Co-creating Inclusive Interviews: VR technologies for job interview training of individuals on the autism spectrum and strategies for employers

By

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ABSTRACT

This paper reported on the research of how to use Virtual Reality (VR) technologies and Video Self-Modeling (VSM) techniques to structure job interviews so that individuals on the autism spectrum could more easily provide the information that employers seek. The paper also addressed the use of the same technologies for job interview training by informing the affordances of a different structure of behavioral interview questions. The participatory research comprised two phases, Phase 1: co-design development and deployment, and Phase 2: co-design evaluation and revision. It was rooted in an iterative and inclusive process that generated an app with a scaffolding sequence of behavioral interview questions to address different verbal abilities of individuals with Autism Spectrum Disorder (ASD). It resulted in the creation of strategies for employers such as the Inclusive Interview Guide for Employers and specific question inputs. This co-creative method generated technologies and procedures that could be used by individuals on the autism spectrum, as well as by employers, employment agencies, and ASD support programs. It demonstrated a process by which to communicate better with individuals on the autism spectrum.

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DEDICATION

To my son Teo, who teaches me every day the power of unconditional love.

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INTRODUCTION

Virtual Reality (VR) job interview training for individuals with Autism Spectrum Disorder (ASD) is a new topic to the research community, and there are not many studies on this specific subject matter. Therefore, my approach to the literature search includes breadth and depth of knowledge as it relates to the ASD population and VR; education of individuals with ASD using VR, or video modeling (VM), or video self-modeling (VSM); and employment and ways to increase it. The keyword search terms are *Autism Spectrum Disorder*, *VR*, *employment*, *interview*.

Several search engines have been used for the literature review: Google Scholar, JSTOR, Elsevier, PubMed (NCBI), Springer Link, and IEEE. The literature review includes relevant studies located by lateral searching of references. It comprises reports on issues and initiatives by various government and specialized agencies. It also contains case studies that focus on using VR in teaching the ASD population; studies for job interview training of individuals with ASD; and studies on the use of VR in job interview training for individuals with ASD.

ASD and Employment Rate

The National Autism Spectrum Surveillance System (NASS) was Canada's first national level surveillance-system to register all the individuals affected with ASD. NASS's findings revealed that 1 in 66 children and youth were identified as being on the autism spectrum (Autism Ontario, 2018).

ASD can be defined as a lifelong neurological difference that affects a person's behavior, communication, and social interaction. It influences how a person perceives and interacts with the world around them (Autism Ontario, 2018).

Furthermore, many individuals on the autism spectrum have additional mental health issues (84%) and co-occurring disabilities (87%), with a learning disability being the most common. They need support, aids, or assistive devices (53%). Due to the number of additional concurrent issues, 35% do not have a

high school diploma. The lack of education combined with coinciding struggles results in a 67% unemployment rate as per the Canadian Survey of Disability of 2017(Government of Canada, 2020).

Changing the employment status of individuals on the autism spectrum can lead to more independent living and a higher quality of life. The initial stepping-stone to this is the job interview. Therefore, the job interview became the focus of the research, with an emphasis on the use of behavioral questions. This research aimed to explore the following: VR as a means for job interview training; the structure of behavioral interview questions; and ways to apply these two approaches more inclusively. The co-creation process of development, deployment, evaluation, and revision was done by all parties involved, participants, and researcher alike.

Employment Initiatives

The literature review included current employment strategies and initiatives to address the low employment rate of individuals on the autism spectrum. The intent was to understand the complex employment system and whether VR job interview training for individuals on the autism spectrum could be applied more inclusively.

The review of the literature revealed that there were many successful vocational training programs implemented during secondary education for individuals with ASD (Welham et al., 2014) but not many for adults on the autism spectrum. Due to a high unemployment rate, the Canadian government launched the Blueprint for National Autism Spectrum Disorder Strategy (the Blueprint) along with a substantial fund release (the Fund). The Fund dedicated 9.1 million dollars over five years to support innovative community-based projects designed to help individuals with ASD (ages 15-29) better cope with the challenges of living with the condition. It included five action areas, one of which was employment. The program that resulted from these initiatives was Worktopia, a program offered by the EmploymentWorks Canada Centre. Worktopia is part of the employment action area, providing pre-employment training for young adults on the autism spectrum. Through this program, individuals with

ASD learn to define their goals, deal with workplace challenges, and practice the communication and social skills necessary for future employment (Chowdhury, 2017).

The Spectrum Works Autism Job Fair in 2019 proved that there has been an increase in employers' awareness of the abilities of people on the autism spectrum (Simmons, 2019). In a similar vein, there is Specialisterne Canada, an employment agency that focuses on employment strategies for individuals with ASD who have completed higher education within the IT industry (Specialisterne, 2013). However, despite the rise in initiatives and programs such as one run by the Dan Marino Foundation—and many new employers open to hiring individuals with ASD—the unemployment rate for individuals with ASD is still extremely high.

VR benefits

Most studies of VR as an educational tool were done with children on the autism spectrum. VR technology helps children with ASD improve their contextual processing and cognitive flexibility (Wang, Reid, 2013). Therefore, if a VR environment is carefully designed, it can provide students with more accessible contextual learning (Lan et al., 2018). The customizable aspect of VR environments allows for creating various domains where parameters could be adjusted as per each individual's needs. Garland et al. (2012, 511) emphasize the importance of this individual adjustment, referring to it as "instruction delivered with high fidelity implementation." The flexibility of VR, where steps could be repeated as many times as needed, allows for the degree of autonomy required by each learner since children, who are the same as adults with ASD in this regard, "follow their own agenda when learning" (Hentschel & Lange-Küttner, 2019, 191).

Like children, adults with ASD benefit from the flexible options inherent in VR to accommodate their individual needs and unique learning styles. White et al. (2019) suggested that this customizable aspect of VR interventions benefits students in higher education. Most of the studies on the use of VR

technology to improve the quality of life of adolescents with ASD were found in the *Journal of Autism and Developmental Disorders.* This journal has been the most productive in the area, as established by the bibliometric study done by Fernández-Herrero et al. (2018). Articles published in the journal explore using VR to treat fears and phobias in individuals with ASD by way of cognitive and behavioral interventions (Maskey, 2014). Some articles point to VR as social imitation learning (Simões, 2014) and social cognition training (Yang et al., 2017). VR's adjustable features allow simulation of environments in which complexity is reduced, thereby enabling ASD individuals to learn social skills, social cognition, and social functioning (Kandalaft et al., 2013). Individuals with ASD experience VR environments as "safe to explore social risk-taking" (Gallup & Gallup, 2019, 226).

VR Job Interview Training & VM

Although many studies show the benefits of VR for individuals on the autism spectrum, only a few have dealt with VR job interview training (Strickland et al., 2013, Smith et al., 2014, Burke et al., 2017.)

Strickland et al.'s (2013) study comprised a number of components including online training; role-play interview sessions for a hypothetical position; one VR job training session including feedback; and repeated role-play interviews to measure performance improvement. The VR session consisted of two avatars: an interviewer and an interviewee. However, the avatar interviewer was led remotely by a clinician, and the participants had only one VR session and no opportunity to rehearse. It represents the main difference between Strickland et al.'s(2013) study and the studies by Smith et al.(2014) and Burke et al.(2017)—namely that Smith et al.(2014) and Burke et al.(2017) used humanoid avatar interviewers. Smith et al. (2015) also had role-play interviews as a baseline and an e-learning module with resume building. The VR program randomized 1,000 questions and selected them based on participants' resumes. The VR feature also included a *coach* function to help participants with responses. There were 2,000 ready answers that the coach would offer participants if they needed help. The Burke et al. (2017) study included one baseline VR session, four practice VR sessions, and role-play interviews. Although all the studies reported improvements in participants' performances, Strickland et al. (2013) and Smith et al.

(2014) used role-play interviews for hypothetical positions, and participants in Burke et al.'s (2017) study had 14-week training with embedded curriculum for a particular job position and interview process.

Although these studies offered participants help with answers either in the form of a coach avatar (Smith et al., 2014) or educational training (Burke et al., 2017), they did not explore alternatives for interview questions. Additionally, none of the studies included participants in the development process or in conducting the data analysis.

Video modeling (VM), which is when individuals watch a video recording of someone performing a skill in order to learn that skill, or video self-modeling (VSM), which is when individuals watch a video recording of themselves and learn how to change something in their performance, can be a powerful learning strategy for individuals on the autism spectrum. VM can be even more effective than immersive VR, which places a person in a virtual environment (Fitzgerald et al., 2018).

Interview Questions

As per Huffcuff (2011), the analysis of the employment interview construct literature shows that "the twin interpersonal constructs social skills and verbal expression appear to have some of the strongest correlation with interview ratings" (Huffcuff, 2011, 74). Individuals on the autism spectrum struggle with interpersonal and communication skills, which would result in a low interview rating despite their educational achievements and qualifications for the position. For a person on the autism spectrum, job interviews are very challenging.

The interviews usually consist of behavioral, situational, and specific job components (Structured Interviewing, n.d.). The behavioral element seems to be the most difficult for individuals on the autism spectrum because of the broad nature of behavioral interview questions. Some of the research literature suggests considering volunteering and school experience as transferable skills, since individuals on the autism spectrum usually do not have a lot of work experience (Autism Speaks, 2013, Fraser, 2016). Fraser (2016) also suggests rewording questions to be more experiential.

Additionally, each interview should consist of questions regarding fundamental skills, personal management skills, and teamwork skills (Employability Skills, n.d.) Nowack (n.d) confirmed the importance of these components in his *Personality View 360: Structured Behavioural Interview Guide*.

Purpose of the Study

The unemployment rate of 67% for persons with ASD demonstrates that traditional hiring approaches are not favorable to individuals on the autism spectrum. The ongoing communication challenges affect their prospects of employment. The main factor in getting a job is a powerful job interview performance. It is difficult for an individual on the autism spectrum to realize a successful job interview performance despite their talents and qualifications for the position.

The recent employment initiatives demonstrate the new direction that is being taken to support individuals on the autism spectrum to be successful in gaining employment. However, very few of these initiatives prepare individuals on the autism spectrum for a rigorous interview process. VR environments are beneficial to individuals with ASD because of their customizable nature, the possibility of realistic simulations, and the opportunity for repetition of the trials until the task is mastered. There are not many VR simulations of job interview training, thereby leaving a significant gap in the literature and a need for further research. Contrary to the existing VR job interview studies, I wanted to explore with this research *behavioral interviews* and *broad interview questions*. In consultation with others interested in these issues, I tried to answer the following research questions:

- How can VR/VSM technology be used for job interview training of adolescents and adults with ASD? How can the same technology be used to structure job interviews so that individuals with ASD can more easily and better provide the information employers seek?
- What are the affordances of the different structures of behavioral interview questions?

In conducting this research, my highest priority was that it be participatory research, where participants were included in all the co-creation process phases: development, deployment, evaluation, and revision.

METHODOLOGY

The *quality* or well-done, meaningful, and useful research involving individuals on the autism spectrum is based on person-oriented ethics, including individualization, acknowledgment of the lived world, empowerment in decision-making, respect for holistic personhood, and a researcher-participant relationship (Cascio, Weiss, & Racine, 2020). As an individualization segment, this research included an assent form with simplified language; an option for text on the screen during semi-structured interviews; visuals for all the prototyping; and optional support (one participant had a support worker). This research acknowledged the lived world of participants by inviting parents and significant others who play an important role in their lives/world to view video recordings and provide feedback. The participants' session schedules and changes were respected and accommodated. Additionally, I, as a researcher, shared with participants my lived experience, disclosing that my interest in the topic came from having a son on the autism spectrum. As participatory research, participants were involved in the co-design process of development, deployment, iterations, and testing the prototype, rooted in an iterative and inclusive process shown in Figure 1 (green color indicates co-design iterations that included participants).

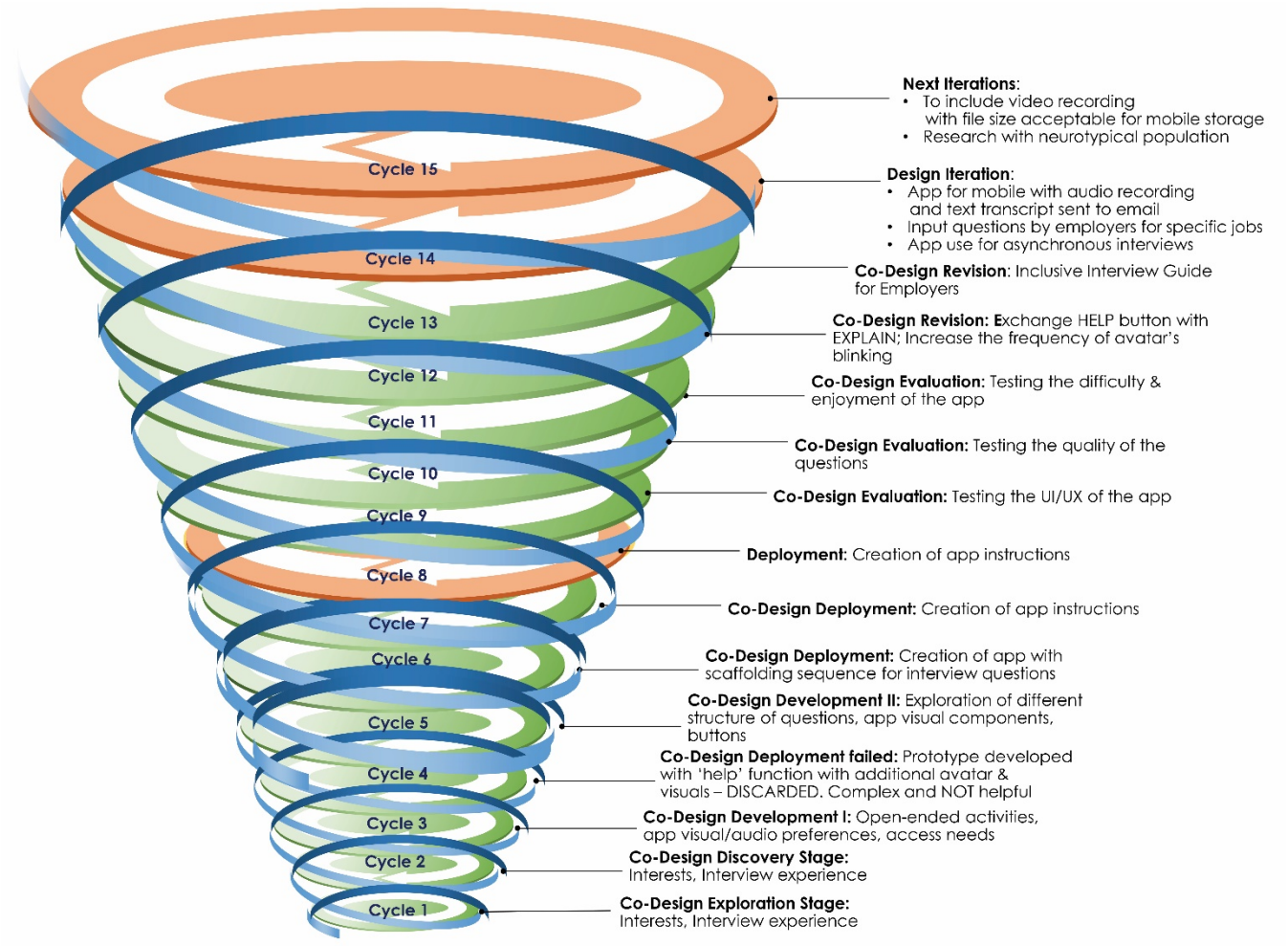


Figure 1. Virtuous Tornado: design iterations of the inclusive process of the research

The research suggests that the biggest challenge in conducting quality participatory research is power-sharing (Nind & Vinha, 2014, Hagen et al., 2012, Reason, Bradbury, &Wicks, 2012). Additionally, it further indicates that there needs to be trust and openness to address the power imbalance. Therefore, participants were invited to share their interests and participate in discussions other than a research topic to facilitate trust-building. They talked about the love of singing, online games, and shared their Anime work. They were shown respect as individuals, not only as research subjects. The honorarium was mailed to each participant with a personalized message to express gratitude for their participation, and follow-up confirmation of their receipt of it was done via email.

All the participants, stakeholders, and stakeholder organizations will continue to be included in the dissemination of the results. The accessible format will also be provided to all the parties (**see Appendix A**). It represents the final segment of the person-oriented ethics that this study strived to achieve.

METHOD

Ethical approval for the research was received from the Research Ethics Board at the OCAD University, Toronto, Ontario (Ethics Approval Number 2020-52). The research consisted of Phase 1: Co-design development and deployment; and Phase 2: Co-design evaluation and revision. The purpose of Phase 1 was to allow participants to share experiences and to explore visual and audio preferences and accessibility features that would inform the following prototype. Phase 2 was the process of analysis, during which the app went through an iterative process.

Participants

There were two participants in Phase 1 of the study (P1, P2) and three participants in Phase 2 (P2, P3, P4). One individual who participated in Phase 1 (P2) expressed an interest in being part of Phase 2, for which she signed a separate consent form. During Phase 1, assent and parental consent were obtained as participant P2 was a minor at that time. At the time of Phase 2, the same participant reached adulthood and signed a consent form. Therefore, P1 and P2 were the participants in Phase 1, while P2, P3, and P4 were participants in Phase 2.

Participants in Phase 1 were recruited through community organizations. P1 came from a special-care facility for adults with complex needs. P2 was recruited through a local community-based center delivering a social development program for young adults with intellectual disabilities, including ASD. Participants P3 and P4, who were part of Phase 2, were recruited through a consulting-service organization that provides solution-based assistance to individuals with ASD. The recruitment poster was included in the quarterly newsletter of the consulting-service organization.

All the participants were identified as on the autism spectrum and were older than 16, which constituted inclusion criteria. Additionally, participants had to satisfy technology requirements to be part of the study, which had to be conducted online due to the pandemic. Participants had to have a

laptop or computer with a camera and internet access. One participant (P3) was acquiring a new laptop, so she used her mobile phone instead for all the sessions.

Participants asked that their first names be used, so, going forward in this paper, I will refer to them by their names.

Table 1 Participant Identifier-Name Description

Identifier	P1	P2	P3	P4
Name	Shemar	Christina	Olivia	Nicholas

Phase 1: Co-Design Development and Deployment

Phase 1- Process

Phase 1 of the research consisted of four sessions. Each session was 30 minutes long. For each session, an email was sent containing the link for a Microsoft Teams meeting (video conferencing tool). Participation was ensured through screen sharing in Microsoft Teams, and sessions were recorded with participants' permission. One individual attended all four sessions; the other participant could do two merged sessions at once (duration – 1 hour). This combined session could not be recorded due to technical difficulties, so it was treated as an observation and data extracted from extensive notes taken during the session. After the last session, participants were thanked and offered an honorarium of a $20 gift- card. Shemar had a support worker present during the session.

The prolonged recruitment process, timing, and scheduling conflicts resulted in separate co-design sessions. Sessions 1 and 2 with the first participant were part of the initial exploration stage. They were conducted as semi-structured interviews, which provided insight into the participant's interests, online

activities, volunteering or job experience, and volunteering or job interview-experience. Session 3 was part of the discovery stage. Through a semi-structured interview and PowerPoint slides, the participant was invited to draw upon their experiences with similar scenarios that could inform their proposed designs and which they had previously experienced as successful or enjoyable. Session 4 included prototyping with open-ended activities where the participant explored the app's visual and audio aspects, such as avatar, setting, and voice (i.e., computer-generated vs. human). The app also included an accessibility feature—closed captioning. The help option with an additional avatar was also examined. It was supposed to provide more specific questions, supported with visuals, to clarify the broad interview questions (shown in Figure 2). However, it added to the complexity and was not effective in the provision of help. It was reconsidered, and the new approach was explored with the second participant.

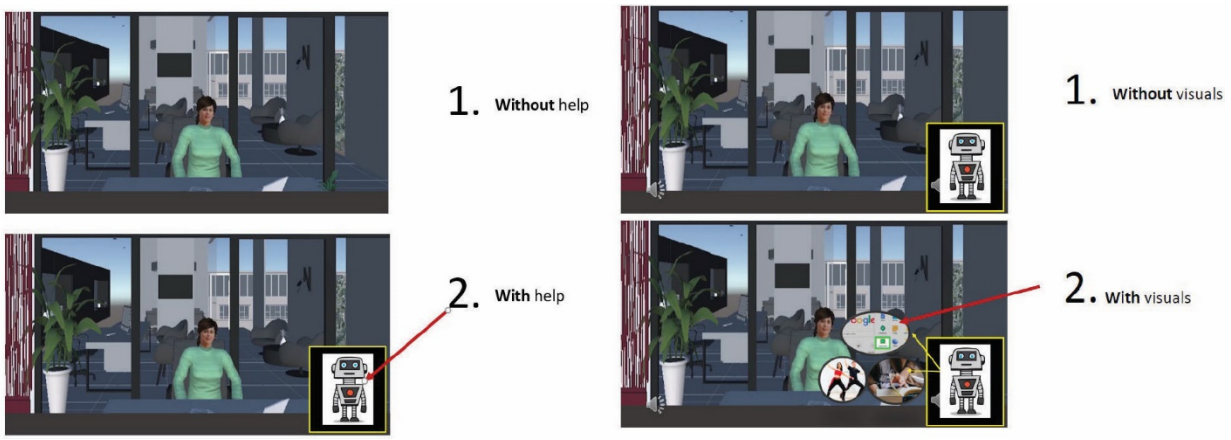


Figure 2. Exploring the idea of help avatar (robot) with supporting images

The second participant of Phase 1 explored the different structure of behavioral interview questions as a help feature. He also defined the difficulty of the questions, as shown in Figure 3. The session's result demonstrated that if the participant needed help, they would select the "help" button, which would lead to a more specific question, requiring a short "yes" or "no" as an answer. After having selected either "yes" or "no," the participant would be prompted to answer an additional question. The improved help function provided the scaffolding sequence for each interview question. It was more

efficient as the questions were more explicit, easier to answer, and encouraged the participant to provide more information.

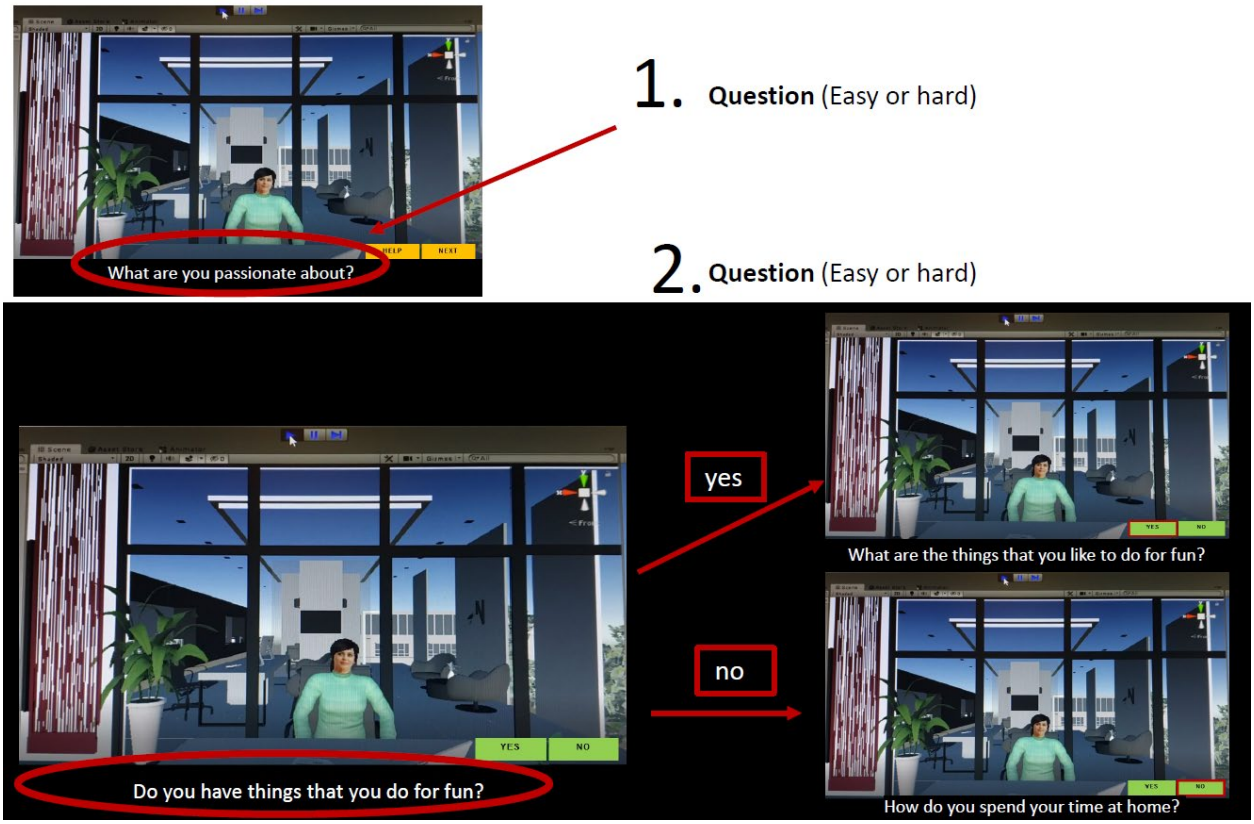


Figure 3. Exploring the different structure of the behavioral questions

Phase 2: Co-Design Evaluation and Revision

Phase 2 – Process

There were four sessions with participants in Phase 2 of the research, and each session was 40 minutes long. At the end of each session, participants were invited to draw from their life experiences not related to the research as topics for discussion. The discussion was on a voluntary basis, intended to demonstrate that participants were valued as individuals, not only as research subjects (Cascio, Weiss, & Racine, 2020). The discussion prolonged most of the sessions, with a maximum session duration of 2

hours. In the end, participants were thanked for their participation and offered a stipend of a $50 gift-card.

There was a total of 10 main behavioral questions. There were three questions per session for Sessions 1, 2, and 3, and one question for Session 4. The end of Session 4 was left open for final comments and closing remarks.

This general session-plan was modified and depended on participants' dispositions at the time of the session. All sessions were conducted through screen sharing in Microsoft Teams. At the beginning of Session 1, participants watched a short instructional video on using an app. As shown in Figure 4., the instructional video consisted of slides. Since participants did not have direct access to the app, they had to declare which button they would like to select, and the facilitator would carry out the task. For each question, a closed caption was displayed. It remained on the screen until the individual was ready to move to another question, allowing participants to reread the question and process the information at their own pace.

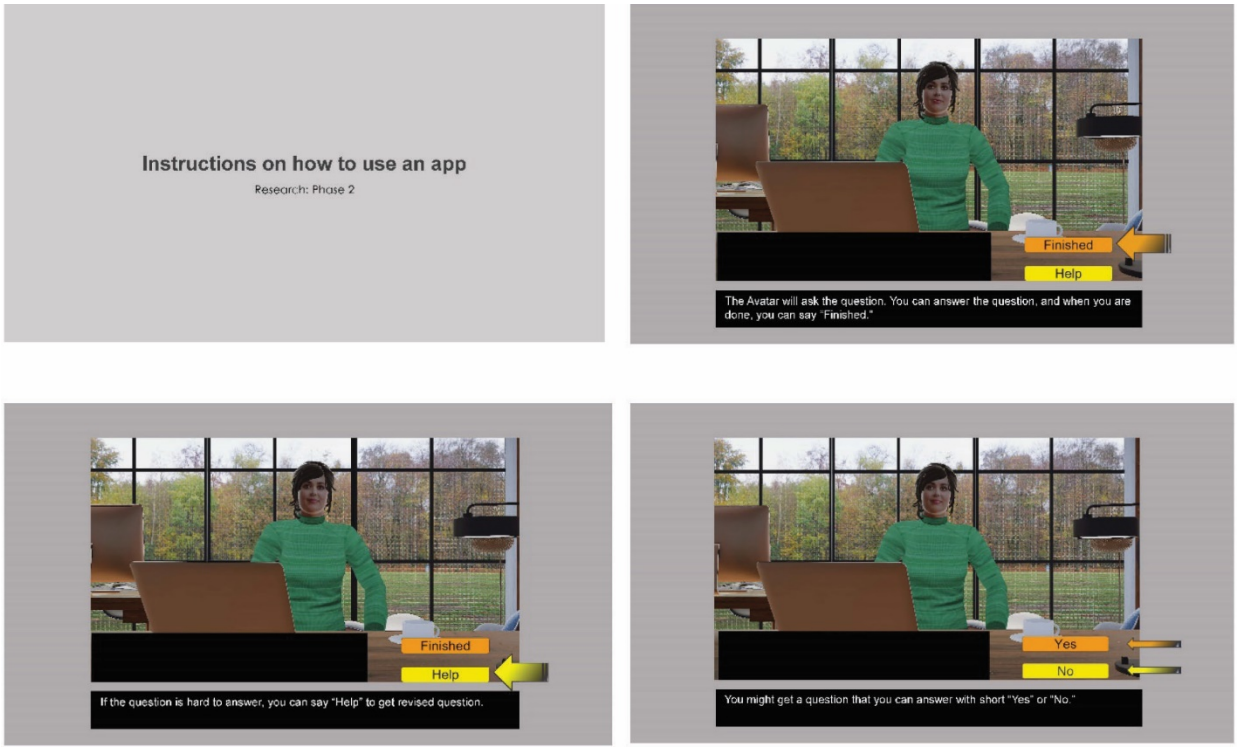


Figure 4. Instructional Video Slides

All sessions in Phase 2 consisted of three main activities:

1. Answering the questions
2. Responding to the survey
3. Analyzing the quality of the questions

Answering the questions

During the first activity, participants engaged with an app and committed themselves to providing answers to behavioral interview questions. If they knew the answer to the question, they would ask for the "finished" button to be selected, and the app would randomly choose another of ten main questions. If the participant did not know the answer to the question, they would ask for the "help" button. It would lead them to the more specific formulation of the same question, to which they could reply with "yes" or "no" as shown in Figures 5 and 6. Each of these replies would lead to an additional explicit question (**see Appendix B**).

Figure 5. App Question No. 2 Interface – Scaffolding Sequence

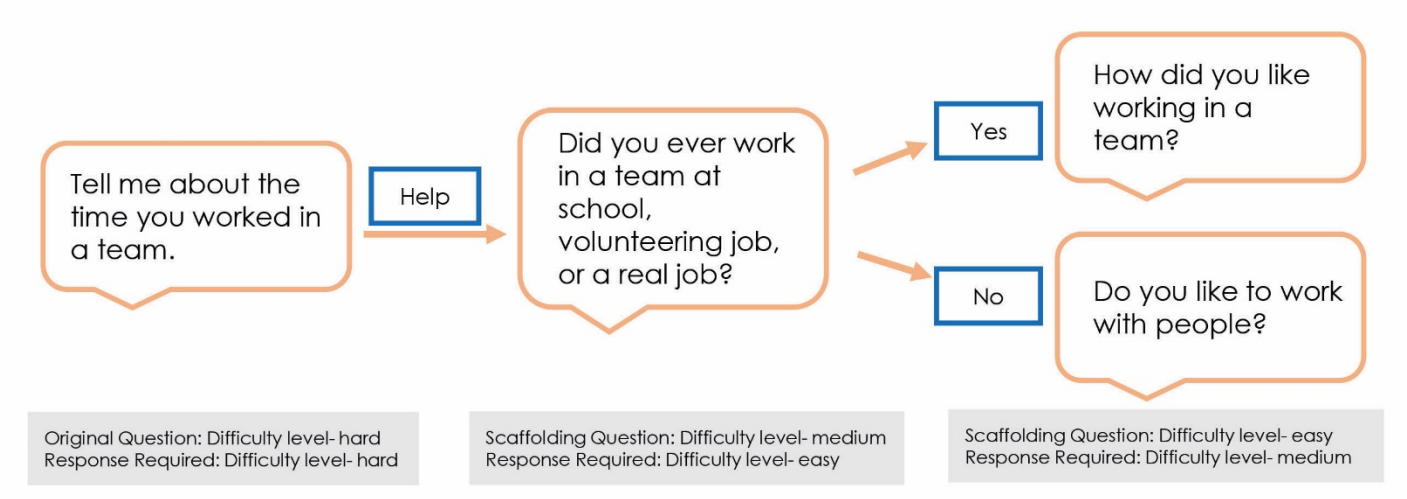
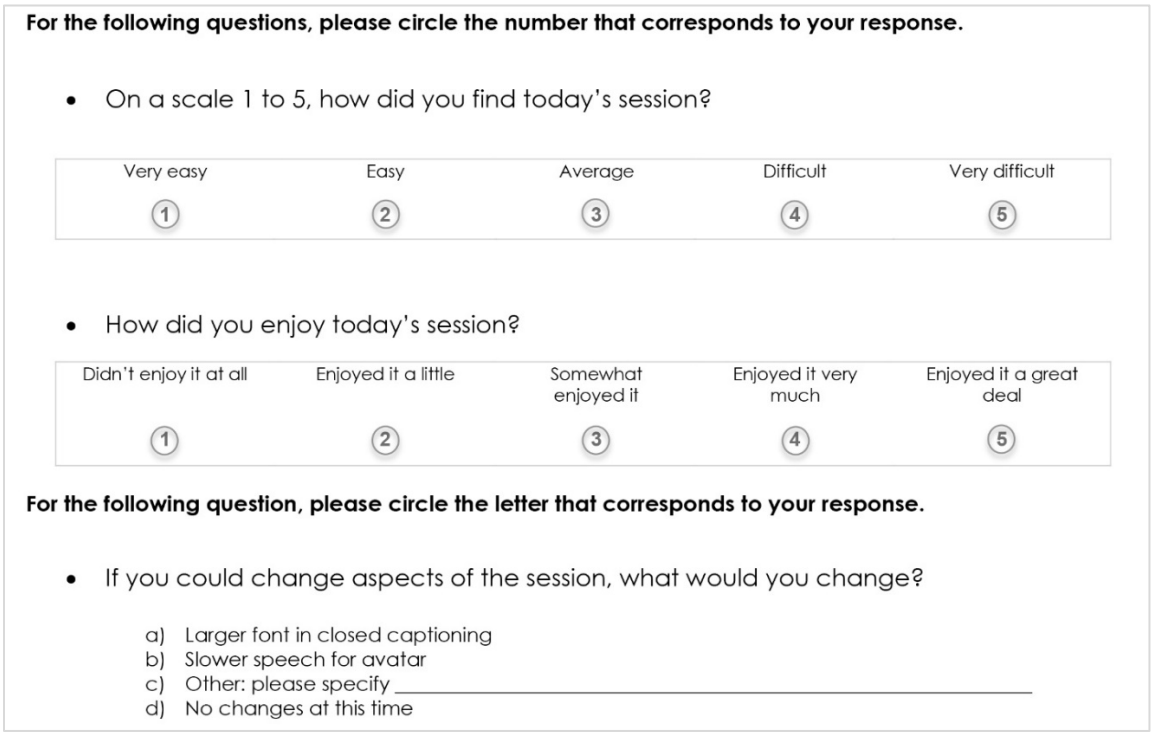


Figure 6. Representation of Scaffolding Sequence for Question No.2

Responding to the survey

After participants finished the first activity, they would respond to the Evaluation Survey shown in Figure 7. In this survey participants were asked to rate the session's difficulty from 1-5 using the Likert-type scale (Joshi et al., 2015, 398). Similarly, they were asked to assess their enjoyment of the session on a scale of 1-5. Next, participants were asked to note their assessment of the app and propose any adjustments to it (such as visual, audio, or any other of its features) or choose an option which indicated no proposed modifications to the prototype.



For the following questions, please circle the number that corresponds to your response.

- On a scale 1 to 5, how did you find today's session?

Very easy	Easy	Average	Difficult	Very difficult
①	②	③	④	⑤

- How did you enjoy today's session?

Didn't enjoy it at all	Enjoyed it a little	Somewhat enjoyed it	Enjoyed it very much	Enjoyed it a great deal
①	②	③	④	⑤

For the following question, please circle the letter that corresponds to your response.

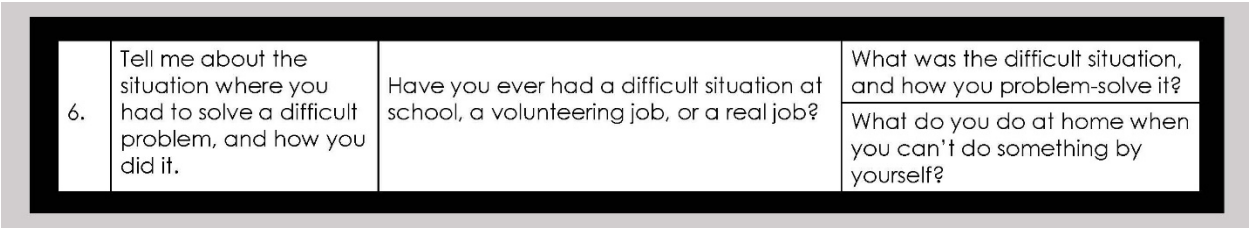
- If you could change aspects of the session, what would you change?

a) Larger font in closed captioning
b) Slower speech for avatar
c) Other: please specify _____
d) No changes at this time

Figure 7. Evaluation Survey Components

Analyzing the quality of the questions

For the last activity, the facilitator would use screen sharing and PowerPoint slides to display the text questions. Questions were shown one by one in the order the participant had been presented with them during the first activity. Each question was presented in its entirety of scaffolding stages (sample question 6 shown in Figure 8). There were "main," "help," "yes" and "no" questions, representing four stages in the scaffolding sequence. Participants engaged in the analysis of the quality of each of the questions. They were asked to provide suggestions on improving each question's structure, to define if questions were easy or hard to answer, and to propose alternatives to make the questions more explicit.



6.	Tell me about the situation where you had to solve a difficult problem, and how you did it.	Have you ever had a difficult situation at school, a volunteering job, or a real job?	What was the difficult situation, and how you problem-solve it?
			What do you do at home when you can't do something by yourself?

Figure 8. Sample Question 6

DATA ANALYSIS

All sessions were video-recorded using a web camera, a part of the Microsoft Teams videoconference tool platform. The exception was Shemar, who did two merged sessions that could not be recorded due to technical difficulties. All the information collected from this participant was recorded in the notes, and this data was treated as observation. Video recordings were transcribed using Dragon Professional speech recognition software operating from the PC, ensuring the confidentiality and security of the data. The researcher manually adjusted transcripts to match verbatim the video-recordings' content. The text segments of the transcripts were treated as codes. Data coding was conducted using NVivo for Windows Qualitative Data Analysis software. Data were analyzed using an iterative and inductive approach, identifying patterns of meaning that came up frequently to inform themes. The themes that emerged were reorganized with further iterations. The final result was the identification of the following themes:

1. Interview Quality

1a) Technology- app

1b) Video Performance Feedback

2. Questions- Scaffolding Affordances

2a) Question Creation

3. Communication

The first theme that appeared was the Interview Quality theme. Technology- app and the Video Performance Feedback were closely linked to it. All three themes correlated with the first research question. Theme 1 indicated how VR/VSM technology could be used to structure job interviews so that individuals with ASD can more easily and better provide the information that employers seek. Themes 1a) and 1b) related to the ways VR/VSM technology could be used for job interview training of individuals on the autism spectrum.

The themes of Questions- Scaffolding Affordance and Question Creation were associated with the second research question that explored affordances of the different structure of behavioral interview questions.

Theme 3 was a part of a broader category of secondary themes, out of which Communication provided the wider social context for this research. It is an over-arching theme, connective fibers that bind segments of this research to society as a whole. It demonstrates the need for and possibility of this inclusive matrix.

Each theme is schematically represented by a Theme Concept Map shown in Figures 9,10,11,12, and 13. The Theme Concept Maps demonstrate the process of qualitative analysis. They reveal data that were assigned specific codes, which, in turn, were grouped into nodes with similar properties. Nodes with similar attributes were further classified into sub-themes. A few sub-themes constituted each theme. The legend for the schematic representation of the categories is shown below each illustration (categories: theme, sub-theme, node, code).

1. Interview Quality

Figure 9. The concept map for Theme 1. Interview Quality

The first central theme that emerged from the data analysis related to the interview quality. The data collected in this theme correlated both with the quality of the answers participants provided and participants' interview experience or preparation.

Out of three participants who were part of Phase 2, one had both college preparation for job interviews and job interview experience. Another participant was interviewed once for a volunteer position, while the third participant did not have any interview experience. This information was categorized into three sub-themes: *No Interview Preparation, Interview Employment Preparation, and Interview Experience*. The data grouped into these sub-themes did not correlate with the number of times a participant

needed clarification on questions and used the "explain" function.

However, there was a correlation between data about the interview experience and the nature of answers participants provided, which informed the sub-theme *Quality of Answers.* Most of the answers participants provided were grouped into the node *Adequate Answers.* Other nodes, such as *Long Answers, Answers Related to Different Topic,* represented the groupings of either too-long or off-topic responses. The responses that were too personal or described negative traits and negative people were regarded as outside the adequate interview response scope.

Closely connected to off-topic answers was a sub-theme of *ASD Related Influences.* The participant who previously had job coaching provided concise and on-topic replies with some explanation. The other two participants struggled with the length, points that should be included, and whether the answer should be related to professional or personal experience.

> *Because one of difficulties I have is is when I start opening up and start talking about something, one of my difficulties and part of its from being on the spectrum, a big part of it I have trouble stopping or knowing what information is pertinent and important and what is unnecessary. That's something I am doing my best work on. (Nicholas, Phase 2, Session 3).*

Therefore, if participants could watch an instructional video before engaging with the app, the quality of the answers could improve. The instructions could provide a brief overview of the STAR Interview Technique (Doyle, 2020) and a few suggestions on the length and the topic of interview answers as per the following example:

RULES FOR EACH ANSWER:

- **S**ituation- provide the background of your story
- **T**ask- explain what was supposed to be done
- **A**ction- describe what you did
- **R**esult- report how it ended

GENERAL RULES:

- *Is the answer about the job?*

  Interview answers should always be related to work, volunteering, or school experience UNLESS you are specifically asked about personal things (i.e., things you do for fun, etc.)

- *What type of information to include in my answer?*

  Interview answers should always be related to people and situations you consider pleasant UNLESS you are specifically asked about an unpleasant situation such as a conflict with someone (i.e., to describe a situation when you didn't get along with someone)

- *How long should be my answer?*

  The answers' duration is different, but the answer should have more than one sentence and not be longer than five minutes as a general rule

1a) Technology- app

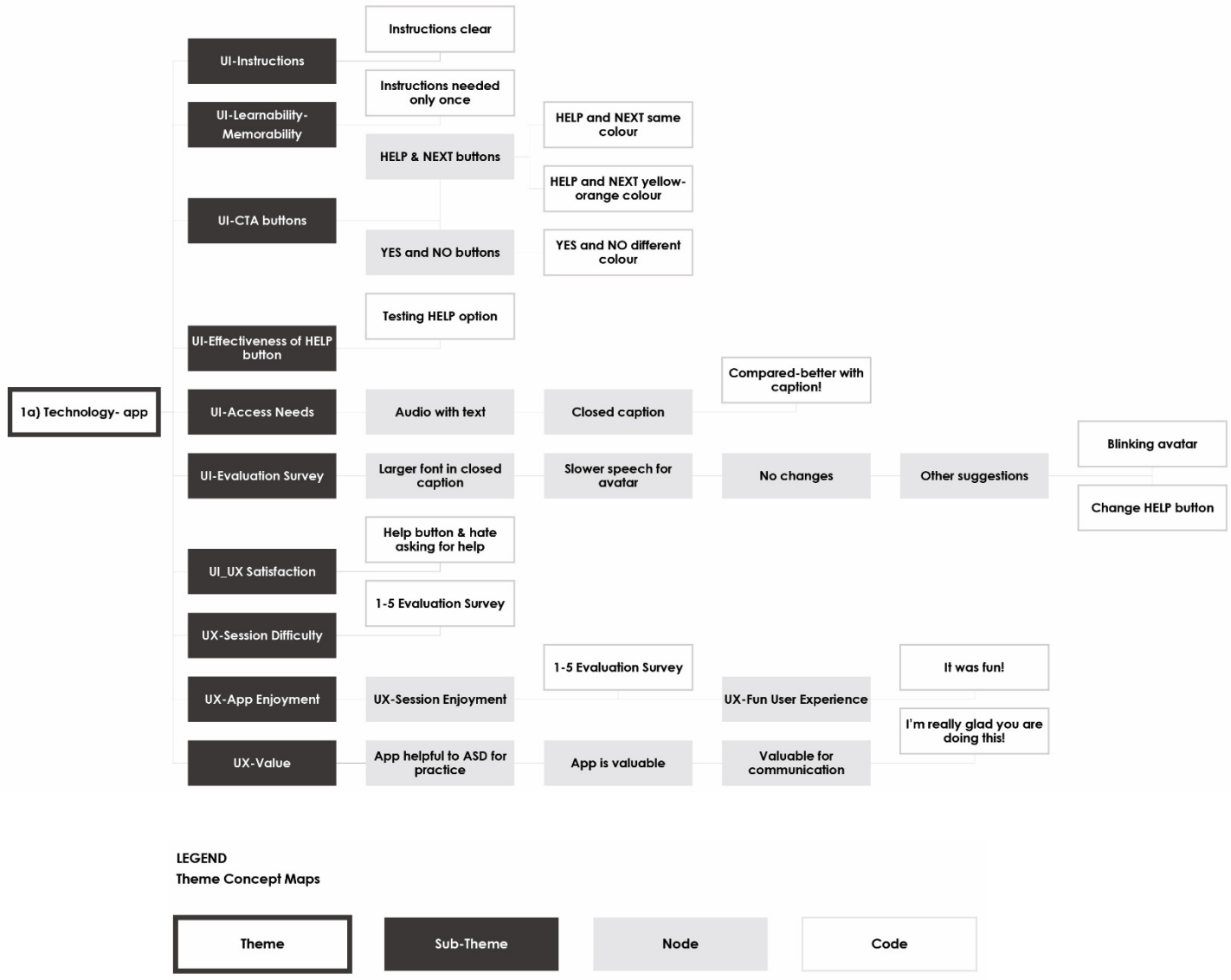


Figure 10. The theme concept map for Theme 1a) Technology-app

Another theme that emerged from the data analysis consisted of a few sub-themes that were related to accessibility, usability (UI), and user experience (UX). The sub-themes related to the UI revolved around UI design principles such as easy-to-follow navigation, making call-to-action (CTA) buttons clear, and user-centered design (Ye, 2017).

At the beginning of the first session of Phase 2, the participants watched an instructional video on using an app. The instructions were reported to be clear, and they needed to watch them only one time. This confirmed the easy-to-follow navigation UI principle.

The other UI design principle that was seen in the sub-themes was making CTA buttons clear. During the Co-Design Development and Deployment- Phase 1, it was discovered that the bright color was more visible to participants and that there should be a color differentiation between the two buttons that were shown on the screen. Therefore the buttons "finished" (formerly "next") and "explain" (formerly "help") became orange and yellow. For consistency, "yes," and "no" also became orange and yellow.

The user-centered design principles were reflected in the participants' choice to have closed captions with the interview-questions' audio (Phase 1). They also decided to have closed captions displayed for the duration of question-answering until they made another selection.

The Evaluation Survey that participants did after each use of the app in Phase 2 of the research consisted of questions about the font size in the closed captions, the avatar's speech speed, and any other suggestions participants had. It influenced the iterations of the prototype, with changes in the frequency of the avatar's blinking. It also resulted in replacing the button "help" with "explain."

The "help" button's erasure echoed the participants' satisfaction. As Olivia shared:

> *I hate the word "help." I hate asking for help. It's so weird. We just don't push "help" button [referring to individuals on the autism spectrum]. Even if we want to push the "help" button—we don't!...because so many people on the spectrum will not click the button if it says "help!" (Olivia, Phase 2, Session 2).*

The *UI UX Satisfaction* sub-theme represented a UX design component. Additionally, sub-themes *UX Session Difficulty, UX-App Enjoyment,* and *UX Value* also described aspects of UX design. The Evaluation Survey that participants completed as activity 2 of Phase 2 had a component related to the session's ease. On a scale of 1 to 5 (with 1 being *Very Easy* and 5- *Very Difficult*) and across the four sessions, the

participants rated the session "easy" (i.e. rated as 2 on the Likert-type scale) eleven times, and one participant assessed it as "average" (i.e., rated as 3 on the scale).

The same Evaluation Survey also had a part related to the pleasure participants experienced while interacting with the app. Participants had to assign a numeric value of their enjoyment on a scale of 1 to 5, with 1 being *Didn't enjoy at all*, and 5 – *Enjoyed it a great deal*. Participants appraised sessions and stated one time that they "somewhat enjoyed it" (rated as 3 on the scale), stated eight times that they "enjoyed it very much" (rated as 4 on the scale), and stated three times that they "enjoyed it a great deal" (rated as 5 on the scale).

Therefore, participants considered the app easy to use and enjoyable. They also stated about the app that:

> *It was fun! (Olivia, Phase 2, Session 2)*.

In the sub-theme UX Value, participants reflected on the value they perceived in the app. They thought that the app was helpful to people on the autism spectrum. They saw it as a way to improve communication with individuals on the spectrum. As Nicholas declared:

> *That's why I'm really glad you're doing this! (Nicholas, Phase 2, Session 2)*.

1b) Video Performance Feedback

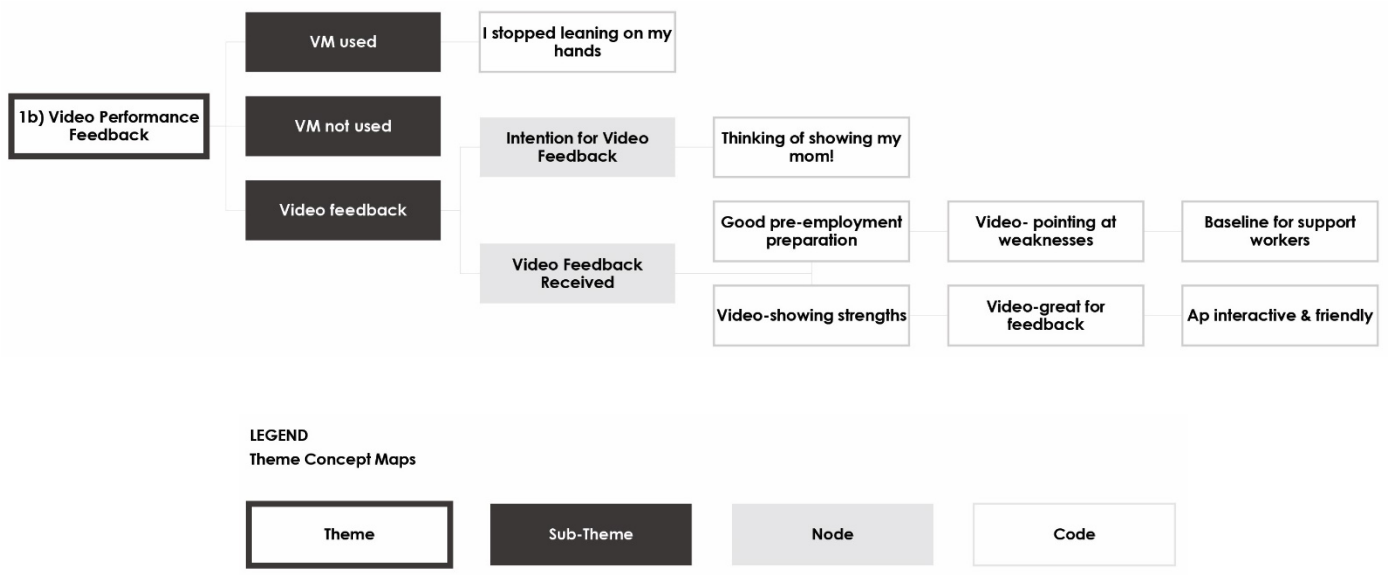


Figure 11. The theme concept map for Theme 1b. Video Performance Feedback

VM is considered an effective way to facilitate learning in individuals on the autism spectrum (Fitzgerald et al., 2018). The use of video recordings (i.e., VSM) is regarded as a supplementary tool to VR to provide feedback and allow users to take self-correcting measures pertaining to supplemental aspects of the interview process such as posture, eye contact, etc. (Burke et al., 2017).

All the Co-Design Evaluation and Revision sessions – Phase 2 were recorded, and the link to the video content was emailed to participants. Only one participant, out of three in this phase of the research, watched the video and corrected her posture for future sessions:

> *For example, after watching my first video, I stopped leaning on my hands and holding my chin because this might tell the person interviewing me that I'm bored. (Christina, Phase 2, Session 2).*

Participants expressed interest in showing the video to parents and getting feedback from them. As Nicholas reported, he and his mom never had a chance to do that. However, Christina did show all the videos to her mom. It was reported that the video recordings were a great way to both see the

strengths and point to the weaknesses in her daughter's job interview performance. Christina's mom described the value of the video recordings as extremely useful for feedback and job interview preparation. In conclusion, Christina's mom reported that she considered the app to be interactive and friendly.

Therefore, the video recordings seemed to help participants both as a self-correcting measure and, more importantly, as a way to obtain helpful feedback from parents or other persons constituting participants' support networks.

2. Questions-Scaffolding Affordances

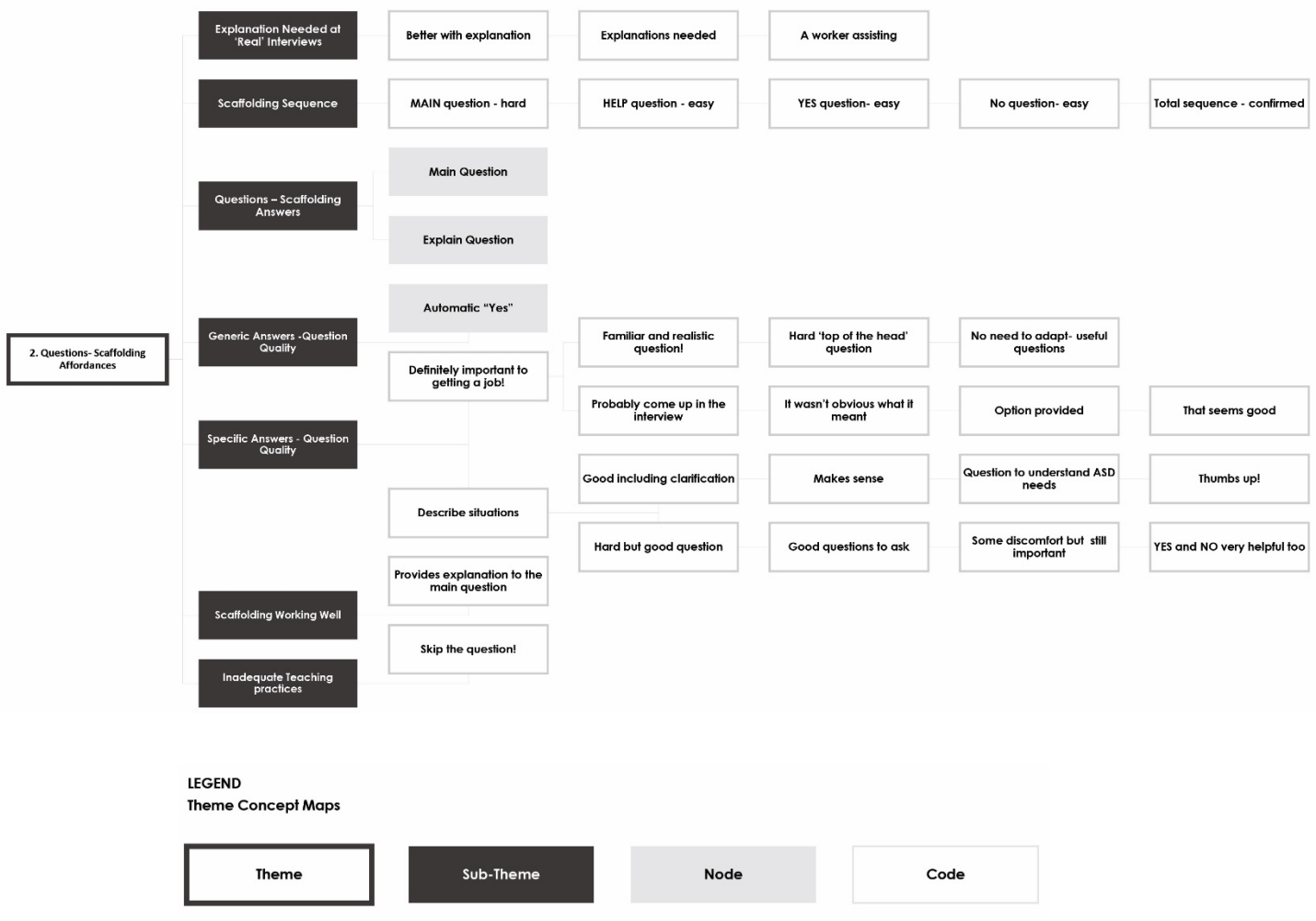


Figure 12. The concept map for Theme 2. Questions- Scaffolding Affordances

One of the sub-themes that composed Questions- Scaffolding Affordances was *Explanation Needed at "Real" Interviews.* During the Co-Design Development and Deployment phase (Phase 1), Christina talked about her interview-process experience for a volunteer position. The semi-structured interviews with the participant revealed the importance of explanations of interview questions. Interview questions were not considered hard if the clarification was provided, as Christina noted:

> *No, the boss was explaining to me… (Christina, Phase 1, Session 2).*

The option with question clarification was considered an improved alternative:

> *Yes, it was better (Christina, Phase 1, Session 2).*

During Phase 1, it was discovered that the "help" function in the form of another avatar with visuals was too complex and ineffective. A different approach was taken, and the new iteration started with the focus on the different structure of behavioral interview questions. The "help" function was revised. It now provided the same question in the explicit form to which the participant could answer with a short "yes" or "no." This would further lead to the related question that would ask for some examples or clarification. This sequence of questions would consist of the "main," "help," "yes," and "no" questions. In co-design sessions with participants, it was discovered that the "main" type of question was considered difficult to answer, but explicit options of the same question ("help," "yes," "no") were deemed to be easy. The data about the questions' difficulty and the confirmation of the scaffolding method used were grouped in sub-theme *Scaffolding Sequence.*

In the Co-Design Evaluation and Revision phase (Phase 2), during the first activity (Answering the Questions), the participants tested the new iteration of the prototype/app. Each participant had ten questions to answer in the course of four sessions. For the most part, participants were able to answer "main" questions. Two participants needed the "help" function three times, and one participant needed it only once. These answers informed the sub-theme *Questions-Scaffolding Answers.*

As a part of the third activity in Phase 2- Analyzing the Quality of Questions, participants were asked to assess the quality of questions they had been given earlier in the session. They were looking at all the

questions in the scaffolding sequence and providing feedback. Some of the answers participants provided were grouped under the sub-theme *Generic Answers- Question Quality,* and they consisted of routine "yes" replies. More specific responses were grouped into a sub-theme *Specific Answers-Question Quality*. These responses were rich and vivid, and as Olivia enthusiastically affirmed:

> That's exactly the way they are going to ask it. So, that's perfect! *(Olivia, Phase 2, Session 1)*.
>
> Also, another really likely question you are going to be asked. About 100 times… *(Olivia, Phase 2, Session 1)*.

Participants confirmed that the scaffolding method worked well to clarify the broad behavioral questions. Additionally, if adopted by employers, the scaffolding method could provide insight into an individual's needs and demonstrate if the individual can articulate those needs. Ultimately, it could help employers better understand and learn how to communicate with individuals on the autism spectrum. As pointed out by Nicholas:

> *It could help show the employer as well as… I am trying to think of how to clarify this. Part of the communication difficulties. Like, on one hand it can help the employer to see what the person's difficulties and needs are, and on the other hand it can also help show them if the person has any knowledge on how to deal with their own difficulties and needs as well. Does that make sense? (Nicholas, Phase 2, Session 1)*.

The data grouped in sub-theme *Inadequate Teaching Practices* refers to current teaching practices for training individuals on the autism spectrum. Having attended job interview preparation courses, Olivia's experience was that if an individual on the autism spectrum did not know how to answer a question at the job interview, they were advised to ask an interviewer to:

> *Just skip it! (laughing) (Olivia, Phase 2, Session 2)*.

The educational advice to skip the interview question demonstrates the current lack of understanding by employers of individuals with ASD. It illustrates the need to improve our awareness and learn how to better communicate with individuals on the autism spectrum.

The data gathered in the Questions- Scaffolding Affordances theme has a profound impact, as it revealed that with added clarification an individual on the autism spectrum could do a job interview without skipping any questions (Olivia, Personal Communication, November 24, 2020).

2a) Question Creation

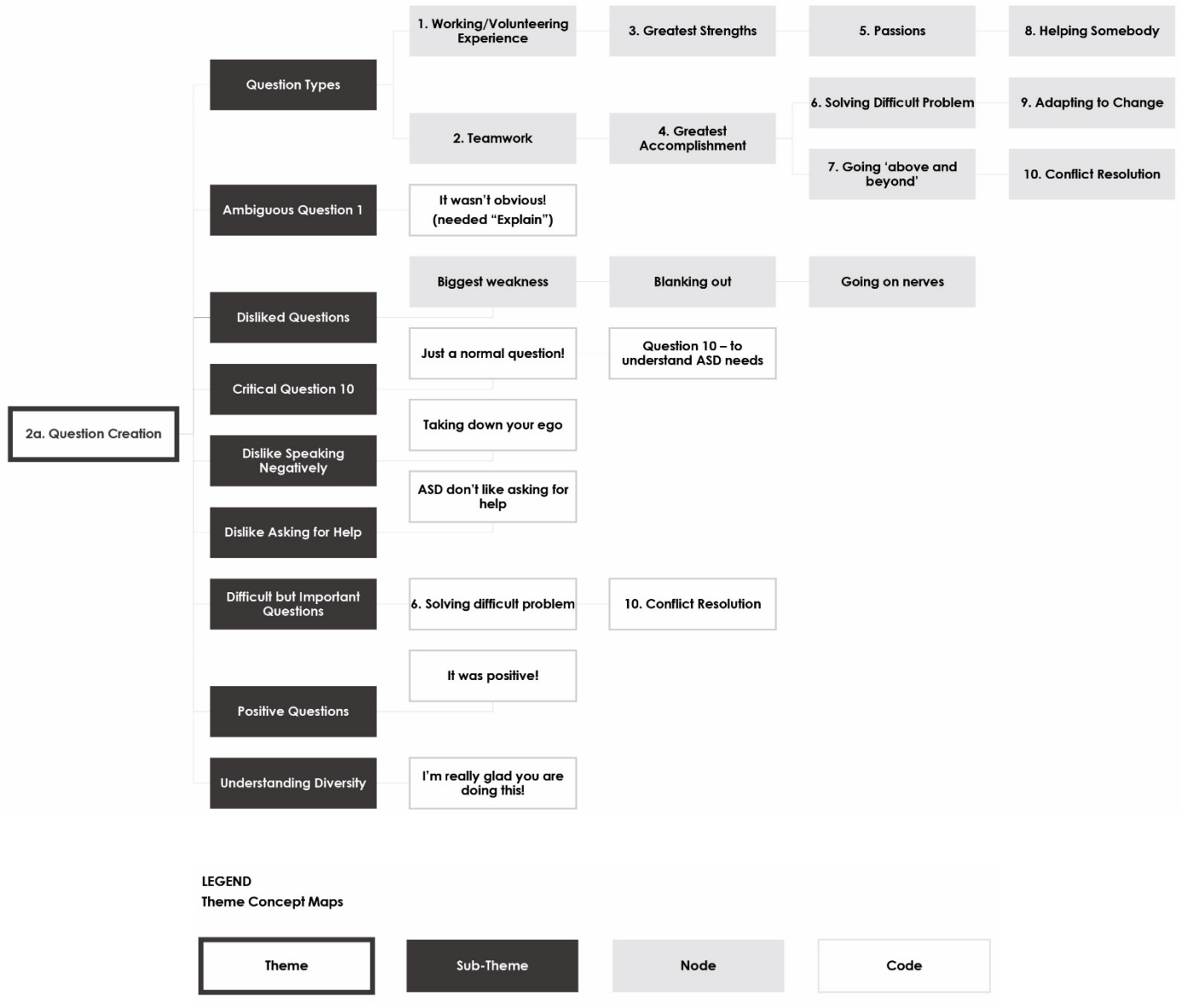


Figure 13. The concept map for Theme 2a) Question Creation

The Question Creation theme came as a surprise as part of secondary findings. The theme development unveiled some compelling information about participants and their preferences. The highly captivating nature of the data and participants' intense feelings about these topics led to the design of the Inclusive Interview Guideline for Employers, as shown in Figure 14.

Because the structure of our education system is designed mainly to attend to the neurotypical population, individuals on the autism spectrum often need accommodation for their differences. They are in constant need of some support that routinely attracts negative attention and to which is attached a stigma.

This results in the internalization of a negative bias about requesting help and thus not asking for assistance even when it is needed. As Olivia illustrated:

> *Even if when we want to push the "help" button—we don't! (Olivia, Phase 2, Session 2).*

Additionally, the participants did not have issues with answering questions about the resolving of conflicts or the solving of complex problems. They disliked being asked to disclose moments of helplessness, panic, or mental collapse that evoked strong negative-feelings about themselves, such as:

> *Tell me a time about when you went blank. (Olivia, Phase 2, Session 2).*

As already stated, they do not like questions that:

> *…make me speak negatively. I don't like being negative. We just don't like talking bad about ourselves [referring to individuals on the autism spectrum]. It's taking down your own ego. (Olivia, Phase 2, Session 2).*

Therefore, the Question Creation theme findings revealed that participants had hesitancy to ask for help and disliked talking negatively about themselves. These two findings, along with the previously described finding that individuals with ASD struggle with broad interview questions, constituted the few items on the Inclusive Interview Guide for Employers that employers would do well to consider when interviewing individuals on the autism spectrum. As a result of this discovery, a few options were listed in

the guide that employers could implement to make the interview process easier for persons on the autism spectrum. When conducting interviews, employees could offer explanations, clarification with examples, avoid discussing negative experiences, provide the written form of interview questions, or provide an opportunity for the person with ASD to choose an asynchronous interview option.

Figure 14. Infographics: Inclusive Interview Guide for Employers

3. Communication

Some of the topics in the secondary themes related to participants' passion for art, gaming, music, and how well they were doing in these particular fields. They also included unique family influence in advocating; choosing future professions; and some personal struggles related to comorbid issues. But the topic that was discussed most of all was the prevalence of lack of understanding and communication difficulties in the social domain. As participants mostly had school experience to relate to when discussing social functioning, their examples demonstrated how these difficulties occurred or were exacerbated in the school social sphere.

The lack of understanding at school was rooted in the absence of knowledge and training. A participant described feeling not having control over school life, as the structure of school life was imposed and enforced by staff who did not know how to communicate with individuals on the autism spectrum. All the issues that come later in life derive from this lack of understanding and communication. The damage individuals on the autism spectrum experience due to lack of understanding and communication during school years have far-reaching consequences, affecting their ability to get employment, as the following comments eloquently attest:

> *I didn't really have much of any control over my situation throughout school (Nicholas, Phase 2, Session 4).*
>
> *A lot of the issues in dealing with now, as adults on the spectrum that can affect my ability to get a job. A lot of that stemmed from how things were run in school. The fact that barely anyone on staff actually understood how people like me function. (Nicholas, Phase 2, Session 4).*
>
> *Like a lot of the issues people on the spectrum like me can have in adult life stem from everything in how things were handled in school as we were growing up. That if it's not sufficient there, it's toxic even with lasting scars and inadequacies in our ability to perform an adult life. (Nicholas, Phase 2, Session 4).*

It is evident that to help improve the social quality-of-life for individuals on the autism spectrum, the most critical aspect in need of being addressed is communication. The employment status quo can only shift if we make a collective effort to increase communication with individuals on the autism spectrum.

The aim of this research was to demonstrate that individuals on the autism spectrum could perform job interviews successfully if there were increased understanding and improved communication. This app can serve individuals on the autism spectrum to practice job interview questions. But, equally important, it also provides an effective method and strategies for employers to conduct inclusive interviews.

DISCUSSION

The most current research that deals with VR job interview training of individuals on the autism spectrum is related to the simulation of interview questions for a specific position (Smith et al., 2014, Burke et al., 2017.) Smith et al.'s (2014) study was very comprehensive as it offered in-the-moment feedback, scores on a range of performance, audio recordings, written transcripts, and e-learning preparation for the interview process. It provided an option of 1,000 questions and 2,000 pre-made responses. Burke et al.'s (2017) study included educational training and placement for the participants while doing VR practice.

In this participatory research, participants were involved in the co-design process of development, deployment, iterations, and testing of the prototype that generated an app with a scaffolding sequence of behavioral interview questions.

The app can provide adults with ASD the opportunity to practice the interview process in the safety of VR. Training using the app may help individuals on the autism spectrum to build confidence in the social skills necessary for successful job-interview performance. The video recordings could help users assess their performance and gain feedback. They can use the VSM aspect and apply it as a self-correcting measure for additional elements of the interview process such as posture, eye contact, etc. The design intention, supported by the research findings, is represented with the tetrahedron artifact 1, shown in Figure 15.

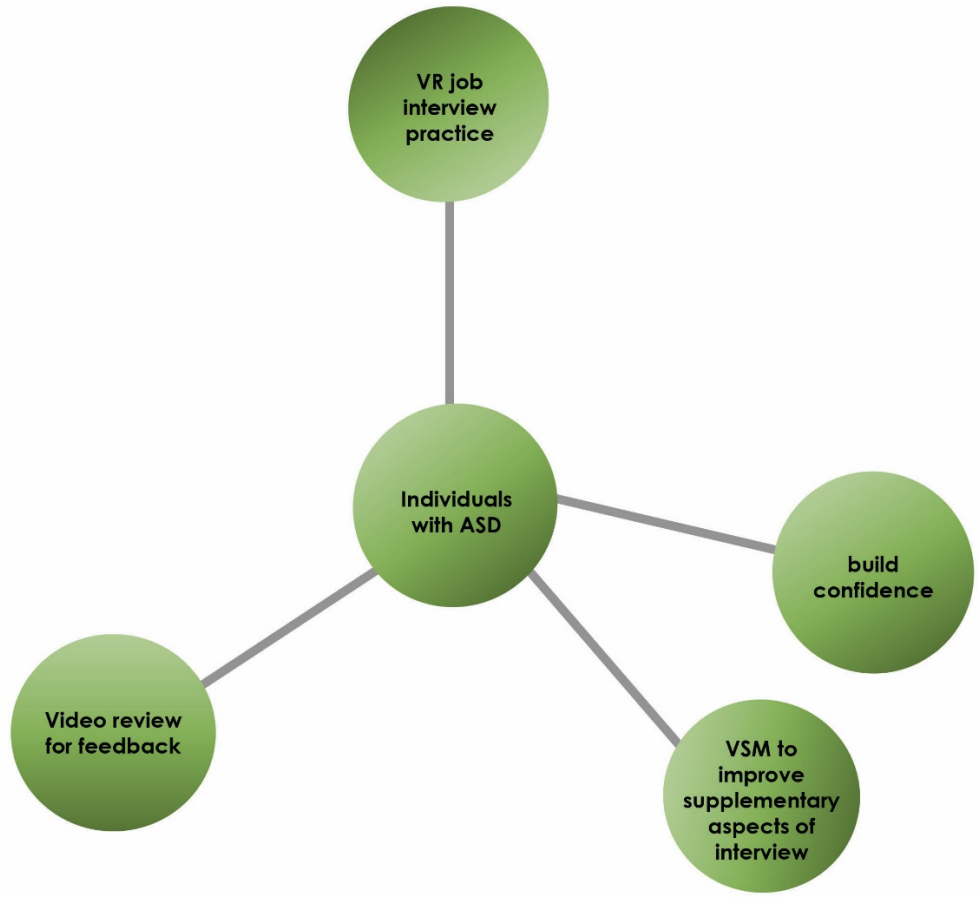


Figure 15. Tetrahedron Artifact 1: VR/VSM for individuals on the autism spectrum

The unique method of the scaffolding sequence is designed with human uniqueness and variability in mind. The scaffolding provides an opportunity for individuals with diverse verbal and cognitive abilities to use an app successfully. It delivers a specific version of the broad behavioral questions and prompts users to provide more information about themselves, as shown in Figure 16.

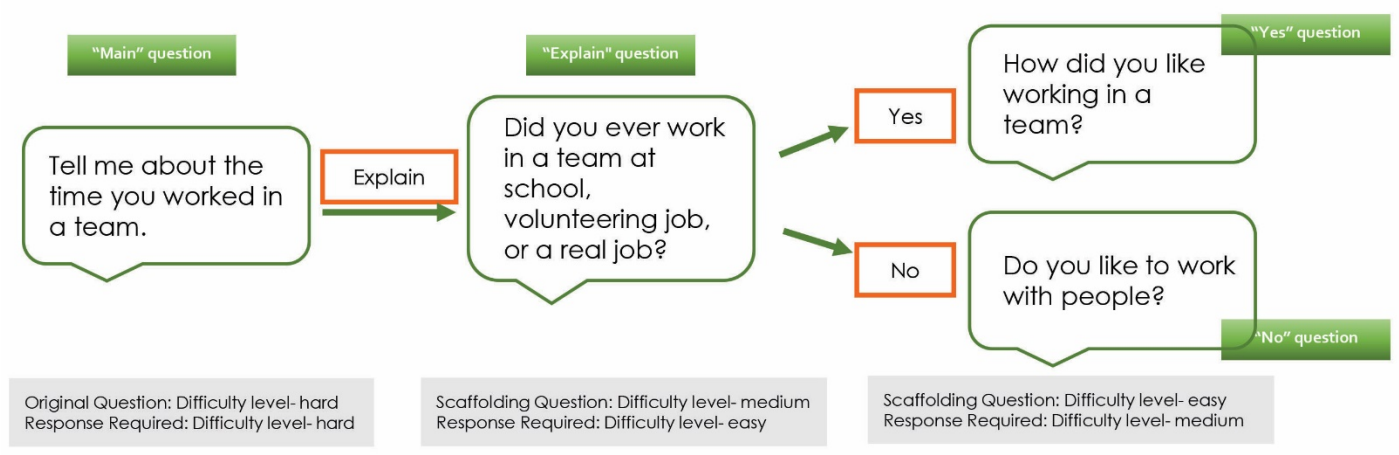


Figure 16. Scaffolding Sequence of Behavioral Interview Questions

The study revealed additional ways to better communicate with individuals on the autism spectrum. The findings resulted in the development of the Inclusive Interview Guide for Employers.

Additionally, the app allows employers to input their questions, customize the interview process, and use it as an asynchronous interview alternative. It can also enable employment agencies to prepare clients for future jobs. The provision of another way to do job interviews can contribute to a more inclusive interview process. The customizing option ensures flexibility that other VR studies do not demonstrate. This alternative enables the use of the app to create interview questions for specific jobs as well. Nicholas expressed an interest in such a possibility:

> *And if it [referring to an app] also includes examples of kinds of questions that someone might be asked while pursuing a particular position, I think that would also be helpful. (Nicholas, Phase 2, Session 1).*

The video recordings proved effective not only as VSM but as feedback. The new iteration allows for the provision of text transcripts sent to the user's email. These features can help employment-support agencies to provide feedback to their clients on the autism spectrum. Currently, employment-support agencies and programs provide training on creating resumes and a general overview of interview

questions. The employment-support programs could use an app to help their clients get ready for job interviews and to assess their performances.

A previous study has revealed that VR job-interview training is beneficial for neurotypical individuals who have been unemployed for more than one year (Aysina, Maksimenko, & Nikiforov, 2016). The anecdotal survey findings from the Inclusive Spectrum Exhibition confirm the interest of neurotypical individuals in using an app (*VR/VM Job Interview Training of individuals with ASD: Inclusive Spectrums, 2020)*.

The research and the app can affect all of the parties involved in the employment system, as represented with the tetrahedron artifact 2, shown in Figure 17. It can result in a more inclusive employment structure.

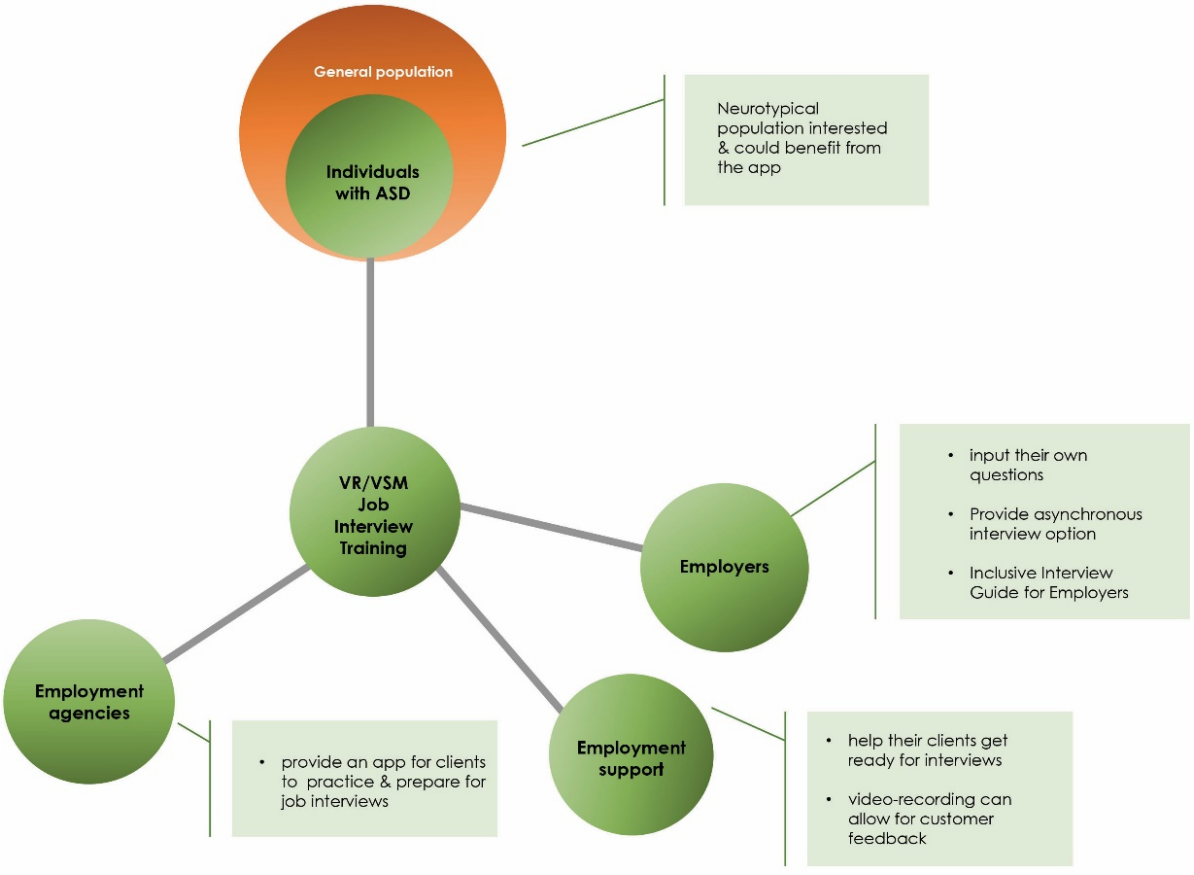


Figure 17. Tetrahedron Artifact 2: inclusive employment structure

The further iteration of the app could include video recording with file size acceptable for mobile storage. It may also involve an instructional video at the beginning of the app to ensure concise and on-topic answers. Future studies could test the feasibility of the Instructional Video and include neurotypical participants.

CONCLUSION

This research represents a fulfillment of a longing to contribute to the inclusion of individuals on the autism spectrum. The world of autism is a realm where a constant chase of "normalcy" starts from the first signs of autism a toddler shows and never ends.

Individuals on the autism spectrum are expected to perform self-erasure daily to be part of our neurotypical world. If we made an effort to learn how to communicate with these atypical individuals, we would discover a dimension of unprecedented honesty, dependability, commitment, focus, precision, and diligence.

The possibility of inclusive interviews would be a benefit to all of us. We could realize a wholesome society where everyone, including individuals on the autism spectrum, would have an equal employment opportunity regardless of their unique expression.

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Appendix A: Additional Material

Title: Co-Creating Inclusive Interviews

Description: VR technologies for job interview training of individuals on the autism spectrum and strategies for employers

Date: 2021, April 24

Accessible Version - YouTube Video Link: https://youtu.be/ZIT1zDpjvL8

Appendix B: Scaffolding Sequence of Questions

Question 1: **Tell me about yourself.**

- If a participant selects "help": **Have you worked or volunteered anywhere before?**
    - If a participant selects "yes": **Did you use a computer to send emails?**
    - If a participant selects "no": **Did you use a computer at school to send emails?**

Question 2: **Tell me about the time you worked in a team.**

- If a participant selects "help": **Did you ever work in a team at school, volunteering job, or a real job?**
    - If a participant selects "yes": **How did you like working in a team?**
    - If a participant selects "no": **Do you like to work with people?**

Question 3: **What are your greatest strengths?**

- If a participant selects "help": **Are there personal qualities that make you good at school, a volunteering job, or a real job?**
    - If a participant selects "yes": **What are those qualities?**
    - If a participant selects "no": **What are the things you want to become better at?**

Question 4: **What is your greatest accomplishment?**

- If a participant selects "help": **Have you ever won an award, or did someone praise you?**
    - If a participant selects "yes": **What were you awarded or praised for?**
    - If a participant selects "no": **What are some of the things that you do really well?**

Question 5: **What are you passionate about?**

- If a participant selects "help": **Do you have things that you do for fun?**
    - If a participant selects "yes": **What are the things that you like to do for fun?**
    - If a participant selects "no": **Do you do things at home for fun?**

Question 6: **Tell me about the situation where you had to solve a difficult problem and how you did it.**

- If If a participant selects "help": **Have you ever had a difficult situation at school, a volunteering job, or a real job?**
    - If a participant selects "yes": **What was the difficult situation, and how did you problem-solve it?**
    - If a participant selects "no": **What do you do at home when you can't do something by yourself?**

Question 7: **Tell me about the time you went 'above and beyond.'**

- If a participant selects "help": **Did you do something extra for your school project, a volunteering job, or a real job that wasn't asked of you?**
    - If a participant selects "yes": **What was it that you did extra that wasn't asked of you?**
    - If a participant selects "no": **Do you help at home with chores without being asked?**

Question 8: **Describe a time you went out of your way to help somebody.**

- If a participant selects "help": **Did you ever help someone at school, a volunteering job, or a real job?**
    - If a participant selects "yes": **Who was it that you helped, and how did you help?**
    - If a participant selects "no": **Do you help others at your home?**

Question 9: **Tell me about the time you had to adapt to change over which you had no control.**

- If a participant selects "help": **Was there ever a change of routines at your school, volunteering job, or a real job?**
    - If a participant selects "yes": **What was a change, and what did you do about it?**
    - If a participant selects "no": **Have you ever had any sudden changes in your routines at home?**

Question 10: **Describe a situation where you didn't get along with someone.**

- If a participant selects "help": **Was there ever a person at your school, a volunteering job, or a real job that you didn't get along with?**
    - If a participant selects "yes": **How did you handle it when you didn't get along with the person?**
    - If a participant selects "no": **Do you always get along with others in your house?**