Software for Autistic Children

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Outline

- Introduction to Autism
- Interventions and computer-based technologies
- Story-builder software
- Computer aided communication software
Autism

- Derived from the Greek word autos (αὐτός, meaning self)
- One of the autism spectrum disorders (ASD) [DSM-V]
  - Autistic disorder
  - Asperger’s syndrome disorder
  - Childhood disintegrative disorder
  - Pervasive developmental disorder not otherwise specified (PDD---NOS)
Autism symptoms

Marked impairment in:
- Social interaction
- Communication
- Repetitive and inflexible behavioral

Autism video:
- http://www.youtube.com/watch?v=lbXjW-cX9kQ
Autism statistics

- 1 out 100 people, around 700,000 in the UK [www.autism.org.uk]
- 1 percent of the children in the U.S. ages 3-17
- 1 to 1.5 million Americans live with an ASD
- 10 - 17 % annual growth
- Boys four times likely than girls [www.autism-society.org]
The exact causes of autism are unclear.

Genetic influences and biological processes before during and after birth are most likely to blame.

Scientists are yet to discover a cure for autism.

[www.nhs.uk]
Interventions

- Social stories and comic strip conversations
- Alternative and augmentative communication
- Behavioural and developmental interventions
- Speech therapy
- Biomedical intervention
- Health and service-based interventions

[autismcenter.org/treatment_interventions.aspx]
[http://www.autism.org.uk/approaches]
- Natural affinity for computers\textsuperscript{1}
- Learn social interactions without the fear of difficulties involved in face-to-face interaction\textsuperscript{1, 2}
- Learn at their own pace
- Increase in focused attention, in-seat behaviour and better motor skills\textsuperscript{3}


Story-builder software
Story-builder projects

Social stories

- Initially developed by Carol Grey (1994) for use by children with ASD.
- Short stories describing situations or concepts in a format that is meaningful for ASD.
- They are usually based on the child's daily experiences and situations that are familiar to them.
- These stories focus on the social and emotional implications of a situation which makes it an appealing tool for empathy and social interaction difficulties experienced by autistic children.
Social story evidence

- Supported mostly by anecdotal evidence, though there have been formal studies\(^1\), \(^2\).

- The studies reveal that the use of social stories appeared to have an impact on the reduction of negative social behaviours and promoting positive ones.

- The studies also suggest the importance of tailoring the social stories according to children’s individual needs, interests and learning style, for example, using the picture of their favourite cartoon character.

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Social stories can take many forms - booklets, flashcards, posters and video- and audio-based media have all been employed.

The appeal of an interactive medium for social stories is clear – it initiates a two-way process by which the child can contribute to and learn from the stories.

A “shell” system designed to make it easy for parents and teachers to create their own individualised computerised stories as learning materials for their children.
Story-builder overview
Bank of four main types of sentences: descriptive, perspective, directive and affirmative.

The picture library offered by Widget - “Communicate: in print” as all special schools at York use it.
Read story and feedback

Read a story

Provide feedback
Development process

- An initial design was drawn up, based on literature concerning CBL for social skills education and the previous version story builder software\(^1\).
- User centred design involve a Senior ASD Practitioner at the York City Council.
- Heuristic evaluations by 4 undergraduate students at York.
- User evaluations by three specialised ASD teachers at York.

The overall response to the system was very positive.

They thought the tool enables them to write the sort of stories they wanted and the autistic children would want to use the stories written with the shell.

They liked the feature of “bank of sample sentences” and appreciate with the use of pictures from Widget.

The users learnt to use all the functionalities in less than 10 minutes, and they find the software is easy and intuitive to use.

The average SUS satisfaction score of the “Story Builder” is 73.16, well above the average of 68, which affirms the usability of the software.
Possible enhancements

- **Feature wise**
  - Text editing, formatting and automatic spelling check facilities.
  - Print story on paper or PDF.
  - Computer read a story, thus increase concentration and help to match words with sounds.

- **Research wise**
  - The addition of simple questions.
  - More complex agent-based conversations, via Comic Strip Conversations.
Computer-aided communication
Augmentative and Alternative Communication (AAC)

- Methods used to supplement or substitute natural speech in people with speech delays or impairment.

- Unaided, e.g.
  - Sign language, e.g. British Sign Language (BSL), Makaton

- Aided, e.g.
  - Picture Exchange Communication System (PECS)
  - Speech generation device
Existing AAC Software 1/3

TapToTalk

All equally categorised
Existing AAC Software 2/3

Proloquo2Go

Many, disorganised and confused
Existing AAC Software 3/3

Sono Flex

Many, disorganised and confused
Projects


Specially designed for less advanced PECS users.

Mainly for basic request, the use of proper sentence formulation is not enforced.

I want to eat a pizza.
I want to eat a pizza.

A clear sense of sequentiality and navigation steps
The symbols that shall be used within the application are PECS symbols.

The application shall guide children and allow them to learn from their mistakes.

Items shall not be over-categorised, though one categorisation level would not be too deterrent.

All the sentences shall be spoken out in British English.

The formulation of sentences focuses on their basic needs and not something else.
User centred design involves a specialised teacher at York city council and the mother of an autistic child.

Two prototypes which have led us to the final design.
User centred design involves a specialised teacher at York city council and the mother of an autistic child.

Various symbols have been corrected or replaced with others, ...

... sentences to be spoken out have been simplified, ...
... one categorization level has been added.

food & drink
activities
Toys
Indirectly tested the application at home with an autistic child for a month and proved quite positive.

Google Play Statistics

- The application has been awarded 3.5 out of 5 stars and
- Out of the 421 downloads it has had, it is still being used by 211 people.

[up to 28 Jan 2014 ]
Maryam’s software
Specially designed for advanced PECS users.
Learn sentence building as well as communication.
User Centred Design

Mock ups from several iterations
Heuristic Evaluation followed by cognitive walkthrough
- one advanced ASD practitioner,
- one speech/language pathologist and
- the mother of an autistic child

Suggestions
- Promising for advanced PESC users, but not suitable for children in the early stages of learning.
- Provide categories to avoid intensive scan of items.
- Disappearing is better than disabling symbols.
- Incorporate courtesy words like “please” and “thank you”.
Design principles learned

- Catch the child’s interest
- Interface not over-cluttered with symbols
- Categorise items but not overdo
- Distinguish essential and normal needs
- Simple modality
- Disappearing rather than disabling items
- Clear sequentiality and navigation
- Repetitive and recursive steps
Special thanks to

CITY OF YORK COUNCIL

THE UNIVERSITY OF YORK
DEPARTMENT OF COMPUTER SCIENCE

York HCI

THE UNIVERSITY OF YORK
Department of Psychology

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