A Systematic Review of Virtual Reality Interventions for Children with Social Skills Deficits

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***Abstract*—Children who lack social capacities and interactive abilities can be classified as having "social skills deficits". Children with these symptoms can also meet the criteria for multiple mental health diagnoses, e.g., social anxiety disorder (SAD), social phobia, attention-deficit hyperactivity disorder (ADHD), public speaking anxiety (PSA), autism spectrum disorder (ASD), and other pervasive developmental disorders (PDDs). With ever-growing research in regard to technology applied in clinical psychology, it is crucial to convert traditional therapeutic thinking to a more cross-sectional perspective — to use effective technology-based interventions in an inclusive manner for children with various mental illnesses. In view of this reflection, we present a systematic scoped review for children with social skills deficits, focusing on early interventions based on virtual reality (VR) technology and its feasibility and efficacy of social skills improvement. We specifically scope on efficacious VR intervention strategies which are presented for children with similar issues of social skills. The highlight of these research findings is that VR can be applied to psychological research and clinical usage within specific contexts, and a promising tool for social skills training.**

***Keywords*—VR, Children, Social skills, Early intervention**

I. Introduction

Mental disorders among children are considered severe challenges to their development and daily life, typically including learning, behaviors, emotions, and sociability. These issues cause children distress and problems getting through the day [1] that can potentially exclude them from everyday classroom learning experiences. Children can exhibit weaknesses in social skills for various reasons (e.g., their genes, early traumatic events, parenting style, shyness, temperament, brain structure, mental disorders, and childhood experience with the specific environment. Social skill deficits exist in individuals who present low levels of social interaction and who evidence a high level of aggressive and disruptive behaviors and deficits in daily communication [2]. Ecological factors, anxiety, depression, or past failures can also cause this issue for some children [3]–[7]. Deficiencies of social skills can become more evident as children age and social landscapes have more complex. Social skills deficits are a defining feature of individuals who are commonly diagnosed with general social needs, social anxiety disorder (SAD), autism spectrum disorder (ASD), social phobia, attention-deficit hyperactivity disorder (ADHD), public speaking anxiety (PSA), and other pervasive developmental disorders (PDDs).

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Virtual reality (VR) technology is currently experiencing a reemergence [8] and is increasingly being used in mental health treatment and clinical research [9]. VR is a technology that combines visual displays, computer graphics, motion tracking, and sensory devices to provide users with a visual multi-sensory experience and a realistically simulated virtual environment [10], [11]. With the continuous improvement of computer-generated graphic technology, these virtual environments have been created as a replacement or extension of the physical world, allowing users six degrees of freedom.

Currently, there are two types of VR environments being applied in the field - immersive VR and non-immersive VR. When experiencing immersive VR, the user is situated in the virtual environment via a headset display or projection system (Cave automatic virtual environment - CAVE), whereas non-immersive VR uses computer monitors or screens as displays, such as video games [12]. Research has demonstrated a close connection between human activities and cognitive behavior development in daily life. Therefore, advanced computer display technology, such as VR, can coherently present auditory, visual, and haptic information while also controlling the level of sensory information provided for the user [13]. Hence, VR can potentially provide an effective learning gateway for researchers and psychologists to explore patient interventions with immersive VR technologies [14].

As an intervention approach, VR has significant potential to be applied in psychological and clinical contexts. VR holds particular relevance to therapeutic interventions as it can help patients reach a higher level of physical and cognitive competence of social inclusion [15], allowing the user to become more integrated into society. Specifically, it has been shown to support the practice of social skills and environmental motivation within a carefully designed and controlled environment that has no evident threatening factors [16]. It also delivers a human-computer interaction for users to experience a sense of presence and immersion, exposing individuals to simulated real-life scenarios, reducing anxiety, and provoking cues to learn valuable inter-personal coping abilities that could be transferred to reality [17]. Therefore, our research presents a systematic review to analyze VR's usage as an intervention and its feasibility and efficacy in improving social skills deficits.

A. Research Question

The purpose of this study was to collect secondary data and analyze it to better understand if VR intervention can be an effective approach for children with social skills issues and if VR can be utilized to enhance children's social skills. Thus, it was necessary to adopt a systematic and explicit review methodology to identify, select, and critically appraise relevant primary research using a repeatable method that could then identify the need for primary or secondary research in the future. Therefore, we aimed to evaluate existing research using large databases and given specific limitations that relate to our research question: What is the feasibility and efficacy of VR intervention for children with social skills deficits? From this research question, we propose to explore the following:

H1 Literature can be explored to substantiate the use of VR in interventions for children with social skills deficits

H2 Previous findings can provide evidence for the feasibility and efficacy of VR for social skills improvement

II. Methodology

This study uses the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) as the primary guide to carry out a series of searches [18]. These searches were completed on 01/04/2021.

A. Search Strategy

The following significant terms derived from the research questions for this study were used for the search: (i) virtual reality; (ii) children; (iii) social skills. Also, relevant keywords and synonyms - VR, immersive VR, children with special needs, social skills deficit, and social anxiety, have been identified to enrich and compound the search string. Moreover, the Boolean "AND" was used for concatenating keywords, while the "OR" operator was used to connect synonyms. The following inclusion and exclusion strategies were implemented:

1) Inclusion Criteria:

- Articles published in the last ten years
  - between 2010 & 2021
- Discussing virtual reality applications
- Targeting children (age < 18) who are diagnosed with
  - general social needs
  - social anxiety disorder (SAD)
  - autism spectrum disorder (ASD)
  - attention-deficit hyperactivity disorder (ADHD)
  - social phobia
  - public speaking anxiety (PSA)
  - other pervasive developmental disorders (PDDs)
- Focus on social skills enhancement for the target group
- Review, pilot, usability, or experiment based studies
- Written in English

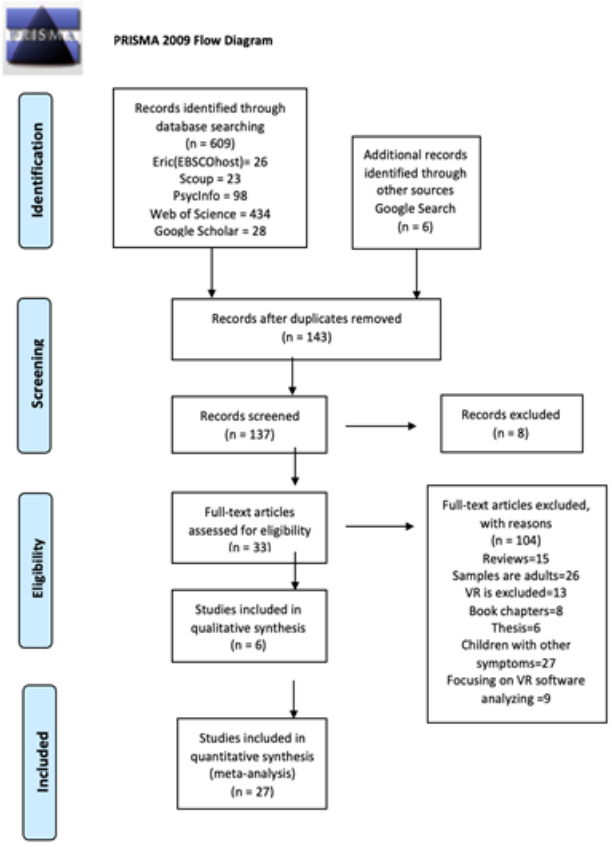

Fig. 1. PRISMA 2009 Flow Diagram

2) Exclusion Criteria:

- Inappropriate sample sizes that were inapt for robust analyses (viz. sample size < 5)
- Research focusing only on VR technology or software development and ignores the importance of human development
- Book chapters without any empirical or experimental data
- Theses that have not been peer-reviewed
- Articles with poorly structured methodology, experiment, or explicit findings
- Documents that are not available for download from the university library portal or are not open access
- No clear authorship indicated

3) Databases: Due to the inter-disciplinary nature of this research, the following databases related to the field of education and psychology were chosen to support the search strategy: Eric (EBSCOhost), Scopus, PsycINFO, Web of Science, and Google Scholar. Databases of a technical nature without specific focuses on cohorts of psychology and education were not chosen, e.g., the Association for Computing Machinery (ACM) Digital Library, the Institute of Electrical and Electronics Engineers (IEEE), and Springer. Google Scholar was used as a broad and complementary database to provide comprehensive coverage of other research depositories.

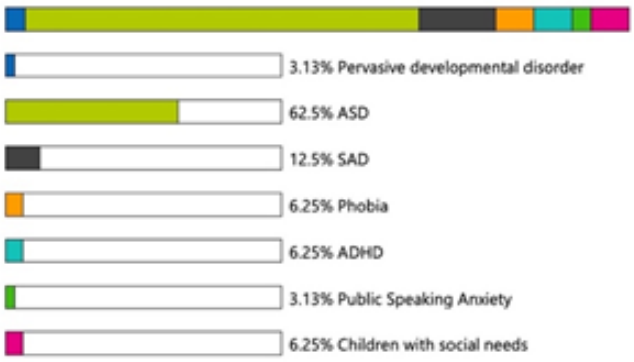

Fig. 2. Social skills deficits observed within the reviewed articles

III. Results

Following this intricately structured search methodology, we identified 609 articles. We then screened these results to remove duplicates and only included articles in the English language, resulting in 143 unique reports. After further review, full-text articles were excluded if they presented without a structured research methodology, robust and validated experiment tools, or offered results with insufficient evidence or underlying thesis. After this second round of screening, 137 papers were left remaining. Finally, after further eligibility screening, 33 manuscripts were selected and given a detailed full-text examination in the presented systematic review (see Figure 1).

A. Summary of Evaluated Articles

As previously stated, social skills deficits are a defining feature of individuals who are commonly diagnosed with general social needs, SAD, ASD, social phobia, ADHD, PSA, and PDDs [3]–[7]. Therefore, reviewed articles include VR for children with a range of clinical symptoms instead of only one diagnosed mental disorder. A summary of the specific social skills deficits within the 33 reviewed articles can be seen in Figure 2.

IV. Discussion of Results

Among the reviewed articles, 33 percent related to children with autism, 21.88 percent concerning children with SAD, Phobias, and PSA, and the remaining 15.63 percent papers were linked to children with ADHD and PDDs, and general social needs (see Figure 2). Thirty-three studies met the inclusion criteria, with a total of 657 participants. Eight studies used experimental groups and control groups. Three studies used VR intervention and compared it to other intervention types. Six studies are particularly valued because they used qualitative approaches, and 19 studies used a virtual reality environment (VRET) system. Conditions categorized as VR-Based social skills training [12], [19]–[23], VR air travel training [24], VR-based CBT [25], a VR-based Anxiety-sensitive (AS) assessment system [26], and VR-based role play [27], [28]. Children with social skills deficits were commonly diagnosed with various symptoms (e.g., individuals with general social needs, SAD, social phobia, ADHD, ASD, PSA, and other PDDs. Thus, the reviewed articles consisted of 62.5 percent related to children with ASD, 12.5 percent about children with SAD, 6.25 percent on children with various phobias, 6.25 percent about children with ADHD, 6.25 percent related to children with general social needs, 3.13 percent to children with PDD, and 3.13 percent related to children with PSA (see Table I).

A. Feasibility and Efficacy of VR Intervention Statistics

All recorded studies employed VR-based intervention for social skills training or social-emotional cognition purpose for participants. Most studies (67 percent) reported that VR systems had improved children's social skills. Seventy percent of studies demonstrated that VR interventions effectively reduced children's symptoms and enhanced social skills. Also, it is a reliable means to reduce children's anxiety and provide them with a safer setting to have therapeutic sessions. Forty-five percent of studies notably indicated that VR technology had been valued as an acceptable approach, creating a comfortable environment for the intervention process. Forty-eight percent of articles suggested that VR could be potential and promising for future studies regarding early intervention. Meantime, 21 percent of studies reported that children enjoyed the intervention, expressing that the VR environment is cool and exciting. Nine percent of research claimed that VR is a cost-effective approach for therapies and that there should be more VR applications related to intervention industries and products in the future. However, VR has its limitations. Twelve percent of research indicated that VR is imperfect and unsuitable for analysis purposes. For example, 9 percent of studies highlighted that children had a higher stress level and other difficulties after VR intervention. Some research (12 percent) also indicated not many differences were detected after the post-intervention stages. Little research (3 percent) addressed that VR is expensive and unaffordable for many therapists, educators, and researchers.

B. VR for Children with Social Skills Deficits from A Range of Symptoms

The presented studies illustrated that VR interventions are a safe and innovative methodology for engaging children and youths with ASD. Firstly, the reviewed studies showed preliminary evidence to support that during VR intervention, children, adolescents, and students under 18 years old with autism were socially responding to virtual characters in a virtual environment, which have been designed to support people with autism to have conversations, use their gestures, and facial expressions [29].

Meantime, VR has been successful in serving the general population's phobia of flying and heights, spiders, and public presentation [30]. Another success is that VR helped people with SAD to improve social skills (e.g., social understanding, facial expression and emotions, traffic safety, and fire prevention training [31]–[33]. Based on these empirical studies, VR has been reported as a novel opportunity for anxiety and phobia-based exposure and social skill development.

TABLE I
SUMMARY OF REVIEWED ARTICLES

Author (Year)	Diagnosis	Approach (Group size)	Main Findings
Ip et al. (2018) [14]	ASD	Experiment Group (n=36) Control Group (n=36)	Improvements in children's emotional expression, regulation, and social emotional reciprocity.
Moon & Fe (2019) [27]	ASD	VR Exposure Therapy (n = 15)	Participants displayed improved behavioral performance after VR-based training.
Crowell et al. (2020) [35]	ASD	VR Exposure Therapy (n=36) LEGO Therapy (n=36)	Significant differences were not detected. Creating collaborations and comfortable environments for socialization were also suggested.
Felnhofer et al. (2019) [36]	SAD	Experiment Group (n=12) Control Group (n=12)	The VR exposure was effective.
Garcia-Castellar et al. (2018) [37]	ADHD	Experiment VR Therapy (n=24) Control VR Therapy n=28	No significant differences between Spanish children with ADHD and the control group in detecting and encoding social cues.
Ghanouni et al. (2019) [38]	ASD/ADHD	VR Exposure Therapy (n=63)	Most scenarios were agreeable for participants.
Wong Sarver et al. (2014) [19]	SAD	Social Effectiveness Therapy (n=11)	The VR intervention reduced anxiety and distress.
Cheng et al. (2015) [20]	ASD	3D Social Understanding (n=3)	Children enjoyed the interaction with the virtual instructor and practiced their social competences.
Miller (2020) [24]	ASD	VR-air Travel Training (n=5)	Both parents and children reported that there was an improvement after the intervention.
Bailey et al. (2019) [39]	Social needs	VR Group (n=26) TV Group (n=26)	Children enjoyed VR exposure with physical action.
Zhao et al.(2016) [40]	ASD	VR Therapy Group (n=3) Typical Development Group 1 (n=3) Typical Development Group 2 (n=6)	The experimental group (ASD) had a higher level of communication than the standard group.
Kuriakose et al. (2013) [41]	ASD	VR Exposure Therapy (n=3)	Results demonstrated a proof-of-concept application but the VR system had some limitations.
Halabi et al. (2017) [42]	ASD	ASD VR Therapy Group (n=3) Typically Developing Group (n=7)	The virtual avatar had a natural interaction with the children.
Ke et al. (2015) [23]	ASD	VR Social-interaction Training (n=5)	Children with ASD could switch social roles using VR.
Matsentidou & Poullis (2014) [43]	ASD/ADHD	VR Exposure Therapy (n=6)	The experimental group achieved the learning goals and tasks in the simulation.
Le & Beidel (2017) [28]	SAD	VR Exposure Therapy (n=30)	Using VR for long time reduced the cost of assessment.
Morasse et al. (2020) [44]	Social needs	Role Play (n=46) VR environment assessment (n=46)	There was a connection between heightened emotional, social decision making, and empathic responses after adolescents used VR.
Yuan & Ip (2018) [45]	ASD	VR Training Group (n=36) Control group (n=36)	Children made new friends and joined a two-way conversation. They also learned visual and audio information through immersive VR.
Ke & Lee. (2016) [46]	ASD	VR Design Task (n=2)	Children with high-functioning ASD gained identity, social norm, and flexibility in VR.
Ke et al. (2020) [47]	ASD	VR Social Skills Training (n=7)	Improved social skills performance; however, the intervention effect on specific social skills fluctuated due to external factors.
Kahlon et al. (2019) [25]	Phobia	CBT with exposure (n=27)	VR was an effective tool for children with PSA.
Kuriakose & Lahiri (2016) [26]	PSA	Anxiety-sensitive VR system (n=9)	The VR system caused variations in performance measures, but improved in-task progression patterns.
KB & Lahiri. (2016) [22]	ASD	VR Social Communication (n=4)	Variations in task performance in VR-based social tasks.
Bouchard (2011) [48]	SAD/Phobia	VR Exposure Therapy, Vivo (n=9)	VR worked for specific phobias, whereas the research is limited by an insufficient control group.
Maskey et al. (2014) [30]	ASD	VR Exposure Therapy (n=9)	Most children improved on their baseline ability to handle the working situation.
Abdelmohsen & Arafa (2021) [12]	ASD	VR/Social Robot (n=15)	Study is ongoing.
Parrish et al. (2016) [17]	SAD	Experiment Group (n=20) Control Group (n=21)	VR presented vivid social cues for children with SAD.
Wallace et al. (2017) [29]	ASD	Experiment Group (n=10) Control Group (n=10)	VR exhibited an ecological context for children who had issues recognizing facial effects.
Beach & Wendt (2014) [49]	ASD	Ethnographic (n=2)	The VR intervention had a moderate contribution to participants.
Cheng & Huang (2012) [50]	PDD	VR system (n=3)	Participants' joint attention skills were improved.
Ke & Moon (2018) [51]	ASD	VR Gameplay (n=8)	The VR-based game-play promoted social interaction performance in high-functioning autistic children.
Ke & Im (2013) [21]	ASD	VR Exposure Therapy (n=15)	VR improved participants' communication and friendship development.
Herrero & Lorenzo(2020) [52]	ASD	VR Exposure Therapy (n=7)	The VR intervention enhanced students' social skills.

Fig. 3. Word cloud of social skills from reviewed articles

Therefore, VR can be seen to arouse individuals' emotional responses and estimate related outcomes on anxiety and stress obtained during the treatment sessions. In terms of how VR could serve children with SAD, phobia, and PSA, given there are challenges and stress that adolescents and children face within the peer social occasions, tailored VR systems and applications are becoming optimal instruments for young adults to deal with SAD before practicing them in natural social occasions [17]. Similar research has pointed out that VR treatments are feasible and acceptable for children with SAD and their families. Many children believed that VR intervention could bring them less anxiety [19]. Finally, these studies have proved that VR is feasible for improving memory functionality, sensory processing, and levels of attention for children with social skills deficits, including focused, selective, sustained, alternating, and divided attention [34].

C. The Potential of VR to Improve Social Skills

Social relationships in daily lives were previously explored regarding how individuals will respond while being imitated by others under a variety of social norms. It was observed that traditional experiments could examine live social interactions by conducting plain cognitive experiments with only one stimulus and a few potential responses. From a psychological perspective, the main reason to use VR in social behavior experiments was to magnify the experimental effects of complex social interactions. When conducting an intervention in a VR scenario, manipulating only one variable at a time with complete control ensures reasonable control of any interactive situation [53]. The highlight of this review is using VR as an instrument for children's social skills. Thus, the central thesis from the reviewed 33 articles was that VR provides a stimulating environment, motivating children to learn and practice social skills. Many children have positive comments on emotional recognition, understanding the perspective, and the ability to problem-solve. Chronically, children who had VR intervention would use learned skills and benefit from real-life human social interaction.

The recorded research has highlighted that the development of social skills development depends on the complexity of human social interactions, which includes eye contact, smiling, joint attention, imitation, language acquisition, and physical motions. These factors play a vital role for children in accomplishing childhood developmental outcomes (e.g., academic achievement, peer acceptance, and mental health) [54]. Thus, in response to the focus of this research - what social skills VR has improved for children with social skills deficits, to introduce a range of specific social skills that VR has worked on, we extracted the keywords from the reviewed experiments and results and generated a word cloud (Figure 3). From the analyses of the literature, we can see the various social skills that can be enhanced by VR intervention, especially the core social skills, such as social interaction, emotion recognition, empathy, and undertaking social tasks.

1) Social Interaction: A study from Beach and Wendt [49] addressed that participants with ASD reported moderate improvement in their areas of weakness by engaging VE scenarios. During the sessions, they were impressed by life-like virtual characters and also had eye interaction with these avatars within the immersive scenario. They could concentrate and interact with the virtual character, and one of the participants held eye contact with the character consistently. Cheng and Huang [50] reported that their experiment results indicated that children with PDDs have further improvement on joint attention after a period of time by using tailored VR application for joint attention training. The main components of the research design include 3D animation, interactive text, audio effects, and system feedback. The 3D animation with social cues is related to school occasions and events. It motivated participants' learning tasks since they presented great passion and interest in chatting with virtual characters and toys in the VR system. Moon and Ke's research [27] recruited eight children with ASD to participate in a home-based VR-based learning program. Experimental evidence was collected via record screening and on-site observation of actions and reactions from participants. Overall, results showed that there was enhanced behavior regarding targeted social functions during the process. Designed VR collaborative game such as chess, sports and racing games, and role play enhanced their ability of negotiation, cognitive flexibility, and self-identity expression.

2) Empathy and Perspective-taking: Cheng and Huang [20] have demonstrated that a collaborative VR environment could enhance social behaviors for children with autism, such as social manners, eye interactions, listening behaviors, empathy, and perspective-taking. Although participants had stereotyped characteristics (e.g., stubbornness) during their experiment, they have learned and memorized basic principles of target behaviors. Bailey et al. [39] compared immersive tech-intervention on social compliance improving, inhibitory control, and sharing behaviors for children with general social needs. Embodied characters and settings that present interactive opportunities through verbal (e.g., conversations) and non-verbal responses (e.g., hands-up and social proximity), influencing their social cognition and behaviors. For example, many children developed a one-way emotionally-tinged attachment with their favorite media characters, which could be seen as parasocial relationships [55], [56]. Therefore, VR

can present social simulations to practice prosocial behavior, empathy, and perspective-taking by creating real-world scenarios and drawing children's attention to virtual characters.

3) Emotions Recognition: Kandalaft and Didehbani [57] examined a life-based VR system, designed as participants in a one-to-one role play setting. The participant was engaged with the game through different virtual avatars and morphed her/his voice to mimic different social characters. This research revealed that VR intervention significantly affects children with ASD's emotional competence, social tasks, and real-life common functioning. Likewise, on a VR-based social skills training program, Ke and Im [21] observed a VR social skills training program, demonstrating participants presented enhanced behavior in Comparing immersive VR effect and a desktop display influences on children's decision-making, the results suggested that using VR as an emotion elicitation medium could be more effective than the other tool's greeting and responding. VR initiated their positive conversation, as well as social competence during and after the intervention. Susindar and Sadeghi [58] have compared immersive VR effect and a desktop display influences on children's decision-making, the results suggested that using VR as an emotion elicitation medium could be a more effective tool than classical methods regarding emotion recognition and decision making.

Furthermore, a research project was designed to assist children with autism in how to react when facing unsafe conditions. Ip and Wong [14] have indicated that project researchers used a CAVE system to mimic the real-life situation of crossing the road. Within the emotion control into relaxation scenario, participants experienced the four seasons' situation and interacted with virtual characters in the VR environment. Results exhibited that a range of training sessions substantially improved emotion regulation, verbal and emotional expression, and social interaction for children with ASD. These findings have proved that VR is an immersive technology, which promises to enhance children's socio-emotional expression.

V. Implications of Findings

As a cutting-edge technology, VR presents a computer-generated environment that synthesizes multi-sensory stimulation and immersive scenes to simulate real-world contexts, therefore, VR can improve the human experience [53], [59]. As an emergent technology, VR contributes to our understanding of technology-mediated collaborations and displays new solutions to current phenomena. For example, VR-based intervention has developed promising evidence on its facilitation for traditional methods. VR simulates a variety of senses in an immersive setting. Relevant VR applications for mental health issues and human developmental problems have been progressively developed in recent decades. However, it is relatively new equipment in psychological research with a powerful function to generate simulated social occasions. It triggers individuals' spontaneous sense of "being there" [60]. Nowadays, many VR applications are disruptive and imaginatively complex. Immersive VR environments enabled target groups (e.g., children, students, and trainees) to explore multiple aspects of their social identities, facilitating their expression and self-construction, including design-based identity presentations or descriptions of "positionality" [46].

In many of the reviewed experiments, the cohort goal of group bonding is embedded into the collaborative design. This finding supports that VR applications can be designed to back up cognitive development (e.g., self-identity) for individuals with ASD, SAD, PDD, ADHD, and PSA, etc. More importantly, much research indicated that the technology is modern and the intervention design could be replicable and cost-effective for consumers. The strength of VR intervention also encompasses controllability, predictability, multi-sensory stimulation, goal-oriented intervention, affordability, and its potential to intervene issues related to individuals with social skills deficits [41]. Hence, advantages of VR intervention can be used for social skill training in a controlled immersive environment. Also, the reviewed articles concluded VR is promising, feasible, cost-effective, and acceptable with disruptive possibilities for intervention.

There have been common criticisms of VR throughout the reviewed studies. Many of these VR experiences remind users of the expected responses to real-world interactions. The first issue would be VR's side effects. Being immersed in a virtual setting can introduce cybersickness, which is related to the device or the interference between system information. The device issue (e.g., the inflexible headset causing facial stiffness or long time looking at liquid crystal display for an extended time induce eye strain) has become a problem. Although VR is growing at a fast pace, the corresponding visual stimuli content may still lag behind the tracker's processing speed. These inconsistencies within the VR system could lead to symptoms such as headache, vertigo, nausea, and blurred vision.

On the other hand, developing virtual models and characters requires specialists in three-dimensional (3D) modeling, texturing, character animation, and programming [48]. The expertise for creating VR applications is a difficulty and limitation for most psychologists and therapists. Collaboration with technology experts is needed to produce bespoke products for children with special needs [19]. Meantime, the cost of advanced VR systems partly remains relatively high, even though it has decreased cost in recent years. For instance, a tracking system to cover a large area could cost upwards of a hundred thousand dollars. Experimental new methods may cost millions to develop and all the above issues need to be considered in the pre-experiment stage.

VI. Conclusion

Emerging collaborations between innovative technologies and therapeutic activities contribute to diverse solutions for current issues and phenomena in psychology and other human services. This systematic review has highlighted the use of VR intervention for children with social skills deficits to convert traditional therapeutic thinking to a more cross-sectional perspective. Also, it has examined the feasibility and efficacy of VR technology interventions for these children's social skills enhancement. Within the reviewed 33 articles, most studies

reported that VR was feasible and acceptable for children with social skills deficits. It was particularly effective for some children's social interaction, empathy, perspective-taking, and emotional recognition improvement. The immersive settings and realistic characters presented in VR triggered the participants' curiosity and prompted interactivity. Apart from children with social skills deficits, most parents, therapists, and practitioners were also satisfied with the VR interventions.

The limitation of current VR technologies included cybersickness and the relative unaffordability for ordinary families and schools. However, VR is reemerging (again) [8], with the relevant equipment, products, and technology becoming replicable and cost-effective for public usage. The reviewed studies view that VR appears to be gaining popularity for application in psychological and clinical use, and it is a tool that can effectively deal with the disruptive possibilities of social skills improvement. Furthermore, it may also be useful for broader applications in the classroom [61] for more inclusive educational experiences.

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