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Using Mixed-Reality Simulation To Teach Job Interview Skills To Young Adults With Intellectual Disabilities

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USING MIXED-REALITY SIMULATION TO TEACH JOB INTERVIEW SKILLS TO
YOUNG ADULTS WITH INTELLECTUAL DISABILITIES

A Dissertation
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Philosophy
Special Education

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by
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Accepted by
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Dr. William Bridges

ABSTRACT

Job interviews are a critical step to obtaining employment, however, the social demands of job interviews are often difficult for individuals with intellectual disabilities (ID). Both the use of technology (e.g., mixed-reality simulation, video modeling, virtual reality) and attending inclusive postsecondary education programs that teach independent living skills and employment skills have been effective in improving job interview skills and employment outcomes. Using an underpowered randomized-control trial research design, the researcher examined whether using mixed-reality simulation technology to practice job interview skills improved job interview skill acquisition for young adults with ID compared to face-to-face practice that is typically conducted in the classroom. The researcher also collected pre-test and post-test data on participant job interview-related anxiety. The researcher analyzed the data using two separate repeated measures ANOVAs. No significant differences were found between the two groups in terms of job interview skill acquisition. The face-to-face group was found to have statistically significantly lower self-reported job interview anxiety at post-test than at pre-test. Implications for practice and directions for future research are discussed.

DEDICATION

This manuscript is dedicated to my parents, John and Michelle Carlson and my grandparents, Carol and Wayne Warne, and Carolyn and Richard Carlson. From a young age you instilled in me the value of people, empathy, a love for learning, and the belief that I can do anything I set my mind to. I am eternally for all of your love and support that you have given me throughout my life.

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Chapter I: Introduction

As of April 2023, the national unemployment rate for non-disabled individuals was 2.3%. However, only 34% of individuals with ID are employed, with only 18% working within a competitive employment setting (Avellone et al., 2021; Siperstein et al., 2013). Additionally, individuals with intellectual disabilities (ID) are estimated to have competitive employment at a rate of 16% compared to 60.2% of the non-disabled population (Bureau of Labor Statistics, 2023; National Core Indicators, 2023). In this case, competitive employment rate is defined as the number of people with a job, divided by the number of people who are of age to work a job. Furthermore, for individuals with ID who maintain competitive employment, their average hourly wage ranges from $10.07 - $12.15 per hour (National Core Indicators, 2023). In contrast, the average hourly wage for non-disabled employees was nearly three times that at $33.36 per hour (Bureau of Labor Statistics, 2023). In addition to much lower hourly pay rates, individuals with ID, on average, only worked 13.75 hours per week (National Core Indicators, 2023), compared to 34.4 hours per week for non-disabled employees (Bureau of Labor Statistics, 2023). These limited work hours mean that employees with ID make significantly less money, and typically do not receive benefits such as retirement or health care. This limited income also makes it difficult for individuals with ID to afford housing (Tanis et al., 2022), a correlate with competitive employment and higher self-reported quality of life (Nota et al., 2010; Ryan et al., 2019).

Importance of Job Interviews

Job interviews are often the final barrier between a potential employee and the job they hope to obtain. Job interviews are a unique social interaction that requires the interviewee to engage in several overt and subtle social behaviors to "sell" themselves as the most qualified

candidate. A study conducted by Mutua et al. (2023) sought to determine which job interview skills displayed by individuals with ID were most crucial for subsequent employment. Fifty-six participants with ID enrolled in a multi-tiered inclusive postsecondary education program participated in mock interviews as a part of the study. Following each mock interview, the interviewer would score the participants on a number of different variables and whether or not they would hire the participant following the interview. Using this data, the authors used structural equation modeling to identify which variables significantly impacted subsequent employment. Those variables included: a) sitting still and straight, b) understandable speech, c) good posture, d) appropriate voice, and e) appropriate handshake (Mutua et al., 2023). For many individuals with ID, acting on these overt and subtle social cues during interviews may prove especially difficult (Smith & Matson, 2010) due to limitations in social skills which are a characteristic of ID (American Association on Intellectual and Developmental Disabilities, 2023). To be successful in a job interview, it is also important for candidates to be adept at small talk, non-verbal communication (e.g., posture, eye contact), and openly sharing relevant information about themselves with or without prompting, to help make a good first impression (Shipley & Wood, 1996). To account for these skill deficits, individuals with ID must receive quality instruction on improving their job interview skills. Given the importance of job interview skills for job seekers with ID, it has become a common practice to provide opportunities to practice these skills during mock interviews within programming focused on transitioning individuals with ID from school to the work force (Grigal et al., 2021).

Barriers to Employment

Intellectual disability is characterized by deficits in intellectual functioning (e.g., learning, judgment, problem-solving) and adaptive behavior. Adaptive behavior is further broken

down into: (a) conceptual skills (e.g., self-direction, concepts of money, time, and numbers); (b) social skills (e.g., interpersonal communication, self-esteem, following rules); and (c) practical skills (e.g., money management, keeping a schedule, using transportation; [Noel et al., 2017]). These deficits which are inherent in ID can create barriers to earning and maintaining competitive employment. For example, individuals with ID may experience a lack of self-confidence and self-determination or fail to understand the "unwritten rules" of social interaction in the workplace. These internal barriers stemming from ID can keep individuals from meeting their employment goals if adequate supports and training are not provided. In addition to the internal barriers for individuals with ID seeking employment, they must also overcome external barriers. Individuals with ID often face issues regarding transportation, fear of loss of disability benefits, or employer perceptions regarding their abilities (Scheef et al., 2018). The combination of internal and external barriers to employment comes to a head for individuals with ID when they participate in a job interview with their prospective employer. Therefore, it is essential that individuals with ID receive targeted instruction on job interview related skills.

Inclusive Postsecondary Education Programs

One transition program type that has demonstrated improved employment outcomes for individuals with ID are postsecondary education (PSE) programs (Grigal et al., 2022). The passage of the higher education opportunity act (HEOA) in 2008 opened the door for individuals with ID to pursue postsecondary education with a focus on employment by providing financial aid. According to Grigal et al. (2022), at the time of their report more than 300 PSE programs were serving approximately 6,000 students with ID across the country. Since then, the number of programs has risen to 337 (Institute for Community Inclusion, 2024). PSE programs provide instruction on key employment and independent living skills, allowing individuals with ID to

improve their capacity to participate in both domains (Prohn et al., 2018). A recent report showed that nearly two-thirds (64%) of students from PSE programs were employed one year after exiting, while one-third (33%) were no longer living with family members (Grigal et al., 2019). Furthermore, some individual PSE programs have provided outcome data as well. For example, Ryan et al. (2019) reported that 84% of graduates of a PSE program (N = 17) were gainfully employed and that 44% of graduates lived independently.

Technology as a Learning Tool

The development of new assistive technologies has greatly aided individuals with ID with a variety of tasks. Various assistive technologies have been found as effective means to teach and enable individuals with ID to learn and maintain essential independent living and academic skills. For example, mobile phone applications have been demonstrated to improve skill acquisition related to cooking, meal planning, and office related tasks (Randall et al., 2019; Stierle et al., 2023; Walters et al., 2021b). Additionally, video modeling and video prompting have a strong literature base supporting its efficacy in teaching skills to individuals with ID (Park et al., 2019). Just as traditional university, and employment preparation courses integrate technology into coursework to better serve their students and instructional methodologies, PSE programs and other transitional support programs for individuals with ID should also seek to do the same. In addition to these established technological instructional support methods, research indicates that a variety of cutting-edge technologies such as mixed-reality simulation (Walker et al., 2016), augmented reality (McMahon et al., 2015), and virtual reality (Ludlow, 2015) could be effectively integrated into the classroom. These technologies allow for a different level of immersion in the simulated world that is being presented. In mixed-reality simulation, the participant communicates with an avatar that is situated in a virtual environment (e.g., classroom,

business environment). The avatar is controlled in real time by an actor behind the scenes allowing for real time interactions with participants. In augmented reality, the user utilizes a piece of mobile technology equipped with a camera (e.g., phone, tablet). The screen then shows the environment with added virtual effects based on the direction the camera is pointing. Lastly, participants in virtual reality typically are fully immersed in the virtual world through the use of a headset that is worn over the eyes and projects a virtual world for the participant to navigate on the screen. For example, a growing base of research done within the world of teacher preparation has found that mixed-reality simulation (MRS) can be an effective tool to increase skills and self-efficacy for non-disabled students given its opportunity for low-risk, targeted practice of essential skills (Lindberg & Jönsonn, 2023; Walters et al., 2021a). Therefore, it is worth exploring whether this technology may also be effective when implemented within a transition program to improve skills for individuals with ID.

Using Technology to Teach Interview Skills

To date, there has been limited research examining how technology has improved social skills related to job interviews for individuals with ID. Two reviews have recently sought to summarize the literature on using technology to teach social skills to individuals with ID. First, Walker et al. (2019) conducted a literature review to provide transition professionals with an idea of what technologies could address skill deficits for individuals with ID related to employment preparation. As such, the authors note that the review is not comprehensive. Within this review, Walker and colleagues (2019) specifically identify virtual reality and mixed-reality simulation (MRS) innovative technologies that providers of transition services should explore with their students. The authors note that despite a limited but promising evidence base, transition service providers may miss out on a dynamic teaching method by not utilizing these technologies. Just as

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iPads were widely used in classrooms prior to the establishment of an evidence base, so too should educators seek to incorporate cutting-edge technology if educators use their best judgment to determine they will not do harm (Walker et al., 2019). To that point, it is imperative that researchers continue to study the use of this technology to educate students with ID on job interview skills.

A second systematic review was conducted by Montoya-Rodriguez et al. (2022) to identify studies that have used either virtual reality or augmented reality to teach social skills to individuals with ID. The authors searched for articles published between 2005 and 2020. In total, six articles were identified for inclusion in the review. The authors then coded each article for descriptive information about each study including demographic characteristics of the participant sample, the purpose of the study, the research design, variables and instruments, and the primary findings of the studies. Montoya-Rodriguez et al. (2022) found that the participants in the included studies predominantly identified as males with a diagnosis of Autism. Additionally, the authors report that most of the included studies (66%) used a pretest-posttest/group design, and did not include a control group. This finding is significant because although these studies offer preliminary insight into the effectiveness of the interventions, due to the lack of experimental control, it is not possible to conclude their efficacy. These findings highlight that there is still a need within this area of research to explore how young adults with different disabilities respond to these technologies, as well as how effective these technologies are for individuals with ID.

Purpose

Therefore, the purpose of this study aims to examine the effectiveness of mixed-reality simulation technology in improving job interview skills for individuals with ID. Specifically, this study utilized a randomized controlled trial design to compare the use of MRS to traditional

classroom peer-to-peer practice. The present study focused on developing job interview skills for participants aged 18-26 enrolled in a postsecondary education program. To our knowledge, this study is the one of the first to specifically examine the use of MRS technology to teach interviewing skills to young adults with ID. Therefore, the results will guide people working in inclusive PSE programs, allow researchers to determine whether the technology is worth the investment, and provide future research into how to use it best.

Research Questions

1. Does practice in a mixed-reality simulation environment improve job interview skill acquisition for young adults with ID compared to Business as usual peer practice?

2. Does practice in a mixed-reality simulation environment lower participant self-reported anxiety related to completing job interviews?

3. Do participants and their teachers view mixed-reality simulation as a socially valid and feasible intervention for job interview skill acquisition?

Chapter II: Literature Review

To analyze the use of technology to support job interview skill acquisition for young adults with intellectual disabilities (ID), the author conducted a systematic literature review. The primary objectives of this review were to examine: (a) the characteristics of the participants, (b) the research designs and results of the studies, and (c) the types of technology used to train the participants on job interview skills. The authors retrieved articles for this review via electronic and hand searches. An overview of the process is provided in the following sections.

Data Collection

Inclusion Criteria

The studies selected for inclusion in this review met the following criteria: (a) the article must have been published in a peer-reviewed journal or have been a dissertation study. Masters theses were excluded as they are typically not as rigorous as doctoral dissertations; (b) the study must have included transition-age (16 – 26 years old) participants with ID (e.g., Down Syndrome, Autism); (c) the authors of the study utilized a quantitative research design (e.g., single-case, group contrast, pre-test/post-test comparison). As this review sought to examine the quantitative changes in job interview skills following technological interventions, articles were excluded if they were qualitative research designs, literature reviews, surveys, meta-analyses, practitioner papers, and conceptual papers; (d) the study involved training on job interview skills. Studies that provided training on other work-related tasks (e.g., navigating to work, completing a work task) were excluded; (e) the articles must have been published in 2008 or later due to the passing of the Higher Education Opportunity Act which allowed for financial aid to be used for students with disabilities attending postsecondary education programs; and (f) the authors utilized a technology-based intervention in the study (e.g., augmented reality, mixed-reality, virtual reality, video modeling).

Search Terms

The author searched the following databases for studies on technology-related interventions (e.g., augmented reality, video modeling, virtual reality, mixed-reality) with young adults with IDD: Academic Search Premier, APA PsycArticles, APA PsycInfo, Business Source Complete, Education Full Text (H.W. Wilson), Education Research Complete, ERIC, Humanities Full Text (H.W. Wilson), Professional Development Collection, Social Sciences Full Text (H.W. Wilson). The author entered the following search terms in each database using Boolean indicators (e.g., "or", "and"): (mixed-reality simulation or mixed-reality simulator or augmented reality or virtual reality or assistive technology) AND (intellectual disability or ID or IDD or autism). Furthermore, the search was limited to articles published a) between 2008 and 2023, and b) peer-reviewed journal articles published in English. The search returned a total of 2,227 results. Following the removal of duplicates, 866 articles remained. Each of the 866 articles were screened by reading their title and abstract. If the title or abstract did not indicate exclusion, the article was identified for retrieval. A total of 16 articles were retrieved and a full-text review was conducted to determine final inclusion. After coding each article for inclusion, a total of five articles met the inclusion criteria for this review.

A search of the database Dissertations & Theses Global was also conducted using the using Boolean indicators: title (mixed reality simulation OR augmented reality OR virtual reality OR video modeling) AND title (intellectual disabilities OR autism OR ID OR IDD) OR abstract (mixed reality simulation OR augmented reality OR virtual reality OR video modeling) AND abstract (intellectual disabilities OR autism OR ID OR IDD). The search was further limited to dissertations written in English between 2008 and 2023; master's theses were excluded. This search yielded an additional 222 studies. The author reviewed each of the 222 dissertation study titles and abstracts with the assistance of a doctoral student in special education and identified

three dissertation studies for full review. The author then read each of the identified dissertation studies to determine eligibility for inclusion. Following this evaluation, the author determined one dissertation study eligible for inclusion. Interrater reliability (IRR) was conducted for 100% of the electronic search process. Specific information about how the IRR was completed is provided in the next section.

Ancestral and forward searches of all included studies were completed. The ancestral search was done by screening the titles of each of the articles cited in the six studies identified for inclusion in this review during the electronic search. The forward search was conducted by using Google Scholar to screen the titles of all of the studies that have cited the six studies identified for inclusion in the review during the electronic search. Yielded three additional studies for a total of nine articles included in this review. As the *Journal of Autism and Developmental Disorders* published multiple studies included in this review, the author completed a hand search of each publication dating back to 2008. The hand search did not yield any additional studies. A summary of the systematic search process is provided in Figure 1.

Figure 1
PRISMA Chart of Systematic Review Process

Identification of studies via databases and registers

Identification of studies via other methods

Identification

Records identified from:
Databases (*n* = 2,449)

Records removed *before screening*:
Duplicate records removed (*n* = 1,341)

Records identified from:
Forward Search (n = 6)
Ancestral Search (*n* = 1)
Hand Search (*n* = 2)

Screening

Records screened
(*n* = 1,108)

Records excluded
(*n* = 1,089)

Reports sought for retrieval
(*n* = 19)

Reports not retrieved
(*n* = 0)

Reports sought for retrieval
(*n* = 9)

Reports not retrieved
(*n* = 0)

Reports assessed for eligibility
(n = 19)

Reports excluded:
DV (*n* = 9)
Research Design (*n* = 3)
Participants (*n* = 1)

Reports assessed for eligibility
(*n* = 9)

Reports excluded:
DV (*n* = 2)
IV (*n* = 2)
Participants (n = 2)

Include

Studies included in review
(n = 9)

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Note: DV = Incorrect dependent variable; IV = Incorrect intervention technology

Inclusion Coding Procedures

        The author reviewed and double-coded 100% of articles during the initial retrieval through the database search, backward search, and forward search with the support of a doctoral student. The author also double-coded the full texts of each of the nine studies identified for inclusion in this review with the assistance of the same doctoral student. To ensure that the author and the doctoral student were clear on the coding inclusion and exclusion criteria, they first met one-on-one to review the criteria. Then they each coded a small selection of the identified studies and coded them independently and then met again to review their codes and ensure that they were above 80% agreement. After meeting that threshold. They each coded the remaining articles independently before meeting again to review their codes. In all coding phases, disagreements were reviewed by both coders, compared to the inclusion criteria and discussed until a consensus was reached. Interrater agreement (IRR) was calculated by dividing the number of agreements by the number of possible agreements. The IRR for this portion of the coding process was 97.8%.

Descriptive Coding

        To identify key information from the existing literature base, the author coded each article for items related to participant demographics and intervention components. The coding of the participant demographics included (a) age of participants, (b) sample size, (c) demographic information (e.g., race, gender), (d) disability classification of the participants (e.g., Autism, Intellectual Disability) with percentages if necessary.

        The author used a shared coding worksheet to support reliability in coding. This worksheet included all of the descriptive components for which the included articles would be coded. Two of the nine included articles were coded simultaneously, to establish agreement in

understanding of each indicator and explore possible disagreements. The authors coded the final seven articles individually and then met to review the codes and discuss differences in order to come to a consensus if necessary. Across all reviewed studies, the IRR during the descriptive coding stage was 100% for demographics, descriptive characteristics, simulation components, and social validity.

<div align="center">

Results

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The nine studies included in this review were published between 2013 and 2023. Results from the descriptive coding are presented in the following sections by participant demographics and intervention characteristics.

Participant Demographics

Age of Participants

The ages of participants were reported differently in each study. As such it is not possible to report a mean participant age across the nine studies. Some studies only provided the range of student ages, while some provided the age of each participant, and others provided the mean age of the participants. Across the nine studies, the participants ranged in age from 16 to 31. The mean age of participants was not below 17 years of age and did not exceed 25 years of age. A breakdown of the ages of each participant can be found in Table 1.

Descriptive Demographics

Only five of the nine studies included in this review reported a breakdown of racial demographics of their participants (Burke et al., 2021; Kumazaki et al., 2022; Smith et al., 2014; Smith et al., 2021; Strickland et al., 2013). In four of those studies, the majority of the participants were White, ranging from 45% (Smith et al., 2014) to 68.2% (Strickland et al.,

2013). The only study in which the majority of the participants were not White was Kumazaki et al. (2022), in which all of the participants were Asian.

Each of the nine studies reported demographic information regarding gender. In seven of the studies, the majority of participants were males (Bahcali & Ozen, 2019; Burke et al., 2021; Hayes et al., 2015; Kumazaki et al., 2022; Smith et al., 2014; Smith et al., 2021; Stickland et al., 2013). Across the nine studies included in this review, 243 (77.6%) of the 313 participants were males.

Disability Classification

The presentation and description of the disability classifications of each of the participants varied from study to study. Per the inclusion criteria, the studies must have included participants with an intellectual or developmental disability (e.g., Down Syndrome, Autism). Six of the nine studies (67%) included participants only with a diagnosis of Autism (Hayes et al., 2015; Kumazaki et al., 2022; Lopez, 2019; Smith et al., 2014; Smith et al., 2021; Strickland et al., 2013). Two studies included participants (22%) with both Autism and ID (Bahcali & Ozen, 2019; Burke et al, 2021) and one (11%) study included only participants with ID (Walker et al., 2016). A breakdown of the reported disability classifications of the participants in each study is located in Table 1.

Table 1

Participant Demographic Characteristics

Author	Sample Size	Gender (%)		Race (%)			Participant Age in Years Range (Mean if Applicable)	Disability Classification (Percentage of Sample if Applicable)
		Male	Female	W	B	O		
Bahcali & Ozen, 2019	3	66.6	33.3	NR			21-24	Autism and ID (33%), ID (66%)
Burke et al., 2021	153	72.55	27.45	60.1	--	39.9	NR (21.71)	Autism (64%), ID (40%), ADHD (16%), Cerebral Palsy (4.58%), Down Syndrome (0.65%), Prader-Willi Syndrome (0.65%), and Non-Specific IDD (24%)
Hayes et al., 2015	15	86.7	14.3	NR			17-18 (17.9)	Autism (100%)
Kumazaki et al., 2022	15	100	0	--	--	100	18-24 (21.1)	Autism (100%)
Lopez, 2019	3	0	100	NR			22-23 (22.67)	Autism (100%)
Smith et al., 2014	26	77.5	22.5	45	27.5	27.5	18-31 (24.05)	Autism (100%)
Smith et al., 2021	71	83.1	16.9	55.4	28.9	15.7	16-26 (19.6)	Autism (100%)
Strickland et al., 2013	22	100	0	68.2	22.8	9	16-19 (17.9)	Autism (100%)
Walker et al., 2016	5	20	80	NR			18-21 (20)	ID (100%)

Note. NR = Not Reported; W = White; B = Black; O = Other (e.g., Asian, Hispanic/Latino, Biracial); ID = Intellectual Disability

Intervention Characteristics

Research Design and Sample Size

Three (33.5%) of the included studies used a group comparison research design (Smith et al., 2014; Smith et al., 2021; Strickland et al., 2013), three studies (33.5%) used a single case research design (Bahcali & Ozen, 2019; Lopez, 2019; Walker et al., 2016), two studies (22%) used a pretest-posttest design (Burke et al., 2021; Kumazaki et al., 2022), and one study (11%) used a mixed method design (Hayes et al., 2015). The sample sizes in each study ranged from 3 participants (Bahcali & Ozen, 2019; Lopez, 2019) to 153 participants (Burke et al., 2021). The mean number of participants across the nine included studies was 24.1.

Location of Intervention

Of the nine studies, eight (88%) of them provided the intervention to the participants in a classroom or private office within the university or high school in which the study was conducted (Bahcali & Ozen, 2019; Burke et al., 2021; Hayes et al., 2015; Kumazaki et al., 2022; Lopez et al., 2019; Smith et al., 2014; Smith et al., 2021; Walker et al., 2016). Of those eight studies, two (Burke et al., 2021; Walker et al., 2016) required that participants be enrolled in a post-secondary education program. One study (11%) provided the intervention both virtually through use of a home computer by the participant and in a research lab at the university (Strickland et al., 2013).

Dependent Measures

To be included in this review, the interventions provided in each study must have been targeted at improving job interview skills for young adults with IDD. Despite each of the nine studies examining the same broad outcome, each used slightly different dependent measures. Dependent variables measured across studies included, social responsiveness, interview anxiety,

job interview self-efficacy, job interview skills, vocational outcomes, social validity, gaze, and behavioral challenges. More specifically, an author developed measure of interview performance was used as the dependent variable in eight of the nine included studies (Bahcali & Ozen, 2019; Hayes et al., 2015; Kumazaki et al., 2022; Lopez et al., 2019; Smith et al., 2014; Smith et al., 2021; Strickland et al., 2013; Walker et al, 2016). The one study that did not use a researcher created measure to assess the job interview performance of their participants was Burke et al. (2021), in which they used the *Marino Interview Assessment Scale*. Additionally, Lopez (2019) also assessed for self-efficacy during their study. This assessment was done using a modified version of the *Interview Self-Efficacy Scale (*ISE; Tay et al., 2006).

Intervention Technology

Another key component coded in each article was the type of technology used to provide an intervention to improve the interview skills of young adults with IDD. Four studies (44%) used virtual reality (e.g., JobTIPS, SIMmersion) (Lopez et al., 2019; Smith et al., 2014; Smith et al., 2021; Strickland et al., 2013), two studies (22%) used mixed-reality simulation (e.g., Virtual Interactive Training Agents, TeachLIVE) (Burke et al., 2021; Walker et al., 2016), two studies (22%) used video modeling (Bahcali & Ozen, 2019; Hayes et al., 2015), and one study (11%) used virtual robots (Kumazaki et al. 2022).

Duration of Intervention

The duration of the intervention sessions across the nine included studies was highly variable. With the shortest amount of time being one 30-minute intervention session (Strickland et al., 2013) and the longest being over 20 hours (Kumazaki et al., 2022). Given the various methods used to report duration of the intervention, details of the intervention provided, and the results of each study are located in Table 2.

Social Validity

Only 5 of the 9 studies (56%) included social validity as a dependent variable (Bahcali & Ozen, 2019; Hayes et al., 2015; Kumazaki et al., 2022; Lopez et al., 2019; Smith et al., 2021). The specific methods used to measure social validity included the Treatment Acceptability Rating Form, Participant Interviews (e.g., semi-structured, one-on-one), and the Participant Rating of the Enjoyment and Satisfaction with Intervention Rating Scale (adapted from Williams, 2012).

Findings

Of the nine studies included in this review, seven reported statistically significant differences in participant scores following the implementation of a technology intervention to address job interview skills. Specifically, three studies reported significant increases in the participants' overall job interview skills score (Hayes et al., 2015; Smith et al., 2014; Smith et al., 2021). In addition to significant increases in overall job interview skill scores, other studies reported significant increases in domain scores such as self-efficacy (Burke et al., 2021; Lopez, 2019), appropriate vocal volume, sharing things positively, sounding honest, sounding interested in the job (Kumazaki et al., 2022), and interview content and delivery (Strickland et al., 2013). Although two studies did not report significant results, they did find that the participants improved their job interview skill scores following their technology intervention (Bahcali & Ozen, 2019; Walker et al., 2016). A description of results found in each study is found in Table 2.

Table 2

Study Characteristics

Author	Study Characteristics		Intervention Technology	Brief Summary of Results
	Research Design.	Sample Size		
Bahcali & Ozen, 2019	Multiple Probe Across Participants Design	3	VM on Tablet PC	Mehmet's baseline performance: Before Interview Skills = 5%; During Interview Skills = 0%; after intervention, both skills up to 100% Damla's baseline performance: Before Interview Skills and During Interview Skills = 10%; after intervention, both skills up to 100% Hakan's baseline performance: Before Interview Skills and During Interview Skills = 0%; after intervention, both skills eventually reached 100%
Burke et al., 2021	Within-subjects Repeated Measures (Pretest-Posttest)	153	MRS (ViTA)	Statistically significant increases in the average score were seen for on measures of self-efficacy, strengths, career decisions, and general. All the increases were still statistically significant but slightly smaller after controlling for age, the number of disabilities, sex, and ethnicity.
Hayes et al., 2015	Mixed Methods	15	VM on Mobile Phone	The authors found statistically significant differences between groups on presentation scores and overall interview scores.

Author	Study Characteristics		Intervention Technology	Brief Summary of Results
	Research Design.	Sample Size		
Kumazaki et al., 2022	Pretest-Posttest	15	Virtual Robot	Significant increases between the first and second assessment in appropriate word use, appropriate question response, speaking calmly, being sincere, being enthusiastic, natural facial expressions, gesturing naturally, appropriate speaking speed, responding with appropriate timing, appropriate vocal volume, sharing things positively, sounding honest, sounding interested in the job, and establishing overall rapport.
Lopez, 2019	Changing Conditions Design	3	VR (SIMmersion)	Increase in interviewee impression management behaviors (i.e., gaze and conversational reciprocity) across multiple exemplars (i.e., interviewers) for three young adults with a self- reported diagnosis of ASD. Self-efficacy also increased from pre- and post-intervention based on self-report. Participant social validity scores indicated general satisfaction with intervention.
Smith et al., 2014	Randomized Control Trial	26	VR (SIMmersion)	The intervention group improved in the subdomains of job-relevant interview content and interviewee performance ($d = 0.76$ and 0.73, respectively), while the TAU group did not demonstrate improvement ($d = 0.08$ and 0.10, respectively). Intervention subjects improved on the individual domains of hard worker, easy to work with, sounding professional, sharing things positively, sounding interested in the job, and establishing overall rapport (*Cohen's d* ranged from 0.40 to 0.87). The TAU group did not improve on any individual items.

Author	Study Characteristics		Intervention Technology	Brief Summary of Results
	Research Design.	Sample Size		
Smith et al., 2021	Randomized Control Trial	71	VR (SIMmersion)	Significant differences between groups in regard to Total Mock Interview Score, "are you someone they want to work with?", Confidence, Likeliness to be hired, Positivity, Professionalism, "Will you do a good job?", "Will you be a good worker?", Sharing strengths and skills, Sharing limitations, Job interview anxiety, competitive integrated employment (25% treatment v. 0% control).
Strickland et al., 2013	Group Comparison	22	VR (VenuGen4)	No group differences were found for length of either interview or for the number of days between interviews. Treatment group demonstrated significant positive change at the second interview on the Content Scale and growth toward a positive change on the Delivery Scale.
Walker et al., 2016	Multiple Probe Across Days Design	5	MRS (TeachLIVE)	Of all participants, Carlitos (increase of 46%) improved the most while Anne (increase of 18%) improved the least. Across all participants the mean score improved by 30.4. All participants improved their live interview performance, with growth ranging from 18 to 46 points.

Note. MRS = Mixed-Reality Simulation; VR = Virtual Reality

Discussion

The goal of this systematic review was to explore the characteristics of the participants, the research methods, and the technologies used to teach job interview skills to young adults with IDD. As only nine studies met the inclusion criteria for this review, there is a lack of research related to the use of technology to improve job interview skills for young adults with IDD. Young adults with IDD have complex needs when it comes to preparing for competitive employment, which has historically resulted in low employment rates for this population (National Core Indicators, 2020). Therefore, it is essential for researchers to continue to study cutting edge technological methods to improve these outcomes. Despite the overall lack of research related to the use of technology to teach job interview skills to young adults with ID, the findings of this review offer interesting insights into what has been done so far, and the gaps in the literature base that warrant further research.

Participant Demographics

In seven of the nine studies included in this review, and four of those which reported racial demographic data, the majority of the participants identified as White males (See Table 1). This is not surprising given that prevalence rates indicated that ID is more prevalent in non-Hispanic white males than females (Zablotsky & Black, 2020). Another interesting finding is that six of the nine studies included in this review reported a sample in which 100% of the participants were diagnosed with Autism. While it is important to identify practices that are effective for a certain population, given the diverse nature of IDD, future research should seek to study the effects of using technology to teach interview skills to people of varying kinds of IDD.

Research Characteristics

Due to the fact that the research included in this review was not situated solely in k-12 public education settings, it was not appropriate to assess the methodological rigor of the included studies using the Quality Indicators set forth by the Council for Exceptional Children (2014), as is commonly done in systematic reviews related to special education. However, it is important to note that two of the included studies implemented a randomized controlled trial design (Smith et al., 2014; Smith et al., 2021) and three studies used a single case research design (Bahcali & Ozen, 2019; Lopez, 2019; Walker et al., 2016), both of which are considered to be rigorous research designs (Campbell & Stanley, 1963; Kazdin, 2011).

There was no consensus across the nine studies in terms of the measures that were used to assess the impact of the technology intervention on the acquisition of interview skills. However, common dependent variables included social responsiveness, interview anxiety, job interview self-efficacy, job interview skills, and gaze. For example, Walker et al. (2016) created a rubric to assess the interview skills of their participants. This method of assessment could be used or modified by future researchers to fit the needs of their participants (See Walker et al., 2016).

Technology Used to Teach Employment Skills

The technologies used to teach interview skills within the studies in this review included virtual reality (Lopez, 2019; Smith et al., 2014; Smith et al., 2021; Strickland et al., 2013), mixed-reality (Burke et al., 2021; Walker et al., 2016), video modeling via phone/tablet PC (Bahcali & Ozen, 2019; Hayes et al., 2015) and Virtual Robots (Kumazaki et al., 2022). Approximately 44% of the studies included in this review focused on virtual reality technology. The overall lack of research related to technological interventions to improve job interview skills for young adults with ID necessitates further research into the use of all of these technologies.

However, there is a noted lack of research into mixed-reality simulation (MRS) and augmented reality.

Education Research and Mixed-Reality Simulation

Mixed-reality simulation is a technology in which the person using it communicates directly with an avatar person. The avatar person is a computer-generated individual, who is controlled behind the scenes by an interactor, a trained actor who, through the abilities of the MRS technology, is able to respond in real time to the person using the technology (Dieker et al., 2015). This technology is very beneficial because not only does it allow for a high degree of flexibility in terms of the type of scenario that researchers or practitioners can implement to isolate specific skills, but it also provides participants with multiple opportunities to practice specific skills in a low-risk setting (Dieker et al., 2008; Dieker et al., 2015). This is a key feature that lends itself to the needs of students with ID, who may need more processing time, or additional opportunities to ask questions. Furthermore, as Dieker et al. (2008) notes, in the same way that it is not ideal for pre-service teachers to practice their newly learned skills on classes that are held accountable for the material that they learn, it follows logically that it is not beneficial for individuals with ID to practice implementing job interview skills for the first time in a real job interview.

Within the field of education, MRS technology has primarily been studied as a tool for both preservice and in-service teachers to practice discrete skills that could be difficult to practice in or to prepare for teaching in front of real students. For example, multiple studies have found that MRS technology has been effective in improving educator confidence and skill around foundational aspects of teaching (Hirsch et al., 2023, Lindberg & Jönsonn, 2023; Walters et al., 2021a). Despite the focus on teacher skill acquisition using MRS technology within the

field of education, Dieker et al. (2015) share a more expansive view of how MRS technology could be used. This view is supported by MRS technology site license holders, such as Kennesaw State University, who advertise scenarios for practitioner and researcher use such as classroom management, counseling sessions, parent teacher conferences, and interviewing skills. Given that we know MRS technology has been an effective form of practice across multiple domains of teacher education (Lindberg & Jönsonn, 2023), colleges in which PSEs are housed and partnered with teacher education programs may wish to explore how MRS technology could be used to support the needs of the students they serve. For example, PSE programs often focus on preparing students for competitive employment (Prohn et al., 2018). As such, it is necessary for those programs to provide instruction and opportunities for practice to these students so that they may acquire the skills necessary to earn competitive employment. This type of research, though scarce, has been explored in two studies (Burke et al., 2021; Walker et al., 2016), as identified by this literature review. In both of these studies, the authors recruited participants from postsecondary education programs who were seeking to improve their job interview skills (Burke et al., 2021; Walker et al., 2016). Furthermore, despite the use of different research methodologies, both teams reported improvements in participant interview skills ((Burke et al., 2021; Walker et al., 2016). Given the flexibility of using MRS technology and the opportunities for controlled skill practice future research should seek to examine if MRS is an effective and viable technology to supplement the interview preparation process for young adults with ID.

Limitations

While this review sought to comprehensively explore the literature to learn about the demographic characteristics of the participants and the technologies being used to teach interview skills, it is possible that some studies were not identified due to human error. Second,

given the quantitative focus of this review, qualitative research studies were not included. This is

a limitation as these studies could provide additional understanding of how this type of research

is conducted and provide qualitative insight into the experiences of the researchers and

participants. Given the dearth of research on this topic, future researchers should consider

conducting a scoping review that includes qualitative studies in order to more fully synthesize

the literature base. Additionally, due to the exploratory nature of this review, and the overall lack

of research in this area related solely to the ID population, inclusion in this review did not require

that studies meet a specific criteria other than that they included participants with a diagnosed

IDD. For example, there was not inclusion or exclusion criteria that specified a specific IQ level

range for participants. Therefore, studies were included if the participants has a diagnosis of

Autism Spectrum Disorder as well as if they had an Intellectual Disability (e.g., Down

Syndrome). Due to the wide range of intellectual functioning that exists in Autism Spectrum

Disorder (ASD), it is important to take caution comparing the outcomes of studies that had

participants with high functioning ASD (e.g., Strickland et al., 2013) and those with participants

with ID (e.g., Walker et al., 2016). As such, the results of this study should be interpreted with

caution as to not improperly aggregate and generalize findings from this review. Third, as this

review was exploratory in nature, the methodological rigor of each included study was not

assessed. Methodological rigor is essential for establishing evidence-based practices and as such,

future research should assess the research designs of studies within this body of knowledge in

order to establish evidence-based practices for using technology to teach interview skills to

young adults with ID.

Implications for Practice and Future Directions

In assessing the various demographic and experimental characteristics of each study, a number of patterns were identified. Firstly, the primary disability category of participants in these studies was Autism. Given the diverse characteristics and diagnoses of individuals with IDDs, future research should seek to recruit participants that reflect that diversity (e.g., recruit participants with various disabilities such as Down Syndrome, Autism, Prader-Willi, Williams Syndrome, etc.). As this body of research continues to grow, future reviews should seek to hone in on specific ranges of cognitive functioning in order to assess the efficacy of using this type of technology with a specific population.

Additionally, the establishment of inclusive PSEs for young adults with ID is a relatively new phenomenon in the United States (Grigal et al., 2022). Many of these programs work with or operate within the college of education or teacher preparation programs at the university in which they are housed. Due to the opportunity for low-risk, targeted practice that MRS provides, it has been described as a transformational technology (Rock et al., 2016) and as a result, universities have begun to integrate MRS into their teacher preparation coursework. Therefore, opportunities may exist for researchers working with inclusive PSE programs to partner with the teacher preparation program to conduct research on job interview skills.

Chapter III: Methods

Participants and Setting

Participants included a convenience sample of 12 young adults with ID attending a 4-year postsecondary education program housed in a large public university in the southeastern United States. At the time of the study, the program enrolled 53 students with ID. Within the program, students take an integrated course of study to cultivate their independent living and employment skills. To be included in the study, participants must have (a) a diagnosis of mild or moderate ID (i.e., IQ of 36-69, (b) been enrolled as a Freshman in the Basic Certificate track of the PSE program, and (c) concurrently taken the Employment I course. The 12 participants made up the entirety of the Freshmen class within the PSE this study was conducted. University-approved institutional review board (IRB) consent was obtained from all students before the beginning of the study. For students without self-guardianship, assent to participate in the study was obtained along with consent from their legal guardians (e.g., parents). The participants from both groups received instruction in a room at the institute in which the PSE program is housed. This space included a large high-definition flat-screen monitor located on one wall. During the simulations, participants sat at a table approximately six feet away from the monitor when interacting with the avatar. Speakers from the connected computer allowed participants to hear the avatar's questions and responses. A webcam and microphone allowed the avatar and the researchers to see and hear the participant throughout all simulation sessions.

Dependent Measures

Two dependent measures were used in the study. The first was a researcher-created job interview response rubric, and the other was an adapted version of the Measure of Anxiety in Selection Interviews (MASI; McCarthy & Goffin, 2004).

Interview Response Rubric

The primary dependent measure was a researcher-created interview response rubric. The rubric consists of 10 questions (or criterion) and a 3-point rating scale (3 = Good, 2 = Fair, 1 = Poor) with indicators for each performance level and criterion. This measure was developed in collaboration with the employment instructor to align with the curriculum delivered to the students in the class and to specifically highlight the types of responses that they would like their students to make to the interview questions that are asked of them during their mock interviews at the end of the semester. Therefore, although each item is rated on a scale of 1 to 3, what the participants must do in order to earn each of those scores differs from question to question. The employment instructor's goal for each student is to obtain a score of 3 ("good') on each question in the interview protocol. Additionally, this measure was piloted the year prior to the present study with a group of students who met the same inclusion criteria as this study. Within the pilot study, there were no major issues related to the student's understanding of the questions and therefore, the originally developed measure was kept as is. A copy of the interview rating scale, which includes the criterion for each interview question is located in Figure B1 of Appendix B.

Job Interview Anxiety Measure

The Measure of Anxiety in Selection Interviews (MASI; McCarthy & Goffin, 2004), designed for college-level students to measure self-reported anxiety about job interviews, was used to assess participant anxiety before and after the administration of the intervention. The MASI includes 30 questions divided equally across five domains of interview anxiety: (a) communication, (b) appearance, (c) social, (d) performance, and (e) behavioral. Participants answered the questions using a 5-point Likert-type scale, where 5 = strongly agree, 4 = agree, 3 = feel neutral, 2 = disagree, and 1 = strongly disagree. The MASI has been psychometrically

validated and is a reliable assessment (McCarthy & Goffin, 2004). In order to ensure that the

MASI was appropriate to use for the participants in the study, the words used within each

question of the MASI were reviewed by the author and an Assistant Professor of Special

Education, who specializes in research related to young adults with ID. If deemed necessary, the

wording of the question was simplified. For example, one question of the MASI (McCarthy &

Goffin, 2004) reads, "I become so apprehensive in job interviews that I am unable to express my

thoughts clearly." This was then simplified to " I get so nervous during job interviews that I can't

say what I am thinking." A further explanation of how the author worked to ensure the measure

met the needs of the participants is described in the next section. To further ensure that the

participants were able to give valid responses to each question, this study implemented a

pictorial scale based on a similar measure developed used by Cummins et al. (2010) that was

used to measure the subjective quality of life of individuals with ID. Cummins et al. (2010)

developed a scale that used pictures ranging from a very sad face to a very happy face to assist

individuals with ID in understanding the scale. As this study was not examining how satisfied or

dissatisfied the participants were with job interviews, and rather sought to understand their level

of agreement with statements about job interview anxiety, a pictorial scale of five different

thumbs ranging from thumbs down to thumbs up was used in the present study. The procedure

for validating whether a three- or five-thumb scale should be used is described in the next

section. A copy of the MASI including the original questions and adapted questions is located in

Figure B2 in Appendix B.

Determining Assessment Response Scale.

To ensure that participants understood the values of each potential selection on the

MASI, the participants underwent pretesting to determine whether a three-point or five-point

response scale was most appropriate. To determine this, the lead researcher read a pre-made

protocol that first examined their ability to differentiate between the meaning of a thumbs up and

a thumbs down symbol. First, the lead researcher said "Here are two thumbs. One is a thumbs up

to mean agree a lot [Point] and the other is a thumbs down to mean disagree a lot [point]." Then

the lead researcher asked each participant something they really liked to do. For example, if the

participant answered "Going to football games." The lead researcher would record that as a

"success" and proceed to ask the participant "So if I said, "Going to football games is the best.

Which thumb would you point to?" If the participant pointed to the thumb's up icon, it was

marked as a success. Next, the participant was asked, "What is something that you really dislike

doing?" If the participant responded by saying "Cleaning the bathroom." The lead researcher

would mark the trial as a success and ask the participant, "If I said, "cleaning the bathroom is the

best!" Which thumb would you point to?". If the participant then pointed to the thumbs down

icon the researcher recorded the trial as a success. After the initial two successful thumb

identifications, the participant was presented with a set of three different thumbs. This time the

researcher began the script by saying, "Here is another set of thumbs. This time you can see there

is a middle thumb [point]. This thumb does not agree or disagree." After presenting the new

scale, the researcher asked the participants which thumb they would point to if they strongly

agreed with a statement, strongly disagreed with a statement, or neither agreed or disagreed with

a statement. If the participant selected the correct thumb in each of the three instances, the

participant moved to the next scale. After successfully passing the three-thumb scale, the

researcher presented a scale with five thumb icons and said, "Here is the last set of thumbs. This

time there are five thumbs. There are three you have seen before and two new ones. The ones

you know are [point to each in turn], 'disagree a lot', 'don't agree or disagree', and 'agree a

lot'. The new ones are [point to each in turn], 'agree a little bit', and 'disagree little bit'. So, going over the thumbs again we have [point to each in turn], 'disagree a lot', 'agree a little,' 'neither agree or disagree', 'agree a little', and 'agree a lot', Is that OK?". Then, just as during the trial with the three thumb icons, the researcher asked the participant which thumb they would point to in each of the five instances. If the participant got any of the questions incorrect, the researcher would review the thumbs with the participant and do the trial again. If the participant did not answer all of the questions correctly on the third trial, the participant was assessed using the three-point scale. If the participant was able to correctly identify the thumbs for each level of agreement on either the first or second attempt, that participant was assessed using the five-point scale.

Independent Variable

The implementation of additional instruction and practice on job interview skills served as the independent variable in this study. Participants received this practice in one of two mediums depending on which group they were assigned to. All participants, regardless of their assigned group received the same amount of opportunities to practice their interview skills and followed the same procedures as is described in the following sections.

Face-to-Face Condition

Participants in the control condition received additional practice opportunities and feedback from an in-person meeting with the lead researcher once per week for approximately 15 to 20 minutes over the course of the four-week instructional plan.

Mixed-Reality Simulation Condition

Participants in the mixed-reality simulation (MRS) condition received additional practice with an avatar interviewer and feedback from the lead researcher following MRS sessions that

occurred once per week for approximately 15 to 20 minutes over the course of the four-week instructional plan.

Interventionists and Materials

The primary interventionist was a doctoral student with seven years' experience working with individuals with ID. Using a researcher-created prompting sheet, the researcher provided participants feedback on their performance between MRS and face-to-face sessions. The lead researcher has experience using MRS technology in previous research studies. Treatment fidelity data and interrater reliability data were conducted by the lead researcher with the help of doctoral research assistants. The study used the MRS program licensed and provided by Kennesaw State University.

Experimental Design

Due to the small sample size, the study used an underpowered randomized control trial (RCT) with matched pair design where participants were paired based on their pre-intervention interview response rubric scores. The best way to match is to form pairs based on their baseline probe value from highest to lowest (Bloom, 2005). One participant from each pair was randomly assigned to the MRS group, starting with the pair that scored the highest on the baseline probe. In contrast, the other participant was assigned to the face-to-face group. Matching ensures that the treatment and control groups are as similar as possible. This design is often used to reduce bias and with smaller sample sizes, provides a very high predictive power (Bloom, 2005). Given the novelty of this area of study, it was determined that an underpowered RCT was appropriate as a) there is no ethical concern as the research is exempt and poses no risk to the participants, and b) the goal of the study is not to establish an evidence-based practice, but rather to explore whether the findings indicate a proof of concept that the use of MRS to teach job interview skills

to young adults with ID warrants further research (Rosoff, 2004). As stated in the limitations section within Chapter V of this study, given the small sample size, it is critical to take caution when interpreting the results.

Social Validity

Given that the focus of this study was to examine the effectiveness and feasibility of using MRS to teach job interview skills to young adults with ID, after the study, participants in the MRS group completed a focus group interview and questionnaire to gather social validity data on what they thought of the experience of using MRS. Social validity is vital to ensure that treatments are relevant and valued by participants (Schwartz & Baer, 1991). The focus group interview consisted of five semi-structured questions (e.g., What did you think about interviewing with the avatar? Do you think it helped you get ready for an actual interview? If yes – how/why? If no – how/why?). Focus groups were conducted to allow for natural responses between the researchers and the participants as well as between participants; this format permitted follow-up questions as needed f1or clarification (Glesne, 2016). The focus group protocol intentionally included simple language, broad items, and specific follow-up prompts to give participants opportunities to respond with personal experiences and examples. The questions asked in the focus group were exploratory in nature to help provide brief quotes to supplement the responses on the quantitative social validity survey.

The social validity survey consisted of a five-question 5-point Likert-type scale with picture symbols of various faces ranging from sad (score of 1 = *strongly disagree*) to happy (score of 5 = *strongly agree*). Smiley face Likert- type scales are often used with adults who may struggle with being able to read (Reynolds-Keefer et al., 2009) and are frequently used in health care for individuals with intellectual disabilities due to their simplicity (e.g., *Faces Pain Scale*).

The researcher converted Likert-type faces into numeric scores and analyzed the results to determine the mean and standard deviation for the overall social validity of the intervention.

Procedures

Preparation for Mixed-Reality Simulation

Prior to the participants practicing in the mixed-reality simulation environment, the lead researcher met with the simulation specialist at the Kennesaw State Avatar Lab. During the first meeting the lead researcher provided a scenario for the simulation specialists to review, and provided them with the overall goals of the study. In this case, the goal for this study was for students to practice and acquire job interview skills. Next, a script for the simulation scenario was shared with the simulation specialist. A script was provided to ensure consistency across participants who participate in the job interview simulations. During this time, the simulation specialist was able to ask clarifying questions about the script to confirm how they should respond if various scenarios arise (e.g., a participant repeatedly gives off-topic answers to job interview questions). Once the script was determined for the simulation scenario, the researcher and simulation specialist continued to meet 5-10 minutes prior to the scheduled simulation time with participants to ensure ongoing fidelity to the scenario. A copy of the scenario used for this study is located in Figure A2 of Appendix A.

Data Collection

Prior to the four-week interview unit, all participants individually participated in a pretest interview probe with the lead researcher. During this probe, each participant was read a mock-interviewing script outlining the session's purpose and what to expect. All probe interviews were recorded, and all data was stored in a secure data file.

Instructional Phases

All 12 participants received the same instruction on each interview question during their Employment Class. Over the course of the four-week intervention plan, the employment instructor instructed the participants on each of the ten interview questions. Each lesson introduced the questions being covered for that day. Following the introduction of the questions, the participants completed a brief outline graphic organizer to help them brainstorm potential answers to the questions. After the participants wrote down some potential answers, they were paired and took turns asking and answering the interview questions with each other. During this time, the employment instructor provided feedback to the pairs as necessary. Each instructional session only focused on the interview questions taught that day. This means the participants did not practice answering the questions they received instruction on during the week prior.

Face-to-Face Condition. The participants were enrolled in an employment-based course, meeting weekly for 60 minutes. The course examined employment options aimed to increase skills such as resumé building, soft skills instruction (e.g., problem-solving, asking for help), and interviewing skills. Within the employment course, the unit on interviewing occurred over a four-week period, culminating in mock interviews with various community and business partners partnered with the PSE to provide paid and unpaid employment opportunities for enrolled students with ID. During the interviewing unit, the employment instructor taught participants how to conduct themselves during interviews (e.g., eye contact, body language) and how to answer different types of questions. See Appendix A for a list of interview questions that were used in this study. The employment instructor held a master's in special education with six years of teaching experience. Following the instruction for the week, participants met with the lead researcher for approximately 15 minutes to role-play the interview process. During this time, the interventionist monitored student performance using the researcher created interview response

rubric, and used the scores obtained during the practice session to provide individual feedback while students are role-playing. Each week, during individual practice, the participants practiced answering the questions in focus for that day and the questions from the previous week(s). In total, students will spend approximately 60 minutes role-playing how to answer the interview questions across the four-week unit.

        Mixed-Reality Simulation Group. Each student participated in four MRS sessions, each lasting between 15 and 20 minutes for a total of 60 to 80 minutes of time spent in the MRS environment across the four-week unit. Before each simulation session, the interventionist met with the interactor (i.e., the person controlling the avatar). The interactor was a trained actor hired by Kennesaw State University to assist in running simulation in the lab. The purpose of meeting with the interactor was to promote the procedural fidelity of the upcoming session. During the practice interview portion of the intervention, participants in the MRS condition would answer the interview questions asked by the avatar. Within mixed-reality-simulation, the avatar is a computer-generated image, similar to that which may be seen in a video game, of a person. The MRS software allows the avatar to respond flexibly to participants in real time, as opposed to only being able to provide pre-recorded responses. Within this scenario, the avatar was presented as a hiring manager, who was interviewing the participants for a job. The avatar in this scenario only asked the questions that were of focus during the instructional sessions during the week and the questions reviewed in previous weeks. For example, in the first session, the participants only answered two interview questions from the avatar. In the second session, the participants in the MRS group answered questions 3 and 4, in addition to questions 1 and 2, and so on. Following the first practice session, the interventionist provided feedback to the participant on their performance before allowing the participant to attempt to answer the

questions again. After the second time the participants answered the interview questions from the avatar, the interventionist provided one area of positive feedback to the participant and one area of improvement for the participant to focus on for future interviews. Each student participated in four MRS sessions, for a total of eight mock interview sessions, each lasting between 10 and 20 minutes.

Post-test Interview. Following the completion of the four-week interview skills unit, all twelve of the participants participated in a post-test interview probe. The post-test interview probe followed the same procedures as the pretest interview probe. Prior to the beginning of the probe, the interventionist explained the purpose of the session and the expectations for the participant during that session. Then the interventionist role-played as the interviewer and the participant as the interviewee. The interventionist used the researcher-created interview skills rubric to score the participants' performance.

Fidelity of Implementation

To ensure treatment fidelity during the baseline and intervention phases, each session was video recorded on the authors laptop and a doctoral level special education teacher reviewed the recordings and completed fidelity checklists for 30% of the intervention sessions (i.e., practice with the BAU and MRS groups). Watching the recorded sessions, the observer completed an intervention integrity checklist to ensure that the participants received the same instruction and that the interventionist provided the intervention as outlined in the script. Overall, the treatment fidelity of the sessions scored was 100% A copy of this checklist is available in the appendix.

Data Analysis

Each participant's interview performance was scored using the researcher-created interview skills rubric. Scores for each rubric were entered into a Microsoft Excel spreadsheet,

and the scores were de-identified for each participant through random assignment of participant numbers. The data was then converted into the open source statistical software R version 4.4.1 to complete all data analyses. Descriptive statistics (e.g., *M*, *SD*) were calculated for the mean total interview rubric scores for each group and the scores on the MASI.

To examine differences in the changes in the participants' scores on the interview skills rubric and the MASI from pretest to post-test, two separate one-between, one-within repeated measures ANOVAs were used. In the first analysis, the mean score on the interview skills rubric served as the one variable between groups. The time of each assessment (i.e., pretest and post-test) served as the within-subjects variable. In the second analysis, the mean score on the MASI served as the one variable between groups, and the time of each assessment (i.e., pretest and post-test) served as the within-subjects variable. Prior to conducting the ANOVAs, the author examined the data in R to assess that the normality assumption was met. As the groups were approximately equal, any potential violation of the equal covariances matrices assumption were not serious. Additionally, as the groups were approximately the same size, the homogeneity of variance assumption was not at significant risk of being violated (Pituch & Stevens, 2016). Both groups were assessed on the same measures at two different times.

The responses to the social validity questionnaire were analyzed by calculating descriptive statistics (i.e., *M, SD*) for both groups. Furthermore, the responses to the social validity questionnaire were compared using a t-test. Lastly, positive and negative quotations from the focus group interview were noted and are presented to highlight differences and similarities between how the students viewed the intervention and their teachers.

Chapter IV: Results

This study sought to answer three research questions:

1. Does practice in a mixed-reality simulation environment improve job interview skill acquisition for young adults with ID compared to face-to-face practice?

2. Does practice in a mixed-reality simulation environment, as opposed to face-to-face, lower participant self-reported anxiety related to completing job interviews?

3. Do participants and their teachers view mixed-reality simulation as a socially valid and feasible intervention for job interview skill acquisition?

To answer the first two research questions, the author used one-between, one-within repeated measures ANOVA tests. Prior to reviewing the statistical analyses in the following sections, descriptive data is provided on each group's pretest and posttest performance on the job interview skills probe.

Impact of Intervention on Job Interview Skill Acquisition Findings

Across all participants, the average pretest score was a 14.91 out of a possible 30 total points. Within the MRS group, the average pretest score was 15.66 and within the face-to-face group, the average pretest score was 14.16. Although the MRS group had a higher mean score at pretest than the face-to-face group, there were no statistically significant differences between the groups, indicating that the randomization was effective. Following the intervention, the average posttest score across all participants was 21.42. More specifically, the average posttest score for the MRS group was 23.17 and the average posttest score for the face-to-face group was 19.67. Despite the MRS group having an overall higher average score at posttest than the face-to-face group, within three of the six pairs (50%), participants from the face-to-face group improved their score more than their pair in the MRS group. A summary of each participants scores on the

pre- and posttest job interview skills probes is provided in Table 3. As represented in the table below, 11 of the 12 participants (91.67%) improved their score on the job interview skills probe from pretest to posttest, and the average improvement across all participants was 6.5 points.

Table 3

Change in Participant Interview Rubric Scores by Pairs and Group

		MASI Scores					
Pairs		Pretest		Posttest		Change	
MRS	FtF	MRS	FtF	MRS	FtF	MRS	FtF
P1	P2	22	18	24	27	+2	+9
P4	P3	16	16	25	18	+9	+2
P5	P6	15	15	22	23	+7	+8
P8	P7	13	14	19	22	+6	+8
P9	P10	13	11	23	17	+10	+6
P12	P11	15	11	26	11	+11	0
MRS (*M*)	FtF (*M*)	15.66	14.16	23.17	19.67	+7.5	+5.5
Total (*M*)		14.91		21.42		+6.5	

Note. MASI = Measure of Anxiety in Selection Interview scale. MRS = Mixed-Reality Simulation. FtF = Face-to-Face. P# = Participant #. *M* = Mean. Numbers are underlined to indicate where scores are higher.

To determine whether there were statistically significant differences on the job interview skills probe scores between the two groups, a one-between, one-within subjects, repeated measures ANOVA was conducted. In this analysis, the score on the job interview skills probe served as the dependent variable. The time that the participant took the probe (i.e., pretest, posttest) served as the within subjects' variable and the method of practice (i.e., MRS, face-to-

face) served as the between subjects' independent variable. The analysis indicated that no statistically significant differences at the $p < 0.05$ level existed between the two groups for the method of practice ($F[1,10] = 1.71$, $p = 0.22$) or for the interaction between the method of practice and time in which the participant took the probe ($F[1,10] = 0.99$, $p = 0.34$). However, a statistically significant difference between group scores was detected for the time variable ($F[1,10] = 41.9$, $p < 0.001$). To further study this difference, the author used t-tests to compare the scores of the two groups over time. This analysis indicated a statistically significant change in both the face-to-face group's job interview skills probe scores over time ($p = 0.015$) and the MRS group's job interview skills probe scores over time ($p = 0.002$). Given that both the MRS and face-to-face groups' mean scores on the job interview skills probe increased from pretest to posttest, t-tests indicate that both groups had statistically significantly higher scores on the job interview skills probe at posttest.

Impact of Intervention on MASI Scores Findings

As the MASI contained 30 items scored on a 1 to 5 Likert type scale, the minimum total score a participant could report is 30 (i.e., low self-reported job interview anxiety) and maximum potential score is 150 (i.e., high self-reported job interview anxiety). One participant (i.e., participant 11) did not receive scores on the MASI as they refused to complete the assessment. Across all participants, the average pretest MASI score was an 83. Within the MRS group, the average pretest MASI score was 84.33 and within the face-to-face group, the average pretest MASI score was 81.4. Following the intervention, the average MASI posttest score across all participants was 68.64, indicating a mean decrease in self-reported job-interview related anxiety of 14.36 points. More specifically, the average posttest score for the MRS group was 77.67 and the average posttest score for the face-to-face group was 57.8. A summary of each participants

scores on the pre- and posttest MASI is provided in Table 4. As represented in the table below, 9 within the group of 11 participants (75%) that decreased their score on the MASI from pretest to posttest (i.e., decreased self-reported anxiety related to job interviews), the average decrease in self-reported anxiety was 20.56 points.

Table 4

Change in Participant MASI Scores by Pairs and Group

Pairs		MASI Scores					
		Pretest		Posttest		Change	
MRS	FtF	MRS	FtF	MRS	FtF	MRS	FtF
P1	P2	<u>62</u>	56	<u>78</u>	55	<u>+16</u>	-1
P4	P3	74	<u>90</u>	37	<u>62</u>	<u>-37</u>	-28
P5	P6	<u>92</u>	80	<u>103</u>	38	+11	<u>-42</u>
P8	P7	80	<u>90</u>	74	<u>76</u>	-6	<u>-14</u>
P9	P10	<u>98</u>	91	<u>86</u>	58	-12	<u>-33</u>
P12	P11	<u>100</u>	--	<u>88</u>	--	<u>-12</u>	--
MRS (*M*)	FtF (*M*)	<u>84.33</u>	81.4	<u>77.67</u>	57.8	-6.67	<u>-23.6</u>
Total (*M*)		83		68.64		-14.36	

Note. MASI = Measure of Anxiety in Selection Interview scale. MRS = Mixed-Reality Simulation. FtF = Face-to-Face. P# = Participant #. *M* = Mean. Numbers are underlined to indicate where scores are higher.

Within the sample for this study, the author observed increases of self-reported anxiety for two participants (i.e., participant 1 and participant 5). To investigate specific areas of increase and decrease, the author examined these participants' scores at the MASI anxiety domain level. Examining the participant pretest and posttest scores at the domain level indicated that

participant 1 had increased levels of self-reported job interview anxiety within the appearance anxiety and performance anxiety domains. Despite also having decreased self-reported levels of behavioral anxiety, the increases in the two previously mentioned domains resulted in an overall score increase from pretest to posttest.

For participant 5, examining the participant pretest and posttest scores at the domain level indicated that they had increased levels of self-reported job interview anxiety within the communication anxiety, social anxiety, and behavioral anxiety domains. Despite also having decreased self-reported levels of anxiety in both appearance anxiety and performance anxiety, the increases in the previously mentioned domains resulted in an overall score increase from pretest to posttest. A summary of the descriptive MASI anxiety domain analysis for these two participants is provided in Table 5.

Table 5

MASI Domain Score by Participant

MASI Domain	Participant 1		Participant 5	
	Pretest	Posttest	Pretest	Posttest
Communication Anxiety	<u>22</u>	14	18	<u>22</u>
Appearance Anxiety	6	<u>14</u>	<u>18</u>	15
Social Anxiety	6	6	18	<u>21</u>
Performance Anxiety	6	<u>28</u>	<u>16</u>	15
Behavioral Anxiety	<u>22</u>	16	22	<u>30</u>
Total Score	62	<u>78</u>	92	<u>103</u>

Note. MASI = Measure of Anxiety in Selection Interview Scale. Numbers are underlined to indicate where scores are higher.

To determine whether there were statistically significant differences on the job interview skills probe scores between the two groups, a one-between, one-within subjects, repeated measures ANOVA was conducted. In the analysis, the score on the MASI served as the dependent variable. The time that the participant took the probe (i.e., pretest, posttest) served as the within subjects' variable and the method of practice (i.e., MRS, face-to-face) served as the between subjects' independent variable. The analysis indicated that no statistically significant differences at the $p < 0.05$ level existed between the two groups for the method of practice ($F[1,9] = 1.81$, $p = 0.21$) or for the interaction between the method of practice and time in which

the participant took the probe ($F[1,9] = 2.22$, $p = 0.17$). However, a statistically significant

difference between group scores was detected for the time variable ($F[1,9] = 8.28$, $p = 0.018$). To

determine where this difference existed, the author completed a pairwise t-test comparison of the

MASI scores of the two groups over time. This analysis indicated a statistically significant

change in the face-to-face group's MASI scores over time ($p = 0.031$), but did not find a

statistically significant change in the \MASI scores of the MRS group over time ($p = 0.38$). The

p-value of 0.031 means that it is 96.9% likely that the mean MASI score either increasing or

decreasing from pretest to posttest was not due to chance alone. Given that the mean MASI score

for the face-to-face group decreased from pretest to posttest, the pairwise comparison indicates

that the face-to-face group's MASI scores were statistically significantly lower at the time of the

posttest assessment.

Social Validity Questionnaire

All participants completed a 5-item social validity questionnaire after the completion of

the intervention. Each item on the questionnaire contained a five-point Likert-type scale with the

highest possible total being 25. Across all participants, the total mean was 23.67 ($SD = 1.87$). A

breakdown of group social validity responses is provided in Table 6.

Table 6

Responses to Social Validity Questionnaire by Group

Question	Rating on Social Validity Questionnaire		
	MRS (*SD*)	**Face-to-Face (*SD*)**	**Total (*SD*)**
How did you feel about practicing with the avatar/face-to-face?	4.83 (0.41)	5 (0)	4.92 (0.29)
How do you feel about the statement "The avatar/face-to-face-practice helped me prepare for interviews."?	4.83 (0.41)	4.33 (0.56)	4.58 (0.51)
How do you feel about the statement "I had fun practicing interviewing with the avatar/face-to-face?"	4.87 (0.82)	5 (0)	4.83 (0.58)
How would you feel if next year's freshmen used the MRS and avatar/practiced face-to-face to practice interviewing?	4.83 (0.41)	4.83 (0.41)	4.83 (0.39)
How would you feel if you had to use the MRS and avatar/practice face-to-face again for another class?	4.5 (0.84)	4.5 (0.84)	4.5 (0.80)
Total Combined Scores	**23.67 (2.42)**	**23.67 (1.21)**	**23.67 (1.82)**

Note. MRS = Mixed-Reality Simulation. *SD* = Standard Deviation.

The author used a t-test in order to determine if there were differences in the social validity scores between the two groups. Although the scores of the MRS group were slightly more variable (*SD* = 2.42) than those of the face-to-face group (*SD* = 1.21), because the group means were identical, no significant difference existed between social validity scores of the two groups.

Social Validity Focus Group Findings

Following the completion of the intervention data collection, the MRS group met with the author to complete a focus group interview to discuss what they did and did not like about

working with the avatar in the MRS environment, and the suggestions they had for improving the experience.

Group Opinions About Interviewing with the Avatar

Overall, each of the six participants expressed that they enjoyed the experience of interviewing with the avatar. Positive participant responses included:

"It was a pleasure to interview with the avatar because it was so easy to answer the questions. I loved it."

"I think it was good to practice the interview with the avatar. I like introducing myself to the avatar."

"I liked it. It was pretty cool."

"It was like really helpful and stuff."

Although the majority of the opinions were positive, one participant stated, "It was good at first and I got nervous later on. I had never done it before." That same participant also expressed that it was difficult to hear sometimes, as they use hearing aids and it is usually easier to hear when working face-to-face with a person.

Group Opinions About What They Liked About the Experience

Across all six participants, all of them expressed that they enjoyed the experience with a focus on how the avatar interacted with them in the interview. Responses included:

"I loved how they give so much energy. It was so easy to do. Overall 10."

"I liked talking to him. I liked his attitude."

"I liked being able to introduce myself."

"That it could actually help you have a job."

"He was really nice and understandable, like easy to understand."

Group Opinions About What They Did Not Like About the Experience

Five of the six participants stated that there was not anything that they did not like about interviewing with the avatar. One participant even stated "I liked everything." Only one participant expressed something they did not like, reiterating that it was difficult to hear. Stating, "That [hearing] was the hardest part."

Group Opinions on If the Experience Prepared Them for Real Interviews

Each of the six participants expressed belief that interviewing with the avatar in the MRS setting helped prepare them for their mock interviews the participated in as a part of their employment class. Participant responses included:

"All the way so I can understand the questions and the words he says."

"Yes, it makes me get on time, dress appropriately, make sure you're making eye contact."

"It did. I know what to wear in the interviews."

"It helped me know like what to wear and helped me know like how to be on time."

Group Recommendations for Changing the Experience

When asked for recommendations on what could be changed about the experience of interviewing with the avatars in the MRS environment, all of the participants expressed that they would keep it the same. In response to another participant's answer, one participant stated, "I would say the same thing, because I really enjoyed it.".

Chapter V: Discussion

The goal of this study was to examine the effectiveness of mixed-reality simulation technology in improving job interview skills for individuals with ID. Specifically this study explored the following research questions:

1. Does practice in a mixed-reality simulation environment improve job interview skill acquisition for young adults with ID compared to face-to-face practice?

2. Does practice in a mixed-reality simulation environment, as opposed to face-to-face, lower participant self-reported anxiety related to completing job interviews?

3. Do participants and their teachers view mixed-reality simulation as a socially valid and feasible intervention for job interview skill acquisition?

In the following sections, the findings related to these research questions will be discussed. Furthermore, the author will discuss the limitations of this study, along with the implications for future practice and research.

Effectiveness of MRS Intervention

Although not statistically significant, the findings from this study add to the literature base that has found that technology interventions can be effective in improving skills for individuals with ID (e.g., Park et al., 2019; Randall et al., 2019; Stierle et al., 2023; Walters et al., 2021b). As stated in Chapter II, only three total studies identified within the systematic literature review were found to specifically examine the impact of technology interventions on the acquisition of job interview skills for young adults with ID. Of those studies, two used MRS as the intervention (Burke et al., 2021; Walker et al., 2016) and one used video modeling (Bahcali & Ozen, 2019).

In the present study, although the MRS group (M = 23.17) finished with a larger group mean on the job interview skills probe than the face-to-face group (M = 19.67), and on average improved by a larger number of points (MRS group improved by an average of 7.5 points, whereas the face-to-face group improved by an average of +5.51), no statistically significant differences were found between the two groups. However, the findings of this study are similar to the findings of Bahcali and Ozen (2019) who also reported improvements in the job interview skills of their participants following a video modeling intervention. Additionally, the findings of the present study were similar to the two studies that used mixed-reality simulation as the technology intervention for the participants to practice their interview skills (Burke et al., 2021; Walker et al., 2016) in the sense that like those two studies, participants in the present study improved their job interview skills. Furthermore, in both the Bahcali and Ozen (2019) and Walker et al. (2016) studies, participants improved their scores on their job interview skills assessment following the intervention, but both teams of researchers did not report significant effect sizes to constitute a functional relation between the two variables.

On the other hand, Burke et al. (2021) differed from the current study and those of Bahcali and Ozen (2019) and Walker et al. (2016) as they reported statistically significant, and potentially clinically significant improvements in participant scores on the job interview skills assessment. It is important to note that Burke et al. (2021) had 153 participants, which provided them with greater statistical power to detect differences in comparison to the 12 participants, divided into two groups of 6 in the present study. There are other differences that could account for the findings in the present study and the Walker et al (2016) study. For example, Walker et al. (2016) used a single case research design. Given the demands of that design, participants in that study were exposed to the intervention a total of 6 times for between 5- and 15-minutes per

session (i.e., between 30- and 90-minutes total), and in Burke et al. (2021), although the length of each session was not reported, participants engaged in a 22-week long curriculum.

That is in comparison to the present study, in which due to time constraints of working within the schedule of the university (e.g., spring break, summer break) and participants employment class (i.e., not beginning the intervention before instruction began in the class), participants only practiced in the MRS environment and received feedback four times. Given these differences, it is possible that with a larger sample size and additional time practicing within the MRS environment, statistically and/or clinically significant differences may be observed as they were in Burke et al. (2021). In summary, despite the lack of statistically significant findings, none of the findings of this study as it relates to participant acquisition of job interview skills suggests that using an MRS environment to practice job interview skills is an ineffective or detrimental intervention.

Impact of Intervention on Job Interview Anxiety

Both the MRS group (pretest $M = 83.45$; posttest $M = 77.67$) and the face-to-face group (pretest $M = 81.4$; posttest $M = 57.8$), decreased their average MASI score over the course of the intervention, indicating that after the intervention their anxiety decreased. This is similar to the findings of Smith et al. (2021) who explored the effect of a virtual reality intervention on the acquisition of job interview skills for sample of 71 young adults with Autism. Smith et al. (2021) assessed their participants for job interview anxiety and found that the group that received the virtual reality intervention reported statistically significantly lower job interview anxiety at posttest than at pretest. Although the job interview anxiety findings in present study are similar to those of Smith et al. (2021) the in the sense that the groups decreased their job interview anxiety from pretest to posttest, there was no statistical significance found in the present study

between the two groups or in the interaction between the intervention and the time variable. The present study also differs from Smith et al. (2021) in the sense that the face-to-face group, and not the group that received the technology intervention was found to have statistically significantly lower self- reported anxiety scores from pretest to posttest. This is an interesting finding, however, perhaps not surprising. The MRS group only interacted with the avatar eight times (two practice interviews per session) and none of the individual practice interviews lasted longer than seven minutes. This did not allow for much interaction outside of the interview setting, similar to what a real job interview would be like. This is in comparison to the face-to-face group which completed their practice interviews with the author of this study each week in a consistent manner. Despite both groups following the same procedures, answering the same interview questions each week, and coordinating meeting times with the author each week, participants in the face-to-face group received additional social interaction by completing practice interviews with the author, potentially making the participants feel more comfortable with what they conceive job interviews to be. In all, this may account for why the face-to-face group had statistically significantly lower self-reported job interview anxiety levels and the MRS group did not. There are a number of other factors that could explain the difference in findings from this study and Smith et al. (2021) including this study having: a) a much smaller sample size (12 participants vs. 71 participants) which impacts statistical power and decreases the ability of statistical tests to detect differences, b) participants with ID vs those with Autism. As the nature of the disabilities of the assessed participants differs between the two studies, this could account for the differences in findings related to job interview anxiety; and c) this study used a different measure of job interview anxiety than Smith et al. (2021) which could have impacted the results as well.

The findings related to job interview anxiety in this study are somewhat at odds with the suggestion of Walker et al. (2018) in which they posit that mixed-reality technologies may be able to address anxieties due to safe and support exposure to the object of the anxiety, which in this case would be job interviews. Furthermore, the self-reported job interview anxiety scores decrease from pretest to posttest for 10 of the 12 participants in the study. Both participants for which the self-reported job interview anxiety scores increase were in the MRS group. Therefore, it is important to consider that similar to the findings related to the impact of practicing in the MRS environment on job interview skills performance, it may be possible that given a larger sample size and additional opportunities for exposure to the MRS environment, that the self-reported job interview anxiety scores may have changed more significantly.

Social Validity

Despite a lack of statistically significant findings related to the two primary dependent variables in this study, the use of MRS technology to support the job interview skill acquisition of young adults with ID may still be a helpful tool to PSE programs and transition service providers. In one of the groundbreaking articles on social validity, it is argued that, "whether or not the program is helpful can be evaluated only by the consumer." (Wolf, 1978, p. 210). In the present study, participants in the MRS group rated the intervention highly across all measured questions ($M = 4.73$). Furthermore, these responses were supported by participant input during the post-intervention focus group interview, with all participants stating that they would not change the intervention and that it helped them to prepare for their mock interviews that they completed as a part of their employment class. Given that the social validity scores across all questions for the face-to-face group were the same as the MRS group ($M = 4.73$), transition programs such as PSEs and their teachers should assess their available resources (e.g., time,

equipment, staff) to make an informed decision on how to best practice job interview skills. This is a positive addition to the research base as the two studies conducted with this type of technology previously (i.e., Burke et al., 2021; Walker et al., 2016) did not report social validity findings from their participants.

Implications for Practice

One of the reasons for this study was to explore whether research related to using MRS technology to teach job interview skills to young adults with ID is warranted. An additional purpose was to determine whether it would be worth it for inclusive PSE programs to invest in this type of technology to support the employment goals of their students. In the present study, on average, both groups of participants improved their job interview skills and also decreased their job interview anxiety. Furthermore, both the MRS and face-to-face groups received the same opportunities for practice and feedback that supplemented the instruction the participants were already receiving in the classroom and indicated they found both methods of extra practice social valid. In sum, despite positive outcomes for these participants there were no significant differences between the two groups in either job interview skill acquisition or changes in job interview-related anxiety. As such, stakeholders within inclusive PSE programs should conduct a careful cost-benefit analysis of using MRS technology to teach job interview skills. For example, some of the benefits of mixed-reality simulation include being a flexible, low-stakes practice environment for those that use it. It can be a wonderful technology to use to replicate scenarios that cannot be safely or ethically replicated for novice learners in everyday life (e.g., flying a plane, attending to a patient, teaching children with disabilities). However, it is very expensive to use this technology. Given the cost of using MRS and the complexities related to scheduling sessions (e.g., simulation time blocks are limited depending on availability), and participants

(e.g., busy schedules between classes, clubs, and independent living needs) findings from this study indicate that it would be more cost effective to provide additional practice in a face-to-face format. However, if a program is housed within a university that has a site license for MRS technology with their own discretion on how and when to use the technology, providing practice opportunities within the MRS environment could be an effective way to provide targeted practice on job interview skills. Furthermore, the instruction provided as a part of the intervention in this study supplemented the instruction provided in the participants' employment class. Practitioners working to use this technology to assist their students with job interview skills acquisition may benefit from integrating the

Limitations and Future Research

The findings of this study should be interpreted in light of the limitations that exist. First, the results of this study do not generalize to the broader population as this study used a convenience sample of participants enrolled in a PSE at a large southeastern university. Additionally, the sample size itself is another limitation. Only 12 individuals participated in this study, which greatly limited the statistical power available to detect potentially significant results, especially since the research design further divided the participants into two groups of six. Future research should continue to strive to use larger sample sizes in order to improve the generalizability and reliability of the findings. Given the expansion of inclusive PSE programs across the country, future researchers from different universities housing similar programs should consider a collaborative approach to increasing sample size within this population.

Related to the research design, logistical and ethical considerations necessitated that all participants receive additional practice on job interview skills in addition to the instruction received in their employment class. This resulted in a lack of a true control group, which blurs

the ability to make accurate assessments of the effectiveness of the MRS intervention. Additionally, participants also received feedback on their performance in between practice sessions. This additional instruction makes it difficult to draw definitive conclusions about which parts of the intervention were most effective. Researchers seeking to expand on this work should consider examining the impact of coaching in addition to practice by assigning one group of participants to practice within the MRS environment with no feedback and the other with feedback. This research should also continue to use rigorous research designs such as single-case research designs and randomized control trials (with a comparison group that does not receive the intervention) in order to better isolate the impact of the independent variable and work towards establishing a best practice as it relates to using this technology.

Third, due scheduling constraints of the university, the employment class in which the participants were enrolled in, and the participants daily schedules, only four intervention sessions (eight practice interviews per participant) were able to be had, thus limiting the exposure to the intervention. Additionally, two participants, one from the MRS group, and one from the face-to-face group missed an intervention session, further limiting their exposure to the intervention. , Future research should take this potential pitfalls into consideration and if possible, in coordination with the participants' instructor as necessary, include an additional week of practice to allow any participants who may have missed a session to make it up. Future research should also seek to compare the duration of the intervention that is provided to participants. The findings of the present study suggest that the intervention may not have been long enough to produce a significant change in job interview skill acquisition, so future studies should examine the impact of intervention duration on performance. For example, if implementing the study

within a PSE, future research might look at implementing the intervention throughout the entire school year, as opposed to just a portion of the spring semester.

Lastly, due to the dearth of research in this subject area, this study served as an exploration to determine whether future research is warranted. To expand on this work, researchers should look to further examine the relationship between participant demographic variables (e.g., age, gender, IQ, adaptive skills) and response to the intervention. Furthermore, future researchers should seek to examine the effects of relationship building with the avatar serving as the interviewer to see if additional social interactions with the avatar improves participant performance.

Conclusion

There remains a great need to identify interventions that effectively prepare young adults with ID to be successful in job interviews. Despite the widespread use of technological interventions in other areas of education, there remains a lack of research related to how technologies such as VR, MRS, and augmented reality can be used to teach job interview skills to young adults with ID. The dearth of research becomes greater when specifically looking at the effectiveness of MRS technology. The two studies that have used MRS technology for this purpose, have found that it is beneficial for improving the job interview skills of young adults with ID. The current study also found that practice in an MRS environment, in addition to performance feedback increase participant scores on job interview skills assessments, however, these findings were not statistically significant. Despite the lack of statistical significance, the improvement in job interview skills, decrease in self-reported job interview anxiety, the high levels of social validity expressed by the students, and potential limiting factors of the present

study (e.g., sample size), this line of research warrants further investigation into the feasibility of using this technology.

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Appendix A: Interview Questions, Scripts, and Scenario

Figure A1

Interview Questions

1. Tell me about yourself. Where are you from? What year are you? What do you like to do?

2. Have you ever had a job before? Tell me about it.

3. What are your strengths?

4. Do you have any areas you can improve in?

5. What would be your dream job? What are your employment goals after ClemsonLIFE?

6. What makes you a good employee?

7. Why should I hire you?

8. Is there anything else you would like me to know?

Figure A2

Interview Skills Scenario Provided to Interactor

Interview Skills Scenario

Synopsis

A college underclassmen is interviewing for a job they have applied for (HOSPITALITY SETTING). They will greet the interviewer (AVATAR) and provide answers to the AVATARS questions and maintain appropriate body language (e.g., feet flat on the floor, hands on the table or in lap). Once the student is done with the interview, the scenario is over.

Learner Challenge

The learner will need to navigate through each interview question to express why they are a strong candidate for the job.

Objectives

Learner will use four steps to introduce themselves to the avatar stranger.
• Maintain appropriate posture
• Greet the interviewer and tell
them their name.
• Only answer questions that have been asked (e.g., stay on topic)
• Speak as clearly and loudly as appropriate

Materials

List materials needed here:
Avatar Lab
- Interview Questions

SCENARIO GUIDE

Objective

Learner will use three or four steps to introduce themselves to the avatar stranger.

• Maintain appropriate posture
• Greet the interviewer and tell
them their name.
• Only answer questions that have been asked (e.g., stay on topic)
• Speak as clearly and loudly as appropriate

Avatars

Dani Pierce

Learner Audience
▪ Freshmen ClemsonLIFE students (young adults aged 18-26 with intellectual disabilities)

Interview Skills Scenario Guide

When learners…	Avatars will…
HIT	HIT
▪ *Respond to the AVATAR's greeting welcoming them to the interview by introducing themselves*	▪ Avatar will say, Nice to meet you, _____ .and then explain they are happy to have them in for the interview.
▪ *Answers the first interview question*	▪ Say Excellent, thank you for explaining that.
▪ *Answers the second interview question.*	▪ Say "Alright, I'm glad to hear you have some experience in that area"
There will be eight interview questions so after each appropriate answer, you can provide a brief appreciation for their answer and move on to the next question.	
▪ *Answers the last 0nterview question*	▪ Say, "That sounds great. That's all we have for you today, thank you for coming in"
● Says Thank you for this opportunity, I look forward to hearing from you	● You're very welcome, we will be in touch with you soon. Bye now.
Miss	Miss
▪ Does not introduce themselves to the interviewer	▪ Say, "What is your name?"
▪ Just says their name – no greeting	▪ Say "and what are you here for today?"
▪ Responds to interview question with off topic information (i.e., strengths = playing video games)	▪ Answer "I'm glad to hear that, but since this is a job interview, can you tell us about you are good at as an employee?
▪ Does not answer an interview question or takes longer than 10s to respond	▪ Say, "Would you like me to repeat the question?"

▪ Student is fidgeting or their body is facing away from the interviewer	▪ Say "are you feeling nervous?" or "can you bring your attention back to me?"

Figure A3

Interview and Feedback Script: Face-to-face Group

<div align="center">Face-to-face SCRIPT – Before Session</div>

Hello! Today we are going to be practicing your interviewing skills. In a minute, I will ask you to step out of the room. Then when you hear me say "we are ready for you", you may come back in and start the interviewing process. Remember to use all the different skills you've been learning about in Miss Katie's class. When you finish the interview, we will go over how you did, and talk about ways you can improve, and then you will get to practice again! Do you have any questions? If at any time during the interview you want to stop or take a break, please let me know. Do you have any questions before we start?

When you are ready, you can step right outside the door and I will call you in to start your interview!

After 1st MRS Interview – Prompting/Instruction Sessions
Great work! Let's talk a bit about how you did, and then we can practice again. Some things that I noticed were……

☐ Review strengths and weaknesses of Pre-Interview Protocol
Example: Remember, when you start the interview, you need to initiate it – that means you start! You greet the avatar, wave, introduce yourself, and set your resume down on the desk in front of the screen.

☐ Review strengths and weaknesses of Question 1 response:
Example: When the interviewer asks you to tell them about yourself – remember to tell them where you are from (which is where?), what year you are (what year are you?), and something you like to do (what is something you like to do?).

☐ Review strengths and weaknesses of Question 2 response:
Example: For the question about jobs, we want you to be able to name three different jobs you've had and what you did at that job. For example, one job I had was as a waitress, where I would take orders and deliver food to customers. What's a job you've had? What did you do there? If you haven't had an official job, what are some different tasks/chores that have been your job? For example, have you been responsible for cleaning the bathroom? So, can you say that you have worked at cleaning bathrooms before, and can clean the sink, toilet, and floor?

☐ Review strengths and weaknesses of Question 3 response:
Example: What are the strengths that you have talked about with Miss Katie? So, if you are _____, when is a time you showed that strength? Remember you need to give the interviewer two different strengths and explain when you showed each strength. For example, I might say, "One strength I have is that I'm very

dependable. At my previous job I only missed two days during the whole year because I was sick."

☐ Review strengths and weaknesses of Question 4 response:
Example: Do you remember what areas you talked about with Miss Katie that you needed to improve in? What were they? When the interviewer asks you what areas you can improve in – you want to improve in, you list those two areas.

☐ Review strengths and weaknesses of Question 5 response:
Example: When the interviewer asks you what your dream job is and about your *employment goals after you graduate, you need to be sure you answer with a realistic job. A realistic job is a job that you can do – not a fantasy job. For example, I would love to be an astronaut, however, I'm not smart enough in math to be able to do that job. What is a realistic job that you want to do? Remember your answer for this question is simply, "After getting the skills from ClemsonLIFE and internships, I will pursue a _____ job (or a job in _____)."*

☐ Review strengths and weaknesses of Question 6 response:
Example: What are soft skills? Skills like asking for help, being on time, respecting your boss and co-workers, asking questions, staying off your phone, having good hygiene – these all are soft skills. Remember, for this question you are sharing two soft skills that make you a good employee. You can answer by saying something like, "I will be a great employee because I'm always on time, and I work well with others."

☐ Review strengths and weaknesses of Question 7 response:
Example: when the interviewer asks you why they should hire you, you are just repeating your strengths and/or soft skills. You need to give them two reasons they should hire you – it may be "You should hire me because I'm dependable and work well with others."

☐ Review strengths and weaknesses of Question 8 response:
Example: For the last question, the interviewer will ask you if there is anything else you want them to know. You can tell them anything you want about yourself – this could be related to a job experience, or something person. For example, you might say, "One thing I'd like you to know about me is that I really enjoy going to church and go most Sunday mornings." OR "Another think I like to do is work with kids, so I like to volunteer at the Meyers Center".

☐ Review strengths and weaknesses of Post-Interview Overall Interviewing Behavior:
Example: What about body language? Did you sit straight, with your feet on the floor? Were your hands clasped in front of you? Did you make good eye contact with the avatar who was interviewing you?

Face-to-face SCRIPT – 2nd Session

You are going to get to practice your interviewing skills again in a minute! Remember what we talked about and how you should answer. In a minute, I will ask you to step outside of the room again. When you hear me say "We are ready for you", you may come back in and go ahead and start the interviewing process. Do you have any questions?

Remember, if at any time during the interview you want to stop or take a break, please let me know.
Do you have any questions before we start?

When you are ready, step outside of the room and we will start your interview!

After MRS Interview #2 –
Great work! Let's talk a bit about how you did. Some things that I noticed were……

1. One question/area the student did well in….
    a. You did an amazing job when you answered _____.

2. One question/area that the student needs to keep working on….
    a. Remember, when the interviewer asks you _____, you want to answer with _____. We will keep practicing next week on all the questions!

3. Thank student
    a. Thank you so much for all your hard work today – we could tell you were working hard at answering all the interview questions! Great work ☺
    b. Any questions before you leave?
    c. We will see you next week!

Figure A4

Interview and Feedback Script: MRS Group

MIXED-REALITY SCRIPT – Before MRS Session

Hello! Today we are going to be practicing your interviewing skills. In a minute, you will see the screen in front of you change to another setting and a different avatar. Once you see the change in screen, you may go ahead and start the interviewing process. Remember to use all the different skills you've been learning about in Miss Katie's class. When you finish the interview, we will go over how you did, and talk about ways you can improve, and then you will get to practice again! Do you have any questions?

If at any time during the interview you want to stop or take a break, simply say "Pause Simulation". When you are done with the interview, you can say "Stop Simulation." Any questions before we start? When you are ready, say "Start Simulation" and you can start your interview!

After 1st MRS Interview – Prompting/Instruction Sessions

Great work! Let's talk a bit about how you did, and then we can practice again. Some things that I noticed were……

☐ Review strengths and weaknesses of Pre-Interview Protocol
Example: Remember, when you start the interview, you need to initiate it – that means you start! You greet the avatar, wave, introduce yourself, and set your resume down on the desk in front of the screen.

☐ Review strengths and weaknesses of Question 1 response:
Example: When the interviewer asks you to tell them about yourself – remember to tell them where you are from (which is where?), what year you are (what year are you?), and something you like to do (what is something you like to do?).

☐ Review strengths and weaknesses of Question 2 response:
Example: For the question about jobs, we want you to be able to name three different jobs you've had and what you did at that job. For example, one job I had was as a waitress, where I would take orders and deliver food to customers. What's a job you've had? What did you do there? If you haven't had an official job, what are some different tasks/chores that have been your job? For example, have you been responsible for cleaning the bathroom? So, can you say that you have worked at cleaning bathrooms before, and can clean the sink, toilet, and floor?

☐ Review strengths and weaknesses of Question 3 response:

Example: What are the strengths that you have talked about with Miss Katie? So, if you are _____, when is a time you showed that strength? Remember you need to give the interviewer two different strengths and explain when you showed each strength. For example, I might say, "One strength I have is that I'm very dependable. At my previous job I only missed two days during the whole year because I was sick."

☐ Review strengths and weaknesses of Question 4 response:
Example: Do you remember what areas you talked about with Miss Katie that you needed to improve in? What were they? When the interviewer asks you what areas you can improve in – you want to improve in, you list those two areas.

☐ Review strengths and weaknesses of Question 5 response:
Example: When the interviewer asks you what your dream job is and about your *employment goals after you graduate, you need to be sure you answer with a realistic job. A realistic job is a job that you can do – not a fantasy job. For example, I would love to be an astronaut, however, I'm not smart enough in math to be able to do that job. What is a realistic job that you want to do? Remember your answer for this question is simply, "After getting the skills from ClemsonLIFE and internships, I will pursue a _____job (or a job in _____)."*

☐ Review strengths and weaknesses of Question 6 response:
Example: What are soft skills? Skills like asking for help, being on time, respecting your boss and co-workers, asking questions, staying off your phone, having good hygiene – these all are soft skills. Remember, for this question you are sharing two soft skills that make you a good employee. You can answer by saying something like, "I will be a great employee because I'm always on time, and I work well with others."

☐ Review strengths and weaknesses of Question 7 response:
Example: when the interviewer asks you why they should hire you, you are just repeating your strengths and/or soft skills. You need to give them two reasons they should hire you – it may be "You should hire me because I'm dependable and work well with others."

☐ Review strengths and weaknesses of Question 8 response:
Example: For the last question, the interviewer will ask you if there is anything else you want them to know. You can tell them anything you want about yourself – this could be related to a job experience, or something person. For example, you might say, "One thing I'd like you to know about me is that I really enjoy going to church and go most Sunday mornings." OR "Another think I like to do is work with kids, so I like to volunteer at the Meyers Center".

☐ Review strengths and weaknesses of Post-Interview Overall Interviewing Behavior:

Example: What about body language? Did you sit straight, with your feet on the floor? Were your hands clasped in front of you? Did you make good eye contact with the avatar who was interviewing you?

MIXED-REALITY SCRIPT – 2nd MRS Session
You are going to get to practice your interviewing skills again in a minute! Remember what we talked about and how you should answer. In a minute, you will see the screen in front of you change to another setting and a different avatar. Once you see the change in screen, you may go ahead and start the interviewing process. Do you have any questions?

Remember, if at any time during the interview you want to stop or take a break, simply say "Pause Simulation". When you are done with the interview, you can say "Stop Simulation." Any questions before we start?

When you are ready, say "Start Simulation" and you can start your interview!

After MRS Interview #2 –
Great work! Let's talk a bit about how you did. Some things that I noticed were……

4. One question/area the student did well in….
    a. You did an amazing job when you answered _____.

5. One question/area that the student needs to keep working on….
    a. Remember, when the interviewer asks you _____, you want to answer with _____. We will keep practicing next week on all the questions!

6. Thank student
    a. Thank you so much for all your hard work today – we could tell you were working hard at answering all the interview questions! Great work ☺
    b. Any questions before you leave?
    c. We will see you next week!

Figure A5

Treatment Fidelity Checklist

Circle/Highlight One: MRS Practice | Face-to-Face Practice

Focus of Interview Practice (write Interview Question #s):

Participant Name: **Date:**

Interview Session:	1	2	3	4

Step:	Completion:	
Script Read	Yes	No
Interview Session #1	Yes	No
Prompting/Instruction Session #1	Yes	No
Interview Session #2	Yes	No
Prompting/Instruction Session #2	Yes	No

Interview Session:	1	2	3	4

Step:	Completion:	
Script Read	Yes	No
Interview Session #1	Yes	No
Prompting/Instruction Session #1	Yes	No
Interview Session #2	Yes	No
Prompting/Instruction Session #2	Yes	No

Interview Session:	1	2	3	4

Step:	Completion:	
Script Read	Yes	No
Interview Session #1	Yes	No
Prompting/Instruction Session #1	Yes	No
Interview Session #2	Yes	No
Prompting/Instruction Session #2	Yes	No

Interview Session:	1	2	3	4

Step:	Completion:	
Script Read	Yes	No
Interview Session #1	Yes	No
Prompting/Instruction Session #1	Yes	No

Interview Session #2	Yes	No
Prompting/Instruction Session #2	Yes	No

Figure B1

Interview Skills Rubric/Probe: MRS and Face-to-Face

Rubric/Probe

Participant: _____   Date: _____

Questions/Topic	Criterion		Notes:
Pre-Question Introductions: - student initiated, wave, introduce themselves, greet interviewer, leave resume,	□ Student Initiated □ Wave or handshake □ Introduce themselves □ Greet Interviewer ("Hello") □ Hand them resume		
Score	**1 – Poor Completes 3 or less behaviors**	**2 – Fair Completes 4 behaviors:**	**3 - Good Completes all 5 behaviors**

Questions/Topic	Criterion	Notes:
1. Tell me about yourself. Where are you from? What year are you? What do you like to do?	□ Correct residence (either hometown or current housing) □ Correct year □ In the ClemsonLIFE program □ Share one thing about themselves (can be personal; "I like to swim in the lake, and I like to play basketball.")	

Questions/Topic	Criterion		Notes:
	☐ Share one thing about themselves (can be personal; "I like to swim in the lake, and I like to play basketball.")		
Score	**1 – Poor** **Responds with 3 or less**	**2 – Fair** **Responds with 4**	**3 - Good** **Responds with all 5**

Questions/Topic	Criterion		Notes:
2. Have you ever had a job before? Tell me about it.	☐ Job #1 name ☐ What they did at Job #1 (at least one thing) ☐ Job #2 name ☐ What they did at Job #2 (at least one thing) ☐ Job #3 name ☐ What they did at job #3 (at least one thing)		
Score	**1 – Poor** **Responds with 4 or less**	**2 – Fair** **Responds with 5**	**3 - Good** **Responds with all 6**

Questions/Topic	Criterion		Notes:
3. What are your strengths?	☐ Strength #1 ☐ Give example or share time they showed Strength #1 ☐ Strength #2 ☐ Give example or share time they showed Strength #2 o Strengths will include - dependable, flexible, self-motivated, team player, good communication skills, trustworthy, people person, problem solver		

Score	1 – Poor Responds with 2 or less	2 – Fair Responds with 3	3 - Good Responds with all 4

Questions/Topic	Criterion		Notes:
4. What areas you can improve in?	☐ Shares 1 area of improvement ☐ Shares 2nd area of improvement		

Score	1 – Poor Responds with none	2 – Fair Responds with 1	3 - Good Responds with 2

Questions/Topic	Criterion		Notes:
5. What would be your dream job? What are your employment goals after Clemson LIFE?	☐ A realistic dream job (no "fantasy" jobs) ☐ Mentions Skills– basically, just a summary sentence saying that after getting the skills from ClemsonLIFE and internships they will pursue XX (realistic) job.		
Score	1 – Poor Students responds with a fantasy or unrealistic job AND forgets to mention skills they will learn.	2 – Fair Students responds with a fantasy or unrealistic job OR forgets to mention skills they will learn.	3 - Good A realistic job & skills– basically, just a summary sentence saying that after getting the skills from ClemsonLIFE and internships they will pursue XX (realistic) job.

Questions/Topic	Criterion		Notes:

6. What makes you a good employee?	☐ Soft Skill #1 ☐ Soft Skill #2 　　○ asking for help, being on time, respecting their boss, handling conflict, asking questions, following directions, staying off of my phone, have good hygiene, work well with others		
Score	**1 – Poor** **Shares no soft skills**	**2 – Fair** **Shares one soft skill**	**3 - Good** **Shares two soft skills**
Questions/Topic	**Criterion**		**Notes:**
7. Why should I hire you?	☐ Skill or strength #1 ☐ Skill or strength #2 Student should basically come back to strengths and what makes them a good employee. List two of their "strengths or skills"		
Score	**1 – Poor** **Responds with none**	**2 – Fair** **Responds with 1**	**3 - Good** **Responds with 2**
Questions/Topic	**Criterion**		**Notes:**
8. Is there anything else you would like me to know?	☐ Fact, skill, strength ☐ Why they shared it Need to answer – it can be a personal fact – can state a volunteer thing, or a club they are part of and then follow-up what they say with why they would share that, "I volunteer at the Meyer Center because I like to work with kids."		

Score	1 – Poor Responds with none	2 – Fair Responds with one	3 - Good Responds with both

Questions/Topic	Criterion		Notes:
Post-Question Overall interviewing behavior	Good body language □ back straight □ feet on the floor □ hands clasped on desk in front of them □ maintain eye contact for majority of interview.		
Score	1 – Poor 2 or less behaviors displayed	2 – Fair 3 behaviors displayed	3 – Good 4 behaviors displayed
Total Score:			

Figure B2

Adapted Measure of Anxiety in Selection Interviews

Participant: _____   Date: _____

Adapted Measure of Anxiety in Selection Interviews (MASI) (McCarthy & Goffin, 2004)

Communication Anxiety	1 = Strongly Disagree	2 = Disagree	3 = Feel Neutral	4 = Agree	5 = Strongly Agree
I become so apprehensive in job interviews that I am unable to express my thoughts clearly. **I get so nervous during job interviews that I can't say what I am thinking.**	1	2	3	4	5
I get so anxious while taking job interviews that I have trouble answering questions that I know. **I get so anxious during job interviews that I have trouble answering questions I know the answer to.**	1	2	3	4	5
During job interviews, I often can't think of a thing to say. **During job interviews, I usually can't think of what to say**	1	2	3	4	5
I feel that my verbal communication skills are strong. * **I am good at talking with other people.**	1	2	3	4	5
During job interviews I find it hard to understand what the interviewer is asking me. **During job interviews, it is hard to understand the questions.**	1	2	3	4	5
I find it easy to communicate my personal accomplishments during a job interview. * **During a job interview, it is easy to tell the interviewer what I am good at.**	1	2	3	4	5
Appearance Anxiety	1 = Strongly Disagree	2 = Disagree	3 = Feel Neutral	4 = Agree	5 = Strongly Agree

	1	2	3	4	5
I often feel uneasy about my appearance when I am being interviewed for a job **I am usually worried about how I look during a job interview.**	1	2	3	4	5
Before a job interview, I am so nervous that I spend an excessive amount of time on my appearance. **I spend a lot of time making sure I look good before I have a job interview because I am nervous.**	1	2	3	4	5
In job interviews, I worry that the interviewer will focus on what I consider to be my least attractive physical features. **In job interviews, I worry that the person interviewing me will notice things I don't like about how I look.**	1	2	3	4	5
If I do not look my absolute best in a job interview, I find it very hard to be relaxed. **I can't relax if I do not look really good when interviewing for a job.**	1	2	3	4	5
I feel uneasy if my hair is not perfect when I walk into a job interview. **I get nervous if my hair is messy when I go to a job interview.**	1	2	3	4	5
During a job interview, I worry about whether I have dressed appropriately. **During a job interview, I worry if I am wearing the right clothes.**	1	2	3	4	5
Social Anxiety	1 = Strongly Disagree	2 = Disagree	3 = Feel Neutral	4 = Agree	5 = Strongly Agree
While taking a job interview, I become concerned that the interviewer will perceive me as socially awkward. **During a job interview, I worry the person interviewing me will think I am weird.**	1	2	3	4	5
I become very uptight about having to socially interact with a job interviewer. **I am anxious about having to talk to the person interviewing me.**	1	2	3	4	5
I get afraid about what kind of personal impression I am making on job interviewers. **Thinking about what the person interviewing me thinks about me makes me afraid.**	1	2	3	4	5

	1	2	3	4	5
During a job interview, I worry that my actions will not be considered socially appropriate. **During a job interview, I worry that my behavior is not appropriate or bad.**	1	2	3	4	5
I worry about whether job interviewers will like me as a person. **I worry about whether the person interviewing me will like me.**	1	2	3	4	5
When meeting a job interviewer, I worry that my handshake will not be correct. **I worry that I will not correctly shake the hand of the person interviewing me.**	1	2	3	4	5
Performance Anxiety	**1 = Strongly Disagree**	**2 = Disagree**	**3 = Feel Neutral**	**4 = Agree**	**5 = Strongly Agree**
In job interviews, I get very nervous about whether my performance is good enough. **I get really nervous about if my interview answers are good enough.**	1	2	3	4	5
I am overwhelmed by thoughts of doing poorly when I am in job interview situations. **I have a lot of thoughts that I will not do a good job during the job interview.**	1	2	3	4	5
I worry that my job interview performance will be lower than that of other applicants. **During a job interview, I worry that I will not answer the questions as well as other people.**	1	2	3	4	5
During a job interview, I am so troubled by thoughts of failing that my performance is reduced. **During a job interview, I don't do as well as I could because I don't think I can do a good job.**	1	2	3	4	5
During a job interview, I worry about what will happen if I don't get the job.	1	2	3	4	5
While taking a job interview, I worry about whether I am a good candidate for the job. **During a job interview, I worry about if I am a good fit for the job.**	1	2	3	4	5

Behavioral Anxiety	1 = Strongly Disagree	2 = Disagree	3 = Feel Neutral	4 = Agree	5 = Strongly Agree
During job interviews, my hands shake.	1	2	3	4	5
My heartbeat is faster than usual during job interviews.	1	2	3	4	5
It is hard for me to avoid fidgeting during a job interview.	1	2	3	4	5
Job interviews often make me perspire (e.g., sweaty palms and underarms). **Job interviews make me sweat more than usual.**	1	2	3	4	5
My mouth gets very dry during job interviews.	1	2	3	4	5
I often feel sick to my stomach when I am interviewed for a job.	1	2	3	4	5

Note. ∗indicates a negatively keyed item. Items are rated on a 5-point response scale: 1 = *strongly disagree,* 2 = *disagree*, 3 = *feel neutral*, 4 = *agree*, 5 = *strongly agree*. Questions that were adapted for the participants in this study are bolded.

Figure B3

Post-intervention Social Validity Questionnaire: MRS Group

Individual Likert-Style Questions (POST MRS)

Using the following scale please answer each question:

1 – Disagree a lot   2 – Disagree a little   3 – Neutral   4 – Agree a little   5 – Agree a lot

- -

1. **How did you feel about practicing interviews with the Avatar?**

1 – Disagree a lot   2 – Disagree a little   3 – Neutral   4 – Agree a little   5 – Agree a lot

2. **How do you feel about the statement, "The avatar helped me prepare for interviews."**

1 – Disagree a lot   2 – Disagree a little   3 – Neutral   4 – Agree a little   5 – Agree a lot

3. **How do you feel about the statement, "I had fun practicing interviewing with the avatar."**

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

4. How would you feel if next year's ClemsonLIFE freshmen used the mixed-reality simulator and avatar to practice interviewing?

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

5. How would you feel if you had to use the mixed-reality simulator and avatar again for another class?

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

Figure B4

Post-intervention Social Validity Questionnaire: Face-to-Face Group

Individual Likert-Style Questions (POST MRS)

Using the following scale please answer each question:

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

1. **How did you feel about practicing interviews face-to-face in person?**

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

2. **How do you feel about the statement, "Practicing face-to-face helped me prepare for interviews."**

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

3. **How do you feel about the statement, "I had fun practicing interviewing face-to-face with a real person."**

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

4. **How would you feel if next year's ClemsonLIFE freshmen used practiced interviewing face-to-face with a real person?**

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

5. **How would you feel if you had to practice face-to-face with a real person for another class?**

1 – Disagree a lot	2 – Disagree a little	3 – Neutral	4 – Agree a little	5 – Agree a lot

Figure B4

Focus Group Interview Questions: MRS Group

<div align="center">

Focus Group Interviews (POST MRS)

</div>

1. What did you think about interviewing with the avatar?

2. What did you like about it?

3. What didn't you like about it?

4. Do you think it helped you get ready for real interviews? If yes – how/why? If no – how/why?

5. If we were to do this again, is there anything you think we should do differently? Or keep the same?