HYPERLEXIA WHAT SYNDROME IS THIS? REFLEX AND REFLECTIONS OF LITERARY PRODUCTIONS

HIPERLEXIA QUE SÍNDROME É ESTA? REFLEXOS E REFLEXÕES DAS PRODUÇÕES LITERÁRIAS

¿HIPERLEXIA QUÉ SÍNDROME ES ESTA? REFLEJOS Y REFLEXIONES DE LAS PRODUCCIONES LITERARIAS

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ABSTRACT: Hyperlexia is a syndrome characterized by early reading that also presents other symptoms and different characteristics, which damage the diagnosis that is commonly confused with the Autism Spectrum Disorder (ASD). The literature about this subject is very small and most of the works consist in isolated cases. This article, in form of a systematic review, seeks theoretical subsidies in data banks that can clarify the topic of hyperlexia, as well as verifying if there is a connection of the early reading of this syndrome, with the early reading in the high abilities. The descriptors used were hyperlexia and high ability, which were used separately and combined using the Boolean operator, and (hyperlexia and high ability). The databases consulted were Education Resources Information Center (ERIC) and ScienceDirect of the Publisher Elsevier. It was looked for studies conducted in the last twenty years, from 1999 to 2019. The criteria of inclusion of the works were two: the paper has to be completely available in the database and the second one is that the studies offered a discussion about hyperlexia only or concomitantly with the high abilities. As a result, was obtained a limited number of papers about hyperlexia that attend the inclusion criteria, considering the period covered that was the last twenty years and none paper was found that discussed hyperlexia with the high abilities.

KEYWORDS: Hyperlexia. High ability. Literature productions.

***RESUMO**: A hiperlexia é uma síndrome caracterizada pela leitura precoce, apresenta outros sintomas e características diferentes, ao qual dificulta o diagnóstico que é comumente confundido com o Transtorno do Espectro do Autismo (TEA). Este artigo em forma de revisão sistemática, busca conhecer as produções acadêmicas em bancos de dados entre 1999 e 2019 que possam discutir a temática da hiperlexia, bem como, verificar se há uma conexão entre a leitura precoce dessa síndrome e a leitura precoce das altas capacidades. As palavras-chave utilizadas nas pesquisas foram: hyperlexia e high ability, e foram usadas separadas e de forma combinada utilizando o operador booleano and (hyperlexia and high*

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ability). As bases de dados consultadas foram: Education Resources Information Center (ERIC) e ScienceDirect da editora Elsevier. Como resultado foram obtidas dez (10) produções, uma (01) no ERIC e nove (09) no ScienceDirect, que atenderam aos critérios de busca estabelecidos, cabe ressaltar que é um número baixo, levando em consideração o período de vinte (20) anos, e nenhum estudo foi encontrado que tratasse da hiperlexia e altas capacidades conjuntamente neste período.

PALAVRAS-CHAVE: *Hiperlexia. Altas capacidades. Produções literárias.*

RESUMEN*: La Hiperlexia es un síndrome caracterizado por la lectura precoz, presenta otros síntomas y características diferentes, al cual perjudican el diagnóstico que comúnmente se confunde con el Trastorno del Espectro Autista (TEA). El presente artículo en forma de revisión sistemática busca conocer producciones académicas en bancos de datos entre los años de 1999 a 2019 que puedan desenmarañar el tema de la hiperlexia, así como verificar si existe una conexión de la precocidad en lectura de este síndrome con la precocidad en lectura en las altas capacidades. Las palabras clave utilizadas fueron: hyperlexia y high ability, en las búsquedas las palabras se utilizaron separadamente y combinadas utilizando el operador booleano and, (hyperlexia and high ability). Las bases de datos consultadas fueron: Education Resources Information Center (ERIC) y ScienceDirect de la editora Elsevier. Como resultados se obtuvo diez (10) producciones sobre la hiperlexia, una (01) en ERIC e nueve (09) en ScienceDirect, que atendía a los criterios de inclusión establecidas de búsqueda, cabe destacar que es un número bajo teniendo en cuenta el período de veinte (20) años, y ningún estudio fue encontrado que trataba de hiperlexia y las altas capacidades conjuntamente en este período.*

PALABRAS CLAVE*: Hiperlexia. Altas capacidades. Producciones literarias.*

Introduction

The concept of hyperlexia was originally defined as an unusual learning style in the early 1960s, when it was used for the first time by the American Hyperlexia Association and already in the 90s, this same Association established four basic characteristics to identify this syndrome; they are: early ability to read - more than expected for the age; an intense fascination with letters and numbers; a significant difficulty understanding spoken language; difficulties in their social skills (RIBEIRO; LEMOS; SANT'ANNA, 2009). Although Ostrolenk *et al*. (2017) point out that cases of hyperlexia described as early as 1918, with Hollingworth and Winford, and in 1930 also can be found in the literature, long before the introduction of the nomenclature/syndrome of hyperlexia and autism spectrum disorder (ASD).

It has been noted that the concept of hyperlexia has been used in different ways by different authors, sometimes it is defined as a high reading ability, a special talent, and other

times it is defined as a disability, indicating poor reading comprehension. (ZUCCARELLO *et al*., 2015 apud GRIGORENKO *et al*., 2003).

Castles *et al*. (2010 *apud* GRIGORENKO *et al.,* 2003; NATION, 1999) point out that there is a debate about this syndrome, which should be classified as a form of dyslexia or not. The authors also point out that the word/nomenclature "hyperlexia" always emphasizes the presence of an early or advanced reading, and the semantic deficit of "nonsense reading" is typically the most generalized symptom regardless of reading level.

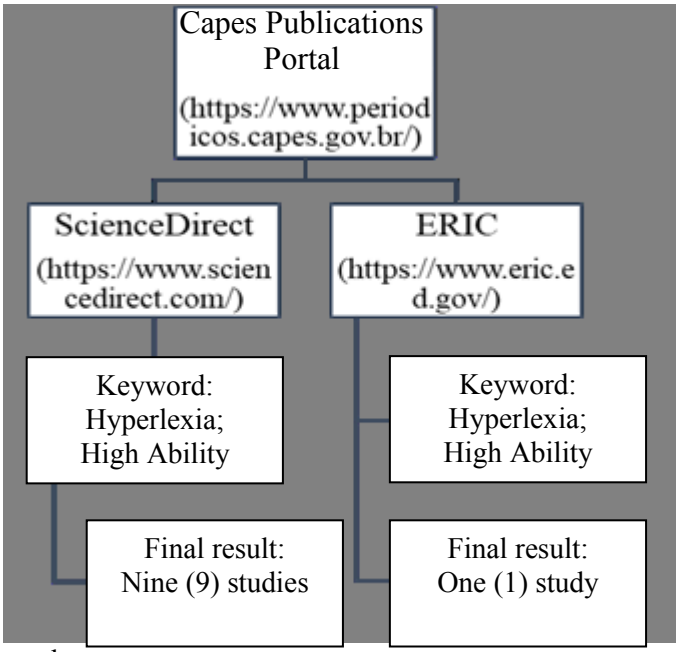
The exceptional characteristic of reading early in hyperlexic children is also present in children with high abilities, according to Lamônica *et al.* (2013, p. 392), "the early appearance of reading ability may suggest that the child has superior intellectual ability". For Renzulli (2013) more capable students demonstrate, or have the potential to demonstrate, exceptionally high ability in relation to an ability to learn, create or execute, or cognitive ability far above average within a specific domain - academic or nonacademic.

This article seeks to know academic productions in databases with a temporal cut of the last twenty years (1999 to 2019) that can clarify the issue of hyperlexia, as well as verify if there is a connection between the early reading of this syndrome with the precocity in reading in high capacities. The methodological design was the systematic review that consists of a summary of evidence from primary studies carried out to answer a specific study question (KOLLER; COUTO; HOHENDORFF, 2014). A thorough, impartial and reproducible literature review process is adopted, which seeks, evaluates and synthesizes the evidence from scientific studies to obtain reliable results (BRASIL, 2012).

The keywords used were: *hyperlexia*; *high ability*, used separately and in combination. The databases consulted were: *Education Resources Information Center* - (ERIC) and *ScienceDirect*. Access to these data banks was first given through to the Capes Newspaper Portal, which has an agreement with the Universities, so that they offer free access to paid data banks. Using the data filter, the two databases were searched for studies about hyperlexia carried out in the last twenty (20) years, from 1999 to March 2019.

The inclusion criteria of the studies was initially the availability of the complete work in the database and that they offered a discussion about hyperlexia or a joint discussion of hyperlexia with high abilities. Articles that did not contain new data, or at least a brief description of the syndrome were excluded; studies that were not available in the databases, like duplicate papers, were discarded from the review, resulting in ten (10) papers that met the inclusion criteria.

Figure 1 – Illustration of the path taken to the data banks



Source: Devised by the authors

Results and Discussion

The first selection was in the database itself, which was initially searched for descriptors, separated and combined using the Boolean operator *and*, (e.g. hyperlexia and high ability). In the first base, *ScienceDirect*, with the filter of 20 years and only with the word hyperlexia, one hundred and ninety-one (191) results were found, including articles, book chapters, or index, which turned out to be the majority, but only one hundred forty-eight (148) works were available at the base. Then the selection was based on the abstract, for which all the indexes were discarded, as well as those works that did not meet the inclusion criteria. In the search with the words hyperlexia and high ability with the Boolean operator *and*, one hundred and ten (110) works were found, and most were works previously found with the word hyperlexia, or they were index, both discarded and resulting in no works that discussed high capacities together with hyperlexia.

In the ERIC database, using the keyword "Hyperlexia" a total of seventeen (17) results were found with the selected years filter, and following the selection criteria of the availability of the complete work in the database, only one work was obtained (Table 1). Using the Boolean operator *and* with the words hyperlexia *and* high ability, the same previous work of the keyword “Hyperlexia” was found, being discarded from the total calculation of works

found. In this database we also did not find any work that discussed hyperlexia with high abilities.

As mentioned above, following the inclusion criteria, a total of ten (10) works were found, illustrated in Figure 2, which contemplated the requirements and are presented in Tables 1 and 2.

Table 1 – Productions from the ERIC database

Title	Authors	Year	Associated Condition	Journal
Reading and math achievement profiles and longitudinal growth trajectories of children with an Autism Spectrum Disorder	WEI, X., CHRISTIANO, E. R. A., YU, J. W., WAGNER, M.; SPIKER, D.	2015	TEA	SRI International

Source: Devise by the authors

The study by Wei *et al*. (2015) examined the reading and mathematics performance profiles of one hundred thirty (130) children aged 6 to 9 years diagnosed with ASD in a longitudinal study (from 2000-2004), with a nationally representative sample in the United States. As results, four profiles were identified: higher performance (39%), hyperlexia (9%), hypercalculia (20%) and low performance (32%).

The results obtained in the ScienceDirect database will now be presented in Table 2, followed by a brief summary of the studies found, and then will be presented the analysis and discussion.

Table 2 – Productions from the ScienceDirect database

Title	Authors	Years	Associated Condition	Journal
Learning disability subtypes: classification of high functioning hyperlexia	RICHMAN, L. C.; WOOD, K. M.	2002	Asthma; diabetes; leukemia; nanism; attention deficit hyperactivity disorder; ASD; oppositional defiant behavior disorder	Brain and Language
Hyperlexia profiles	KENNEDY, B.	2003	Brain tumor in the right hemisphere, hydrocephalus; delay in expressive language.	Brain and Language
The Neural Basis of Hyperlexic Reading: An fMRI Case Study	TURKELTAUB, P. E.; FLOWERS, D. L.; VERBALIS, A.; MIRANDA, M.; GAREAU, L.; EDEN, G. F.	2004	Generalized development issue; Hyperlexia	Neuron
Hyperlexia in a 4-year-old	ATKIN, K.; LORCH M.	2006	ASD	Journal of

boy with Autistic Spectrum Disorder	P.			Neurolinguistics
Developmental and acquired dyslexia's	TEMPLE. C. M.	2006	-	Cortex
Hyperlexia in Spanish-speaking children: Report of 2 cases from Colombia, South America	GUTIERREZ, C. T.	2006	ASD; Motor function deficits.	Journal of the Neurological Sciences
Developmental dissociations between lexical reading and comprehension: Evidence from two cases of hyperlexia	CASTLES, A.; CRICHTON, A.; PRIOR, M.	2010	ASD	Cortex
Early language learning profiles of young children with autism: Hyperlexia and its subtypes	LIN, C. S.	2014	ASD; deafness; hand-eye coordination problems	Research in Developmental Disabilities
Hyperlexia: Systematic review, neurocognitive modelling, and outcome	OSTROLENK, A.; D'ARC, B. F.; JELENIC, P.; SAMSON, F.; MOTTRON, L.	2017		Neuroscience & Biobehavioral Reviews

Source: Devised by the authors

The first article by Richman and Wood (2002) examined thirty (30) children with hyperlexic reading patterns and average intelligence to determine whether the established learning disability subtypes could apply to these children with hyperlexia, and two groups emerged: a type showed patterns of language learning disorder with good visual memory and also a high percentage of phonetic word errors. The second group showed traces of non-verbal learning disorder with visual space deficiencies and impaired visual memory, this last subgroup presented few phonetic errors manifesting more errors in the visual part. These findings suggest high-functioning hyperlexia subtypes, one showing language deficits characteristic of dysphasia and one showing dyslexia-like patterns.

Kennedy's research (2003) evaluated two (2) individuals, one fifteen years old, presenting with a brain tumor in the right hemisphere and hydrocephalus; the other nineteen (19) years old with delay in expressive language with basic reading skills, the results suggested different pathways to superior word recognition skills that can be described with a contemporary model of skillful reading, and differential acquisition of basic skills. Superior word recognition ability was associated in both cases with specialized development in a basic area: spelling processing. The results showed that instead of being assimilated to the subtypes of reading pathology (dyslexia), it was observed that hyperlexia was accompanied by assets that are absent in the dyslexic profiles.

Turkeltaub *et al.* (2004) propose a case study with a nine (9) year old boy, who reads six (6) years before his age, diagnosed with ASD and hyperlexia. By using functional magnetic resonance imaging to study the neuronal bases of this early reading ability, it was possible to identify greater activity in the left inferior frontal cortex and superior temporal cortex. These findings suggest that early reading occurs by simultaneously using the phonological systems of the left hemisphere and the visual system of the right hemisphere. Therefore, hyperlexic reading is associated with hyperactivation of the left superior temporal cortex, just as dyslexia is associated with hypoactivation of this area.

The work by Atkin and Lorch (2006) deals with a case study of a four (4) year old boy with ASD with a mental age of approximately one and a half years (1/5) that demonstrates behaviors of early reading and absence of spontaneous speech. Reading tests of regular and irregular words, pseudowords, simple sentences and texts were carried out. Performance on a variety of reading tasks demonstrates an ability to use grapheme-phoneme correspondence and whole-word reading to decode simple words. The successful reading of some homographic heterophones and the semantic paraphrase of texts indicate a level of lexical, syntactic, semantic and pragmatic development that goes far beyond their mental or chronological age, suggesting the possibility of an atypical route for language acquisition.

Temple (2006) discusses dyslexias, proposing in his study that hyperlexia integrates this set together with deep dyslexia, phonological dyslexia and superficial dyslexia, suggesting that reading ability in hyperlexia is like superficial dyslexia, presenting a good nonsense word reading and strong phonological reading ability.

Gutierrez (2006) presents an eight (8) year longitudinal study with two cases of children diagnosed with ASD and hyperlexia, with neuropsychological evaluations of language, motor skills, visual perception, attention and behavior. Both children read before the age of five (5), but with minimal understanding of what they were reading, they also exhibited obsessive reading behavior and difficulties in social skills and attention. Computed tomography of the brain was normal and hyperlexia has been associated with hyperactivation of the left superior temporal cortex, similar to the results found by Turkeltaub *et al.* (2004), concluding that the orthographic route is a probable mechanism for the development of hyperlexia.

Castles *et al.* (2010) focused on investigating reading and comprehension in a set of specifically selected irregular words (nouns, body parts, names of animals and foods). The study discusses two cases of hyperlexia, both the participants are male, diagnosed with ASD, aged between 8 and 10 years, in which, they presented normal or higher levels in the

conversion of printed letter to reading/speech, but were very impaired in understanding the writing/meaning of words.

In turn, Lin (2014) used a standardized computer-assisted language assessment tool to identify early learning characteristics in young children with autism. The tool consisted of six subtests: decoding, homographs, vocabulary listening comprehension, vocabulary visual comprehension, sentence listening comprehension, and sentence visual comprehension. Thirty-five children with ASD between the ages of 4 to 6 participated in the study. Fifteen children (2:15 girl/boy ratio) with ASD were identified as hyperlexic and selected for further analysis, resulting in five subtypes of hyperlexic profiles.

In the latest study found, de Ostrolenk *et al*. (2017) carried out a systematic review of the literature in the Pubmed database, encompassing studies that dealt with both individual cases and group studies with individuals with hyperlexia. As results, a large number of studies were found correlating hyperlexia with ASD.

Regarding the characteristics found in the studies, Temple (2006) points out that hyperlexia is an abnormality in reading, more commonly reported in the literature in children with mental retardation or other conditions, but with significantly higher reading levels. Lin (2014) in her research cites that in the literature cases of hyperlexia associated with Turner syndrome, Tourette syndrome, Attention Deficit Disorder and Hyperactivity have been found, and Zuccarello *et al.* (2015) also add findings that the syndrome is commonly associated with ASD and Intellectual Disability. Thus, it was possible to select characteristics that the reviewed authors consider descriptors of hyperlexia, which are arranged in Table 3.

Table 3 – Characteristics of Hyperlexia Indicated by the Studies Reviewed

Authors/Year	Characteristics
RICHMAN Y WOOD (2002)	Early ability to read words, generally before the age of 5, without prior formal instruction.
KENNEDY (2003)	Early reading; attraction to alphabetic symbols; unexpectedly early decoding; reading comprehension inferior to decoding ability, and associated pathology.
TURKELTAUB *et al.* (2004)	Presence of a developmental disorder, most commonly ASD; acquisition of reading skills before age five without explicit instruction; advanced word recognition ability in relation to mental age, regarding comprehension along verbal ability; messy oral communication
ATKIN Y LORCH (2006)	Word decoding higher than predicted by age; early manifestation of decoding skills before the age of 5; spontaneous start of reading without specific instruction; compulsion to read, but without discriminated sense; poor reading comprehension; coexisting developmental disorder.
TEMPLE (2006)	Lack of an understanding of the meaning of what is being read; impoverished semantic knowledge of words; impaired lexical-semantic reading system.
LIN (2014)	Echolalia; difficulty in using language; difficulty in understanding language; visual preferences; early reading skills before age 4.

WEI *et al.* (2015)	Good word decoding, but poor understanding; Exceptional speed of retrieving letters from long-term memory and producing word sounds.
ZUCCARELLO *et al.* (2015)	Advanced reading skills, but impaired comprehension skills; early acquisition of reading skills without explicit instruction; strong interest in written material (letters and numbers); usually has a concomitant neurodevelopmental disorder.

Source: Devised by the authors

It was also observed in most of the studies analyzed that ASD is the neurodevelopmental condition most associated with hyperlexia, and even in cases where there is no clear diagnosis of the syndrome, the behavioral characteristics and cognitive profile are clearly autistic (MOTTRON *et al*., 2013 *apud* ARAM; HEALY, 1988). This finding coincides with the precept of Lin (2014 apud GRIGORENKO *et al*., 2002) that also suggests that there is a higher frequency of hyperlexia among children with pervasive developmental disorders (PDD), which includes ASD, and other conditions or disabilities, however, in the literature it is not yet clear why this occurs and many times both conditions are still confused.

Wei *et al*. (2015 *apud* JONES *et al*., 2009) mention about ASD that results of group studies can mask different learning patterns of subgroups of children with ASD and this in turn makes it difficult to provide adequate individualized instruction, or adequate support for these students, but we can also apply this to students with hyperlexia who present such varied characteristics, and who, perhaps for this reason, are so confused with autism.

Turkeltaub *et al.* (2004 *apud* YEARGIN-ALLSOPP *et al*., 2003) suggest a prevalence of 2.2/10,000 for hyperlexia in the general population. They also note that results for verbal ability and IQ are better for children with ASD and hyperlexia than for other children with only ASD disorder (2004 *apud* BURD *et al.*, 1986; FISHER *et al*., 1988), possibly because reading provides an additional route for communication and socialization (2004 *apud* KISTNER *et al*., 1988).

About this frequency Mottron *et al*. (2013) cite studies that indicate incidence percentiles of hyperlexia in autistic children: Burd and Kerbeshian (1985) with an estimate of 5-10%. Jones *et al*. (2009) adopting less rigorous criteria indicates an estimate higher than 10% of the population, reaching 14%. Already Grigorenko *et al*. (2002) with even less rigorous criteria, indicates that a total of 20% can be reached. In summary, as Ostrolenk *et al*. (2017) and Lamônica *et al.* (2013) the reported prevalence of hyperlexia increases when the rigor of the criteria used decreases, which varies according to the specific criteria adopted by each author. Furthermore, the few existing studies are carried out through isolated clinical cases.

Relevant information found in the studies that needs to be mentioned is the use of standardized tests presented in Table 4, among the ten (10) works found, seven (7) of them resorted to these tests in their studies with the objective of measuring or obtaining valuable information from the participants about their cognitive development and/or reading ability. The most widely used were three, namely: Wechsler Intelligence Scale for Children-III (WISC-III); Comprehensive Test of Phonological Processing (CTOPP); Woodcock Reading Mastery Test (WRMT) and the Peabody Picture Vocabulary Test (PPVT).

Table 4 – Tests applied in studies

Authors/Year	Tests
WEI *et al*. (2015)	Woodcock Johnson III (WJ III; Woodcock *et al*., 2001); Comprehensive Test of Phonological Processing (CTOPP, Wagner *et al*., 1999)
RICHMAN; WOOD (2002)	Wechsler Intelligence Scale for Children-III (WISC-III, Wechsler, 1991); Wide Range Achievement Test-R (Jastak & Wilkinson, 1984); Standard Reading Inventory (McCracken, 1966); Neurosensory Center Examination for Aphasia (Spreen & Benton, 1979); Hiskey – Nebraska Test of Learning Aptitude (Hiskey, 1966); Sentence Repetition (Spreen & Benton, 1979); Visual Form Discrimination Test (Benton, Hamsher, Varney, & Spreen, 1983); Judgment of Line Orientation (Benton, Varney, & Hamsher, 1978); Bender Visual – Motor Gestalt Test (Koppitz, 1963); Grooved Pegboard (Rourke, Yanni, MacDonald, & Young, 1973); The Color Span Test (Richman & Lindgren, 1988)
KENNEDY (2003)	Comprehensive Test of Phonological Processing (CTOPP, Wagner, Torgesen, & Rashotte, 1999); Test of Phonological Awareness (TOPA, Torgesen & Bryant, 1994); Slingerland Pre-Reading Screening Procedures (Slingerland, 1995); The Jordan Left–Right Reversal Test (JLRRT, Jordan, 1990); Orthographic Choice I y Orthographic Choice II Hultquist (1997); Woodcock Reading Mastery Test (WRMT, Woodcock, 1998); Test of Word Reading Efficiency (TOWRE, Torgesen, Wagner, & Rashotte, 1999); Kaufman Test of Educational Achievement (KTEA, Kaufman & Kaufman, 1998); The Peabody Individual Achievement Test (PIAT, Markwardt, 1998); Gray Oral Reading Tests (GORT, Wiederholt & Bryant, 1992); Test of Reading Comprehension (TORC, Brown, Hammill, & Wiederholt, 1995); Wechsler Intelligence Scales for Children-III (WISC-III, Wechsler, 1991); Peabody Picture Vocabulary Test (PPVT, Dunn & Dunn, 1981); Leiter International Performance Scale (Roid & Miller, 1997)
TURKELTAUB *et al.* (2004)	Wechsler Intelligence Scale for Children-III (WISC-III, Wechsler, 1991); Rey - Osterrieth Complex Figure; Woodcock-Johnson III; Gray Oral Reading Test
GUTIERREZ (2006)	Psycholinguistic Abilities (ITPA) – Spanish; Wechsler Intelligence Scale for Children-Revised (WISC-R); Rey - Osterrieth Complex Figure test; Myklebust/Johnson's Tests of Visualization (Analysis and Synthesis).
CASTLES, CRICHTON, PRIOR (2010)	Peabody Picture Vocabulary Test (PPVT); Wechsler Intelligence Scale for Children-III (WISC-III; Wechsler, 1991); Woodcock Reading Mastery Test E Revised (WRMT-R; Woodcock, 1987); Neale Analysis of Reading Ability-III (NARA-III; Neale, 1999).
LIN (2014)	The Computer-Aided Language Assessment for Preschool Children with Autism (CALA) (Lin *et al*., 2013); The Hyperlexia Behavior Checklist (HBC); The Caregiver Questionnaire (CQ).

Source: Devised by the authors

Gutierrez (2006) mentions frequent characteristics found in other studies: as example being male, also presenting ASD, and with a history of high prenatal and perinatal risk, including neonatal seizures. And in this sample of studies a higher frequency of cases of male

participants was also verified, this data is similar to that found in ASD where most of the population affected by the disorder are male (OSTROLENK *et al*., 2017). The participants of the reviewed studies had a mean age between 4 to 19 years, but most of the studies presented cases of children between 4 to 9 years, in agreement with Lin *et al*. (2013) who in their works also found participants aged between 6 and 12 years in a higher proportion in the literature. However, hyperlexia was also observed in normal preschool children (LIN, 2014 apud PENNINGTON; JOHNSON; WELSH, 1987).

Castles *et al*. (2010) mention that the development of hyperlexic individuals present a very different pattern of abnormal reading behavior, since they perform at normal or higher levels when converting the printed letter into speech, but are very deteriorated in their oral and written comprehension of words, that is, reading skills look great but their understanding of printed material is very damaged.

Lin (2014) details five types of hyperlexia in his work, they are: Type I: prototype is the subtype most commonly described in the literature to which there is a higher development in decoding, but difficulties in understanding language; Type II: Strong decoding/homography, characterized by higher than average performance on the decoding and homography subtests, but with lower than average scores on the visual and auditory comprehension of vocabulary subtests; Type III: Strong decoding/homography/visual comprehension of vocabulary, in this subtype the individual presents better development in decoding, homographies and visual vocabulary subtests than peers of the same age; Type IV: Strong homography/visual vocabulary/visual comprehension of sentences, in this type the participants presented a better performance in the visual vocabulary and visual comprehension of sentences subtest. And finally, Type V: Strong performance in all the subtests, in this type the individuals present a better visual performance and in the listening comprehension subtests when compared to children with typical development of similar ages, but still, the most significant results are from the visual subtests.

This paper sought to know academic productions in databases with a time cut from the last twenty (20) years (1999 to 2019) that can clarify the issue of hyperlexia, as well as verify if there is a connection of the precociousness in reading of this syndrome with the precociousness in reading of the high capacities. As has been noted, there were no research results in relation to the precociousness of hyperlexia with high abilities in the international databases investigated, it should be noted that the search encompassed a long period, which can lead us to two hypotheses: either there is no connection between the two conditions or it is still a poorly researched topic.

Final considerations

The results of the search in the databases conclude that there is a small number of works on hyperlexia, considering that the period covered the last twenty (20) years. The results are even scarcer when we associate hyperlexia with high abilities, that no work was found that discussed both conditions together. Most of the studies available in one database were repeated in another database, highlighting the even more marked limitation of studies with this topic. It is worth emphasizing that both the databases are international databases of great importance and academic relevance.

The hyperlexia syndrome is not yet fully understood as already mentioned, its characteristics vary considerably, some of these discrepancies are due, in part, to the lack of control of the subjects and the different inclusion criteria adopted by the authors in their studies. And according to what the literature reflects, hyperlexia is always associated with another condition, and there is a need for more studies that are capable of explaining such an occurrence, and defining whether hyperlexia is part of the ASD picture, once it is observed that hyperlexia is very "close" to ASD, or if hyperlexia is a specific syndrome, so that at last there is a better understanding of its characteristics, forms of identification, resulting in positive advances for those subjects affected by such syndrome, like the appropriate educational care.

Another conclusion that can be presented according to the results achieved is the need to develop more studies on hyperlexia and high capacities, since no work was found in the investigated databases with both concomitant conditions, allowing the exploration of other hypotheses to justify early reading and high abilities, as was the initial proposal of this study.

The two neuropsychological evaluations presented here present very interesting data that are similar, concluding that there is greater activity in the left superior temporal cortex, which is why it is interesting to carry out more studies that question this pattern. Further clarification or speculation is also necessary on the theory, proposed in one of the studies found, that hyperlexia would be a fourth category of dyslexia.

Some limitations found for the realization of this study are highlighted firstly by the little literature found on the subject; unclear discussions of the characteristics and causes such as, for example, why does it occur more often concurrently with ASD? to which the replication of studies or development of new research is indicated.

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