



A Systematic Review of Play-Based Interventions Targeting the Social Communication Skills of Children with Autism Spectrum Disorder in Educational Contexts

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Abstract

Children with autism spectrum disorder (ASD) experience social communication difficulties which can be compounded by increased social demands and expectations of the school environment. Play offers a unique context for social communication development in educational settings. This systematic review aimed to synthesize play-based interventions for the social communication skills of children with ASD in educational contexts and identified nine studies. Overall, studies in this review provided a promising evidence base for supporting social communication skills through play in education for children with ASD. The review also highlighted gaps in research on play-based interventions for the social communication skills of children with ASD within naturalistic educational settings.

Keywords Play · Social communication · Education settings · Autism spectrum disorders

Social communication skills are a complex set of skills highlighted as difficult for children with autism spectrum disorder (ASD) (Balasubramanian et al., 2019; Howlin, 2000; Laugeson & Ellingsen, 2014). Social communication is an ‘umbrella term’, as described by Kossovaki (2018, p.7), for both (1) *social interaction*, defined as the reciprocal exchange of information (Dijkstra, 2015; Shores, 1987) as well as relational components including relationships and friendships (Burk, 1996; Winstead & Derlega, 1986), acceptance and belonging (Duck & Montgomery, 1991; Goffman, 1963) and isolation and loneliness (Laursen & Harup, 2002; Samp, 2009), and (2) *communication*, defined as an interactive process in which information is exchanged between partners through multiple means such as body language, speech, facial expressions and gestures (Gould, 2009; Mehta, 1987; Nilsen, 1957; Rogoff, 1990; Schlosser, 2003). This inherent overlap between social interaction and communication is reflected within the literature (Conn, 2016;

Fuller & Kaiser, 2019; Wetherby, 2006; Wetherby et al., 2007) and has been adopted within the latest diagnostic criteria for ASD (DSM-V) (American Psychiatric Association, 2013). As a result, this review will adopt an all-encompassing approach to social communication and include studies which target any aspect of social communication, in line with the above criteria.

Despite heterogeneity in the experiences and characteristics of individuals with ASD, challenges in social communication are experienced by all children across the spectrum (Anderson et al., 2014; APA, 2013; Balasubramanian et al., 2019; Tager-Flusberg et al., 2001) throughout all stages of life (Plimley et al., 2007; Prizant & Fields-Meyer, 2019; Tomaino et al., 2014; Volkmar et al., 2014) in areas including social-emotional reciprocity and non-verbal communication and in the development and understanding of relationships (APA, 2013). Differences are apparent from early infancy and include difficulties initiating (Franchini et al., 2018; Mundy et al., 2016; Sasson & Touchstone, 2014) and responding to joint attention (Chawarska et al., 2016; Sullivan et al., 2007) as well as differences in understanding non-verbal communication including eye contact (Muzammal & Jones, 2017; Zwaigenbaum et al., 2013), imitation (Ornstein-Davis & Carter, 2014; Rogers & Williams, 2006), body language, gestures and facial expression (Chawarska et al., 2014; Wetherby, 2006; Wetherby

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et al., 2004). Such differences often become more obvious among school-age children with ASD due to increased social demands (Bauminger-Zviely, 2014; Einfeld et al., 2018; Loveland & Tunali-Kotoski, 2005) in particular surrounding peer relations and include reduced levels of peer interactions (Bauminger-Zviely, 2014; Hansen et al., 2014; Wetherby, 2006) as well as quality (Bauminger et al., 2008; Kasari et al., 2011; Petrina et al., 2014) and quantity (Bauminger & Kasari, 2000; Kuo et al., 2013) of friendships and peer relationships.

As a result of these social communication challenges, children with ASD often remain on the periphery of classroom social networks (Chamberlain et al., 2007; Kasari et al., 2011; Rotheram-Fuller et al., 2010). Difficulties persist throughout the school years and extend into adolescence as children with ASD attempt to navigate the complex social world and subtle social cues of the hidden curriculum (Jordan, 2019; Myles & Simpson, 2001). These include differences forming and maintaining friendships (Bauminger & Shulman, 2003; Locke et al., 2010; Shea & Mesibov, 2005) and, in turn, associated loneliness (Bauminger & Kasari, 2000; Deckers et al., 2017; Lasgaard et al., 2010), bullying and victimization (Cappadocia et al., 2012; Symes & Humphrey, 2012; Van Roekel et al., 2010). Although schools may be regarded as the prime context for relationships to flourish (Blatchford et al., 2015; Blatchford et al., 2010; Juvonen, 2018), without sufficient support, such settings may in fact further isolate children with ASD.

Evidence of greater risk of increased social difficulties as children with ASD progress through formal schooling (Bauminger-Zviely, 2014) highlights the need for intervening early to support social communication development among children with ASD within educational contexts (Fuller & Kaiser, 2019; Koegel et al., 2014). Additionally, increasing numbers of children with ASD are accessing inclusive education (European Agency for Special Needs & Inclusive Education, 2018; National Council for Special Education, 2016) and spend the majority of their time in educational settings (Callahan et al., 2008; Parsons et al., 2013). As a result, research now emphasizes the importance of enhancing social communication skills of children with ASD within naturalistic educational contexts (Boyd et al., 2019; Goldberg et al., 2019; Sutton et al., 2019) which may also support generalization (Carruthers et al., 2020; Ostmeier & Scarpa, 2012; Rao et al., 2008) and maintenance effects (Bellini et al., 2007; Neely et al., 2016; Rogers, 2000). Highly controlled clinical interventions may fail to capture authentic interactions within children's everyday environment (Loveland, 2001; Loveland & Tunali-Kotoski, 2005) whereas a shift towards practice-based research (Barry et al., 2020; Boyd et al., 2019; Locke et al., 2019; Suhrheinrich et al., 2019) within a new 'era of translational research' (Boyd et al., 2019, p.595) in real-world educational

settings allows for naturalistic peer interactions (Hume & Campbell, 2019; Kent et al., 2020b; Wolfberg, 2003) and, in turn, may close the research to practice gap (Guldborg, 2017; Kasari & Smith, 2013; Wood et al., 2015) and increase application to real-world contexts (Locke et al., 2015, 2019; Watkins et al., 2019a; Weisz et al., 2004).

One authentic context for social communication interactions embedded within the classroom is play (Balasubramanian et al., 2019; Reifel, 2014; Shire et al., 2020). Described as the primary medium of social interaction in early childhood (Boucher, 1999; Coelho et al., 2017; Harper et al., 2008), play offers a naturalistic platform for social communication development and learning within educational contexts. It has therefore been used as a practice-based intervention in supporting social communication skills for children with ASD. However, despite its centrality in early childhood, play is a multifaceted construct (Eberle, 2014; Sutton-Smith, 2001) which has been construed in different ways including objective criteria such as active engagement and open-endedness (Christie & Johnsen, 1983; Garvey, 1990; Rubin et al., 1983; Wolfberg, 1995, 1999) as well as subjective qualities described as playfulness (Barnett, 1990; Bundy, 1997; Eberle, 2014; Youell, 2008). Types of play include object play, symbolic or pretend play and games with rules (Piaget, 1952; Whitebread et al., 2012, 2017) as well as modern play types including digital play (Marsh et al., 2016). Others describe play in terms of social interaction with another, be it a peer, sibling, or adult (Parten, 1932; Vygotsky, 1978). Finally, play can also be defined in terms of the extent to which an adult is involved: for example, as free (no adult involvement), guided (adult is involved but child leads the play), or structured (adult directs the play interaction) (Rubin et al., 1978; Weisberg et al., 2016; Wood, 2014). As there is no single agreed-upon definition of play (Jensen et al., 2019; Zosh et al., 2018), for the purpose of this review all play-based approaches, self-identified by the relevant authors, were accepted.

Researchers have emphasized the potential of play in supporting the social communication skills of pupils with ASD within educational contexts (Jordan, 2003; Kossovaki & Papoudi, 2016; Manning & Wainwright, 2010; Wolfberg et al., 2015) and called for a move away from clinical settings (Guldborg, 2017; Papoudi & Kossovaki, 2018, 2018; Whalon et al., 2015). Across varying contexts, the relationship between play and multiple aspects of social interaction has been highlighted including turn-taking and sharing (Anderson-McNamee & Bailey, 2010; Stanton-Chapman & Snell, 2011), collaboration (Rowe et al., 2018; White, 2012; Yogman et al., 2018), negotiation (Bergen & Fromberg, 2009; Hirsh-Pasek et al., 2009; Mraz et al., 2016), social reciprocity (Carrero et al., 2014; Wolfberg, 1995) and theory of mind (Qu et al., 2015). Play also provides a natural context for the development of social relationships

and has been described as children's 'natural means of making friends' (Gray, 2011, p.457). Multiple researchers highlight the relationship between social play interactions and the development of friendships (Coelho et al., 2017; Humphreys & Smith, 1987; Scott & Panksepp, 2003) and peer acceptance (Chang et al., 2016a; Coelho et al., 2017; Flannery & Watson, 1993). The relationship between play and communication skills has also been identified including joint attention (Lillard & Witherington, 2004; Mateus et al., 2013; Quinn et al., 2018), joint engagement (Adamson et al., 2004, 2014; Moll et al., 2007; Perra & Gattis, 2012) and gestures and body language (Carlson, 2009; Cochet & Guidetti, 2018; Qing, 2011). Whilst much of the literature has focused on the relationship between pretend play and social communication development (Farmer-Dougan & Kaszuba, 1999; Fung & Cheng, 2017; Lillard et al., 2013; Li et al., 2016; Uren & Stagnitti, 2009; Vygotsky, 1978), in recent years there has been increasing consensus towards the socially interactive nature of many different types of play and their contribution to social communication development (Pellegrini et al., 2002; Veiga et al., 2017; Whitebread et al., 2017).

The Current Study

Previous reviews of the play of children with ASD have focused on the use of interventions to improve play skills (Jung & Sainato, 2013; Kent et al., 2020a; Kosyvakaki & Papoudi, 2016; Kuhaneck et al., 2020; Lang et al., 2011; Lory et al., 2018) or on the promotion of playful engagement among children with ASD (Godin et al., 2019) or therapeutic approaches such as Lego therapy (Lindsay et al., 2017). Fewer reviews have focused on play as a means to develop the social communication skills of children with ASD (Gibson et al., 2020; Mpella & Evaggelina, 2018), and none have examined play-based interventions for social communication skills in educational contexts. For example, Gibson et al.'s (2020) scoping review of early play-based interventions for supporting social communication development of children with ASD, aged 2–7 years, found support for play in contributing to social developmental outcomes across multiple contexts. Our study contributes to the review literature on play-based interventions for the social communication skills of children with ASD (aged 3 to 13 years) by addressing an important gap on evidence synthesis of research conducted within the primary school classroom. The aim of this systematic review was to identify and synthesize research on play-based interventions for the social communication skills of children with ASD in educational contexts. The review was guided by four research questions: (1) What practice-based research has examined the impact of play-based interventions on the social

communication skill development of children with ASD in educational contexts? (2) What are the characteristics of play-based interventions that target social communication skills of children with ASD in educational contexts? (3) What is the quality of research on play-based interventions for the social communication skills of children with ASD in educational contexts? and (4) What recommendations can be drawn from a review of the existing literature for future practice-based research in the field of autism, play and social communication development?

Methods

Protocol and Registration

The planning, organization and implementation of this systematic review was based on the Preferred Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (Moher et al., 2009) and PRISMA-P statement (Shamseer et al., 2015). The review was pre-registered with the Open Science Framework (<https://doi.org/10.17605/OSF.IO/FYEQS>) to ensure transparency and reproducibility (Munafó et al., 2017; Sullivan et al., 2019) and reduce the risk of publication bias (van't Veer & Giner-Sorolla, 2016).

Eligibility Criteria and Study Selection

Studies were included if they met the following criteria: (1) the study reported empirical research (single-case or group research) examining the impact of play-based interventions on social communication skills; (2) play (self-defined by authors and included recognizable characteristics as outlined previously in this review) was identified as the independent variable and primary intervention; any additional strategies used in the intervention were supplementary and incorporated within the play session; (3) at least one outcome measure targeted social communication skills; (4) the article was published in a peer-reviewed journal between the years 2000 and 2020; (5) participants included children, of primary-school age, between 3 and 13 years; (6) the sample population included at least one participant with a diagnosis of ASD; (7) data on dependent variables could be isolated for participants with and without ASD; (8) the study was conducted, at least partially, within educational contexts. Studies were excluded based on the following criteria: (1) the article was written in a language other than English; (2) the study design was a case study; (3) the play intervention was a form of play therapy; (4) participants included children outside of the pre-defined age range (3–13 years) who could not be isolated from the overall sample with regard to the effect of the intervention; and (5) play was used as part of a multi-component intervention approach alongside

strategies including peer training sessions (e.g. Brock et al., 2018; Hu et al., 2018; Kamps et al., 2014; Katz & Girolametto, 2013; Kuhn et al., 2008; Laushey & Heflin, 2000; Lee et al., 2007; Maich et al., 2018; Thiemann-Bourque, 2012; Whitaker, 2004), direct teaching sessions (e.g. Szumski et al., 2016, 2019) or other naturalistic classroom activities including snack or toilet (e.g. Bauminger-Zviely et al., 2020; Boyd et al., 2018; Dykstra et al., 2012) or play was used as the context for the implementation of alternative interventions (e.g. Garfinkle & Schwartz, 2002; Harper et al., 2008; Owen-DeShryver et al., 2008; Simut et al., 2016). Single-case studies were excluded in order to reduce the risk of bias (Schünemann et al., 2013). Studies based on therapeutic interventions such as play therapy, Lego therapy and drama therapy were excluded given that these approaches are based on the therapeutic properties of play (Association for Play Therapy, 2020; Drews & Schaeffer, 2016) and extend beyond the definition of play in this review and have been systematically examined within other literature (Hillman, 2018; Lindsay et al., 2017).

Systematic Search Procedures

The search string was informed by key words and subject terms within sample seminal research in the field (Barber et al., 2016; Boyd et al., 2018; Chester et al., 2019; Dykstra et al., 2012; Hu et al., 2018; Kasari et al., 2012; Katz & Girolametto, 2013; Stagnitti et al., 2012; Vousden et al., 2019; Watkins et al., 2019b; Wolfberg et al., 2015; Wong, 2013; Yang et al., 2003), extensive pilot searching alongside subject librarian consultations and exploration of the thesaurus function across relevant databases. The final comprehensive search was conducted on 9 January 2020 across multiple academic databases including PsychInfo, CINAHL, Education Research Complete and ERIC. Searches across databases were based on the following identical search string: ('Autism Spectrum Disorders' OR 'ASD' OR 'Autis*') AND Play AND ('Social Skills' OR 'Social Interaction' OR 'Social Communication' OR 'Social Competence') AND (Education OR School* OR Class*). This process resulted in the return of 911 citations. Complementary backward chaining was also conducted given that database searching is not exhaustive (Evans & Benefield, 2001). The reference lists of the seminal articles identified (and listed) above were searched for eligible studies alongside the examination of the bibliographies of previous systematic reviews in the area (Alagendran et al., 2019; Cornell et al., 2018; Gibson et al., 2020; Godin et al., 2019; Jung & Sainato, 2013; Kent et al., 2020a; Kossyvakis & Papoudi, 2016; Kuhaneck et al., 2020; Lai et al., 2018; Lang et al., 2011; Lindsay et al., 2017; Lory et al., 2018; Mpella & Evaggelinou, 2018; Pyle et al., 2017). Overall, this process yielded an additional 130 citations resulting in a total of

1041 articles for potential inclusion. Finally, searches were re-run on 10 November 2020 to ensure all recently published material were included and the review was as current as possible, as recommended within the Cochrane guidelines (Lefebvre et al., 2020). This resulted in the inclusion of one additional full-text study based on eligibility criteria (Bauminger-Zviely et al., 2020). Following title and abstract screening, 88 studies were identified by the first author as meeting eligibility criteria. The full text of each article was then screened against the inclusion criteria which resulted in the identification of 29 full-text studies involving the use of play-based interventions to target the social communication skills of children, aged 3–13, with ASD within educational contexts. However, play was the primary independent variable in only nine of these interventions. As a result, the authors segregated these studies into (a) those that were multi-component interventions (i.e. play was one of several independent variables but was not the primary intervention variable) ($n=20$) and (b) those that strictly met criteria for this review ($n=9$). Figure 1 displays the results of each stage of the screening process.

Inter-Rater Reliability

Inter-rater coding was conducted throughout abstract and full-text screening stages. The first author screened all articles for inclusion. The second author blindly and independently screened 10% of the sample at the abstract stage and 20% at the full-text stage. Inter-rater agreement for inclusion was 84% when screening at the abstract stage and 100% when screening full texts in the final stage of the study search. Disagreements were resolved through discussions related to the inclusion and exclusion criteria.

Data Extraction and Narrative Synthesis

Data were extracted by the first author for the purpose of narrative synthesis. Studies included in this review were summarized in terms of: (1) participant characteristics including number, gender, age and diagnostic information; (2) research designs including design and types of methods used; and (3) intervention characteristics including components, frequency, intensity, duration, intervention setting, intervention agent, type of play, social communication outcomes and findings (three-point system outlined in the following section). Data were extracted and reported in tabular form, and a narrative synthesis of the extracted data was conducted to address the four research questions underpinning this systematic review. The second author blindly and independently extracted data from two of the nine selected texts (corresponding to 20% of the sample) according to

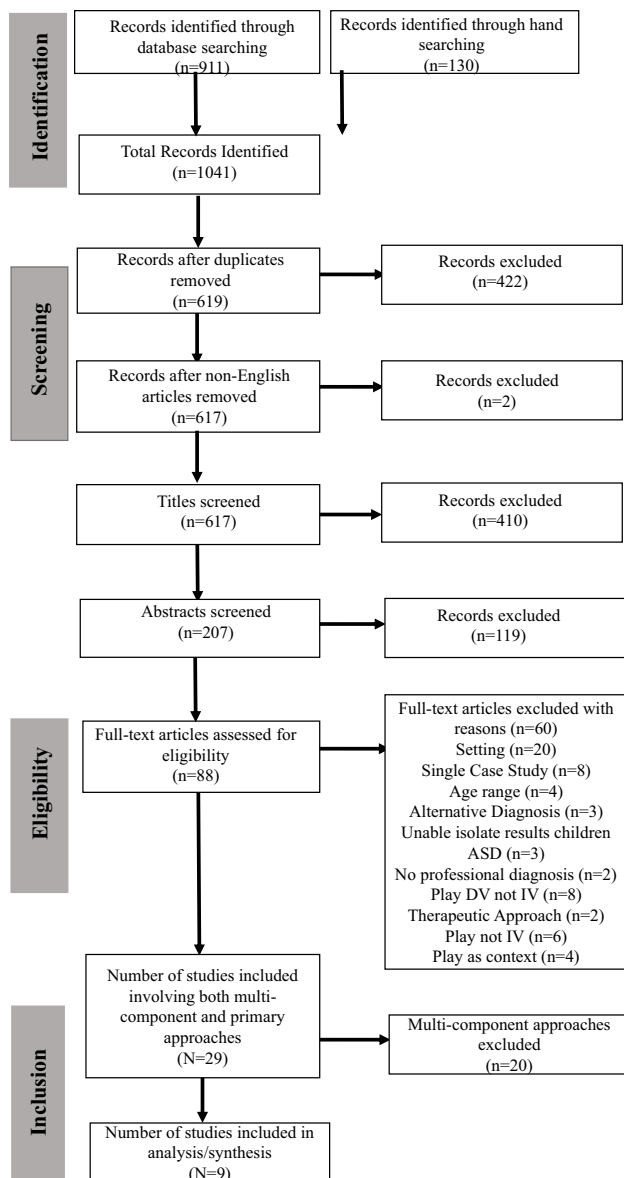


Fig. 1 PRISMA flow diagram

identical characteristics. Inter-rater reliability was calculated and demonstrated 97% agreement, and discrepancies were solved through discussions.

Study Findings

A three-point classification system was used to indicate the type of findings from each study: positive, mixed or negative. A similar approach has been implemented across other systematic reviews where diversity of study designs has meant that it is difficult to compare study results (Gunning et al., 2019; Tupou et al., 2019; Verschuur et al., 2014). Single-case design studies were classified as positive if all participants demonstrated an increase across all social

communication dependent variables, mixed if only some participants increased performance across social communication dependent variables and negative if no participant demonstrated an increase in any social communication dependent variables. Findings from group designs were classified as positive if statistically significant results were reported across all social communication dependent variables, mixed if statistically significant results were reported across some but not all social communication dependent variables and negative if no statistically significant results were reported across any social communication dependent variable.

Quality Appraisal

The quality of each study was assessed according to the Evaluative Method for Determining Evidence Based Practice in Autism (Reichow et al., 2008). This appraisal tool was selected given its specific reference to research within the field of autism, widespread use across other systematic reviews in the field (Ke et al., 2018; Kossyvakı & Papoudi, 2016; Watkins et al., 2015) and reports of validity within the literature (Cicchetti, 2011; Wendt & Miller, 2012). Furthermore, the framework distinguishes between single-case and group research and was, thus, deemed suitable for the diverse range of research designs included in this review.

Single-case and group research studies were evaluated according to specific primary and secondary quality indicators including participant characteristics, clarity with which the independent variable was described, inter-observer agreement, fidelity, generalization and/or maintenance, and social validity. Studies subsequently received a quality rating of high, acceptable or unacceptable. Following this process, studies were categorized as strong, adequate or weak research. The first author independently evaluated all full-text reviews. The second author blindly and independently rated two of the nine selected texts (corresponding to 20% of sample) according to identical primary and secondary quality indicators. Inter-rater reliability was calculated and demonstrated 92% agreement. Discrepancies were solved through discussion as well as reference to the original documentation. The empirical strength of each study was categorized as promising or established based on the outcome of the quality rating process.

Results

Overall, a total of 29 full-text play-based interventions were identified following application of inclusion and exclusion criteria. However, only nine of these studies strictly met all eligibility criteria proposed within this review, specifically in relation to the use of play as the independent variable or

primary intervention in improving social communication skills of children with ASD in educational settings. The remaining 20 articles used play as part of a multi-component social intervention package involving strategies outside of scheduled play sessions such as peer training, direct teaching and pre-teaching (see Table 1). As it was difficult to isolate the impact of play on social communication outcomes in these studies, they are excluded from the data extraction and narrative synthesis reported below.

Data on participant characteristics, study design and intervention characteristics were extracted from the nine eligible studies for inclusion and are first reported in tabular form (see Table 2). Data are further examined in narrative synthesis here.

Participant Characteristics

Overall, 107 children with ASD received treatment interventions within included studies with an additional 43 children with ASD included in wait-list control groups (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012). The vast majority of research samples comprised of male participants with a total of 103 male and 16 female participants included across studies, with the exception of Goods et al. (2013) and Lawton and Kasari (2012) who did not report sample participants' gender. Overall, the age range of participants was 3 to almost 13 years with a mean age of approximately 6.21 years (this is approximate as some studies did not specify age in months). This does not include participants within Thomas and Smith's (2004) study given that information was only provided in relation to age range as opposed to mean. All participants had a professional diagnosis of ASD with some studies reporting IQ levels (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Loncola & Craig-Unkefer, 2005), mental age scores (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012) or severity of ASD (Loncola & Craig-Unkefer, 2005; Watkins et al., 2019b). Five of the studies excluded respondents with co-occurring needs (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Lawton & Kasari, 2012; Loncola & Craig-Unkefer, 2005); however, it is unclear if the remaining interventions included children with co-occurring needs.

Play-Based Intervention Characteristics

Play-based interventions were employed as the independent variable across all nine full-text studies. Play-based interventions varied in their presentation across studies in terms of social partners, types of play used and level of child autonomy and adult involvement. This is unsurprising based on the multi-faceted nature of play. Given the focus on social communication outcomes, all studies involved social play, ranging from play with a single

peer (Ben-Sasson et al., 2012; Loncola & Craig-Unkefer, 2005; Watkins et al., 2019b) to play in peer groups (Beadle-Brown et al., 2018; Vincent et al., 2018) and play with adults (Lawton & Kasari, 2012; Thomas & Smith, 2004) as well as the combination of both adult and peer play (Chang et al., 2016b) with the exception of Goods et al. (2013) whereby it is unclear whether adult play was combined with peer play. Furthermore, studies varied in their approach to peer play with some interventions employing peers with ASD (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Loncola & Craig-Unkefer, 2005) and others utilizing typically developing peers (Chang et al., 2016b; Vincent et al., 2018; Watkins et al., 2019b). The majority of play sessions involved a semi-structured or guided play approach and balance between adult and child agency (Beadle-Brown et al., 2018; Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b) whilst others focused on adult-led structured play (Ben-Sasson et al., 2012; Thomas & Smith, 2004). Although Watkins et al. (2019b) described their play intervention as structured, it involved minimal adult direction and was very much child-led and has consequently been classified as a semi-structured or guided play approach within this review. Finally, the majority of studies adopted an individualized approach to play whereby play types were often selected based on the developmental level of the child (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012) as well as the incorporation of interests and preferences within object play (Thomas & Smith, 2004; Watkins et al., 2019b) or game play (Vincent et al., 2018). Chang et al. (2016b) implemented multiple types of play (cause and effect or object play, functional and symbolic play) with a similar approach adopted across other play-based interventions (Goods et al., 2013; Lawton & Kasari, 2012). Although Goods et al. (2013) or Lawton and Kasari (2012) do not specify types of play employed, reference is made to previous publications which clearly indicate types of play used (object, functional and symbolic play) which are shown in Table 2. The remaining studies focused specifically on symbolic or imaginative play (Beadle-Brown et al., 2018; Loncola & Craig-Unkefer, 2005) and digital play (Ben-Sasson et al., 2012).

Play-based intervention programs were employed across all nine full-text articles included within this review, for example JASPER (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012), as well as individualized adapted interventions (Watkins et al., 2019b). Despite heterogeneity in approaches to play, none of the nine studies explicitly discussed or stated the theory of play which underpinned the intervention. However, upon examination of theoretical underpinnings based on intervention components, the majority of studies were based on naturalistic behavioural approaches (Chang

Table 1 Studies with a play-based component for social communication skills of children with ASD in education

Reference	Sample 3–13 years	Professional Diagnosis ASD	Play-independent variable	Intervention components	Social communication outcomes	Educational setting
Bauminger-Zviely et al. (2020)	Y	Y	N	Preschool peer social intervention: Experiential learning activity + practice sessions in small mixed peer groups during play, snack, joint activity crafts. Techniques involved role play, doll play, audio-visual stimuli and play	Y	Y
Beadle-Brown et al. (2018)	Y	Y	Y	Imagining autism: Children engage with drama practitioners in participatory play within multisensory 'pods'	Y	Y
Ben-Sasson et al. (2012)	Y	Y	Y	Collaborative puzzle game: Comparison of conditions (free play and enforced collaboration) involving collaborative puzzle game on diamond touch interface	Y	Y
Boyd et al. (2018)	Y	Y	N	ASAP: 1–1 and group sessions involving play + naturalistic classroom activities, e.g. snack, toilet	Y	Y
Brock et al. (2018)	Y	Y	N	Peer-mediated intervention: Pivotal response training + recess play sessions	Y	Y
Chang et al. (2016b)	Y	Y	Y	JASPER: Trained teachers implement at pre-existing play centers and promote social interaction and strategies	Y	Y
Dykstra et al. (2012)	Y	Y	N	ASAP: 1–1 and group sessions involving play + naturalistic classroom activities, e.g. snack, toilet	Y	Y
Goods et al. (2013)	Y	Y	Y	JASPER: Play routines used to target communication skills. Strategies include expanding play within routines, all conducted within play session	Y	Y
Hu et al. (2018)	Y	Y	N	Peer-mediated Lego play: Lego play + peer-training in naturalistic strategies to engage children with ASD	Y	Y
Kamps et al. (2014)	Y	Y	N	Peer-mediated intervention: Peer training + direct instruction + written text cues + play	Y	Y
Kasari et al. (2016)	Y	Y	N	Compared SKILLS and ENGAGE: SKILLS involved didactic groups for children with ASD from different classes and grades to teach social skills. ENGAGE involved interest-based groups consisting of multiple activities including free play, games, conversational exercises, storytelling and music for children with ASD and typically developing classmates	Y	Y

Table 1 (continued)

Reference	Sample 3–13 years	Professional Diagnosis ASD	Play-independent variable	Intervention components	Social communication outcomes	Educational setting
Katz and Girolametto (2013)	Y	Y	N	Peer-mediated intervention: Peer training sessions + play sessions	Y	Y
Kuhn et al. (2008)	Y	Y	N	Peer-mediated intervention: Peer training + pivotal response training + play sessions	Y	Y
Laushey and Heflin (2000)	Y	Y	N	Stay Play Talk: Peer training buddy skills + free play sessions	Y	Y
Lawton and Kasari (2012)	Y	Y	Y	JASPER: Teacher implementation of JASPER following training; Social communication outcomes embedded within play routines	Y	Y
Lee et al. (2007)	Y	Y	N	Peer-mediated intervention: Peer training sessions + play sessions	Y	Y
Licciardello et al. (2008)	Y	Y	N	Intervention package: Pre-teaching target children and peers how to engage in play + playground play session including use of reinforcement and prompting	Y	Y
Loncola and Craig-Unkefer (2005)	Y	Y	Y	Plan-Play-Report: Play-based session involving brief planning/discussion with interventionist	Y	Y
Maich et al. (2018)	Y	Y	N	Stay Play Talk: Peer training buddy skills + structured play sessions	Y	Y
Mpella et al. (2019)	Y	Y	N	Theatrical play intervention package: Physical education + theatrical play including use of modelling, shaping and reinforcement	Y	Y
Radley et al. (2014)	Y	Y	Y	Superheroes Social Skills Program: Video modelling + adult modelling + role play + social games + reinforcement	Y	Y
Szumski et al. (2016)	Y	Y	N	Play Time/Social Time: Structured play session including the use of reinforcement and prompting + direct teaching session (social skills lesson)	Y	Y
Szumski et al. (2019)	Y	Y	N	Play Time/Social Time and I Can Problem Solve: PTST involved structured play + direct teaching. ICPS involved activities including play, games, stories, role play in whole-class group	Y	Y
Thiemann-Bourque (2012)	Y	Y	N	Modified Stay Play Talk based on AAC Instruction: Peer training buddy skills + structured play sessions	Y	Y
Thomas and Smith (2004)	Y	Y	Y	Tabletop Identipaly: Table divided in two with clear area for child's toys and adult's toys. Adult lays out toys, implements according to script, models and imitates child	Y	Y

Table 1 (continued)

Reference	Sample 3–13 years	Professional Diagnosis ASD	Play-independent variable	Intervention components	Social communication outcomes	Educational setting
Vincent et al. (2018)	Y	Y	Y	FRIENDS Playground Program: Structured play-based activities implemented during recess	Y	Y
Watkins et al., (2019a, 2019b)	Y	Y	Y	Individualized peer/child play intervention session facilitated by interventionist	Y	Y
Whitaker (2004)	Y	Y	N	Peer-mediated intervention: Peer training session + play sessions	Y	Y
Wong (2013)	Y	Y	N	JASPER Intervention: Teacher training symbolic play × 4 weeks and implemented within classroom play sessions then training joint attention activities × 4 weeks and implemented across multiple activity types or vice versa	Y	Y

et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Thomas & Smith, 2004; Vincent et al., 2018). These approaches combine behavioural and developmental principles within a natural context (Schreibman et al., 2015; Tiede & Walton, 2019), in this case through play interactions. Naturalistic behavioural approaches also combine traditional behavioural components including adult modelling (Ben-Sasson et al., 2012; Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Loncola & Craig-Unkefer, 2005; Thomas & Smith, 2004; Vincent et al., 2018), imitation (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Thomas & Smith, 2004), prompting (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Vincent et al., 2018), positive reinforcement (Goods et al., 2013; Vincent et al., 2018) and visual supports (Thomas & Smith, 2004) with developmental approaches including individualized strategies and support (Beadle-Brown et al., 2018; Chang et al., 2016b; Goods et al., 2013), incorporation of interests and preferences (Goods et al., 2013; Lawton & Kasari, 2012) and environmental arrangement (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Vincent et al., 2018). Watkins et al. (2019b) also drew on such developmental approaches involving individualization of play sessions and use of children's interests. Finally, Beadle-Brown et al.'s (2018) intervention was child-led which incorporated immersive environments, multiple stimuli and scenario based learning whilst Loncola and Craig-Unkefer (2005) employed a social cognitive approach involving instruction of social behaviours, rehearsal or repeated practice, feedback and reinforcement of social behaviours as well as skill maintenance and generalization.

Characteristics of the Educational Contexts for Play-Based Interventions

All nine studies conducted play-based interventions within educational settings, as stipulated within the eligibility criteria. Three of the nine studies were carried out within special schools (Beadle-Brown et al., 2018; Goods et al., 2013; Watkins et al., 2019b) with the remaining interventions conducted within mainstream schools (Lawton & Kasari, 2012; Loncola & Craig-Unkefer, 2005; Thomas & Smith, 2004; Vincent et al., 2018) and special classes (Ben-Sasson et al., 2012; Chang et al., 2016b; Lawton & Kasari, 2012). Four of the interventions were conducted within authentic classroom play areas (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Watkins et al., 2019b) whilst the remaining four studies were implemented outside of the classroom context within an area of the school hallway (Beadle-Brown et al., 2018; Loncola & Craig-Unkefer, 2005), isolated quiet room (Ben-Sasson et al., 2012) or playground recess (Vincent et al., 2018) with the exception of Thomas and Smith's study (2004) whereby the context of the intervention is not specified. Selected studies were carried out across a limited range of geographical locations including the USA (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b) UK (Beadle-Brown et al., 2018; Thomas & Smith, 2004) and Israel (Ben-Sasson et al., 2012). Although all studies were conducted within educational settings, only two of the nine included interventions employed existing school teachers or paraprofessionals as interventionists (Chang et al., 2016b; Lawton &

Table 2 Characteristics of included play-based intervention studies

Author, year, country	Sample characteristics			Research design			Name	Components	Frequency, intensity, duration	Interventionist	Educational setting/context	Play type	Social communication outcomes	Results
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength								
Beadle-Brown et al. (2018), UK	22	7.33–12.92 years M = 9.16 years	18 male; 4 Ffemale	ASD	AB single-case design	Weak	Imagining autism	Children engaged with drama practitioners in participatory play within multisensory “pods.” Encouraged range of stimuli including puppetry, light, sound, costume, masks, digital media and responsive technology. Engaged in five imaginary themes: forest, outer space, arctic, underwater, city	Weekly; 45 min; 10 weeks	Trained drama practitioner	Special school ($\times 3$); school hall	Social play peer groups (3–4 children with ASD); guided play (child-led + adult involvement); imaginative/dramatic	Communication Subscale ADOS; Socialization Subscale VABS (interpersonal relationships, play, coping skills); Communication Subscale VABS (receptive, expressive, written combination)	Mixed (no statistically significant differences in communication scores from pre to post intervention according to ADOS; Statistically significant difference in scores from baseline to intervention in socialization and communication domain of VABS)

Table 2 (continued)

Author, year, country	Sample characteristics			Research design			Play type	Social communication outcomes	Results					
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength				Name	Components	Frequency, intensity, duration	Interventionist	Educational setting/context
Ben-Sasson et al. (2012), Israel	12 (6 dyads)	8–11 years M=9.28 years	12 male	ASD	Within-subject design	Weak	Collaborative puzzle game	Individual training session followed by experimental session. Children paired in dyads and engaged in 3 puzzle games for free play (FP) mode and 3 puzzle games for enforced collaboration (EC) mode. FP mode involved two players independently moving puzzle pieces to match completed puzzle piece on digital table. EC mode forced partners to move puzzle pieces together during joint activity	2 experimental sessions 1 month apart; Duration varied for each dyad depending on time taken to complete	Researcher	Mainstream public school; special class; quiet room within school	Social play (child with ASD + peer with ASD); structured play (adult-led); digital play on diamond touch interface; puzzle game	Friendship Observation Scale; Frequency of Positive and Negative Social Interactions; Social Responsiveness Scale; Parent reported measure of social cognition, social awareness, social communication, social motivation	Mixed (children demonstrated significant difference between EC and FP mode in positive social interaction: No significant difference between modes regarding negative social interaction)

Table 2 (continued)

Author, year, country	Sample characteristics			Research design			Play type	Social communication outcomes	Results					
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength				Name	Components	Frequency, intensity, duration	Interventionist	Educational setting/context
Chang et al. (2016b), USA	66 (38 intervention; 28 waitlist control)	3–5 years M = 50.26 months	59 male; 7 female	ASD	Randomized waitlist control trial	Adequate	JASPER	Classrooms randomized to JASPER intervention or continue as usual ABA preschool curriculum. Teachers underwent training and implemented JASPER at pre-existing play centers using appropriate toy selection to promote peer-to-peer interaction. Teachers actively interacted with children and researchers coached teachers	Daily; 15 min; 8 weeks, total 40 sessions	Trained class teacher and paraprofessionals (N = 13)	6 mainstream public schools; pre-school autism special classroom; play center	Social play (child with ASD + 2–4 typically developing peers or 1–1 interaction with teacher (depending on ability levels); guided play (child-led + adult involvement); play type based on development level; simple (cause and effect), combination (object), pre-symbolic (functional) or symbolic	Percentage of engagement with peers and teachers during play interactions; frequency of spontaneous initiation of joint attention behaviors (verbal and non-verbal) during play sessions as interactions; frequency of initiated behavior regulation during play interactions	Positive (children in intervention group demonstrated significantly more time in child initiated joint engagement with teachers behaviors and peers during play sessions as opposed to control group; Total number of spontaneous initiated joint attention and initiated behavior regulation was also greater among children in intervention group)

Table 2 (continued)

Author, year, country	Sample characteristics		Research design				Name	Components	Frequency, intensity, duration	Interventionist	Educational setting/context	Play type	Social communication outcomes	Results
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength								
Goods, et al. (2013), USA	15 (7 intervention; 8 waitlist control)	3–5 years M=51.71 months	NS	ASD	Randomized waitlist control trial	Weak	JASPER: treatment group withdrawn from same classroom as control. Opportunities were embedded within play routines based on developmental level and interests of child to target social communication skills	Twice weekly; 30 min; 12 weeks, total 24 sessions	Graduate student educational psychology	Private autism special preschool; children withdrawn	Social play (adult+child) Guided play (child-led + adult involvement); play type based on developmental level; object play, functional play or symbolic play	Frequency of spontaneous initiations of Joint Attention and Request Behaviors; Duration of Engagement State in Classroom Play Interactions	Mixed treatment group demonstrated significant decrease in time spent unengaged; Significant increase in frequency of request gestures; No significant difference in initiations of joint attention and request behaviors)	

Table 2 (continued)

Author, year, country	Sample characteristics			Research design			Name	Components	Frequency, intensity, duration	Interventionist	Educational setting/context	Play type	Social communication outcomes	Results
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength								
Lawton and Kasari (2012), USA	16 (9 intervention group; 7 waitlist control)	3–5 years M=44.51 months	NS	ASD	Randomized waitlist control trial	Weak	JASPER	JASPER: teachers from intervention group received training from interventionist in JASPER within classroom context twice weekly; teachers implemented JASPER daily within play routines; set up environment, follow child's toy choice, initiate child's play actions, prompt play actions, establish play routine, wait for communication, contingent language, prompts for joint attention and modelling	Daily, 20 min JASPER session; 6-week intervention	Trained classroom teacher	16 public pre-schools; 8 inclusive classrooms and 3 self-contained classrooms; classroom play area	Social play (adult+child); guided play (child-led+adult involvement); play type based on developmental level; object play, functional play or symbolic play	Frequency of initiations of Joint Attention; Duration of Engagement States in Classroom Play Interactions	Mixed (children in JASPER Treatment group used significantly more joint initiations during class observations in comparison to control. However, mean total of joint initiations were not different between treatment and control; Treatment group demonstrated significant decrease in object engagement and significant increase in supported engagement states)

Table 2 (continued)

Author, year, country	Sample characteristics			Research design			Components	Frequency, intensity, duration	Interventionist	Educational setting/context	Play type	Social communication outcomes	Results
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength							
Loncola and Craig-Unkefer (2005), USA	6	6.01–8.00 years M=6.71 years	5 male; 1 female	ASD	Multiple-baseline design	Adequate	Plan-Play-Report	Three times weekly; 20 min; varied across participant dyads	Trained researcher	Public mainstream school; self-contained classrooms; led + adult involvement; off area hallway	Social play (child with ASD + peer with ASD); Guided play (child-led + adult involvement); symbolic play	Frequency of comments, requests and verbal others directed towards peers	Mixed (increase in peer-directed comments across all children; Increase in peer-directed requests and verbal others across some not all children)

Table 2 (continued)

Author, year, country	Sample characteristics			Research design			Name	Components	Frequency, intensity, duration	Interventionist	Educational setting/context	Play type	Social communication outcomes	Results
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength								
Thomas and Smith (2004), UK	3	3.4–4.1 years M=NS	2 male; 1 female	ASD	AB single-case design	Weak	Tabletop identity-play	Table divided in two with clear area for child's toys and adult's toys; child and interventionist face to face on chairs with two identical sets of toys. Adult lays out toys, implements according to script, models and imitates child	Daily; 5 min; 2 weeks, total 10 sessions	Researcher	Mainstream pre-school; NS	Social play (adult+child); structured play (adult-led); object play	Time engaged in social interactions; frequency eye contact; frequency verbal communication	Positive (children demonstrated increase in frequency of eye contact and verbal communication)

Table 2 (continued)

Author, year, country	Sample characteristics			Research design			Interventionist	Play type	Social communication outcomes	Results				
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength					Name	Components	Frequency, intensity, duration	
Vincent et al. (2018), USA	6 (6 children ASD and 1 child EBD)	5–9 years M = 7.14 years	4 male; 2 female	ASD	Multiple-baseline across-participant design	Adequate	FRIEND Play-ground Program	Multiple structured play activities provided on playground for children with ASD and typically developing peers. This was guided by trained researcher who facilitated sessions using strategies including: following the child's lead, facilitating interactions between students, supporting with prompts and providing reinforcement	Daily; 20-min recess session; 30–34 weeks throughout school year	Trained researcher	Mainstream elementary school; playground	Social play (child ASD + typically developing peers); guided play (child-led + adult involvement); games with rules	Duration of engagement with peers; frequency of Social Initiations	Mixed (all children demonstrated increase in time spent engaged with peers during recess; Some children increased number of social initiations)

Table 2 (continued)

Author, year, country	Sample characteristics			Research design			Name	Components	Frequency, intensity, duration	Interventionist	Educational setting/context	Play type	Social communication outcomes	Results
	Number	Age (as reported by authors in years and/or months)	Gender	Professional diagnosis	Methodology	Strength								
Watkins, et al. (2019b), USA	4	54–74 months M=62.5 months	3 male; 1 female	ASD	Multiple-baseline design	Adequate	Individualized play intervention	Individualized play intervention. 4 children paired with typically developing peers from classroom. Participants engaged in mutually appealing play activity within the classroom facilitated by researchers	Daily; 10-min; varied across participants, total 43 sessions	Researcher	Private special school; inclusive pre-school classroom; play area	Social play (child with ASD + typically developing peer); guided play (child-led + adult involvement) Object play	Frequency of social initiations and responses to peers during interactive play	Positive (increase in initiations and responses to peers across all participants from baseline to intervention) Increase in average duration of interactive play with peers from baseline to intervention across all participants)

NS not specified

Kasari, 2012). The remaining studies involved members of the research team (Ben-Sasson et al., 2012; Thomas & Smith, 2004; Watkins et al., 2019b) or trained independent interventionists (Beadle-Brown et al., 2018; Goods et al., 2013; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018).

Intervention Characteristics Regarding Frequency, Intensity and Duration

Play-based interventions ranged from daily intervention techniques (Chang et al., 2016b; Lawton & Kasari, 2012; Thomas & Smith, 2004; Vincent et al., 2018; Watkins et al., 2019b) to weekly (Beadle-Brown et al., 2018), two times weekly (Goods et al., 2013), three times weekly (Loncola & Craig-Unkefer, 2005) or twice monthly (Ben-Sasson et al., 2012). Interventions also varied in terms of the intensity of intervention sessions from 5–10 min (Ben-Sasson et al., 2012; Thomas & Smith, 2004; Watkins et al., 2019b) to 15–20 min (Chang et al., 2016b; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018) and 30–45 min (Beadle-Brown et al., 2018; Goods et al., 2013; Lawton & Kasari, 2012). The average intensity of intervention was 21 min with the exception of Ben-Sasson et al. (2012) who did not specify intervention intensity. The duration of intervention periods also varied widely from a minimum of 2 weeks (Thomas & Smith, 2004) to a maximum of 34 weeks (Vincent et al., 2018).

Type of Social Communication Outcomes Targeted

All nine full-text reviews targeted social communication outcomes, as stipulated within eligibility criteria. The majority of studies provided a clear operational definition of target outcomes based on the measurement of social initiations (Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b) and responses (Loncola & Craig-Unkefer, 2005; Watkins et al., 2019b) by target participants with ASD towards peers or adults within play. Ben-Sasson et al. (2012) also examined the frequency of positive and negative social interactions alongside social responsive scales whilst other studies focused specifically on initiations of joint attention behaviours (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012). However, social communication outcomes were less clear within some studies (Beadle-Brown et al., 2018; Thomas & Smith, 2004) in particular when dependent measures were based on generic social communication subscales (Beadle-Brown et al., 2018) and social interaction (Thomas & Smith, 2004).

Given that social communication skills did not have to be the exclusive outcome, eight of the nine included

studies incorporated additional outcome measures. These included evaluation of teacher implementation of play-based interventions (Chang et al., 2016b; Lawton & Kasari, 2012); impact of play-based interventions on additional areas of development including language skills (Chang et al., 2016b; Loncola & Craig-Unkefer, 2005), play behaviours (Beadle-Brown et al., 2018; Chang et al., 2016b; Goods et al., 2013; Thomas & Smith, 2004; Watkins et al., 2019b), cognitive skills (Chang et al., 2016b) and the effect of interventionist support during play-based interventions (Loncola & Craig-Unkefer, 2005); and impact of the level of social communication deficits on intervention outcomes (Ben-Sasson et al., 2012).

Study Findings

Results of studies were classified as positive, mixed or negative as outlined in ‘Methods’. Two single-case design studies reported an increase in all social and communication outcomes across all participants and were thus classified as providing positive findings (Thomas & Smith, 2004; Watkins et al., 2019b) with a further group research study also exhibiting significant findings across all social communication dependent variables (Chang et al., 2016b). The remainder of study outcomes were classified as mixed due to demonstration of positive results across some but not all participants (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018) or across some but not all social communication dependent variables (Goods et al., 2013; Lawton & Kasari, 2012).

Study Quality

The quality of included articles was examined using Reichow et al.’s (2008) evaluative framework; however, studies were not excluded based on evaluations of rigor. Given the limited research in this area, each of these studies was valuable in contributing to the evidence base. However, the majority of studies were classified as weak based on primary and secondary quality indicators (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Goods et al., 2013; Lawton & Kasari, 2012; Thomas & Smith, 2004) with the remainder classified as adequate (Chang et al., 2016b; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b). Following implementation of Reichow et al.’s (2008) criteria, play-based interventions are regarded as a promising evidence-based practice given identification of at least three single-subject or at least two group experimental designs of at least adequate research report strength, conducted by at least two different research teams in at least two different locations, involving a total sample size of at least nine different participants across studies.

Generalization, Maintenance and Social Validity

According to Reichow et al.'s (2008) criteria, two of the included full texts collected data on generalization of social communication outcomes within free-play sessions (Chang et al., 2016b) and as part of a formal generalization assessment (Goods et al., 2013). A further three studies implemented generalization measures (Lawton & Kasari, 2012; Thomas & Smith, 2004; Watkins et al. 2019b) however, these were implemented throughout the intervention as opposed to upon its completion, as stipulated within Reichow et al.'s (2008) criteria. Watkins et al. (2019b) measured generalization of social communication skills to novel peer partners. In addition, Thomas and Smith (2004) incorporated generalization measures to ascertain the generalization of play behaviours to free-play contexts and Lawton and Kasari (2012) examined teachers' generalization of JASPER strategies within the classroom. Three of the included studies also completed maintenance measures following the termination of the intervention. Watkins et al. (2019b) conducted follow-up sessions 6 weeks post-intervention whilst Chang et al. (2016b) conducted a 1-month follow-up assessment and Beadle-Brown et al. (2018) conducted three follow-up sessions up to 12 months post-intervention. Watkins et al. (2019b) was the only study to explicitly collect data in relation to social validity based on classroom teacher evaluations, comparisons with typically developing peers and observer ratings. However, using Reichow et al.'s (2008) criteria for social validity, a further five studies included at least four out of seven social validity measures (Ben-Sasson et al., 2013; Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Vincent et al., 2018; Watkins et al., 2019b). These related to socially important outcomes, comparisons conducted between individuals with and without disabilities, clinically significant target behaviour, consumer satisfaction with the results,

implementation in natural contexts and by those who typically come into contact with participants and time and cost effectiveness (ends justified the means) of the intervention. Finally, treatment or procedural fidelity was reported by the majority of included studies using pre-defined checklists and criteria with statistical tests all reaching 80% or over, as stipulated within Reichow et al.'s (2008) criteria (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b). Table 3 presents a summary of results based on Reichow et al.'s (2008) criteria for generalization, maintenance, social validity and fidelity.

Recommendations for Future Practice-Based Research in the Field of Autism, Play and Social Communication Development

This review identified nine promising research studies on play-based interventions in supporting social communication skills of children with ASD within education contexts, a field very much in its infancy. There are several implications for future research in this area. Firstly, future research should explicitly report participant characteristics including IQ, functioning levels and presence of co-occurring needs in order to ascertain if results can generalize across all students with ASD given the heterogeneity of the spectrum, as recommended within similar reviews (Gibson et al., 2017, 2020; Hansen et al., 2017; Kent et al., 2020a; Kossvyaki & Papoudi, 2016). Secondly, although all studies were conducted within educational contexts, future practice-based research may benefit from examining play-based interventions as part of classroom practice as opposed to isolated educational settings, as recommended within previous systematic reviews in the field (Bellini et al., 2007; Hansen et al., 2017; Jung & Sainato, 2013; Kent et al., 2020a) and broader research literature (Kasari &

Table 3 Generalization, maintenance, social validity and fidelity results (Reichow et al., 2008)

Author	Assessments			
	Generalization	Maintenance	Social validity	Treatment and/or procedural fidelity
Beadle-Brown et al. (2018)	N	Y	Y	N
Ben-Sasson et al. (2012)	N	N	Y	N
Chang et al. (2016b)	Y	Y	Y	Y
Goods and et al.(2013)	Y	N	Y	Y
Lawton and Kasari (2012)	N	N	Y	Y
Loncola and Craig-Unkefer (2005)	N	N	N	Y
Thomas and Smith (2004)	N	N	N	N
Vincent et al. (2018)	N	N	Y	Y
Watkins et al. (2019b)	N	Y	Y	Y

Smith, 2013; Koegel et al., 2012; Laugeson et al., 2014; Mazurik-Charles & Stefanou, 2010). Given the diversity and heterogeneity of the classroom environment, this will also enable researchers to identify the influence of contextual variables such as inclusive classroom practices (Woodman et al., 2016), teacher support (Pintrich et al., 1993) and activity types (Vitiello et al., 2012) on social communication outcomes (Gibson et al., 2017; Hume et al., 2019; Kent et al., 2020a). Furthermore, further research is needed to examine the role of educators as interventionists in play-based interventions, as previously recommended (Bellini et al., 2007; Hansen et al., 2017; Kossvaki & Papoudi, 2016). In addition, future research should incorporate measures of generalization and maintenance, in line with previous reviews in the field (Brady et al., 2020; Gunning et al., 2019; Hansen et al., 2017; Kent et al., 2020a). This is especially important given the reported generalization (Carruthers et al., 2020; Ostmeyer & Scarpa, 2012; Rao et al., 2008) and maintenance (Bellini et al., 2007; Neely et al., 2016; Rogers, 2000) benefits of practice-based research. Thirdly, future research should consider seeking input from teachers, peers and also children with ASD, as reflected within broader participatory research recommendations (den Fletcher-Watson et al., 2019; Houting et al., 2020; Jivraj et al., 2014; Lau & Stille, 2014) and, consequently, add to the social validity of this evidence base. Fourthly, given that the vast majority of play-based interventions included in this review were based on predominately male samples across the UK and USA, future research may consider including more geographical and gender representative samples, as identified within other systematic reviews in the field (Gibson et al., 2020; Kossvaki & Papoudi, 2016; Stiller & Möble, 2018). Fifthly, using Reichow et al.'s (2008) quality criteria, the vast majority of studies in this review were classified as weak or adequate. This finding supports recommendations by Gibson et al. (2020) in their recent scoping review of play-based interventions to support social communication development of children, aged 2–7, with ASD in which they highlighted the need for increased rigor in research on play-based interventions for the social communicative development of children with ASD. Finally, given the multi-faceted nature of both play and social communication, future research should provide an account of the theoretical approaches underpinning the play interventions, as recommended within similar reviews (Gibson et al., 2020; Ke et al., 2018; Lindsay et al., 2017).

Discussion

The present review aimed to identify practice-based research on play-based interventions for the social communication skills of children with ASD in educational contexts. The

relationship between play and social communication development within early childhood education is widely recognized (Barnett, 2018; Beazidou & Botsoglou, 2016; Hirsh-Pasek et al., 2009). However, this is an emerging field for children with ASD, as reflected in the results of this review whereby a total of just nine studies were identified, with seven of these studies conducted in the last 8 years.

Research on Play-Based Interventions for the Social Communication Skills of Children with ASD in Educational Settings

Play-based interventions varied widely in terms of intervention characteristics, for example, in types and contexts of play, social communication measures, settings, intensity, frequency, duration and intervention agents. There were, however, commonalities across studies including the selection of types of play and materials based on children's developmental level or interests (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Thomas & Smith, 2004; Vincent et al., 2018; Watkins et al., 2019b), in line with research recommendations (Jordan, 2003; Kasari et al., 2006; Kossvaki & Papoudi, 2016; Papoudi & Kossvaki, 2018). Guided play appeared to form a key part of play-based interventions with the majority of studies involving adult involvement and child autonomy (Beadle-Brown et al., 2018; Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Vincent et al., 2018), reflecting broader recommendations in terms of the provision of support during play for children with ASD (Kok et al., 2002; Papoudi & Kossvaki, 2018, 2018; Sherratt & Peter, 2002; Wolfberg et al., 2012). This also aligns with increasing emphasis on the importance of guided play in educational contexts in order to support learning and development (Weisberg et al., 2013, 2016; Yu et al., 2018; Zosh et al., 2017, 2018). The majority of studies incorporated authentic peers within play-based interventions (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Chang et al., 2016b; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b), a key benefit of conducting research within educational contexts (Hume & Campbell, 2019; Kent et al., 2020b; Wolfberg, 2003). These included both typically developing peers (Chang et al., 2016b; Vincent et al., 2018; Watkins et al., 2019b) and peers with ASD (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Loncola & Craig-Unkefer, 2005), with the selection of peers often dependent on the nature of the educational setting.

Although play-based interventions across all studies involved a social element, they varied greatly in terms of the varieties of play employed from object play (Thomas & Smith, 2004; Watkins et al., 2019b) and game play (Vincent et al., 2018) to symbolic or imaginative play (Beadle-Brown et al., 2018; Loncola & Craig-Unkefer, 2005) and digital play (Ben-Sasson et al., 2012) highlighting the potential

value of all types of play in supporting social communication outcomes (Pellegrini et al., 2002; Veiga et al., 2017; Whitebread et al., 2017).

Commonalities were evident across targeted social communication outcomes specifically frequency of social initiations and responses (Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b) alongside joint attention and engagement (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012). This is surprising given the vast array of social communication skills associated with play for typically developing children including turn-taking and sharing (Anderson-McNamee & Bailey, 2010; Stanton-Chapman & Snell, 2011), collaboration (Rowe et al., 2018; White, 2012; Yogman et al., 2018), negotiation (Bergen & Fromberg, 2009; Hirsh-Pasek et al., 2009; Mraz et al., 2016), theory of mind (Qu et al., 2015) and relational components such as friendships (Coelho et al., 2017; Humphreys & Smith, 1987; Scott & Panksepp, 2003) and peer acceptance (Coelho et al., 2017; Chang et al., 2016a; Flannery & Watson, 1993) as well as communication outcomes such as gestures and body language (Carlson, 2009; Cochet & Guidetti, 2018; Qing, 2011), all skills in which children with ASD may benefit from assistance and support.

Finally, the majority of studies consisted of naturalistic behavioural approaches (e.g. Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Thomas & Smith, 2004; Vincent et al., 2018) similar to findings reported in other systematic reviews in the field (Gibson et al., 2020; Kossyvaki & Papoudi, 2016). This is unsurprising given the current shift within the literature towards an integrated approach to learning involving both behavioural and developmental approaches for children with ASD (Frost et al., 2020; Hume et al., 2021; Schreibman et al., 2015). However, with the exception of Loncola and Craig-Unkefer (2005), philosophies were inferred in this review from the strategies and approaches used, thus highlighting the need to report on theoretical underpinnings going forward within future research, as recommended by Vivanti (2017).

Implications for Practice in the field of Autism, Play, and Social Communication Development

Given that this review focused on examining play-based interventions for social communication of children with ASD in educational contexts, findings can offer unique practical implications. Although findings are not conclusive, they demonstrate promising evidence for the potential of play for social communication of children with ASD that extend beyond the clinical context and offer support to those currently implementing play within the classroom, of particular importance given the international promotion of play-based curricula (Aistear, Enriched Curriculum/Early Years Foundation, High/Scope, Reggio Emilia, Te Whāriki)

and increasing endorsement of play within education for children with ASD (Jordan, 2003; Kossyvaki & Papoudi, 2016; Manning & Wainwright, 2010; Papoudi & Kossyvaki, 2018, 2018; Wolfberg et al., 2015). However, given the diversity of interventions included, it proves difficult to evaluate how best to use play to support social communication skills of children with ASD in terms of intervention setting, intensity, frequency, duration and intervention agents. There are however commonalities across included play-based interventions which may offer guidance for practitioners in the field including consideration of the child's developmental level and interests (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Thomas & Smith, 2004; Vincent et al., 2018; Watkins et al., 2019b), use of guided play or adult support and involvement during play (Beadle-Brown et al., 2018; Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Vincent et al., 2018) and involvement of authentic peers (Beadle-Brown et al., 2018; Ben-Sasson et al., 2012; Chang et al., 2016b; Loncola & Craig-Unkefer, 2005; Vincent et al., 2018; Watkins et al., 2019b) as well as the potential value of naturalistic developmental approaches (Chang et al., 2016b; Goods et al., 2013; Lawton & Kasari, 2012; Thomas & Smith, 2004; Vincent et al., 2018). Further research involving practitioners is very much warranted in order to fully determine the feasibility and effectiveness of practitioner-implemented play-based interventions within educational contexts and work towards bridging the gap between research and practice (Guldborg, 2017; Hume et al., 2021; Kasari & Smith, 2013; Wood et al., 2015).

Limitations

This review offers a unique and timely insight into current practice-based evidence surrounding the impact of play on the social communication outcomes of children with ASD within educational contexts. There are, however, several limitations which need to be acknowledged. Firstly, a diverse range of study types were included involving both single-case and group research which restricted subsequent analysis to narrative synthesis as opposed to meta-analysis. Although this allowed for an overview of relevant studies to be synthesized, it prevented effective comparisons to be drawn between research; thus, the extent to which play-based interventions impacted social communication skills is unknown. Secondly, studies were only included if they met strict eligibility criteria. As a result, it is possible that meaningful papers were excluded that did not fit these specific criteria. Whilst every effort was made to conduct searches across multiple databases and types, including the implementation of hand searching and updated follow-up searches, this search was not exhaustive and it is not possible to ensure all relevant studies were included. Thirdly, quality appraisal was conducted based on strict interpretation of criteria outlined by Reichow et al. (2008). This was selected

following careful consideration of quality frameworks given the diverse range of single-case and group research included in this review. However, appraisal ratings were based on the level of detail outlined within studies and it is possible details may have been omitted which subsequently may have influenced appraisal ratings. In addition, such studies may have received alternative ratings if different appraisal tools were selected.

Conclusion

Overall, this review identified the emerging evidence base of practice-based research that has examined the potential of play-based interventions in supporting the social communication outcomes of children with ASD within educational contexts. To the best of our knowledge, this is the first systematic review to investigate the impact of play on the social communication skills of children with ASD in naturalistic educational contexts. As a result, this review significantly contributes to the emerging literature surrounding practice-based research in supporting the social communication development of children with ASD (Barry et al., 2020; Boyd et al., 2019; Locke et al., 2019) and, in particular, provides support for the potential of play-based interventions in contributing to the social communication skills of children with ASD within educational contexts as part of a new ‘era of translational research’ (Boyd et al., 2019, p.595). This is important given the increasing number of children with ASD accessing inclusive education (European Agency for Special Needs & Inclusive Education, 2018; National Council for Special Education, 2016) and associated demands and expectations of formal schooling (Bauminger-Zviely, 2014; Einfeld et al., 2018; Loveland & Tunali-Kotoski, 2005). However, as highlighted by the limited number of studies in this review, there is insufficient evidence to draw conclusions regarding the mechanisms by which play-based interventions might be especially beneficial for the social communication skills of children with ASD in educational contexts. Further rigorous research is warranted to expand on this emerging evidence base.

Author Contribution Christina O’Keeffe and Sinéad McNally contributed to the study conception and design. Literature search was performed by Christina O’Keeffe. Data screening and analysis were performed by Christina O’Keeffe and Sinéad McNally. The first draft of the manuscript was written by Christina O’Keeffe, and both authors critically revised the work.

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Declarations

Ethics Approval This is a review study. As a result, no ethical approval is required. However, the planning, organization, and implementation of this systematic review were based on the Preferred Items for System-

atic Reviews and Meta-analysis (PRISMA) guidelines (Moher et al., 2009) and PRISMA-P statement (Shamseer et al. 2015). The review was also pre-registered with the Open Science Framework (<https://doi.org/10.17605/OSF.IO/FYEQS>).

Conflict of Interest The authors declare no competing interests.

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