

INTRODUCTION

- Autism spectrum disorders (ASD) : neurodevelopmental disorders characterized by impairment of socialization, communication, and behavior
- Eye tracking: technology to record areas of interest in the visual field. Children with ASD may have specific eye movements and areas of interest.

AIM

- To perform eye tracking, vision screening and eye exam in children with ASD and their siblings
- To correlate the results with age-matched controls.

METHODS

Patient Selection:

- Prospective enrollment of 148 subjects between 7 and 17 years: 36 with ASD recruited from the special kids clinic, 27 siblings and 84 controls recruited from the pediatric ophthalmology clinic.

Data Collection:

- Demographic data: age, gender, systemic disease, eye exam parameters and vision screening data from the Plusoptix automated vision screener (Figure 1)

- Eye tracking data (Tobii eye tracker): 6 paradigms studied:

- Horizontal vs vertical motion (Figure 2)
- Face image paradigm (Figure 3)
- Video of a talking girl with sound
- Video of a talking girl without sound
- Animate/inanimate paradigm (Figure 4)
- The inverted scene (Figure 5)



Figure 1: Plusoptix vision screener

RESULTS

- Mean age was 7.7 ±2.9 years in ASD group, 9.8 ±2.3 years in siblings and 10.0 ±2.8 years in the controls. No significant differences were encountered in demographic variables.
- Ocular abnormalities (strabismus/ refractive errors): 20% ASD, 46% controls
- DSM-V severity criteria: ASD group included 16 mild, 10 moderate, 9 severe and 2 unspecified
- In all paradigms: shorter fixation duration and decreased fixation count in ASD subjects (Table 1,2 & Chart 1,2). Siblings fixated longer and more than ASD group but less than controls
- Talking girl with and without sound: ASD subjects fixated faster on the mouth element in both, but more significantly in the mute video. Fixation duration was however longer on eyes in all groups. Controls had higher fixation duration.

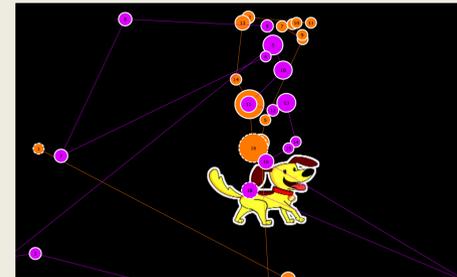


Figure 2 : Vertical motion
Orange=control
Purple: ASD

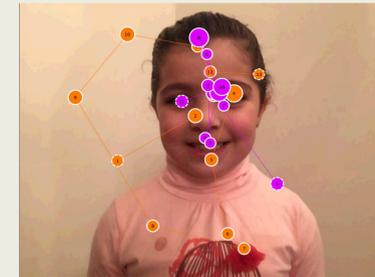


Figure 3: Face image
Purple=control
Orange: ASD



Figure 4: Animate/inanimate



Figure 5: Inverted scene

Chart 1: Total fixation duration & fixation count in vertical motion

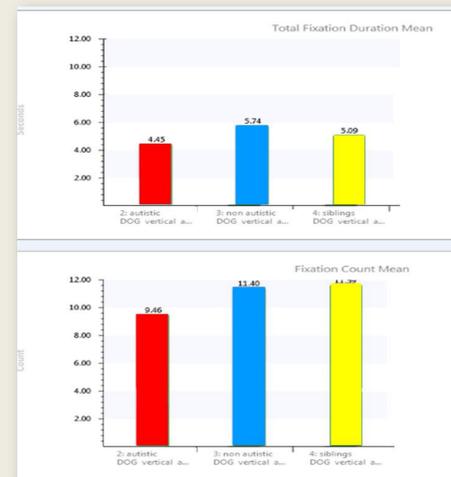


Table 1: Eye tracking parameters for the vertical motion paradigm (mean ± SD)

	ASD N=36	Siblings N=27	Controls N=84	P value
Time to first fixation (secs)	4.22 ± 2.06	3.76 ± 1.68	3.70 ± 1.02	0.08
First fixation duration (secs)	0.42 ± 0.23	0.29 ± 0.09	0.44 ± 0.16	0.22
Total fixation duration (secs)	2.54 ± 03.48	2.83 ± 3.03	4.08 ± 2.67	0.001
Fixation count	6.44 ± 16.77	10.63 ± 15.63	9.65 ± 15.97	0.001
Percentage of fixation	0.97 ± 0.03	0.96 ± 0.04	0.95 ± 0.05	0.88

CONCLUSION

- ASD subjects showed shorter fixation duration and preferential patterns of eye tracking compared to neurotypically developing children.
- Siblings were similar to the control group.

LIMITATIONS

Hospital and not community-based: may not reflect demographics of the general Lebanese population.

FINANCIAL DISCLOSURES

The authors have no financial disclosures

REFERENCES

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Chart 2: Total fixation duration and fixation count in face image



Table 2: Eye tracking parameters for the video without sound paradigm (mean ± SD)

	ASD N=36	Siblings N=27	Controls N=84	P value
Time to first fixation (secs)				
Eyes	0.36 ± 0.45	0.19 ± 0.28	0.10 ± 0.07	0.02
Mouth	0.85 ± 1.30	1.10 ± 1.22	0.63 ± 0.37	0.05
p-value	0.03	0.001	0.001	
First fixation duration (secs)				
Eyes	0.42 ± 0.87	0.22 ± 0.34	0.37 ± 0.61	0.57
Mouth	0.53 ± 0.16	1.09 ± 1.13	0.91 ± 0.91	0.01
p-value	0.95	0.001	0.001	
Total fixation duration (secs)				
Eyes	2.77 ± 2.46	3.51 ± 1.11	3.63 ± 1.39	0.003
Mouth	0.76 ± 1.14	1.73 ± 1.60	1.74 ± 1.76	0.001
p-value	0.001	0.001	0.001	
Fixation count				
Eyes	6.67 ± 17.31	7.96 ± 8.42	7.16 ± 8.50	0.30
Mouth	1.28 ± 1.98	2.30 ± 4.83	2.06 ± 2.25	0.02
p-value	0.001	0.001	0.001	
Percentage of fixation				
Eyes	0.92 ± 0.08	1.00 ± 0.00	0.98 ± 0.02	0.34
Mouth	0.58 ± 0.25	0.85 ± 0.13	0.81 ± 0.16	0.01
p-value	0.001	0.04	0.001	