

LEARNING COMMUNICATION WITH AUTISTIC PEOPLE WITH A MOBILE SERIOUS ROLE-PLAYING GAME

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ABSTRACT

While serious role-play games have been developed for individuals with autism spectrum disorders to learn social interactions and emotions, there is a lack of role-playing games that teach people without autism the necessary communication skills to engage and interact effectively with autistic people. In this research, we present a mobile serious role-playing game as a comprehensive expert-guided experiential and cognitive learning tool, consisting of instruction, play, review, and discussion, that helps achieve enhanced learning outcomes while enabling an independent-learning workflow. By making it available for both iOS and Android devices, it has the potential to help spread the awareness of autism and help create a more inclusive environment for autistic people at schools, universities, and communities.

KEYWORDS

Mobile Learning, Experiential Learning, Role Play, Serious Games, Autism Spectrum Disorder, Virtual Reality

1. INTRODUCTION

More than 200,000 students with autism spectrum disorders (ASD) will arrive on campuses around the United States over the next decade (Borrell, 2018; Pinder-Amaker, 2014)). However, periods of transition are particularly difficult for high school students with ASD entering a postsecondary setting (Wei, et al, 2013). Providing appropriate support to these students is essential to assisting students to achieve a higher quality of life, increased productivity, positive social interactions inside and outside of the classroom, and decreased reliance on subsequent or perpetual disability services post-graduation (Geller, et al, 2009; Goldstein, et al, 2008). Programs such as The RASE initiative (Rando, et al, 2016) provide transition coaching services that team a coach with a student with an autism diagnosis to assist the adjustment period from high school to college. The transition coaches are experienced juniors, seniors, or graduate students without an autism diagnosis; and, if being properly trained and sufficiently prepared, they can effectively help students with ASD in key competency areas: time management and organization, resiliency, advocacy, social skill development and study skills/technology use (Rando, et al, 2016).

However, training student coaches and other care providers to engage with clients with ASD is challenging. For example, the coaches have been socialized throughout their lives to be especially polite and verbose when dealing with a topic that is difficult to discuss (for example – hygiene concerns or feedback on a problem). On the other hand, students with ASD prefer direct, action-based statements that are clear indicators of the expected behavior on their part (Milestones, 2021), such as “I need you to take a shower every day. You can choose the time, but it must be once a day”. Another example is the need for a coach to engage in open-ended questions than a yes or no answer with the client, but the open question also has to be clear and not too broad. For example, it is better to say, “Tell me about one thing you are particularly proud of from high school.” versus “Do you like Sci-Fi shows?” or “What do you do for fun?”. The first is a yes or no answer and the second is too general. As is the case in many social, behavioral, and health science education, it requires much role-play or real-play practice along with expert guidance for transition coaches to make improvements in their proficiency. Unfortunately, due to the limited availability of the professional standardized client and instructional experts, transition coaches currently have very limited opportunities to practice in an

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expert-guided role-play training session. As a result, because of inadequate training and a limited number of prepared candidates, these proven interventions, such as transition coaching services, are under-utilized in practices.

2. APPROACH

The primary aim and contribution of this research are to harness the latest advances in mobile computing, serious games, augmented/virtual reality (AR/VR), and human-computer teaming technologies to address the current challenge of coaching the transition coach to effectively interacting, engage, and build rapport with their student clients with ASD. By uniquely harnessing the built-in multi-modal capabilities of widely available and cost-effective iOS and Android smart devices, we have created and demonstrated a fully immersive first-person view experiential learning-based mobile serious role-play game through which the transition coach candidates can interact with the virtual standardized client with ASD under the guidance of a virtual expert instructor. Furthermore, our mobile serious game approach provides a more objective, accurate, and continuous assessment of trainees' performance in real-time, without having to demand a potentially prohibitive amount of time and effort from the human expert trainers. The improved assessment of individual performance has the potential to provide evidence for the expert instructors to quickly modify specific exercises to maximize training outcome and scalability by identifying each individual's progress and needs, thus supporting the more efficient evidence-based training curriculum.

2.1 Related Serious Role-Playing Games for Autism

Serious role-playing games provide a user experiential learning of the targeted skills and allow practices of a wide range and flexible combination of skill sets and scenarios without incurring potentially prohibitive costs and risks of real plays (Othlinghaus-Wulhorst, et al, 2020). It has been of particular interest and benefits for the training of social skills (Michael, et al, 2006; Daniau, 2016; Zheng, et al, 2021).

Serious role-playing games have also been created and used to support the social skill development of individuals with autism spectrum disorders (ASD) (Tang, et al, 2019; Kokol, et al, 2020; Grossard, et al, 2017; Wouters, et al, 2013). These serious games aim to teach social interactions and emotions to autistic people. However, there is a lack of such role-playing games in the market to help teach people without autism the necessary communication skills to interact effectively with autistic people.

3. DESIGNS

In this research, we aim to design and create a mobile serious role-playing game that encourages and enables everyone to (i.) learn and understand the behaviors of autistic people; (ii.) improve their communication skills to interact with them; and (iii.) be able to easily access the training using mobile devices, such as smartphones, tablets, iPads, etc.

3.1 Skill Acquisition Goals

In the current version of the game, we focus on helping the learner to acquire two important skills when interacting with autistic people:

- using direct, action-based communications.
- dealing with the nonverbal behaviors that could potentially interfere with the ongoing conversation.

3.2 Enabling Technologies

In this section, we will discuss the related technologies that help enable effective and efficient virtual role-playing.

3.2.1 High-Fidelity Virtual Character

Particularly, we investigate the level of hologram fidelity required to facilitate a smooth integration of Alice, the virtual character with ASD as shown in Figure 1, in a real-world setup to simulate a realistic encounter between the learner and Alice. The High-fidelity hologram may lead to a better perception of the virtual character in a static mode but at the cost of high computation that may produce potentially prohibitively long delays and result in degraded perception in a dynamic mode where contents need to be constantly updated on a mobile device. A particular adaptation effort is made to find the right balance to maximize the usability of these devices.

3.2.2 Embedded Virtual Expert to Guide and Review the Role-Plays

As pointed out by Zheng et al. (2021), serious games may improve social skills when used alongside in-person discussion. Serious role-playing games create a complex learning situation that warrants instructional support to facilitate experiential learning. Thus, serious games need to be used in tandem with instruction, play, review, discussion, and debriefing to help learners achieve the learning outcomes (Eng, 2021).

In this research, we have designed, created, and embedded Dr. Erika Parker, a virtual expert instructor, into the game flow. Figure 2 illustrates a review and discussion session led by the expert instructor to help the learner understand the difference between indirect speech and direct speech; moreover, how to convert an indirect speech statement to its corresponding direct speech statement. Such review, discussion, and guidance are made available through the entire training to help enhance the cognitive learning process on top of the experiential learning provided by the role-plays. The learner has the option to request more examples and discussion if needed. Therefore, it provides a comprehensive tool that enables the users with totally independent learning.



Figure 1. Alice with ASD



Figure 2. Prof. Erika Parker, the Embedded Virtual Expert, Provides Case Reviews via a Virtual Whiteboard

3.2.3 Mobile Game available for both iOS and Android Devices

A learner can download this serious role-playing app from the App Store (iOS) or Google Play (Android). The simulation can be completed at any time or place on a tablet or smartphone. These mobile devices, when coupled with the cloud provided services, provide multi-modal capabilities in addition to hologram visuals, such as voice, video, text, speech recognition, eye/gaze/attention tracking, or gestures to support multi-modal learning contents and interactions and multimodal assessments to maximize the learning outcomes. Therefore, it makes it significantly easier to access when compared to other delivery methods, such as VR goggles, laptop/desktop computers, etc. Thus, we believe it will make it easier for people without Autism to access resources and help that is required to learn how to communicate with autistic people.

4. DEMO AND RESULTS

We have designed, created, and released a serious role-playing game that demonstrates the feasibility and robustness of such a mobile computing enabled independent learning/training solution. The following demo results in present samples and offers validations for our design.

4.1 Preview of the Game

When starting the application, the user will be welcomed by Prof. Erika Parker, the virtual expert instructor as shown in Figure 3, who will guide and facilitate the entire training as the instructor of the contents, the reviewer of the plays, and the facilitator of the discussions. It is followed by the introduction of the learning objectives of this serious role-playing game. Then Alice, the standardized client with ASD and an 18 years old new college freshman, is introduced as shown in Figure 4.



Figure 3. The expert instructor - Prof. Erika Parker

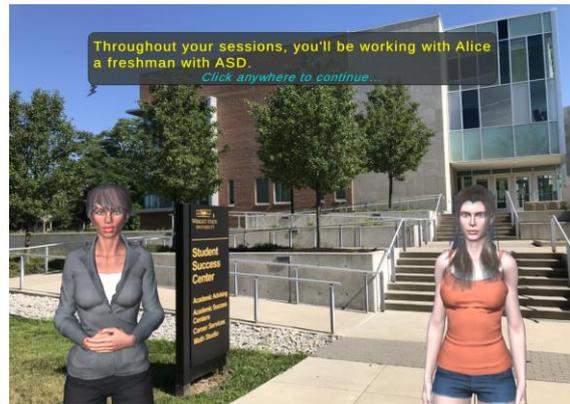


Figure 4. Introduction of Alice

4.2 Direct, Action-based Communication

In this part of the game, the learner is taking the role of a college resident assistant who will meet with Alice in the office as shown in Figure 5. Scripted role-plays, as shown in Figure 6, are particularly designed and adopted to create a rich learning experience on how to communicate effectively in direct and action-based communication when interacting with autistic people. The learner can try different communication styles/options and then observe the corresponding response of Alice, thus supporting the cognitive learning process of the learner. To further enhance the learning, Prof. Erika Parker will provide an immediate review of the plays and facilitate the focused discussion on the communication strategy. Further roleplays may follow if needed based on the learner's performance and progress as shown in Figure 7 and 8.



Figure 5. Direct Communication Training Module



Figure 6. Scripted Direct Communication Role-Plays



Figure 7. Sample Role-Plays and Reviews in the Direct Communication Module



Figure 8. Sample Role-Plays and Reviews in the Direct Communication Module

4.3 Dealing with Nonverbal Interfering Behaviors during Conversation

In this part of the game, the learner is again taking the role of a college resident assistant who will meet with Alice in the office as shown in Figure 9. The game takes full advantage of the graphical capabilities of a mobile device to provide the high-fidelity presentation of a range of subtle Nonverbal Interfering Behaviors for the role-plays. Scripted role-plays, as shown in Figure 10, are designed to practice how to deal effectively with

such Nonverbal Interfering Behaviors in order to ensure a smooth and engaging conversation. The learner can try different intervention options and then observe the corresponding response of Alice. Prof. Erika Parker will provide an immediate review of the plays and a focused discussion on the intervention strategy. Further roleplays may follow if needed based on the learner's performance and progress as shown in Figure 11 and 12.

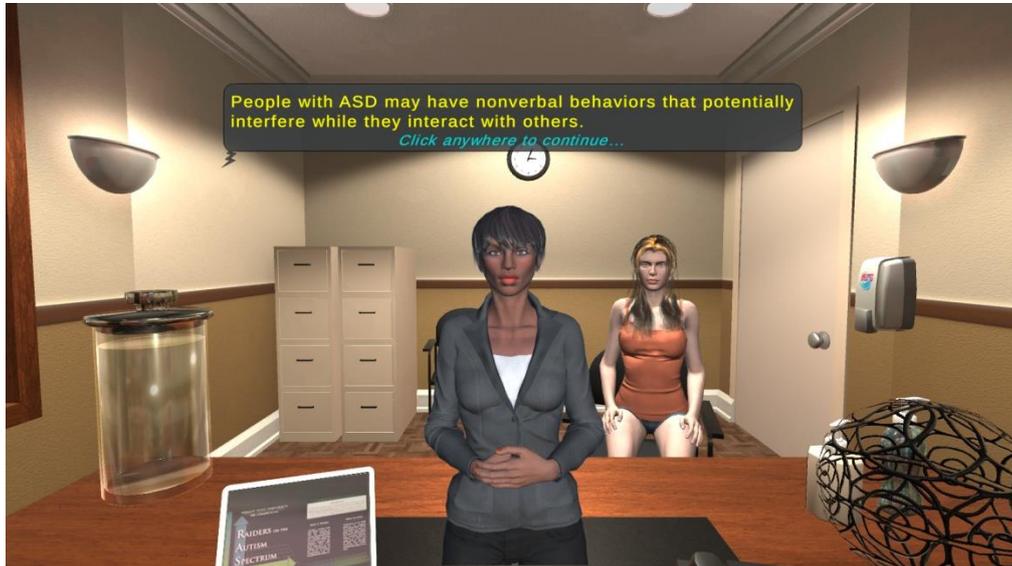


Figure 9. Nonverbal Interfering Behaviors Training Module

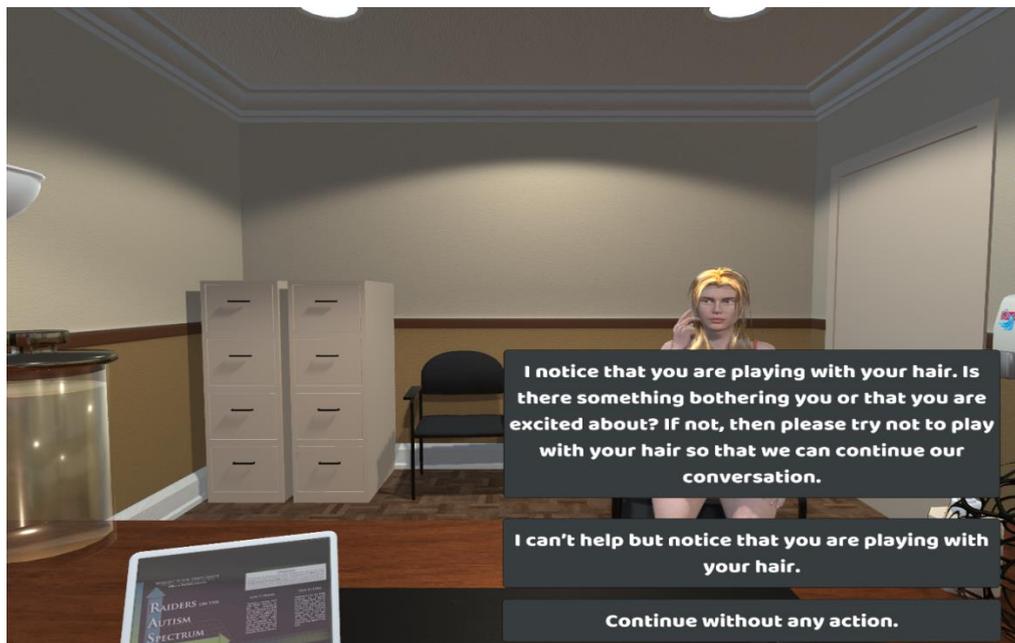


Figure 10. Scripted Nonverbal Interfering Behaviors Role-Plays



Figure 11. Sample Role-Plays and Reviews in the Nonverbal Interfering Behaviors Module

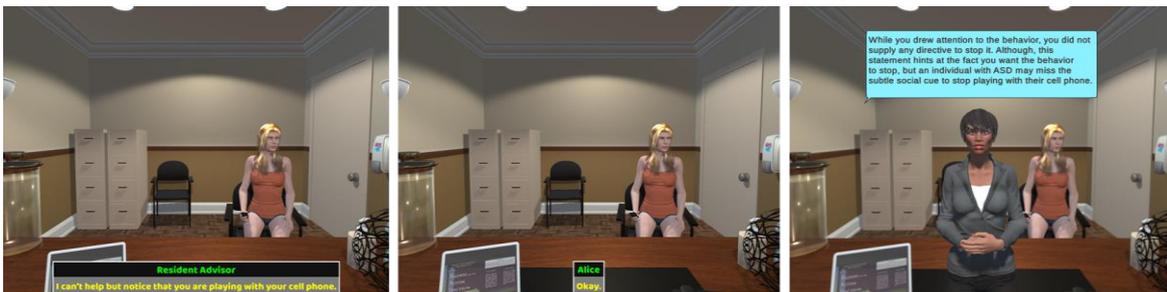


Figure 12. Sample Role-Plays and Reviews in the Nonverbal Interfering Behaviors Module

5. CONCLUSION

An effective and practical solution that helps people to independently learn and practice with ease on how to communicate effectively with autistic people will significantly improve learning efficiency and outcome, and more importantly, help spread the awareness of autism and encourage more people to understand, engage and interact effectively with them. In this research, we have successfully designed and developed a mobile serious role-playing game as a learning tool that harnesses the latest advances in mobile computing, serious game, virtual reality, and human-computer teaming. It resembles a comprehensive expert-guided experiential and cognitive learning process consisting of instruction, play, review, and discussion that help achieve enhanced learning outcomes via an independent-learning workflow. The release of the game for both iOS and Android devices further expands the potential reach of this learning tool and helps spread the awareness of autism and help create an inclusive environment at schools, universities, and communities.

Future works may consider the use of AR and AI capabilities to provide richer multimodal content and assessment. A trial study may also be warranted to establish a comprehensive understating of how such serious role-play games can help people improve communication with autistic people.

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