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# Interaction Design and Autistic Children

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## Abstract

With this workshop we aim to bring together researchers who explore interactive technologies in the context of autistic children. At a point at which considerable effort has been invested in this area and results are promising, but hardly conclusively convincing, we argue that it is time to critically reflect on our work. We do this by posing three provocative questions: 1) Are we trying to do the right thing? 2) Is it working? and 3) Does it matter? With all three questions we aim to kick-start a debate about the goals and intentions with which research is done in this area, how we define that technology is successful and how we can ensure that our research has real-world impact beyond the people involved directly.

## Author Keywords

autism; children

## ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous; See [<http://acm.org/about/class/1998/>]: for full list of ACM classifiers. This section is required.

## Introduction

Autism is a neuro-developmental condition that manifests itself in many different ways. Its hallmark features are atypical social and communication skills as well as repetitive

thought patterns and behaviours. While its causes remain unclear, it is likely to be an interaction between genetic and environmental factors [2]. As diagnostic criteria are shifting and our understanding about autism improves, prevalence rates are on the rise with a currently estimated number of 1 in 68 children being on the spectrum [17].

Autistic children<sup>1</sup> often show an affinity to digital technology as they perceive it as a predictable, structured and safe medium [16]. This has led to increasing attention in the research community on how to use digital technologies in interventions or as every-day supports in the lives of autistic children and their social environment.

The majority of work concerning children is aimed at scaffolding social skills development through interactive technologies. This includes, for example, using tangible user interfaces to increase social interactions during play [3], applications for touch screen devices such as tablets or phones [9], full-body interactions in augmented environments [14], virtual environments [1] or robotics [19]. Several meta-reviews have aimed to provide an overview of the current status of the field, which is commonly referred to as ASDTech. For example, Ploog et al. concludes that there is a lot of promise, but mixed evidence for the effectiveness of technology to enhance social, communication and language development in children [15]. Fletcher-Watson has compared the evidence behind the wide range of available apps for autism, calling for more rigour in methodology [4]. Kientz et al. possibly provide the most extensive overview of different kinds of interactive technologies for autism and the diverse contexts they are being used in [11].

Our own work in the field takes a critical stance towards

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<sup>1</sup>We are aware about the complex discussions surrounding person-first vs. label-first language; we opt for the latter, due to it being the predominantly self-chosen form of people on the spectrum [10].

normative assumptions. Building on the inspiring work by Mankoff et al. [13], we argue for shifting the starting point for technology design from mitigating deficits to creating positive experience that respond to desires and ideas that go beyond the mitigation of limitations that may associated with autism [6]. For the past 3 years, the OutsideTheBox project<sup>2</sup> has engaged autistic children to co-design interactive, smart objects that afford positive experiences through technologies and allows them to share that experience with their social peers. The process we employ is participatory throughout, providing scope for autistic children to shape the development of technology that is meaningful to them. Through multiple case studies, we have made methodological contributions to co-designing with autistic children [8, 12], theoretical contributions that critically reflect on our models of disability and how that reflects on the technologies we design [5] and with respect to rethinking the way we assess the experience of autistic children with technology [18].

With this work we aimed to highlight that technology can have diverse roles in the lives of autistic children and that designing and evaluating these technologies is situated, complex and multi-faceted. This raises methodological and theoretical challenges which we want to begin to address with this workshop.

### **Scope of the Workshop**

With this workshop, we want to bring together the substantial number of researchers in our community who explore technology in the context of autism, to collectively reflect on the status of our efforts and engage in a critical discussion about future directions in this area. In a talk given by the first author as part of the Digital Bubbles Seminar Se-

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<sup>2</sup><http://outsidethebox.at>

ries<sup>3</sup>, he posed three leading questions to facilitate such a reflective process, which this workshop aims to pick up on:

1. Are we trying to do the right thing?
2. Is it working?
3. Does it matter?

The first question aims to provoke researchers to take a step back and critically examine their goals and, inherently, their assumptions about what roles technology can have in the lives of autistic children. What are the intentions with which we design technology in this space telling us about our conception of autism? In a related workshop at CHI'16 [7], we explored a similar question which led to a healthy debate around empowerment, neuro-diversity, assistance and functional support.

Diversifying goals also means that evaluating technology becomes a lot more challenging. What is success? What does it mean to design technology that “affords positive experience” or supports the well-being of autistic children? How can we make statements about the impact of the technology we build that are both, scientifically rigorous **and** relevant within the messy life-worlds of autistic children?

Finally, the last question relates to how we can achieve impact that is sustainable and scalable. A lot of research rightly involves autistic children directly in developing technology and the heterogeneity of the target group means, that outcomes vary from case to case. How can we scale up or even transfer insights when solutions rely on being fitted to particular users and particular contexts?

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<sup>3</sup><http://digitalbubbles.org.uk/>

## Schedule & Activities

We are proposing a full day workshop that combines input from the participants from within their contexts of research with focus group work for critical reflection. The proposed schedule is as follows:

9:00	Welcome & Introductions
9:10	Participant Input - Show & Tell
10:00	Focus Session: Are we doing the right thing?
11:00	<b>Coffee Break</b>
11:15	Focus Session: Is it working?
12:15	Quick Synopsis & Documentation in the plenum
12:30	<b>Lunch Break</b>
13:30	Focus Session: Does it matter?
14:30	<b>Coffee Break</b>
15:00	Synopsis and Discussion
16:00	Fresh Air Break
16:15	Plans for Dissemination
17:00	<b>Workshop end</b>

In the Participant Input session, we will ask participants to prepare 3 slides about their work, engaging with the workshop themes from in a reversed form: 1) Our goal is... 2) We know it is working, because... 3) It matters, because...

All focus sessions will follow the same format: there will be a 10 minutes presentation as a provocation to stimulate discussion before all participants split up in groups to discuss. Each group will be 4 to 8 people and moderated by one organiser (or a designated participant).

## Organisers

All three organisers currently work on the OutsideTheBox project at the Human-Computer Interaction Group, Institute

for Design and Assessment of Technology, TU Wien, Austria.

**Christopher Frauenberger** is principle investigator of OutsideTheBox. His research focuses on designing technology with and for marginalised user groups, such as those with disabilities and in particular with autistic children. He is committed to participatory design approaches and builds on theories and methods from diverse fields such as the action research, disability studies, philosophy of science, research ethics amongst others.

**Julia Makhaeva** is product designer, MA and specialises in social design, social interaction and conceptual work. She graduated from the University of Applied Sciences Dresden in Germany. Prior to joining OutsideTheBox, she was a social and product designer at morethanshelters in Berlin and Hamburg, a social enterprise that creates concepts and solutions for humanitarian needs. She is exploring how designers might empower stakeholders, particularly children, by means of participation and co-design. She is also interested in how smart materials and technologies could be used as tools for gaining and sharing knowledge.

**Katharina Spiel** uses humanistic theories to understand problems in human-computer interaction. Previous work dealt with gender construction in Italian western, blind players in text-based games and the novelty effect on gameplay experiences. Within OutsideTheBox the focus lies on understanding the experiences autistic children have with technologies and how autistic children can be directly included in evaluation.

## Outcomes

As the main outcome, we plan to launch a special issue, preferably in the International Journal for Child Computer Interaction, which synthesises the main challenges that

were identified. Furthermore, we aim to report more directly on what was discussed in a collective publication, for example in the ACM interactions magazine.

## Call for Participants

This workshop aims to bring together researchers who explore interactive technologies in the context of autistic children. Our aim is to foster the relationships between researchers in this field and critically reflect on the current status of our efforts. We do this by posing three provocative questions:

1) Are we trying to do the right thing? 2) Is it working? 3) Does it matter?

We invite position papers (two to four pages, SIGCH Extended Abstract Format) which explore existing work through these questions. Submissions should include a brief overview of the research (past or planned), as well one paragraph reflection for each of the three questions. For more background, please see the full workshop proposal document on our webpage (below).

Position papers should be submitted by XXX 2017 (12pm PDT) via email to [christopher.frauenberger@tuwien.ac.at](mailto:christopher.frauenberger@tuwien.ac.at). The selection process will ensure that high quality contributions from a range of different perspectives are invited to participate.

Additional resources, related literature and further practical information is available at the workshop's webpage: <http://outsidethebox.at/en/idc17-workshop>

At least one author of an accepted submission is required to attend the workshop, and participants must register for both the workshop and at least one day of the main conference.

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## REFERENCES

1. S. Cobb, L. Beardon, R. Eastgate, T. Glover, S. Kerr, H. Neale, S. Parsons, S. Benford, E. Hopkins, P. Mitchell, G. Reynard, and J. Wilson. 2002. Applied Virtual Environments to Support Learning of Social Interaction Skills in Users With Aspergers Syndrome. *Digital Creativity* 13 (March 2002), 11–22(12). DOI : <http://dx.doi.org/doi:10.1076/digc.13.1.11.3208>
2. Marc Fakhoury. 2015. Autistic spectrum disorders: A review of clinical features, theories and diagnosis. *International Journal of Developmental Neuroscience* 43 (June 2015), 70–77. DOI : <http://dx.doi.org/10.1016/j.ijdevneu.2015.04.003>
3. William Farr, Nicola Yuill, and Hayes Raffle. 2010. Social benefits of a tangible user interface for children with Autistic Spectrum Conditions. *Autism* 14, 3 (2010), 237–252. DOI : <http://dx.doi.org/10.1177/1362361310363280>
4. Sue Fletcher-Watson. 2013. A Targeted Review of Computer-Assisted Learning for People with Autism Spectrum Disorder: Towards a Consistent Methodology. *Review Journal of Autism and Developmental Disorders* 1, 2 (Nov. 2013), 87–100. DOI : <http://dx.doi.org/10.1007/s40489-013-0003-4>
5. Christopher Frauenberger. 2015a. Disability and Technology - A Critical Realist Perspective. In *Proceedings of the 17th International ACM SIGACCESS Conference on Computers & Accessibility*. ACM Press, Lisbon, Portugal, 8. DOI : <http://dx.doi.org/10.1145/2700648.2809851> Best Paper Nomination.
6. Christopher Frauenberger. 2015b. Rethinking Autism and Technology. *interactions* 22, 2 (Feb. 2015), 57–59. DOI : <http://dx.doi.org/10.1145/2728604>
7. Christopher Frauenberger, Judith Good, and Narcis Pares. 2016a. Autism and Technology: Beyond Assistance & Intervention. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '16)*. ACM, New York, NY, USA, 3373–3378. DOI : <http://dx.doi.org/10.1145/2851581.2856494>
8. Christopher Frauenberger, Julia Makhaeva, and Katharina Spiel. 2016b. Designing Smart Objects with Autistic Children: Four Design Exposés. In *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems (CHI '16)*. ACM, New York, NY, USA, 130–139. DOI : <http://dx.doi.org/10.1145/2858036.2858050> Honorable Mention (best 4% of submissions).
9. Juan Pablo Hourcade, Stacy R. Williams, Ellen A. Miller, Kelsey E. Huebner, and Lucas J. Liang. 2013. Evaluation of Tablet Apps to Encourage Social Interaction in Children with Autism Spectrum Disorders. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (CHI '13)*. ACM, New York, NY, USA, 3197–3206. DOI : <http://dx.doi.org/10.1145/2470654.2466438>

10. Lorcan Kenny, Caroline Hattersley, Bonnie Molins, Carole Buckley, Carol Povey, and Elizabeth Pellicano. 2015. Which terms should be used to describe autism? Perspectives from the UK autism community. *Autism* (July 2015). DOI : <http://dx.doi.org/10.1177/1362361315588200>
11. Julie A. Kientz, Matthew S. Goodwin, Gillian R. Hayes, and Gregory D. Abowd. 2013. Interactive Technologies for Autism. *Synthesis Lectures on Assistive, Rehabilitative, and Health-Preserving Technologies* 2, 2 (2013), 1–177. DOI : <http://dx.doi.org/10.2200/S00533ED1V01Y201309ARH004>
12. Julia Makhaeva, Christopher Frauenberger, and Katharina Spiel. 2016. Creating Creative Spaces for Co-Designing with Autistic Children – The concept of a “Handlungsspielraum”. In *Proceedings of the 14th Participatory Design Conference*. ACM Press, Aarhus, Denmark, 51–60. DOI : <http://dx.doi.org/10.1145/2940299.2940306>
13. Jennifer Mankoff, Gillian R. Hayes, and Devva Kasnitz. 2010. Disability studies as a source of critical inquiry for the field of assistive technology. In *Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility (ASSETS '10)*. ACM, Orlando, Florida, USA, 3–10. DOI : <http://dx.doi.org/10.1145/1878803.1878807>
14. Joan Mora-Guiard, Ciera Crowell, Narcis Pares, and Pamela Heaton. 2016. Lands of Fog: Helping Children with Autism in Social Interaction through a Full-Body Interactive Experience. ACM Press, 262–274. DOI : <http://dx.doi.org/10.1145/2930674.2930695>
15. Bertram O. Ploog, Alexa Scharf, DeShawn Nelson, and Patricia J. Brooks. 2013. Use of Computer-Assisted Technologies (CAT) to Enhance Social, Communicative, and Language Development in Children with Autism Spectrum Disorders. *Journal of Autism and Developmental Disorders* 43, 2 (Feb. 2013), 301–322. DOI : <http://dx.doi.org/10.1007/s10803-012-1571-3>
16. Sathiyaprakash Ramdoss, Wendy Machalicek, Mandy Rispoli, Austin Mulloy, Russell Lang, and Mark O'Reilly. 2012. Computer-based interventions to improve social and emotional skills in individuals with autism spectrum disorders: A systematic review. *Developmental Neurorehabilitation* 15, 2 (2012), 119–135. DOI : <http://dx.doi.org/10.3109/17518423.2011.651655>
17. Ginny Russell, Stephan Collishaw, Jean Golding, Susan E Kelly, and Tamsin Ford. 2015. Changes in diagnosis rates and behavioural traits of autism spectrum disorder over time. *British Journal of Psychiatry Open* 1, 2 (2015), 110–115. DOI : <http://dx.doi.org/10.1192/bjpo.bp.115.000976>
18. Katharina Spiel, Christopher Frauenberger, and Geraldine Fitzpatrick. 2017. Experiences of autistic children with technologies. *International Journal of Child-Computer Interaction* (Feb. 2017). DOI : <http://dx.doi.org/10.1016/j.ijcci.2016.10.007>
19. Joshua Wainer, Ester Ferrari, Kerstin Dautenhahn, and Ben Robins. 2010. The effectiveness of using a robotics class to foster collaboration among groups of children with autism in an exploratory study. *Personal Ubiquitous Comput.* 14, 5 (July 2010), 445–455. DOI : <http://dx.doi.org/10.1007/s00779-009-0266-z>