Context analysis, needs assessment and persona development: towards a digital game-like intervention for high functioning children with ASD to train social skills

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Abstract

Children with autism spectrum disorders (ASD) often face challenges in social situations. Although designers and researchers explore the potential of digital (game-like) interventions, most interventions lack evidence in efficacy or proper design. The aim of this study is to explore the worldview and needs of the target users in their daily life context and convert them into authentic and lifelike personas and guidelines for design. To get insight in the user group’s worldview and needs we conducted focus groups with children with ASD (n=8), focus groups with parents (n = 6) and stakeholder interviews (n = 7). Different generative and exploratory methods were used during the interviews. We present the findings on the three main topics: everyday life, social skill training, and video games. The findings resulted in three authentic and lifelike personas. To develop a successful new game-like intervention the children’s needs must be more explicitly addressed in the design. The user-centered approach makes clear that children with ASD have different goals to pursue then their parents and professionals.
Introduction

Children with autism spectrum disorder (ASD) often face challenges in social situations. Children with ASD are facing difficulty in interpreting verbal and nonverbal social communication, are facing difficulties in maintaining conversations and face difficulty in interpreting the intentions of others [1]. Children with ASD are more often victims of bullying [2], are more likely to be excluded by peers [3] and have a higher risk to develop depressive or anxious feelings [4]. High-functioning children with ASD, who score normally in non-verbal IQ measurements (IQ > 70), also lag in terms of social skills [5]. Children suffering high-functioning ASD generally have normal intellectual and language abilities and generally perform well at school. Yet, when it comes to social interaction, they often avoid eye contact [6-8] and do not spontaneously interact with other people [9,10]. On formal cognitive social tests, high-functioning children with ASD show specific impairments in understanding intentions of others [8,10] and a lack of intuitive judgments within social contexts [10,11]. Therefore, it is crucial that interventions developed for high-functioning children with ASD put emphasis on improving social skills [12].

The notion that children with ASD are less developed in their social skills, does not mean that children with ASD are unable to develop these skills [13]. At least some of the children with ASD have a desire for more social interaction with peers [13]. Clinical practice provides a broad spectrum of interventions for children with ASD to improve social skills [14] such as social stories [15], peer-mediated interventions [16], parent-assisted interventions [17], social skills groups in a clinical setting [18], school-based social skills training [19] and computer-based interventions [20]. Yet, many interventions lack proof of effectiveness [21], or the effectiveness is shown in terms of the continuity and intensity of the intervention [22]. Transfer of the learned social skills in training to the daily life of children with ASD is often difficult and the motivation of children with ASD to remain committed to social skills training is often low.

Designers and researchers increasingly explore the potential of digital (game-like) interventions to find strategies that increase players' motivation, offer personalized training and enhance learning effects [23,24]. Games and game-like interventions are able to offer unique features to motivate, trigger and facilitate learning processes [25]. Digital (game-like) interventions can also provide a safe environment for practicing, especially when it comes to training of more complex skills [26]. In the field of autism research, there's a growing interest in the development of digital (game-like) interventions, resulting in several different digital and game-like interventions developed in the last decades. Such interventions often build on findings that children with ASD enjoy playing (video)games in their spare time [27].

For children with ASD, there is a broad spectrum of developed digital (game-like) interventions. At first, there are simulation-based interventions, providing a controlled environment to practice social skills, based on virtual replications of social scenes [28]. Those interventions are aiming for the first class of transfer [29] trying to represent the
real world as literal as possible and providing a real-life environment to practice, but are seeming not to succeed in that aim. A review of their effectiveness showed that transfer from the virtual environment to the real world [30] was not achieved. This makes it questionable whether developing a virtual environment with this aim is worth the effort. Social communication is complex and non-verbal communication can be very subtle, which make it incredibly difficult to simulate in virtual representations.

The second path of interventions are the more gamified or game-like digital interventions. For example: ‘LIFEisGAME’ [31], ‘Secret Agent Society’ [32], ‘Let’s Face It!’ [33], ‘A SUNNY DAY’ [34] and ‘TeachTown’ [35]. Most of those examples are based on a gamification approach, offering a reward system for finishing traditional therapeutic tasks. According to Malinverni et al. [36], this approach comes with a few concerns: (1) although game elements and therapeutic tasks are combined, they are not providing a coherent experience. This phenomenon is called fidelity dissonance [37], an incongruence in in-game concepts, causing a disturbance in the game experience. Also, (2) compared with video games on the market, those interventions offer a poor game experience, which might undermine children’s interest to play [36].

Thirdly, there are examples of game-like interventions which offer a more sophisticated design, aiming to provide a proper game experience. Interventions that facilitate collaboration and social interaction with a more integrated game design are ‘Invasion of the Wrong Planet’ [38] and ‘Collaborative Puzzle Game’ [39], offering an environment to collaborate through puzzling; ‘Lands of Fog’ [40], which facilitates collaboration between a ASD child and a neurotypical child in augmented environments; and ‘Pico’s Adventures’ [36], based on full-body interaction promoting social initiation skills. Those games use more abstract mechanisms to provoke social interaction, with metaphorical game environments. Those interventions are aiming for the second class of transfer [29], where the aim is to transfer learned skills and behaviours from an abstract game environment to the children’s everyday life.

Despite the fact that these games build on a better thought-out game design and are promising in itself, the research reports are rather limited. Studies are only reporting the game design requirements briefly [38] or are focussing on the effect [39]. As Kuipers et al. [41] state, in many projects that aim to develop digital and game-like interventions for healthcare, the process of designing and/or the design rationale itself is often neglected [41]. The studies that report about ‘Lands of Fog’ [40] and ‘Pico’s Adventures’ [36] do pay attention for the process of designing, proposing a participatory design method which promotes an active role for children in the process of designing. This increases the chances of developing an effective intervention [42]. Nevertheless, it can be challenging to engage children on a regular basis in a long-term design process.
Design based research approach

To get grip on the process of design and the different phases of design, different design approaches can provide direction. Throughout the process, children can be involved in different participatory and cooperative methods [36,40,43-45] and user insights can be used to develop vivid personas within persona-based design [46,47]. Participation of children throughout the design process has different purposes: at the start participation of children can help to explore their context, worldview and needs, children can participate in constructing and/or utilize prototypes, children can give feedback in user tests and children can help to develop to gain insight in the social system, in which an intervention should be implemented [48]. van Rijn, Visser, Stappers, and Özakar [49] state that direct contact with users is most valuable for designers and improves the quality of concepts, but through limited time and budget in practice it is often difficult. Therefore, it is necessary to make good considerations in how and when you actively involve the target group into the process of design, especially when the target group is children.

To translate insights gained from a user-centered approach to useful design implications, personas are a useful method to bundle them. Personas are ‘fictitious specific, concrete representations of target users’ [50] which provides concrete, authentic and life-like insights which can be used in the following phases of the design process. Although personas are fictitious, personas are based on insights obtained from exploratory and generative methods, directly from the context of the users. Personas have the potential to build empathy for the target users, can be used to check with experts whether the designers view on the target group is valid, can be helpful to formulate design requirements with a various of stakeholders and experts, and can be used as a design compass in ideation sessions with, for example, questions as ‘how would this persona respond to this specific idea?’. Personas also have a positive effect on brainstorming, which makes them a powerful tool to catalyst innovation [51].

This research project was undertaken as a first step in designing and evaluating a new digital game-like intervention to facilitate social skills learning for high functioning children with ASD. The aim of this study is to explore the worldview and needs of high functioning children with ASD in their daily life context through a user-centered approach. This approach will provide a good picture of the target group which will lead to useful user insights and specific design implications that can be addressed in the further design process. The user insights provided through focus groups and stakeholder interviews will be converted into authentic and lifelike personas.
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Methods

Study design

This research project and this study are structured around a design science research approach [52]. This research approach involves (1) the definition of the problem and the objectives of the artifact, (2) the design and development of the artifact, and (3) the evaluation of the artifact as a design-in-the large [53]. This study focuses on the first step: the definition of the problem and formulating the objectives of the artifact.

This study follows the design research approach of the Design Research Framework (DRF) [54,55]. This framework is based on the instructional design model for rapid prototyping [56], which facilitates the design of educational applications. The natural reflex to think in terms of products and solutions too soon during the design process is curbed by the DRF through methodically exploring the existing situation (assessment of needs, analysis of content and context). This almost always leads to a diversion and an in-depth investigation of the initial problem. It is not about pre-determining the current situation versus the desired situation (design gap), but about a deep understanding of needs, (existing) content and context, preferably defined from the perspective of the end user [55]. Different design-based methods can be suitable to explore the existing situation. Depending on what insights are needed, carefully chosen design research methods can be applied to get the most complete picture of the existing situation as possible. The data distracted from these activities will lead to concrete input for ideation and prototype sessions (construct- and utilize prototype) later on in the design process. The activities in this study can be mapped in the upper left of the DRF (Figure 1).

To get a good understanding of the context and users, in a limited period of time, different perspectives have been explored. Focus groups were formed with children and their parents to get an impression of the daily life of high functioning children with ASD and their needs in relation to social skills. Stakeholder interviews were conducted with professionals who work with the target group. The stakeholder interviews provide a professional perspective on high functioning children with ASD and are providing specific insights into their experiences with the target group in social skills training sessions. Personas were created to merge the different perspectives [57]. The nature of the re-
search in this phase of the design process is mainly exploratory and generative, with the aim of understanding the reality and daily life of the individual participants as good as possible and translate this in design guidelines. This means that the results are not, or intended to be, value-free, but are interpretations of the design-researchers.

**Participants and recruitment**

For the focus group interviews, high functioning children with ASD between the ages 8–12 were recruited. The children were recruited in cooperation with a child and youth psychiatric institution, located in the northern part of the Netherlands. Professionals selected 8 high functioning children with ASD and their parents. From the children, 2 were girls and 6 were boys. Of the parents, only mothers participated in this study. The children and their parents gave informed consent and parents gave verbal and written permission for their children’s involvement.

For the recruitment of the stakeholder interviews professionals were selected who were, at the time of the interviews, active as social skill trainer for children with ASD or were directly professionally involved with those children in daily practice. Interviews were conducted with 7 mental health professionals (child psychologists, ASD-coaches, social skill trainers) and educational professionals (teachers, remedial educationalists), all with specific expertise on social skills training for ASD-children. The professionals gave informed consent.

**Focus groups**

The aim of the focus group sessions was to research (1) which obstacles the high functioning children with ASD experienced in their daily lives through less developed social skills, (2) what their everyday lives looked like, (3) which (video)games they played in daily life and (4) how they experienced social skill training. The focus groups interviews were performed at the children’s home. To give the children a more active role during the interviews, the children themselves chose, on the basis of thematic maps (Figures 2, 3 and 4), the order of the themes to be dealt with [45].
To get insight into the daily life of the children different design research methods were used [58]. To get insight into the daily life of the children semi-structured interviews were held around an empathy map [59]. To identify critical incidents involving social skills in the daily life of a child, a day reconstruction method was used [60], tailored around a child’s regular day. To get insight into how the children interpreted different social situations factually and emotionally, the What, How, Why- method was used. Children were shown three pictures (Figures 5, 6, and 7) and were asked what the children in the picture are doing, how they were doing it and why they were doing it.

To get insight into which games the children like a few open questions, outlined in Textbox 1, were asked to get insight into which games the children play in their daily lives. After these questions, a dot-voting-method [58] was used in prioritizing game elements they like. Within this method, children voted with stickers on elements in a bingo card they prefer in a game. The elements were based on different design principles [61]. Conclusively, children were asked how they would design a game. The aim of this question was not mainly to identify or generate design ideas, but to keep identifying children’s interests and motivations.

| 1. | What games do you play? Can you show them? |
| 2. | Why do you play these games, what do you like about them? |
| 3. | What do you dislike about these games? |
| 4. | What would make these games even more interesting? |
| 5. | Do you play these games with others? |
| 6. | What do you like about playing games with others? |

Textbox 1. Predefined questions to initiate open-ended discussions.

Finally, children were asked questions about the more traditional social skills training. A customer experience map [58] was used to evaluate different parts of the social skills training and the specific experiences of the children in those training. In addition, children were asked what they see as a desired situation for the training.

The parents were interviewed separately from the children by a second researcher. The interviewer followed a similar protocol as with the children: the same methods were used and the same themes were discussed. Interviewers urged the parents to consistently respond from the perspective of their child. The results of this are seen as complementary to what the children have said and provided an extra perspective.

The focus group interviews each lasted approximately 90 min and were audio recorded.
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Figure 5. Sitting children.

Figure 6. Teacher and Child.

Figure 7. Sad boy.
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Stakeholder interviews

The same protocol was used for the stakeholder interviews as for the focus groups: the same methods were used, and the same themes were discussed. In addition to the insights that the Day Reconstruction Method provided with the children, the professionals were asked which critical incidents concerning social situations are regularly discussed during therapy sessions. Furthermore, the professionals were asked about their vision on social development in schools, in order to get more grip on critical and authentic incidents in the daily life of the children.

Another theme that was discussed during the stakeholder interviews were the social skill training sessions: what are positive and negative elements within the training, according to the professionals, and how much benefit do they think the children have from it? Finally, the professionals were asked what possibilities they see in digital and game-like interventions, especially to explore where their motivations and interests lie.

Analysis

The data from the focus group interviews and stakeholder interviews were analyzed using a General Inductive Analysis [62]. The General Inductive Analysis involves the following steps: collecting the raw data, processing the raw data, interpret the data and derive concepts and themes from it. This approach fits the exploratory nature of this research, where the aim is to understand participants experience better. The rich data that was created from this approach, formed the basis for the creation of the personas.

Results

Demographics

Six focus group interviews were held with a total of 8 children participants (6 male, 2 female) between the ages 8–12 and 6 parent participants (6 female), two of them were a parent of 2 children who participated. Seven stakeholder interviews were held with 7 professionals from 4 different organizations.

The thematic categories derived from the focus groups and stakeholder interviews were the everyday life of the children, the experiences with social skills training and video games.

Everyday life

For all children, the school is the most important place where they spend their day. The school is also the place where they most often encounter their limitations in social interaction. However, children do not blame the difficult social situations they encounter at school as a result of their lack of social skills. They just want to be part of the group. Seven out of eight children say they have little contact with peers on school. All
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children say they have only one to three friends. At school, six children find (analog) games or playing with toys the most fun activities to do with others. Most children perform relatively well at school and have little difficulty with the teaching material.

All children indicate that they challenge physical or verbal annoying behaviour of peers, or a combination of both, in their daily lives. All interviewed children report they are facing this frequently, at least once a week. According to the interviewed children, their usual reactions to difficult situations are either an angry verbal or physical counter reaction (called six times) or retreating from the situation (called four times). What helps the interviewed children in difficult social situations differs. Sometimes it is in objects; ‘I have a string that I tie when I’m angry or when I actually just want to walk away’. Sometimes help is in the help of peers; ‘but then I have to know them and trust them for a long time’. The parents and professionals additionally indicate that unpredictable situations and situations with a lot of stimuli can be difficult for children with ASD. One mother describes: ‘my son can hardly shut himself off from children who are very crowded’. Parents and professionals also indicate that behaviour of others that is interpreted as annoying causes many difficulties for children with ASD in social interaction with peers, in which they explicitly explain the cause to the child with ASD and his or her interpretations of social interaction and not to the behaviour of other children.

The situations set out in the empathy map concern situations in which the children do not know how to act in difficult social situations. These situations often create a feeling of anger or frustration. Because of these emotions, the children tell that they are no longer able to think carefully and act purely on the basis of their emotion, which often results in an escalation. Another noticeable finding of the empathy maps was that children attribute the annoying situations they encounter mainly to the behaviour of others, parents and professionals attribute it more to the lack of social skills of the child with autism itself.

An element of social behaviour that, according to professionals and parents, could be improved, is the insight into the emotions, wishes, and needs of others. However, according to one of the professionals, this is quite an ambitious goal: ‘real understanding of others may be too much to ask. Understanding that someone else could want or think something else would already be a huge step forward’. Another professional states: ‘If a child is better able to deal with difficult social situations, it is learned behavior. It will never be or feel natural for the child’. A number of professionals also indicate that children do not always share the vision on formulated development goals of the professional for the children. Children mainly want to be accepted by their peers and do mostly not see the link between the formulated development goals and being more accepted by peers.

Although interpreting emotions is according to the professionals and parents one of the weakest abilities of the children with ASD, seven of the eight children mentioned the emotions of the children in the scenes in the pictures which have been presented at the end of the everyday life section. They explicitly mention that the children are laugh-
Social skills training

Most of the interviewed children followed a social skills training because of the problems they were facing within social interaction with others. All the interviewed children, on beforehand, were reluctant to go to a social skills training. Do not knowing the other children in the group and low expectations on finishing the training positively were the most mentioned reasons. The interviewed children often experienced shame around participating in social skills training, they mention that they didn’t want to mention it at school to their peers. Also, children do not see the added value of social skills training in relation to the problems they encounter in daily life. The children mainly want to be part of the group at school and feeling accepted by their peers. The interviewed children do not see how social skills training is of any added value to pursue that goal.

According to the children, the training itself builds on a broad spectrum of assignments, such as for example role-playing exercises in which situations are played out. The children experienced the content within the training sessions mainly positive. The training also included homework assignments, only two children completed those homework assignments: ‘I completed the homework assignments because I could earn rewards for it’. Four respondents indicated that the training did have an impact, but they found it difficult to indicate what the specific effects were. One child says it helped him to deal with anger: ‘I learned to get angry less often, but I don’t know how I learned that.’ Other effects include being better able to solve difficult social situations and learning to deal with the annoying behaviour of other children, for example: ‘I let other children say what they want, but I don’t react to it anymore’. Finally, all the children got along well with some other children of the group. Five out of eight children even made friends.

Two of the parents indicated that the reward system for homework assignments was a success for their child. All parents mention a positive change for their child as a result of the training but find it difficult to clarify what the change consists of. One of the parents indicated that social skills training is not sufficient, because the training is too short to really learn new social skills.

According to the professionals, the role of parents and teachers is important for the outcome of the social skills training: ‘To ensure that the learned skills in social skills training have a sustainable impact, you need teachers and parents.’ According to all professionals, children with ASD should not be expected to make the transfer by themselves: ‘the transfer must first be made by others.’

When practicing assignments, it is important to practice in other situations and contexts. For example, a professional explains:
‘Practice in other places with a skill is very important. If you learn something during the social skills training, it does not necessarily mean that you can perform it in another situation, because generalizing is very difficult. You can make small steps forward by practicing the same thing in different situations in different contexts.’

According to all professionals, it is important to practice at school because that is the place where children need their social skills the most. In practice, practicing at school doesn’t happen very often, at least not in the social skills training the interviewed children attended to.

**Video games**

All children who have been interviewed say they like video games. They play video games very frequently. The children mention that they especially like to build or adjust things themselves. This can be customizing a car, hovercraft, whole environments or the avatar you play with. According to the children, playing a game with others can be fun, whether cooperative or against each other. However, some children also mentioned that other players can be annoying. One of the children: ‘If I have built something and they are going to demolish it all the time it’s very annoying.’

According to the professionals, the preference for games has a specific cause:

‘The social interaction through games is especially preferred by children with ASD because face-to-face contact is difficult for them. So, playing games is actually avoiding face-to-face contact and going for contact via a screen. I think it would be better if the children would succeed to have face-to-face contact.’

This professional also thinks that children feel safer in the digital world: ‘you can be who you want to be; an insecure boy of 9 may present himself as a tough 14-year-old’. Another professional adds: ‘For children with ASD, it is very difficult to interpret the non-verbal signals. For children with ASD, these signals are distracting stimuli that complicate the factual information.’

Parents are more positive about video games than professionals. In the questions about the added value of a digital application that helps children to learn social skills, one of the parents mentions that something can be learned in a safe and familiar environment. Another parent mentions that it is important that playing the game should not be a ‘must’. Within games, different learning goals can be integrated. Goals in the game can be to learn to deal with loss and setbacks, to learn values, and to experience the consequences of specific behaviour. One of the parents mentions as an idea for a game:

‘Attracting a child to a wrong situation would be a good idea. If the child correctly assesses the situation and remains away from trouble, the child receives bonus points. But, if the
child nevertheless commits to this wrong situation, the child must do extra assignments to get out of it.’

Within the game, it can be of added value for parents to have insight into what the child is doing in the game. The parents can ‘learn from the way the child learns’. However, the child must be given the opportunity to start the game without his or her parents.

<table>
<thead>
<tr>
<th>Persona A</th>
<th>Persona B</th>
<th>Persona C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sara</td>
<td>Max</td>
<td>Joris</td>
</tr>
<tr>
<td>Female, 9 years old</td>
<td>Male, 8 years old</td>
<td>Male, 11 years old.</td>
</tr>
</tbody>
</table>

Table 1. Persona overview.

Three personas were created, 2 boys (Joris and Max), and 1 girl (Sara). Table 1 provides a summary of the three personas. The persona descriptions of Joris (Figure 8), Max, and Sara contain interpreted data from the focus groups and stakeholder interviews. The results relating to the (1) daily life of the children, (2) social skills training and (3) have been given an explicit place in the personas which will serve as a compass in the following phases of the design process.

The personas have some notable characteristics: the children are doing relatively well at school in terms of results, but in the social field they all have a harder time. All the children were reluctant to social skills training, but also made friends at the training. All children like games, especially the aspect where things can be customized to their
own taste. Finally, within games, the children are communicating with others, or they like to play games with others.

**Discussion**

Principal findings and implications for design

In this study, we found confirmation that children with ASD often face challenges in social situations, especially at school in contact with peers. School is pre-eminently the place where the learned skills from social skills training should be put into practice, which is hardly the case with the interviewed children. Although some children indicate that they have benefited from the training, professionals and parents indicate that it is not expressed enough at school. The interviewed children regularly turned out to be victims of physical or verbal violence by their peers, phenomena that previous research reported as well [1,2]. The children themselves do not blame the difficult social situations they encounter at school as a result of their lack of social skills. They just want to be part of the group and don’t see the connection between social skills training and being more accepted by their peers at school. For design, this means that an intervention which is aiming to do both, facilitate the children to connect and interact with their peers and stimulate and train social skills, is more likely to be successful. An intervention which can do both means an intervention which facilitates children and professionals and parents to pursue their personal goals. This means also a shift in focus because most existing interventions were built to pursue the (therapeutic) goals of professionals only.

School is the most important place where children should benefit from social skills training. None of the children have followed social skills training at the school or in a school like setting, which is noticeable, because earlier research indicates that it could significantly increase the chances of success for social skill training [19]. Moreover, the professionals say that there is too little transfer from social skill training to school, something previous research indicates as well [22,21]. Children and parents do find the current social skill training courses useful, but children do indicate that they are not looking forward to it beforehand. Making friends is an important outcome of social skill training for various interviewed children, which indicates that connecting with peers is important for the children.

Although professionals indicated that children with ASD aren’t good at interpreting emotions and are more likely to focus on factual information, most of the interviewed children mentioned the emotions of the children in the submitted photographs. Throughout the interviews, it was more often noticed that the professionals were reasonably conservative in their appreciation of the children’s skills. For the design of an effective intervention, this makes it even more important to keep the children actively involved in the design process, to continuously verify whether assumptions and statements of others about the target group are correct.
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Some children indicated that they communicated a lot with others in or during playing video games; video games offer them a safe environment, especially for communication. Professionals don’t appreciate this and find face-to-face contact superior, even when it comes to playing a game together.

We found that the interviewed children play video games a lot in their spare time, just as earlier research indicates [27]. What all interviewed children like the most within video games are building and customizing things, like customizing a car, buildings, environments or the avatar you play with. Parents see lots of possibilities in developing digital game-like interventions for social skills training, especially to motivate children and offer them safe learning environments, characteristics of games and game-like interventions which are described in earlier research as well [25,26]. For design, this means that a new intervention should offer a good coherent (game) experience, to attract and keep the attention of children who have a high standard in this area.

The personas offer the designers a lifelike representation of the obtained insights. Through their narrative-based form and authentic representations, they provide a consistent picture of the target group between the different stakeholders of the project. They will be used for within-team communication, will help in generating and shaping ideas and as can be used as a compass for making design decisions. Although personas are not replacements for face to face contact with children in the design process, good personas can continuously be used as a user-centered compass for the design process. The face to face moments cost more in terms of organization and also require an effort from the children, which makes it necessary to think carefully about when this is really necessary for the design process.

The used user-centered design approach, following the first steps of the Design Research Framework, led to an in-depth investigation and analysis of the initial (design) problem. Through this approach, we have discovered that the problems and needs which children with high-functioning ASD experience in their daily life are not entirely in line with the more theoretical approach of the professionals or from literature. If we had taken the theoretical description of the target group for granted and used it as a starting point for the design process, there would probably have been designed yet another therapeutic intervention that would have focussed on the training of the social skills alone and the actual needs of the end users would have been insufficiently addressed, which inevitably would have led to a different design. Although the specific characteristics of the children who took part in this study will not apply generically to all high functioning children with ASD, this study learns that the particular method of research applied in this study leads to a good and in-depth analysis of a design issue, and, eventually, to a more appropriate design.
Strengths and limitations

Because the target group is small and difficult to reach, the researchers have made use of their contacts within the child and youth psychiatric institutions, which have selected the participants. Although this was done on the basis of inclusion criteria, the professionals involved will most likely have made an extra selection for suitability for an interview. By highlighting as many perspectives as possible, through the use of different methods and by interviewing the parents and professionals as well, an attempt was made to form the best possible picture of the target group.

The small sample size makes this research just a small window into the views and daily lives of the target group. The focus groups and stakeholder interviews were exploratory and helpful for the further (user-centered) design process, the results are not and not intended to be generalizable or to offer authority in any general interest.

Conclusions

Children with ASD regularly face challenges in social situations, especially in the school context. The user-centered approach of this study makes clear that children with ASD mainly want to be part of the group and interact with their peers, parents and professionals think that training social skills is important to pursue this goal. A new intervention will have to bring together both goals to be successful. Also, if this new intervention focuses on the school context as the context of use, it will have a higher chance of success and a higher chance to establish transfer.

Game-like interventions offer sufficient starting points to explore in order to develop more attractive and more suitable interventions for the target group. In video games and other games, children with ASD can already communicate well, which indicates the potential for a game-like intervention. This also means that the standard for games is high and that a new game-like intervention should provide a coherent (game) experience to attract the attention of children. The personas bring the collected insights into life and are valuable for the next steps of the design process.
References


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https://books.google.com/books/about/The_Gamification_of_Learning_and_Instruc.html?hl=&id=M2Rb9ZtFxccC


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