Daniela Bulgarelli (Ed.)

Perspectives and research on play for children with disabilities

Collected papers

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Cover illustration: Inclusive play at school (Camilla, 10 years, Italy).

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Nicole Bianquin and Fabio Sacchi

3 Studies On Play For Children With Disabilities: Exploring The Interdisciplinary Approach

Abstract. Play is considered one of the main activities carried out by children. It is characterized by several aspects, interconnected and investigated by researchers belonging to heterogeneous disciplinary fields. With the aim of grasping the interdisciplinary complexity around the topic of play for children with disabilities, the present systematic review was conducted. Scientific studies about play for children with disabilities were searched on three databases using key words and then the included papers were analysed through a specific reading form. The scientific fields of the journal containing the article included in the review, were retrieved using the classification system proposed by the SCImago (Science Citation Index) Journal & Country Rank (o SJR indicator), a public available portal that includes national scientific journals and indicators developed by the information contained in the Scopus database. Results highlight that the theme of play of children with disabilities is covered in a variety of scientific fields, belonging from medicine to human-computer interaction, and that the most represented scientific field of the studies where education and psychology. The scientific fields seem to reconfigure their percentages in relation to the characteristics ascribable to the different investigated disabilities.

3.1 Introduction

Play is one of the main activities carried out by every child; it is fundamental for the development of cognitive, social and communicative abilities (Vygotsky, 1967; Piaget, 1981; Sutton-Smith, 1997), and is internationally recognized as a right of infancy (United Nations, 1989) also for children with disabilities (UN, 2013; International Play Association, 2015).

It is characterized by different aspects (Besio, 2017) investigated by researchers belonging to heterogeneous disciplinary fields. The consistent presence of studies related to play for children with disabilities, identified in the last years, highlights an increasing interest in the scientific community (Bulgarelli & Bianquin, 2018). Over the years, pedagogy, engineering, law, medicine, psychology, sociology, design, rehabilitation have investigated the same object, namely play, including that of the child with disabilities, stressing different aspects, such as the analysis of play development in children with disabilities (Meyers & Vipond, 2005, Besio 2010), educational robotics (Besio, Caprino, & Laudanna, 2009, Cook, Encarnação, & Adam, 2010; Robins, Dautenhahn, Ferrari, Kronreif, PrazaK-Aram, Marti, Iacono, Gelderblom, Berned, & Caprino, 2012), adapted toys (Brodin, 1999) or accessibility of play area (Ashley, 1999; Prellwitz, Tamm & Lindqvist, 2009; Ripat & Becker, 2012).

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Moreover, in the international literature, the definitions and classifications of the types of play are multiple (Sutton-Smith, 1997; Besio, 2017): this diversity brings to a variety of tools, procedures, interventions in order to implement and evaluate play (Bulgarelli & Bianquin, 2018).

This plurality of researches has been published in journals belonging to specific disciplinary fields (Nagpaul, 1995). The examination of papers published in such journals provides a picture of the complexity through which the topic of 'play' is investigated, giving at the same time information about their quantity, the categories of play investigated, and the disabilities considered.

The aim of this paper is to provide a systematic review of the recent studies that analysed the theme of play for children with disabilities in order to seize the complexity of the interdisciplinary approach highlighted above. The specific research questions are:

1. In which scientific journals have been articles about play for children with disabilities published in the period from 2006 to 2017?
2. To which disciplinary fields such researches do they belong?
3. Which types of disabilities have been investigated by these researches?
4. Which categories of play have been investigated by these researches?

3.2 Play: an interdisciplinary research area

There are few subjects that have been studied by many disciplines as play (Gordon, 2009): biology, psychology, education, anthropology, sociology, history, engineering, design have all focused on play.

Play has many irreducible features, some of which have been highlighted by different theorists (Huizinga, 1950; Bateson, 1955; Vygotskij, 1967; Piaget, 1981; Sutton-Smith, 1997). Providing a comprehensive definition of play remains a theoretical challenge because there are different forms of play, which have several functions and characteristics, multiple players, play contexts, perspectives and languages through which to analyse and to describe it. Furthermore, there is a lack of an effective coordination of the different scientific fields within a single speculative framework, which can bring to a clear systematization, to the identification of further research questions and to the creation of new studies, tools and methodological proposals (Besio, Carnesecchi, & Encarnação, 2015; Besio, Bulgarelli, & Stancheva-Popkostadinova, 2017).

For these reasons, the COST Action TD1309 "LUDI – Play for Children with Disabilities" was born; it was an international and interdisciplinary network of researchers and professionals funded by the European COST Program[3] (COoperation in

3 The title of the COST Action initiating the project is: *LUDI-Play for Children with Disabilities*. For more information https://www.ludi-network.eu/

Science and Technology). This action aimed at creating an innovative and autonomous field of research and intervention on play for children with disabilities (Besio et al., 2017). The network involved over 100 researchers, professionals and practitioners from 32 European and non-European countries, belonging to the most diverse disciplines focusing on the topic of play for children with disabilities - clinic (paediatricians, physiatrists, child neuropsychiatrists), rehabilitation (physiotherapists, speech therapists, rehabilitation therapists, neuropsychomotricists), psychology (developmental and educational psychologists), education (teachers, pedagogists, educators, recreation and education centre operators, sociology), engineering, design, industrial sector, legal and policy - establishing a constructive dialogue between them, in order to reach shared definitions and knowledge (Bianquin, 2017). In addition to the vastness and variety of the areas involved, the LUDI network has also another constitutive characteristic: the confluence between theoretical studies and studies related to intervention practices from clinical to industrial contexts. LUDI has therefore carried out a systematization of the new multidisciplinary study area, building the effective basis for future developments.

3.3 Play and disabilities construct within the LUDI theoretical framework

Among the several definitions and classifications of play (Bulgarelli & Bianquin, 2017), LUDI decided to adopt the one proposed by Garvey, the broadest and at the same time flexible one, for the purposes of the project: «play is a series of voluntary and intrinsically motivated activities, normally associated with entertainment and recreational pleasure» (1990:4).

The concept of play is strongly connected to the distinction between ludic activities – play for the sake of play – and play-like activities (Visalberghi, 1958).[4] The first are started and implemented by the player (alone, with peers, with adults) with the sole purpose of play itself (fun, joy, interest, challenge, competition, etc.). These activities clearly have consequences on growth and development, but these outcomes are not intentionally pursued. Instead, play-like activities are initiated and conducted

4 The Italian pedagogist Aldo Visalberghi systematized these concepts in 1958. According to the scholar, play has the following characteristics: it is demanding, requires a complete commitment of the player; it is continuous, it develops throughout a child's life; it is progressive, since it can gradually become more complex; foresees the end of the activity and does not require any kind of continuation once finished. Many activities carried out in schools or in educational contexts that have learning objectives can have the appearance and even the structure of the play activities and can, of course, have fun features. For these activities Visalberghi proposes the expression of 'ludiform'. They have the same first three characteristics of play activities but not the last one, since they do not end in themselves but have educational objectives and a final scope, that of learning.

by adults, in educational, clinical or social contexts; they appear playful and pleasant, but their main objective is other than play: cognitive and social learning, functional rehabilitation, observation and evaluation, psychological support, psychotherapy, etc. (Besio, 2017).

Moreover, LUDI has chosen to adopt the definition of disability proposed by the International Classification of Functioning, Disability and Health (WHO, 2001) as suitable for the purposes of the project (Bianquin & Bulgarelli, 2017). In the ICF, disability is conceived as the result of a complex relationship between the individual (its functioning characteristics) and the environment and emphasizes how the latter can represent an obstacle or a facilitation element to the functioning individual. This definition also closely interacts with that given by the Convention on the Rights of Persons with Disabilities (UN, 2006),[5] which underlines the importance of the participation dimension for everyone, and for people with disabilities.

To share a common language and classification, LUDI also identified the categories of disability, starting from the ones[6] developed by the OECD's (Organization for Economic Cooperation and Development) Center for Educational Research and Innovation (CERI; see Table 3.1, Bianquin & Bulgarelli, 2017). The categories adopted are functional and meaningful for the purposes of the project, and they are related to impairments that could prevent or reduce children's playing possibilities.

Table 3.1: The LUDI classification of disabilities.

Mental or intellectual disability (mild, moderate, severe, profound)
Hearing impairments (partially hearing impaired – deaf)
Visual impairments (partially sighted – blind)
Communication disorders (language disorders)
Physical impairments (mild, moderate, severe)
Autism spectrum disorders
Multiple disabilities

5 «[Recognizing that] disability is an evolving concept […] [that] results from the interaction between persons with impairments and attitudinal and environmental barriers that hinders their full and effective participation in society on an equal basis with others» (Convention on the Rights of Persons with Disabilities, Preamble, Art. e).

6 The document 'Students with Disabilities, Learning Difficulties and Disadvantages: Policies, Statistics and Indicators' (2007, an updated version of a previous document published in 2005) contains a collection of data from many countries and present a comparison of data concerning the access to educational provisions by students with special needs in a number of OECD countries.

3.4 Scientific subjects classification in the Scimago system

Most scientific publications are tracked by electronic databases that can be considered the greatest repositories of scientific knowledge (Gómez-Núñez, Vargas-Quesada, de Moya-Anegón, & Glänzel, 2011). Among the different databases, some contain only works related to a specific subject area (for example, ERIC for the educational sciences, INSPEC for physics and engineering, PsycINFO for psychology or MEDLINE for medical literature); others, as Web of Science (WOS) and Scopus, are interdisciplinary and include research from different scientific fields. These databases collecting publications from different disciplinary areas and require systems of classification and organization of scientific knowledge (Gómez-Núñez et al., 2011). Among the different classifications, one of the most important is that proposed by Scopus (Falagas, Kouranos, Arencibia-Jorge, & Karageorgopoulos, 2008) which is based on a two-level hierarchical classification system: the areas (first level) and the categories of subjects (second level). All publications collected from this database are placed first in one or more areas and then categorized based on criteria such as title, scope or citation models. Starting from the classification system and the data contained in Scopus, a group of scientists led by the Consejo Superior de Investigaciones Científicas (CSIC) in Spain created the SCImago (Science Citation Index) Journal & Country Rank (o SJR indicator), a public available portal that includes national scientific journals and indicators developed by the information contained in the Scopus database. The publications available in the SCImago public portal are organized in levels, according to a progressive classification system in which four *Super Groups* are located at the top level: Life Sciences, Social Sciences, Physical Sciences and Health Sciences. These *Super Groups* are further divided in 27 *Major Thematic Areas* indicated with a numerical code from 1000 to 3600 and 313 *Specific Subject Categories*.[7] This information can be used to evaluate and analyse scientific domains and journals by making comparison or single analysis (Gómez-Núñez et al., 2011).

The title of a paper is inserted in the search engine to identify the scientific fields of classification: if the journal is registered, the system provides automatically information about its classification, with the reference to the *Major Thematic Areas* and the *Specific Subject Categories*. From them is possible to date back to the 4 *Super Groups*. The identification could not be always univocal because a journal might have been classified into different *Major Thematic Areas* that, in turn, could refer to a different *Super Groups*.

For example, the *Major Thematic Areas* Psychology identified by the numerical code 3200, belongs to the *Super Groups* Social Sciences and is divided into 8 *Specific Subject Categories* (see Figure 3.2).

7 https://www.scimagojr.com/aboutus.php

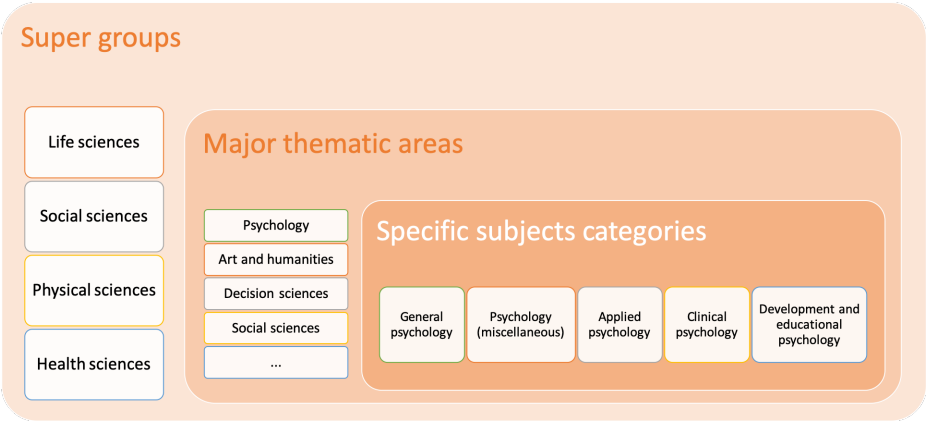


Figure 3.1: SJR levels: example of the thematic area and specific subject "Psychology".

The journals[8] *Education & Training in Developmental Disabilities* and *Education and Training in Autism and Developmental Disabilities* belong to the *Super Group* Social Sciences, to *Major Thematic Area* Psychology and Social Sciences and to the *Specific Subject Categories* related to Developmental and Educational Psychology and Education.

3.5 Method

In order to select the articles to be included in the systematic review, a multi-phase procedure based on guidelines was followed (Kitchenham, 2004). First, a thorough discussions between the researchers about the goals of the systematic review and the inclusion and exclusion criteria aimed at building a shared understanding and a common framework for the selection phases. Then, the following steps were taken.

The words characterizing the LUDI project, i.e. "play" "children" and "disabilities" (using the logical operator AND) were used to query the databases and to identify the papers. In order to cover different scientific fields, three databases were chosen: Education Resources Information Center (ERIC), an authoritative database of indexed and full text education literature and resources; Institute of Electrical and Electronic Engineers Xplore Digital Library (IEEE Xplore Digital Library), a research database for discovery and access to journal articles, conference proceedings and related materials on computer science, electrical engineering and electronics, and allied fields; and

8 These three journals were founded in the present review.

Public/Publisher MEDLINE (PUBMED) PubMed, a free search engine based on the MEDLINE database, of biomedical scientific literature.

The results from all databases were registered, merged and duplicates were removed. Two independent raters examined the titles and abstracts and applied the inclusion and exclusion criteria.

The review included studies that:

1. Addressed play;
2. Addressed children with disabilities (0 to 18 years old);
3. Were published in the period from 2006 to 2017 in peer reviewed journal or peer reviewed conference proceedings;
4. Were published in English or there is an English translation available;

The search took place from 27 June 2018 to 6 July 2018. The two raters then compared their decisions and settled all differences through discussion. In cases where it was not clear from the abstract if the study should be included or not, the full paper was retrieved and analysed from both raters to better support the decision. Subsequently, the articles corresponding to the eligibility criteria were analysed using a reading form to obtain information relevant to the research questions identified: title, authors, journal, year, *Super Group*s, *Major Areas* and *Categories* (according to the SJR classification), disability diagnosis (see Table 3.1) and play type (play vs. play-like activities).

3.6 Results

The databases search identified 584 documents. After removing duplicates, 579 studies remained and 80 were included in this review. The inter-rater reliability score was 89% (good) and the Cohen's kappa coefficient of 0.75 (good) was obtained. The selected papers are reported in the Table 3.3.

As regards the years, 30 of them were distributed equally in the years 2009, 2010 and 2011, when the major number of papers was published (graph. 3.1). The year with the least number of publications (N = 3) was 2006.

The Table 3.3 shows the disabilities considered in the selected papers. The diagnostic labels used by the researchers were exactly reported. 46 studies took into consideration only one disability, the remaining ones (34) focused on more. Regarding the different diagnoses, the most represented was the Autism Spectrum Disorder (31/80 - ST 4, 6, 7, 8, 11, 13, 17, 19, 22, 26, 27, 28, 33, 34, 40, 50, 51, 52, 56, 59, 62, 64, 68, 72, 73, 74, 75, 76, 78, 79, 80)), followed by Down Syndrome (12 - ST 4, 11, 14, 16, 25, 28, 32, 44, 54, 64, 67, 73) and Cerebral Palsy (7 - ST 16, 20, 42, 47, 49, 63, 71) and Intellectual Disability (7 - ST 17, 18, 22, 24, 26, 43, 53). It must be noted that 10 studies did not provided a specific diagnosis but referred generically to a *wide range of disabilities* or *special needs* (ST 2, 3, 21, 30, 35, 36, 38, 41, 46, 60).

Table 3.2: Selected papers.

Code	Author/s	Title	Year
ST1	Celeste M	Play Behaviors and Social Interactions of a Child Who Is Blind: In Theory and Practice	2006
ST2	DiCarlo CF, Stricklin SB, Reid DH	Increasing Toy Play among Toddlers with and without Disabilities by Modifying the Structural Quality of the Classroom Environment	2006
ST3	Pang Y	Assist Parents to Facilitate Social Skills in Young Children with Disabilities through Play	2006
ST4	Rutherford MD, Young GS, Hepburn S, Rogers SJ	A Longitudinal Study of Pretend Play in Autism	2007
ST5	Cress CJ, Arens, KB, Zajicek, AK	Comparison of Engagement Patterns of Young Children with Developmental Disabilities between Structured and Free Play	2007
ST6	Robins B, Otero N, Ferrari E, Dautenhahn K	Eliciting Requirements for a Robotic Toy for Children with Autism - Results from User Panels	2007
ST7	Nelson C, McDonnell AP, Johnston SS, Crompton A, Nelson AR	Keys to Play: A Strategy to Increase the Social Interactions of Young Children with Autism and their Typically Developing Peers	2007
ST8	Wong CS, Kasari C, Freeman S, Paparella T	The Acquisition and Generalization of Joint Attention and Symbolic Play Skills in Young Children with Autism	2007
ST9	Johnson KA, Klaas SJ	The changing nature of play: implications for pediatric spinal cord injury	2007
ST10	Raisamo R, Patomäki S, Hasu, M, & Pasto V	Design and evaluation of a tactile memory game for visually impaired children	2007
ST11	Colozzi GA, Ward, LW, Crotty, KE	Comparison of Simultaneous Prompting Procedure in 1:1 and Small Group Instruction to Teach Play Skills to Preschool Students with Pervasive Developmental Disorder and Developmental Disabilities	2008
ST12	Hsieh HC	Effects of ordinary and adaptive toys on pre-school children with developmental disabilities	2008
ST13	Ganz JB, Flores MM	Effects of the Use of Visual Strategies in Play Groups for Children with Autism Spectrum Disorders and Their Peers	2008
ST14	De Falco S, Esposito G, Venuti P, Bornstein MH	Fathers' Play with Their Down Syndrome Children	2008

Continued **Table 3.2:** Selected papers.

Code	Author/s	Title	Year
ST15	Cress CJ, Moskal L, Hoffmann A	Parent Directiveness in Free Play with Young Children with Physical Impairments	2008
ST16	Buchanan M, Johnson Giovacco T	A Second Look at the Play of Young Children with Disabilities	2009
ST17	Marti P, Moderini C, Giusti L, Pollini A	A robotic toy for children with special needs: From requirements to design	2009
ST18	Malone M	Patterns of Home- and Classroom-Based Toy Play of Preschoolers with and without Intellectual Disabilities	2009
ST19	Lang R, Machalicek W, O'Reilly M, Sigafoos J, Rispoli M, Shogren K, Regester A	Review of Interventions to Increase Functional and Symbolic Play in Children with Autism	2009
ST20	Odle BM, Irving A, Foulds R	Usability of an adaptable video game platform for children with cerebral palsy	2009
ST21	Di Carlo CF, Schepis MM, Flynn L	Embedding Sensory Preference into Toys to Enhance Toy Play in Toddlers with Disabilities	2009
ST22	Di Carlo CF, Schepis, MM, Flynn, L	Exploring play styles with a robot companion	2009
ST23	Banerji S, Heng J	A unified, neuro-physio platform to facilitate collaborative play in children with learning disabilities	2009
ST24	Handen BL, Sagady AE, McAuliffe-Bellin S	Methylphenidate and Play Skills in Children with Intellectual Disability and ADHD	2009
ST25	Venuti P, de Falco S, Esposito G, Bornstein MH	Mother-Child Play: Children with Down Syndrome and Typical Development	2009
ST26	Marti P, Giusti L	A robot companion for inclusive games: A user-centred design perspective	2010
ST27	Walberg, Loncola J, Craig-Unkefer LA	An Examination of the Effects of a Social Communication Intervention on the Play Behaviors of Children with Autism Spectrum Disorder	2010
ST28	Barton EE	Development of a Taxonomy of Pretend Play for Children with Disabilities	2010
ST29	Ahmad WF, Akashah PEA, Azmee S	Game-based learning courseware for children with learning disabilities	2010

Continued **Table 3.2:** Selected papers.

Code	Author/s	Title	Year
ST30	Myck-Wayne J	In Defense of Play: Beginning the Dialog about the Power of Play	2010
ST31	Pizzo L, Bruce SM	Language and Play in Students with Multiple Disabilities and Visual Impairments or Deaf-Blindness	2010
ST32	De Falco S, Esposito, G,Venuti P, Bornstein MH	Mothers and Fathers at Play with Their Children with Down Syndrome: Influence on Child Exploratory and Symbolic Activity	2010
ST33	Tsao LL, McCabe H	Why Won't He Play with Me?: Facilitating Sibling Interactions	2010
ST34	Ganz JB, Flores MM	Supporting the Play of Preschoolers with Autism Spectrum Disorders: Implementation of Visual Scripts	2010
ST35	Clark MK, Nwokah, EE	Play and Learning in Summer Camps for Children with Special Needs	2010
ST36	Lifter K, Mason, EJ, Barton, EE	Children's Play: Where We Have Been and Where We Could Go	2011
ST37	Elmore SR, Vail CO	Effects of Isolate and Social Toys on the Social Interactions of Preschoolers in an Inclusive Head Start Classroom	2011
ST38	Stanton-Chapman TL, Hadden DS	Encouraging Peer Interactions in Preschool Classrooms: The Role of the Teacher	2011
ST39	Klein T, Gelderblom GJ, de Witte L, Vanstipelen S	Evaluation of short term effects of the IROMEC robotic toy for children with developmental disabilities	2011
ST40	Jull, S,; Mirenda, P,	Parents as Play Date Facilitators for Preschoolers with Autism	2011
ST41	Childress DC	Play Behaviors of Parents and Their Young Children with Disabilities	2011
ST42	Pfeifer LI, Pacciulio AM, dos Santos CA, dos Santos JL, Stagnitti KE	Pretend Play of Children with Cerebral Palsy	2011
ST43	Wasterfors D	Stretching Capabilities: Children with Disabilities Playing TV and Computer Games	2011

Continued **Table 3.2:** Selected papers.

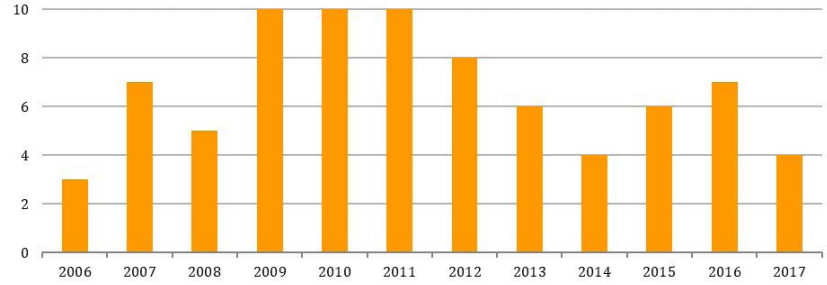
Code	Author/s	Title	Year
ST44	Frey JR, Kaiser AP	The Use of Play Expansions to Increase the Diversity and Complexity of Object Play in Young Children with Disabilities	2011
ST45	Vail CO, Elmore SR	Tips for Teachers Selecting Toys to Facilitate Social Interaction	2011
ST46	Burke J.	"Some Kids Climb up; Some Kids Climb down": Culturally Constructed Play-Worlds of Children with Impairments	2012
ST47	Chiarello LA, Palisano RJ, Bartlett DJ, McCoy Westcott S	A Multivariate Model of Determinants of Change in Gross-Motor Abilities and Engagement in Self-Care and Play of Young Children with Cerebral Palsy	2012
ST48	Bartolomé NA, Zorrilla AM, Zapirain Bg	A serious game to improve human relationships in patients with neuro-psychological disorders	2012
ST49	Hsieh HC	Effectiveness of Adaptive Pretend Play on Affective Expression and Imagination of Children with Cerebral Palsy	2012
ST50	Wong C, Kasari C	Play and Joint Attention of Children with Autism in the Preschool Special Education Classroom	2012
ST51	Ganz JB, Flores MM	Teaching Play Skills to Children with Autism through Video Modeling: Small Group Arrangement and Observational Learning	2012
ST52	Scheflen Clifford S, Freeman, SFN, Paparella T	Using Video Modeling to Teach Young Children with Autism Developmentally Appropriate Play and Connected Speech	2012
ST53	Nader-Grosbois N, Vieillevoye S	Variability of Self-Regulatory Strategies in Children with Intellectual Disability and Typically Developing Children in Pretend Play Situations	2012
ST54	Matthews A, Rix, J	Early Intervention: Parental Involvement, Child Agency and Participation in Creative Play	2013
ST55	Stockall N, Dennis L	Fathers' Role in Play: Enhancing Early Language and Literacy of Children with Developmental Delays	2013

Continued **Table 3.2:** Selected papers.

Code	Author/s	Title	Year
ST56	Jung S, Sainato DM	Teaching Play Skills to Young Children with Autism	2013
ST57	Hughett K, Kohler FW, Raschke D	The Effects of a Buddy Skills Package on Preschool Children's Social Interactions and Play	2013
ST58	Guerette P, Furumasu, Jan; Tefft, Donita	The Positive Effects of Early Powered Mobility on Children's Psychosocial and Play Skills	2013
ST59	Hobson JA, Hobson RP., Malik S, Bargiota K, Calo S	The Relation between Social Engagement and Pretend Play in Autism	2013
ST60	Crawford SK, Stafford KN, Phillips SM, Scott KJ, Tucker P.	Strategies for inclusion in play among children with physical disabilities in childcare centers: an integrative review	2014
ST61	Mills PE, Beecher CC, Dale PS, Cole KN, Jenkins JR	Language of Children with Disabilities to Peers at Play: Impact of Ecology	2014
ST62	Stockall N, Dennis LR, Rueter JA	Play-Based Interventions for Children with PDD	2014
ST63	Oliveira E, Sousa G, Aires Tavares T, Tanner P	Sensory stimuli in gaming interaction: The potential of games in the intervention for children with cerebral palsy	2014
ST64	Barton EE	Teaching Generalized Pretend Play and Related Behaviors to Young Children with Disabilities	2015
ST65	Suhonen E, Nislin MA, Alijoki A, Sajaniemi NK	Children's Play Behaviour and Social Communication in Integrated Special Day-Care Groups	2015
ST66	Murphy FE, Donovan M, Cunningham J, Jezequel T, García E, Jaeger A, McCarthy J, Popovici EM	i4Toys: Video technology in toys for improved access to play, entertainment, and education	2015
ST67	Macedo I, Trevisan DG, Vasconcelos CN, Clua E	Observed Interaction in Games for Down Syndrome Children	2015
ST68	Finke EH, Hickerson B, McLaughlin E	Parental Intention to Support Video Game Play by Children with Autism Spectrum Disorder: An Application of the Theory of Planned Behavior	2015
ST69	López SA, Corno F, De Russis L	Playable one-switch video games for children with severe motor disabilities based on GNomon	2015

Continued **Table 3.2:** Selected papers.

Code	Author/s	Title	Year
ST70	Chuang TY, Kuo MS	A Motion-Sensing Game-Based Therapy to Foster the Learning of Children with Sensory Integration Dysfunction	2016
ST71	Ryalls BO, Harbourne R, Kelly-Vance L, Wickstrom J, Stergiou N, Kyvelidou A	A Perceptual Motor Intervention Improves Play Behavior in Children with Moderate to Severe Cerebral Palsy	2016
ST72	Kossyvaki L, Papoudi D.	A Review of Play Interventions for Children with Autism at School	2016
ST73	Karaaslan O	Comparison of Social Engagement of Children Having Disabilities with Their Mothers and Fathers	2016
ST74	Mahoney G, Solomon R	Mechanism of Developmental Change in the PLAY Project Home Consultation Program: Evidence from a Randomized Control Trial	2016
ST75	Shireman ML, Lerman, DC, Hillman CB	Teaching Social Play Skills to Adults and Children with Autism as an Approach to Building Rapport	2016
ST76	Kim S	Use of Video Modeling to Teach Developmentally Appropriate Play with Korean American Children with Autism	2016
ST77	Eilertsen LJ	Constructing Conditions of Participation through Play Formats: Children with Hearing Impairment and Complex Needs	2017
ST78	Mizumura Y, Ishibashi K, Yamada S, Takanishi A, Ishii H	Mechanical design of a jumping and rolling spherical robot for children with developmental disorders	2017
ST79	Miller LJ, Schoen SA, Camarata SM, McConkey J. Kanics IM, Valdez A, Hampton S	Play in Natural Environments: A Pilot Study Quantifying the Behavior of Children on Playground Equipment	2017
ST80	Nelson C, Paul K, Johnston, SS, Kidder JE	Use of a Creative Dance Intervention Package to Increase Social Engagement and Play Complexity of Young Children with Autism Spectrum Disorder	2017



Graph 3.1: Years distribution of the selected paper.

Subsequently, the disabilities were re-classified according to the seven typologies identified by the LUDI network and considered significant in relation with the topic of play. Most of the studies focused on children with autism (N = 31 - ST 4, 6, 7, 8, 11, 13, 17, 19, 22, 26, 27, 28, 33, 34, 40, 50, 51, 52, 56, 59, 62, 64, 68, 72, 73, 74, 75, 76, 78, 79, 80). Followed by Mental or Intellectual Disability (N = 25; ST 4, 5, 11, 14, 16, 17, 18, 22, 25, 26, 28, 32, 37, 39, 42, 44, 45, 53, 54, 55, 59, 61, 64, 67, 73) including studies about Down Syndrome (N = 12), Intellectual Disabilities (N = 7) and Developmental Delays (N = 6). According to the LUDI Conceptual Review of Disabilities in the category of Physical Impairments were included papers (N = 15; ST 9, 15, 16, 17, 20, 22, 26, 42, 43, 47, 49, 58, 63, 69, 71) related to motor impairments (N = 3), physical disabilities (N = 4), cerebral palsy (N = 7) and spinal cord injury (N = 1). Hearing Impairments were the less investigated disability (N = 1; ST 77).

The information about the two categories of play was then retrieved. Sixty-two papers were included in the category of play for the sake of play (ST 1, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 27, 28, 31, 32, 33, 34, 35, 37, 38, 39, 42, 44, 45, 46, 47, 49, 50, 51, 52, 53, 54, 57, 58, 59, 60, 63, 64, 65, 66, 67, 68, 69, 71, 72, 73, 74, 76, 79, 80), 14 into the one of play like activity (ST 20, 29, 30, 40, 43, 48, 55, 56, 61, 62, 70, 75, 77, 78) and 4 in both categories (ST 2, 6, 36, 41). Most of the articles that feature both play as play for the sake of play and play like activity belong to the *Super Group* of Social Sciences.

For each paper the journal was identified: totally 51 different titles of journals were founded. The journals with the major number of retrieved articles were:

- 'Young Exceptional Children' (N = 5; ST 33, 34, 30, 38, 44, 62);
- 'Education & Training in Developmental Disabilities' (N = 4; ST 5, 7, 11, 19);
- 'Education and Training in Autism and Developmental Disabilities' (N = 4; ST 27, 51, 52, 80);
- 'Journal of Autism and Developmental Disorders' (N = 4; ST 4, 13, 50, 74).

Table 3.3: Disabilities considered in the selected papers reorganized according to the LUDI classification.

LUDI classification of disabilities	Label reported in the papers	N	N (tot)
Autism Spectrum Disorder	Autism	31	31
Mental or Intellectual disabilities	Down Syndrome	12	25
	Intellectual disability	7	
	Developmental disabilities	6	
Physical impairments	Physical Disabilities	4	15
	Cerebral Palsy	7	
	Motor impairments	3	
	Spinal cord injury	1	
Visual impairments	Visual impairment	3	5
	Blindness	1	
	Blindness with deafness	1	
Hearing impairments	Hearing Impairment	1	1
Communication disorders	Language delays	2	3
	Social and communication Delays	1	
Multiple disabilities	Multiple disabilities	3	3
Other disabilities not included in the LUDI classification of disabilities	**Label reported in the papers**	**N**	**N (tot)**
	ADHD	3	31
	Learning disabilities	5	
	Regulatory disorder	2	
	Developmental delays	6	
	Neuro-psychological disorders	1	
	Pervasive developmental disorder	1	
	Sensory disorder	1	
	Sensory Integration Dysfunction	1	
	Severe disabilities	1	
	Not specified	10	

Only two journals, 'Journal of Play' and 'American Journal of Play', were not present on the SJR portal. In Table 3.4, the list of all journal titles retrieved is reported.

According to the SJR classification 54 studies were included in the *Super Groups* of the *Social Science* and 33 in the one of *Health Sciences*, whereas 16 entered the *Physical Sciences Super Group*. No studies were founded in the *Super Group* Life Sciences. The three studies published in the two journals not classified by SJR were not considered.

Table 3.4: List of the journals selected in the current paper.

Journal	Article (ID)
American journal of play	16
American Journal on Intellectual and Developmental Disabilities	25
Assistive Technology	58
British Journal of Developmental Psychology	59
Communication Disorders Quarterly	15
Deafness & Education International	77
Disability & Society	43, 46
Early Childhood Education Journal	55
Early years	54
Education & Training in Developmental Disabilities	5, 7, 11, 19
Education and Training in Autism and Developmental Disabilities	27, 51, 52, 80
Educational Sciences: Theory and Practice	73
European Journal of Special Needs Education	65
Exceptional Children	64
Frontiers in psychology	71
Infants and young children	21, 28
Intelligent Technologies for Interactive Entertainment (INTETAIN), 2015 7th International Conference on IEEE	69
Interacting with Computers	10
International Journal of Disability, Development and Education	18, 72
International Journal of Special Education	3
Journal of applied behavior analysis	75
Journal of Applied Research in Intellectual Disabilities	32
Journal of Autism and Developmental Disorders	4, 13, 50, 74
Journal of early intervention	36, 61
Journal of Educational Technology & Society	70
Journal of Intellectual & Developmental Disability	56
Journal of Intellectual Disability Research	14, 53
Journal of Mental Health Research in Intellectual Disabilities	24
Journal of Occupational Therapy, Schools, & Early Intervention	79

Continued **Table 3.4:** List of the journals selected in the current paper.

Journal	Article (ID)
Journal of play	35
Journal of Positive Behavior Interventions	40
Journal of Visual Impairment & Blindness	1, 31
Language, speech, and hearing services in schools	68
NHSA Dialog A Research-to-Practice Journal for the Early Childhood Field	2, 37, 45
Physical & Occupational Therapy in Pediatrics	42, 47, 60
Proceedings - IEEE International Conference on Robotics and Automation	26
Research and Practice for Persons with Severe Disabilities	8, 76
Research in Developmental Disabilities: A Multidisciplinary Journal	12, 49
Robotics and Biomimetics (ROBIO), 2017 IEEE International Conference on IEEE	78
RO-MAN 2007 - The 16th IEEE International Symposium on Robot and Human Interactive Communication	6
The 18th IEEE International Symposium on Robot and Human Interactive Communication	22
The Journal of Spinal Cord Medicine	9
Topics in Early Childhood Special Education	41, 57
Young Exceptional Children	33, 34, 30, 38, 44, 62
2009 IEEE 35th Annual Northeast Bioengineering Conference	20
2009 IEEE International Conference on Rehabilitation Robotics	17, 23
2010 2nd International IEEE Consumer Electronics Society's Games Innovations Conference	48
2010 International Symposium on Information Technology	29, 39
2014 IEEE Games Media Entertainment	63
2015 48th Hawaii International Conference	67
2015 IEEE International Symposium on Technology and Society (ISTAS)	66

The journals containing the articles included in this review were ascribable to different *Major Thematic Areas*. As shown in the Table 3.5, in the *Super Group* Social Sciences (54) most articles were included in the *Major Thematic Areas* of Psychology (42), Social Sciences (37) and Arts and Humanities (6). Within the area of Psychology, the great prevalence of articles referred to *Specific Subject Categories* Developmental and

Educational Psychology (36); regarding the area Social Sciences the most relevant *Specific Subject Category* identified was Education (31).

The second *Super Group* for representativeness was that of the Health Sciences (N = 33 studies). Analysing the overall internal architecture, the most representative *Major Thematic Areas* were Medicine (N = 21 studies), Health Professions (N = 14) and Neurosciences (N = 3). With reference to the *categories* – micro level of the SJR classification – 13 dimensions had a value of articles greater than three: for Medicine, Paediatrics, Perinatology, and Child Health (N = 9), Rehabilitation (N = 9), Psychiatry and Mental health (N = 8), Medicine (miscellaneous, N = 5) Clinical Neurology (N = 4); for the Health Professions, Health Professions (miscellaneous, N = 7), Physical Therapy, Sports Therapy and Rehabilitation (N = 4) and Occupational Therapy (N = 4).

The last *Super Group* detected was that of the Physical Sciences (16 articles) whose architecture was, compared to the two previously illustrated, less articulated as constituted only by two *Major Thematic Areas*: Computer Sciences with 15 articles and Engineering with 9 articles. The two areas were respectively divided into five and four *categories* (Computer Graphics and Computer-Aided Design, Computer Vision and Pattern Recognition, Human-Computer Interaction, Software) with an article value of more than three and in two categories of which only Electrical and Electronic Engineering includes more than three researches.

This concentration of articles in two categories (31 in Education and 36 in Developmental and Educational Psychology) determines an inhomogeneous distribution with an average value of 5.82 and a standard deviation of 9.53. The *Super Group* of Health Sciences, instead, is characterized by a more homogeneous distribution of studies within the different categories, such as Clinical Neurology, Ophthalmology, Physical Therapy, Sports Therapy and Rehabilitation, and in which the average value settles around 3.82 with a standard deviation of 1.89. The trend in the number of studies, in the *Super Group* of Physical Sciences, presents an average value of 5.25 and a standard deviation of 4.89. This *Super Group* could be considered in an intermediate position compared to the two previously analysed.

As previously reported the most presented diagnosis was Autism Spectrum Disorder (N = 31). Concerning the SJR classification, the largest number of studies is within the *Super Group* Social Sciences (N = 25), followed by Health Sciences (N = 9) and Physical Sciences (N = 5); the *Major Thematic Areas* most involved are Psychology (N = 24) and Social Sciences (N = 17).

Studies related to the intellectual disability were 25 and according to the *Super Group*s SJR classification, most of the studies concerning this disability were included in publications belonging to the Social Sciences (N = 20), then the Health Sciences (N = 10) and Physical Sciences (N = 5). The most representative *Major Thematic Areas* was represented by Psychology (N = 16) and Social sciences (N = 13).

Table 3.5: Major Thematic Areas and Specific Subject Categories in the selected papers.

Super Groups	Major Thematic Areas	Specific Subject Categories	
Health sciences (33)	Medicine (21)	Ophthalmology	2
		Rehabilitation	9
		Medicine (miscellaneous)	5
		Paediatrics, Perinatology, and Child Health	9
		Psychiatry and Mental health	8
		Clinical Neurology	4
		Public Health, Environmental and Occupational Health	3
	Health professions (14)	Occupational Therapy	4
		Physical Therapy, Sports Therapy and Rehabilitation	4
		Health Professions (miscellaneous)	7
		Speech and Hearing	2
	Neuroscience (3)	Developmental Neuroscience	1
		Neurology	2
Social Sciences (54)	Social Sciences (37)	Education	31
		Social Sciences (miscellaneous)	2
		Linguistics and Language	2
		Health (social sciences)	2
		Sociology and Political Sciences	2
	Psychology (42)	Social psychology	3
		Developmental and educational psychology	36
		Neuropsychology and Physiological Psychology	1
		Applied Psychology	2
		Psychology (miscellaneous)	2
		Clinical Psychology	2
	Arts and Humanities (6)	Arts and Humanities (miscellaneous)	4
		Language and Linguistics	1
		Philosophy	1

Continued **Table 3.5:** Major Thematic Areas and Specific Subject Categories in the selected papers.

Super Groups	Major Thematic Areas	Specific Subject Categories	
Physical Sciences (16)	Computer Science (15)	Artificial Intelligence	1
		Computer Graphics and Computer-Aided Design	4
		Computer Vision and Pattern Recognition	14
		Human-Computer Interaction	6
		Software	5
	Engineering (9)	Electrical and Electronic Engineering	8
		Engineering (miscellaneous)	1

15 studies out of 80 included were attributable to physical impairments: 6 of them were found in publications belonging to the *Super Group* of Health Sciences, followed by the one of Physical Sciences (N = 5) and Social Sciences (N = 4). The most representative *Major Subject Areas* were Health Profession (N = 5) in Health Sciences and Computer Science (N = 5) in Physical Sciences.

Autism, the most studied disability, includes papers referring to 8 different *Major Thematic Areas*, with a clear prevalence (25/31) of researches falling within the Social Sciences *Super Group*. The most populated area (24) is the one of Psychology with the *specific subject category* of Developmental and Educational Psychology. A substantial similarity characterizes the distribution of the studies also included in the second most representative disability, namely the intellectual one, in which the Social Sciences area although always preeminent is slightly smaller (7% less) to the benefit of the Health Sciences. The latter that in autism included 23% of the studies, in this disability come to include 29%. The distribution in terms of areas and categories reflects the one already highlighted in autism. On the other hand, the situation of the third most studied disability, motor impairments, appears different, since the relationships between the three *Super Groups* change substantially. The most representative *Super Group* (40%), in fact, is that of the Health Sciences with two *areas*, Health Professions and Medicine, while the Social Sciences are the least involved (only 27% of the studies). Finally, it should also be noted that the *Super Group* of Physical Sciences has major importance including 33% of the researches.

3.7 Discussion

This systematic review identified 80 articles that in the last 10 years (since 2006) focused on the research topic of play for children with disabilities. The papers were

presented continuously in the period considered, highlighting a continuative interest on this issue. It should also be noted that, since the Convention of the Rights of the Child (United Nations, 1989), also at international level there has been an important movement, consolidated in the last 10 years, aiming at sanctioning the right to play also for children with disabilities (Bianquin, 2017; Towler, 2018) as evidenced by authoritative documents: the Convention on the Rights of Persons with Disabilities, Article 30 (UN, 2006); the General Comment N° 17 (UN, 2013), the Position Statement on the Play Rights of Disabled Children (IPA, 2015). References to this authoritative documentation, however, were reported in the theoretical framework of two papers only (Buchanan, Johnson & Giovacco, 2009; Barton, 2015) out of the 80 investigated.

The high number of scientific journals containing the articles included in the present review, 51 journals for a total of 80 articles, confirms the existence of a multi-perspectival approach to the theme of play (Bulgarelli & Bianquin, 2017; Bulgarelli, Bianquin, Caprino, Molina, & Ray-Kaeser, 2018). This variety is also supported by the linguistic analysis of the titles of scientific publications belonging to the group of journals. There is a clear connection with specific scientific areas of study directly in the title of the journal itself: to psychology (*British Journal of Developmental Psychology, Frontiers in Psychology*), education (*Early Childhood Education Journal, International Journal of Special Education*), technologies (*Assistive technology, Interacting with Computers*) and medicine (*Journal of Mental Health Research in Intellectual Disability, The Journal of Spinal Cord Medicine*). The same type of analysis conducted on the titles of the proceedings, the other component of the scientific publications considered, highlights that 11 titles out of the 12 retrieved made a direct reference to the technologies (*2014 IEEE Games Media Entertainment, 2009 IEEE International Conference on Rehabilitation Robotics*). Finally, it should be noted that there are only two journals stating that play is the focus of their interest: *American journal of play* and *Journal of play*.

This multi-perspectival approach also emerges from the analysis carried out through the classification proposed by SCImago. Regarding the *Super Groups*, Social Sciences appears to be the most represented, including the highest number of studies (54 out of 80), followed by the Health Sciences (33 studies included). The comparison between these two *Super Groups* underlines a similar architecture regarding the number of areas and categories that constitute them, but it must be noted that the one of Social Sciences is monopolized by studies falling in the categories of Education and Developmental and Educational Psychology, which are traditionally interested in the topic of play.

The investigation of the *categories* containing the largest number of studies in each *Super Group* identifies how some of these have a major role compared to the study of play for children with disabilities: apart from the aforementioned Education and Psychology, these are the Paediatrics and Rehabilitation (for the Health Sciences) and the Computer Vision and Pattern Recognition (for the Physical Sciences). The analysis carried out on the classifying architectures of the SJR levels give a further

evidence on the multidisciplinary nature characterizing the researches focusing on the topic of play.

Moreover, the disciplinary variety outlined above emerged from the examination of the studies referring to the different types of disability, to the three most represented (highest number of researches). The multidisciplinary perspective that accompanies the theme of play seems to be reflected also in the distribution of studies related to the different disabilities as proposed by SCImago, even if showing a differentiation as regards the scientific fields involved. A further qualitative analysis of the present survey could gather more detailed information on the studies with regards to the methodologies, aims and results in order to relate them to the categories of the SCImago classification system.

Despite the complexity of the results obtained, this work presents some important limits with reference to the number of databases investigated and the choice of a specific classification system. Future research could implement the number of databases and perform analyses and subsequent comparisons with different classifications to find further disciplinary and interdisciplinary perspectives.

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