NEW FRIENDS 2018

The 3rd international conference on
social robots in therapy and education

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Proceedings

Bienvenido a nuevos amigos…

New Friends 2018 in Panama city has been an impressive event, with over 500 attendants who enjoyed the presentations, demo's and workshops. There was a remarkable amount of attention from the media and local organizer Víctor López Cabrera not only did an extraordinary job setting this up, acquiring sponsors and making all visitors feel welcome, he also generated a lot of publicity and goodwill.

Moreover, this conference marked the birth of an association that will undoubtedly support many conferences to come.

New Friends 2018 was the first conference in this series outside Europe and we certainly look forward in doing that again.

On behalf of the New Friends Association,

Marcel Heerink

Contents

Picking a hospital companion - Preferences of Dutch primary school children and medical professionals

Martina Heinemann and Marcel Heerink

Robotics Research Group, Windesheim University, Almere, The Netherlands

Abstract. We studied the preference for a pet robot to be taken to hospital by interviewing Dutch primary school children and medical professionals. Although boys and girls show a variation in their answers a clear preference for the dog is found, closely followed by cat. Dinosaur Pleo, which is at this moment the most widely used because it can be kept very hygienic due to its skin, is strongly disliked by girls and about a third of the boys. Although the choice was made based on pictures, these results indicate that it might be worthwhile to develop a dog pet, seal or cat robot which adheres to high hygienic standards.

Keywords: social robots, robotic pets, multidisciplinary research

INTRODUCTION

Robots have found their way into schools and hospitals as support materials for the medical staff (1,2). They are being utilized to encourage collaboration and increase technical insight but also to reduce stress and distress during medical procedures and periods in clinics and hospitals.

Since lots of children have a favourite cuddly toy or safety blanket in their everyday life which seems to enhance their general well being the question we want to adress here is: "Which pet robot would children choose? ", the underlying assumption being that their chosen pet robot would increase the positive effects of stress reduction and distraction. At this moment the robot of choice is the Pleo (3), a dinosaur, due to hygiene considerations (4).

In this study we asked school children for their choices from pictures of 8 different pet robots including Pleo to see how these compare and whether we find any clear preferences and dislikes.

METHOD

We interviewed 42 children, aged 6 to 8 years, 19 girls and 23 boys, attending groups 3 to 5 of two primary schools in Almere, The Netherlands.

All children were handed a sheet with photographs of 8 different pet robots, see Fig. 1. They indicated their primary and secondary choice for favored pets and their least favorite by marking them on the sheet. Some needed assistance from the teacher but most children did this without help on an individual basis.

For comparison we interviewed medical professionals at a symposium using the same photo sheet. They were asked which choices they expected from girls and boys, and whether they came into contact with children in such a situation on a regular basis in their work. We got responses from 13 people, 8 women and 5 men; 8 GPs, 4 consultants and 1 assistant. All but 2 respondents had regular contact with children in the applicable situation.

Figure 1. Picture sheet handed to the children and medical professionals for indicating their choice.

RESULTS AND DISCUSSION

The results are depicted in figs 2, 3 and 4 for girls, boys and the entire group, respectively. Note that positive is the accumulated value from first and second choice. Negative means "I would rather not have this animal with me". The upper diagrams show the answers by children themselves and the lower by the medical professionals. The results for girls and boys are very different: whereas girls like cat, dog and seal – in this order – and strongly dislike the dinosaur Pleo, the boys like the dog, Pleo and the seal best. But Pleo also invokes the strongest dislike for one pet among boys. The expectations from the medical professional for Pleo correspond somewhat with the answers by the children, but they do not predict a dislike in boys. If we look at the greatest net positive attitude towards a pet we find dog and seal in shared first place.

CONCLUSION AND FURTHER RESEARCH

From the answers by the children we find that only cat, dog and seal evoke a strong positive response. The dog is the only pet no child rejected and it had the most positive votes (22). For the runner up, the cat, this is also true for girls, but for boys it scores much weaker than the dog. Pleo is the least liked by most girls whereas more boys favored than rejected it. Still, Pleo gets the most dislike votes among boys too. Overall, the dog is the frontrunner, closely followed by the cat, Pleo is strongly disliked.

The medical professionals have a slightly less negative expectation for Pleo, but they also mark dog and seal as more positive.

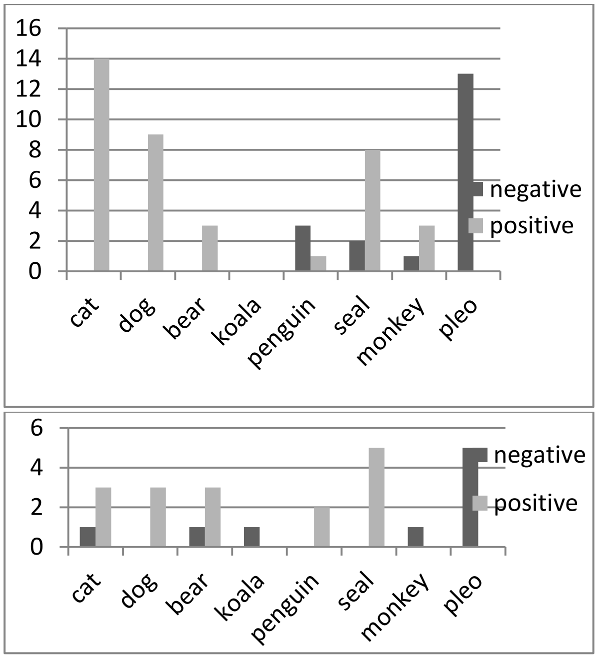

Figure 2. Girls' preferences. Note that positive is the accumulated value from first and second choice. Negative means "I would rather not have this animal with me".

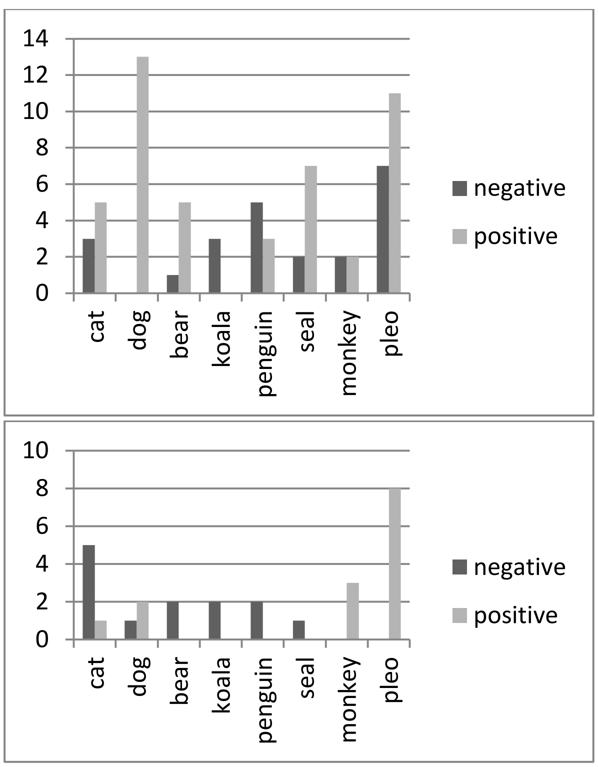

Figure 3. Boys' preferences.

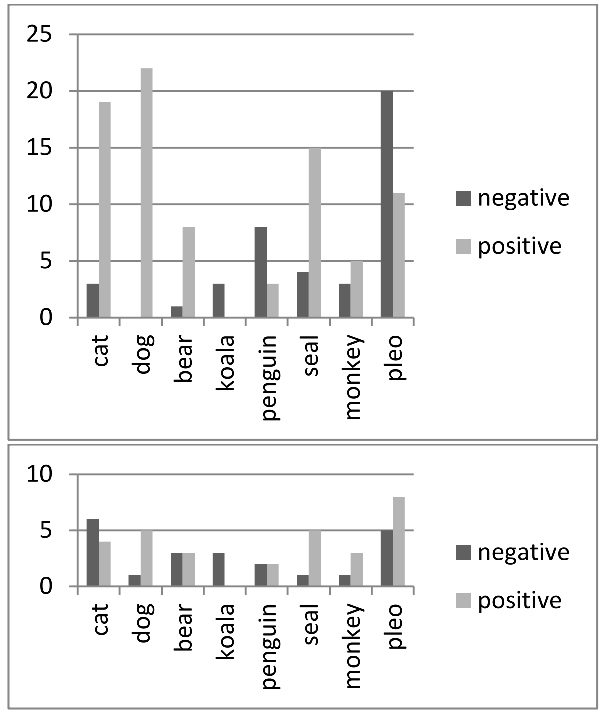

Figure 4. Girls' and boys' added preferences.

These results suggest it might be worthwhile to develop a dog pet, cat or seal robot which adheres to high hygienic standards. However, the specific design of each animal should also needs to be considered, especially the fact that all animals where pictured as furry except for Pleo. Moreover, a presentation of 'live' animals that move, make sounds and can be touched would be necessary to reach stronger indications of preferences.

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Robodi, A Social Modular Robot

Cristina Abad-Moya[a] and Alex Barco[b]

[a]*La Salle – Universitat Ramon Llull*
[b]*ASCoR – University of Amsterdam*

Abstract. The aim of this article is to present a social robot that is based on modules. The modules are understood as pieces or blocks that can be added or removed from the base of the robot. These pieces fit together and can be imagined as part of a puzzle. Each of these pieces brings a specific social function to the robot which is based on an Arduino platform and it is controlled by a mobile application. The modularity of the robot consists of four different functionalities that allow the robot to become social and interact with the user. In this article we present the usability results extracted after carrying out a test with children and a set of ideas for improvement.

Keywords: Social robot, Modular robot, Children-Robot interaction.

INTRODUCTION

A robot has many definitions but the most popular is that it senses, processes and acts [1]. Also, it is something with autonomy, mobility and communication towards the outside, and if we add reciprocal interaction it can be considered as a social entity [2]. There are many social robots already developed and in the following lines we present a review of a few of them. Jibo is a robot designed by a spin-off of MIT that can be used as an interactive companion for families [3]-[4]. Zenbo is an assistant robot for elderly people designed by Asus [5]. Buddy is a low-cost version created by Blue Frog Robotics that can connect, protect and interact with each member of the family [6]. Finally, Aibo is a zoomorphic robot (dog-like) designed by Sony that psychologically engages people [7]. All the aforementioned platforms can be used as companions in a domestic environment to interact with family members.

If we refer to modular robots, understood as pieces or blocks with the same shape that come together in a different way to become a robot, there are a few in the market. M-Blocks is a self-assembling, self-reconfiguring cubic robot designed by developers of MIT that uses pivoting motions to change its intended geometry [8]-[9]. Robo Wunderkind is an educational robot created by co-founders to introduce children to robotics and programming [10]. Finally, Modi, a small module robot designed by Luxrobo that uses magnetic modules to create IoT (Internet of Things) and robot devices [11].

Based on the previous information, we have seen that there are different social and modular robots in the market; however, there is not a robot that has both functionalities. Therefore, the idea of this project is to integrate the two concepts into a single robot, including both sociability and modularity. In this article we present Robodi, a social robot with different modules that have their own functionalities, and the results obtained regarding its usability.

Figure 1. The Robodi Robot and the 4 Modules.

ROBODI

The robot is based on an Arduino platform [12]. This open-source hardware and software platform enables students, engineers or large corporations to be creative with technology. The great advantage of this tool is that it is supported by a large community, which helps other users with tutorials, forums and groups around the globe.

The Arduino microcontroller allows connectivity with a mobile application through Bluetooth. In addition, two DC motors allow mobility and a relay provides the necessary power supply to the lights and motors through an external battery.

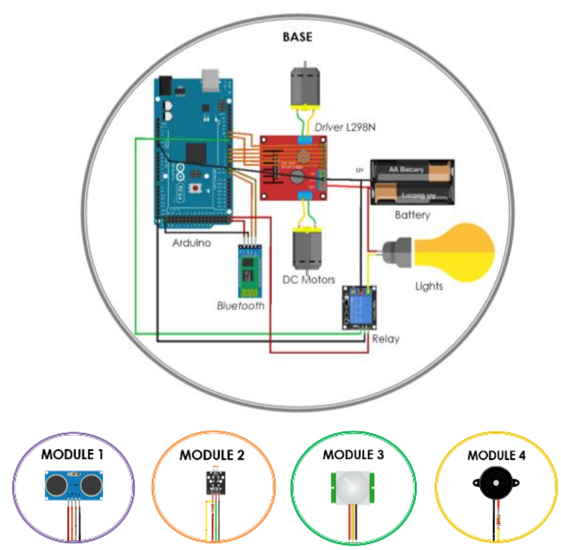

Figure 2. Robodi Scheme.

Moreover, the robot consists of four modules with different functionalities. The first one contains a distance sensor that functions by sending a high frequency pulse that bounces to the object and is received by the sensor. This allows the robot to move autonomously and to avoid obstacles. The second module has a photoresistor, the more light it receives, the less resistance. This module is able to detect the lighting in the air. If it is scarce, it activates the lights on the base. The third module consists of a motion sensor. All bodies emit a certain amount of infrared energy that increases depending on the temperature of the body. The PIR (Passive Infrared Sensor) devices have a piezoelectric sensor that is able to capture this radiation and convert it to an electrical signal. This module detects movement, and as a result the lights of the base can turn on. Finally, the fourth module is an 8-ohm loudspeaker. This provides the robot the possibility to have sound effects.

METHODS

5 boys and 5 girls between 6 and 12 years of age were recruited. The parents signed a consent form and children were asked to verbally assent to participate. A test was performed in order to evaluate the response of the robot and analyze its usability. The test consisted of 8 challenges, which served to evaluate the interaction with the robot. At the end of the test, the participants were asked about their opinion through different questions.

The first challenge was to turn on the robot. Next, they were asked to connect the Bluetooth with the mobile phone in order to move the motors. After that, the children were asked to play with the different modules, in order to observe if they were placed correctly on the robot´s base. Then, they had to guess the function of each of the four modules.

Lastly, they were asked six questions to understand which module of the four was the most difficult to guess and what extra functionality they would like to add to the robot.

RESULTS

After completing the test, we conclude the following: 6 out of 10 users used the mobile application without problems, the other children needed help from the instructor. These 4 users were the youngest children (6-7 years old). As for the Bluetooth connection, all but one needed a lot of help and in most of the cases it was because they did not know what Bluetooth was. All users knew how to place the modules in the correct position. About the modular features, the module 3 was the least intuitive of the 4 modules. They had to deduce that it detected movement in a brief time and that is why 2 out of 10 found it difficult. Finally, regarding the question about extra functionalities, 4 out of 10 said speech capability, 2 out of 10 flying capability, and other functions such as how to dance or more speed.

CONCLUSIONS AND FUTURE LINES

The main objective of this project was to create a modular social robot with multiple functions and intuitive for children. Specifically, the purpose of implementing such a robot was based on a platform that allows adding different functionalities through blocks or modules.

The idea was developed because we wanted to create something new in the market. There is no obvious demand in the market for modular social robots, but it provides the added value of a transportable and reorganizable robot that performs multiple functions. After that, we focused on the design of the robot, working on the mechanism to add and extract the different modules. We followed by integrating, programming and building the complete robot. And finally, we tested it with the end users, drawing conclusions about a future version of the robot.

As far as the interaction and usability, the children gave the robot the highest score possible and found it easy to use, proving that the robot allows for simple interaction.

Considering the results, there are also clear improvements in terms of future lines. Regarding the application, it would be necessary to modify the Bluetooth connection and include symbols instead of words to control the engines, since, the youngest users (6-7 years old) had problems reading it. Regarding the robot, the loudspeaker could be enhanced to have a louder sound, and to incorporate speech. Finally, it would be necessary to run more tests with more users in order to have more conclusive results about the use of the robot.

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Child-Robot Interaction: The Importance of Getting Acquainted

Mike Ligthart[a], Koen V. Hindriks[a] and Mark A. Neerincx[a,b]

[a]*Interactive Intelligence, Intelligent Systems, Delft University of Technology, Delft, The Netherlands*
[b]*TNO, Soesterberg, The Netherlands*

Abstract. In this paper we investigate the role of the child and the robot getting acquainted during their first encounter for a sustainable long-term interaction. We show that social robots need to reciprocate children's self-disclosures, manage their expectations, and teach them how to communicate with them. We furthermore show that a robot can stimulate the children to self-disclosure more by explicitly liking what they like. This allows for better personalization in future interactions.

Keywords: Child-Robot Interaction, Social Robotics, Getting Acquainted

INTRODUCTION

The field of Child-Robot Interaction (CRI) is continuously growing. Projects are getting more ambitious. We, for example, aim to facilitate autonomous repeated interactions between children and robots in a pediatric oncology care setting. The aim is to reduce stress by facilitating a child-robot bond [1].

In this paper we investigate the position of the first encounter and the role of the child and the robot getting acquainted in a long-term interaction scenario.

RELATED WORK

There are a number of perspectives we can take analyzing the position of the first encounter between a child and the robot. First, we will discuss what we can learn from human-human interaction, then we will discuss where it differs, and finally we will go over the practical side of a first encounter.

People automatically use the first encounter to get acquainted, usually by having a conversation that follows a specific procedure and uses certain resources and constrains [2]. The most important activity is to mutually self-disclose personal information with an increasing level of intimacy [3]. For the first encounter between children a greater positive affect was achieved when the partner self-disclosed more and when the social attraction was greater [4].

The innate human tendency to mutually self-disclose personal information needs to be facilitated by social robots in order to sustain a meaningful long-term interaction [1]. Human-computer interaction research shows that an agent with this ability was "respected more, liked more, and trusted more, even after four weeks of interaction" [5].

A big difference between robots and people however is the lack of a common ground. This makes it difficult for children to know what to expect from the robot. Science fiction movies and books heavily skew the expectations of people [6].

Children often have too high expectations of the physical and cognitive capabilities of robots. This has a negative impact on the effectiveness of a social robot intervention [7]. It is therefore important that children get acquainted with the capabilities of the robot during the first encounter.

Finally, there are some practicalities that need to be covered during the first encounter. Learning how to communicate with the robot is one. We use the Nao robot a lot in our research. For example, telling children that they have to wait till the beep before answering a question prevents a lot of failed speech recognition attempts.

GETTING ACQUAINTED

In the rest of the paper we focus on our research aimed at designing the social robot behaviors that facilitate mutual self-disclosure and getting acquainted during the first encounter. In a first pilot study we investigated what response to a child's self-disclosure would be more fitting and stimulates the children to disclose more. We compared a robot that explicitly likes what the child likes with a robot that had a more nuance style of responding.

In the study the robot asked the child "what is your favorite …" pet, sports, color, school subject, and holiday destination. After each answer the robot would give a short anecdote about its favorite answer.

The explicit robot would literally say: "that is my favorite too" in every response. The nuanced robot matched the answer of the child but just gave the anecdote about that answer. However, in one out of five responses the robot would explicitly express it liked something else and give an anecdote about that instead.

We hypothesized that the nuanced robot would yield better results because it showed more variation in its responses [8].

Design and measures

We had one between-subject factor: *response style* (explicit vs. nuanced). We counted the number of *self-disclosures* given by the children. Furthermore, we asked the children to rate the robot's *spontaneity*, *authenticity*, *similarity* to themselves and whether the conversation made them *happy*.

Participants, set-up and procedure

30 children (age: 8-10) from a Dutch primary school completed the pilot experiment.

The participants interacted over a course of three days one-by-one with a NAO robot. The experiment was set-up in a separate room at the school. It lasted for 20 minutes in total, 10 minutes interaction and 10 minutes explanation and questions. One wizard was present to control the robot and one experimenter was present prepping the child and presenting the questions.

Results

Using an ANCOVA we determined that there was a significant medium main-effect of the robot's response style on the amount of self-disclosure after controlling for the age of the participants, $F(2{,}27) = 4{,}886, p = .036, \eta^2 = .153$. Participants on average disclosed more to the explicit robot (13.13) than to the nuanced robot (10.93), see Figure 1.

Mann-Whitney U tests were run to determine if the response style had a main effect on the participants ratings. The test showed that the median similarity score was significantly higher for the explicit (4) robot than for the nuanced (3) robot, $U = 37, z = -3.2, p = .001$. All other ratings did not significantly differ, $all\ U's > 78{,}5, z's > -1.5\ and\ p's > .161$.

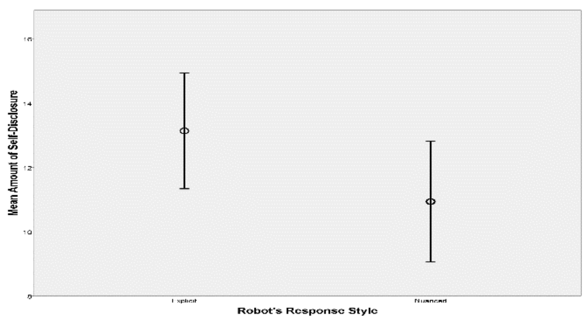

Figure 1. Mean amount of self-disclosure with 95% confidence intervals for the explicit and nuanced robot.

Discussion

In contrast to our hypothesis, participants disclosed more to a robot that explicitly liked what they liked than to a more nuanced robot. It is plausible that because they felt more similar they disclosed more or because an explicit affirmation resulted in a more positive affect towards the robot, leading to more self-disclosure [4].

Alternatively, because the interaction was fairly short it could still be that eventually it will get annoying if a robot constantly explicitly likes what you like and that a robot with its own interests is more interesting. It would be helpful if the robot could adapt over time to these changes [8].

PERSONALIZATION OVER TIME

Personalization in long-term CRI is important because the interpersonal differences between children are highly influential. Furthermore, the interests of the children and their demands of the robot change over time. For creating a sustainable child-robot bond the robot needs to take these factors into account [8].

It's not only important that the child gets acquainted with the robot, but also that the robot gets acquainted with the child. This allows the robot to personalize its behavior and the content of the conversation. In upcoming work we are expanding on what was presented in this paper to evaluate the bonding process spanning multiple interactions.

CONCLUSION

We have showed that the child and the robot getting acquainted with each other is important for a sustainable child-robot interaction.

A robot that explicitly likes what the child likes while reciprocating their self-disclosures reinforces the amount of self-disclosures by the child. This allows the robot to better personalize to the child in future encounters. Whether this response style remains sustainable over time is a question for future research.

ACKNOWLEDGEMENT

This work is part of a project[1] (#15198) that is included in the research program Technology for Oncology, which is financed by the Netherlands Organization for Scientific Research (NWO), the Dutch Cancer Society (KWF), the TKI Life Sciences & Health, ASolutions, Brocacef, Cancer Health Coach, and Focal Meditech. The research consortium consists of the Centrum Wiskunde & Informatica, Delft University of Technology, the Academic Medical Center, and the Princess Maxima Center.

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[1] Improving Childhood Cancer Care when Parents Cannot be There – Reducing Medical Traumatic Stress in Childhood Cancer Patients by Bonding with a Robot Companion.

Engaging Children with an Interactive Affective Storytelling Robot

Mike Ligthart[a], Koen V. Hindriks[a] and Mark A. Neerincx[a,b]

[a]*Interactive Intelligence, Intelligent Systems, Delft University of Technology, Delft, The Netherlands*
[b]*TNO, Soesterberg, The Netherlands*

Abstract. In this paper we investigate what behaviors a robotic storyteller needs to have to be able to sufficiently engage children. We identified that adjusting the affective expressions to the story and interactive behaviors increase engagement. From a pilot study comparing a shallow implementation of interactive behavior to a plain robotic storyteller we learned that a shallow implementation is not enough. Finally, we identified that allowing children to make choices about static story elements and re-enacting parts of the story to be two interactive behaviors that likely will increase engagement.

Keywords: Child-Robot Interaction, Social Robotics, Interactive Affective Storytelling

INTRODUCTION

Telling stories to children with interactive technology seems to be a good match. Numerous interactive storytelling applications exists. These applications are not only meant to be fun but often have a therapeutic or educational purpose [1].

Our aim is to design an intervention with a storytelling robot that is able to distract pediatric oncology patients during potential traumatic experiences. For example, when they need to be isolated during radiation treatment.

Being engaged with the story and the robot is essential for most applications [2]. For example, in an attempt to distract children from a flu shot with a robot, researchers found that the interaction must be highly engaging in order to work [3].

The question we are investigating in this paper is *what behaviors does a robotic storyteller need to have to become 'highly engaging' for children*?

RELATED WORK

We treat engagement, similar as Corrigan et al. (2016), as having a cognitive and an affective component. The cognitive component is the attention children can direct at the interaction. The affective component is the feeling of enjoyment [4].

In previous work we have learned that engagement can be increased by letting the robot adapt its affective expressions to the story appropriately during the storytelling process [5].

Another approach suggested in the literature is by including interactive elements [1]. A popular approach to interactive storytelling is by making the children the author of a story and give them the opportunity to express themselves freely [6].

However, this approach is not always practical or desirable. For example, in a case where children are undergoing treatment or when the story itself is meant to convey particular information. Furthermore, the technical requirements of such an approach are very demanding.

We need a way to incorporate interaction in storytelling, and give the children a sense of involvement, in a setting where the robot tells the story.

To get more insight on the required level of sophistication of the interaction we ran a pilot study to compare a plain storytelling robot with a shallow implementation of an interactive storytelling robot in a primary school in the Netherlands.

PILOT EXPERIMENT

Design and measures

We had one between-subject factor with two conditions: plain versus shallow interactive. The robot told an educational story about the flu. In the plain condition the robot just told the story while in the interactive setting the robot asked questions about the flu during the story.

A rater who was present rated the *attention* the participants directed at the robot on a 5-point Likert scale ranging from 1 (little to no attention) to 5 (highly focused on the robot).

The participants self-reported their *enjoyment of the story*, *the robot*, and whether they wanted to *meet the robot again* on a 5-point Likert scale.

Participants, set-up and procedure

24 children (age: 7-9) from a Dutch primary school completed the pilot experiment.

The participants interacted over a course of two days one-by-one with a NAO robot. The experiment was set-up in a separate room at the school. It lasted for 20 minutes in total, 10 minutes interaction and 10 minutes explanation and questions. One wizard was present to control the robot and one experimenter was present prepping the child and rating the attention.

Results

Mann-Whitney U tests were run to determine if there were differences in attributed attention, enjoyment of the story, the robot, and the desire to meet again (see Figure 1). Median attention scores for plain (4) and interactive (4.5) storytelling was not statistically significantly different, $U = 82, z = .608, p = .534$. Median scores for the other (affective) measures, plain (all 5) and interactive (all 5), did not statically significantly differ either, $all\ U's > 84, z's > 1.446\ and\ p's > .148$.

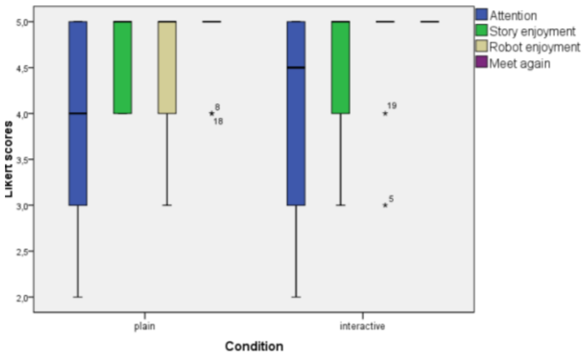

Figure 1. Boxplots showing the scores for the different measures between the plain and interactive conditions.

Discussion

The shallow implementation of interactive behavior did not result in more attention from the participants than plain storytelling. The first lesson is that our next implementation of interactive behavior needs to be more sophisticated.

Furthermore, a ceiling effect occurred on the three self-report measures (all median scores where the maximum of 5), making it difficult to establish if and how the interactive behavior influenced the enjoyment. A likely explanation is the novelty effect [7]. The second lesson is that we need to prevent the ceiling effect from affecting the results in a future experiment.

INTERACTIVE STORYTELLING BEHAVIORS

From the literature we identified two leads for interactive storytelling behaviors that are likely to increase children's engagement. Research shows that offering children choices increases affective engagement [8].

The robot could ask children to make choices about certain static story elements. For example, the outfit of the main character. This keeps it technically feasible for an autonomous robotic storyteller.

To support the cognitive engagement children could be invited to actively participate in the storytelling process [9]. For example, by inviting children to reenact certain parts of the story together with the robot. For example, roaring like a lion (sound) or racing like a race driver (gesture).

CONCLUSION

In pursuit of designing behaviors to make a robotic storyteller highly engaging for children we performed an initial pilot study. We learned that a shallow implementation is not enough and that preventing a ceiling effects is essential for including self-report measures in the evaluation of the behaviors.

Using these lessons and the literature we designed an interactive affective storytelling robot that adjusts its expressions based on the affective development of the story, it provides children with the opportunity to make choices about the story, and it encourages children to reenact parts of the story together. To deal with the ceiling effect we have planned a repeated interaction user-study.

Ultimately, all with the goal to allow pediatric oncology patients to escape the hospital walls for just long enough.

ACKNOWLEDGEMENT

This work is part of a project[1] (#15198) that is included in the research program Technology for Oncology, which is financed by the Netherlands Organization for Scientific Research (NWO), the Dutch Cancer Society (KWF), the TKI Life Sciences & Health, ASolutions, Brocacef, Cancer Health Coach, and Focal Meditech. The research consortium consists of the Centrum Wiskunde & Informatica, Delft University of Technology, the Academic Medical Center, and the Princess Maxima Center.

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[1] Improving Childhood Cancer Care when Parents Cannot be There – Reducing Medical Traumatic Stress in Childhood Cancer Patients by Bonding with a Robot Companion.

RoboPlus: collaborating with coaches of ASD children on the use of social robots

Saskia van Oenen and Marcel Heerink

Windesheim Univiersity, Robotics research group, Almere, The Netherlands

Abstract. This paper describes the start phases of our practice based research on the usefulness of social robots in youth care institutions, working with young people with forms of autism. We highlight especially the collaboration between researchers and practitioners in the development of our research design. This includes the choice of specific robots, possibly with adjustments, to match particular needs of practitioners in their regular work processes.

Keywords: Social Robots, Autism, Collaborative Design

INTRODUCTION

A lot of research has already been done, and is ongoing, on social robots as assistants for young people coping with forms of autism (ASD; Autism Spectrum Disorders), and as assistants in their therapies. However, this is still mostly done in experimental settings, rather than as part of regular daily activities, regular therapy or education [1].

The project 'Roboplus' (2017-18) focusses on these regular settings, especially the possible deployment of social robots in regular work sessions in youth care institutions, including children with ASD.

The project is undertaken by Windesheim Flevoland in cooperation with five youth care institutions in the Dutch cities Almere and Lelystad, and several research partners. The youth care institutions had shown their interest in advance, and participated in brainstorm sessions about possible deployments of a variety of robots, introduced by the researchers.

An important starting point was the shared interest in robots as a possibly extra tool for professionals, to better achieve their own goals in their work with young clients with ASD (and sometimes also their parents). The aim of the project is, to improve the goal oriented interactions of the professionals with these clients.

PHASES IN COLLABORATION

Initial interviews

The project started as a series of sessions with professionals (partly practitioners, partly management) of each institution, to map the bottlenecks they encounter in their regular work processes with individual clients with ASD, or group activities where clients with ASD are included. They were specifically advised to map these professionals bottlenecks without anticipation on ideas for robot based solutions.

This advice was given to prevent tunnel vision, tending to occur when people focus too strongly on 'what a robot could do'; as this is often based on just vague impressions, too restricted or too glorious expectations of robotic possibilities. Or in worst case, it could lead to the deployment of robots just because they can do something, disregarding the question if that something really connects to encountered problems and work goals to be attained.

After mapping the bottlenecks, we asked the professionals how they had tried to tackle these up till now, why that did not work, and finally: why then, do you think, could a robot offer a solution? Which characteristics are required in such a robot?

The outcomes of this questioning were not spectacular, in as far as the desired characteristics corresponded with those usually noted to be especially relevant to people with ASD: the neutrality of expression, constant and unchanging in repetitive (inter)actions, the possibility to practise safely time and again with interactional codes. However, with regard to the collaboration between the researchers and practitioners, this process was really essential to improve mutual understanding and engagement.

Requirements for suitable robots

This was continued in the selection of specific robots, with the perilous problem how to make a trade-off between desired characteristics, and types of social robots that are financially affordable for the participating youth care institutions. After all, it had to be robots that, if these pilots would prove to be successful, were payable – and possibly in larger quantities than just one or two - from their regular budgets.

So here some disillusions did lay in wait. It was clear to all that advanced but very pricey social robots like Kaspar or equivalents, favorite in many laboratory experiments with children with ASD [2], were out of the question.

The researchers presented a selection of alternatives up to maximally €500 apiece, also mentioning possible little adjustments to enhance their usages. Some practitioners or their managers, not satisfied with the limited capabilities of these specimens, undertook treasure hunts themselves on the internet. Coming up triumphantly with alternatives, it took some time before they accepted the explanation of the researchers that the capabilities of robots can be presented in a deceivably flattering way.

Once resigned to the limitations of affordable social robots, the professionals redesigned their (up to now rather general) wishes into more modest but concrete plans, for the deploying of this kind of robots in their own work processes. In one institution the toy dinosaur Pleo [Figure 1] was chosen to explore his possibilities as a help for dimming individual emotional eruptions during group sessions, and so ease the way to regain contact with the child. Elsewhere Pleo was chosen as an extra tool in forms of guided play, targeting the growth of awareness about social interaction repertoires.

Figure 1. Pleo

Other institutions wanted a robot to assist children in learning processes for cleaning up messes in the kitchen or their own room. Hitherto used instruction schemes (digital or on paper) tend to be disregarded or misunderstood by the children. The accompanying parents lose their patience; and coaching youth care professionals at long last also feel an emotional tone creeping up in their reactions, which is held to be disturbing for children with ASD and thereby contra productive in the coaching process. Hopefully a robot could give more neutral directions and responses; but above all it is expected that a robot will have an extra motivating impact on the children.

For these 'cleaning' pilots, several programmable (and affordable) robots were first shown to a group of young clients, letting them indicate their preference as described in a paper of Scheick, Meijer and Heerink [3]. This conquest was won by the Meccanoid [Figure 2]. On account of his humanoid appearance, this robot was perceived as a convincing task advisor.

Adaptations

Adjustments to the chosen robots were made by technicians attached to the project. Pleo is normally developing certain capacities in stages of use, but for usability in the playing groups he had to start on an advanced level.

This was not easily contrived, since this factory product is not made for such manipulations. This already implicates the question, to which extend practitioners are dependent on technical expertise in eventual future use of this (and any) robot.

The same and more goes for the Meccanoid. This robot was adjusted with a smartphone, in which a script could be programmed: consisting of questions, instructions and feedback. This script is drafted in collaboration between practitioners, researchers and technicians. Some accompanying speech, gestures and changing eye colours are also collaboratively designed.

The pilots will have to reveal the suitability and effectiveness of this upholstering, which we are curiously awaiting, just as we do await the usefulness of Pleo in the other pilots.

Figure 2. Meccanoid

Measuring instruments

Last but not least: the complete research designs and measuring instruments for the several pilots are also composed in consultation with the practitioners: partly for the whole project, partly tailor made for each pilot. During the writing of this paper, the effectuation of the thus developed pilots was still forthcoming.

CONCLUSIONS

Practice based research, choosing and exploring the usefulness of social robots for contextually specific aims, is also an intriguing search into collaboration processes between researchers, practitioners and technicians. The details in these processes require more eager attention.

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Choosing a Robot With ASD Children

Robin Scheick[a], Esther Meijer[b] and Marcel Heerink[a]

[a]Windesheim Univiersity, Robotics research group, Almere, The Netherlands
[b]Aumazorg, Lelystad, The Netherlands

Abstract. Children with ASD are generally attracted to robots. To explore this attraction and possible task directed preferences, we set up a small experiment and asked ASD children to choose between three different types of robots for different tasks. They clearly showed task dependent preferences and demonstrated remarkable signs of self reflection.

Keywords: Social robots, autism, ASD children

INTRODUCTION

The use of social (socially interactive) robots can be an effective tool for professionals who work with children with autism spectre disorder (ASD). Many children with ASD are attracted to robots because of their controllability, their predictable and consistent behavior and physical appearance (1-3). The robot can be touched and grabbed and thereby provides an experience in reality. In addition, the robot can fulfill many roles, for example as a mediator, interaction partner or tutor (4, 5).

Within the RoboPlus project, research institutions from The Netherlands, Belgium and Spain collaborate with professionals who coach children with ASD in their daily living activities and communication skills. The focus is on commercially available robots and on integration of robot centred activities within the current approach of the professionals. Research activities are derived from ideas of these professionals, which concerned emotion regulation, social skills development and independency skills (teenage children, learning to live as independent as possible)..

When it came to picking a robot to work with that would be of help to develop independency skills, professional coaches suggested to have their children make a choice, not only to see which robot would be most attractive to them, but also to establish if their choice would be based on general or task oriented preferences. The latter would be an indication that they were able to reflect upon themselves, their condition and the learning environment they were in at that moment.

SETUP

Participants were ASD children who were part of a group in which they were coached to develop their independent living skills. There were 2 groups containing 4 and 5 children, their age ranged from 8 to 16 years. The robots we chose differed in humanoid characteristics and mobility, but were all capable of social interaction:

- A BB8 sphero robot with a ‘somewhat humanoid’ appearance. It is about 15 centimetres high, has a spherical body with a magnetized appendage for its head. It is controlled by a Bluetooth connection in concert with an app on a mobile device. It is very mobile, with different speeds.
- Cozmo, a little bulldozer (thus not humanoid) or lift truck shaped robot on tracks. It has a pixel screen for use of expressions in a face (mainly eye`s). It has mobility, but less than BB8.
- Meccanoid (version 2.0) , a humanoid robot with very limited mobility and the capability to wave its arms by utilizing the 2 servo`s in each arm. Apart from the mechanical features it also has the ability (even if it is not very robust) to understand certain voice commands.

Figure 1. From left to right: BB8, Cozmo and Meccanoid

For this test we exposed the children to all 3 robots in sequence by their own choice. We asked them the following questions:

Q1. Which one of the shown robots would be you accept to help guide you with doing chores around the house ?
Q2. What are your thoughts with this particular robot?
Q3 Which robot is more awesome /cool?
Q4 From which robot would you be able to learn more or quicker?
Q5 Why did you give that answer?
Q6 From which robot do become more or less calm?

For the experiment we had two sessions with 4 children sitting around a table and asked them to meet the 3 robots to evaluate their personalities, behavior and task suitability. After they met all 3 robots, we asked the six listed questions.

Figure 2. Setup

RESULTS

We noticed that children's responses mirrored the energy that the robot expressed. They would become restless when the robot got exited and hyper and they calmed down when the robot asked them question which they needed to answer.

With regard to the specific questions, the interviewed children unanimously decided that the Meccanoid device would be the most acceptable device to use for the purpose of helping with structure in and around the house. They found the Cozmo and (even more) the BB8 too restless.

We listed the answers that were representative for the group in Table 1.

Table 1. Generalized answers.

	BB8	**MECANOID**	**COZMO**
Q1	NO SPEECH	YES	To hyper-active
Q2		It talks !!	
Q3	Nothing specific	Awesome	It`s cute
Q4	Too restless	This one is perfect	Better than BB8 but still to restless
Q5	Not enough interaction	Lots of options and speech	To distracting
Q6	Less calm	Calming down	Less calm

CONCLUSIONS AND DISCUSSION

We found it remarkable how the robots' behavior was mirrored by the children. However, perhaps the most significant finding was that the children were aware of the impact of the robots. They realized the Cozmo and especially the BB8 robots would make them too restless to be suitable for learning tasks.

The actual choice for a Meccanoid could be seen as predictable, but we found it remarkable to be unanimous and well-based on rational arguments.

However, we have to be aware of the limitations of this small experiment: children were interviewed in groups and may very well have impacted each other. Moreover, the choice was limited and the robots differed in more than one aspect. This may be a problem that is hard to overcome when we compare commercially available robots, but it still needs to be addressed.

In future research we suggest a more individual approach of the children and a 'omne at a time' focus on different aspects of social robots.

However, we find that a conscious evaluation of social robots is a valuable exercise that could both train and expose self-awareness and self-reflection of chidren with ASD.

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Current technical and practical impediments to research on social robots

Alex Barco[a] Caroline van Straten[a] Chiara de Jong[a] Jochen Peter[a] Rinaldo Kühne[a]

[a]*ASCoR- University of Amsterdam*

Abstract. Social robots are increasingly gaining the attention of the research community. However, there are various impediments to using social robots within scientific research. Some of the issues concern their limited availability in the market, their high cost and the inaccessibility to reprogram them. This paper reflects on the current state of the field.

Keywords: Social robots, research, HRI, CRI.

INTRODUCTION

Commercial social robots are flourishing. A rapidly growing industry produces social robots, notably as companions for the elderly or as devices to teach or entertain children [1-2]. Researchers using social robots, however, still encounter several problems. For example, while many social robots are advertised, many of them are not yet available and remain on a "pre-order" status for a long time. Another key problem of using social robots in research is the price. Many of the currently available social robots are expensive and sometimes require pricey maintenance.

Apart from their lacking availability and high price, many social robots currently suffer from limited technical capabilities. Manufacturers of robotic platforms tend not to be sufficiently transparent about robots' actual capabilities [3-6]. To get a somewhat more realistic impression of what social robots can – and cannot – do, researchers are thus bound to rely on videos on Youtube or other video-sharing platforms only. On the one hand, some of these videos can convey reasonably well how interactive a robot is, how smoothly it moves, and how easy it is to use. On the other hand, some of these videos can sometimes be misleading. They show impressive capabilities of the robot in perfect conditions with little noise and perfect light. Unsurprisingly, in such conditions key features of social robots, such as speech and image recognition, work impeccably under such circumstances. However, functionalities such as face detection, face recognition, object recognition, and human behavior understanding, can currently only be used in restricted scenarios [7]. In addition, speech recognition is still underperforming. Consequently, natural language understanding – a crucial aspect of human-robot interaction (HRI) – remains cumbersome and communicative HRI scenarios are limited [8].

A final problem of current social robots concerns the possibilities to reprogram the robot. In some studies, researchers may want to change the behavior of the robot (e.g., personalize an interaction in line with characteristics of the human actor). In that case, researchers need access to the code with a Software Development Kit (SDK). Not all the commercial platforms, however, provide easy access to their codes. The resulting issues often consume a lot of time and effort.

THE MARKET

Against this background, we investigated the market in terms of different social robotic platforms and their fit to the necessities of our project. Our project, which is funded by the European Research Council (ERC) and conducted in The Netherlands, aims to develop an integrative framework of child-robot interaction (CRI). We study what predicts children's acceptance of social robots; whether CRI affects the extent to which children learn social skills from social robots and form relationships with them; and which processes my underlie such effects. Thus, we need a reliable, interactive, affordable, programmable, entertaining and robust social robot.

One of the most popular social robots is the NAO which has been used in many studies in CRI [9-11]. However, its price (>5000€), is a limitation when, as part of the project, an in-home study with many children is to be conducted. Other human-like robots such as Alpha 1 Pro [10] or Darwin-Mini [13] do not meet our expectations about autonomous behavior and their capacity of being reprogrammed. Moreover, they are not available with Dutch language abilities.

Other social robots that are about to enter the market turned out not to meet our expectations etiher. Jibo seems to become a popular robot for use at home. It can look, listen, and learn due to its artificial intelligence. It offers many interesting capabilities but it is currently only shipped to Canada and the United States of America [14]. The Zenbo robot [15], the Kuri robot [16], or the FURo-i robot [17] all seem to offer capabilities similar to Jibo, but are not yet on the market.

As available social robots are not suitable for our project and potentially suitable social robots not yet available, we focused on smart toys, defined as toys that "contain embedded electronic features such that they can adapt to the actions of the user […] [and] process more information from a greater variety of sensors. This may include the use of microphones or speech recognition, cameras for detection of patterns and visual cues, accelerometers, proximity sensors, gyroscopes, compasses, radio transmitters, or Bluetooth for communicating between various parts to

[sic] the same toy" [18, p. 2]. We considered platforms such as Cozmo (170€), a robot with autonomous behavior, emotions, which is controlled by a mobile app with many capabilities [19]. We also looked at zoomorphic robots, such as Pleo, the dinosaur [20], and Chip, a dog robot [21]. However, all these platforms have their own limitations. Most importantly, they tend to look like toys rather than robots, are less interactive than social robots, and can be difficult to reprogram to meet the needs of our project.

CONCLUSIONS

Many different robotic platforms are currently available, but few can engage in a meaningful interaction with children (e.g., with good speech or emotion recognition). Moreover, many social robots are expensive and difficult to reprogram. Some technical universities build their own robot, but without such expertise, studies with social robots need to be adapted to the reality of the market. It is important that the current technical impediments on social robots are more strongly taken into account in strategies to advance the development of research on this field.

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A Review of Social Robotics in Education: From Literacy to Math Teaching

Olga Sans-Cope[a] and Jordi Albo-Canals[b]

[a] *Technical University of Catalonia, Barcelona, Spain*
[b]*CEEO-Tufts University, Medford, MA, US*

Abstract. In this paper, we present a review of the research about the applications of social robots in education based on their roles and their applications. Although in the literature we can find other reviews, none of them covers the approach based on the role of an active mediator that creates a context of affective learning based on social interactions between educators and learners.

Keywords: Social robots, Learning, Education, Math, Literacy.

INTRODUCTION: THE ROLE OF SOCIAL ROBOTS IN EDUCATION

In education, we can find inherently the social relationship between the teacher and the students or between students. The human brain is a social organ, and it learns from social relations between people. Recently there has been an increase in digital tools to improve learning. However, most of them do not contemplate the use of socialization strategies. Although there is the use of virtual avatars as agents that can create a perception of social interaction, the use of robots with a physical body can improve that perception and therefore represent an extension, in time and space, of the teacher or classmates [1].

If we look at what we can find in the literature on social robots, we will see that we have three categories of application: motivational, affective and mediating. These social robots aim to improve the teacher's ability to collect information on the child's progress while also personalizing education. This ability is because the robot is a machine that can operate non-stop collecting "big data". In itself, the educational robotic platforms, in general, enable an educational method called active learning [2], which is based on the fact of improving the efficiency of learning thanks to the significant value of the activity plus the creation of a context favorable to social interactions.

In the use of the robot as a motivational tool, it can play different roles according to the role in the learning process. For example, Tanaka [3] proposes the robot as the student's role, that is, the recipient of learning, which is known as learning when teaching a classmate. On the other hand, the group of Personal Robots, led by Cynthia Breazeal, propose learning similar to that of Tanaka, but with the robot as a partner role that guides the student in the vocabulary learning process [4] and [5]. In [6] and [7] the robot is presented as a tutor role, in which the robot conducts the learning activities on the part of the child.

In working environments with children with special needs as in [8], [9] and [10] the robot has been seen as the mediator between the student and the teacher or between the students. In this work, this third approach has been adopted given that we understand that it is the most efficient way to train the teacher with a tool that increases their abilities in the classroom.

According to Rosalind Piccard of the group of Affective computing of the MIT Media Lab [11], the change of emotional states changes the way of thinking. A social robot infers different emotional states to the individual or community with which it is or is part [12], so that our approach as a facilitator, a robot that cares about our learning, helps the student's motivation to perform the educational tasks [13].

EXAMPLES OF APPLICATIONS OF SOCIAL ROBOTS IN EDUCATION IN RESEARCH

Figure 1. Hookie Robot mediating in an activity with kids learning math.

We can find multiple applications of social robots in education. Below we have listed examples of platforms and applications: 1) In [3] and in [14] the social robot, Nao and Tega, respectively, is used for language learning. Also in [18] with the use of the iCat robot. A full-sized humanoid robot, TIRO, is presented in [19] for the same purpose. ; 2) In [15] and [16] the Hookie robot (See Figure 1) and Darwin is used for social and math skills. At a very humanized robot level, the robot Saya in [20] helped the learning of sciences in general;

3) In [5] children learn math and vocabulary with the humanoid robot Nao ; 4) In [17] we present social robots in multiple education scenarios with various roles.

EXAMPLES OF SOCIAL ROBOTS IN EDUCATION IN THE MARKET

During the last year, we have seen multiple products coming to the market to full fill the space for social robots in Education. Most of them, like Jimu from Ubtech Robotics, and LEGO Boost, evolved from Educational Robots to become more social. However, Jibo Inc. with its Be a Maker app also has appeared moving from a family robot to a social, educational platform.

CONCLUSIONS

Although there are a lot of studies and reviews about social robots in Education, most of them are based on the number of subjects and how long is the study. In this paper, we tried to cover the gap between the role and application of this robots within the context of education. We want to focus on the inherent use to create an affective environment where the robot helps the learning process through social cues.

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Pedagogical Robotics In Learning For Autism Children

José Carlos Rangel[1] and Cristian Pinzón[1]

***Abstract*— This project applies the Pedagogical Robotics Approach in order to help the teaching techniques for children with autism. The selection of such group is based on the particularities presented by this kind of students that directly impact on their performance on both, inside and outside the classroom. Pedagogical robotics focus on the inductive learning and guided by discovery. Therefore, this approach uses a mix of several software tools and educational robotics devices. Also, let us make the most of some of the special features of the children allowing them to solve problems in an enjoyable way and at the same time generate knowledge through the use of robots.**

***Index Terms*— pedagogical robotics, autism, special needs, teaching**

I. INTRODUCTION

Several times autism children need some help when they are receiving class, in latest years traditional learning systems have reduced the current technological gap. However, on special education this gap is still present, hence their teaching methodologies do not show either the inclusion nor the use of technological tools in order to powers and improve the learning for autism children.

As the base of this study we take into account the features of the current learning techniques that could be listed as [5]:

- Expository traditional class
- Meaningless learning by repetition
- Mechanic memorization of contents
- Lack of creative, dynamic and innovative classes.

Also, autism children have problems in several areas as is defined in Medline Plus [9],some of these areas are: Social Interactions, Actuated games, Oral and not oral communication. These problems and the current teaching approach work as the starting point for this research, that also involves teachers for being able to define a way to deploy and measure the effectiveness of the proposed solution.

Taking as base the education deficiencies and the characteristics of autism children we propose a project based on Pedagogical Robotics for supporting the teaching and learning of these kind of students. The project uses a software tool with educational robotics kits and a set of practice workshops used in the classes with the children. These workshops are focused on improving the special difficulties of the students that directly impact on knowledge acquisition.

Pedagogical robotics let us include the technology to the autism children in order to improve the way their learn in the classroom as have presented in [1], [6], [7].

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[1]ROBOTSIS, Universidad Tecnológica de Panamá{jose.rangel,cristian.pinzon} at utp.ac.pa

II. DEVELOPMENT PHASES

The project has been developed inside a specialized institution on the attention of several kinds of disabilities, concretely in the *Instituto Panameño de Habilitación Especial* (IPHE) of the province of Veraguas in Panamá. One of the first steps was the coordination with the teachers of the center in order to know what are the main problems and difficulties of these children and then define the methodology of the study.

Once the first phase is over, the next includes the creation of the workshops and tools taking into account the teachers recommendations. We defined 12 workshops, every one focus on different aspect, or a mix of them, of the children. Generally, the workshops were focus on develop some pedagogical aspect such as maths or language, mixed with soft skills such as the attention on the task completion. As part of the project, a survey was developed to measure some progress indicators in the children, these indicators were the goals on which workshops were focused.

The survey used in the study evaluate the following progress indicators:

- Concentration
- Follow Instructions
- Numerical Comprehension
- Motor skill
- Language

These indicators were selected taking into account the necessity of the students and the recommendations of the teachers of the school.

Next, we began the work with a group of 5 children in the school, this work was individual with every child and the majority of the time, under the supervision of the parents or teachers (see Figure 1). Children repeated the workshop during the a week for almost an hour. The students for the group were selected by the teachers based on their capabilities and necessities, for example children should be capable of use some devices such as the computer mouse, or understanding letters and numbers among others.

Some workshops used some robotic kit for challenge the students to use a robot for seeking a specific letter or number that has been previously ubicated in the classroom. On the other hand, other workshop allows students to control a robotic car using their arms, by mean a kinect camera(Figure 1).

Once, the work with children stage has finished, we proceed to collect the final survey in order to know the impact of the workshop on the students. This survey was completed by the teachers. Also, we held conversations with the parents in order to know their impressions about the project and also get to know the infants reaction to the project. These conversations focused on knowing the behavior of the children at home during the implementation of the project. In order to know the perception of the students about it.

Table I shows the scale used for measure the progress of the students before and after the application of the workshops

TABLE I: Evaluation Scale

Value	1-2	3-4	5-6	7-8	9-10
Meaning	Too low	Low	Regular	Good	Very Good

Fig. 1: Children during the workshops

III. EQUIPMENT

During the development of the workshops we use a mix of several technologies that could be listed below. These resources were used individual or in combinations depending on the objective of each workshop. One of the reason for selecting this kits is due to their toy appearance, because they are more attractive for the students' attention.

- Bioloid Premiun [2]
- Lego Mindstorms [3]
- Arduino [4]
- Kinect Sensor [8]

IV. RESULTS

The results of the project indicate that the majority of the children improve their skills in several of the progress indicators measured in the survey. Table II shows the initial and final condition as perceived by the teachers in the classroom. We could see that we reached a 23% of improvement when we compared with the initial condition of the students (see Figure 2).

V. CONCLUSIONS

The pedagogical robotics let us make the most of peculiarities of the autism children in order to create improvements in their learning skills.

The use of pedagogical robotics allow autism children improving their learning needs by the use of technological tools and equipment that let them improve the way they interact with the rest of the world.

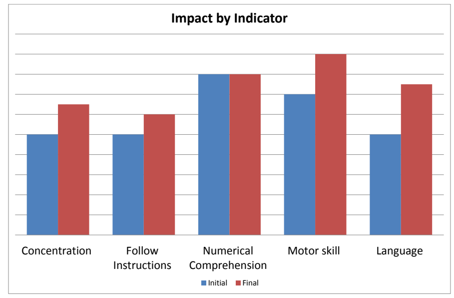

Fig. 2: Results obtained in the experiments

TABLE II: Survey Results

Indicator	**Survey**	
	Initial	**Final**
Concentration	10	13
Follow Instructions	10	12
Numerical Comprehension	16	16
Motor skill	14	18
Language	10	15
Percentage(%)	**60**	**74**
Progress Percentage (%)	**23.33**	

Every child with special needs requires a personalized care and attention. Therefore, taking into account these promising results, we plan to evaluate new research lines such as intelligent agents that have the capacity to learn and adapt to new situations.

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3D Robot Simulation Platform for Learning Programming and Physics Using Project Based Learning

Humberto Rodríguez[a] and Eduardo Villar[a]

[a] *Technological University of Panama, Department of Mechanical Engineering*

Abstract. A virtual 3D simulation environment is developed, aimed at students of pre-media and media, which facilitates the development of capabilities for the analysis and solution of science and technology problems, through computer programming and using a project based learning (PBL) methodology. The platform will involve the interaction of robots in several scenarios and the possibility of establishing challenges with different levels of complexity using available online resources.

Keywords: Educational Robotics, Robot Simulation, Project Based Learning, Coding Learning.

INTRODUCTION

Currently, computer programming is one of the most valued competences in the Industry and Academic fields and it will continue to be valued in the coming decades, given the growing development and ubiquity of information technologies. In fact, some of the most important technology companies in the world, such as Google, Microsoft and Apple are now focusing on teaching to employees and future leaders the computer programing skills that will be required [2]. The progress skill can be used in finance, engineering, economics, environmental sciences, art and many other fields, and will increasingly enter all aspects of daily life, thanks to emerging technologies, such as the internet of things (IoT), Virtual / Augmented reality, artificial

intelligence and robotics. In the last five years, developed countries have opted to modify their academic programs to make coding part of their curriculum. Such is the case of the European Union, where 16 countries, such as Austria, France, Spain, Bulgaria and Hungary, have integrated coding within their curriculum at national, regional or local level [10] in order to improve the computational thinking of their students. It is because of this recognized importance of Coding in programming languages, that we have proposed this project. Our goal is to develop a tool, easily accessible via the web, that allows the middle school students of our country to acquire these skills.

In the same way that natural languages allow to fix a person's thoughts, programming languages allow to fix our understanding of the world of computing. Therefore, if we want to understand the potential and the limitations of the future intelligent systems, we must start understanding the basic vocabulary of such systems, which has several levels of abstraction and that is constituted by the different elements of these languages. In this project, we have chosen C# and Python object oriented languages, which are popular in the academy and freely distributed.

On the other hand, there are reports in the literature of successful results that support the premise that Robotics can be used to promote the learning of concepts of physics, mathematics and programming, while students remain motivated [4, 5, 6, 7 , 10, 11]. In most cases, the costs of robotic kits range between $ 400.00 and $700.00. Hence, this project proposes the development of a 3D simulation platform that replaces the physical robotics kit, with a lower cost. In short, the proposed simulation environment incorporates different programmable dynamic systems using a Blockly graphic language and the C# and Python languages. This allows introducing more formal programming concepts, in a simple way, while having a much higher data processing capacity and a great availability of libraries with functions of all kinds.

METHODOLOGY

Before defining the details of the simulator, a bank of possible projects and challenges with robots was generated, based on bibliographic research and on our experience with the RoboCup Jr [2], in the challenges of the different student Robotics competitions that take place in other countries and in other existing platforms for learning computer programming. González in [8] asserts that students learn in a more efficient way, when they are engaged in the elaboration, by their own means, of their projects. So this project seeks that students can interact with a virtual environment, where the PBL methodology is used for learning with a playful approach, in order to motivate students. The idea is that, with the PBL learning methodology and with the appropriate tools and didactic material, they can learn not only to program computers, but also mathematics and physics, while enjoying the exercise of creativity through stimulating projects.

SIMULATION PLATFORM

To develop the 3D simulation platform, an evaluation was made of the different software interface alternatives available to perform this task, such as Swift, Java 3d, Python, Panda3D, Unity3d, among others. In accordance with the selection criteria (the possibility of simulating 3D scenarios, forces and mechanical properties), the Unity3d graphical engine was chosen for the project. Unity3d [3] is a powerful multiplatform game engine (for computers, consoles and mobile devices). In addition, it is an easy to use environment for developers.

On the other hand, for the child-simulator interaction, according to Kaplancali [9], block-based visual programming tools are the most popular way of exposing infants to coding at an early age. Kaplancali mentions that children in 10th grade who have taken Scratch courses in 9th grade, learn faster and understand better the concepts of logic, sequences and loops, than when using languages such as Java to learn. It is for this reason that it was chosen to use a visual language. After an evaluation of different libraries, such as Scratch, Blockly, Trinket, AppInventor, among others, the Blockly library was chosen because it is a free and open source library, highly customizable, which we can use with Unity using the C# language and JavaScript.

Blockly is a library that allows you to create development environments using graphical language. This library has different types of predefined blocks such as logic, loops, mathematics, texts, lists, variables and functions. In addition, the library has an interpreter to generate the code of the selected blocks. It is important to note that, it is possible to add custom blocks to the library, with which we can design the necessary blocks for the simulation, such as the sensors and actuators of the robot.

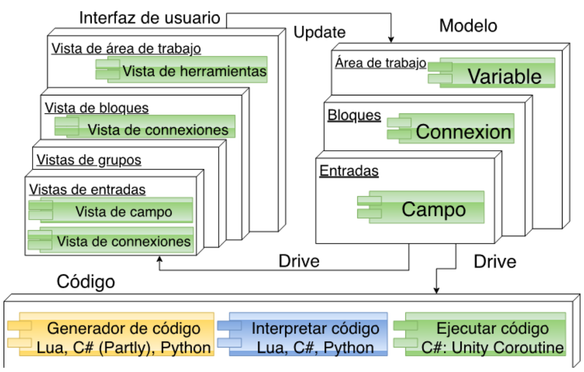

Figure 1: Framework of the platform.

The project framework (see Figure 1) has three modules: blockly model, the generator and interpreter of the code and the user interface. The model includes the workspace, the variables, the connections of the blocks and the entries of the fields. The workspace is where the blocks will be programmed. The "code" module interprets, generates or executes the code in an orderly manner, depending on the position of the blocks, starting from the top down.

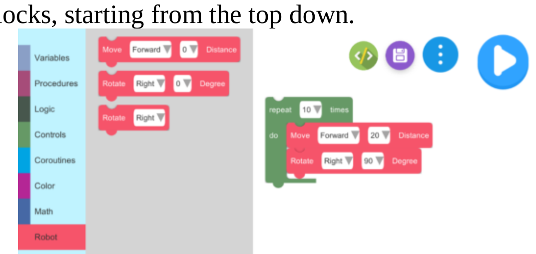

Figure 2: User Interface.

The user interface (see Figure 2) shows the different blocks, groups, input fields and the workspace. It has buttons to execute the blocks, to save, to open and to display the code in C# of the blocks. Then, when executing the code, the simulation is displayed in a second window (see Figure 3).

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Figure 3: Mobile robot in the scene.

DISCUSSION AND CONCLUSIONS

Teaching children to program gives them a useful skill for their life. With this project, it will be possible to reach out a greater number of students, since it will be online and will not require a physical robotics kit. It is expected that tutors can add and personalized challenges in the platform. Likewise, it is expected to obtain, as a result of this project, a 3D simulation platform to learn how to program (in particular to codify in C# and Python) and online didactic resources to apply the PBL methodology to challenges in the field of physics and mathematics (projects, guides and rubrics). In the last stage of this project a selection of 100 students will be made from all over the country and they will be given access to the platform to develop a project, with the purpose of evaluating the degree of acceptance and the potential of the tool.

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Robotics For Learning Mathematical Thought

Rita Quintero Endico

Fundación para la Eficiencia Intelectual

Abstract. Thanks to technology, Educational Neuropsychology explains how the human machine learns and what are the previous stages for learning mathematics, such as motor development and mathematical thinking. But this new information is not easy to transmit to all teachers, especially in third world countries. Social robots are alternative tools that can facilitate the process, showing exercises and tasks to teachers and students..

Keywords: Educational neuropsychology, human machine, learning, mathematics, social robots

THE OPTIMIZATION OF THE LEARNING OF MATHEMATICS

Thanks to technology, neurosciences such as educational neuropsychology explain learning processes in an increasingly specialized manner. To optimize the learning of mathematics it is necessary to develop elementary skills such as mathematical thinking and motor development [1].

Motor, vestibular and lateral development allow to develop other cognitive abilities necessary for learning, such as attention [2, 3], memory, reasoning, perception, language. Also, the notion of balance and space, necessary in mathematics to position and order numbers correctly, and integrate the other basic concepts: size, shape, quantity.

In addition, motor and vestibular development (in all ages, thanks to brain plasticity), allows multiple connections between the brain and the senses; especially vision and hearing, which should work optimally, as they take most of the information to the brain to be processed. For example, the coordination of vision and hearing are necessary to be able to identify the grapheme and the phoneme quickly and accurately in the reading and comprehension of the mathematical problem statement. [4].

SYSTEM DEFICIENCES AND THE GENDER GAP

To facilitate the learning of mathematics, mathematical thinking must also be developed from pre-school stages, exercising the capacities of observation, classification, comparisons, sequences, relationships [5]. However, it is difficult to get this information to education administrators and then to all teachers. The deficiencies of the systems that should be involved to optimize learning are reflected in the poor school performance and affect subsequent job performance.

Studies on the gender gap in Latin America, carried out by the Information Center for the Improvement of Learning - CIMA, of the Inter-American Development Bank, indicate that women when they enter the labor market receive salaries 40% lower than their counterparts and that very few studies science, technology, engineering, these being the professions most demands in the labor market.

They wonder if it's due to the education system. If so, it is related to a deficiency in mathematics, to their education since girls and their games, which would not include the necessary development for mathematics. This also seems to be the case in Korea. But their children recover quickly, since they enter school. Among others, they receive stimulation for mathematical thinking. [6].

According to Bers & Portsmore [7] it is very difficult to develop and implement innovative curricula in mathematics that go as far as the development of mathematical thinking. Yet, one of the main challenges would be transmitting such information to teachers.

LEARNING WITH ROBOTS

Robotics facilitates the work of the teacher [8] and student learning. The study by Rodrigalvarez [9] with robots as tools for learning, showed that children had an active, creative and intuitive response. Another study based on theories of experimental, constructivist and fun learning, conducted by Chen, Hung, Wei [10] in Taiwan, has shown that learning with robots provides fun and increases student motivation.

According to Wei, Chun, Lee & Chen, [11] and Appelman [12] manipulative exercises facilitate repetition and practice time, which provide a positive effect on learning and knowledge construction; as well as increasing the learning of more concepts [13].

AN OPEN WINDOW

The use of robotics in education represents an open window in this new era of teaching [14]. Since many good educators have limited access to technology, educational robots can connect educators and children with technology [15] and with scientific information that can help to optimize school learning.

A good interdisciplinary design could produce multidisciplinary and integrative learning [16]. The design of robots with programs to develop motor and others skills that influence mathematical thinking represents an alternative to be seriously considered for the optimization of the learning of mathematics.

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Interactive robot tree and its use as a tool in Psychodynamic therapies

H. Peña Aznar, N. Galy, A. Moncada, M. Victoria, L. González, P. Carreras

Latin University of Panama – Faculty of Engineering affiliations

Abstract. In an study concerning Psychodynamic Therapy of Emotional Expression and Social Skills we aim to determine the effectiveness of the interactive social robotic tree versus the use of an application monitor as a tool to capture the attention of children with diagnosis or suspicion of GDD (Generalized Developmental Disorder). This will be applied to 36 children between 6 to 8 years old with the previous condition, by Occupational Therapists, who will employ two distinct activities each one. Later we will distribute to three children each treatment: 1. Control Treatment with a specialist face-to-face, 2. with the application monitor and 3. with MyRoT.

Keywords: robotic tree, skills development, occupational therapy, expression and social skills

INTRODUCTION

Psychodynamic Therapy is the therapeutic technique which encompasses the work of all analytic therapies. The objective is to take the unconscious mind to be conscious, and in this way help individuals to understand their true feelings, deeply rooted in them with the goal of finding a resolution [1].

This type of therapy is useful for the integral development of boys and girls with special disabilities or not, but in order to develop their skills a cognitive process to capture their attention is required because this is the door to access relevant information allowing to select the appropriate information stimuli and to discard others [2]. The current technological revolution has greatly influenced the daily lives of human beings, such that it is imminent that therapists use technological tools in their tasks [3].

In this paper we discuss an approach to evaluate the effectiveness of a newly developed instrument for this type of therapy, comparing it to the application monitor as a tool to capture the attention of children with diagnosis or suspicion of GDD (Generalized Developmental Disorder) in Psychodynamic Therapy of Emotional Expression and Social Skills.

THE ROBOT TREE

MyRoT is an interactive social robotic tree which promises to capture the attention of boys and girls to reach objectives such that: operational memory, temporal organization, reasoning, concept formation, generation of volunteer actions, mental flexibility, emotional expression and social skills. MyRoT is 1.70 and 3.00 m of high and between 50 and 75 cm wide. Inside the trunk of the tree a touch screen tablet is employed to present a face with eyes, eye brows, and mouth with programmed expressions such as: awe, sadness, happiness, and others. Using a wireless voice sound can be emitted, giving the impression that the tree is talking.

Figure 1. Robot tree

This is an attractive tool for specialists who need to provide therapy in a remote fashion from another location, clinics, hospitals and non-governmental

Table 1. Work scheme for Psychodynamic Therapy: Emotional Expression Game.

ACTIVITY	MATERIALS		DESCRIPTION	Repetition	Duration (Minutes)	Sessions
Table of Faces	T1	Paper figures	Different emotional expressions are shown: sad, mad, happy … the boy or girl must indicate the expression that has been indicated to him/her.	3	10	10
	T2	Digital figures				
	T3	"Face" of MyRoT©.				
Express	T1	Songs.	In any of the treatments a sad and a happy son are sung. Then, the subject is asked which one of those he/she would like to listen to again.	1 of each one	15	10
	T2	Songs.				
	T3	Songs.				

Table 2. Work scheme for Psychodynamic Therapy: Game to work on Social Skills.

ACTIVITY	MATERIALS		DESCRIPTION	Repetition	Duration (Minutes)	Sessions
Story: Goliat the guardian dog	T1	Live narration	The story is narrated in a theatrical and exaggerated style. At the end questions for comprehension will be asked.	1	10	10
	T2	Narraction through monitor				
	T3	"Face" and Audio of MyRoT©.				
The telephone	T1	Specialist´s Voice	It all starts with a Word, the child must say another Word to complete the phrase, later the therapist continues in this fashion until communication breaks.	1	Depending of the child´s memory	15
	T2	Voice from the Monitor				
	T3	Audio from MyRoT©.				

organizations which work in pro of boys and girls with special disabilities. MyRoT is multiuse, with low energy consumption and made of environment friendly materials.

The robotic social tree will be handled using an App installed in a cellular from via Bluetooth using a comptroller (by the therapist, psychologists or teacher). The controller can activate different options from the menu like: gestures, didactic games or songs which help him/her to perform his/her work.

PROPOSED STUDY

To evaluate the effectiveness of MyRoT compared to the use of a monitor, as a tool to capture the attention of children with GDD, we propose the following study.

We will carry out interventions with 36 children age 6 to 8 with diagnosis or suspicion of diagnosis of GDD (previous authorization of their parents) by Occupational Therapists who will employ different activities (see figure No.1 and 2). Later we will distribute three children per treatment.; 1. Control with specialist face to face. 2. with a monitor and 3. with MyRoT.

Finally, Psychologists and Occupational Therapists, will organize and interpret the information captured by the auditory and visual system of children in each treatment. Each patient will be evaluated by individual using GDD (Generalized Development Disorder) an ENFEN Test (Neuropsychological Evaluation of Executive Functions in Children), which will be compared with one previously performed to check its evolution and the progression achieved with rehabilitation therapy.

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An Initial Approach of How Marketing can influence User Perception of Social Robots

Natalia M. Martin Almohalla[a] and Jordi Albo-Canals[b]

[a] *NTT DATA – Boston Exponential Hub, Cambridge, MA, US*
[b] *CEEO-Tufts University, Medford, MA, US*

Abstract. In this paper, we would like to demonstrate how the marketing tools could influence the user's perception of a social robot. In order to achieve this objective, we are focusing our study on marketing tools, in this case, Youtube videos of two of the most popular social robot platforms recently launched to the market, Jibo and Aibo.

Keywords: Social robots, Marketing, Perception, Social being, User, Consumer.

INTRODUCTION

Even though what is referenced in [1], the researchers should start taking in account the consumer's perception of the product, thus this factor could make their research and robot design to be modified the way in the communication is going to be done.

Social robots have a singularity compared to other high-tech products in the market; they have the attribute of a technologic product, as well as social being. However, consumers tend to perceive one interpretation stronger than the other [2]. According to [3], the context created around the product, in this case, the social robot, the environment, and the user are key factors to perceive the robot as the primary purpose of the brand.

As is said in [4], there is still working to do addressing proper marketing strategies to match user perception with product capabilities to maximize user satisfaction.

In this paper, we intend to demonstrate that if you determinedly use the current marketing tools, you could influence your final consumers in the right or in the wrong way.

Furthermore, to validate the hypothesis, we would like to focus in analyze the feedback of the users, after watching marketing campaigns of social robots in Youtube. For the analysis has taken into account the first 100 comments, that have higher evaluations in the channel where we are doing the research.

In order to successfully integrate robots into the consumer landscape, roboticists must understand consumer value perceptions of human-robot interaction(HRI).

METHODOLOGY

In the literature, we can find multiple research papers based on Youtube platform as a user's perception data provider [5].

We have a focused our analysis in two of the top social robots recently launched in the market so that we can evaluate the comments of Youtube videos from the company and influencers (See Table 1). The two social robot platforms are Jibo [6] and Aibo [7]

Table 1

	Jibo		Aibo- Sony	
	Influencer	Jibo Official Comercial	Influencer	Aibo Sony Official Comercial
Positive	26	56	26	57
Neutral	20	26	10	13
Negative	54	18	64	30

Number of opinions from the users of Youtube, divided between Jibo and Aibo-Sony robot, in the Influencer channel showing Jibo robot or Aibo-Sony; and the Official channel of the brands mentioned before.

We have gone through two different type of channels: owned by the brand of the robot and by a technical influencer with robots. Regarding Jibo, the perception of the users with the brand video was 56 positive answers, out of 100 that has been our samples. However, when we have a look at the influencer video, the users wrote 54 negative comments related to the robot and the use cases.

Regarding Aibo-Sony launched at 2017, we have faced some inconvenient to have the comments of the videos thus to the restricted communication policy that Japan has with the social media channels. Nevertheless, we have been able to compare the two different types of channel. The first type of channel, the owned by the brand, has 57 positives answers, 31 more answers than the ones written in the influencer video.

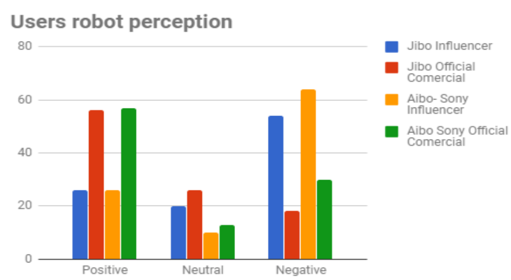

Figure 1. Chart of the robots' users perception to the commercials of the brands (Jibo, from Jibo Robot; and Aibo, from Sony Corporation), in comparison the positive, neutral and negative comments at the video.

PRELIMINARY FINDINGS

Concerning Jibo videos, we could conclude that if the brands make their online explanation, they get more users engaged than letting influencers try to engage with their target. Probably, this influencer has not been given the right instructions or either he has not allowed the brands teach them how to use the robot and which is the real role of it. This will make our hypothesis becoming true, using in a wrong way the marketing tools could be worst that make your marketing campaign.

In this case, in the Aibo-Sony video, the content is only focused on the moves and the physical aspect of the robot. In the branded video, they explain how the robot can interact with the family, which are the functionalities that the robot can do, and try to get still engaged the Aibo before users, and attract the potential new ones.

Nowadays, there is some noise with the perception of robots, in general terms. There is a lack of knowledge in social robots that make the user feel the existed gap, based on science fiction, that the promoters are not covering when they are making marketing campaigns for social robots. When it exists a lack of information about some topic, what most of the users do is to take references to something similar, with they could compare what they are getting impact [2]. The previous statement is confirmed by the results obtained in our data analysis.

CONCLUSIONS

Although an influencer has the reputation of engaging a high audience, because of the lack of knowledge about the social robotic platform, it creates an inaccurate message that turned to be a negative perception of the product. However, because the product owner knows how to present the message related to the social platform, the general perception is positive.

We can conclude that a proper marketing strategy, focusing on the reinforcement of the social being attribute of the product (role, character, etc.) will be helpful trying to approach your target, instead of letting leaders' opinion to give your users the wrong message of the social robot.

Future lines of this work should cover more commercial social robotic platforms, as well as more social media channels (marketing tools). As well, we should consider the review of users that have already purchased the product and view the brand/influencer videos as the guidelines of the product (social robot).

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Reflecting upon the use of AI and robot technologies for therapy

Eduard Fosch-Villaronga[a]

[a] *Microsoft Cloud Computing Research Centre and Centre for Commercial Law Studies, Queen Mary University of London, United Kingdom (e.foschvillaronga@qmul.ac.uk).*

Abstract. This article reflects upon the growing use of artificial intelligent (AI) and robot technologies for therapeutic purposes. Although recent studies support the adoption of robotic technologies for therapy and education, other research in different fields suggest that technology has a profound and alerting impact on us and on our human nature. This article brings these findings into the debate on whether the adoption of therapeutic AI and robot technologies is adequate, not only to raise awareness of the possible impacts of this technology, but also in order to help steer the development and use of AI and robot technologies in therapeutic settings in the appropriate direction.

Keywords: Social Robots, Therapy, Ethics, Psychological Aspects, Screens, Pan-centered Approach.

INTRODUCTION

The insertion of robotic and artificial intelligent (AI) systems for therapeutic purposes is accelerating. The latest findings show that robots are a good therapeutic tool for children with some cognitive disorder because they can adapt to the children's needs thanks to their modularity, and they can tackle the core aspects of the disorder [1]. Although these results are qualitatively rich, there are not many quantitative studies [2]. Moreover, the results tend to be presented under the positive bias.

This article reflects upon the suitability of AI and robot technologies for therapeutic purposes. The main goal of the article is to promote a constructive discussion among experts to consider whether these technologies are designed and implemented so that they truly help the users.

REFLECTIONS

The following subsections show results from different fields of research. Although apparently dissonant to human-robot interaction studies (HRI), these findings may be relevant when given a careful glance.

Technology has long-term consequences

An overexposure to screens has, among others, two worrying consequences. First, it activates a system of rewards in the brain that releases dopamine, which leads to a pathological addiction involving irritability, anger, aggressivity and violence called 'digital heroin' [3]. Second, the frontal cortex is altered and shrinks if we face screens excessively, something typically related with disorders such as the autistic spectrum disorder (ASD) or bipolarity [4-5]. These findings could suggest that the solution that therapeutic robots claim to propose could be at the same time the cause of the problem [6].

Procrustean design may challenge personalized care

Just like when we buy a t-shirt and we adapt to its size and not the other way around, humans have to adapt to robots. The physical embodiment, the access to certain cloud services and the technology applied to the robot limit robot behavior. Consequently, the interaction with the human is conditioned. The procrustean design refers to the constraints that the standardization of HRIs may imply if individual differences are disregarded. This gains importance in sensitive applications such as the use of emotions in HRI [7]. This is likely to clash with the personalization of care if it is not appropriately addressed.

STEM separates us from being humans

Branches of study such as engineering have almost lost all connection with human spoken language. Harari explains that the mathematical language is not natural, that humans never communicated in binary code, not even in 0-9 numbers; and that if we are teaching humans to communicate in this new language, it is because machines do not understand how we talk, feel and dream [8]. Although coding literacy may be important for STEM curricula and may provide students employability in the future [9], this may entail a greater disconnection from what constitutes to be human in the long term, as the more time we spend with technology, the less time we spend in the real world [6].

User-centeredness may disregard larger implications

Children under the ASD have deficits in social communication, social interaction, social-emotional reciprocity, and difficulties in developing, maintaining and understanding relationships [10]. Accordingly, ASD robotic therapeutic interventions have focused on social and cooperative skills training [11].

However, it remains in question it remains in question 1) why these therapies are not equally spread among young and adult population;[1] 2) who decided that autistic children needed to be forcibly trained in social and cooperative skills; and 3) why society is not learning how to understand, respect, integrate autistic children in the same way these learning how to adapt to neuro-typically developed people.

ENCOURAGEMENT

The following subsections aim at providing some recommendations to steer the development and use of AI and robot technologies in therapy in the appropriate direction.

Technology as a means, not as an end

If technology is conceived as a means either of communication or information not an end on itself, then it serves as a bridge between humans. On the contrary, technology as an end on itself could entail isolation contexts. Robots as social mediators in therapies are a good start to mitigate this [11]. In addition, it goes without saying that if there are available research suggesting that the screens cause addiction problems and health-related problems, perhaps the embodiment of the robot should be screenless.

Pan-centered approach

While user-centered approaches can improve personalized care, these need not to disregard the milieu where the user will be contextualized. This may entail that a parallel effort from society should have to be carried out in order to understand, accept and integrate therapeutic children as they are.

Physical & psychological comprehensive approach

Although the robot is physically speaking ‘safe,’ this does not mean all HRIs are equally safe. If robots interact with users socially, cognitive safeguards and protocols to avoid cognitive and psychological risks should be put in place [12-13]. This is crucial for therapeutic contexts.

Organic mindset

There are places proud to not have internet connection. Similarly, traditional technology-free therapies may be revisited and offered as an alternative to the growing adoption of robot and AI technologies in therapy. This could be a way to give the right to choose to users, and keep the human in the loop. Cumulatively, time constraints could be applied for the user not to become attached to the robot or suffer related consequences.

CONCLUSIONS

The insertion of an AI robot or technology in a therapeutic environment is not simple. Advances in related research suggest that it should be considered before adopting new technologies in therapeutic environments as this could have long-term negative consequences for the user. An inclusive quantitative analysis is needed to understand better the compounding risks and decide if this is what we want for society.

[1] “It's never too late to be diagnosed with ASD, although it's not always easy because some local NHS authorities don't provide NHS funding for diagnosing ASD in adults,” extracted from https://www.nhs.uk/conditions/autism/adults/

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Orthotic Therapeutic System, Adapting Cerebrovascular Accidents Patients within Typical Surroundings: State Of the Art And Empirical Research

Donna Angela Roper[a], Raúl Rodríguez [b], Gustavo Adolfo Díaz[a], Viviana Justin[a]

[a]*Universidad de Panamá*, [b]*Columbus University*

Abstract: 21st a century of great revolution, not only of knowledge and technology, but also of health and readiness. The brain, one of our most valued organs, is in great danger and is affecting the human productivity. Thus ICT lends a range of opportunities, to help relearn, rehabilitate and reconnect humans to his social environment.

Keywords: Rehabilitation, CVA, cerebrovascular accidents, stroke, therapeutic resource, neuroplasticity, training, ICT, Social Connection.

WHAT IS KNOWN

There are different factors that can cause a physical and motor disability in human beings, factors such as: infectious, viral, rheumatic, neurological, muscular and those that are related to a trauma. So, regardless of the disease, the disability can be classified by the lack of movement that can be accomplished by a person and the number of affected parts of the body (hemiplegic, paraplegic, monoplegic, quadriplegic), all of these which can be treated through electronic, mechatronic or robotic rehabilitation methods, that can assist a physiotherapist intervention [1].

Cerebrovascular Accidents

We are going to concentrate on one of those diseases that affect human free mobility, Cerebrovascular accidents (CVA), which is one of the main causes of mortality and disability in Latin America [2]; in Panama it is the fourth cause of death [3] [4]. Our focus on CVA, is because they lead to partial lack of movement capacity and a loss of sensitivity in upper limbs. As public health nationwide strategy, one the goals of inclusion and rehabilitation programs is that people with these conditions should work to become productive, self-sufficient and communicated with his social environment [5]. It is common to hear of depression in CVA patients, but, what cause this? The absence of interaction with other people, losing control of their whereabouts and could eventually provokes death [6]

Objectives

The main object of this paper is to present the state of the art of a practical research which aims to develop a system that complements the interaction between a therapist and a patient diagnose with CVA.

ICT and Robotic Devices

There are several therapeutic resources used on patients, focused on the different pathologies related with CVA and that affects upper or lower limbs. The use of these resources as part of a therapy that's controlled by the intensity and specific rutines, needs a multidisciplinary approach to guarantee the stimulation of a patient's neuroplasticity [7]. There are those mentioned in [8] [9] with Gloreha, where you can improve functionality in stroke patients in upper limbs; also there is the Amadeo Finger Hand Rehabilitation [10] with a therapeutic system that enhances the response in upper limbs. On the other hand, there is Honda walking assist and Tibion Bionic leg [11] both are robotic orthotics device, used on lower limbs. Then we have the Erigo [12] that's a robotic device that promotes mobilization through electrical stimulations of lower limbs' paralysis, in early stages. The trend in using robotic movements mechanism, allows intensive mobilization training in the early phases of rehabilitation. It also reduces dependence of a practitioner been during all the sessions.

On the verge of experimenting on a more accessible device, we also propose an ergonomic prototype named "Interglove biometric system". *Inte* from real integration glove, and base on [13], to improve the quality of life of CVA patients.

Methods and Materials

The study was carried out in two basic stages: the bibliographic review and the experimentation, based on the methodology in [14] [7]. The second stage included the design-confection of the prototype, simulation-tests and data analysis. The "Interglove", made of natural materials, was designed and laced with an Arduino, sensors of proximity, flexibility and strength, intended to distinguish the features of certain environment (temperature and distance). The main idea was to integrate these materials to calibrate a subject response to according to a physical condition. The selection of 15 subjects ages ranging between 18 to 25 years, whom freely accepted being part of the study, four repetition of proximity tests and the four, of flexibility tests. A scenario was simulated where these subjects (with no physical disability) were prepared with similar conditions of a CVA patient. The data recollected for calibration purposes, helped us establish the first values to integrate the system to a robotic orthotic device that will be used for future researches on actual patients.

Expected Results

The values obtained of the proximity, temperature and flexibility test should reflect, with every trial, a normalization in the expected values that means that at more repetitions we can get more stable values from the subjects. Also, it's expected that according to the gender, differentiated values should be reflected in final data. On the other hand, having closeness with the environment improves their social interaction that can reduce the possibility of death outcome.

Conclusions

There a wide range of devices, systems and procedures, some using mechanic, electromechanic, robotic, mechatronic and electronic methods, for disability of upper and lower limb in patients with stroke symptoms or cerebrovascular accidents. Each pathology needs to have, in first place, a training process that helps calibrate the device, mechanism or resource to each patient condition. After this process, the next stage is learning or re-educating the brain to adapt in a different way, to its surroundings which provokes healthier social interaction with others. The effectiveness of a therapy, which adds up a process, a resource, and different professionals, depends on factors like: repetition, intensity, frequency and the state of mind that causes not only the adaptation but also de adoption for an improved quality of life. And last, but not least there is an economic component that's associated to each therapy and, promoting new solutions with the same or better effect, is subject of future studies.

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An experience of activities with educational robots in the rehabilitation therapy of patients with reduced mobility.

Dr. Josep Medina, Raquel Bautista (Guttmann),

Carlos Garcia, David Coll, Jordi Collado (Garbí Pere Vergés)

Abstract. One of the concerns of therapists in the rehabilitation of patients with reduced mobility is the involvement in the treatment of Neurorehabilitation which is a series of repetitive and long-term activities, and often meaningless for the patient. The introduction of activities with elements that are new or attractive, such as educational robots, increases the interest and can improve the performance of some of the exercises.

Keywords: robots, rehabilitación, neurorehabilitation

ROBOTICS PROJECT GUTTMANN – GARBÍ PERE VERGÉS

During the school year 2016-17 a group of volunteers from the Escola Garbí Pere Vergés of Badalona contacted which is responsible for the Guttmann Hospital in Badalona specialized in neurorehabilitation in order to start a joint project in which students of the School would participate in some rehabilitation sessions by providing some of the educational robots used in technology class. At school the robots have been part of the educational project since the school year 2011-12, and they are the work axis of the subject of technology among students aged 12 to 16 years (1st to 4th of compulsory secondary education) and later in optional subjects and Research Projects at 17 years (pre-university studies).

The Institut Guttmann is a specialized hospital in the medical and surgical treatment and comprehensive rehabilitation of people with spinal cord injury, acquired brain injury or other neurological disabilities. Its main objective is to provide specialized, comprehensive, continuous and personalized care, incorporating the highest levels of science, technology and compassion. The Institut Guttmann's Children and Youth Rehabilitation Unit attends patients aged 0 to 16 years old with functional sequelae, being physical, cognitive and behavioral or neurological, resulting from diseases or neurological injuries, whether congenital or acquired, such as infantile cerebral palsy, neurodegenerative diseases, epilepsy, muscle-skeletal disorders, spinal cord, myelomeningocele, rare diseases, brain injury caused by vascular accident, traumatism, tumor, or after surgical ...

In the first meetings between the management teams of the school and the hospital, Jordi Collado, Director of the school, and David Coll, facilitator of volunteering, agreed with Dr. Josep Medina, head of the Functional Rehabilitation Unit, the lines of action with the aim of designing a set of exercises to improve the mobility of the upper extremities, and stimulating the cognitive functions, and therefore these action could raise the interest of the younger ones, enhancing the work between equals using educational robots.

Table 1. Robots and objectives of the activities and games.

Robot	Mototritity	Cognition
Blue-Beebot: Circuits and missions	1	5
Albert: Programming with cards.	1	5
MakeBlokt: Driving with drawing /Joystick	3	3
Sphero: Driving with Gyroscope.	1	5
Lego Midstorm EV3:		
Click & Go, Robotic wheelchair	5	1
Joystick driving games.	3	3
Lego We Do 2: Sensory missions.	3	3
Parrot Jumping: Circuits and missions.	1	5
Drones Parrot y AirBlock: Circuits and missions.	3	5

(Level of incidence in Objective 1 to 5)

Figure 2. Explanatory cards para HP-Sprout, MakeBlock, Sphero, Jumping Parrot y AirBlock.

Design of Activities

Once the proposal was received, a group of students from the school led by the technology teacher Carlos Garcia, started to design the activities with all the available robots to achieve the goals: to boost both the manual motricity and the activity cognitive related to action-reaction and prediction of results.

To facilitate the work of patients and volunteers, some explanatory cards were prepared detailing the steps and objectives of each activity.

Figure 2. Explanatory cards for Lego Mindstorm, Blue BeeBot and Albert

1st Day of Robotics 2017

The first big day of Robotics was held during the month of May of 2017 and approximately 150 students of the school participated divided in four shifts of morning and afternoon. Throughout the day all the activities were tested with groups of patients of all ages, and the possible improvements and changes in some of them were noted.

Figure 3. Photos of the robotics day 18-5-2017

At the end of the day the teams of Guttmann and Garbí Pere Vergés met to analyze the session and to implement the necessary changes in the activities for the planned rehabilitation objectives. In December the session was repeated with thirty volunteers focused on the group of children and young people of the afternoon sessions and reducing the activities to the one that had been considered the most appropriate.

During the first semester of 2018 a small group of Students volunteers and patients continued the project in two-hour afternoon sessions, planning activities under the supervision of the therapist responsible for each patient. All the patients are in Rehabilitation process, and follow a program of therapeutical based on physiotherapy, occupational therapy and neuropsychology.

Figure 4. Photos of some weekly sessions.

Conclusions

The final assessment of these activities has been very positive, and although no conclusions can be extrapolated, the medical and technical rehabilitation team observed a positive change in the attitude of the young patients towards the proposed exercises. On the other hand, the young volunteers said they felt satisfied with the activities carried out and more sensitized to personal and social problems derived from this type of injuries.

Now we are working on the design of new activities and new robots for the school year 2018-19.

Thanks

We thank all the students who have participated in the workshops especially to: Ernest Gassó, Alfredo did Alexander, Claudia Torres, María Mercadé, Carmen Aznar, Joan Garcia, and Martina Márquez.

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Evaluation of the use of a Pleo robot at a child consultation clinic

Reensina Eind and Marcel Heerink

Windesheim Univiersity, Robotics research group, Almere, The Netherlands

Abstract. This paper describes an explorative study to evaluate the use of a Pleo baby dinosaur robot with two todlers in the waiting room of a child consultation clinic in The Netherlands. Research was done by observations of both caregiver and children. Findings indicate that application of Pleo is very useful in this specific environment to decrease anxiety and to facilitate treatment. However, anticipation of the caregiver on Pleo’s behavior and the child’s response to it is essential.

Keywords: Social robots, anxiety treatment, children

INTRODUCTION

A consultation clinic visit may not be a potentially traumatic experience as a hospital treatment, it still has a more or less similar setting and can be associated with pain, stress and anxiety. Recently some research has been done, on the possibilities of play in general and robots specifically to decrease the severity of these feelings [1, 2]. Also robot Pleo (see Figure 1) has been used in these projects. Pleo is a commercially available robot in the shape of a baby dinosaur, that develops its behavior and increasingly does so if it receives petting and nurturing in the form of plastic food (mainly leaves). The assumption is that distraction, increased by the feeling of care, is the main cause of this decrease[3-5]. This assumption derives from the notion that the design of pet like robots is mostly inspired by real animals who are known to often have a stress reducing effect on people. The fact that animals are mostly not allowed in clinical settings for hygienic reasons, leads researchers and health professionals to explore the effects of a robot with animal like qualities that could meet the hygienic standards.

Figure 1. Pleo

Results of the above mentioned studies show positive indications, but of course we have to be critical before generalizing and much research still has to be done, but results indicate that these robots may have a potentially beneficial effects in a health care environment. Based on these outcomes it is assumed that social robots can lead to a decrease of stress and anxiety and possibly of pain in a way that is similar to play materials and animals in a health care related environment.

The study described in this paper addresses this assumed effect on children visiting in a Dutch consultation clinic for vaccination. The study includes both observations and interviews, but in this paper only the observations are described in detail.

SETTING

During the toddler consultations with vaccinations at the clinic, the child is usually personally prepared by a assistant or the parent for the vaccination. After this, the youth assistant prepares the actual vaccination and gives the vaccinations, sometimes with a countdown.

In this study a Pleo wearing patches was introduced to the child with the phrase ‘Look at this is Pleo, he lives here at the clinic’ by the assistant, while a student researcher was observing. Subsequently the child was taken to other parts of ‘Pleo’s house’ an Pleo was also included in weighing and measuring.

The assistant subsequently gave an explanation of vaccination procedures, explaining that Pleo helps all children here and gives them a good feeling. Questions like ‘What do you like best?’ (open question) or ‘Do you like X too?’ (closed question) were used to associate with positive feelings and empathize with the child's perception: ‘Do you enjoy eating ice cream / swimming? You will also enjoy playing with Pleo’.

Pleo could also receive a sample test, viewed by the child and the child (or parent) was free to choose whether to hold Pleo or to leave him on the table.

The observant focused on (1) the reaction of the child when seeing Pleo for the first time, (2) behavior and utterances of the child, (3) the dynamics of the environment (e.g. other parents / children, toys, sounds), (4) interaction during consultation and vaccination between (a) child and Pleo, (b) assistant and Pleo and (c) parent(s) and Pleo

OBSERVATIONS

Child 1 (girl, 3 years, 9 months)

Environment: Waiting room. Present are just the girl, her father, the assistant and the observer. There is a play kitchen, a chest with toys, a cupboard with booklets and several tables with changing cushions.
Reaction to Pleo: Walks to the father while looking at Pleo.
Behaviors: The girl is told that Pleo is the doctor's pet and that he is now asleep and very sweet. When asked if she wanted to pet Pleo, she walked to Pleo and the observer to quickly pet Pleo and subsequently resumed playing in the play kitchen.

When told that she would receive injections later, the girl has tears in her eyes, crawls against her father and says she doesn't want that. She is told Pleo also had injections: 'You see? That's why he has patches. Pleo wants to help all children here with the injections because he makes them very happy and they can give each other kisses and hugs'. The girl says yes and pets Pleo intensively. When she wants to give him food, Pleo does not want to eat. It is suggested to her that she perhaps has to cook it for him. She goes to the kitchen with Pleo, puts leaves it in a pan and says 'just cook', brings the food to Pleo and says 'Here you go, Pleo' after which Pleo accepts.

During consultation: The girl pets Pleo. Pleo moves with his head. The specialized nurse says 'I think Pleo wanted to give you a kiss'. The girl nods.

The nurse explains the eye test, gives the girl a stick associated with it. The girl touches Pleo's leg with the stick and just at that moment he raises his leg. The nurse says: 'He wants to give you a high five'. The girl tries several times with the stick to get his leg up again. It does not work. She no longer listens to the nurse, who decides to stop this eye test and try another one. During this test, exactly at the moment the girl named a picture accurately, Pleo made a sound. The nurse says 'Pleo says you're doing well'. Later in the consultation Pleo turns his head to the girl when she is scared. The nurse says: 'Oh, he gave you a kiss'. The girl says: yes, we are going to cuddle nicely together.'

The nurse says: 'Pleo has also received a shot on his back and head. And you also get a shot in your arm'. When the girl says she does not want this, the nurse says 'Pleo also does not want a shot, but sometimes it needs a moment'. The girl cries a few seconds after the injection and gave Pleo a high five, stays with her father for a moment and then says: 'Now I will play again'.

Child 2 (boy, 3 years, 9 months)

Environment: The consulting room. Present are just the boy, his mother, the nurse and the observer.

Reaction to Pleo: Immediately says 'hello' to Pleo, and asks: 'But how is he going to walk?'. He looks at Pleo, strokes him, laughs at him, tries to give him food, but Pleo does not open his mouth to eat.

He starts building with cubes. The nurse says laughing: 'you have almost constructed Pleo'. He looks at Pleo and asks: 'how does his mouth open?' Nobody responds.

While playing with the blocks, the child says: 'he (Pleo) is tired'. He looks at Pleo and says 'open your mouth'. Just at that moment Pleo roars. He gives Pleo a piece of plastic food.The nurse says to the boy: I just want to listen to your heart, do you think that Pleo also has a heart?' 'YES!' the boy calls out. The nurse allows the child to listen to Pleo's heart, he says: 'I hear something'. The nurse then listens to the boy's heart. He asks: 'may I?' She gives the boy the stethoscope and he listens to his own heart.

When the boy says: 'I also must blood', she asks if he means he needs to have an injection. He says yes. 'Pleo also had injections' told the nurse and she asks: 'What do you like to do?'. The boy says 'ride my bycicle veeeery fast.'. 'Oh', she says, 'Pleo also likes to watch people cycling. Mother and child watch Pleo and laugh. The boy says: 'we do not count to 5'. Mother tells that they had agreed upon this at home. The nurse explains that she is going to count to 5 and that it is already done before the 5. The boy says 'yes, but I do not get any pain and I do not cry'. The nurse then says: 'Okay, but when Pleo got a a shot he shouted *auch!* and then it was done. 'Yes', the boy says. I think Pleo is hungry', and he tries to give Pleo food. He observes the injection and shouts 'auch' after which the nurse says 'Finished, like Pleo, you said that very loudly. The boy laughs and says it did not hurt. Mother looks at him and says 'I am proud of you.'and later 'Pleo also thinks it's cool. The child says: I want to give Pleo a high five. He gives Pleo a high five and laughs.

CONCLUSION

The sessions concerning the two children illustrate the possibility to help a child feel more relaxed, and . However, it also shows that children respond differently and that it demands a nurse's flexibility, creativity and improvisation skills to function properly. The session with the girl who did not listen to the caregiver during the eyetest anymore, demonstrates the downside of being distracted.

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Robotics based therapy with Chilean children with autism spectrum disorder (ASD)

Madariaga, L.[1], Yanez, C.[2], López, C.[2] , Troncoso, M. [2], Lagos, P. [2] and Dorochesi, M.[1]

(1) *Design Engineering Department, Universidad Técnica Federico Santa María, Valparaíso, Chile*
(2) *Child Neuropsychiatry Service, San Borja Arriarán Hospital, Santiago, Chile*

Abstract
The use of robotic technology with therapeutic focus has been proven to be effective for improving social skills in children with ASD. However, no data exists for the Chilean context. A study with two phases was conducted in a large public hospital in Santiago in order to determine if robotics-based therapy improves social and visuomotor skills in a group of children with ASD. Phase 1 used a case-control method (n=4) and phase 2 was a prospective longitudinal study (n=10). Phase 1 displayed significantly higher levels of attendance of a robotic-based workshop (compared to social skills workshop). In phase 2, SCOPE interview to children's teachers showed that the children improved in volition, communication and processing dimensions of the survey. Robotic therapy motivates autistic children and seems to improve their social skills

Keywords: Autism spectrum disorder, robotic-based therapy, social interaction, therapy

INTRODUCTION

Technology appeals to ASD children [1]. The use of this interest to help them improve socialization skills has received increasing research attention in the last decades [2,3]. Furthermore, special concern of ASD children for LEGO toys has been observed, which is theorized to be because they are highly structured and systematic [4]. Studies have shown their usefulness when applied in the appropriate therapeutic context [5,6]: they can decrease disruptive behaviors and improve social skills in ASD children, in a spontaneous and entertaining way, being less exhausting for patients and therapists [7,8]. Additionally, the use of robotic artifacts has been established to be appealing due to their predictable and repetitive behavior [2]. However, up to date no data or results have been reported in the Chilean therapeutic or educational context.

METHOD

The study was approved by the Central Metropolitan Health Service Ethical Committee. Participants were recruited in the Child Neuropsychiatry Service of San Borja Arriarán Hospital in Santiago, Chile. Due to the nature of this research on a special population, the number of participants was limited. Parents signed informed consent and children signed informed assent. This study was divided in two phases: Phase 1: Determine whether robotics-based therapy improves social skills in an initial group of children with ASD. Phase 2: Determine if whether robotics-based therapy improves social and visuomotor skills in a larger group of children with ASD

Phase 1: Initial group

Cases and controls, prospective longitudinal study. 3 groups of 4 children with ASD diagnosis, confirmed with Autism Diagnostic Observation Schedule (ADOS); age higher than 9 years, normal intellectual coefficient with WISC (Wechsler intelligence scale for children). A group participated in workshops of LEGO Robotics (LEGOr-w), the second in workshops of social skills (SS-w) and the last one was not intervened. Both workshops lasted 10 sessions and were performed once every two weeks. Measured results: Vineland scale, satisfaction surveys to parents and children, video-coding and attendance of workshops.

Phase 2: Larger group

Prospective longitudinal study. 10 children with ASD, confirmed with ADOS (Scale Observation for Autism Diagnosis); age 9-13 years, normal / borderline Intelligence quotient (IQ) with WISC (Wechsler Intelligence Scale for Children). They participated in 8 robotic sessions. Initial interview to parent was performed to determine baseline children state. Measured results: attendance, SCOPE interview to professors (initial / final), Gilliam autism scale (GARS) (initial / final), visual-motor integration scale (VMI) (initial / final).

RESULTS

Phase 1: 4/4 men, average age: 11 years. Comparable groups. Vineland: significant differences in categories: socialization ($p=0.002$) and communication ($p=0.039$) comparing initial and final average scores of the 3 groups. No differences between groups ($p>0.05$, confidence level of 95%). Video coding: children that joined LEGOr-w improved the following behaviors: initiation of meaningful conversation, autonomy in the resolution of problems; less disruption to other, less echolalia, fewer episodes of discouragement or abandonment of activity. However, these changes did not have statistical significance. Surveys: statistically non-significant difference between scores of satisfaction surveys comparing initial and final assessments of parents and children in both workshops. Workshop attendance (Figure 1): statistically significant difference in the attendance between the LEGOr-w and the SS-w (p=0.009), being the LEGO robotics group the one with better participation.

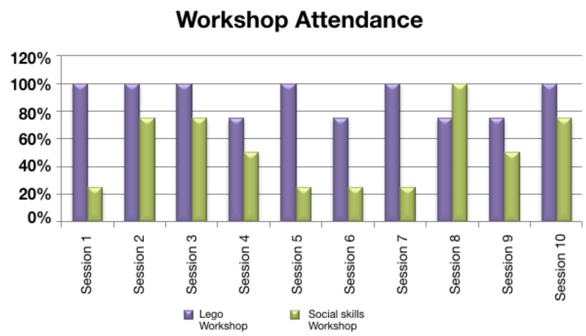

Figure 1. Workshop attendance

Phase 2: 10/10 men, average age: 11 years. Mild to severe autism with ADOS. 8/10 use drugs (6 methylphenidate, 4 antipsychotics). Daily life activities (DLA): 4/10 remarkable help, 3/10 little help, 3/10 no need. 5/10 previous occupational / behavioral therapy. Assistance to workshops: 10/10 greater / equal to 50% of workshops. Comparison of initial and final surveys:

- SCOPE (Figure 2): Obtained in 5/10: statistically significant improvement in volition (p=0.015), communication (p=0.016), processing (p=0.03) and total score (p=0.003)
- GARS: slight numerical tendency to improve social interaction and emotional responses, without statistical significance (p=0.343).
- VMI: 2/10 VMI improvement, 2/10 visual improvement, 4/10 motor improvement; although without statistical significance.

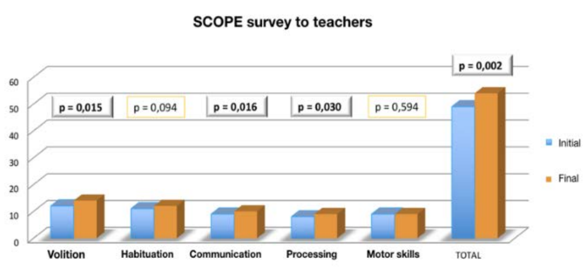

Figure 2: SCOPE survey results

CONCLUSIONS

Phase 1: Better adherence to LEGOr-w, no differences in Vineland between groups, while the three improved. Novel intervention oriented towards users of Chilean public health system with restricted access to technology and limited offer of therapeutic interventions. Therapy aimed towards an age group where indifference attitudes have negative impact on interventions, contrary to the observations of this study sample.

Phase 2: significant behavioral improvement is reported by teachers, demonstrating a positive effect of this intervention beyond the therapy sessions, impacting children's daily life and school insertion. Good perception, adherence and motivation of patients, parents and therapeutic team. Difficulty to expand n patients due to the cost of technology. Importance of multidisciplinary team participation, combining areas of medicine and engineering.

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Towards an Engaging Coaching Framework

Raquel Ros

La Salle-Ramon Llull University
Department of Engineering
Barcelona, Spain

Abstract. This extended abstract introduces few ideas on what coaching systems should cover in order to engage users that are either acquiring or reinforcing knowledge, habits or skills with the support of a social robot. It is based on previous works carried out within the FP7 ALIZ-E project where children between 9 and 11-years-old interact with a robot to improve their knowledge and habits with regards to healthy life-styles.

Keywords: coaching, social robots, engagement.

INTRODUCTION

Coaching is defined as "the act of giving special classes to one person or a small group"1. In general, coaching involves a *coach*, the one in charge of training a skill or set of skills, and a *coachee(s)*, the one(s) learning the skill(s). Typically the skills to be acquired are related to some sport or to acquire knowledge at school or working environments.

The introduction of social robots in training settings in the past years has expanded the application of coaching to other areas as well, such as home and hospitals, to help train different sorts of population, ranging from children to elderly, and in a greater variety of skills, such as social [2], motor [1] and language [5], among others.

Moreover, engagement and motivational support explicitly appear as core aspects that an interactive system should include to ensure the success of the training. While for human coaches motivational abilities are given for granted, is not the case for robots, where we are still far from building fully social robots capable of sustaining engagement through time.

COACHING SYSTEMS REQUIREMENTS

When it comes to coaching, whatever the area where the coaching system will be focused on, at least two main streams should be considered while designing the coaching system:

- the activity
- the motivational support

Both streams must be designed to work together in order maximize the knowledge gain and/or retention of the skill and to do so through an engaging environment across time. Focusing on one or the other would fail in achieving the overall goal. In other words, carefully designing the task, but forgetting about the motivational aspect, will lead to activity withdrawal, i.e. the user will not feel motivated to continue the training.

On the other hand, achieving engaging interactions, but lacking content, will lead to failing in the acquisition of the skill, where the robot would become an entertaining activity, which eventually would be withdrawn nevertheless.

The activity

The activity comprises three aspects that must be clearly defined: the task, the methodology and the evaluation.

The task should describe the goal of the session. For instance, to support exercises in physiotherapy, to acquire knowledge on maths or to reinforce turntaking in social activities.

The methodology should describe how the training will be provided and it depends at least, on the task at hand (e.g. motor skills vs cognitive skills), the type of user (children vs adults vs elderly) and the available time (number and duration of sessions) among others.

An example of different methodologies applied in coaching sessions can be seen in previous work we did within the ALIZ-E project [3]. The goal was to support healthy habits acquisition through body movement (creative dance). To this end, the activity used three methods: sequence learning, concept learning and relational learning. The approaches were inspired by observational sessions where a professional dance teacher worked with children at schools to reinforce subjects learnt at class through body movement. Each method was applied at different stages in the session according to the goals each stage had.

Finally, along with the task and the methodology, metrics on how to evaluate the evolution of the sessions should be clearly defined. While the metrics will provide feedback on the effectiveness of the activity, these will also be useful for the coaching system to monitor the session as it is delivered in order to adapt or change methodologies on the fly to maximize success.

The motivational support

This stream should cover the design of the robot behaviour that, on the one hand will allow smooth and interactions with humans, and on the other hand, will introduce motivational mechanisms to engage the user through time.

In [4], continuing our work on a coaching system for healthy habits acquisition on children, we discovered that children were keen on taking the lead from time to time in the sessions. Hence, they not only expected to receive input from the robot, i.e. having the robot as the leader and following its instructions, but they also wanted to be part of the sessions as proactive agents, proposing the robot what to do next. We therefore introduced role-switching, an intrinsic motivational mechanism, where the child was able to ask the robot to do certain movements while at the same s/he reinforced her/his learning evaluating the robot's performance. This motivational mechanism worked very well in the experiments we performed, and we could clearly see an increase of engagement when the child felt that s/he was in charge of the session.

Few other aspects that should be considered to allow motivational interactions are:

- Personalization: each user is different, hence, will learn and develop in different ways. A coaching system should tailor each session to the user as much as possible.
- Enhanced social interaction: the robot should behave in a way that the user feels comfortable with, where clear communication is provided, either through verbal or non-verbal communication, without ambiguity nor misunderstandings. Natural interaction cues such as head movements, following gaze, etc. are expected.
- Positive feedback : always praise the efforts of the user as they occur, and when corrections have to be given, always use positive statements.
- Use of additional resources such as music, images, objects, etc. that complement the content of the training. These resources usually help the user either to achieve a better comprehension of the content or to change their emotional state and hence, their attitudes towards learning.

OPEN ISSUES

Many questions on what is the best approach towards engaging and efficient coaching systems are open yet and need further exploration. Few questions that easily come into mind from the current thoughts presented in this abstract are:

- What other factors determine the methodology to be used?
- How frequently should the robot provide feedback?
- When shall the system push the user to continue an exercise or decide to stop?
- How shall the task be defined so that adaptation can be done automatically?
- To what extent human intervention should be used?
- What information should be gathered from the user to allow personalization?

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