Ethiopian Journal of Behavioral Studies, 2023, 6(2), 30-55

Effectiveness of Interventions for Children with Intellectual Disabilities: A Systematic Review

Firafis Dereje[1] and Sileshi Zeleke[2]

Abstract

Individuals with intellectual disability (ID) encounter difficulties in several areas of functioning because of skill deficits (e.g., cognitive, adaptive, and social skills) and/or problem behaviors (e.g., hyperactivity and irritability). Many scholars have attempted to address these problems through various interventions. This paper presents a systematic review of the literature on commonly used interventions and their relative effectiveness. A search of three electronic databases (PsycINFO, Scopus and EMBASE) produced 87 articles published between 2004 and 2022. Seventeen peer-reviewed articles written in English from open-access journals met the inclusion criteria. The review identified a variety of interventions commonly employed to help improve the conditions of students with ID. These include play therapy, physical exercise, training, video modelling, computer-based cognitive training, peer tutoring, storytelling, portage early intervention training program, comprehensive reading intervention, and emotional intelligence-based intervention. The synthesis shows that play therapy was the most commonly employed intervention to address target behaviors in several areas (adaptive behavior, social skills, self-esteem, and problem behaviors). Besides, whereas the interventions produced small to large effects, only one produced very small or negligible effects. All the interventions that employed play therapy, in particular, had effects of large magnitude. Play therapy appears to be the most effective and widely applicable intervention to help improve skill deficits and reduce problem behaviors among students with ID. Finally, the paper suggests a direction for future research.

Keywords: *Intellectual disability, intervention, adaptive behavior, social skills, cognitive skills, effectiveness*

[1] PhD candidate, CEBS, School of Psychology, AAU, Email-firafisd2008@yahoo.com

[2] Associate Professor of Psychology. CEBS, School of Psychology, AAU.Email address: sileshi.zeleke@aau.edu.et

Introduction

According to the American Psychiatric Association (APA) (2022), intellectual disability (ID) is a neurodevelopmental disorder with onset during the developmental period that includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains. APA provides three diagnostic criteria for ID: (1) deficits in intellectual functions, (2) deficits in adaptive functions, and (3) onset of intellectual and adaptive deficits during the developmental period.

Relating the deficits and the resulting challenges in the lives of individuals with ID, APA (2022) further indicates that deficits in intellectual functions have consequences on the individual's skills in the areas of reasoning, problem-solving, planning, abstract thinking, judgment, academic learning, and learning from experience. On the other hand, deficits in adaptive functioning result in failure to meet developmental and sociocultural standards for personal independence and social responsibility. The adaptive deficits limit the individual's functioning in one or more daily life activities, such as communication, social participation, and independent living, across multiple environments, such as home, school, work, and community.

Given these deficits, one can imagine the challenges individuals with ID encounter in social, academic, or other community settings. Studies indicate that children with ID often face limitations in adaptive skills, impaired cognitive abilities, behavioral anomalies (Schalock et al., 2010) and lack of social skills (Matson et al., 2009). Because of their social skills deficits, children with ID may exhibit a lack of social reciprocity, poor eye contact, facial expressions, nonverbal behaviors, and struggle with maintaining relationships with peers. One can observe therefore that ID has significant social consequences for individuals (Katz & Lazcano-Ponce, 2008).

Addressing the challenges that individuals with ID encounter requires concerted efforts of schools or centers that provide services to these children, their family and the community at large. One of these efforts focus on interventions that aim to address the skill deficits of the children. By addressing the skill deficits in their interventions, scholars have made exerted effort to enhance various skills (e.g., adaptive behavior, social skills, motor proficiency, and cognitive skills) of

individuals with ID. The types of interventions conducted by scholars in different countries include, among others, play therapy, social skills training, video self-modeling, combined use of video modeling and social stories, life skills training, physical exercise to enhance the children's motor proficiency, and game-based cognitive training.

The various interventions have produced good results that helped to improve the children's skills in various domains. These include, among others, (1) the cognitive domain, including enhanced reasoning, problem-solving, planning, abstract thinking, judgment and academic learning, (2) the social domain, including better social reciprocity and communication and (3) the behavioral domain such as self-regulation and reduced destructive behaviors.

Despite the efforts exerted so far by scholars to conduct interventions to help improve the lives of children with ID, there is a dearth of research that synthesizes the findings of interventions. Besides, there is limited evidence regarding the relative effectiveness of the various interventions. This systematic review aimed to narrow this gap by synthesizing the effectiveness of the intervention studies conducted on children with ID. More specifically, the systematic review explored the relative effectiveness of the different types of interventions that aim to enhance different skills of children with ID and to improve the quality of the children's lives in general. Particularly in low-income countries where resources are limited, centers that provide services to children with ID encounter several challenges in managing children with ID. The centers can learn from each intervention study included in this systematic review on how to manage children with ID better and improve the children's skills. Besides, the synthesized evidence can also help the centers choose the interventions that are more promising in enhancing the skills of children with ID.

Purpose of the Systematic Review

The purpose of this systematic review was to examine interventions that are commonly employed to enhance different skills (e.g., cognitive, adaptive and social skills) of children and adolescents with ID. The review also examined the relative effectiveness of the interventions in improving the skills of students with ID and in reducing problem behaviors.

Methods

Literature Search

We conducted online electronic searches of the PsycINFO, Scopus and EMBASE databases. Key terms or phrases used for the search included “social skills," “adaptive behavior” “cognitive skills," “motor skills,” “intervention" and “intellectual disability." The language of publication had to be English. We found a total of 87 documents. We also screened the reference lists of studies included in the electronic search to identify additional studies (see Figure 1) but this did not produce any more studies.

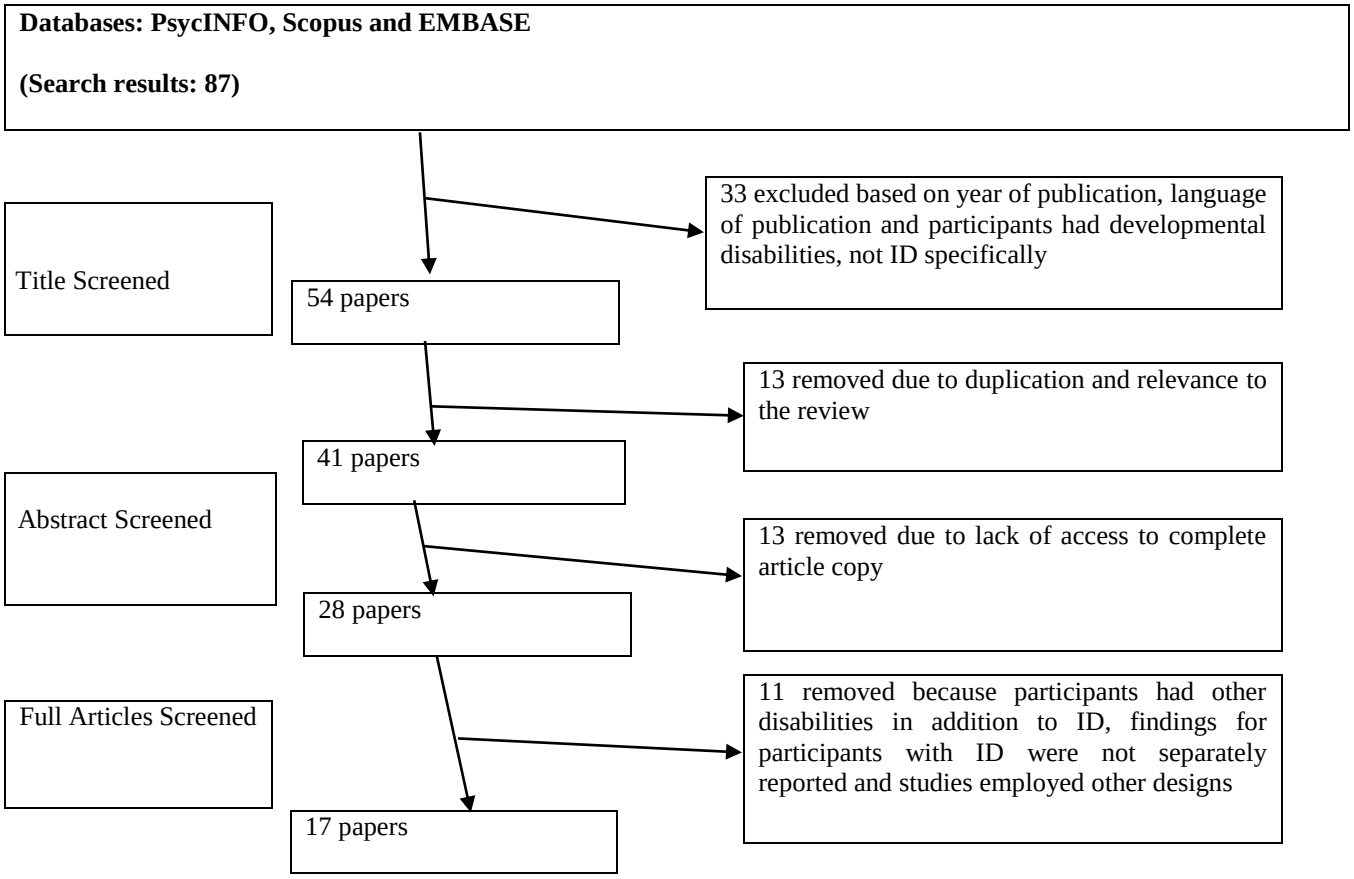

Figure 1. *Flow Chart of the Systematic Literature Search*

Selection Criteria

Screening criteria were determined using the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA). The first author searched the literature for interventions that aimed to improve adaptive behavior, social skills, cognitive skills (e.g., reading, mathematics problem solving) and motor skills of children with ID.

Inclusion and Exclusion Criteria

Inclusion criteria: We considered studies that met the following criteria: (1) the article must be published in English in a peer-reviewed, open-access journal, (2) the study must be published between 2004 and 2022, (3) study participants must have be identified as individuals with ID, and (4) the study must use either quasi-experimental design or experimental design.

Exclusion criteria: Studies were excluded if they were (1) published in languages other than English, (2) not published between 2004 and 2022, and (3) about children who have disabilities other than ID (e.g., autism spectrum disorder (ASD) or if they have ID along with other disability such as ASD).

Outcome of the Search

We found 87 studies using the search terms/phrases "intellectual disability," "social skills," "cognitive skills," "adaptive behavior," "motor skills" and "intervention," (see Figure 1). The first author reviewed the entries based on the inclusion and exclusion criteria established prior to the search. Of the 87 articles, 33 were excluded because they did not meet the above exclusion criteria. The remaining 54 articles were further reviewed for overlap and relevance, resulting in the removal of 13 additional articles, leaving 41 studies.

Among the 41, we further excluded 13 studies because we could not access the full articles. The full texts of the remaining 28 articles were read, resulting in the removal of 11 more articles that did not meet the inclusion criteria. More specifically, six studies were excluded because they used

participants have other disabilities, namely autism spectrum disorder (ASD). We excluded two more studies because they used children with several disabilities in combination and the findings of those with ID were not reported separately. Finally, we excluded three studies because they did not employ quasi-experimental or experimental design (i.e., they rather employed either survey or qualitative approaches). Thus, the systematic review was based on the remaining 17 studies.

Quality Assessment

To ensure that the systematic review included studies of good quality, the authors evaluated the studies using several standards. First, they evaluated the studies for their design and found that the included studies employed repeated-measures design (pretest-posttest design with or without control group or multiple probe, multiple baseline or A-B-A design). The authors ascertained that these studies had better quality than survey and qualitative studies in the sense that they examined the target behavior before and after the intervention. Second, we included studies that were published in peer reviewed journals. That is, the articles were evaluated for their scholarly merits and the peer review process ensured, at least to some extent, the quality of the studies.

Third, the systematic review did not consider grey literature (e.g., unpublished research reports) because such studies, unlike published articles, are less likely to have gone through a robust scrutiny and evaluation by scholars. Fourth, the review included studies that reported the effect of the intervention either directly [e.g., reporting effectiveness of the intervention in terms of effect sizes of different kinds such as (R^2 or η^2) or indirectly (through reporting the descriptive statistics necessary to compute effect size].

Strategy for Data Synthesis

We conducted a narrative synthesis of the results of the included studies. We tried to estimate the effects of the interventions using the effect size statistic, and this supported the narrative analysis, particularly when comparing the effects of the interventions. Estimating the effect size for each study facilitated the comparison of the different groups of interventions in terms of the improvements in the participants' behaviors or skills which resulted from the interventions. The effect size, as a

measure of the magnitude of the effect of the interventions, was either provided in the original studies or estimated by the authors of this systematic review based on the descriptive statistics obtained from the original studies.

Data Extraction

The process of data extraction and coding followed the following procedure [1]First, the first author recorded the information from the 17 studies independently using a table prepared for the purpose. Second, the second author independently coded the necessary information from the 17 studies. Third, the two authors met to discuss the two independently extracted sets of information from the studies. Through discussion, the two authors identified some differences (e.g., effect size was included in one but not in the other; the specific design was included in one but not in the other) between the two sets of records. Fourth, the two authors reviewed the differences one by one and resolved them through discussion. Fifth, after resolving the differences through discussion, they agreed on the variables that should be included and excluded from the records and that completed the data extraction and coding procedure.

After agreeing about the variables to be included in the coding, we extracted and recorded information from the 17 studies about the characteristics of the intervention, participant characteristics, design of the study, and findings of the intervention. Below is a description of each.

Regarding the intervention characteristics, we recorded information about the type of intervention conducted, the country in which the intervention was conducted, the duration of the intervention, and the target behavior the intervention addressed. Regarding participant characteristics, we extracted information on the total number of participants, the size of those included in the experimental and control groups (if any), age range (or mean age), and number of participants by gender. Concerning the design of the study, we recorded information on whether the study employed pretest-posttest with control group or without control group and whether the intervention was conducted on a single subject or multiple subjects. Regarding findings of the intervention, we extracted information on descriptive statistics (e.g., means, standard deviations, percentage correct, median ranks, interquartile range, effect sizes) and inferential statistics (e.g., t

values, F values, z) when possible. Furthermore, we recorded information about the specific measure or tool employed to measure the outcome of the intervention.

Results

Characteristics of the Included Studies

Table 1 below shows the countries where the interventions were conducted, the designs employed, the target behaviors/skills addressed and the severity level of the participants' ID. The As can be seen from the table, 17 interventions were conducted in 10 countries, namely the United States (3), Iran (3), Nigeria (2), Turkey (2), South Korea (2), Israel (1), Jordan (1), Kuwait (1), Pakistan (1) and South Africa (1).

Regarding the design employed, 11 of the studies used quasi-experimental design, whereas the remaining six were experimental designs. Of these, three employed single-subject designs and the remaining three used multiple-subject designs. In other words, among the 17 studies, only three used single-subject designs, whereas the remaining 14 studies employed multiple-subject designs. The 11 quasi-experimental studies employed a pretest-posttest design with or without a control group. Whereas eight studies employed a control group, the remaining three employed no control group.

The interventions targeted behaviors or skills of individuals with ID in six categories: (i) social skills (5 studies), (ii) cognitive skills including reading and mathematics (4 studies), (iii) adaptive behavior (3 studies), (iv)motor skills or proficiency (3 studies), (v) self-esteem (1 study) and (vi) problem behaviors (1 study).

In terms of the level of severity of ID, the majority of the studies (9 out of 17) conducted the intervention on children with mild ID followed by three studies that focused on children with mild and moderate ID. Among the remaining five studies, two conducted their interventions on children with moderate ID, one on children with moderate to severe ID and one on those with moderate, severe and profound ID. The remaining one study did not report the level of severity of the participants' ID.

Table 1
The Studies by Country, Design, Target Behavior the Intervention Addressed and Severity of ID

S. No	Author (Publication Year)	Country	Design	Target behavior (s)	Severity of ID
1	Adeniyi & Omigbodun (2016)	Nigeria	QED (Pretest-posttest without CG)	Social skills	Mild to moderate
2	Adiyaman & Ozkan (2022)	Turkey	QED (Pretest-posttest with CG)	Motor skills	Mild
3	Alajmi (2021)	Kuwait	QED (Pretest-posttest with CG)	Adaptive skills	Mild
4	Allor et al. (2010)	USA	ED (Pretest-posttest with CG)	Reading skills	Moderate
5	Al-Wedyan & Al-Oweidi (2022)	Jordan	QED (Pretest-posttest without CG)	Adaptive skills	Mild
6	Asjad et al. (2017)	Pakistan	QED (Pretest-posttest with CG)	Social skills	Mild to moderate
7	Bana et al. (2017)	Iran	QED (Pretest-posttest with CG)	Self-esteem	Mild
8	Behroz-Sarcheshmeh et al. (2017)	Iran	ED (Pretest-posttest with CG)	Social skills	Mild
9	Burton et al. (2013)	USA	ED (Multiple baseline)	Functional math problem solving skills	Mild
10	Fernandes et al. (2022)	South Africa	QED (Pretest-posttest with CG)	Motor proficiency	Moderate to severe ID
11	Gul (2016)	Turkey	ED - Multiple probe design	Social skills	Mild (2) & Moderate (1)
12	Jacob et al. (2021)	Nigeria	QED (Pretest-posttest with CG)	Social skills	Mild
13	Khodabakhshi-Koolaeeet al. (2018)	Iran	QED (Pretest-posttest with CG)	Adaptive behavior	NR
14	Kim & Lee (2021)	South Korea	QED (Pretest-posttest with CG)	Cognitive learning ability	Mild
15	Ko et al. (2020)	South Korea	ED (Pretest-posttest with CG)	Cognitive skills	Mild
16	Lotan et al. (2004)	Israel	QED (Pretest-posttest without CG)	Physical fitness and functional abilities	Moderate (4), severe (8) & profound (3)
17	Swan (2011)	USA	ED (single-subject, A-B-A design)	Problem behaviors	Moderate

Note. ED = Experimental design, QED = Quasi-experimental design, EG = Experimental group, CG = Control group, ID = Intellectual disability, NR = Not reported

Table 2 below presents the studies in terms of the type of intervention conducted, duration of the intervention and the measure or tool they administered to evaluate the intervention's impact or effectiveness. The studies conducted various interventions, including play therapy (4 studies), computer-based intervention including video self-modeling or video modeling alone or in combination with social stories (4 studies), different forms of physical exercise (3 studies) and direct training (2 studies). The remaining four studies employed comprehensive reading intervention (1 study), emotional intelligence-based intervention (1 study), peer tutoring and storytelling (1 study), and Portage early intervention program (1 study).

Among the five studies that aimed to improve the social skills of children with ID, two used direct training of the children, and one used play therapy. Of the two remaining studies, one used video modeling and social stories in combination, whereas the other employed peer tutoring and storytelling. Besides, different forms of play therapy were used to enhance the children's social skills (play therapy), adaptive behavior (Puppet play therapy), and self-esteem (cognitive behavioral play therapy), as well as to reduce the children's problem behaviors (child-centered play therapy).

The duration of the interventions ranged from three hours and 20 minutes (the shortest duration employing puppet play therapy) to 40 minutes daily for over a year (the longest duration for a comprehensive reading intervention). The duration of those interventions that aimed to enhance children's cognitive skills was longer (12 weeks up to more than a year) than the duration of the other interventions. The latter included interventions that aimed to enhance the children's motor proficiency (6 weeks up to 12 weeks), adaptive behavior (2 weeks up to 6 months), social skills (less than 10 weeks), self-esteem (6 weeks) or the one that aimed to reduce the children's problem behaviors (3 weeks).

Regarding the measures/tools administered, most of the studies (12 out of 17) administered standardized measures, whereas some of the studies (5 out of 17) administered non-standardized measures. The studies used various standardized measures, including the Vineland Adaptive Behavior Scale, Adaptive Behavior Scale for Children, Cooper-Smith Self-Esteem Inventory, Adaptive Behavior Index, Social Skills Rating Scale, the Korean Version of WISC-IV, Aberrant Behavior Checklist, and a comprehensive test battery to measure reading. The non-standardized procedures used included several evaluation tests, evaluation forms and checklists

Table 2
The Studies by Intervention Type, Duration of the Intervention and Measures/Tools Used

S. N.	Author (Publication Year)	Intervention Type (Duration of the Intervention)	Measure/Tool administered
1	Adeniyi & Omigbodun (2016)	Social skills training (3-4 times a week for 8 weeks)	Matson evaluation of social skills for individuals with severe ID (MESSIER)
2	Adiyaman & Ozkan (2022)	Fun athletics program (2 days a week for 12 weeks)	Performance Evaluation Tests (Agility, speed, strength, balance, speed) & using Psychomotor Skills Evaluation Form
3	Alajmi (2021)	EI-based intervention (NR)	Vineland Adaptive Behavior Scale (VABS)
4	Allor et al. (2010)	Comprehensive Reading Intervention (Daily for 40 minutes for one to one and a half year)	A comprehensive battery comprising 5 tests (PPVT, EVT, WLPB, CTOPP and TOWRE)
5	Al-Wedyan & Al-Oweidi (2022)	Portage Early Intervention Training Program (6 months)	Adaptive Behavior Scale for Children with ID
6	Asjad et al. (2017)	Play therapy (20 sessions, 45 minutes per session)	Social skills checklist
7	Bana et al. (2017)	Cognitive Behavioral play therapy (CBPT) (12 sessions, 60 minutes per session)	Cooper-Smith Self-Esteem Inventory (CSEI)
8	Behroz-Sarcheshmeh et al. (2017)	Life skills training (9 sessions, two 50-minute sessions a week)	Teachers completed the Social Skills Rating Scale (Teacher Form)
9	Burton et al. (2013)	Video self-modeling (Twice daily, 4 days a week until criterion was achieved)	Percentage of steps completed accurately and independently
10	Fernandes et al. (2022)	Motor intervention program (30 minutes, 3 times a week for 6 weeks)	Bruininks-Oseretsky Test of Motor Proficiency, 2nd ed. (BOT-2) Brief Form
11	Gul (2016)	Combined use of video modeling and social stories (NR)	Evaluation of accuracy of participants' performances and controlled event recording
12	Jacob et al. (2021)	Peer tutoring and Storytelling (30 sessions over a 10-week period)	Social skills performance scale
13	Khodabakhshi-Koolaeeet al. (2018)	Puppet play therapy (8sessions, each 25minutes long, twice a week)	Adaptive Behavior Index (ABIC) with 38 items and 11 subscales
14	Kim & Lee (2021)	Neuro-World, a game-based cognitive training (24 sessions twice a week, 8 times a month)	K-WISC-IV (Korean version of WISC–IV)
15	Ko et al. (2020)	A tablet computer-based cognitive training (30 minutes per session, twice a week for 12 weeks)	Measures: BSID II, PEDI, LAP-TAB, ECBQ and GAS
16	Lotan et al. (2004)	Treadmill (A daily 20–30 min exercise on the treadmill for 2 months)	Pulse rate measure and Functional ability measure
17	Swan (2011)	Child-Centered Play Therapy (3 weeks of play therapy 3 times per week)	Aberrant Behavior Checklist (ABC)

Note. NR = Not reported

Table 3 below presents the studies by sample size for the total sample and for the experimental and control groups separately whenever possible, gender of participants, age (mean age or age range) and effect size. Overall, the 17 studies conducted their intervention on 414 participants. Among the 414 participants, only three were in their young adulthood. All the other participants (n = 411) who were involved in the interventions were either children or adolescents.

In terms of sample size, the studies employed a minimum of one and a maximum of 60 participants. Thus, on average, 24 participants were involved in each intervention. Excluding the four studies (with 85 participants) which did not report gender of the participants, there were 225 male and 104 female participants in the remaining 13 studies.

Among the 414 participants, 233 were involved in the experimental group, whereas 166 participated in the control group. One study with 15 participants did not report the specific number of participants in the experimental and control groups. The ages of the participants ranged from 4.26 years to 23 years. As indicated above, 411 were either children or adolescents, whereas only three were young adults.

In terms of the effectiveness of the interventions, 11 (64.7%) of the studies reported large effect sizes (effect sizes greater than or equal to .8). That is, the interventions were highly effective in either reducing undesirable behavior of the participants (e.g., problem behaviors) or enhancing the participants' skills (cognitive, social, adaptive or motor skills) and self-esteem. Among the remaining six studies, three (17.6%) reported small effect sizes (effect sizes less than .5) whereas the remaining three (17.6%) found medium effect sizes ($.5 \leq d < .8$).

Table 3
The Studies by Sample Size, Gender and Age Range of Participants and Effect Size

S. No.	Author (Publication Year)	Sample Size Total (EG, CG)	Gender		Age Range or Mean age (in Years)	Effect Size*
			EG (M, F)	CG (M, F)		
1	Adeniyi & Omigbodun (2016)	30 (30, 0)	(16, 14)	(0, 0)	12 – 19	0.48
2	Adiyaman & Ozkan (2022)	20 (10, 10)	NR	NR	10 – 14	r = .83[b]
3	Alajmi (2021)	15 (NR, NR)	NR	NR	6.6 – 8.2	r = .68
4	Allor et al. (2010)	28 (16, 12)	(14, 2)	(8, 4)	EG =9.46 (1.19) CG=9.25 (1.76)	0.71[b]
5	Al-Wedyan & Al-Oweidi (2022)	10 (10, 0)	(4, 6)	(0, 0)	3 – 9	5.78
6	Asjad et al. (2017)	10 (5, 5)	NR	NR	5 – 15	1.71
7	Bana et al. (2017)	40 (20, 20)	NR	NR	8 – 12	4.74
8	Behroz-Sarcheshmeh et al. (2017)	40 (20, 20) Boys only	(20, 0)	(20, 0)	16 – 18	.938
9	Burton et al. (2013)	1 (1, 0)	(1, 0)	(0, 0)	13	1.00
10	Fernandes et al. (2022)	38 (15, 23)	(10, 5)	(14, 9)	15 - 17	0.16
11	Gul (2016)	3 (3, 0)	(3, 0)	(0, 0)	20, 23 and 25	0.80
12	Jacob et al. (2021)	34 (10, 11, 13)[a]	(5,5) (6,5)	(5, 8)	Mean ages: 11.4, 12.1, 11.7	.799
13	Khodabakhshi-Koolaeeet al. (2018)	30 (15, 15)	(15, 0)	(15, 0)	9 - 11	1.14[b]
14	Kim & Lee (2021)	60 (30, 30)	(23, 7)	(19, 11)	EG: 8.83 (1.79) CG: 9.57 (2.17)	1.48
15	Ko et al. (2020)	38 (20, 18)	(11, 9)	(7, 11)	Mean age in months EG: 54.8 (21.0) CG: 51.1 (21.7)	.47[b]
16	Lotan et al. (2004)	15 (15, 0)	(8, 7)	(0, 0)	5 – 10	2.28
17	Swan (2011)	2 (2, 0)	(1, 1)	(0, 0)	5 and 6	3.17[b]

Note. EG = Experimental group, CG = Control group, NR = Not reported
[a]The first two are experimental groups
[b]Mean or median effect size is reported for studies that used multiple measures or a measure with subscales
**Effect sizes reported in the table are Cohen's d unless indicated otherwise.*

Synthesis of the Intervention Outcomes

As shown in Table 4 below, the findings of the 17 studies were statistically significant, irrespective of the target behaviors the interventions addressed. In other words, all the interventions could either significantly improve the participants' skills (cognitive skills, motor proficiency, adaptive behavior, and social skills) and self-esteem or significantly reduce problem behaviors (hyperactivity and irritability) that the participants were exhibiting before the intervention. However, despite the significant differences that all the interventions reported, one can observe that the interventions produced effects of different magnitudes. Although the interventions have brought about positive changes in the participants, the impacts or effects were not the same as estimated by effect size (see Table 3).

Overall, the examination of the effects of the interventions in terms of the associated effect sizes indicates that the 17 interventions have produced effects that range from small to large. With the exception of six studies that produced either small or medium effects, the majority of the studies (11 studies) produced effects of large magnitude. More specifically, three studies (Adeniyi & Omigbodun, 2016; Fernandes et al., 2022; Ko et al., 2020) produced effects of small magnitude (effect size less than .5) and three more studies (Alajmi, 2021; Allor et al., 2010; Jacob et al., 2021) yielded effect sizes of moderate magnitude ($.5 \leq d < .8$). The remaining 11 studies (Adiyaman & Ozkan, 2022; Al-Wedyan & Al-Oweidi, 2022; Asjad et al., 2017; Bana et al., 2017; Behroz-Sarcheshmehet al., 2017; Burtonet al., 2013; Gul, 2016; Khodabakhshi-Koolaee et al., 2018; Kim & Lee, 2021; Lotan et al., 2004; Swan, 2011) brought about effects of large magnitude ($d \geq .8$).

In the following sections, we grouped the interventions based on design, type of intervention, duration of intervention, and level of severity of the ID) to examine their relative effectiveness. We evaluated the relative effectiveness of the interventions using the effect size statistic.

Table 4
Description of the Studies by Objective and Finding of Intervention

Author (Year)	Objective of intervention	Findings
Adeniyi & Omigbodun (2016)	To investigate the effect of a social skills training	The social skills of participants with ID improved significantly during the 8 weeks the Explore social skills curriculum was administered from a mean of 126.63±17.91 at pretest to 135.97±20.81 at posttest (t=3.71; p= .001).
Adiyaman & Ozkan (2022)	To examine the program's effect on motor development of children with mild ID	The study found improvement in gross and fine motor skills from pretest to posttest for those in the EG (p<.05) but not in the CG. With the exception of few tests, the intervention improved the EG's motor skills in various areas (e.g., both right and left grip strength, side direction shift both left and right, Hexagon, agility, zigzag, static body and hip flexibility, etc.).
Alajmi (2021)	To examine effectiveness of EI-based intervention in enhancing adaptive behaviors	Statistically significant differences in the mean scores of Vineland Adaptive Behavior Scale at posttest favor the EG. The mean pretest-posttest difference adaptive scores of the EG (85.8 – 210.2) and CG (85.0 – 104.2) were significantly different in favor of the EG.
Allor et al. (2010)	To examine the effectiveness of a comprehensive reading instruction in small groups of 1-4 students to teach reading	Means favored the EG on all measures with moderate to strong effect sizes (.36 to 1.00). Significant differences were found on most measures (CTOPP Blending Non-words, CTOPP Segmenting Words, CTOPP Sound Matching, PPVT, TOWRE Sight Word Efficiency, TOWRE Phonemic Decoding Efficiency, WLPB-R Letter-Word Identification, WLPB-R Passage Comprehension, and WLPB-R Word Attack).
Al-Wedyan & Al-Oweidi (2022)	To improve adaptive skills by training mothers to use Portage Early Intervention Program on their children	The children's adaptive skills significantly improved from a mean total score of 1.79 (SD=.38) at pretest to 2.25 (SD=.29) at posttest due to the intervention. The improvement at posttest was significant for all four adaptive behavior subscales (i.e., communication, daily life skills, socialization and motor skills).
Asjad et al. (2017)	To enhance social skills of children with ID	Paired samples t test for the EG showed significant improvement in social skills from pretest to posttest (t = -4.21, df = 4, p = .014) whereas there was no significant change in the mean scores of the CG (t = 2.5, df = 4, p =.067).
Bana et al. (2017)	To examine the effectiveness of CBPT in improving self-esteem of children with ID	Self-esteem significantly increased in the EG from a mean of 12.90 (SD=2.97) at pretest to 26.95 (SD=3.63) at posttest (p<.01) whereas for the CG the pretest and posttest means were 12.10 (SD=2.83) and 12.40 (SD=3.40), respectively. There was a statistically significant difference on the posttest scores between the EG and CG (t=13.43, df=38, p<.001).
Behroz-Sarcheshmeh et al. (2017)	To investigate the impact of life skills training on the social skills of students with ID	ANCOVA yielded a significant effect of the life skills training on the participants' social skills in general and a significant difference between the means of the two groups. Life skills training had significant and positive effect on cooperation (F=392.385, P<0.0005), assertion (F=235.669, P<0.0005), and self-control skills (F=157.369, P<0.0005).
Burton et al. (2013)	To improve functional math problem solving skills	The mean percentage of steps solved correctly during intervention was 98.5% from only 14% during baseline. The increase in the percentage of steps solved correctly during intervention was 84.5% with an effect size of 1.00.

Fernandes et al. (2022)	To examine the impact of the program on the motor proficiency levels of learners with moderate to severe ID	Most of the learners in the EG (74%) and CG (60.8%) had well-below average motor proficiency levels (MPL) at pretest. At posttest, 46.7% of the EG and 52.2% of the CG had a well-below average MPL. Thus, there was a reduction of 27.3% for the EG and 8.6% for the CG from the pretest results. Besides, 26.7% of the EG managed to obtain the average MPL, whereas none (0%) of those in the CG managed to acquire this category. Overall, the intervention significantly improved the total scores (p = .038) and the overall MPL (p = .0447) of the EG.
Gul (2016)	To teach social skills	All participants acquired the target social skills with 100% accuracy (at the posttest from 0% at pretest), maintained these skills over time, and generalized them across settings, conditions, and people.
Jacob et al. (2021)	To enhance social skills of children with mild ID	Using ANCOVA, the study showed that the two experimental groups had a significantly higher mean social skills scores than the control group on the posttest [$F(2,28) = 147.589$, $p<.05$, $\eta 2=.799$]. Storytelling (mean = 29.38) was found to be more effective than peer tutoring (mean = 23.83) in enhancing social skills of children with mild ID.
Khodabakhshi-Koolaee et al. (2018)	To investigate the influence of puppet play therapy on adaptive behavior and social skills in boys with ID	Using ANCOVA (pretest scores were covariates), the study found significant group differences in the posttest scores in favor of the intervention group in six ABIC subscales. These included violent and disruptive behavior (F=2.61, p=.007), antisocial behavior (F=3.41, p=.016), rebellious behavior (F=2.41, p=.011), untrustworthy behavior (F= 8.20, p= .008), stereotyped behavior (F=0.87, p=.039) and unacceptable eccentric habit (F= 5.51, p=.026).
Kim & Lee (2021)	To improve cognitive learning ability	The difference between the pretest (62.1) and posttest (65.4) mean scores of the GBCT program were statistically significant and showed superiority in comparison with the conventional program (60.3 and 60.1). Whereas the pretest scores of the two groups were not significantly different [F=3.877, df (1, 58), p = .054] the posttest scores were [F=33.62, df (1, 58), p < .001].
Ko et al. (2020)	To examine the applicability and efficacy of the training)	Mental scale of BSID II, PEDI (social function), LAB-TAB (observation), LAB-TAB (manipulation), and GAS showed statistically significant improvements in the EG compared with the values in the CG (P<.05). After adjusting for the pretest scores and cognitive age, the program had significant effect on the posttest scores of Mental scale of BSID II, PEDI (social function), LAB-TAB (observation), LAB-TAB (manipulation), and GAS (P<.05).
Lotan et al. (2004)	To investigate if treadmill improves physical fitness and functional abilities of children with ID	Paired samples t-test showed a significant improvement in both pulse-at-rest (p < .016) and pulse-at-effort (p < .001) measures from the beginning of the intervention to the end. Likewise, there was a significant improvement in the functional tests performed at the beginning and the end of intervention (p < .0007).
Swan (2011)	To examine the effect of CCPT on problem behaviors of 2 children with ID	The results indicated that problem behaviors (hyperactivity and irritability) decreased for both participants. Results from the percent of non-overlapping data (PND), an index for effect size further revealed that play therapy was a very effective treatment for participants. Follow-up interviews suggested that play therapy is a viable intervention for children with ID and problem behaviors.

Note. EG = Experimental group, CG = Control group

Effectiveness of the Interventions by Design

The examination of the relative effectiveness of the interventions by their designs indicates that both groups of studies that employed experimental and quasi-experimental designs produced effects that ranged from small to a large magnitude. The six experimental studies yielded effects of small to large magnitudes (.47 to 3.17) with a mean effect size of 1.18. Thus, on average, the effect of the six experimental interventions was of large magnitude.

Likewise, the 11 quasi-experimental studies produced effects of small to large magnitudes (.16 to 5.78) with a mean effect size of 1.83. Again, on average, the effect of the 11 quasi-experimental interventions was of large magnitude. Thus, both experimental and quasi-experimental designs had effects of large magnitude. Nonetheless, a comparison of the effect sizes suggests that interventions with quasi-experimental designs were more effective than those with experimental designs.

We also compared the effect sizes of the six experimental studies in terms of the specific designs employed. Three of the six studies employed single-subject designs, and the remaining three used multiple subjects in their experiments. The effect sizes of the three studies that employed single-subject designs ranged from .8 to 3.17, with a mean effect size of 1.66, which is large. On the other hand, the three experimental studies that used multiple-subject designs produced effect sizes that ranged from .47 to .938, with a mean effect size of .71, which is of medium magnitude. Thus, the three experimental studies with single-subject designs were more effective than those with multiple-subject designs.

We can further compare the effectiveness of the 11 studies that used quasi-experimental designs. Eight of the studies used control group, and the remaining three conducted the intervention without control group. The eight studies with control group yielded effect sizes ranging from .16 (very small or negligible) to 4.74 (large) with a mean effect size of 1.44, which is large. On the other hand, the three quasi-experimental studies that employed no control group had effect sizes ranging

from .48 (small) to 5.78, with a mean effect size of 2.85, which is also large. In sum, these results suggest that the quasi-experimental studies that employed no control group were more effective than the quasi-experimental studies that used control group.

Effectiveness of the Studies by Type of Intervention

The 17 studies employed nine types of interventions. These were play therapy (4 studies), physical exercise (3 studies), training (2 studies), video modeling alone or in combination with social stories (2 studies), computer-based cognitive training (2 studies), peer tutoring and storytelling (1 study), Portage early intervention program (1 study), comprehensive reading intervention (1 study) and Emotional Intelligence-based intervention (1 study).

The four studies that employed play therapy yielded effect sizes that ranged from 1.14 to 4.74. All four forms of play therapy (cognitive behavioral play therapy, child-centered play therapy, puppet play therapy and simple play therapy) had large effects on the participants' behaviors, with a mean effect size of 2.69. On the other hand, the three studies that employed physical exercise intervention produced effect sizes ranging from .16 (very small or negligible) to 2.28 (large), with a mean effect size of 1.09. Based on the mean effect size, it is possible to say that, on average, physical exercise produced an improvement of large magnitude in the participants' physical/motor proficiency.

In two other studies, the intervention was conducted by training individuals with ID. These studies produced small and moderate effect sizes (that is, .48 and .94) with a mean effect size of .71, which is of medium magnitude. That is, on average, the training produced a moderate effect. Similarly, two other studies used video modeling, which produced medium effect sizes (that is, 1.00 and .8). The mean effect size is also large (.90). In two more studies, the intervention was computer-based cognitive training, which yielded small and large effect sizes (.47 and 1.48) with a mean effect size of .98. Here also the mean effect size is large.

The remaining four types of intervention included peer tutoring and storytelling (with an effect size of .80), Portage early intervention program (effect size = 5.78), comprehensive reading intervention (effect size = .71), and emotional intelligence-based intervention (effect size = .68).

Thus, the latter four types of intervention have produced improvements of moderate and large magnitude.

Overall, whereas the portage early intervention program produced the largest effect (5.78), followed by play therapy (mean effect size = 2.69), the smallest effect (effect size = .68) was that of emotional intelligence-based intervention. In short, examination of the effect of the 17 interventions by the type of intervention suggests that all interventions had either moderate or large effects, but portage early intervention and play therapy yielded the largest effects.

Effectiveness of the Studies by Duration of Intervention

Duration of the interventions ranged from less than four hours to over a year. For comparing effectiveness of the interventions in terms of their duration, we classified the studies that lasted for three months or more as having longer duration and those interventions that lasted for less than three months as having shorter duration. The 5 studies which lasted three months or more yielded effect sizes ranging from .47 (small) to 5.78 (large), with a mean effect size of 1.85 (which is large). The interventions with shorter duration (10 studies) produced effect sizes ranging from .16 (negligible) to 4.74 (large), with a mean effect size of 1.64. Thus, on average, the interventions with relatively shorter duration had large effects on the participants' behaviors. These results suggest that both groups of interventions with relatively shorter and longer duration produced large effects. However, a comparison of the relative effectiveness of the interventions indicates that the interventions with longer duration (mean effect size = 1.85) are relatively more effective than those with shorter duration (mean effect size = 1.64).

Effectiveness of the Interventions by Target Behavior Addressed

The 17 interventions addressed target behaviors (enhancing different types of skills or reducing problem behaviors such as hyperactivity) in six area: These were social skills, cognitive skills, adaptive behavior, motor/physical proficiency, self-esteem and problem behaviors. The five interventions that addressed social skills of the participants with ID produced effect sizes that

ranged from .48 (small) to 1.71 (large), with a mean effect size of .95, which is large. Thus, on average, the impact of the interventions that targeted the participants' social skills was large.

For four of the interventions, the target behaviors were different cognitive skills (e.g., reading, math problem solving). These interventions yielded effect sizes that ranged from .47 (small) to 1.48 (large), with a mean effect size of .92, which is large. Like the interventions that addressed social skills, those that targeted cognitive skills were effective with a large mean effect size. On the other hand, three studies targeted the participants' adaptive behavior. These studies had effect sizes that range from .68 (medium) to 5.78 (large), with a mean effect size of 2.53, which is also large.

Another three studies focused on improving motor/physical proficiency of participants with ID. The impact of these studies, in terms of effect size, ranged from .16 (very small or negligible) to 2.28 (large), with a mean effect size of 1.09, which is again large. The remaining two studies, one addressing self-esteem and the other addressing problem behaviors, had effect sizes of 4.74 and 3.17, respectively. The effects of the latter two studies were also of large magnitude.

In sum, the above results show that all the six groups of interventions, on average, produced effects of large magnitude. However, comparing the relative effectiveness of the six groups of studies in terms of their mean effect sizes, one can see that the two single studies that addressed self-esteem and problem behaviors of participants with ID were the most effective interventions with highest mean effect sizes (4.74 and 3.17, respectively). Following these, the results suggest that the three studies that addressed adaptive behavior were more effective (with a mean effect size of 2.53) than the three studies that targeted motor/physical proficiency (with a mean effect size of 1.09), which in turn were more effective than the five studies that targeted social skills (with a mean effect size of .95). Finally, the four studies that targeted cognitive skills had a mean effect, which was comparatively the smallest (.92).

Effectiveness of the Interventions by Level of Severity of the Participants' ID

Most studies (9 out of 17) were conducted on participants with mild ID. The effect sizes of these studies range from .68 (moderate) to 5.78 (large), with a mean effect size of 1.86, an effect of large magnitude. The remaining (8 out of 17) interventions were conducted on individuals with mild and moderate ID (3 studies), moderate ID (2 studies), moderate and severe ID (1 study) and moderate, severe and profound ID (1 study). In other words, the latter eight interventions, which were conducted on participants with mild to profound ID, had effect sizes ranging from a minimum of .16 to a maximum of 3.17, with a mean effect size of 1.16, which is of large magnitude. These results suggest that the interventions conducted on individuals with mild ID were relatively more effective than those conducted on children with mild to profound ID in combination.

Discussion

Through this systematic review, the authors sought to identify interventions commonly conducted to address skill/behavioral deficits of children and adolescents with ID. The other purpose of the review was to examine the relative effectiveness of the interventions in enhancing skills and reducing problem behaviors of persons with ID. Thus, among initially identified 87 studies, 17 met the inclusion criteria, and the review was based on these studies.

This systematic review found that there are various interventions conducted to improve the lives of individuals with ID. In particular, the 17 studies employed nine types of interventions. Of these, play therapy was the most common. Four studies employed play therapy to improve adaptive behavior, social skills, and self-esteem and to reduce problem behaviors of children with ID. Thus, play therapy was not only the most commonly administered intervention, it was also a type of intervention used to address deficits in several areas.

The other commonly used intervention was physical exercise to improve participants' motor/physical proficiency and three studies used this intervention. The remaining interventions included training (e.g., in life skills), video modeling, storytelling, computer-based cognitive training, peer tutoring, emotional intelligence-based intervention, portage early intervention, and

comprehensive reading intervention. Examination of the literature similarly shows that various interventions aim at improving skill deficits/behavioral difficulties of individuals with ID (Travers & Carter, 2022; see also Swan, 2011).

Regarding the general effectiveness of the interventions, the results show that the interventions were effective with different magnitude of impact on the participants' skills or problem behaviors. The magnitude of the interventions' effectiveness was estimated by effect size, which ranged from very small or negligible (.16) to large or very large (5.78). In most cases, however, the effect sizes were large (11 studies), and effects of small (3 studies) and medium (3 studies) magnitudes were observed only in six studies. Overall, therefore, the interventions effectively addressed the participants' skill and behavior deficits, suggesting that with exerted effort, we can improve quality of life of individuals with ID.

It should be noted that the smallest effect size was recorded in a study that used the intervention on children with moderate to severe ID. Perhaps it was because of the inclusion of children with severe ID that led to the negligible effect size observed. As shown in Table 1 and Table 3 above, the participants of the studies with the two largest effect sizes (4.74 and 5.78) were children with mild ID. This suggests that interventions for children and adolescents with ID could be more effective when dealing with those with mild ID than those with more severe levels of ID.

Given that approximately 40% of children and adults with severe ID show challenging behaviors, such as self-injury and aggression (see Oliver et al., 2012) and that severity of self-injurious and aggressive behaviors rises with age, it seems difficult for interventions to bring about significant impacts on the behaviors of these children as compared to those with mild ID.

Regarding the interventions' relative effectiveness and feasibility in addressing skill/behavior deficits across several areas, the synthesis suggests that play therapy is the most effective. All four interventions that employed play therapy addressed deficits in different areas and all of them were effective with large magnitude. This suggests that play therapy has several areas of application with significant impacts. Consistent with this finding, the literature indicates

that play therapy is widely accepted as a valuable and developmentally appropriate intervention particularly for children (Homeyer & Morrison, 2008). Besides, the application of play therapy in a variety of areas such as supporting children who suffer from emotional, social and behavioral difficulties is well recognized (Landreth, 2002).

The results of the synthesis further indicate that studies that employed experimental and quasi-experimental designs had mean effect sizes that are of large magnitude. A comparison of the mean effect sizes of the experimental and quasi-experimental studies indicate that the mean effect size of the quasi-experimental interventions (i.e., 1.83) is greater than that of the experimental studies (i.e., 1.18). Although both mean effect sizes are of large magnitude, the effect size of the quasi-experimental studies is larger.

This result is contrary to our expectation in that true experimental studies are generally considered to have high internal validity (Cohen et al., 2018) and thus more effective in bringing about change or improvement in interventions. One possible explanation for this finding could be the level of control exercised in true experimental studies as compared to the level of control exercised in quasi-experimental studies. In the former studies, many of the potential extraneous variables are controlled whereas in the latter this is not the case. Thus, because of the more robust control exercised by the investigators in true experimental designs, the mean effect size of these studies could be lower than the one reported for quasi-experimental designs.

Similarly, there is a finding that indicates that the quasi-experimental studies that employed no control group were more effective than the quasi-experimental studies that used control group. This finding is also against our expectation. A similar explanation can be advanced for this finding as well. That is, this could be due to the fact that the use of a control group facilitates control of potential extraneous factors which could result in an effect of a relatively smaller magnitude when compared with quasi-experimental studies that did not use control group.

Conclusions

This systematic review showed that there are a variety of interventions that could be used to address skill and behavioral deficits of individuals with ID (e.g., play therapy, physical exercise, training, video modeling, computer-based cognitive training, peer tutoring, emotional intelligence-based intervention, storytelling). Among these interventions, the review found that play therapy has wider applications across several areas of behavioral difficulties and skill deficits. These included enhancing social skills, self-esteem and adaptive behavior and reducing problem behaviors such as hyperactivity and irritability.

The review also showed that most of the interventions were generally effective. The effectiveness of the interventions, as estimated through the effect size statistic, ranges from negligibly small to large. Despite this range, most (nearly 65%) of the studies produced effects of large magnitude. A good example are the studies that employed play therapy, which resulted in significant improvements with effect sizes of large magnitude.

Limitations

Because the authors did not have access to articles from journals other than those which are open access, the review could not include other intervention studies. Because of this, the studies included in this systematic review may not represent all published intervention studies globally. As a result, the generalizability of the findings could be limited and readers should exercise caution in this regard.

Directions for Future Research

Even though this review included interventions that addressed skill deficits among children with moderate, severe and profound ID, they were very few particularly those interventions for individuals with severe and profound ID. On the other hand, most of the studies included in this review dealt with children or adolescents with mild ID. Most of the latter interventions significantly improved the participants' problems with large effect sizes. However, there is no evidence whether these interventions would be equally effective if used with individuals who have severe or profound ID. There is, therefore, a need for future research to narrow this gap in research by conducting different interventions that aim at addressing

skill deficits and behavioral difficulties among children and adolescents with severe and profound ID.

References

References marked with an asterisk indicate studies included in this systematic review.

Adeniyi, Y. C., & Omigbodun, O. O. (2016). Effect of a classroom-based intervention on the social skills of pupils with intellectual disability in Southwest Nigeria. *Child and Adolescent Psychiatry and Mental Health, 10* (1), 29. https://doi.org/10.1186/s13034-016-0118-3

Adiyaman, S., & Ozkan, Z. (2022). Investigating the effects of 12-week fun athletics program on motor skill development of 10-14 year old children with mild intellectual disability *Journal for Educators, Teachers and Trainers*, *13*(6). 708 – 719. https://doi.org/10.47750/jett.2022.13.06.070

Alajmi, M. A. A. (2021). The effectiveness of emotional intelligence-based intervention on enhancing adaptive behaviors of educable intellectual disabled children. *Elementary Education Online*, *19*(1), 442-442. https://doi.org/10.17051/ilkonline.2020.661873

Allor, J. H., Mathes, P. G., Roberts, J. K., Jones, F. G., & Champlin, T. M. (2010). Teaching students with moderate intellectual disabilities to read: An experimental examination of a comprehensive reading intervention. *Education and Training in Autism and Developmental Disabilities*, *45*(1), 3–22. http://www.jstor.org/stable/23880147

Al-Wedyan, A. B. A., & Al-Oweidi, A. M. (2022). The effectiveness of Portage Early Intervention Program in improving adaptive behavior skills with intellectual disorders. *International Education Studies*, *15*(1), 16-31.

American Psychiatric Association (2022). *Diagnostic and statistical manual of mental disorders text revision* (5th ed.),. Washington, DC: Author.

Asjad, A. T., Iqbal, N., & Masroor, U. (2017). Effectiveness of play therapy in enhancing social skills in intellectually disabled children. *Rawal Medical Journal*, *42*(3), 338-340. https://rmj.org.pk/fulltext/27-1475429001.pdf

Bana, S., Sajedi, F., Mirzaie, H., & Rezasoltani, P. (2017). The efficacy of cognitive behavioral play therapy on self-esteem of children with intellectual disability. *Iranian Rehabilitation Journal*, *15*(3), 235-242. https://doi.org/10.29252/nrip.irj.15.3.235

Behroz-Sarcheshmeh, S., Karimi, M., Mahmoudi, F., Shaghaghi, P., & Jalil-Abkenar, S. S. (2017). Effect of training of life skills on social skills of high school students with intellectual disabilities. *Practice in Clinical Psychology*, *5*(3), 177-186.

Burton, C. E., Anderson, D. H., Prater, M. A., &Dyches, T. T. (2013). Video self-modeling on an iPad to teach functional math skills to adolescents with autism and intellectual disability. *Focus on Autism and Other Developmental Disabilities*, *28*(2), 67-77. http://dx.doi.org/10.1177/1088357613478829

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education*. London: Routledge.

Fernandes, J. M. M., de Milander, M., & van der Merwe, E. (2022). The effect of a motor intervention programme for learners identified with moderate to severe intellectual disabilities. *Heliyon, 8*(10), e11165. https://doi.org/10.1016/j.heliyon.2022.e11165

Gül, S. O. (2016). The combined use of video modeling and social stories in teaching social skills for individuals with intellectual disability. *Educational Sciences: Theory and Practice*, *16*(1), 83-107. https://doi.org/10.12738/estp.2016.1.0046

Homeyer, L. E., & Morrison, M. O. (2008). Play therapy**:** Practice, issues and trends. *American Journal of Play*, *Fall*, 210-228.

Jacob, U. S., Pillay, J., Ayandokun O. C., & Oyundoyin, J. O. (2021). Social skills of pupils with mild intellectual disability: Do peer tutoring, storytelling and gender play a role? *Universal Journal of Educational Research*, *9*(12): 1887-1897. https://doi.org/10.13189/ujer.2021.091201

Katz, G., &Lazcano-Ponce, E. (2008). Intellectual disability: Definition, etiological factors, classification, diagnosis, treatment and prognosis. *Saludpública de México*, *50*(S2), 132-141.

Khodabakhshi-Koolaee, A., Falsafinejad, M. R., & Rezaei, S. (2018). Effectiveness puppet play therapy on adaptive behavior and social skills in boy children with intellectual disability. *Caspian Journal of Pediatrics*, *4*(1), 271-277. http://caspianjp.ir/article-1-85-fa.pdf

Kim, S. C., & Lee, H. S. (2021). Effect of game-based cognitive training programs on cognitive learning of children with intellectual disabilities. *Applied sciences*, *11*(18), 8582. **https://doi.org/10.3390/app11188582**

Ko, E. J., Sung, I. Y., Yuk, J. S., Jang, D. H., & Yun, G. (2020). A tablet computer-based cognitive training program for young children with cognitive impairment: A randomized controlled trial. *Medicine*, *99*(12).

Landreth, G. (2002). Play therapy: *The art of the relationship* (2nd ed.). New York: Brunner.

Lotan, M., Isakov, E., Kessel, S., & Merrick, J. (2004). Physical fitness and functional ability of children with intellectual disability: Effects of a short-term daily treadmill intervention. *The Scientific World Journal*, *4*, 449-457. https://doi.org/10.1100/tsw.2004.97

Matson, J. L., Dempsey, T., & LoVullo, S. V. (2009). Characteristics of social skills for adults with intellectual disability, autism and PDD-NOS. *Research in Autism Spectrum Disorders*, *3*(1), 207-213. https://doi.org/10.1016/j.rasd.2008.05.006

Oliver, C., Petty, J., Ruddick, L., &Bacarese-Hamilton, M. (2012). The association between repetitive, self-injurious and aggressive behavior in children with severe intellectual disability. *Journal of Autism and Developmental Disorders*, *42*, 910-919.

Schalock, R. L., Luckasson, R., &Tassé, M. J. (2021). Intellectual disability: Definition, diagnosis, classification, and systems of supports.*American Journal of Intellectual and Developmental Disabilities, 126*(6): 439–442. https://doi.org/10.1352/1944-7558-126.6.439

Swan, K. L. (2011). *Effectiveness of play therapy on problem behaviors of children with intellectual disabilities: A single subject design*. University of North Texas.

Travers, H. E., & Carter, E. W. (2022). A portrait of peers within peer-mediated interventions: A literature review. *Focus on Autism and Other Developmental Disabilities*, *37*(2), 71-82.