A REVIEW OF THE EVIDENCE SUPPORTING PLAY-BASED LEARNING FOR CHILDREN WITH AUTISM SPECTRUM DISORDER

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Abstract

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Autism Spectrum Disorder (ASD) has become more prevalent through more diagnosis, with about 1 in 54 being diagnoses with ASD (Center for Disease Control, 2016). With more children being diagnoses with ASD, more services are needed. Adapted Physical Education (APE) is a direct service provided for children with disabilities, and APE teachers should use proven methods to effectively and efficiently assist these children in their area of need. Play-based learning has proven to help improve many social, communication, social skill engagement and play behaviors in children with ASD so play-based learning should be utilized more within the context of APE so more children can receive these benefits. This systematic review searched Academic Search Premier for articles from 2005-2020 and retrieved 35 articles of children with ASD, aged 0-21, within a variety of group settings, most of which resulted in positive outcomes.

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Chapter I: Introduction

Autism Spectrum Disorder (ASD) is a developmental disorder that can be diagnosed as early as 18 months with most children being diagnosed between the ages of 3 to 4. ASD impacts the communication and behavior skills, as well as produces noticeable repetitive and stereotypical behaviors (National Institute of Mental Health, 2008). In 2013 the American Psychological Association began categorizing children under the term ASD, instead of previous diagnosis terms, such as autistic, Asperger' s syndrome, childhood disintegrative disorder pervasive development disorder not otherwise specified. Under the Individual with Disability Education Improvement Act (2004) schools and teachers are required to implement evidence-based practices (e.g., play-based learning) for all children in the classroom, including those with ASD. Play-based learning is designed around teacher facilitated learning activities where children are engaged in structured activity that focuses on meeting academic objectives. Play-based learning has been implemented with children who experience ASD to observe the effectiveness on behavior and communication skills, as well as repetitive and stereotypical behaviors (Wolfberg, De Witt, Young, & Nguyen, 2014) and has demonstrated positive results in language, social and emotional skills, while also fostering creativity and imagination (Aktova, 2017).

Play-Based Learning

Play-based learning has been defined as an adult led, organized, and directed context for learning through which children organize and make sense of their social worlds, as they engage actively with people, objects and representations (Aktova, 2017). Other criteria for play-based learning includes: (a) the child takes an active role in learning, (b) the child is engaged throughout the lesson, (c) the information learned is meaningful, and (d) the context of the activity promotes social interaction (Pasek, 2018). Play-based learning has been effective with children with ASD in social skills training and fostering communication (Lindgren & Doobay, 2011).

Benefits of Play for Children with ASD

For children with ASD, play-based learning has demonstrated benefits in the core deficits (i.e., social skills, communication skills) associated with the disability. In terms of social skills, researchers have demonstrated that play-based learning can improve children with ASD in many ways. These include ways, such as collaborative play (Bauminger et al., 2013; Ben-Sasson et al., 2013; & Huskens et al., 2015), cooperative behavior (Bauminger et al., 2013; Murdymootoo et al., 2017), and social skills (Chester et al., 2019; Kaboski et al., 2015; Murdymootooet al., 2017; Szumski et al., 2019). Other social benefits from play include an increase in social competence (Chester et al., 2019), an increase in social imitation (Ozen, 2015), and a decrease in social anxiety (Kaboski et al., 2015).

Researchers have also demonstrated children with ASD may gain communication skills from play-based learning. Through play-based learning, children with ASD may see communication benefits in problem solving (Bauminger et al., 2013; Szumski et al., 2019), storytelling (Bauminger et al., 2013), social communication (Boyd et al., 2018), social interactions (Brock et al., 2018; Harper et al., 2008; & Ozen, 2015) and social initiations (Harper et al., 2008; Hu et al., 2018; & Licciardello et al., 2008). Children have also shown an increase in social responses (Hu et al., 2018 & Licciardello et al., 2008) and an increase in gaining peer attention (Harper et al., 2008). Studies within this review also found benefits of play as they pertain to verbalization. For example, Koegel et al. (2012) reported an increase in verbal initiations, while MacDonald et al. (2009) observed an increase in verbalizations, and Macpherson et al. (2015) found an increase in verbal compliments.

Finally, play has demonstrated positive results towards improving social skill engagement (Bauminger et al., 2013; Boyd et al., 2018; Koegel et al., 2012; Locke et al., 2019; Shih et al., 2019; & Wolfberg et al., 2015) and play behaviors in children with ASD. Unengaged behaviors (Boyd et al.,2018), solitary play (Brock et al., 2018; Shih et al., 2019), and inappropriate behaviors (Brock et al., 2018) may be reduced. Play-based learning may also promote appropriate behaviors (Brodhead et al., 2014), increase turn taking (Harper et al., 2008), increase on-task behavior (Neff et al., 2017), and increase shared behaviors (Sawyer et al., 2005). There may also be an increase in simple play, combination play, pre-symbolic play (Shire et al., 2019), symbolic play, and social play (Shire et al., 2019; Wolfberg et al., 2015), as well as an increase in joint attention (Chang

et al., 2016; Ozen, 2015; Shire et al., 2019), joint engagement (Chang et al., 2016; Lawton & Kasari, 2012; Shire et al., 2019), and child initiated joint attention and engagement (Chang et al., 2016; Lawton & Kasari, 2012). Therefore, the purpose of this systematic review was to identify how play based learning is being utilized for children with ASD aged 0-21.

Chapter II: Method

Eligibility Criteria

Articles selected for this review met the following criteria. First, all articles had to be published in a peer-reviewed English-language journal within the last 14 years (i.e., 2005-2019). Next, all articles reviewed must include at minimum two individuals, with one of the individuals having a diagnosis of ASD or autistic disorder, Asperger's syndrome, Rett syndrome, childhood disintegrative disorder, or PDD/NOS and the other individual having or not having a disability. Additionally, all articles had to place the participants in a play-based learning setting (i.e., academic objectives had to be present) with an instructor scaffolding instruction when needed. Moreover, participants had to be playing with a similarly aged matched peer (i.e. with 2 years of age). Finally all participants had to be 0 to 21 years of age, with the design of the study following experimental, quasi-experimental, correlation, single subject, or qualitative guidelines.

Information Sources

The database used for this systematic review was Academic Search Premier. The focus of Academic Search Premier, a publication of EBSCO, is international universities, covering social science, education, psychology, health, medicine, and other subjects. Additionally, Academic Search Premier contains peer-reviewed journals that report on children with ASD.

Search Strategy

Search terms were placed into three categories (i.e., I, II, III) with Category 1 focusing on type of disability: (i.e., autism, Asperger's, PDD/NOS, ASD, Rett syndrome, developmental disability, and social pragmatic disorder). Category 2, focused on types of play (i.e., symbolic play, types of play-based learning, structured play, integrated play, play therapy, guided participation, social skill training, parallel play, cooperative play, joint attention, peer engagement, associative play). Category 3, focused on age (i.e., children, students, and youth). Finally, Category 4, focused on type of setting (i.e., classroom, outdoors, community-based).

Study Records and Selection Process

Academic Search Premier was searched with the listed search terms and eligibility criteria, saved into an excel file and Zotero, relevant articles were identified, and duplicate articles were removed. The researchers reviewed titles and abstracts and met to review methods if articles were in question. The researchers made final decisions and met if any articles were in question. The researchers separately screened each article's title and abstract to eliminate bias through an inter-observer agreement. When the researchers disagreed on inclusion or exclusion of an article, they met, reviewed the article together, and came to an agreement about the article.

Data Collection Process

Articles found within search were reviewed by two researchers and determined if they fit within the eligibility criteria. Abstracts, methods, results, and discussions of the selected articles were reviewed to determine the data collected from the article. The researchers discussed if articles fit criteria or not. There was multiple times where the researchers differed on articles included within criteria. The researchers met, discussed the articles in question, and came to a mutual decision about the inclusion or exclusion of the article.

Outcomes and Prioritization

Each article that displayed in the final inclusion criteria was reviewed and the author, date of publication, research methodology (to see the most prevalent), participant characteristics (to ensure significant number of participants being tested), setting (type of setting; school, recreational, home), and outcome were collected to put into a table.

Synthesis of Results

Table 1.

Full Description of Author/Title, Participants, Method/Setting, Results, and Discussion

Author/Title	Participants	Method/Setting	Results	Discussion
Bauminger-Zviely et al. (2013)	22 children with ASD 18 Male 4 Female 8 to 18 years of age	Quasi-experimental design K-12 Classroom	The results showed significant differences in the collaboration concept clarification summary variable defined as the total of all four variables (picture title, story description, and definition) prior to and following the intervention ($z = -1.93$, $p < 0.05$), as well as in the summary variable of social conversation concept clarification defined as the total of the four social conversation items (picture title, story description, definition, and example; $z = -3.06$, $p < 0.01$)	As hypothesized, participants improved on socio-cognitive measures with children being able to provide examples of collaborative act with peers. These results suggest that social awareness may be improved with collaborative peer interactions.
Ben-Sasson et al. (2013)	12 children with ASD (all male)	Quasi-experimental	Results demonstrated a significant difference	This study provides evidence for using EC

Author/Title	Participants	Method/Setting	Results	Discussion
	8 to 11 years of age	K-12 Classroom	between the EC versus the FP mode in the PSI (*Mdn* = 45.5, *Mdn* = 38.0, respectively; *Z* = −2.28, *p* = 0.02, *r* = –.66).	interface with children with HFASD. This was achieved as participants played in similar and familiar settings (i.e., school/educator, therapist, classmate). Additionally, children with lower communication impairment scored higher on social behaviors with EC mode.
Boyd et al. (2018)	161 children with ASD 139 males 22 females 3 to 5 years of age	Experimental Design Preschool Classroom	The results indicated play showed little evidence of change over time or of treatment differences (all scores *p* > .05).	This study showed no significant social-communication results. ASAP group was more likely to be engaged. Unengaged, Some Engagement, and Overall Engagement showed significant results from pre- to post-test, increasing engagement among children.

Author/Title	Participants	Method/Setting	Results	Discussion
Brock et al. (2018)	11 students with ASD 10 males 1 female 19 TD peers 8 males 11 females 8 to 12 years of age 11 Adults supervisors	Experimental Design Elementary and Middle School Recess	Results demonstrated statistically significant ($p < .05$) and substantial intervention effects on total interactions ($d = 1.13$), interactions from the target student toward peers ($d = 1.01$), and interactions from peers toward the target student ($d = 0.89$).	Social interactions among students with ASD and peers were improved. Improvements were large but not all significant. Children with ASD and their peers showed substantial effects for interaction, as well as both reporting that they enjoyed their interactions.
Brodhead et al. (2014)	6 children with ASD 4 males 2 females 3 to 5 years of age	Quasi-experimental design Clinical setting	Results demonstrated that appropriate gameplay did not happen at baseline due to off task behavior. When graduated guidance and vocal prompting was introduced, 2 children met 80% stability for 10 sessions, 2 children for 8 sessions, and 2 children for 7 sessions.	This study showed that two independent activity schedules can be linked to promote appropriate play in children with ASD during social play and can control social interactions during less structured play.

Author/Title	Participants	Method/Setting	Results	Discussion
Chang et al. (2016)	66 children with ASD 59 male 7 female 3 to 5 years of age	Experimental design Preschool classroom	Results demonstrated significance ($p = 0.019$) where children in the IT group spent significantly more time in child-initiated joint engagement than children in WL.	This study showed that children who received JASPER demonstrated significant increases in initiations of joint attention gestures, joint attention language, child-initiated joint engagement and mean length of language with their teachers over children in the waitlist.
Chester et al. (2019)	45 children with ASD 36 males 9 females 8 to12 years of age	Quasi-experimental design Clinical setting	Results demonstrated that that the semi-structure group performed significantly better than unstructured group at weeks 4 ($p<.001$) and 8 ($p<.01$).	This study supported the hypotheses that social competence and social skills of children with ASD would improve following a SST intervention that included play, relative to a wait-list control group.
Colombi et al. (2009)	14 individuals with ASD 13 males 1 female 15 individuals with DD	Quasi-experimental design Clinical setting	Results demonstrated that children with ASD showed significantly lower coordination during several tasks compared to DD ($p < .01$; $p < .05$) as well as	This study showed that in children with ASD, imitation and joint attention are significant correlates to cooperative behavior. Children with

Author/Title	Participants	Method/Setting	Results	Discussion
	13 males 2 females 2 to 4 years of age		significantly lower performance during object imitation ($p < 0.05$), manual acts imitation task ($p < 0.05$), spontaneous imitation task ($p < 0.01$), and responses to joint attention ($p < 0.01$).	ASD also were less responsive to bids for cooperative behavior than the DD peers.
Gunn & Trembath. (2014)	13 individuals with ASD 8 males 5 females 2 TD peers 1 to 4 years of age	13 quasi-experimental case studies Preschool classroom	Results indicated that two of the four children with ASD demonstrated initiation bias towards peers with ASD across structured context sessions. Children with ASD initiated more frequently during the semi-structured ($M=3.42$) context compared to during the structured context ($p = 0.15$).	This study demonstrated that during structured play, ASD peers showed greater interaction towards ASD peers opposed to TD peers.
Harper et al. (2008)	2 males with ASD 8 and 9 years of age	Single Subject Multiple baseline design across subjects Elementary school classroom and playground	Results demonstrated that both participants improved their social peer interactions during recess following a peer mediated, naturalistic intervention program.	Social initiations, narrating play, gaining peer attention, reinforcing attempts, and turn taking all improved in both children following intervention.

Author/Title	Participants	Method/Setting	Results	Discussion
Hu et al. (2018)	3 males with ASD 4 to 6 years of age	Single Subject A-B-A-B reversal design with non-concurrent multiple probe across participants Preschool classroom	Results demonstrate that all three children began baseline testing near zero. After intervention, all three children scores increased social responses, and two of the children increased social initiations as well.	Data on social interactions suggested that the intervention was effective in increasing both social initiations and responses for Yangyang and Youyou. For Xinxin, the intervention improved his social responses but social initiations remained difficult.
Huskens et al. (2015)	3 pairs of siblings 1 with ASD, 1 TD 4 males 2 females 5 to 13 years of age	Single Subject Multiple Baseline Design Clinical setting	Results demonstrate that all participants increased the percentage of interaction initiations and all except Eric increased responses during intervention. Tau-U analysis indicated that the change for Eric and his TD sibling was statistically significant (Tau-U = -0.96, 90 % CI -1.00 to -0.33).	This study found no statistically significant changes in interaction initiations, responses and play together for the children with ASD. Two of three pairs did increase in responses, as well as an increase in interaction initiations during the 'guide' sessions.
Iwanga et al. (2014)	20 children with HFASD 18 males	Quasi-experimental design	Results demonstrate that the Total score for Group Therapy showed significant	This study found that during SIT, all scores except Verbal Index

Author/Title	Participants	Method/Setting	Results	Discussion
	2 females 4 to 5 years of age	Clinical setting	gains from before and after therapy (p=.015).	score significantly increased. Only Total score significantly increased for GT.
Jull & Mirenda (2011)	2 males with ASD and their mothers 4 and 5 years of age 2 TD peers as playmates 4 and 6 years of age	Single Subject A-B-A-B reversal designs Home-setting	SRI scores for both children scored low at baseline (5.3%, 2.6%) and increased scores during parent training (63.8%, 48.3%) and implementation (78%, 64%). Both children's scores then decreased during reversal (8%, 17%) and increased again during final implementation (100%, 66.5%).	The scores with SRIs decreased dramatically during a single reversal activity due to supports being removed. When supports were given, SRI scores increased.
Kaboski et al. (2015)	1 child with ASD 1 TD peers 12 to 17 years of age	Quasi-experimental design Weeklong Robotics Camp	Results demonstrated that the ASD group showed a significant reduction in self-reported social anxiety between baseline and posttest ($p < .05$). There was not a statistically significant increase in social skills exhibited by the ASD group ($p = 0.12$)	This study showed a reduction in self-reported social anxiety in adolescents with ASD.

Author/Title	Participants	Method/Setting	Results	Discussion
Kemp et al. (2013)	37 children with various disabilities 11 with ASD 27 males 10 females 1 to 5 years of age	Experimental design Indoor/outdoor	Results demonstrated that the 11 children with ASD were less engaged in free play, adult engagement and peer interaction. Significant differences were found in favor of the children without autism for total engagement during free play ($p<.0005$) and peer interaction ($p=.003$).	This study provided evidence that the children with ASD had significantly lower levels of engagement and peer interaction during free play compared with the other disability group.
Koegel et al. (2012)	3 children with ASD 2 males 1 female 9 to 12 years of age	Single Subject Multiple baseline across participants design Elementary school lunchroom and playground	Results indicated that all children scored near 0% at baseline, but increased to near 100% interaction with peers during intervention. Unprompted verbal interactions all began at 0 during baseline but increased during intervention.	This study suggested that developing activities that are interesting to the child with ASD results in increases in social engagement and verbal initiations without social skill intervention.
Lawton & Kasari (2012)	16 children with ASD 3 to 5 years of age	Experimental Design Preschool Classroom based	Results showed that children in IT used more IJA ($p<.005$), had increases in IJA ($p=.005$), and used more points ($p<.005$) and shows ($p<.01$) than the DT group. There was improvement in object engagement ($p<.01$) and	This study found that children with autism increased their classroom frequency of IJA and improved their joint engagement during a play interaction.

Author/Title	Participants	Method/Setting	Results	Discussion
			supported engagement states ($p<.05$).	
Licciardello et al. (2008)	4 children with ASD 3 males 1 female Grade K-4	Single Subject Multiple baseline across participants design Elementary school recess playground	Results demonstrated that all four children began baseline with a low percentage (0-4%) of intervals per play period of social interaction or social responses. All four children improved in both social interactions (19.6%-43.9%) and responses (26.7%-45.1%).	This study provided evidence that after intervention, the number of total social initiations and responses between peers improve meaningfully.
Locke et al. (2019)	31 elementary children with ASD 27 males 4 females 5 to 11 years of age	Experimental Design Elementary school recess playground	Results demonstrated that there was a significant increase in joint engagement ($p<.001$) and a significant decrease solitary engagement ($p<.001$), both were maintained at follow up ($p<.001$, $p<.001$). Social Network Inclusion showed an increased rate of improvement ($p=.033$).	This study compared RR with implementation support and without. RR with implementation support was shown to increase social network inclusion and friendship nominations, while RR increased playground peer engagement.
Lu et al. (2010)	25 elementary school children 23 male	Quasi-experimental design	Results demonstrate that children initially responded to this semi-structured sand play	This study found that a semi-structured creative sandplay intervention for

Author/Title	Participants	Method/Setting	Results	Discussion
	2 female 7 to 12 years of age	Elementary school classroom	activity reluctantly, but increased engagement over the course of the 10 weeks supported their developmental skills in communication, socialization, and symbolic elaboration.	children with ASD provided support for play and creative expression.
MacDonald et al. (2009)	2 males with ASD 2 TD 5 to 7 years of age	Experimental Multiple Probe design Elementary school/classroom	Results show that both children improved in scripted verbalizations (Collin 1-14; Alden 0-12) and scripted actions (Collin 5-13.5; Alden 4-13.6) scores. Collin increased cooperative play at airport (17-87%), zoo (.06-85%), grill (15-90%). Alden also increased at airport (6-78%), zoo (0.5-74.5%), and grill (3.5-67%).	This study demonstrated that before video instructions, little appropriate play occurred between children. Both pairs acquired verbalizations and pay actions quickly.

Author/Title	Participants	Method/Setting	Results	Discussion
Macpherson et al. (2015)	5 elementary school children with ASD 4 males 1 female 9 to 11 years of age	Single Subject Multiple Baseline design across participants Elementary school classroom and playground	Results demonstrated that all four children increased their verbal compliments. All children scored 0 at baseline, and their scores during intervention ranged from 80-100%. The children demonstrated 6-21 different unscripted verbal compliments.	This study reveled that all participants increased their use of verbal compliments. Four of the five participants demonstrated an increased number of compliment gestures during intervention.
Morrier & Ziegler (2018)	35 preschoolers 10 ASD 6 males 4 females 3 to 5 years of age 25 TD 15 males 10 females 2 to 4 years of age	Experimental design Preschool school playground	Results demonstrated that children with ASD showed significantly higher rates of proximity ($p=.002$) and initiated significantly more social bids towards their peers ($p<.001$) during the *Buddy Game* than during baseline or generalization to free play.	The results of this study indicate that the *Buddy Game* is an effective strategy for increasing social bids in both children with ASD as well as their typical peers.
Murdymootoo et al. (2017)	6 children with ASD 4 males 2 females 9 to 10 years of age	Experimental design Hospital clinical setting	Results demonstrated a significant increase in SEP scores ($p<.05$), a reduction in CARS scores, and a 1.5 fold increase in EQ scores.	In the SEP, children improved social skills, were more adaptable to change, had more self-confidence, opened up more to others, demonstrated more

Author/Title	Participants	Method/Setting	Results	Discussion
				patience and tolerance, displayed less excitement, were more responsive to requests from other children, and better identified requests. The children cooperated more, were more accepting of others, engaged in conflict less, and identified different response strategies.
Neff et al. (2017)	3 sibling dyads consisting of one with ASD and one TD 3 males 2 females 4 to 6 years of age	Quasi-experimental design Home setting	Results showed that Tim's independent responses increased (15-52%) from the first experimental session to for the last experimental session. On-task behavior increased for both Tim (3-64%) and Olley (Dyad 1: 0-18%, Dyad 2: 15-60%, and generalization: 0-49%).	This study demonstrated that video modeling could be used as an effectively teaching prompting and reinforcement skills. When the children used appropriate prompts and reinforcement more, the children with ASD increased on-task behavior.
Osborne et al. (2019)	4 children with disabilities 2 ASD 1 male	Quasi-experimental design	Results demonstrated that the two children with ASD did not play or interact much	This study stated that the target children with ASD might not have had appropriate prerequisites

Author/Title	Participants	Method/Setting	Results	Discussion
	1 female 4 and 6 years of age 9 TD 4 to 5 years of age	Inclusive Preschool Classroom	with peers. No results were significant.	in order to get increased social interaction with peers.
Özen (2015)	3 individuals with ASD 1 male 2 female 5 to 6 years of age TD siblings 3 males 9 to 11 years of age	Experimental Multiple Probe design across participants Home intervention sessions	Results demonstrated that the three children increased scores from baseline to post-intervention for following directions (0-50%-85-100%), turn taking (0%-75-100%), and giving appropriate responses (0%-80-100%).	This study showed that after intervention, social interaction, imitation, joint attention, and behavior techniques could be improved and maintained.
Parsons et al. (2019)	60 children 51 male 9 female 51 with ASD 6 to 11 years of age	Experimental design Clinical setting	Results demonstrated an approach to significance for the CCC-2 (p=.039), EVT-2 (p=0.91), and CCBRS (p=.086) scales.	This study provided evidence that children are likely to benefit from this intervention due to high scores on Use of Context (CCC-2), Separation Anxiety (CCBRS) combined with low scores on Nonverbal Communication (CCC-2) and Coherence (CCC-2) and EVT-2.

Author/Title	Participants	Method/Setting	Results	Discussion
Sawyer et al. (2005)	One male with ASD 4 years of age	Single Subject A-B-C-B design Preschool classroom	Results demonstrated an increase in physical sharing (M=0.5-5.8) and verbal sharing (M=4.8-8.0) during intervention.	This study suggested that share behaviors can be improved by priming before classroom play session then combining prompting and reinforcement in-session.
Shih et al. (2019)	80 children with ASD 73 males 7 females 5 to 11 years of age	Experimental design Elementary school playground	Results demonstrated that children in RR had significantly less solitary play (p=.049), were more salient (p=.05), and had more friendship nominations (p=.037) than WL. Teacher perception of the children's social skills improved (p<.001).	The study showed that children in RR spent less time in solitary play, were likely increasing in engagement but were not fully engaged in joint games and conversation, and improved their connections in the classroom. Children in RR did not differ significantly from control group in peer engagement.
Shire et al. (2017)	113 children 88 male 25 female 105 ASD/PDD-NOS 8 other disabilities 2 to 3 years of age	Experimental design Classroom setting	Results demonstrated that in JASPER there was a significant increase in child initiated joint engagement (p<.001), IJA and IBR (p=.011) gaze, gesture, and language, one word (p=.05)	This study provided evidence that children in JASPER made significant gains in joint engagement, social communication and play. Children began high-

Author/Title	Participants	Method/Setting	Results	Discussion
			and two word (p=.003) IJA. There was significance for proximal TCX functional play (p<.001), proximal TCX symbolic play (p<.001), distal SPACE functional (p<.001) and symbolic (p<.001) play. Both groups showed significant reductions in TA-child interactions (p< 001) and CGI-S (p<.001) in JASPER.	level play (building, etc.) and demonstrated more high-level play during the TCX interactions than when tested for play skills on SPACE.
Shire et al. (2019)	Study 1: 55 children with ASD 44 male 11 female 2 to 3 years of age Study 2: 63 children with ASD 49 males 14 females 2 to 3 years of age	Experimental design Classroom setting	Results indicated that children spent significantly less time in child-initiated joint engagement (p<.001), increased joint attention (p<.001). Children from both years significantly increased time spent in pre-symbolic play (p<.001) and time spent in symbolic play (p<.001).	This study showed significant gains in children's behavior. Children showed significant improvement in joint engagement, joint attention, simple play, combination play (year 1), pre-symbolic play, and symbolic play.
Szumski et al. (2019)	52 children with ASD in two programs 36 males 16 females 4 to 6 years of age	Quasi-experimental design Preschool setting	Results demonstrated a correlation in TIS scores and ToM in all the assessments ($r = \sim 0.6$), indicating ToM correlates positively with the	This study showed that ToM and peer initiation are highly correlated. ToM is not related to amount of problem

Author/Title	Participants	Method/Setting	Results	Discussion
			interactional skills of children with ASD. TIS scores were not correlated with ToPSS scores in any of the assessments.	behaviors. PT/ST had an impact on interactive social skills and social problem solving and produced more interaction skills and social problem solving than ICPS and children with ASD.
Wolfberg et al.	48 children with ASD 41 males 7 females 5 to 10 years of age	Experimental design After-school elementary setting	Results demonstrate a significant increase in symbolic pretend play ($p<.001$) and a significant decrease in not engaged behaviors. For social domain, results showed a significant increase in parallel-proximity and common focus behavior ($p<.001$) and significant decrease in onlooker-orientation play behavior.	This study revealed positive outcomes after participating in a 3-month IPG intervention. Children with ASD showed significant gains in both symbolic play and social play, as well as decreases in not engaged and manipulation-sensory play behaviors.

Note: ASD = Autism Spectrum Disorder; CARS = Childhood Autism Rating Scale; CBT = Cognitive Behavior Therapy; CCBRS = Conners Comprehensive Behavior Rating Scales; CCC-2 = Children's Communication Checklist Second Edition; CGI-S = Clinical global impressions-severity; DD = Developmentally Delayed; DT = Delayed Treatment; EC = Enforced

Collaboration; EQ = Empathy Quotient; EVT-2 = Expressive Vocabulary Test; FP = Free Play; GT = Group Therapy; HFASD = High Functioning Autism Spectrum Disorder; IBR = initiations of behavior regulation; ICPS = I Can Problem Solve; IJA = Initiating Joint Attention; IT = Immediate Training; IT = Immediate Treatment; JASPER = Joint Attention, Symbolic Play, Engagement, and Regulation; *M* = Mean; PT/ST = Play Time/Social Time; RR = Remaking Recess; SEP = Social-Emotional Profile; SIT = Sensory Integration Therapy; SPACE = Short play and communication evaluation; SRI = Synchronous Reciprocal Interaction; SD = Standard Deviation; SST = Social Skills Training; TA = Teaching Assistant; TCX = Teaching assistant–child play interaction; TD = Typical Developing; TIS = Teacher Impression Scale; ToM = Theory of Mind; ToPSS = Taxonomy of Problematic Social Situations for Children; WL = Waitlist.

This review included a total of 1244 participants, 957 of which had a diagnosis of ASD or autistic disorder, Asperger's syndrome, Rett syndrome, childhood disintegrative disorder, or PDD/NOS. The studies reviewed utilized experimental, quasi-experimental, and single-subject designs. There are many benefits for conducting an experimental design. One benefit is the control the researcher has to manipulate the variables in an effort so each participant is not influenced by other variables, aside from the dependent and independent variables (Wharrad & Silcocks, 2009). Quasi-experimental design (non-randomized) can be beneficial to the researcher by allowing a comparison between groups that can help the researcher to make inferences about the possible existence of a cause and effect relationship of the treatment (Bradley, 2018). Quasi-experimental research is also an effective method of longitudinal studies, like is seen throughout this review. Single-subject design is a cost-effective method and results may contain a strong basis to show a working relationship (Alnahdi, 2013). Researchers also have the control over participants, which allows the researcher to overcome the diversity and variability of populations (Alnahdi, 2013).

Finally, this review included studies done at a clinical setting, at schools in the classroom and playground (preschool-12), at home, indoors and outdoors, and during youth camps. A clinical setting is a conducted in an environment specifically designed for the research, which gives researchers more control so research is more likely to represent a true experimental design. Controlled studies, like a clinical setting, have more control of random variables that might influence the results and gives a more accurate observation of the behavior (Bland & Altman, 1994). Researchers are limited in real-life

application of clinical studies due to the ability to create near perfect conditions within the clinical setting. A real-life setting, such as classroom and playground in a school setting, allows researchers to see participants within their natural environment, which can create results applicable to the studied population. A classroom and playground setting allow for a more uncontrolled and unpredictable variables and threats. Researchers can manipulate aspects of their study to reduce threats, but they are inevitable when conducting research within a natural setting. This can be positive or negative, as it gives researchers an opportunity to study things that cannot be manipulated within a lab or clinical setting. Researchers have less control in a school/playground setting than in a clinical setting, but they still have more control than research done in a completely natural environment, such as indoor, outdoor, and youth camp. Research done in an environment such as these have similar advantages and disadvantages to a classroom/playground setting. It is a natural setting, but with less control than classrooms and playgrounds. The environment may be more unpredictable, causing participants to behave different which may affect results. There are more variables that may influence the study for which must be accounted. The results from a study done in a natural setting (school/outdoor/youth camp) also allow participants to be around peers and interact in a social environment. This also allows for more opportunities for participants to be physically active and gain heath benefits from physical activity. Each setting has limitations and benefits that are necessary to be mindful about when conducting and reviewing research.

Discussion

The purpose of this systematic review was to identify how play based learning is being utilized for children with ASD aged 0-21. Play-based learning was utilized in many different settings, among a wide variety of ages, and were conducted using different research methods. Many benefits were seen throughout the various settings, ages, and experiment designs. These benefits can reap in other settings, as well, such as Adapted Physical Education. Play-based learning in APE could potentially show the same benefits for students as it has in the many settings, ages, and experimental designs found during this systematic review. Of the thirty-five studies included within this review, zero studies were observed in the APE or general PE setting. Play-based learning in APE can potentially have positive outcomes on students receiving the service. Play-based learning should be utilized in APE so students can receive the potential benefits.

Play-based learning in the APE setting can be utilized in many ways. Play-based learning is defined as an adult led, organized, and directed context for learning through which children organize and make sense of their social worlds, as they engage actively with people, objects and representations (Aktova, 2017). In APE, play-based learning can be inclusive or in small or large groups, but always directed by the APE instructor, as guided play appears to be more beneficial in the acquisition of academic skills (Danniels, 2018). APE teachers can help improve social skills, communication skills, and play behaviors in children with ASD through play-based learning. Play-based learning can

create a unified class with strong personal relationships that may be easier to obtain through play-based learning.

Limitations to this systematic review include the scope of databases that were searched, studies were limited to no earlier than 2005, and a meta-analysis has not been conducted. This systematic review utilized articles from Academic Search Premier, a multidisciplinary research database. Although Academic Search Premier provides researchers with acclaimed full-text journals, magazines and other valuable resources that were very assistive throughout this systematic review, there are many other databases available for research. A meta-analysis has not been conducted on this review because of the limited databases searched. This systematic review provides an in-depth synthesis of current research of play-based learning with children with ASD aged 0-21. Future research can use this systematic review to build off and provide further analysis in this specific area of education for individuals with ASD.

Conclusions and Recommendations

This systematic review of thirty-five peer-reviewed journal articles showed the benefits of play-based learning for children with ASD aged 0-21 in a variety of settings. Play-based learning may benefit children with ASD by improving social skills, communication skills, social skill engagement, and play behaviors. This review was limited to Academic Search Premier, indicating future research has the potential to expand on this review and potentially conduct a meta-analysis. Play-based learning has shown the ability to assist children with ASD in many aspects of life and should be explored and utilized to its fullest extent. A setting in which play-based learning could be utilized with children with ASD is Adapted Physical Education. APE teachers can incorporate aspects of play-based learning into their daily lessons and allow their students to gain the social and communicative benefits from it, whether in an APE specific or inclusive PE class. There is sufficient evidence to support the benefits from the use of play-based learning, so teachers and instructors should utilize it as much as possible.

References

Aktova, A. (2017, December). The Scots College. What are the benefits of play-based learning? Retrieved from: https://www.tsc.nsw.edu.au/tscnews/what-are-the-benefits-of-play-based-learning

Alnahdi, Ghaleb. (2013). Single-subject designs in special education: Advantages and limitations. *Journal of Research in Special Educational Needs*.

Bauminger-Zviely, N., Eden, S., Zancanaro, M., Weiss, P. L., & Gal, E. (2013). Increasing social engagement in children with high-functioning autism spectrum disorder using collaborative technologies in the school environment. *Autism: The International Journal of Research & Practice*, *17*(3), 317–339.

Ben-Sasson, A., Lamash, L., & Gal, E. (2013). To enforce or not to enforce? The use of collaborative interfaces to promote social skills in children with high functioning autism spectrum disorder. *Autism: The International Journal of Research & Practice*, *17*(5), 608–622.

Boyd, B. A., Watson, L. R., Reszka, S. S., Sideris, J., Alessandri, M., Baranek, G. T., Crais, E. R., Donaldson, A., Gutierrez, A., Johnson, L., & Belardi, K. (2018). Efficacy of the ASAP intervention for preschoolers with ASD: A cluster randomized controlled trial. *Journal of Autism & Developmental Disorders*, *48*(9), 3144–3162.

Bland & Altman. (1994). One and two sided tests of significance. *BMJ* 309: 248.

Bradley, Katherine. (2020, March 31). Quasi-experiment advantages & disadvantages. *classroom.synonym.com*. Retrieved from https://classroom.synonym.com/quasiexperiment-advantages-disadvantages-8614272.html

Brock, M. E., Dueker, S. A., & Barczak, M. A. (2018). Brief Report: Improving social outcomes for students with autism at recess through peer-mediated pivotal response training. *Journal of Autism & Developmental Disorders*, *48*(6), 2224–2230.

Brodhead, M. T., Higbee, T. S., Pollard, J. S., Akers, J. S., & Gerencser, K. R. (2014). The use of linked activity schedules to teach children with autism to play hide-and-seek. *Journal of Applied Behavior Analysis*, *47*(3), 645–650.

Centers for Disease Control and Prevention. Data & statistics on autism spectrum disorder. (March 2020). Atlanta, GA: *U.S. Department of Health and Human Services, Centers for Disease Control and Prevention*. https://www.cdc.gov/ncbddd/autism/data.html

Chang, Y.-C., Shire, S., Shih, W., Gelfand, C., & Kasari, C. (2016). Preschool deployment of evidence-based social communication intervention: JASPER in the classroom. *Journal of Autism & Developmental Disorders*, *46*(6), 2211–2223.

Chester, M., Richdale, A.L. & McGillivray, J. (2019). Group-based social skills training with play for children on the autism spectrum. *J Autism Dev Disord* 49**,** 2231–2242.

Colombi, C., Liebal, K., Tomasello, M., Young, G., Warneken, F., & Rogers, S. J. (2009). Examining correlates of cooperation in autism: Imitation, joint attention, and understanding intentions. *Autism*, *13*(2), 143–163.

Danniels, E. (2018). Defining play-based learning. *Encyclopedia on Early Childhood Development.*

Gunn, K. S., Trembath, D., & Hudry, K. (2014). An examination of interactions among children with autism and their typically developing peers. *Developmental Neurorehabilitation*, *17*(5), 327–338.

Harper, C. B., Symon, J. B. G., & Frea, W. D. (2008). Recess is time-in: Using peers to improve social skills of children with autism. *Journal of Autism & Developmental Disorders*, *38*(5), 815–826.

Hu, X., Zheng, Q., & Lee, G. T. (2018). Using peer-mediated LEGO® play intervention to improve social interactions for Chinese children with autism in an inclusive setting. *Journal of Autism & Developmental Disorders*, *48*(7), 2444–2457.

Huskens, B., Palmen, A., Werff, M., Lourens, T., & Barakova, E. (2015). Improving collaborative play between children with autism spectrum disorders and their siblings: The effectiveness of a robot-mediated intervention based on LEGO© therapy. *Journal of Autism & Developmental Disorders*, *45*(11), 3746–3755.

Iwanaga, R., Honda, S., Nakane, H., Tanaka, K., Toeda, H., & Tanaka, G. (2014). Pilot study: Efficacy of sensory integration therapy for Japanese children with high-functioning autism spectrum disorder. *Occupational Therapy International*, *21*(1), 4–11.

Jull, S., & Mirenda, P. (2011). Parents as play date facilitators for preschoolers with autism. *Journal of Positive Behavior Interventions, 13*(1), 17–30.

Kaboski, J., Diehl, J., Beriont, J., Crowell, C., Villano, M., Wier, K., & Tang, K. (2015). Brief report: A pilot summer robotics camp to reduce social anxiety and improve social/vocational skills in adolescents with ASD. *Journal of Autism & Developmental Disorders, 45*(12), 3862–3869.

Kemp, C., Kishida, Y., Carter, M., & Sweller, N. (2013). The effect of activity type on the engagement and interaction of young children with disabilities in inclusive childcare settings. *Early Childhood Research Quarterly, 28*(1), 134–143.

Koegel, L. K., Vernon, T. W., Koegel, R. L., Koegel, B. L., & Paullin, A. W. (2012). Improving social engagement and initiations between children with autism spectrum disorder and their peers in inclusive settings. *Journal of Positive Behavior Interventions, 14*(4), 220–227.

Lawton, K., & Kasari, C. (2012). Teacher-implemented joint attention intervention: Pilot randomized controlled study for preschoolers with autism. *Journal of Consulting & Clinical Psychology, 80*(4), 687–693.

LeGoff, D. B. (2004). Use of LEGO© as a therapeutic tedium for improving social competence. *Journal of Autism & Developmental Disorders, 34*(5), 557–571.

Licciardello, C. C., Harchik, A. E., & Luiselli, J. K. (2008). Social skills intervention for children with autism during interactive play at a public elementary school. *Education & Treatment of Children, 31*(1), 27–37.

Lindgren, S., Doobay, A. (2011, May). Iowa Department of Human Services, Center for Disability and Development. Evidence-based interventions for autism spectrum disorders.

Locke, J., Shih, W., Kang-Yi, C. D., Caramanico, J., Shingledecker, T., Gibson, J., Frederick, L., & Mandell, D. S. (2019). The impact of implementation support on the use of a social engagement intervention for children with autism in public schools. *Autism: The International Journal of Research & Practice, 23*(4), 834–845.

Lu, L., Petersen, F., Lacroix, L., & Rousseau, C. (2010). Stimulating creative play in children with autism through sandplay. *Arts in Psychotherapy, 37*(1), 56–64.

MacDonald, R., Sacramone, S., Mansfield, R., Wiltz, K., & Ahearn, W. H. (2009). Using video modeling to teach reciprocal pretend play to children with autism. *Journal of Applied Behavior Analysis*, *42*(1), 43–55.

Macpherson, K., Charlop, M., & Miltenberger, C. (2015). Using portable video modeling technology to increase the compliment behaviors of children with autism during athletic group play. *Journal of Autism & Developmental Disorders*, *45*(12), 3836–3845.

Morrier, M. J., & Ziegler, S. M. T. (2018). I wanna play too: Factors related to changes in social behavior for children with and without autism spectrum disorder after implementation of a structured outdoor play curriculum. *Journal of Autism & Developmental Disorders*, *48*(7), 2530–2541.

Murdymootoo, V., Elissalde, S.-N., Salle-Collemiche, X., Guivarch, J., Poinso, F., Tardieu, S., & Jouve, E. (2017). Impact of an implicit social skills training group in children with autism spectrum disorder without intellectual disability: A before-and-after study. *PLoS ONE*, *12*(7), 1–18.

Neff, E. R., Betz, A. M., Saini, V., & Henry, E. (2017). Using video modeling to teach siblings of children with autism how to prompt and reinforce appropriate play. *Behavioral Interventions*, *32*(3), 193–205.

Osborne, K., Ledford, J. R., Martin, J., & Thorne, K. (2019). Component analysis of stay, play, talk interventions with and without self-monitored group contingencies and recorded reminders. *Topics in Early Childhood Special Education*, *39*(1), 5–18.

Özen, A. (2015). Effectiveness of siblings-delivered iPad game activities in teaching social interaction skills to children with autism spectrum Disorders. *Educational Sciences: Theory & Practice*, *15*(5), 1287–1303.

Parsons, L., Cordier, R., Munro, N., & Joosten, A. (2019). A play-based, peer-mediated pragmatic language intervention for school-aged children on the autism spectrum: Predicting who benefits most. *Journal of Autism & Developmental Disorders*, *49*(10), 4219–4231.

Pasek, H.K. (2018, September). Concordia University-Portland. The importance of play-based learning. Retrieved from: https://education.cu-portland.edu/blog/classroom-resources/play-based-learning/

Sawyer, L. M., Luiselli, J. K., Ricciardi, J. N., & Gower, J. L. (2005). Teaching a child with autism to share among peers in an integrated preschool classroom: Acquisition, maintenance, and social validation. *Education & Treatment of Children*, *28*(1), 1–10.

Shih, W., Dean, M., Kretzmann, M., Locke, J., Senturk, D., Mandell, D. S., Smith, T., Kasari, C., Campbell, J., & Hume, K. (2019). Remaking recess intervention for improving peer interactions at school for children with autism spectrum disorder: Multisite randomized trial. *School Psychology Review*, *48*(2), 133–144.

Shire, S. Y., Chang, Y., Shih, W., Bracaglia, S., Kodjoe, M., & Kasari, C. (2017). Hybrid implementation model of community-partnered early intervention for toddlers with autism: a randomized trial. *Journal of Child Psychology & Psychiatry*, *58*(5), 612–622.

Shire, S. Y., Shih, W., Chang, Y.-C., Bracaglia, S., Kodjoe, M., & Kasari, C. (2019). Sustained community implementation of JASPER intervention with toddlers with autism. *Journal of Autism & Developmental Disorders*, *49*(5), 1863–1875.

Szumski, G., Smogorzewska, J., Grygiel, P., Orlando, A.M. (2019). Examining the effectiveness of naturalistic social skills training in developing social skills and Theory of Mind in preschoolers with ASD. *Journal of Autism and Developmental Disorders.,49*(7), 2822.

The National Institute for Mental Health. Autism Spectrum Disorder. (2008, March). Retrieved from: https://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-asd/index.shtml

Watson, L. R., Reszka, S. S., Sideris, J., Alessandri, M., Baranek, G. T., … Belardi, K. (2018). Efficacy of the ASAP intervention for preschoolers with ASD: A cluster randomized controlled trial. *Journal of Autism & Developmental Disorders*, *48*(9), 3144–3162.

Wharrad & Silcocks. (2009). An Introduction to Experimental Design. *The NIHR RDS EM / YH.*

Wolfberg, P., DeWitt, M., Young, G., & Nguyen, T. (2015). Integrated play groups: Promoting symbolic play and social engagement with typical peers in children with ASD across settings. *Journal of Autism & Developmental Disorders*, *45*(3), 830–845.

Yang, T.-R., Wolfberg, P. J., Wu, S.-C., & Hwu, P.-Y. (2003). Supporting children on the autism spectrum in peer play at home and school. *Autism: The International Journal of Research & Practice, 7*(4), 437–453.