Long-term Use of QTrobot Platform for Autism in Families: The Parents' Reports

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Fig. 1. QTrobot for Autism platform includes a QTrobot, an educator tablet and a learner tablet.

1 INTRODUCTION

Families with children with neurodevelopmental disorders such as autism face difficulties in supporting their children's learning. The Covid-19 pandemic put these families in an even more challenging situation [3]. Being forced to stay at home, to work from home and to support their children in home-schooling, parents had to add teacher-like duties to their caregivers' and professionals' roles. Homes became shared places for home, school and work.

In this situation, children with autism became especially vulnerable; they were not able to learn new or even maintain their existing skills in online classes, and were losing their social, linguistic, emotional and cognitive skills that they worked so hard for [2]. Caregivers of these children experienced stress-related disorders; they felt helpless and not able to provide the quality of care for their autistic children as they needed [1, 7].

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Research on Robot-Assisted Autism Therapy (RAAT) reports positive results of using social robots as a support tool for autism therapy [5, 8, 10]. However, studies that meet the quality requirements of randomised control trials (RCT) in RAAT are rare and their results are mixed [6, 9]. In addition, all interventions from literature are outcome of experimental setups with intervention duration between a single session of 10 minutes and multiple sessions over several weeks [9]. Such setups do not allow for any insights into their ecological validity, and it was not possible to validate RAAT system at homes in long-term studies because RAAT platforms that are accessible and robust enough to be used at home in non-experimental conditions were simply not available. QTrobot for Autism platform solves this problem.

In practice, when families use robots at homes, it is to expect that they need some flexibility in how and when they use the robot. Thus, deviations from the recommended learning plan are expectable 'in the wild'. It is also projectable that changes in the skills of the children is not the only possible result of long-term RAAT at home. Especially in extreme situations, such as pandemics, accessible and easy-to-use RAAT platforms can be life-changing for all family members.

This article reports about the use of the QTrobot for Autism platform for about one year during the pandemics in families. The setup was not experimental, it was not planned as an interventions and therefore, there is no researcher's bias in the results. Several families from USA, UK and Canada chose QTrobot for Autism platform to support their children in learning during the pandemic. We asked caregivers to record their opinions about their experience with the QTrobot Autism Platform after approximately one year of use. Caregivers were free in what they would say. Although this robot-assisted teaching was not designed as an intervention, we learned a lot from it and want to share the insights in the workshop.

2 QTROBOT FOR AUTISM PLATFORM

The platform includes one robot and two tablets as shown in Figure 1: a learner tablet and an educator tablet. The educator tablet is used by a caregiver during all sessions to select the learning material, start and end lessons, evaluate the learner answers. The learner tablet is used to show the learner pictures related to tasks and games, and the learner is asked to select answers to some questions using the tablet. The robot is an active part of the tasks and games: facial expressions, voice and gestures are activated to demonstrate and stimulate social cues, support and empower the learner, and to provide feedback and support learning.

The activities include the caregiver in the interaction, and in case of social skills, the child is directly instructed to observe the caregiver modeling a behavior or is instructed to practice the behavior with the human in the loop. This triadic interaction facilitates the transfer of skills from the interaction with the robot, to human-human interactions. The curriculum[1] uses evidence based practices in autism therapy (discrete trial teaching [4]) including modeling, video modeling, visual support, social narrative, reinforcement and prompting. It focuses on the early developmental milestones and covers skills areas such as social-emotional skills, language and communication and cognitive skills and covers early independent living skills such as autonomy in getting dressed.

The platform was designed to be accessible and easily usable by non-technical caregivers of autistic children, such as parents and therapists. The setup does not require any coding to get started. The tablets automatically connect to the robot when they are turned on, and the learner can start working as soon as a caregiver starts a lesson.

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[1]LuxAI Autism Curriculum https://luxai.com/qtrobot-curriculum-for-autism/
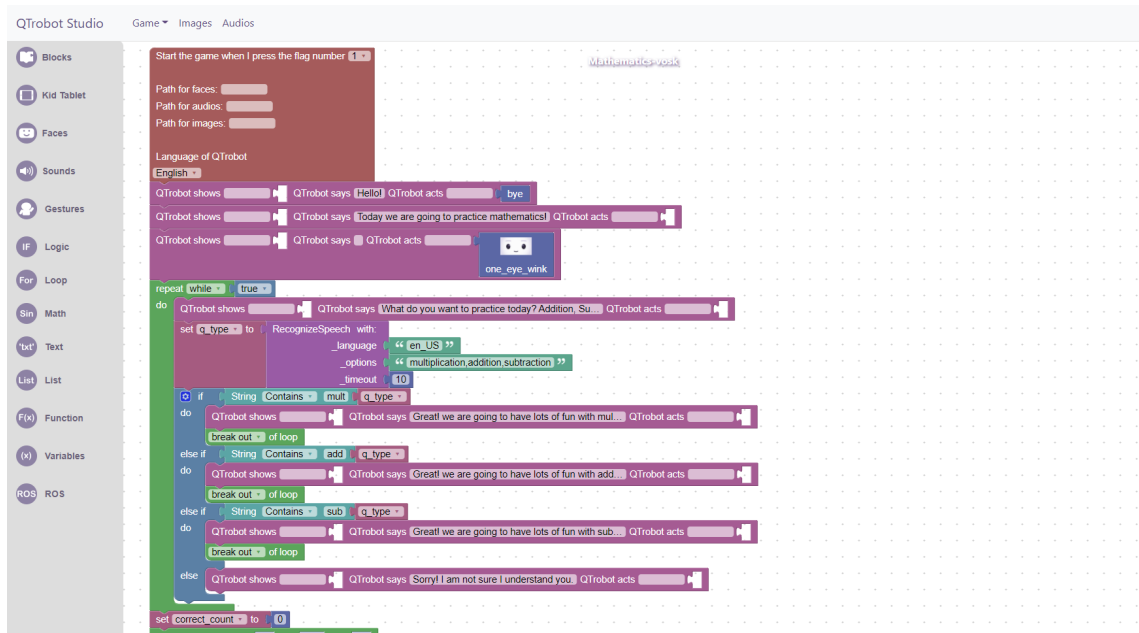
Fig. 2. Screenshot of the lesson creation prossess with QTrobot Studio

The curriculum is currently offered in English The content is designed by autism specialists using a block-based online graphical interface. The content can be translated, using a tool accessible to therapists, allowing the extraction of the activity text and replacement with the new text in the new language. New content for learning, also in other languages, can be created in QTrobot Studio[2] - an online tool for block-based interaction design (see Figure 2).

3 SUCCESS AND CHALLENGES

Because this robot-assisted learning was not planned as a research study, we have no uniform protocol for the study design, we neither measured the skills of the children at baseline or at any other point of the curriculum. When families started using QTrobot, parents filled a placement quiz, focused on evaluating the development level of the child across the developmental milestones of the first 4 years of life. The placement quiz was shared with the LuxAI support team, and was used as for developing the individualised activity plan for each child according to their level of development. Parents also shared school evaluation and individual educational plans, which was compared with the parent filled placement quiz, to obtain a more in-dept view of the child's current intervention needs. These documents varied considerably in scope, quality, and focus, but were useful in advising individual families on their use of QTrobot. The parents also completed an assessment questionnaire which covered each skill in the Early Stage Development Curriculum. The results of this questionnaire were used to advise families on a starting point for each learner. Students using the Emotional Skills Curriculum were generally advised to start with the first module as this is a specific difficulty relating to autism and developmental delays in general.

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[2]https://docs.luxai.com/docs/tutorials/intro_studio

Six reports were evaluated qualitatively by a researcher who joined the team recently. Each testimonial has been shared with LuxAI team as a video of a duration between 2,5 and 18 minutes. The total duration of video material was 45,5 minutes. The researcher did not have any preconception about what might be found in testimonials.

The analysis disclosed that the robot took over the role of a teacher to a large extent, helping the parents to better separate between their contradicting roles (caregiver and teacher) during the lockdown. It also helped to create a better connection between parents and autistic children and other family members and autistic children. Parents could closely observe the progress of the learners, while before they 'only dropped the kid off in a therapy session and then picked up'. Siblings of autistic children were able to conduct lessons using the platform which facilitated a meaningful play between children with different demands, and in this way, created stronger positive emotional connections between siblings.

Some families, however, could not benefit from using QTrobot for autism. The challenges included language barriers (two families using QTrobot with Google Translate), lack of engagement from caregivers (e.g. grandparents bought QTrobot and parents did not use it), lack of engagement from children, technical problems (e.g. tablet was broken) and family issues (e.g. moving house, illness of parents).

4 CONCLUSIONS AND FUTURE WORK

Although RAAT studies mostly focus on the changes in the skills of autistic children themselves, our qualitative study shows that if a robot is placed at home it affects the entire family. Looking at this with the view of evaluating RAAT effectiveness as multi-stakeholder area of impact, at home autism robots can bring more values than just improving the skills of children. Their potential impact can include improving the family involvement in care, increasing the parents sense of effective contribution, and reducing their anxiety caused by lower than expected access to support for their children. In our planned long-term clinical study, we will tackle both the measurable effects in children and the perceived effects on families.

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