KASPAR in the Wild – Initial Findings from a Pilot Study

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Abstract. This extended abstract describes the initial pilot work when evaluating the use of the UH Humanoid Robot KASPAR in a specialist nursery for children with social and communication disorders. Staff and volunteers at the nursery were trained in the use of KASPAR and are currently using KASPAR in their day to day activities in the nursery. This paper focuses on the design and results from the initial interviews with the participants. Results high-light the challenges of transferring experimental technologies like KASPAR from a research setting into everyday practice.

1 Introduction

The work described in this extended abstract is part of our ongoing investigation into the use of robots for children with Autism Spectrum Conditions (ASC). It is estimated that around 1-2% of primary school children in the UK might be diagnosed with one of these conditions [2], which is characterised by *the presence of social and communication difficulties, as well as strong and narrow interests and/or repetitive and stereo-typed behaviour* (ICD-10 [9]). As [2] notes, the number of diagnoses has increased dramatically over the last 30 years, and this has prompted considerable interest in these conditions and how to address them. In particular, the use of robots for therapeutic interactions to address ASC issues has been a rich field of inquiry for some time, with many research platforms being developed and tested [13, 5, 14] in order to examine the efficacy of using robots as socially assistive aides [7], facilitating interactions between children with ASCs and teachers, therapists, parents, and other carers.

2 KASPAR

The University of Hertfordshire's humanoid robot KASPAR, has shown great promise as a tool for interactions with children with ASCs [12], but like the majority of robots being used for this purpose as of today, KASPAR is primarily a research prototype. This means that transferring the successes from KASPAR's use in research to everyday practice, especially with practicioners who are not roboticists, may not be as simple as one might think. There are a number of technologies that are being used in interventions for ASC [8], and while KASPAR might be a potentially highly useful tool in terms of clinical success, its adoption by carers will likely depend on other factors that are independent of therapeutic outcomes [10].

The initial development of KASPAR by the UH Adaptive Systems Research Group (ASRG) is described in detail in Dautenhahn et al.[6]. One of the key features of KASPAR highlighted here is that it is an '*open platform that would allow the development of a variety of different controllers and algorithms*'. This has made it suitable for several strands of research at UH, both in general Human-Robot Interaction Research as well as research focused on children with ASC. However, many of the features of the robot were originally designed as tools for where the intended user has been a researcher familiar with such experimental prototypes.

Figure 1. KASPAR

This has not an been issue for its use within the UH team when using the platform for work with children with ASCs. Researchers in the Adaptive Systems Research Group will often have the capability to customise the software and hardware components for specific studies. They will also have direct access to other members of staff that have accumulated years of experience in using KASPAR, and can provide support both in terms of explaining general principles in the use of KASPAR as well as work-arounds for specific problems.

Professionals and other carers for children with ASC, on the other hand, will not have this level of expertise and training. In order to ensure that KASPAR can make a positive contribution to the lives of ASC children and their families, we need to examine how we can make the use of this robot accessible to future users from non-technical backgrounds.

As part of this effort, the Adaptive Systems Research Group at the University of Hertfordshire is currently running a pilot project into the use of KASPAR by child-care professionals in a specialist nursery for children with social and communication disorders. This small-scale exploratory study is intended as a test-bed for exploring the issues of deploying KASPAR in the wild and is a precursor to a more extensive large-scale study with the platform. Through our work with the Staff and Volunteers at this nursery, we hope to gain further insights into how we can transform KASPAR from an experimental research prototype to a tool that will benefit, teachers, therapists, carers, parents and children from a wide range of backgrounds,

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by examining their interactions with KASPAR.

3 Setting and Participants

The setting for this study is an Early Years Centre specialising in children with complex social and communication disorders ages 2-6. It is a relatively small centre, with a maximum number of children per session of 8. The nursery is a short journey away from UH, which allowed easy access for members of the UH team to visit for interviews as well as for technical support. This nursery had previously allowed UH staff access for interaction studies with KASPAR [11], which meant that the staff at the nursery had seen KASPAR in action before, but they had not used it themselves.

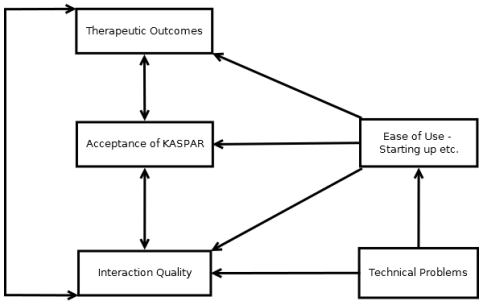

Figure 2. Acceptance of KASPAR

4 General Approach

For the purposes of this pilot study, it was important to us to understand *how* participants used KASPAR and the *impact* that KASPAR had on their interactions with the children in the nursery. While our approach was inspired by more formalised Technology Acceptance Models, for the purposes of this small–scale exploratory pilot study, we adopted a more open-ended approach, and decided to collect data along 4 general dimensions. The proposed relationships between these dimensions can be found in Figure 2

Therapeutic Outcomes For the purposes of *our* motivation to research the use of robots for ASC interventions, this is the most important factor , but as we noted above, this is not necessarily the only predictor of future use [10] of such a technology. The nursery, like most child-care institutions in the UK, conducts continuous assessment of the children along a range of developmental markers using the UK Early Years Foundation Stage framework (EYFS) [15].

Ease of Use — Usability Ease of Use is a central factor in this study. How easy it is for a carer or professional to use KASPAR independently in meaningful interactions is central to all other outcomes, to the extent that a failure of the technology along this dimension renders all other considerations moot. Also, difficulties in using a system will likely detract from other aspects of the overall experience of using it[16], notably Interaction Quality and Acceptance. In this initial pilot study, we examine usability using a two-pronged approach. The first is a modified System Usability Scale (SUS)[4], supported by a small number open-ended questionnaire items. The SUS is a widely used tool for measuring usability, noted for its robustness across a wide range of applications. It is also short, and easy to fill in quickly [1]. This makes it ideal for use in a real-life setting. In this pilot-study, there were too few responses to make any meaningful quantitative analysis of the results from these, and the inclusion of this questionnaire was primarily to flag any particular participants that found the robot difficult to use, and as a jump-off point in a subsequent interviews.

Interaction Quality The perceived quality of the carer-child interactions that are mediated by KASPAR is also of prime importance. If KASPAR's mediation is experienced as detracting from the interactions between carer and child, this is likely to impact acceptance and continued use of the system. While for the carer , interaction quality is likely to be linked to perceived Therapeutic Outcomes, it still needs to be addressed on its own as an intrinsically motivating factor for the use of the system. While there are standardised scales for measuring interaction quality (As in [3], for example), semi-structured interviews addressed this aspect as well in this pilot study.

Acceptance Acceptance of KASPAR, is as shown, in Figure 2, likely dependent on Ease of Use. It is however, likely to co-vary with Interaction Quality and perceived Therapeutic Outcomes. In this pilot-study we aim to assess it in terms of open-ended questions, as well as in the semi-structured interviews where it will be related to to Usability, Interaction Quality and Perceived Therapeutic Outcomes.

5 Interviews

As of the writing of this extended abstract, two sets of interviews have been conducted, an initial pre-deployment interview, which was conducted before a training session with UH staff and KASPAR, and one which was conducted 6 weeks into the study. We are currently preparing a third set of interviews.

5.1 First Interview

The first interviews were conducted in order to gain a more thorough understanding of the participants, their roles in the nursery, their level of technical confidence and expertise and their hopes and motivation for using KASPAR as well as their fears and concerns regarding their adoption of the robot in their everyday working environment. The participants were interviewed individually in a separate room of the nursery.

Below are the main themes from the initial interviews:

Motivation – Hopes While the possible benefit of KASPAR for the children in the nursery was referenced by all the participants, they would also reference other motivations. Some participants saw working with the robot as intrinsically motivating and interesting and looked forward to engaging with it as a technology. Others referenced an interest in the research, excitement at taking part in a novel study as well as the possibility of furthering the research on using KASPAR for ASC interventions.

Concerns – Fears The main fear referenced by the participant was that of technical breakdowns. Some of the participants when discussing this with the interviewer, go into detail as to how such breakdowns might impact interactions, and how they would have to deal with it. Other participants were concerned with wider logistical issues in the running of the nursery, in terms of space, timetabling

and creating meaningful links between KASPAR and the rest of the teaching in the school. The complexity of the system in particular in terms of setting it up for a session was a cause for concern.

Conclusions The findings from the initial interviews gave the impression of a group of participants that were highly motivated to use the system in the manner intended by the UH Research team. The participants looked forward to using the system, both in itself and as a tool for their work with the children in the nursery. The majority of concerns were related to things that would prevent them from using KASPAR in their everyday practice, either technical problems, or issues in the logistics of setting up sessions with the robot, not concerns regarding the robot itself.

5.2 The Second Interview

The second interview set was conducted in the third week of KASPAR having been deployed. The participants had had a chance to use KASPAR in this period on an almost daily basis, with the exception of incidents of technical breakdown. The participants were interviewed in private as in the initial interview set. The semi-structured interviews were intended to gain as rich a data set as possible.

Usability Overall, the participants stated that they found KASPAR easy to use, but this was qualified with several suggestions as to how the usability of the robot could be increased for them. Most of these suggestions centered around the control interface, which they felt could be quite cumbersome, and several feasible changes to the interface was suggested. The main threat to the usability of the robot, were technical breakdowns, however. While most technical problems with KASPAR were easily rectified in a short amount of time, they did lead to a breakdown in the interaction with the child. However, participants had developed strategies to deal with such breakdowns, and provided concrete examples to the researchers illustrating how they had successfully maintained interactions throughout such incidents. In addition, participants felt that some of the breakdowns could be avoided, and suggested that a troubleshooting manual be compiled for the most common problems.

Motivation – Rewards When asked about positive aspects of KASPAR, the majority of statements related to the quality of the interactions that they had with the children. All of the participants would describe specific episodes in which they where surprised by how well children responded to the robot and the participant in the interaction. One participant referred to these as '*WOW-moments*'. Most of the intrinsic motivation for using KASPAR seemed to derive from these in–situ episodes rather than the more high-level reasoning more commonly given in the initial interviews.

6 Conclusions

Even at this early stage of our deployment of KASPAR the participants were able to provide the UH team with highly useful insights. In particular, their suggestions for not only improving the interface but for how to increase the customisability of it, have already been adopted by the UH team, and their strategies for maintaining interactions throughout breakdown incidents will be useful when deploying KASPAR with a wider group of users.

Another interesting facet is the change in participants' references to their motivations to use KASPAR, from the potential therapeutic benefit to the child in the first interviews to the immediacy of their experiences when interacting with children using KASPAR in the subsequent interviews. This change in motivation is encouraging, as it suggests that despite the issues of usability, the participants enjoyed using the robot, and that the robot-mediated interactions were rewarding in and of themselves.

7 Future Work

While the initial work on the use of KASPAR in this specialist nursery has been promising, the pilot study is still is ongoing, and the results from this will assist in further, more large-scale studies. We hope to gain new insights into how we can continue the development of KASPAR into a tool that could provide real benefits for children with ASC and their carers.

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