Chapter 6

Fuzzy Bird Helps Me Calm Down and Connect: Touch with Restraint in an Interactive Object for Children with Autism

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Abstract

This paper explores the nascent concept of *touch with restraint* in the design of an interactive object. The design was developed to support children on the autism spectrum in social interaction and to facilitate a feeling of social connectedness. Throughout a constructive design case, the desired nature and interaction style of this interactive object emerged. An object that is characterized by *touch with restraint* facilitates adoption as a transitional object and mirrors passively and minimally the actions of a user. The design concept and prototype Fuzzy Bird showed the effectiveness of the concept in a user test. This strong concept contributes to the debate of how we come to live with interactive technologies, by drawing attention to the possibility of self-imposing limits on how much interactive technologies do and being respectful toward the human interactions they help facilitate.

Keywords: touch with restraint, autism, strong concept, constructive design research

1. Introduction

This paper explores a nascent "strong concept" termed *touch with restraint* in the design of an object to support children on the autism spectrum in social interaction. A "strong concept" is at an intermediate level of knowledge between general theory and specific instances; it is constructed through generative design research and can be appropriated by designers and researchers to create new instances, concerns the dynamic, interactive behavior of design solutions, and resides at the interface between technology and people [1]. The strong concept

Figure 1. A user in interaction with the Fuzzy Bird prototype.

touch with restraint we propose here draws attention to minimal interactivity to be respectful toward the human interactions they help facilitate. The strong concept is explored in this paper through the case of Fuzzy Bird, a tangible interactive object that supports children with autism in involving themselves in social interaction (**Figure 1**).

2. Design and research challenges

Meet Tommy (**Figure 2**). Opening up and connecting are hard for Tommy every day. Many of the one in 70–100 children diagnosed with autism like Tommy struggle to connect socially [2, 3]. We wanted to help Tommy dare to be more open in new and unexpected situations at home and outside the home, so he can feel more socially connected. Social self-exclusion arises from overwhelmedness [4]: it is a challenge for many children with autism to integrate many sensory impressions. They frequently withdraw or get stressed in social interaction. Yet, engaging socially is beneficial and desirable to them: "*social skill interventions are important to the successful outcomes of youth on the autism spectrum*" [5]. Focused interventions can help [6], as "*children with autism appear to behave based on the same mechanisms (e.g., reinforcement, punishment, extinction) that control the behavior of children without autism*" [7]. Interactive objects can address various conditions [4, 8–10]—could one enable Tommy to feel more socially connected? This project sought to develop a support for children with autism to engage in social interaction. The main design question we posed was: how can we facilitate social connection for children on the autistic spectrum? To address this question, we sought to answer the research question: what are the effects of specific interaction qualities of an interactive object on such children's ability to engage in social interaction?, as a contribution to the debate of how we live with interactive technology.

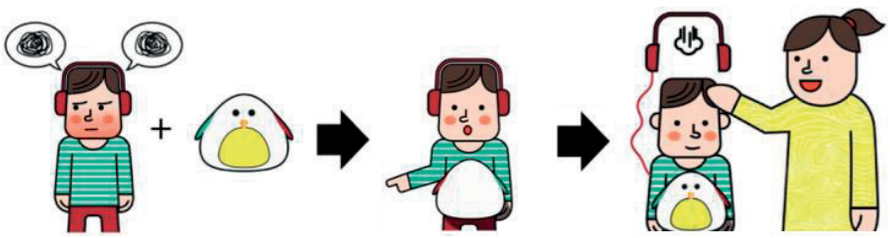

Figure 2. Tommy, a boy with autism (scenario of using Fuzzy Bird).

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3. Approach

We used a *constructive design research* approach, in which construction, in this case of an interactive object, is central and becomes the key means in constructing knowledge [11]. We developed Fuzzy Bird using a design approach of rapid, iterative prototyping. "*Prototypes let the designer communicate the (design) concept […] and give him insight on how well the designed features of the interactive product concept match the design brief. The iterative process was built up out of three main activities: prototyping (build in order to try out); concurrent reflection and testing; and theorizing (engage with literature)"* [12] (**Figure 3**).

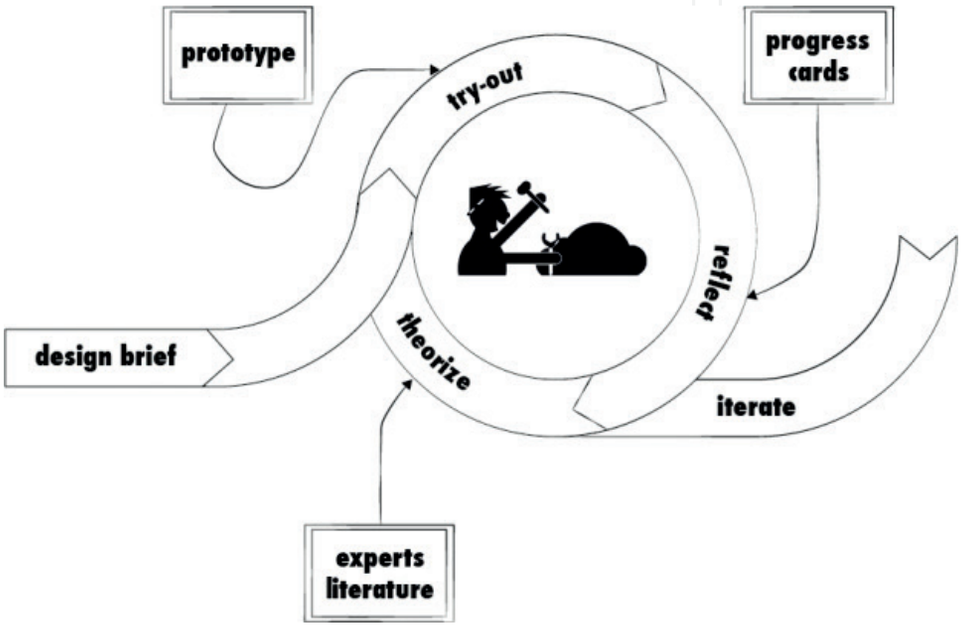

Figure 3. Iterative process of constructive research.

4. The design case

We developed a first idea and mocked it up as a rough prototype: "Eggy", an interactive object that would teach coping by demonstrating the child's own behavior, thus prompting the child to develop calming responses and thus become more ready to engage in social interaction. Eggy would move at certain moments in a distressed fashion, and by stroking it, the child could calm it down. The Eggy prototype is shown in **Figure 4**.

We tested this initial prototype in action ourselves, immersing in the Tommy persona. When held, Eggy moved as if it wanted to get away. This movement felt violent and jerky, like that of a stressed child with autism. We interpreted that the experience of other in distress would not facilitate learning but rather risk triggering distress in the child itself. The interpretation was strengthened by findings from literature, where recommendations include to "give (children with autism) a feeling of being in control," "provide a structured situation," "let them create a structure themselves," "reward them with sensory experiences," and "let them use their whole

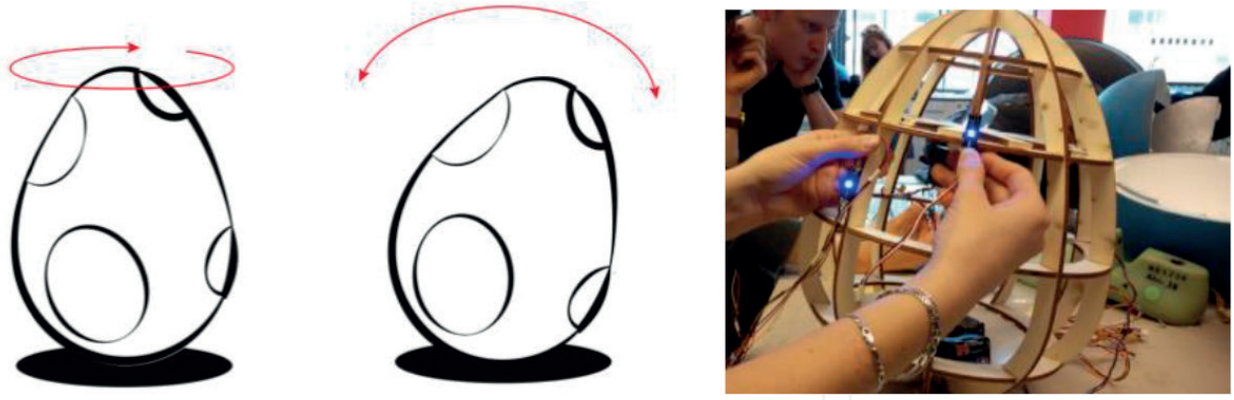

Figure 4. A schematic illustration of the Eggy prototype's actions and the Eggy prototype.

body" [13]. Eggy facilitated only the last of these but obstructed the others. Having experienced the Eggy prototype in our hands and being pointed toward sensory experiences, the importance of touch came into view. Touch, in contrast to the other senses, is an inherently *interactive*, reciprocal experience and "forms the basis for the *feeling* of being in contact" and for "the development of feelings of affection and intimacy" [14]. Touch is an important aspect of *transitional objects*, which facilitate childhood development of social connectedness. These are "objects that are not part of the infant's body yet are not fully recognized as belonging to external reality. They facilitate the initiation of an affectionate type of object-relationship (…), the handling of truly 'not-me' objects. Such a material or object (blanket, soft toy) serves as a "defense against anxiety" [15, 16]. In the case of disabilities like autism, objects can have important transitional roles way beyond the toddler age. As a psychotherapist concluded from therapy with a 9-year-old child with autism, "objects can help those children who find it hard to firstly conceptualize a relationship and then go on to feel safe and free to express the full range of feelings within that relationship" [17]. Affective touch, while an excellent means to communicate emotion, has not yet been explored widely in robot design, due to its complexity with regard to, e.g., gender, social status, and culture, yet further exploration is recommended [8].

5. Touch with restraint: Fuzzy Bird

In a next and final iteration, we drew on the above insights regarding touch, "not-me" objects, and objects that could help a child conceptualize a relationship and express feelings. In that, we focused on the principle of mirroring, which provides structure and is a key part of social interaction, and one that many children with autism find particularly hard to learn [18]. We conceptualized a support as a soft, nonthreatening, inviting, and above all, passive object inviting *touch* while also exercising *restraint*.

Fuzzy Bird is a fuzzy, cuddly, and soft baby bird. The instantiation was chosen for its huggable round shape with little definition and few but distinct movements (flapping little wings). The overall appearance and feel of Fuzzy Bird passively invite interaction, thereby *exercising restraint* and providing the reward of *touch*. An initially stressed child can squeeze and hug Fuzzy Bird ruggedly or even throw it about, absorbing initial anxiety or distress and involving the whole body. The simple responses gradually convey structure. Once calmer, or if the

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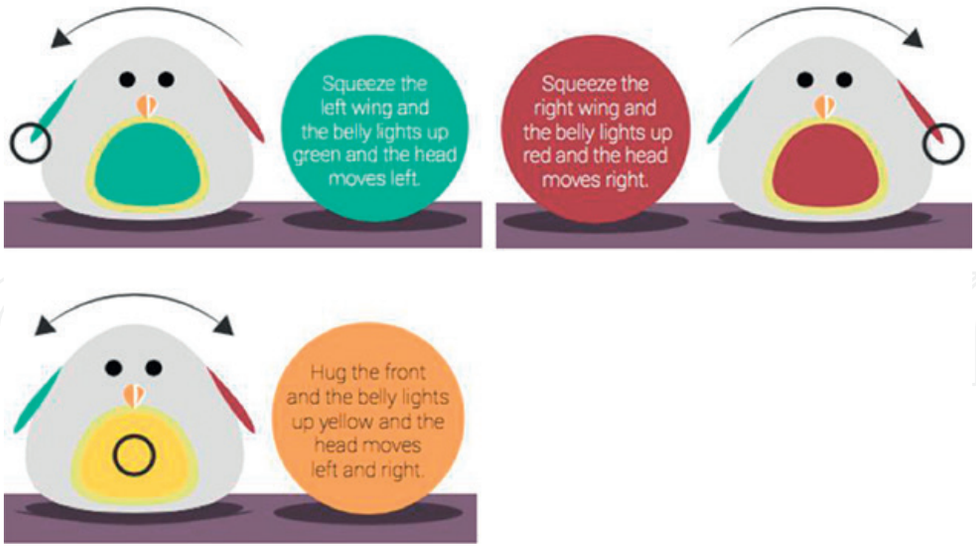

Figure 5. Fuzzy Bird's interaction possibilities.

child is already calm, Fuzzy Bird offers three direct, predictable, and minimal responses, each discoverable by touch and depending on the first move from the child, thus facilitating a feeling of control. This enables the child to create structure of its own and discover the object's response without overload. These are Fuzzy Bird's responses: its wings sport colored patches, one green and one pink; on its belly, there is a yellow patch. A child can squeeze or hit the patches. If Fuzzy Bird's green or pink wing is squeezed, its head tilts to that side and a green or pink LED light up on the belly. The yellow patch on the belly also lights up on touch, and Fuzzy Bird shakes its head left and right gently (**Figure 5**). Fuzzy Bird responds to each action with only one direct, simple response, which in turn invites a direct, simple response from the child. Fuzzy Bird mirrors and takes on the child's actions, but no longer its distress, and invites mirroring in turn, with subtle guidance toward calm.

6. Test

Five children aged 6–10 years and diagnosed or suspected to be on the autistic spectrum tested the prototype at a school for special children. We let the children explore the prototype without much interference (**Figure 6**).

The children tested the prototype in a room, one by one, with a teacher present in the background and a researcher on hand to guide the child through. Each test took ca. 15 min. Children and parents consented to the test ahead of the day. The prototype was fully functioning and attached to wires on a table. The child could pick it up and hug it. The moderator introduced Fuzzy Bird and then maintained respectful verbal contact with the child, while it was free to explore the prototype. The test showed that the principle of *touch with restraint* had the intended effect. We saw a transformation in the children's social interaction with Fuzzy Bird and the moderator: upon entering the room, the children appeared to be closed, shy, and distant. This changed throughout the session: they became more open and relaxed, with more deliberate and calm actions and starting to interact with the researcher freely and trustfully (**Figure 7**).

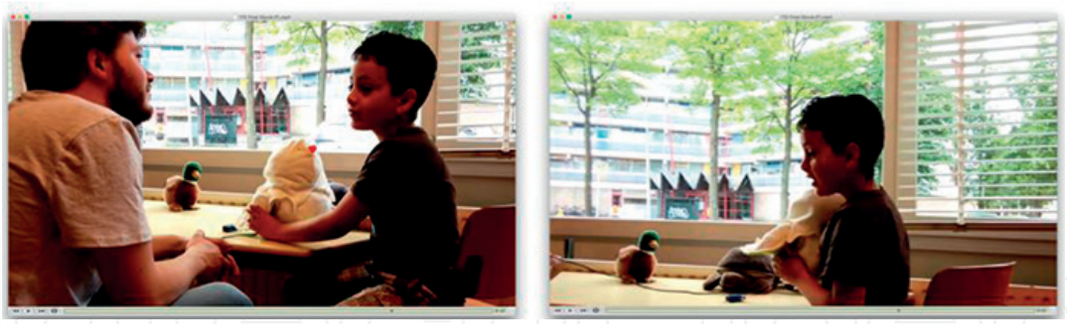

Figure 6. The prototype test situation: interaction, hugging Fuzzy Bird. Parental and child permission given for publication.

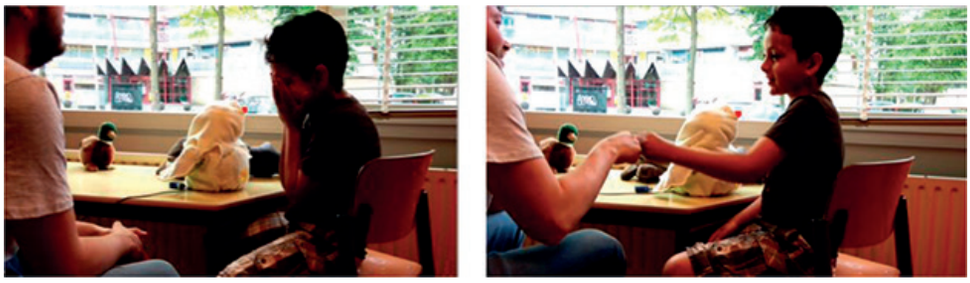

Figure 7. Children's reactions in the test: from stressed to open.

One child picked up Fuzzy Bird to hug it without being asked to do so (**Figure 6**). Another child said that the sound (of the stepper motor) sounded like little farts, and most children commented freely after the test on how we could improve Fuzzy Bird: indications that the children were at ease. All but one activated the prototypes' possibilities. The children discovered the direct response of the prototype and in turn mirrored the prototype's actions. The teacher who observed the test commented that Fuzzy Bird engaged the children better than other toys. However, the test method has some limitations. The children encountered an unknown researcher and object: enough reason to be tense. One of the children was too tense to physically interact with Fuzzy Bird. The researcher's satisfaction at seeing the other children interact with the prototype probably contributed to their relief. Even the teacher's response may have related to the test situation more than to the prototype.

7. Discussion

We developed the concept of *touch with restraint* through constructive design research. The concept describes specific interaction qualities of an interactive object to support the ability of children on the autism spectrum to engage in social interaction. The test showed that Fuzzy Bird supported the children in engaging in social interaction (so far, only with Fuzzy Bird itself and with the researcher) and hopefully feel more socially connected, by responding to touch with restraint, specifically mirroring, and reward. This enables the child to develop trust, learn the principle of a direct response from another, and discern structure.

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These are key aspects in overcoming the overwhelmedness of children with autism in social interaction [4]. However, they should still be tailored carefully to each child, since children may differ strongly [7]. One part of our contribution is that the principle allows the child to itself initiate the beneficial effect of *touch* that has earlier been demonstrated for communication devices [9]: calming down, even physiologically reducing cortisol levels. Our contribution moreover shows how *restraint* contributes to structure and involvement of the body for the child [4, 10].

8. Conclusion: touch with restraint for social connectedness

The goal of the project was to develop a support for children with autism to engage in social interaction and thus facilitate felt social connection. We have shown an application of interactive technology to achieve this and contribute to the debate of how we will live with technology. The strong concept proposed here, *touch with restraint,* is still at an early stage and has not yet been applied or evaluated beyond the case presented. Still, we believe the case is laid out clearly enough to engender discussion on its value, novelty, grounding, and relevance in terms of generativeness [1]. Fuzzy Bird is an instance embodying the strong concept. Rather than creating special environments or products for children with autism as members of a specific group, a design applying a *touch with restraint* concept can enable the child to develop the skills to include himself in social interaction and to feel socially connected.

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