TOWARDS A FRAMEWORK OF EVIDENCE-BASED-PRACTICES (EBP) FOR IT AND ASD

Mark Brosnan and Ouriel Grynszpan
Sue Fletcher-Watson, Gerardo Herrera, Matthew Goodwin,
Patricia Perez, Richard Mills
In the beginning...

ITASD 2014 Paris conference
Digital solutions for people with autism
October 3-4, 2014

15:35-16:30 - PLENARY
Panel discussion: The need for evidence based research in IT applied to ASD
Participants: Mark Brosnan, Matthew Goodwin, Patricia Pérez and Ouriel Grynzspan
Questions...questions...

• ‘Which app is best for social communication?’
• ‘does this app actually help?’
• ‘How do I validate my app?’
• Does it matter?

• “A child with autism only has one childhood”
How many apps are there?

- Google Play: 2,800,000
- Apple App Store: 2,200,000
- Windows Store: 669,000
- Amazon Appstore: 600,000
- BlackBerry World: 234,500
Mental Imagery Therapy for Autism (MITA) is a unique, early-intervention application for children with Autism Spectrum Disorder (ASD). The app includes bright, interactive puzzles designed to help children learn how to mentally integrate multiple features of an object, an ability proven to lead to vast improvements in general learning. Success with MITA could overtime result in significant improvements in a child’s overall development, specifically in the realms of language, attention and visual skills.

SCIENCE BEHIND THE PROJECT

MITA is based on Pivotal Response Treatment (PRT), one of the best-supported therapies for children diagnosed with ASD. The puzzles target three of four critical areas of development supported by PRT: response to multiple cues, motivation, and self-management.

A child’s ability to notice and to respond to multiple visual cues presented simultaneously is the most critical. This ability is typically impaired in individuals with autism, leading to what is commonly described as "stimulus overselectivity", or "tunnel vision." Improving the capacity to respond to multiple cues has been shown to reduce stimulus overselectivity, which in turn leads to vast improvements in general learning.

MITA in the news: https://youtu.be/giZymh3rMHc
A peer-reviewed article describing MITA: http://goo.gl/lyHw95
Mental Imagery Therapy for Autism (MITA) - An Early Intervention Computerized Brain Training Program for Children with ASD

Rita Dunn and Andrey Vyshedsky
Boston University, Boston, Massachusetts, USA and ImagiRation LLC, Boston, Massachusetts, USA

*Corresponding author: Vyshedsky A, Boston University, Boston, Massachusetts, USA and ImagiRation LLC, Boston, Massachusetts, USA; E-mail: vysha@bu.edu

Rec date: September 8, 2015; Acc date: October 20, 2015; Pub date: October 27, 2015

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Abstract

There is a broad consensus that early intervention has the greatest chance of positive impact on an individual with ASD. In this paper, we describe the development of an innovative computerized brain-training program for toddlers and preschoolers that has the potential to completely change their developmental trajectory. We describe the design of iPad-based game-like exercises that train a child to notice and respond to multiple cues. This ability is typically impaired in individuals with autism, leading to what is commonly described as stimulus overselectivity, or "tunnel vision." Improving the capacity to discern and to respond to multiple cues has been shown to reduce stimulus overselectivity subsequently leading to vast improvements in general learning. Our hypothesis is that regular, prolonged practice with such exercises will result not only in a greater ability to attend to multiple cues, but also in vast improvements in transfer tasks measuring visuospatial as well as communicative skills. We also aim to show that computerized brain-training that is based on evidence based therapies could be used to reduce the gap between the amount of therapy recommended for children with ASD and the amount they actually receive. Finally, we describe early indicators of game engagement and outline planned future work to test the games' efficacy as a therapeutic tool.
Initial results

In two pilot studies conducted over nine months, MITA software was used by two therapists as a reward at the end of a regular speech therapy session. Of the fourteen children in the two studies, all of whom were between the ages of 3 and 5, eight of the children were ranked by the therapists as showing "high engagement" with the software, four as showing "moderate engagement" and two as showing "low engagement." The twelve children, who showed either moderate or high level of engagement with the software, performed, on average, 27 tasks before becoming unengaged, with an average session length of 10 minutes. In addition, 2 children showed a tendency for using trial-and-error to solve puzzles as opposed to active mental simulation. Both therapists noted a significant improvement in fine motor skills for all participants at the conclusion of the nine month study.
**Reviews**

**Alex Blais** ★★★★★

The app won't open at all anymore! My son and I are Beyond frustrated. I filled out

**Frankie Delgado** ★★★★★

Used to love this but It keeps glitching and freezing up which as led to many meltdowns

**Bint Omar** ★★★★★

I am forever greatful for the Mita app. I want to extend a huge thanks and appreciation

**Cindy White** ★★★★★

Best ABA app by far especially for younger kids. It does crash a lot though, hope that'll get
Are reviews evidence?

• Recommendations from others:
  • Who are the reviewers: people who comment?
  • How honest are they?
  • Other parents/practitioners
  • App developers
  • Social media
  • Traditional media

• More systematic process...
Over 700 apps reviewed

Apps now have a research rating:

**Anecdotal** = No specific or related scientific studies for this type of app.

**Research** = There are some related scientific studies, but no direct research support for this type of app or technology.

**Evidence** = There is solid or specific scientific evidence that this type of app or technology is helpful.

### Filters

<table>
<thead>
<tr>
<th>What does it do</th>
<th>On what device</th>
<th>For what ages</th>
<th>Or search by keyword</th>
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<td>&lt;Any&gt;</td>
<td>&lt;Any&gt;</td>
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**Name**

<table>
<thead>
<tr>
<th>Category</th>
<th>Platform</th>
<th>Age</th>
<th>Supporting Research</th>
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</table>

EBPforIT&ASD July 2017
42 (6%) have any evidence
Do children with autism learn to read more readily by computer assisted instruction or traditional book methods? A pilot study.

The study evaluates the progress of eight children aged 3-5 years with autism attending a specialist teaching unit in their development of reading skills in two conditions: computer instructed learning and book based learning. The authors developed a direct observation schedule to monitor autistic behaviours using computerized techniques. The children were matched by age, severity of autistic symptomatology and number of spoken words. They were initially randomly allocated to the computer or book condition and crossed over at 10 weeks.

Link to Study:

Purchase Access

Do Children with Autism Learn to Read more Readily by Computer Assisted Instruction or Traditional Book Methods?

Christine Williams Barry Wright Gillian Callaghan Brian Coughlan

Autism 03 2002 ; vol. 6, 1 : pp. 71-91.
DOI: 10.1177/1362361302006001006
Posted online on June 30, 2016

Subtotal: $36.00

Checkout
Scientific publication rate

Number of articles per year

According to scholar.google using keywords: « autism innovative technology »
Heterogeneity in the quality of studies

• Multi-disciplinary community:
  • Design/Engineering
  • Clinical Sciences
  • Psychology/neuroscience

• Engineers can be unfamiliar with experimental methodology

• Experimentalists can be unfamiliar with design issues

• Example: Systematic review of haptic/tactile interfaces for ASD did not yield a single pre-post group design
What constitutes good evidence?
Randomised Control Trial (RCT)
Meta-analysis of Efficacy Studies

- Controlled pre-post designs
- Randomization for 85.6% of participants
- Significant effect: $\text{Cohen’s } d = 0.47$

$\Rightarrow$ Technology-based interventions proven successful

- However, there is still a dearth of high-quality trials


10 randomized controlled studies: similar effect size
Potential Moderator Variables

• Significant heterogeneity among studies

• Different theoretical approaches:
  • Applied Behavior Analysis
  • Cognitive Behavioral Therapy
  • Neuro-rehabilitation

• Different methods:
  • Participants’ characteristics
  • Duration of treatment
  • Unsupervised learning vs. training with a specialist
A trial of an iPad™ intervention targeting social communication skills in children with autism

Sue Fletcher-Watson¹, Alexandra Petrou², Juliet Scott-Barrett¹, Pamela Dicks³, Catherine Graham⁴, Anne O’Hare¹, Helen Pain¹ and Helen McConachie²

Abstract
This study evaluated a technology-based early intervention for social communication skills in pre-schoolers in a randomised controlled trial. Participants were 54 children aged under 6 years with a diagnosis of autism, assigned to either intervention or control conditions. The app engaged children, who played consistently, regardless of developmental level, and was rated highly by parents. There were no significant group differences in parent-report measures post-intervention, nor in a measure of parent–child play at follow-up. Therefore, this intervention did not have an observable impact on real-world social communication skills and caution is recommended about the potential usefulness of iPad™ apps for amelioration of difficulties in interaction. However, positive attitudes among participants, lack of harms and the potential of apps to deliver therapeutic content at low economic cost suggest this approach is worth pursuing further, perhaps targeting other skill domains.
Using computerized games to teach face recognition skills to children with autism spectrum disorder: The Let’s Face It! program

James W. Tanaka, Julie M. Wolf, Cheryl Klaiman, Kathleen Koenig, Jeffrey Cockburn, Lauren Herlihy, Carla Brown, Sherin Stahl, Martha D. Kaiser, and Robert T. Schultz

Table 2: Group x Timepoint interaction effects for each of the Let’s Face It! Skills Battery subtest

<table>
<thead>
<tr>
<th>Subtest</th>
<th>Time 1</th>
<th>Time 2</th>
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<tr>
<td>Face subtests</td>
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<tr>
<td>Face dimensions</td>
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<td>Active: 79.8%</td>
<td>F(1, 79) = .20</td>
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<td>Waitlist: 74.2%</td>
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<td>Masked features</td>
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<td>Active: 58.3%</td>
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<tr>
<td>Object subtests</td>
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<td>House dimensions</td>
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<td>Active: 67.1%</td>
<td>Active: 72.8%</td>
<td>F(1, 68) = .53</td>
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<td>Waitlist: 68.8%</td>
<td>Waitlist: 73.0%</td>
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<tr>
<td>Immediate memory for cars</td>
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</tr>
<tr>
<td>Active: 49.4%</td>
<td>Active: 54.6%</td>
<td>F(1, 43) = .33</td>
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<tr>
<td></td>
<td>Waitlist: 51.8%</td>
<td>Waitlist: 53.6%</td>
<td></td>
</tr>
</tbody>
</table>
Enhancing Emotion Recognition in Children with Autism Spectrum Conditions: An Intervention Using Animated Vehicles with Real Emotional Faces

Ofer Golan · Emma Ashwin · Yael Granader · Suzy McClintock · Kate Day · Victoria Leggett · Simon Baron-Cohen

Fig. 2  Graphs to show mean scores (with SE bars) for each group on the four tasks (* p < 0.001). a Situation-Expression Matching task—Level 1. b Situation-Expression Matching task—Level 2. c Situation-Expression Matching task—Level 3. d Emotional Vocabulary task

- **Typical group**
- **Experimental ASD group**
- **Control ASD group**
Other forms of Evidence?

- Treatment is not always the goal
- Feasibility/Usability studies:
  - Pictogramme communication

- User centred / participatory design approaches

Use of VR headset

Chien et al., *Int J Hum-Comput St*, 2015

Newbutt et al., *J Autism Dev Disord*, 2016
FIRAH project

• Review current state of EBP for digital-based interventions for ASD
• Work with the autism community, software developers and researchers to develop an EBP framework
• Test this framework on databases of ASD technology
• Develop EBP guidelines for research, software development and tutorial for end-users, family and practitioners
To get involved

• Project web site: www.asdtech.ed.ac.uk/index.php/ebp-framework-project
• To work on the project: post-doc position available (contact: ouriel.grynszpan@upmc.fr)