My Drama: Story-based Game for Understanding Emotions in Context

Xiaoyu Shen and Emilia I. Barakova

Eindhoven University of Technology
P.O.Box 513, 5600 MB Eindhoven, The Netherlands
x.shen@studnet.tue.nl, e.i.barakova@tue.nl

Abstract. This paper presents *My Drama*, a story-based game application that helps to understand emotions in context. The game was developed for young people with autism, who usually have trouble understanding the non-verbal expression of emotions. We combined elements of drama therapy and mobile game design to let players experience taking perspectives by assuming the role of the cartoon character and practice context-dependent recognition of expressed emotions in the story, and collecting of related to the story emotional expression photographs n in a known environment. The outcomes of a pilot test indicate that *My Drama* is a promising and engaging training tool for emotion understanding while collecting of emotional expression photographs increased the communication. Long-term research on its effectiveness is needed.

Keywords: Interactive game design, Drama therapy, Emotion understanding, Design for children with autism, Educational applications for adolescents with ASD.

1 Introduction

Deficits in emotion recognition [1] and empathy [2] in children with Autism Spectrum Disorders (ASD) may lead to isolation from their peers and difficulties to integrate into education and everyday life situations. It was shown that drama training can promote self-efficacy and greater awareness and sensitivity towards others [3]. Drama therapy [4] can provide context for the participants to tell their stories, set goals and solve problems, express feelings, or achieve catharsis. Through drama therapy, the depth and breadth of inner experience can be actively explored, and the ability to establish interpersonal relationships can be enhanced. Participants can expand their repertoire of dramatic roles to increase confidence in interaction in real life encounters. This therapy has shown to be both fun and educational.

One example of an application of drama therapy is *Social Emotional NeuroScience Endocrinology (SENSE)* Theatre [5]. It was proposed that the "active practice" of reciprocal social interaction, video modeling, and role-playing might facilitate social

awareness and perspective taking. During the evaluation, participants showed improvements in emotion recognition and empathy [5].

Mobile applications about emotion development that are related to our method were reviewed. Among the existing apps, demonstrative but not interactive ones are prevalent. For instance, *Model Me Kids* [6] demonstrates social skills by modeling peer behavior in videos. *Autism Emotions* [7] models behaviors in photographic storyboards. Mobile applications like *Between the Lines* [8] and *Look at Me* [9] combine context modeling with tasks. The tasks in these apps are independent of each other and are mainly categorized by topics and difficulty.

The current study aims to improve the interaction and playfulness of emotion training tools. Instead of using independent behavior modeling materials, we test whether embedding tasks into a consistent story will help users to perform better in role transformation and contexts awareness. Furthermore, playful elements were also added to keep children with ASD motivated and engaged in the training.

2 Design of the experimental tool

The current study aims to design a novel tool for children with ASD to develop abilities of emotion understanding in context. We combine theatrical intervention [5] with mobile game application methods.

The theatrical intervention [5] features role-play and contextual stimuli, which can create a safe space to work through individual issues. However, it is hard to make a large-scale theatrical intervention, because of high demands on sites, facilities, and trainers. To decrease the expense, we propose a mobile application on the digital devices. The affinity of children with ASD with digital devices is well established [13] while the mobile apps provide conditions for privacy and own tempo of training [14].

With this game we aim to train the children with ASD to recognize emotions, to switch perspectives and learn to gain empathy with others. It aims to demonstrate the importance of the skills of reading and using social cues during interpersonal interaction.

To increase the engagement, we included playful elements in the training. Inspired by the *Look At Me* app [6], rich interactions, reward system, visual/sound effects, etc. were implemented to let the child learning with fun.

Also, familiarity with the context was shown to give very positive effects on training children with ASD [11]. That is the reason to look for popular cartoon movies as the basis of the drama script in this game application.

2.1 Background Information

The song of the sea is a 2014 Irish animated fantasy film by Cartoon Saloon, which is about a little girl who departs on an adventure with her brother, Ben, to save the spirit world and other magical beings like her. The story line of the game *My drama* was adapted from this film. To stay consistent, all the images and music of this game were reproduced from the original movie.

The game was initially designed on Keynote. Links and animation effects were used to make the game interactive. Music and audio effects were added to create a more immersive experience. Then, the game was exported as an HTML file and uploaded on the Internet so that everyone can access it.

2.2 My Drama

My drama is a story-based game application that can be used on a tablet. A cartoon movie *The Song of the Sea* has been adopted as the story background in *My Drama*. The script of the game is adapted from the original story to make the tasks fit into the storyline smoothly. The tasks are related to emotion recognition, understanding, and expression. While emotion recognition has been a subject of many studies, the more complex skill of emotion understanding has not received enough attention in studies of using technologies for autism training. Emotion understanding has been defined by Saarni [19] (page 106) as the '*ability to discern and understand others' emotions, using situational and expressive cues that have some degree of cultural consensus as to their emotional meaning*'. Emotion understanding encompasses a range of behaviours. For example, Denham [20] describes nine areas of emotion understanding. These include the ability to identify situations that might elicit specific emotions, and the ability to understand more complex emotions, such as confusion, shocked, boredom, guilt, pride, or empathy. A story line as *The Song of the Sea* provides opportunities to identify situations and contexts in which an emotion emerges, and to suggest causal relations between an event and the triggered emotion [18].

Tasks that intend to help understanding of emotional states were divided into four increasingly complex levels and embedded in the storyline. These are (1) emotion learning, (2) facial expression recognition, (3) context dependent emotion expression recognition and (4) social interaction with the people in the child's environment.

Considering that boys to girls ratio among the children with ASD is close to 6:1 [15], the story is presented from the perspective of a male character (Ben) that is also the role the player takes.

In the story, Ben's sister, Sanneke, was caught by an evil witch who stole emotions from fairies and turned them into stones. On the way to save Sanneke and the fairies, Ben went through a tunnel where emotion diamonds could be collected and used for defeating the evil witch later.

Collecting emotion diamonds is the first task of emotion learning (Figure 1). It aims to help the player understand the emotions in different facial expressions. A certain emotion will be introduced when the player succeeds in collecting an emotion diamond. The basic emotions like happiness, anger, sadness, fear and complex emotions like confused, shocked, bored were used. Because the complex emotions are more related to the contextual cues, examples of situations that trigger an emotion were presented (e.g. "When something unexpected happens you will feel shocked.").

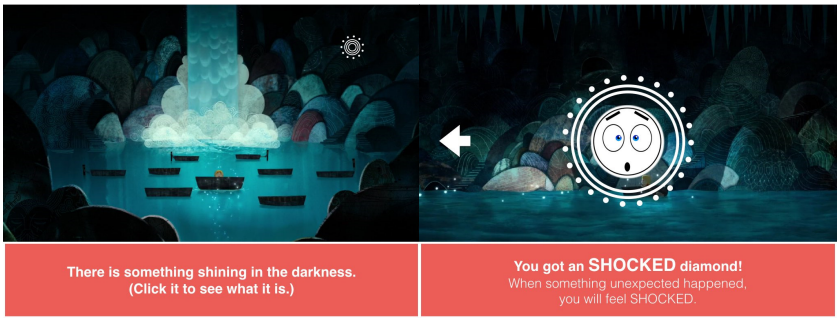

Fig. 1. Task 1 – The player learns about the basic emotions by collecting emotion diamonds. Emotions are presented as a combination of facial expression and context.

At the end of the tunnel, Ben ran into an old fairy who knows everything. To get his trust, Ben must prove he was not a spy from the evil witch by showing his emotions were not stolen. The task given by the old fairy was to recognize the right facial expression for a limited time across a range of increasingly complex levels (Figure 2). The goal of this task is to review the learning outcomes of the first stage.

.

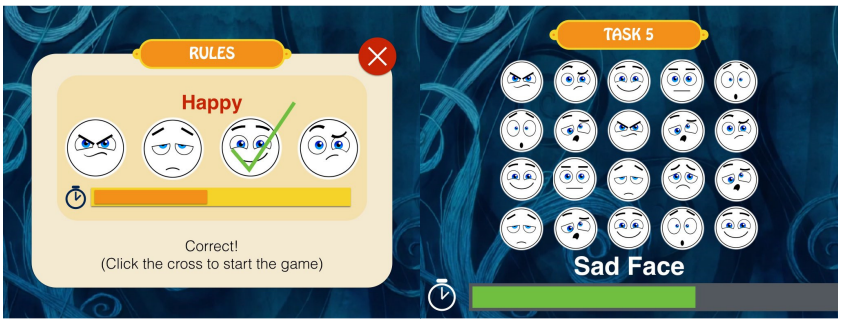

Fig. 2. Task 2 - Facial expression recognition. The player needs to find the right facial expression in a limited time across a range of increasingly complex levels.

With the help of the old fairy, Ben finally found the evil witch. However, the sly witch tried to seduce Ben to give up his emotions and then steal them. To stop her, the player must place right emotion diamonds into memory pieces, such as “Sanneke was taken by Macha’s owls” and “fairies sacrificed themselves to protect you”.

The third task requires the player to express emotion appropriately in different contexts (Figure 3). This assignment aims to develop the ability of appropriate emotion expression. The contexts were selected from the previous story line. The facial expressions in the main pictures were removed, so that player needs to recall the whole story and find the right emotion for each context.

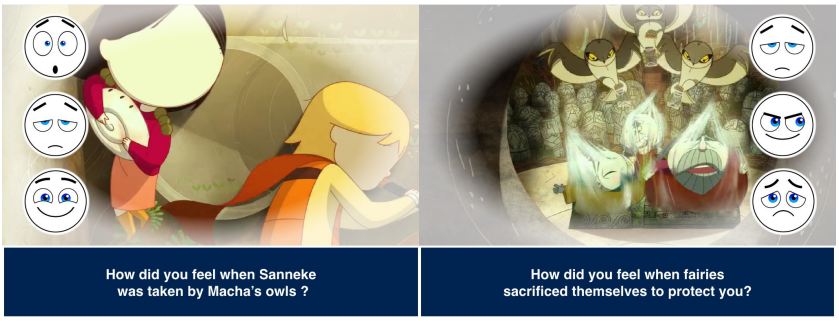

Fig. 3. Task 3 – Context-dependent recognition of expressed emotions. The player needs to choose the right emotions for different contexts selected from the previous story line.

In the end, Ben found Sanneke half-stoned. To save her and defeat the evil witch, the player needs to take photos of specific facial expressions. The final task aims to encourage social interactions. By taking photos of others' face with certain emotion, players will be encouraged to communicate and experience how people express emotions in daily life.

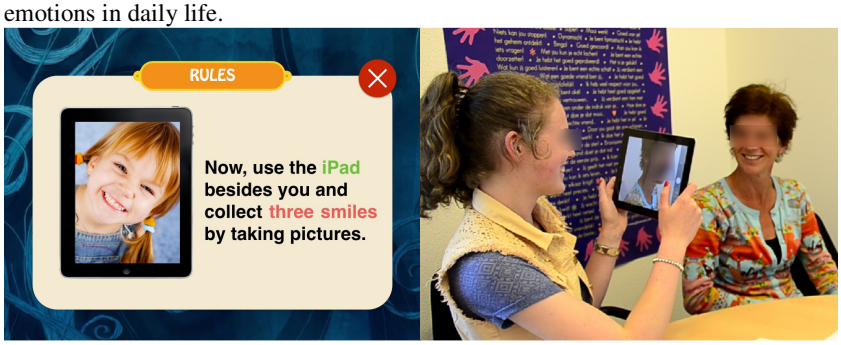

Fig. 4. Task 4 - Social interaction with the people in the player's environment. In the photo of pilot user test, the female participant was taking a smiling photo of her therapist.

Learning with fun was shown to be more effective [16]. According to the study of Alan Amory and his colleges, game elements could provide sufficient stimulation to engage learners in knowledge discovery and skill development and game elements such as logic, memory, visualization and problem solving are the most important ones [17]. Therefore, except for the tasks directly related to emotion recognition and understanding, fun elements related to story progression are added to keep children engaged, such as "get out of the room" or "find where Sanneke was" (Figure 4), etc.

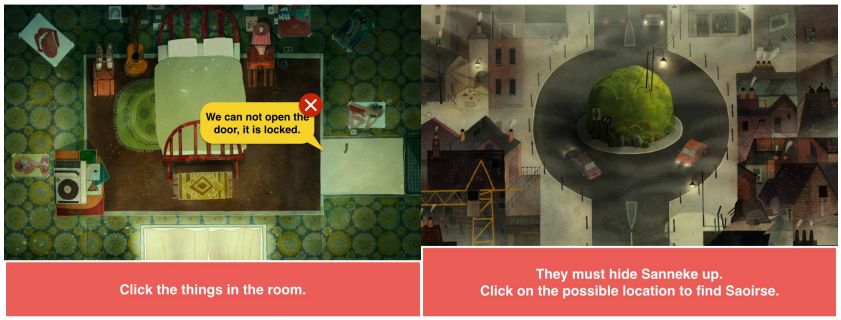

Fig. 5. Two examples of game elements: 1. The player needs to click on the items and find a way to get out of the room; 2. The player needs to click on the possible locations where the target person was hidden.

3 Pilot user test

We piloted the design with Royal Dutch Kentalis [10] expertise center, which is a national organization in the Netherlands specializing in providing diagnostic, care and educational services to people with communication problems, including young people with ASD accompanied by severe speech and language difficulties.

The pilot user test was performed with one therapist and two 15-year-old teenagers with ASD (one male and one female), who both have much lower development in communication and social interactions skills than their age group. The female participant has Attention Deficit Hyperactivity Disorder (ADHD), and she could be distracted easily. This pilot test took place at Kentalis, location Velp. Before conducting the pilot test, informed consent was obtained from the parents of the participants.

Fig. 6. A snapshot of the male participant playing *My Drama* on a tablet. A therapist was present at the test.

Participants played the same game one by one accompanied by their therapist (Figure 5). Because of different reading ability, the male participant played the game on his own, while the female participant asked help from the therapist to read the scripts for her. After playing the game, participants were asked to fill in the questionnaire individually, which reflected his or her attitude towards the game. Then he/she could talk about their feelings while playing the game. The therapist filled another questionnaire at the end of the test and gave comments from the perspective of a psychologist.

The questionnaire for therapist consisted of six statements (e.g., 'I think *My Drama* is an effective training tool to develop ability on emotion recognition and expression') and the questionnaire for the participants consisted of nine statements (e.g., 'It is more fun to have facial expression training on *My Drama* than in the regular treatments.'). All statements were rated on a 5-points Likert Scale with a range from 1 (strongly disagree) to 5 (strongly agree). About the difficulty of the game, the participants rated the perceived difficulty of each task with a range from 1 (very easy) to 5 (very difficult). Finally, the last question of the questionnaire was: 'My final score for *My Drama* is...' where the therapist and participates could choose a score ranging from 1 to 10.

4 Results

The male participant spent 25 minutes to finish the game, and the female participant spent 45 minutes. During the game, participants were especially excited and interested while the music or some audio effects started to play or they succeeded

in passing a task. Both participants performed more concentrated during the game compared to their daily learning activities, as observed by the therapist. This effect was especially strong on the female participant who used to be easily distracted. The male participant passed all the tasks smoothly and quickly without any mistake. The female participant expressed her anxiety at the beginning of the test, but relaxed as the test proceeded. She felt a little nervous and asked for help when she could not finish a task or find the solution. She passed emotion recognition task with two attempts and contextual emotion expression task also with two attempts.

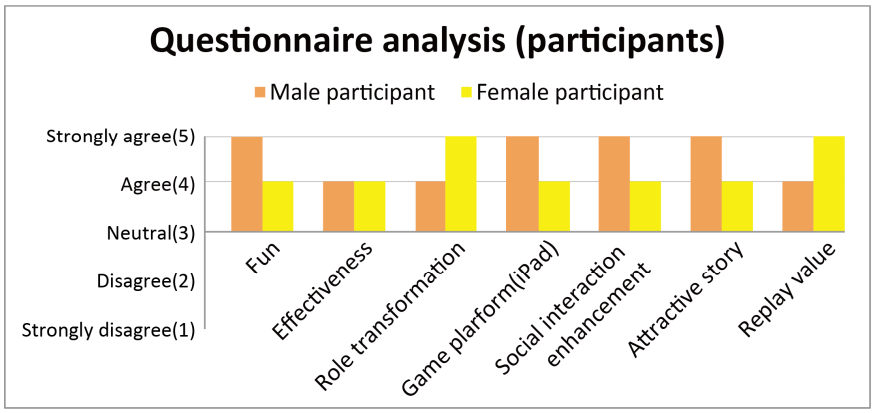

Fig. 7. Evaluation by the participants

Figure 6 shows the data gathered from the participants' questionnaire. The participants reported the facial expression training on *My Drama* as more fun than the regular training (Q_{11}=5, Q_{21}=4). They reported to have learnt how to recognize and use facial expressions in this game (Q_{12}=4, Q_{22}=4). Quoted from the male participate, "What I really like is when the game is close to the end, you have to recall the story and choose the right emotional faces. And that's exactly the game is saying, 'you have to pay attention.'" The instructions in the game are reported as clear (Q_{13}=4, Q_{23}=4). Both participants felt they were the main character in the story (Q_{14}=4, Q_{24}=5). They liked to play *My Drama* on a tablet (Q_{15}=5, Q_{25}=4). All participates expressed their willingness to play the game with others (Q_{16}=5, Q_{26}=4). Moreover, the story was reported as attractive and educational (Q_{17}=5, Q_{27}=4). And more stories were desired on *My Drama* (Q_{18}=4, Q_{28}=5).

Finally, *My Drama* scored 9 out of 10 in the overall evaluation session (Q_1=9, Q_2=9).

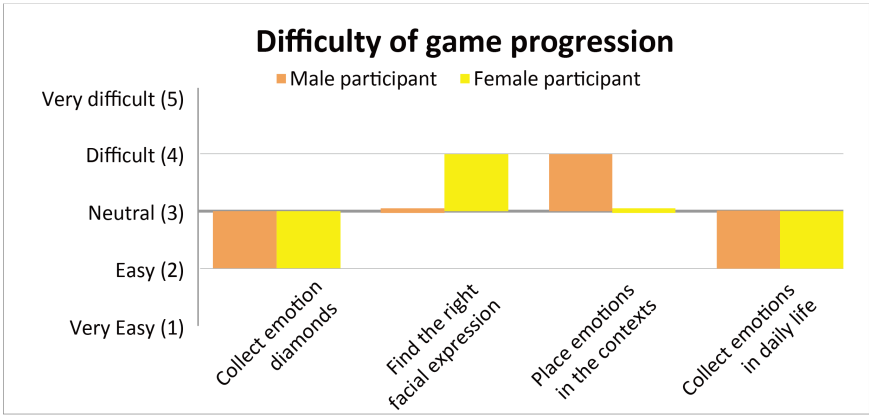

Fig. 8. The perceived difficulty of each task

Figure 7 shows the result of perceived difficulty of each task in *My Drama*. The first task (Collect emotion diamonds) and the last one (Collect emotions in daily life) were both considered as easy (Q_{11}=2, Q_{21}=2; Q_{14}=2, Q_{24}=2). Moreover, the second task (Find the right facial expression) (Q12=3, Q22=4) and third task (Place emotions in the contexts) (Q13=4, Q23=3) were both considered as more difficult.

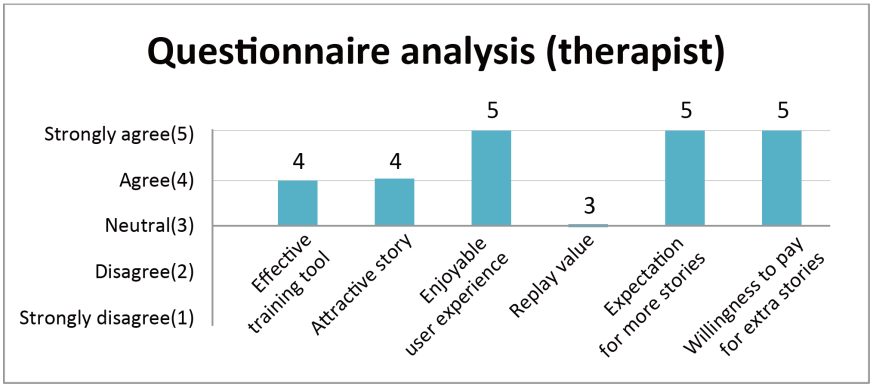

Fig. 9. Evaluation by the therapist

Figure 8 shows the data gathered from the therapist's questionnaire. The therapist reported that she considered *My Drama* as an effective training tool for emotion development ($Q_1 = 4$).

From the perspective of a psychologist, she suggested putting more training materials into the story. "The story in the game is quite long, but there are only four times when the participant has to do something with the emotions. So I would like to advise you to put more emotion recognition (training) into the game."

The therapist liked the story in the game ($Q_2 = 4$), and enjoyed very much playing the game with the two participants ($Q_3 = 5$). As an observer and company to the participants, the therapist said both participants are able to concentrate on the game. “They were quite into the game. Although the female participant with ADHD can get quickly distracted, she was able to concentrate well on the game. I think that makes it a good game. ”

On the other hand, she stays neutral about the statement “The game is worth playing more than once"($Q_4 =3$). She mentioned that, “If they go through the same emotion (game) again and again, then it will be very easy.” In the test, there was only one story in the game. It will be more appreciated, if there are more stories available on *My Drama* platform ($Q_5 = 5$). And she was willing to pay for stories if they are available ($Q_6 =5$).

Finally, the therapist rated the overall acceptability and effectiveness of the training with *My Drama* as positive ($Q = 8$).

5 Conclusions and Future Work

The results of the pilot user test indicate that *My Drama* has a good potential to become an educational support in developing abilities to understand emotions in context. Embedding tasks into one consistent story encourages players to stay focused and think within the different contexts. The indication for that was the engagement of the participants while recognizing and imitating emotions, which was mentioned by the therapist. As mentioned by the male participant, the emotion recognition part made him pay attention to the whole story and recall the scenarios while doing the task. For the female participant the playfulness eliminated the anxiety of being trained, but retained the effect of learning and prolonged training time. The reported feeling of being the main character in the game, *My Drama* could help children and adolescents with ASD develop empathy, which is one of the previously reported benefits of drama therapy [3].

Regarding the game design, audio effects, rich interactions, animations and instant feedbacks were observed to intrigue curiosity and interest of players. Because some individuals with autism are not good at reading text, audio scripts should be added in the future redesign.

Higher game levels were expected to be perceived as more difficult than the lower ones. Based on their perceived difficulty and actual error rate, the difficulty of the first three tasks was found appropriate. However, the final task of collecting emotions in daily life was experienced to be easier than the previous two tasks. This may result from the limitation of the test conditions: In the test room, the participants can ask the therapist or the experimenter to help them finish the last task. Since the rules were available to the therapist and the experimenter, the participants got the final pictures of emotions from them with no effort. The game is actually designed for situations where players are encouraged to interact with people who do not know the game. This way the game encourages communication and social interaction skills to finish the task.

In this pilot study *My Drama* was evaluated from the perspective of usability and user experience. As suggested by the therapist, a good balance between story and training parts should be further considered and improved. The effect on the development of emotion recognition and empathy needs to be validated by a controlled study with more participants. Further improvements of the game are needed for long-term training, as suggested in [12]. The present study only provides one example story with a limited number of emotional contexts, which is not sufficient to support a long-term training. More stories and training approaches need to be developed on *My Drama*.

Finally, to our knowledge, this is the first design that combines the benefits of *Drama therapy* with the positive engagement effects of game design. Different from the majority of existing applications and games in this domain, it embeds the training elements into one consistent story. The understanding of emotions is trained in a context of this story. The affinity of the children with cartoon stories and especially with a familiar story is an extra element that helps the children enjoy the game and learn better.

References

1. Hobson, R. P., Ouston, J., & Lee, A.: Emotion recognition in autism: Coordinating faces and voices. Psychological medicine, 18(04), 911- 923 (1988)
2. Happé, F. G.: An advanced test of theory of mind: Understanding of story characters' thoughts and feelings by able autistic, mentally handicapped, and normal children and adults. *Journal of autism and Developmental disorders*, 24(2), 129-154, (1994)
3. Peter, M.: Drama, narrative and early learning. *British Journal of Special Education*, 30(1), 21-27(1994)
4. Johnson, D.R., Developmental approaches in drama therapy. *The Arts in Psychotherapy*, *9*(3), pp.183-189, 1982.
5. Corbett, B. A., Gunther, J. R., Comins, D., Price, J., Ryan, N., Simon, D., et al.: Brief report: theatre as therapy for children with autism spectrum disorder. Journal of autism and developmental disorders, 41(4), 505-511 (2011)
6. Model Me Kids, http://www.modelmekids.com/
7. Autism Emotion, https://itunes.apple.com/us/app/autism- emotion/id550027186?mt=8
8. Between the Lines, http://www.hamaguchiapps.com/between-the- lines.html
9. The *Look at me* project, http://pages.samsung.com/ca/lookatme/English/
10. Royal Dutch Kentalis, http://www.kentalis.nl/
11. Gruarin, A., Westenberg, M. A., & Barakova, E. I.: StepByStep: Design of an Interactive Pictorial Activity Game for Teaching Generalization Skills to Children with Autism. I *LNCS* 8215, pp. 87-92 (2013*)*
12. Barakova, E. I., Bajracharya, P., Willemsen, M., Lourens, T., & Huskens, B.: Long-term LEGO therapy with humanoid robot for children with ASD. *Expert Systems*, 32 (6) 698–709, (2015)
13. Goldsmith, T. R., & LeBlanc, L. A.: Use of technology in interventions for children with autism. *Journal of Early and Intensive Behavior Intervention, 1*(2), 166-178(2004)
14. Franko, O. I., & Tirrell, T. F.: Smartphone App Use Among Medical Providers in ACGME Training Programs. *Journal of Medical Systems*, 36(5), 3135-3139(2011)
15. Wing, L.: Sex ratios in early childhood autism and related conditions. *Psychiatry research*, 5(2), 129-137(1981)

16. Lepper, M. R., & Cordova, D. I.: A desire to be taught: Instructional consequences of intrinsic motivation. *Motivation and emotion*, 16(3), 187-208 (1992)
17. Amory, A., Naicker, K., Vincent, J., & Adams, C.: The use of computer games as an educational tool: identification of appropriate game types and game elements. *British Journal of Educational Technology*, 30(4), 311-321 (1999)
18. Barakova, E. I., Gorbunov, R., & Rauterberg, M.: Automatic Interpretation of Affective Facial Expressions in the Context of Interpersonal Interaction. *IEEE Transactions on Human-Machine Systems*, 45(4), 409-418, (2015).
19. Saarni, C.: *The Development of Emotional Competence* , New York: Guilford, (1999).
20. Denham, S.: *Emotional Development in Young Children*, New York: Guilford, (1998).