
Use of a Wearable Recording Device in Therapeutic Interventions for Children with Autism

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Abstract

Caring for a child with autism and limited speech involves overcoming communication challenges and understanding how best to provide care. In this research, we used Microsoft SenseCam as a platform for exploring the potential for automatically generated, situated and contextualized picture-based communication and therapy. We present the results of an exploratory qualitative study examining the day-to-day use of SenseCam by children with autism and their caregivers. Our findings indicate that SenseCam has a variety of potential for improving both communication and care for children with autism and their caregivers.

Keywords

Capture and access, autism, SenseCam, augmentative communication, assistive technology

ACM Classification Keywords

K.4.2 Computers and Society: Social Issues, Assistive technologies.

Introduction

Interventions to support individuals with autism often include the use of images—both those captured

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automatically and those manually recorded. Use of these visual artifacts has been shown to reduce the symptoms associated with many disabilities, in particular for individuals with autism [2], and can be used to encourage communication and learning in children. Non-verbal children with autism often communicate via pictures [1]. Specifically, visual supports are “those things we see that enhance the communication process” [3] and can support children learning about the world. Visual supports can include things like body language or natural cues within the environment [3], but of interest here are those tools explicitly created to support individuals who may have trouble interpreting naturally occurring visual cues. These constructed artifacts use images to represent simple everyday needs and elements of basic communication [2]. In these cases, visual supports are used to augment communication, in much the same way that sign language can be a visual representation of language for someone with a hearing impairment. Visual supports have been shown to reduce the symptoms associated with autism [3].

In designing an intervention involving visual supports, to meet the challenges of communication and documentation in everyday life, we used SenseCam, a novel recording technology developed by Microsoft Research [4]. SenseCam is a wearable digital camera designed to take photographs of everyday life without user intervention, while it is being worn. Our use of SenseCam enabled us to explore the potential for automatically generated, contextualized picture-based communication and therapy. SenseCam does not have a viewfinder or a display. Therefore, to ensure that relevant images are captured, it is fitted with a wide-angle (fish-eye) lens that maximizes its field-of-view. It

has multiple electronic sensors, including a light sensor, temperature sensor, and accelerometer, which enable SenseCam to capture images automatically when changes are detected in the sensors’ readings. SenseCam images are transferred to a computer and reviewed at various speeds using SenseCam’s accompanying viewing interface.

In our work, we aimed to gain a nuanced understanding of the challenges that can emerge for caregivers of children with autism with their everyday facilitation and support of SenseCam use.

Method

We present the experiences of three families with the SenseCam intervention over three to five weeks each. Each participating family consisted of one child with autism, a parent who was the primary participant of the study and the primary facilitator of SenseCam’s use, and sometimes other family members and caregivers who acted as secondary users or stakeholders. All of the children were either 14 or 15 years old. Two were non-verbal and used augmentative communication devices, which turned text to speech, allowing them to speak to others. All of the primary users were the children’s mothers.

During an initial meeting, each mother received a SenseCam demonstration and overview. The study was explained as largely user-driven, and they were encouraged to be creative with their use of SenseCam. After a short training session, the mothers were instructed to use SenseCam with their child each day for at least an hour when, how, and where they found most useful. Each week, each mother participated in an interview that lasted approximately one hour. During

these weekly interviews, the mothers were asked to describe their experiences in using SenseCam. They also reviewed the images with the interviewer, noting any images of interest and often describing their own, their children's, and others' reactions to the images. To capture both the creativity and challenges that emerged in our study, interview and observational data from the participants' homes were collected and analyzed by the research team using a grounded theory approach.

Results

The three families participating in this study appropriated SenseCam and our associated intervention into their lives in vastly different ways, making for compelling case studies across the varied potential uses of this novel ubicomp technology.

Our results suggest that use of SenseCam can encourage more communication from a child with autism, a significant goal of many educational and therapeutic interventions and the explicit purpose of augmentative communication technologies. For example, Christine, one of the mothers, perceived that SenseCam images increased her daughter's communication through her text-to-speech device:

"Sometimes... she's really resistant to using [her current augmentative technology device that does text-to-speech]. She'll just use it like – I'll give her a choice. 'What do you want to do' or 'what do you want to eat right now'. Things like that. But she's a little bit more talkative when she has the visual [images from SenseCam] there too."

Shared access of this media also introduced opportunities for a child to communicate about events, concerns, and even moments of joy that would have otherwise been missed:

"With the [text-to-speech device] it's so... she doesn't always feel like using it. And it's not so accessible. So like if we're in the middle of SeaWorld that wouldn't be a time to go 'how do you feel right now?' But later, [we can] talk about that [through the review of the SenseCam images]. ... My [neurotypical] son, he processes and talks about things all the time. But she doesn't really get that opportunity to do that."

Our results also indicate that SenseCam has the ability to give a non-verbal child a "voice." SenseCam empowers a caregiver to view the child's world from his or her own perspective, and the resulting images say what the child may not be able to. For example, by reviewing images and asking her daughter about what she noticed in them, Christine made a surprising discovery:

"I noticed [in the images] that she's sitting there reading music. So I was asking her about that. And she's telling me that she could read music and that she taught herself. I never knew that. So I asked her 'do you want me to get you other music to read, like if I bought you sheet music' and she said 'yeah'. So that was something we just discovered."

Caregivers also tended to examine the images very purposefully to find out about their children's experiences. For example, Elaine considered how she might better interpret her child's behavior on an upcoming family trip:

"It'll be interesting for me to see... like what direction does she look at? Does she actually look at the animals [in the zoo]? Is she not interested in the animals at all? ... If the animal moves, is she actually looking or is she just looking at the people's backs? Because I don't know if she enjoys this or not. I mean if I see that all she does is look at people's back, like why am I gonna take her to the zoo? [If] I don't think she's capturing the essence of going to the zoo. So she can't talk and I don't know where her mind is at. It would be kind of interesting to see, what is she looking at? What is she interested in?"

In a later interview, after the visit to the zoo she was anticipating had taken place, Elaine reviewed the images with the interviewer, noting that she was able to recognize that her daughter was in fact attending to the animals:

"There she's definitely looking at the elephants. That's kind of cute. Because she's leaning I think on the rail."

SenseCam also has storytelling abilities that have the potential to bring families together through a shared experience:

"Even if she's not typing back about it, she's responding. She's lighting up and excited that she can share through her pictures what she did."

Conclusions

The three case studies presented in this work demonstrate that novel capture and access technologies—such as SenseCam—can be used

successfully as augmentative communication tools for children with special needs. These technologies can provide a "voice" for a child who cannot speak, as well as additional information to support communication among caregivers and their children. The case studies also demonstrate how caregivers can creatively make use of flexible capture and access technologies for a variety of purposes. The results of this work indicate promise for the use of capture and access technologies for augmentative communication and other related uses. Their applicability and potential for adoption over long-term use, however, should be investigated further.

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