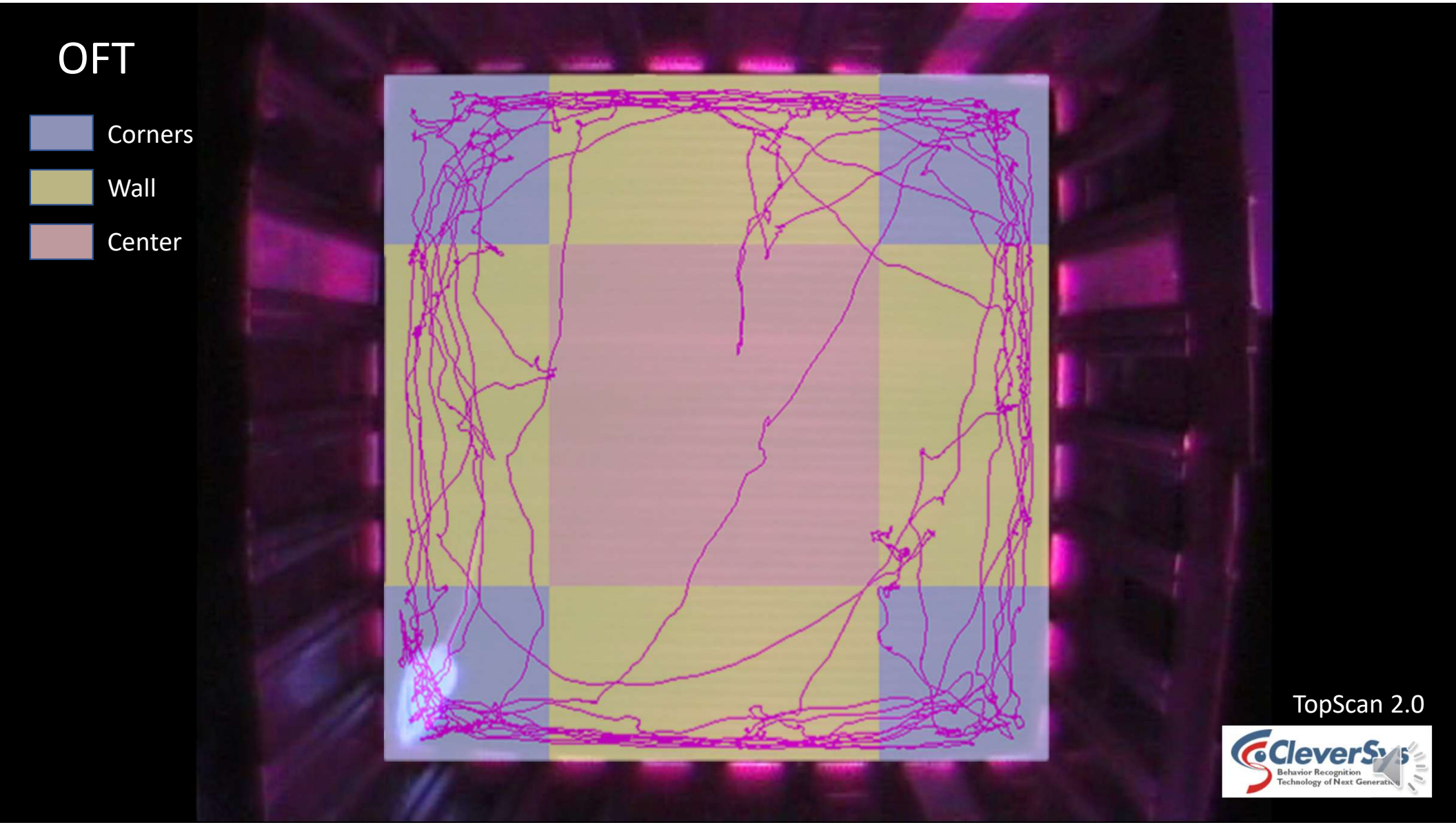
Cage Dimensions:

80 cm long x 80 cm width x 150 cm height.

- *Volume*: 960 000 cm^3
- *Area*: 36 800 cm^2

Animal density:

- *Volume*: 106 666 cm^3/subject
- *Area*: 4 088 cm^2/subject


OFT
Corners
Wall
Center
TopScan 2.0
CleverSys
Behavior Recognition
Technology of Next Generation

Data analysis and Results

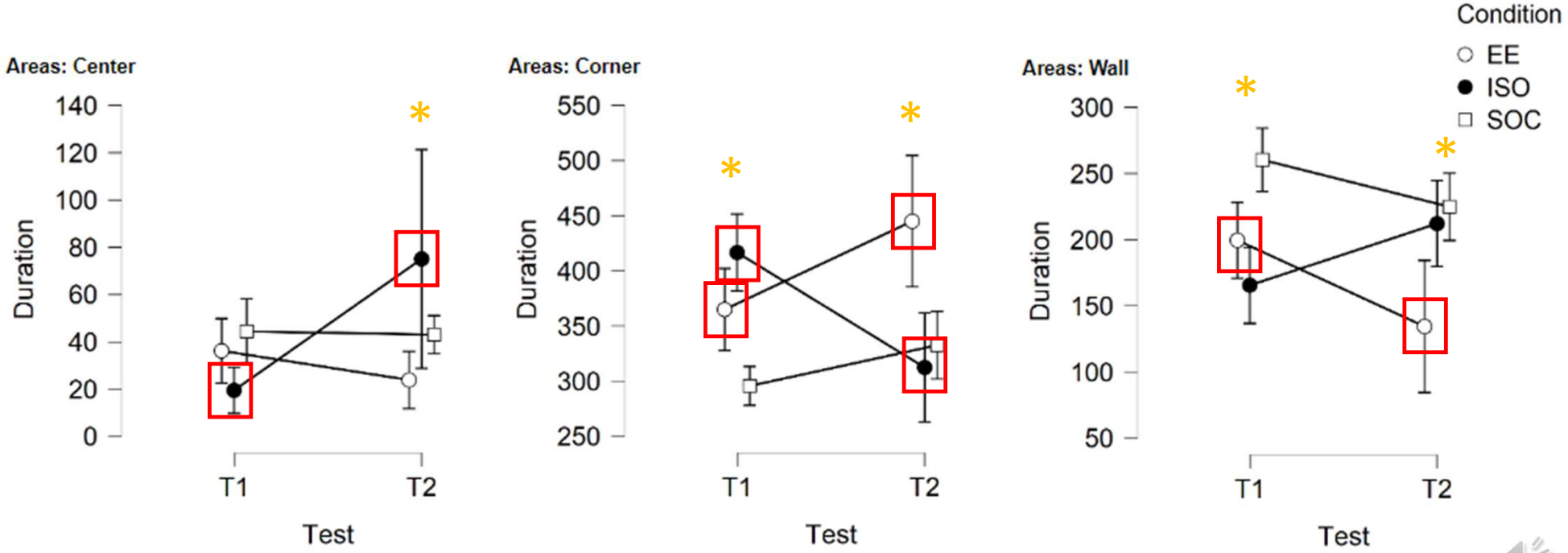
- The analysis showed a statistically significant three-way interaction between condition, test and areas regarding time spent in areas, number of crossings, and distance traveled when the reversion occurred.

TIME SPENT PER AREA

ANOVA - Duration

Cases	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Condition	32.310	2	16.155	0.009	0.991	9.877e −6	1.253e −4
Test	1.001	1	1.001	5.551e −4	0.981	3.060e −7	3.882e −6
Areas	2.748e +6	2	1.374e +6	761.935	< .001	0.840	0.914
Condition ✻ Test	29.335	2	14.667	0.008	0.992	8.968e −6	1.137e −4
Condition ✻ Areas	131737.402	4	32934.350	18.260	< .001	0.040	0.338
Test ✻ Areas	7402.347	2	3701.173	2.052	0.132	0.002	0.028
Condition ✻ Test ✻ Areas	125617.362	4	31404.341	17.412	< .001	0.038	0.328
Residuals	257915.983	143	1803.608				

Note. Type II Sum of Squares

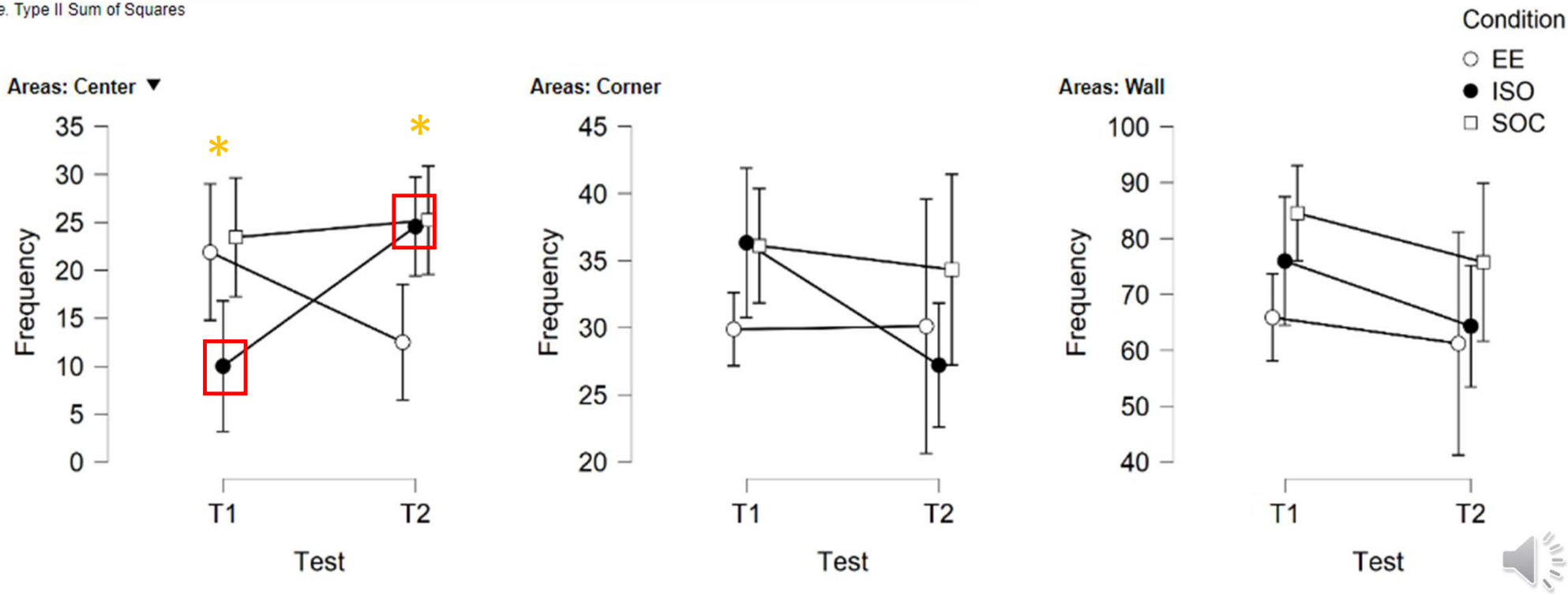


NUMBER OF CROSSINGS

ANOVA - Frequency

Cases	Sum of Squares	df	Mean Square	F	p	η^2	η_p^2
Condition	2609.670	2	1304.835	9.707	< .001	0.025	0.120
Test	402.540	1	402.540	2.994	0.086	0.004	0.021
Areas	77838.057	2	38919.028	289.514	< .001	0.754	0.802
Condition ✻ Test	37.036	2	18.518	0.138	0.871	3.589e −4	0.002
Condition ✻ Areas	729.991	4	182.498	1.358	0.252	0.007	0.037
Test ✻ Areas	796.023	2	398.012	2.961	0.055	0.008	0.040
Condition ✻ Test ✻ Areas	1546.638	4	386.659	2.876	0.025	0.015	0.074
Residuals	19223.333	143	134.429				

Note. Type II Sum of Squares

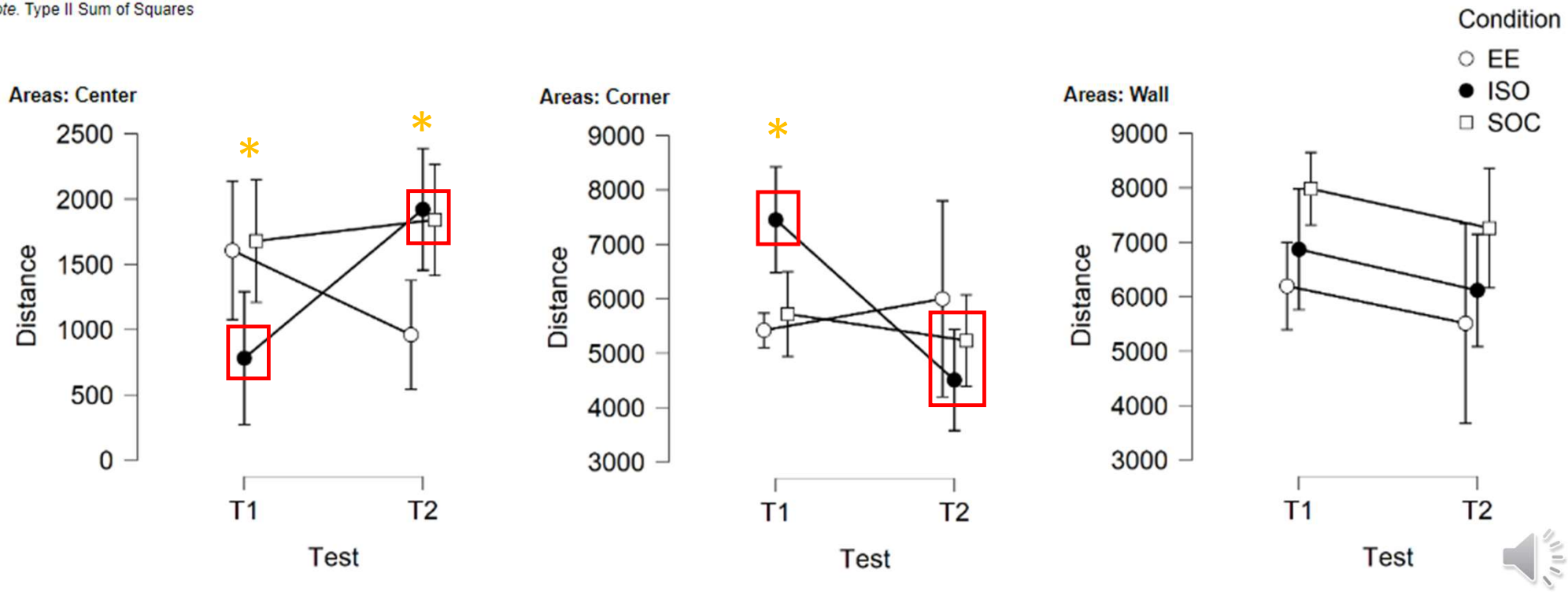


DISTANCE TRAVELED

ANOVA - Distance

Cases	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Condition	1.182e +7	2	5.908e +6	3.977	0.021	0.011	0.053
Test	9.408e +6	1	9.408e +6	6.332	0.013	0.008	0.042
Areas	8.165e +8	2	4.083e +8	274.803	< .001	0.730	0.794
Condition ✻ Test	2.952e +6	2	1.476e +6	0.993	0.373	0.003	0.014
Condition ✻ Areas	2.154e +7	4	5.385e +6	3.625	0.008	0.019	0.092
Test ✻ Areas	1.066e +7	2	5.328e +6	3.586	0.030	0.010	0.048
Condition ✻ Test ✻ Areas	3.346e +7	4	8.365e +6	5.630	< .001	0.030	0.136
Residuals	2.125e +8	143	1.486e +6				

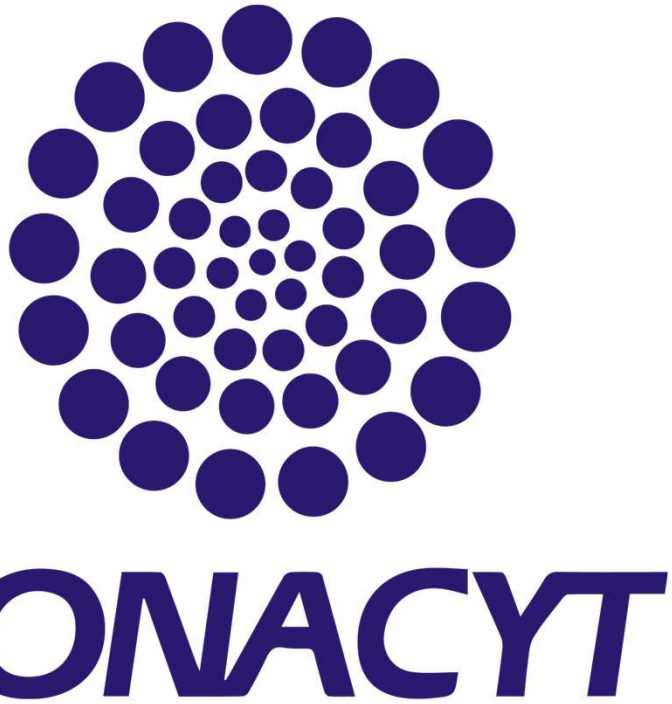
Note. Type II Sum of Squares



Conclusion

- In conclusion, exposure to impoverished environments during adulthood can mitigate the positive effects of EE acquired during early life development.
- This effect works both ways, the exposure to enriched environments during adulthood can mitigate the adverse effects of social isolation during early life development.

Acknowledgements



Thanks for your attention!

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