

Developing for Autism with User-Centred Design

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ABSTRACT

This paper describes the process undertaken to develop software that allows children with Autism Spectrum Disorders (ASD) to explore social situations, in particular the concept of sharing. The User-Centred Design (UCD) process is described, along with adaptations made to alleviate anxiety resulting from the reduced social skills seen in ASD.

Categories and Subject Descriptors

D.2.10 [Software Engineering]: Design - Methodologies

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Keywords: Autism, Autistic, User-Centred Design, Informants, Social Skills, Sharing, Ethnography

1. INTRODUCTION

In the typically developing population, the ability to display appropriate social skills is developed through scaffolding by parents and caregivers from an early age [1]. In Autism Spectrum Disorders (ASD), the typical trajectory of development is compromised. Affecting more than 500,000 people in the UK [2], there is a lack of appreciation of the thoughts, beliefs and feelings of others (Theory of Mind) [1], with established difficulties in social interaction, social communication and social imagination. This lack of social competency can result in significant difficulties in daily living, academic achievement and poor adult outcomes related to employment and social relationship [3]. One particular area of difficulty is sharing, a complex behaviour that forms the basis of many friendships.

The use of technology is limited within the scope of developing social skills, despite those with Autism Spectrum Disorders having a natural affinity with computers [4] due to the predictable and repeatable nature of technology. Furthermore, little work has been conducted in the area of User-Centred Design with children with ASD. This research seeks to involve children with ASD as a valuable source of design inspiration throughout the design and development of the system. The system developed aims to allow children to increase their awareness of their sharing abilities through exploration of these skills in a safe and predictable environment.

2. BACKGROUND (CURRENT SOLUTIONS)

A great deal of expertise, time and effort has been invested in the provision of therapy to improve social skills in those with Autism

Spectrum Disorders. The most well-known of these is Social Stories [5], which aim to provide the missing (non-verbal) information in communication. Social Stories are generally considered effective [6] but often do not utilise technology.

The use of technology as a therapeutic tool is limited, but a number of products are commercially available for use in social communication therapy, the majority of which focus on the recognition of emotions from facial expressions. For example, "Faceland" [7] focuses on providing positive feedback through on-screen characters.

Despite the advances seen in this field, one area lacking is the use of User-Centred Design to develop software and other technologies. Children, particularly those with disabilities, are infrequently involved in the design and testing of computer systems [8]. This is discouraging, as the implementation of a User-Centred Design process can result in a more meaningful integration of design and functionality [9].

3. RESEARCH METHODOLOGIES

A number of research methodologies have been adapted and utilised in the development of this research.

At the outset of this research, ethnographic processes were followed in order to identify the problem area and to ensure that this is clearly defined in a realistic setting [10]. Unstructured observations were conducted to consider specific problems occurring in a practical setting for those with ASD. The observations were conducted within a naturalistic setting, ensuring that the behaviours observed are as close to typical as possible, given the presence of the participating observer. This ensures that the observations are flexible and responsive to events as they occur. Field notes were completed in narrative form within one hour of observations being carried out. Video recording of the sessions was avoided since the participant group was unfamiliar with the observer and so the presence of a video recorder may be intrusive and distracting in this case.

These observations gave rise to two areas of further research. It was noted that teachers and therapists spent a great deal of time customising therapeutic efforts to encompass specific needs and special interests [1]. Furthermore, the concept of sharing was recognised as a specific difficulty, with much time spent working on this particular skill.

Since children with ASD have a narrow range of interests, User Centered Design methodologies are invaluable in ensuring that the opinions and preferences of this primary user group are reflected in the resultant system. Design Workshops included designing a character, drama and role-play sessions, and developing a "fun" location to play in.

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These workshops developed the design themes, which are utilised to promote engagement in the users. The participants were provided with a background image broadly depicting an open grassy space (garden) and were invited to draw objects into it in order to create a fun and motivating location that they would enjoy playing in. The gardens created were analysed using grounded theory methodologies [11] to determine four main themes that emerged: 'space', 'fantasy', 'animals' and 'garden'. These are used to promote engagement with and maintain interest in the system.

Within the research, the children are involved as "Design Informants" through continuous user access and participation [12], rather than being involved as "Design Partners". This is due to the participants with ASD experiencing difficulties in imagining situations and context out with their immediate reality, with the potential for increased anxiety and social stress. For this reason, the researcher assumes responsibility for the design, making inferences from data gathered in design workshops.

4. FINAL SYSTEM

The final system is developed for children with Autism Spectrum Disorders, with a developmental age of 5-8 years. The chronological age may be greater. In the resulting system, the child takes control from the outset, selecting the theme that they prefer by selecting it from the list presented by the system, allowing them to set the trajectory of their interaction. A character then appears on screen and indicates the sharing "problem" that the child has to solve. Once the child is ready to begin, they can select the green coloured "Ready" button. At this point, the screen will display a number of objects across the top and two locations between which to share the objects. The child can manipulate these objects by dragging and dropping across the screen into the relevant areas, which are indicated by being a different colour than the background.

When the child has decided how to share the objects on screen, they can select the green "Done" button. If the objects have been shared correctly (and thus the problem is now solved) there is a visual and auditory confirmation of success. If the objects have not been shared appropriately and according to social convention, then the character will re-appear on screen and offer some advice. If after three attempts, the child is unsuccessful, the character will provide the answer along with an explanation of the solution. It is intended that the character is non-confrontational and does not direct the child; rather the character should be viewed as a source of advice and assistance.

Throughout each scenario/situation, the child is able to set the pace of the interaction, through selecting the green-coloured buttons to indicate that they are ready to move on.

5. EVALUATION PLANS

The summative system evaluation will be conducted in the coming months to determine whether or not the children can benefit from using the software. Six participants, all with a diagnosis of an ASD will use the system for a period of 4 weeks, using both their preferred theme and others to determine their ability to generalise the information and to measure engagement with the system.

There will be videos recorded both pre and post-use in a variety of situations, including a classroom situation, an informal or unstructured situation and pre-determined situations working with the researcher where sharing is required; For example, snack time at school is one situation where sharing is required to divide food amongst the group. British Picture Vocabulary Scale [13] testing will be undertaken to determine the receptive language ability of the participants. Due to the small number of participants involved in this first evaluation stage, the results will be presented as case studies.

Interviews will also be conducted with classroom staff and parents (where possible) to determine if the participants are perceived to have improved their awareness of sharing and their ability and willingness to share objects with others. Time permitting; a follow-up visit will be made to school some time later to determine if any changes are maintained over time. This will involve observations and interviews with school staff.

6. CONCLUSION

Through the implementation of User-Centred methodologies, the software developed aims to allow children with ASD to explore their social skills in relation to sharing. The system will be evaluated within a special school to assess the potential of the software to improve children's awareness of sharing.

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