When the Designer Becomes the User: Designing a System for Therapists by Becoming a Therapist

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Abstract
In this paper, we present the design process for developing a technology to support therapists for children with autism. To learn about the domain for which we were designing, one researcher became trained as a therapist and worked as one part time for over 10 months. This case study outlines the process by which the researcher was trained, the ways in which it was helpful in the design and evaluation of a technology system, and the aspects of the experience that we feel led to a better and more successful design.

Keywords
Participant observation, Design, Autism, Health

ACM Classification Keywords
H5.m. Information interfaces and presentation

Introduction
One of the main tenets that students learn in introductory courses in Human-Computer Interaction (HCI) is that "You are not your user." This advice is intended to instruct students that when designing and evaluating applications, they must talk to people other than themselves to gain a good understanding of the problem and uncover usability issues. This is because designers already have preconceived knowledge of the technology they are designing and may miss obvious

problems that a complete novice would have trouble with. Though we do not dispute this advice in general, we here make the point that designers can *become* users to gain a better understanding of the domain for which they are designing and gain access to and trust of their user population, which opens doors to designing and testing novel technologies.

This case study describes how one researcher became a fully-trained member of a group for which she aimed to design a technology solution that met their needs. The domain was conducting therapy for children with autism, which was completely unfamiliar for the researcher, who had a background in Computer Science and HCI. We argue that by becoming our own user, that is, becoming a fully integrated member of a team of therapists, we were able to design a successful system for this domain. This paper describes the design process, the evaluation of the technology, and feedback on what we believe worked and did not work in this process. Though this work has previously been published on the technology design [6] and the evaluation [5], this case study focuses on how we conducted the intensive formative evaluation that lead to the successful design.

Previous Work in Understanding the Users

Gaining a solid understanding of the problem and the intended user base for technology design is not a new concept in the field of Human-Computer Interaction. In the past, others have argued that designers must do a full formative evaluation using multiple techniques to really understand what designs will be appropriate and which have a high probability of being adopted. For example, the concept of "Scandinavian design" [8] suggests that designers bring in participants from the domain and add them to the design team. With this work, we did the opposite of Scandinavian design. Instead of bringing members of the domain to the design team to help thoroughly with the design, we brought a member of the design team to the group of user participants to have them thoroughly trained on what it is like to be a therapist.

Another aspect of formative evaluation that involves the target population is contextual inquiry [4], or participant observation. This type of evaluation involves members of a design or research team going to the users and observing them while they work and ask questions about their process as they are doing it. In the case of participant observation, the researcher may also participate in the activity, for example, if the researcher is studying musicians, the participant may also try to play along with the musician or take classes a musician would take. The project we present here began along the lines of a contextual inquiry, but took it to a more extreme case. Instead of the researcher remaining an outsider observing, she became fully integrated into the team and was considered a full member with all the access and responsibilities of the other members.

Others have also looked at becoming a member of the domain they are studying to gain a better perspective, such as in the social sciences. For example, researchers have gone "undercover" to learn more about their target population, such as working in a department store [9] or trying to experience what it is like to live on minimum wage [2]. The main difference here is that we were not just studying a target population to write an ethnography on their experiences, but to use that knowledge to also do a design of a technology. We also did not go "undercover" but were open about the relationship and used it as a means gaining access

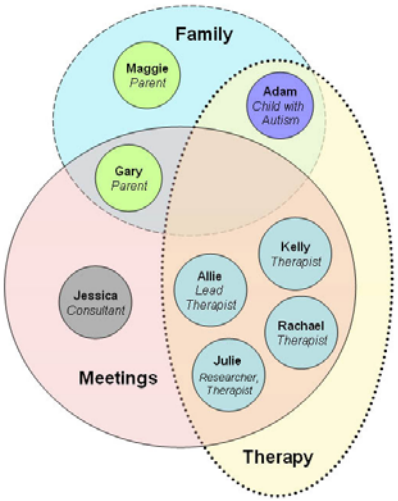

Figure 1: Diagram of a DTT Therapy Team

therapists to help with design. More recent work that is related to understanding a user population in order to design technology was undertaken by Kimel *et al.*, where one researcher lived in an instrumented assisted living facility to understand what it would be like to live with sensors [7]. Our work is similar in spirit, but we undertook the task of working directly with the participants and becoming a member of our target population, rather than simulating it.

Understanding the Domain

We had decided to begin a new research focus on aiding caregivers of children with special needs, and began by seeing how people teach children with autism. Of the many domain experts we talked to, we came across a widely popular method of teaching children with special needs, especially autism, called Discrete Trial Training (DTT) Therapy. DTT therapy is a method for teaching a variety of basic skills in a very structured manner, based on a field of Psychology known as Applied Behavior Analysis. It is commonly practiced in school settings (especially in special needs classrooms and schools) or at the home of the child by a team of external therapists. For our study, we were interested in studying home-based therapists because home therapy teams could more easily adopt new strategies than school-based teams.

In DTT, therapists typically work one-on-one with a child and perform a number of skill tests, called "trials" in a given therapy session. The skills tested include academic skills, such as vocabulary, pronouncing words, or handwriting, and life skills such as asking for help, brushing teeth, or proper eating. Therapists reward correct independent responses with praise or a small treat and prompt for correct responses when the child does not perform them correctly. After each trial is performed, the therapist writes down the response of the child on a data sheet (*e.g.,* can do independently, needs prompting, unable to do skill, *etc.*). Therapy sessions may test approximately 5-25 different skills and may have well over 100 trials per session, which last between 1 and 2 hours. After the therapy session, the therapist spends another 30 minutes calculating the percentage correct for all the trials per skill and graphing the results by hand.

These graphs are then used during weekly or bi-weekly meetings where all the members of the therapy team working with the child come together to discuss the progress of the child. In home settings, we found that the team for a single child usually consisted of 3-6 "regular" therapists, a "lead" therapist, a behavioral consultant, and a member of the child's family, typically a parent. Regular therapists were typically part-time, family members, students, or neighbors who were recruited by the family and were trained by the consultant to conduct therapy. The lead therapist also conducted therapy with the child, but did therapy as a full time job and typically had a degree in Behavioral Psychology. The behavioral consultant was also a professional and had a Ph.D. in Behavioral Analysis, but she did not interact directly with the child during therapy. Figure 1 shows a diagram of the composition of the team of DTT therapists we worked with and how they are related to one another. It should also be noted that while the family member, lead therapist, and behavioral consultant were relatively consistent, the "regular" therapists often changed as students graduated, neighbors moved, or they decided to take a different part-time job.

During the meetings, the behavioral consultant would take the lead by going through the paper-based graphs skill-by-skill and look for changes in progress. When there was sufficient progress, skills were considered "mastered" and a new skill would be added to replace it. When the child had been working on a skill without making much progress, the team would discuss reasons why he might not be learning it and what strategies they might take to improve his progress. If a child had been working on a skill for a significant amount of time, the skill might be put on "hold" to be tried again later, and another skill would take its place. During these meetings, the member of the child's family would also offer information about how the child is doing outside of DTT therapy, such as in school, other types of therapies, or in general home life.

We first began studying DTT by interviewing those who did it, observing one-on-one sessions between therapists and the child, and observing team meetings where the child's progress was discussed. Though this initial insight taught us much about the process, much of what we heard about the process was that "you just have to try it to know." The therapy tends to happen very quickly and many things become second nature to the therapists and are thus difficult to observe or articulate. We found out that "regular" therapists were typically trained by the consultant through on-the-job training while working with the lead therapist, who would critique them and make suggestions for how to improve their technique. Because most regular therapists were part time and did not require any specific educational background, one researcher decided to go through the same process as new regular therapists and join the therapy team to gain a better understanding of what it was like to be a therapist.

Thus, after approximately 1 month of training with the lead therapist, the researcher became a full-fledged member of the therapy team. She conducted 1-2 sessions per week with a given child, with each session lasting approximately 2 hours, including paperwork and playtime with the child. She attended the team meetings that happened every two weeks and were approximately 2 hours long. She worked with the team of therapists for approximately 10 months while designing and implementing a technology solution to aid in DTT therapy and then remained a therapist during a 4 month evaluation.

Design Process

In the process of being a therapist with the mind of a technology designer, the researcher paid close attention to aspects of the therapy that could be improved using technology. During team meetings, the researcher expressed difficulties or hardships she had to determine if these were common problems with other therapists or just difficulties she had as an outsider. She also began to ask the therapists for ideas on how to improve the process and probe new aspects might fit well into their work practices.

Throughout the process, the research team collected a list of potential improvements and ways they might design a system to address the needs of therapists. Some of the requirements suggested by the designer and the team of therapists are as follows:

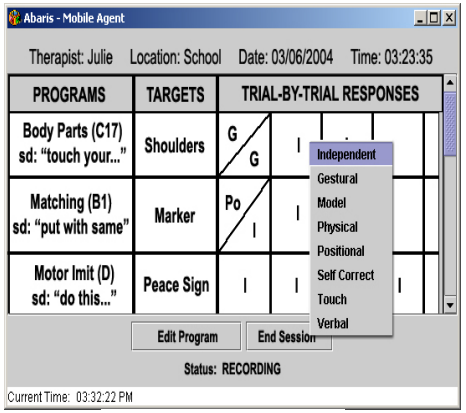

Figure 2: Tablet PC Version of Data Sheet

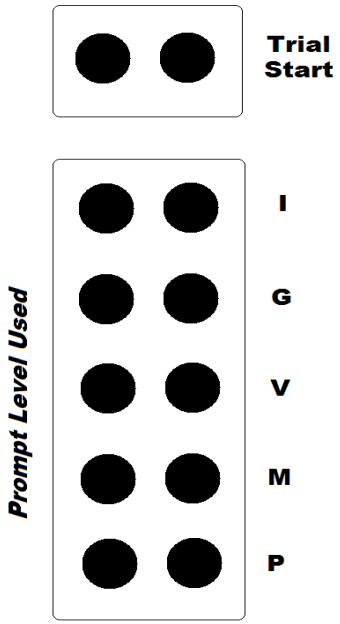

Figure 3: Vision-system gesture-based input. Therapists covered dots to indicate trial start and ending grade.

- Calculating percentages and drawing graphs by hand is cumbersome and time consuming. Data kept on paper is difficult to share and access during team meetings.
- Therapy is fast-paced, so any interaction with technology during therapy must be quick and unobtrusive.
- Because the therapists work with children that have severe cognitive impairments, any technology design cannot rely on the child's cooperation or input. In addition, the technology cannot distract from the therapy itself.
- Therapists have trouble remembering the nuances of what happened during a given therapy session. In addition, it is difficult for therapists to articulate to others what the child did during their sessions. Though videos of sessions are recorded, it is difficult to find a particular instance in the video that they might want to share during meetings.
- The theory behind the therapy is that each therapist must be consistent with the other in the way they test the child and thus therapists must use meeting times to obtain consistency.

The research team began brainstorming ideas for technology designs that might address these issues as well as fit into the everyday practices. Based on the observations, experiences, and the discussions with the team of therapists, the overall idea was for a system that could eliminate the need for hand-drawing graphs while providing a way to easily access and view all the data that was collected. In addition, since therapists were already recording videos of their therapy sessions, we incorporated a way to easily access relevant moments in a video stream to share with others during team meetings.

The therapy team agreed with the overall idea for technology, however, there were many aspects of the design to be considered to ensure that it would fit well within the existing practice. One of the most difficult aspects of the technology was how link parts of the therapy to the relevant moments in the video stream – namely, the beginning and ending of the trial of a skill. Our first idea was to replace the paper data sheet with a Tablet PC version and have users select their grades on a form on the tablet while conducting therapy, which would also record the timestamp. We quickly prototyped this idea and tried it during several therapy sessions (see Figure 2). After using it during therapy sessions, the therapists reported that it felt too heavy and the tablet was not nearly as flexible as the paper data sheet if they wanted to make additional notes. Another idea we tried was to have therapists make a gesture that an overhead camera could recognize, which would indicate the grade for a given trial. This was accomplished by having a sheet of paper with symbols indicating the start of a trial (see Figure 3), which the therapists would cover with their fingers. Then, they covered another set of symbols to indicate the child's grade for a given trial which also indicated the ending time of the trial. The researcher tried this technique during one of her sessions and quickly realized it would not work. It was very difficult to remember to do the start and stop gestures due to the fast-paced nature of the therapy, and it was an additional task that was not part of the normal workflow. These gestures were even more problematic in that child was distracted by them and tried to mimic them, which interrupted the flow of therapy and distracted the child.

Figure 4: Paper data sheet and digital pen

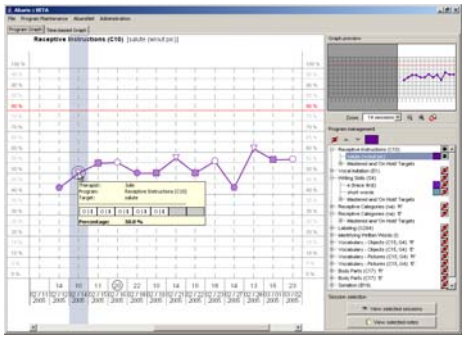

Figure 5: Graph view of Abaris access interface

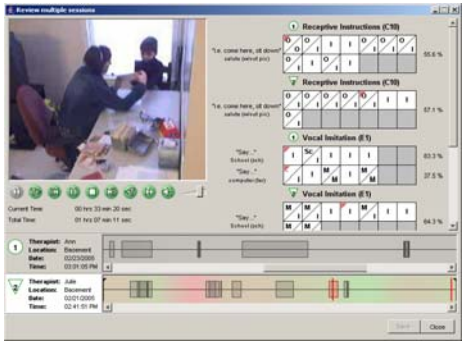

Figure 6: Video review screen for Abaris access interface

With these initial designs quickly tested and dismissed, we settled upon a design that fit well into the therapists' workflow by being completely transparent to them during sessions and only required explicit interaction before and after the therapy sessions and during meetings. The final system designed was named "Abaris", which is a play on ABA, the field that DTT therapy comes from. Abaris consisted of two main parts: a "capture" system that was used by the therapists during their individual therapy sessions and the "access" system, which was jointly used by the entire therapy team during meetings to review the data captured during individual sessions.

The capture part of Abaris replaced their regular paper data sheets with Anoto digital pen and paper technology. The digital pen they used wrote ink like any other pen and also could timestamp the information and export it to a computer for automatic calculation of percentages. To get the timestamp for the beginning of a trial, we had therapists wear a microphone and used phonetic speech detection to recognize the specific verbal command given to the child to perform the skill, which was something therapists were trained to do regardless. Thus, the technology remained ubiquitous and did not disrupt the normal workflow, which the researcher could validate in her own therapy sessions before trying it out with the other therapy team members. Figure 4 shows the digital pen and paper used for Abaris.

The access part of Abaris was a software system that was installed on a computer in the child's home and downloaded the data from the digital pen and automatically generated graphs based on the data. The graphs showing the child's percentage of correct trials were the main view of the software as they had been the main artifacts used during the team meetings (see Figure 5). However, if you hovered over individual points on the graphs, you could automatically display the individual data from that day, which in the paper system, would have required going to a different binder and flipping to the correct page. Lastly, the access interface allowed therapists to click on different data points of the graph and display the video of a given day. The different trials of the day would be displayed, and when the user clicked on them, the video would jump to show the specific trial. Figure 6 shows the video viewing portion of Abaris.

Remaining a User during Evaluation

Once we had settled on the appropriate design for Abaris, we then wanted to implement it and determine if it would actually be useful for the therapists, save them time, and enable better access to data. Thus, we decided to conduct an *in-situ* evaluation of the technology and have it replace their paper system for a 4 month period. During this time, we tested the ability of Abaris to reduce the amount of time therapists spent in paperwork, increase the use of various artifacts in the decision-making process, such as video and data sheets, and increase collaboration amongst the members of the teams during meetings. We also evaluated its general effectiveness in improving the therapy experience for the therapists, which we learned through post-deployment interviews.

Amongst the research team, there was much discussion about whether the researcher/therapist should remain a therapist during the time that the technology was being tested. In the end, we decided it would be less disruptive if we kept the same team and the researcher continued as a therapist to help with the software in case

anything went wrong. There was some concern about the influence the researcher might have had on the outcome of the evaluation metrics, and whether her wanting to see the system succeed would have any impact on the other therapists' adoption of the system. However, we felt justified that even if there was this influence, it would likely play the role of the "champion" of a groupware system, which Grudin describes as being critical to adoption [3].

In the end, having the researcher be a part of the therapy team during evaluation proved to be very valuable. The eventual system design was a research prototype and thus had not been rigorously tested for minor bugs and glitches and occasionally would crash. Because the researcher was regularly using the system and understood the software, she could easily uncover software bugs and fix them after her therapy session as to not interrupt the workflow of the other therapists. In addition, having the designer of the software on-hand during the team meetings helped the other therapists learn to use the system more quickly and they could ask her questions directly if they had them. In post-study interviews, therapists reported that they felt much more comfortable using the new system because the researcher was there. They reported feeling a bit braver in trying new things, because if they "broke" it, she was always there to fix it for them. This helped make *in-situ* deployment possible, because there was not as much worry about the loss of the child's actual therapy data when someone was there to fix things if they went awry.

Discussion

We believe that the researcher learning to become a therapist and joining the therapy team for which she was designing was instrumental to the successful adoption and use of the system over the 4 month period. There were several valuable lessons we learned that we believe can benefit other designers both in the field of healthcare and in designing for specialized domains in general.

Training to become a therapist helped in familiarity of terms used during meetings. During the initial period where we were just observing, it was difficult to understand what was going on during the meeting because there were many domain-specific terms therapist used, such as "behavioral momentum" and "manding." The time spent in training made sure the researcher knew all these terms and how and why they were used. Designers should also consider the time spent in obtaining all of this domain knowledge and whether the payoff of the design of a successful system is worth the many hours the therapist put in. Between conducting therapy and attending team meetings, the therapist averaged 4-6 hours per week over a 10 month period. While this is feasible in a research context, it may not be realistic for those working for design firms where time spent may be significantly more expensive.

Another consideration of this approach is whether this technique is applicable to domains outside of therapy for children with autism, or whether the domain we were studying was unique in its ability to have a complete outsider learn the trade. For example, becoming a therapist just required that she do on-the-job training and work with a lead therapist until she felt comfortable conducting therapy on her own. If a researcher was studying air traffic controllers, for example, it would take much more effort to learn the task, and even then, there are many restrictions that mean that it may be impossible for outsiders to participate as a full member. However, there may be other domains where joining a

target user base is appropriate. For example, a designer might volunteer at a hospital to gain perspective in healthcare or learn to be a paraprofessional to gain access to classrooms.

As is the case with other types of qualitative research, such as participant observation or contextual inquiry, there is a danger of "going native" [1]. Going native means that the researcher has become so ingrained in the population that he is studying that he forgets what is novel or interesting. Throughout the design process, the researcher did learn to do therapy so well that it became second nature. However, due to it not being a full time job and having other research projects, she still maintained her outsider's perspective.

Lastly, there are several ethical considerations that researchers and designers must consider before taking on the task of joining your user population, both from a societal and from a research standpoint. For instance, because the researcher was working with a real child's data while trying out untested and experimental prototypes, it may have compromised the quality of therapy that the child was receiving. The designer has to be careful that anything he or she tries does not interfere with her number one priority, which is administering care to the child and not gathering data for the study. Additionally, researchers should also consider the implications for empirical study design, because it is likely that they will bias the results of a study. We believe that this approach is appropriate for pilot or exploratory evaluations, such as the one we conducted, but after the system has undergone an initial evaluation, it would be prudent to do a new evaluation with a fresh set of users.

References

[1] Denzin, N. and Y. Lincoln. Handbook of Qualitative Research. *Contemporary Sociology*, Vol. 24, No. 3 (May, 1995), pp. 416-418. 1995.

[2] Ehrenreich, B. Nickel and Dimed: On not Getting By in America, New York: Henry Holt and company LLC. 2001.

[3] Grudin, J. Groupware and social dynamic: eight challenges for developers. Communications of the ACM. Vol. 37, no. 1, pp. 93-105. 1994

[4] Holtzblatt, K. and S. Jones. Contextual Inquiry: A Participatory Technique for System Design. 1993.

[5] Kientz, J.A., G.R. Hayes, G.D. Abowd, and R.E. Grinter. From the War Room to the Living Room: Decision Support for Home-based Therapy Teams. In the Proc. of CSCW '06. 2006.

[6] Kientz, J.A., S. Boring, G.D. Abowd, and G.R. Hayes. Abaris: Evaluating Automated Capture Applied to Structured Autism Interventions. In Proc. of Ubicomp '05. 2005.

[7] Kimel, J.C., K. Cobbinah, J. Lundell. Early Retirement: Learning About Elderly Users and Technology Through In Situ Research. UbiHealth 2006 Workshop. Orange County, CA, USA. 2006.

[8] Kyng, M. 1994. Scandinavian design: users in product development. In Proc. of CHI '94. 1994.

[9] MacLean, A.M. Two Weeks in a Department Stores, American Journal of Sociology, Vol. 4, pp. 721-741. May 1899.