Using technology based interventions to facilitate emotion recognition in children with autism spectrum disorder

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Autism Spectrum Disorder

<u>Criteria as outlined by the American Psychiatric</u> <u>Association (DSM-5):</u>

- Persistent deficits in social communication and social interaction across multiple contexts
- 2. Restricted, repetitive patterns of behavior, interests, or activities

Three levels of functioning / required support

Technology in support of the clinic

- Prevalence of ASD on the rise
- Difficulties providing therapeutic support for all.
- Technology could support therapy and extend it.
- Enhancement of independence.
- Culture appropriate.

Technology based training for ASD

(Moore et al, 2000; Parsons & Mitchell, 2002)

- Predictable, consistent format.
- Doesn't require social interaction / enables
 controlled interaction if desired.
- Enables gradual, controlled learning, tailored to individual pace and level.
- Immediate feedback, maintains motivation.
- Relies on strengths characteristic of ASD.

Skill meets Motivation - The Systemizing theory

(Baron-Cohen, 2002)

- Individuals with ASD are strongly attracted to rule based systems and predictable phenomena, and function in them as well as, and sometimes better than the general population.
- This preference for systems could arguably be harnessed to teach emotion understanding through systematic presentation of socio-emotional phenomena.

Skill meets Motivation - The Systemizing theory

(Baron-Cohen, 2002)



Technological interventions in ASD

(Grynszpan et al, 2014)

• Various aims (e.g.):

•Speech and language, literacy

•Problem solving, safety

Socio-emotional understanding

• Various platforms:

Offline/online computer-based training

- Virtual Environments
- Robotics
- Tablets and mobile phones

WHY EMOTIONS? Emotion Recognition in ASD

Children and adults with ASD experience significant difficulties recognizing others', as well as their own, emotions and mental states (Baron-Cohen, 1995; Hobson, 1993), including: facial expressions, vocal intonation, gestures and body language, and their integration in **CONTEXT** (Golan, Baron-Cohen & Golan, 2008).

WHY EMOTIONS? Emotional Expression in ASD

Difficulties in ASD in ability to

- Direct appropriate facial expressions to others (Kasari et al, 1993)
- Modulate vocal intonation appropriately when expressing emotion (McCann & Peppe, 2003)
- -Use appropriate gestures and body language (Attwood, 1998).
- Integrate non-verbal communicative cues with speech (De Marchena & Eigsti, 2010).

Research question

Can the good systemizing skills, characteristic of ASD be used to teach them about emotions? The challenge: generalization of skills.

Review: Ramdoss et al. (2012). Developmental Neurorehabilitation, 15(2), 119-135.







a systematic guide to emotions

- 412 emotions in 24 emotion groups
- For each emotion: 6 facial expression videos,
 6 voice recordings, 6 context examples and a dictionary definition.
- Emotions library, Learning Centre with lessons, quizzes, and rewards, and a Game Zone.



www.jkp.com/mindreading

Mind Reading an interactive guide to emotions

Lessons & quizzes in the Learning Center



Mind Reading a systematic guide to emotions

'Hidden face' in the Game Zone



Evaluation Studies

Golan & Baron-Cohen, 2006; Golan, LaCava, & Baron-Cohen (2007)

- Evaluation studies with adults and primary school aged children with ASD, using software for 10 weeks.
- Improvement on face and voice emotion recognition using stimuli from software, with generalization in children.
- Improvement on mentalizing related social skills on a 1 year follow up.

Children evaluation study results (% accurate)



Reading Mind in Eyes

Complex emotion voice task

Reading Mind in Films





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www.thetransporters.com



Educational aims

- •Familiarise children with human faces and increase their exposure to facial expressions.
- Introduce emotional concepts to children
- •Demonstrate the context of emotions (their causes and consequences)
- •Link between the three
- Additional learning of social interaction scripts and theory of mind.



Evaluation Study Golan et al. (2010), JADD, 40, 269.



•RCT with 4-7 years olds with ASD watching the series daily for a month, compared to ASD treatment as usual and TD controls.

	ASD	ASD	Typical				
	Intervention	Controls	Controls				
	(n=20)	(n=17)	(n=18)				
M:F Sex Ratio	15:5	13:4	12:6				
Age	5.6	6.1	5.3				
	(1.0)	(1.1)	(1.2)				
Verbal IQ	98.9	98.8	102.8				
(BPVS)	(7.9)	(7.6)	(7.8)				
CAST	24.0	23.8	6.0**				
	(6.2)	(5.5)	(3.0)				

Level 1: Defining emotion words



*

p<.0

Level 2: Familiar scenes and faces

Sally's clamp fell off and she might fall.









Level 2: Familiar scenes and faces



*p<.01

Level 3: novel scenes & faces from series

Jennie is stuck in the middle of a busy road. She might be hit by someone.









Level 3: novel scenes & faces from series

ASC intervention ASC control - Typical control



* p < .01

Level 4: novel scenes & faces not from series

The neighbour's dog has bitten people before. He is barking at Louise.







Level 4: novel scenes & faces not from series

ASC intervention — ASC control — Typical control 14 13 12 * * 11 10 9 8 -Time 2 Time 1

* D<.01

Evaluation

 Intervention group improved on emotion recognition and emotional vocabulary over 4 levels of generalization. (Golan et al. 2010).

Better effect than Thomas

(Young & Posselt, 2012)

 Improvement greater than control animation series, maintained on 3m follow-up (Gev, Rosenan & Golan, in preparation).









An internet-based virtual world, teaching children with ASD to recognise, understand and express emotions through facial expressions, voice and body language



Project Main Objectives

- 1. Create an internet-based service that will assist children with ASD and their carers to improve their socio-emotional communication skills.
- 2. Attend both to the recognition and to the expression of socio-emotional cues.
- Attend to individual sensory channels (facial expressions, prosody, body language) separately, and to their integration in context.
- Provide carers with professional information, principles to enhance generalization, and tools to assign tasks and monitor child's progress. ASC-Inclusion



www.asc-inclusion.eu

Evaluation

- Four countries: UK, Sweden Israel, Poland.
- Emotion recognition tasks pre+post intervention.
- SRS and VABS-Socialization scales for generalization assessment.



Distribution of VE use



Preliminary findings: UK

TASK	Mean PRE (SE)	Mean POST (SE)	t value (DF)	P value
Body	14.33 (1.34)	18.73 (.61)	5.14 (14)	<.01**
Integration	11.13 (1.03)	13.47 (.72)	2.79 (14)	.02*
Questionnaire	Mean PRE (SE)	Mean POST (SE)	t value (DF)	P value
SRS N=14	114.78 (7.27)	110.43 (8.25)	1.24	.24
Vineland Social N=11	67.63 (3.91)	71.45 (3.92)	2.99	.01*

Using the VE had a significant effect on both close generalization tasks, as well as the distant generalization neasure of socialization.

Preliminary findings: Israel

Face task

Voice Task



*Significant improvement of the intervention group, compared to controls, on voice and body tasks. Face task and SRS effects are nearing significance.

Expression Evaluation

- 12 Children tested the system's expression recognition with their parents.
- The system correctly recognized 80% of the children's expressions on valid trials.
- Parent-computer agreement was 61.1%.



Conclusions

- Relying on systemizing strengths, favourable multimedia environment, and intrinsic interests could be used effectively to teach individuals with ASD about emotions.
- Successful generalization and integration with other social skills may require further support.
- Need for application for lower functioning users.

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