

Review

# Disorders of Language and Literacy in the Prison Population: A Scoping Review

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**Abstract:** Language and literacy skills are essential for education, school achievements, work and social conditions. Some studies indicate an elevated incidence of problems with language and literacy in the prison population, potentially contributing to increased risks of maladjustment and recidivism. In general, the bulk of research on language and literacy has been directed towards children and adolescents. This study aimed to map the extent of the literature on language and literacy disorders in the adult prison population over the past 20 years, and what it reveals about the prevalence and nature of these disorders in prisoners. In total, 18 studies were identified. Of these, the majority (15) investigated literacy. The three studies investigating language all reported an elevated prevalence in the population. The literacy studies were altogether less clear, due to differences in theoretical approach and methods. In terms of the nature of the disorders, many studies assessed the behavioral level only. Results are discussed in terms of theoretical approaches, as well as recommendations for research, assessment, and intervention.

**Keywords:** language disorders; reading and writing disorders; dyslexia; adult prisoners; prevalence



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## 1. Introduction

Developing good language skills is essential, since language influences factors such as education, school achievements, work, and social conditions [1]. Language is vital for interacting with others, for regulating and controlling one's own feelings and behaviors, and for academic function. Consequently, individuals with oral language impairment are prone to face challenges extending far beyond their language problems [2,3]. For productive and prosocial lives away from the corrections system, a basic pre-requisite is interpersonal competence. Snow and Powell [4] emphasize that oral language competence is pivotal to interpersonal behavior. Furthermore, research from Snow and Powell, e.g., [4–6] in Australia, as well as from the U.S. [7], and the UK [8] has shown that young offenders, especially young men, have a high risk of experiencing unrecognized oral language impairments, in addition to being socially and educationally marginalized.

Research-based knowledge about the level of prisoners' basic reading and writing skills is important as it determines the starting point for education that can benefit the individual and society. Education is recognized as both a basic human need and a human right in international conventions and recommendations, and these recommendations also include prisoners as they are entitled to the same access to education as other citizens. In these recommendations, it is underlined that prisoners with learning difficulties should be given special attention [9]. To start or complete an education while incarcerated, adequate reading and spelling skills are central. Thus, assessment of the prisoners' level of reading and spelling/writing skills is necessary for providing education in line with their needs [10].

It appears to be well established that prisoners, on average, have low literacy levels [11], but there seems to be a clear majority of studies on young offenders, compared to

adults. In this scoping review, we aim to get an overview of reported prevalence rates of adult prisoners' language, reading, and writing difficulties and the foundations these rates are based on.

Both language disorders and reading and writing disorders can be understood in terms of Morton and Frith's [12] model of developmental psychopathology. This model views developmental disorders from a perspective of four levels of explanation: the symptomatic or behavioral level, the cognitive level, the biological level, and the environmental level. The behavioral level concerns what is observable "on the surface", for example problems in morphosyntax [13], slow reading speed [14,15], poor reading comprehension [16,17], or poor spelling skills [18,19]. These behavioral symptoms can originate from deficits at the cognitive level, such as poor phonological processing [20,21], reduced processing speed [22,23], or deficits in working memory [22,24–26]. The cognitive deficits may in turn be caused by factors at the biological level, which may for example include genetic factors [13,27], or brain structure and function [28–30]. Finally, the environmental level continuously influences and modifies the other three levels and comprises conditions such as the educational level of parents and other socio-economic factors [31,32], or school practices and learning environment [33]. This model is a helpful aid in understanding the landscape that is language, reading, and writing aptitude.

Problems in language and literacy can arise from more or less specific disorders, from general learning difficulties, or from conditions in the environment. These different etiologies may, at a general level, display different profiles in the model.

The CATALISE project [34] proposed a distinction between developmental language disorder (DLD—to replace the term specific language impairment, SLI) and language impairment associated with X, with X being other biomedical conditions. The latter refers to language disorders that present as part of a larger picture, such as cognitive impairment, autism spectrum disorder or Down syndrome. Social (pragmatic) communication disorder is another language-based disorder and refers to problems with the use of language in context and in social settings. This includes for example the ability to understand and adhere to social communication conventions, and the understanding and use of figurative language [35,36]. Apart from these defined diagnostic categories, we know that there is considerable individual variation in all aspects of language competence, with some people presenting with skills at the lower end of the normal distribution, even in the absence of any defined disorder.

Research on language skill and language disorders has mainly been concentrated on children and adolescents. Studies on the adult population are scarce, and largely take the perspective of adults who were diagnosed as children. However, Fidler et al. [37] developed methods for first-time identification of developmental language impairments in adult English-speakers. For many other languages, there are no standardized protocols for identification or treatment of language disorders in adults.

Reading and writing are closely associated with language skill, and poor language skills are a known risk factor for dyslexia [38]. Moreover, reading comprehension is largely dependent upon oral language skills [16,39]. Like language skills, reading and writing skills form a normal distribution. Some fall in the lower end of the continuum due to lack of proper instruction, or as part of a larger picture of general learning difficulties. This is different from dyslexia. Our understanding of dyslexia has evolved considerably over the past twenty years. From a focus on single-deficit theories like the phonological hypothesis, stating that the main factor in the etiology of dyslexia is a deficit in phonological awareness, e.g., [40], the field has now largely adopted a multi-factorial view of the disorder. In this view, the disorder can be conceptualized within a dimensional space, consisting of risk factors and protective factors. Each person will have their unique profile within these dimensions, even if the behavioral expression can be similar at a symptomatic level [41–43]. Dyslexia shares some of these risk and protective factors with other disorders, such as DLD [44–46] and attention-deficit hyperactivity disorder (ADHD) [47,48], leading to a considerable overlap between disorders and contributing to reported comorbidity [49–51].

Where persons with dyslexia will normally exhibit problems with decoding, there is also a group who decode rather well, but have considerable problems in understanding what they have read. These cases have been termed poor comprehenders.

Nation [52] suggested a four-quadrant model based on the simple view of reading [53]. The simple view states that reading comprehension is the product of decoding skills and linguistic comprehension skills. Nation's [52] model categorizes different types of problems with language and literacy along these dimensions, proposing that persons with deficits within both decoding and linguistic comprehension could fall within a DLD category, whereas those with deficits within only decoding or only comprehension could be persons with dyslexia or poor comprehenders, respectively. Even though this model does not capture the fuzzy reality of clinical work, it can be a useful way of conceptualizing the space that is problems with language and literacy.

For both language and literacy, it is important to recognize that the cognitive, biological, and environmental background for the behavioral expression in the individual must guide the choice of intervention, to maximize the outcome for each client. In this study, we have chosen to include all studies addressing all varieties of problems of language and literacy, to gain a full overview of the work that has been done in this field within the adult prison population. Even though the etiology of the problems may be different from individual to individual, the detrimental effects in terms of increased risk of dropping out of school [54], and lack of training [55], as well as criminal behavior, maladjustment and recidivism may be comparable, regardless of their origin [56].

A scoping review can be defined as a type of literature review which aims "to map the literature on a particular topic or research area and provide an opportunity to identify key concepts; gaps in the research; and types and sources of evidence to inform practice, policymaking, and research" [57]. Hanneke et al. [58] described the scoping review as "more rigorous than a narrative review but less structured than a systematic review—somewhere in between the two". In the first in-depth description of the framework, Arksey and O'Malley [59] identified five stages to the process of conducting a scoping review: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results. In addition, consultation with stakeholders was identified as an optional sixth stage. The main difference between scoping reviews and systematic reviews lies not in transparency and rigor, but in the purpose of the study. The scoping review seeks to investigate broad topic areas, whereas the systematic review is better suited when the aim is to sum up and evaluate the evidence for a more focused research question, for example when assessing the effectiveness of an intervention method [60]. Moreover, most authors describing the method indicate that a quality assessment of included studies is not part of the review (but see [57] for a different perspective). Additionally, the scoping review is the more appropriate method when the number of relevant papers concerned with the research question is assumed to be relatively low [58], or when the research field to be mapped is very heterogenous [61].

The aim of this study was to gain an overview of research in the last 20 years on language and literacy disorders in the prison population and summarize the findings to provide a picture of the "state of the art" in this field. Hence, we formulated the following research question:

*What does research from the last two decades tell us about the prevalence and nature of difficulties with language and literacy among adult prisoners?*

We wanted to take a broad perspective, to map the full breadth of research on these topics, not limiting the scope to for example only SLI/DLD or only dyslexia, excluding other types of difficulties in language and literacy. Still, we expected a limited number of relevant studies, while at the same time, we were seeking to chart as many relevant studies as possible—thus not excluding studies based on rigorous quality assessments or variations in methodology. Hence, a scoping review was determined to be a suitable approach.

## 2. Materials and Methods

We did our best to follow the steps in the framework provided by Arksey and O'Malley [59] while also considering and incorporating some of the adjustments proposed by other authors, e.g., [57,60,62]. The optional sixth step of the framework (consultation with stakeholders) was not included.

To search for relevant literature, extensive searches in three international databases (Web of Science, PsycINFO, and ERIC (EBSCO)) were completed in September 2020. These databases were chosen because they were judged to provide good coverage of the research field in question. Whereas Web of Science covers a broad range of academic disciplines from the sciences, social sciences, and humanities, PsycINFO and ERIC provide more specific coverage of publications within psychology and education, respectively. In the initial stages of the project, we had assistance from a qualified librarian from the university library in identifying the correct search terms and techniques, determining which databases to use, and ensuring the general quality of the search strategy.

In line with what was described by Hanneke, Asada, Lieberman, Neubauer and Fagen [58], one of the main challenges was identifying appropriate search terms. The field of language and literacy disorders uses a wide range of terms to describe the conditions in point. We used as many of these terms as we were able to identify and employed truncation and Boolean operators to include different varieties and combinations of terms. A further challenge was delineating between studies concerned with disorders of language and literacy, and those concerned with skill level per se. Our primary focus in the review was from a perspective of disorders, but since this is a field where the cut-off between disorder and general low performance is not necessarily clear, this proved to be a point of discussion.

Included studies had to be empirical, published in peer-reviewed journals, or as reports or Ph.D. dissertations, and be written in English or a Scandinavian language. If a study was published as both a report or dissertation, and as a peer-reviewed article, the peer-reviewed article was always chosen for inclusion. The search was limited to the last 20 years (time span 2000–2020), due to advances in the field in terms of our understanding of the disorders in question. A comment is needed regarding the age criterion. We wanted studies on the adult population. Hence, we set the age limit to 18 years. However, we ended up identifying a few papers where the participant group included people on both sides of this limit. In these cases, we included the paper if the lower age limit was no lower than 16. This was done in order not to exclude too many relevant participants, while at the same time not introducing issues pertaining specifically to very young inmates. Please see Table 1 for a full overview of inclusion and exclusion criteria. The search was set up for full text. A copy of search terms and strategies can be found in Appendix A. After we had completed the database search, a hand-search was conducted to identify any publications that were missed in the main search as well as any relevant grey literature.

The search was completed 13 November 2020. A flow-chart illustrating the search process is provided in Figure 1. The database search returned 1182 references 286 of these were immediately excluded as they were duplicates. Then, 896 references were screened based on title and abstract. This was done by two of the authors independently, and the results were compared. After reading the titles and abstracts, 843 references were rejected as they clearly did not meet our inclusion criteria. This left 53 articles that were retrieved and assessed based on their full text. This was also done by two of the authors independently. Any unclear cases were discussed in the team, and decisions were made by consensus, (cf. [62]). Based on this step, 43 studies were rejected. Of these, 24 were rejected because the participants were too young (juvenile offenders), seven were rejected because they were either not empirical studies or they were not full-text publications (e.g., posters), two did not address the prison population, four were concerned with the topic, but in the opposite direction (i.e., how many children with a history of DLD/SLI end up in the correctional system), four were concerned with forensic psychiatry, one did not separate language and communication from general learning disabilities, and one was concerned

with a related concept, but not in a way that would inform our research question. After the full-text assessment, we were left with 10 articles that met our inclusion criteria.

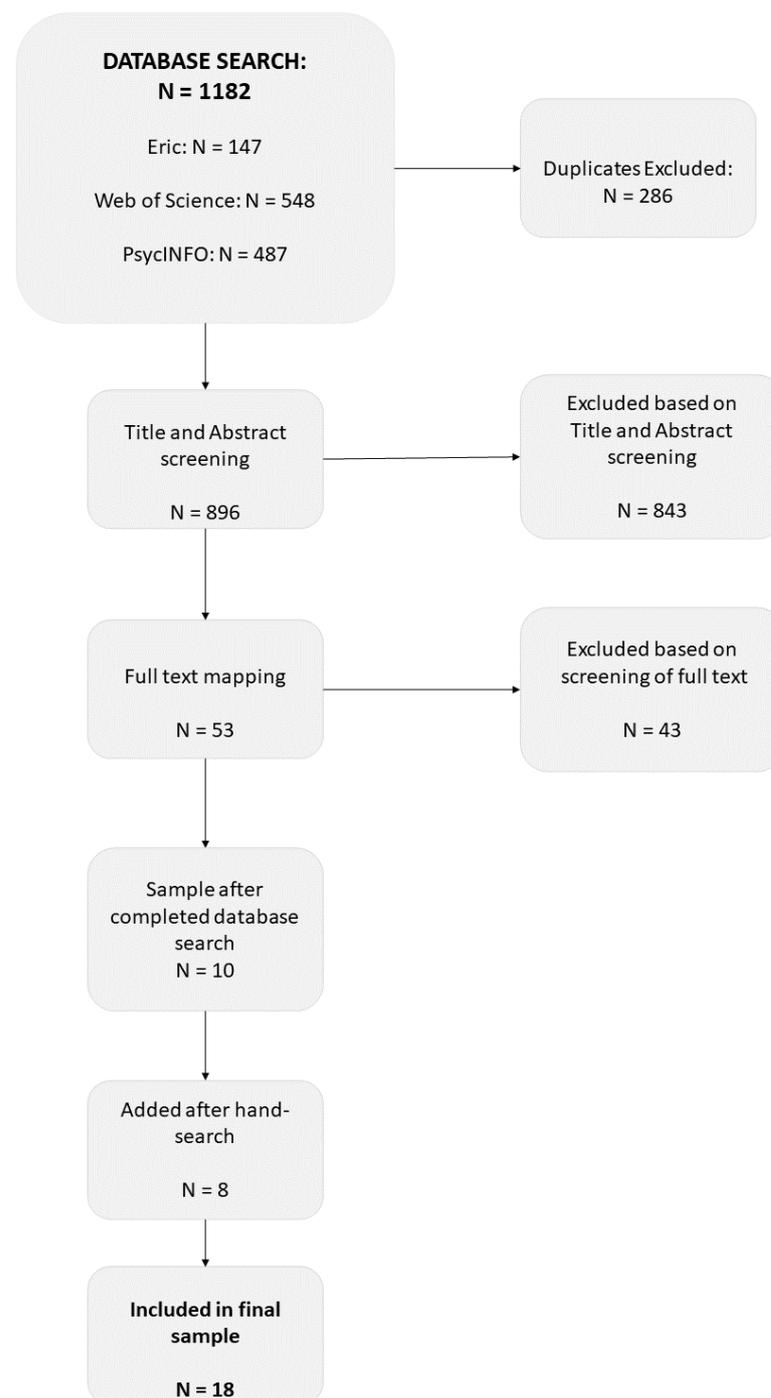
**Table 1.** Inclusion and exclusion criteria.

	Included	Excluded
Databases	Web of Science, PsycINFO, ERIC (EBSCO)	
Time frame	Articles published from year 2000 until September 2020	Articles published before 2000
Publication type	<ul style="list-style-type: none"> <li>✓ Peer-reviewed Articles</li> <li>✓ Empirical studies</li> <li>✓ Reports</li> <li>✓ Ph.D. dissertations</li> </ul>	<ul style="list-style-type: none"> <li>✓ Non-peer-reviewed articles</li> <li>✓ Conference papers</li> <li>✓ Books</li> <li>✓ Book-chapters</li> <li>✓ Editorials</li> </ul>
Topic	Empirical studies focusing on prisoners' language, reading, and writing difficulties.	Studies on speech
Language	English, Swedish, Danish, or Norwegian	Other languages
Target population	Prisoners over 18 years	<ul style="list-style-type: none"> <li>✓ Prisoners under 18</li> <li>✓ Prisoners in compulsory mental health care</li> </ul>

The hand-search comprised several strategies. First, we used the snowball technique, i.e., we went through the reference lists of already included articles to identify publications that had not turned up in the main search. Second, we searched several relevant websites that we deemed relevant for the topic. The included sites are listed in Table 2. Third, we conducted a series of Google-searches, using different combinations of the search terms from the main search. Since this is a strategy that can take an infinite amount of time, we limited the assessment to the first 30 records in each search. This third strategy did not add anything beyond what we had already found through the other approaches.

**Table 2.** Websites included in hand search.

Organisation	URL
County Governor of Vestland, Norway	<a href="http://www.oppikrim.no/Tal-og-forsking/Forsking/Publikasjon/">http://www.oppikrim.no/Tal-og-forsking/Forsking/Publikasjon/</a> (accessed on 11 December 2020)
The Swedish Prison and Probation Service	<a href="https://www.kriminalvarden.se/om-kriminalvarden/publikationer/forskningsrapporter/">https://www.kriminalvarden.se/om-kriminalvarden/publikationer/forskningsrapporter/</a> (accessed on 11 December 2020)
The Danish Prison and Probation Service	<a href="https://www.kriminalforsorgen.dk/om-os/tal-og-fakta/udgivelser/">https://www.kriminalforsorgen.dk/om-os/tal-og-fakta/udgivelser/</a> (accessed on 11 December 2020)
National Institute of Justice, USA: NIJ Journal	<a href="https://nij.ojp.gov/library/nij-journal">https://nij.ojp.gov/library/nij-journal</a> (accessed on 11 December 2020)
Her Majesty's Prison and Probation Service, UK	<a href="https://www.gov.uk/government/organisations/her-majestys-prison-and-probation-service">https://www.gov.uk/government/organisations/her-majestys-prison-and-probation-service</a> (accessed on 11 December 2020)
Prison Reform Trust, UK	<a href="http://www.prisonreformtrust.org.uk/Publications">http://www.prisonreformtrust.org.uk/Publications</a>
The Scottish Centre for Crime and Justice Research	<a href="https://www.sccjr.ac.uk/publications/">https://www.sccjr.ac.uk/publications/</a> (accessed on 11 December 2020)



**Figure 1.** Flow-chart of the search process.

Of the eight publications identified through the hand-search, five could be classified as non-indexed, grey literature. As such, they were not expected to turn up in the main database search. Among the three peer-reviewed papers we identified, two were published in journals that were not indexed by the included databases, and one publication used the term “learning disabilities” to cover reading and writing disorders. We had made a conscious decision not to include this term in the main search to avoid too many irrelevant hits, assuming that any core publications using this terminology would indeed turn up in the hand-search.

The hand-search resulted in eight papers and reports, that were added to the list, giving a total of 18 included studies.

### 3. Results

An overview of key characteristics of the included studies can be found in Table 3. In the following, main findings and conclusions of the included studies are outlined.

**Table 3.** Key information about the included studies.

Authors	Year	Title	Topic	Nationali	Method	Sample Size/Participar	Publication Type
Samuelsson et al.	2000	Is the Frequency of Dyslexic Problems among Prison Inmates Higher Than in a Normal Population?	Frequency of dyslexia	Sweden	Individual testing of reading and writing, phonological and orthographic choice, and orthographic decoding. Interview.	48 male prisoners Aged 19–52 Years, M = 33.0	Peer-reviewed article
Moody et al.	2000	Prevalence of dyslexia among Texas prison inmates	Assess dyslexia	USA	Interview Tests on word decoding, phonological awareness, comprehension	253 male (121) and female (132) prisoners Aged 18–54	Peer-reviewed article
Rasmussen et al.	2001	Attention deficit hyperactivity disorder, reading disability, and personality disorders in a prison population	Assess persistence of ADHD into adulthood. Explore reading difficulties and personality disorder.	Norway	Self-reports/rating-scales Unstructured interview Computerized neuropsychological tests.	82 male prisoners Aged 19–57 years, M = 29	Peer-reviewed article
Kirk and Reid	2001	An examination of the relationship between dyslexia and offending in young people and the implications for the training system	Screen for dyslexia indicators	UK	Screening by computerized self-assessment test (QuickScan). Full assessment of a sub sample using WAIS-R and WRAT-3	50 (6 for full assessment) young offenders	Peer-reviewed article
Lindgren et al.	2002	Dyslexia and AD/HD among Swedish prison inmates	Access frequency of dyslexia. Investigate relations between dyslexia and ADHD.	Sweden	Self-report questionnaires Interviews Reading and spelling tests Neuropsychological tests	45 male prisoners Aged 19–51 years, M = 32.0 SD = 8.3	Peer-reviewed article

Table 3. Cont.

Authors	Year	Title	Topic	Nationali	Method	Sample Size/Participar	Publication Type
Samuelsson et al.	2003	Reading and writing difficulties among prison inmates: A matter of experiential factors rather than dyslexic problems	Investigate whether low reading and writing skills were due to dyslexia or experiential factors	Sweden	Individual testing Structured interviews	82 male prisoners 38 reading-level matched controls (Ages 13–15) 41 adult controls	Peer-reviewed article
Bryan	2004	Preliminary study of the prevalence of speech and language difficulties in young offenders	Prevalence of speech and language difficulties	UK	Individual testing Structured interview	30 prisoners (age 18–21) Gender not reported	Peer-reviewed article
Rack	2005	The incidence of hidden disabilities in the prison population: Yorkshire and Humberside research	Assess the incidence of hidden disabilities	UK	Screening interview Diagnostic tests of a subsample assessing reading and spelling, phonological skills, memory, and information processing	357 (93 for ind. testing) male and female prisoners	Report
Baker and Ireland	2007	The link between dyslexic traits, executive functioning, impulsivity and social self-esteem among an offender and non-offender sample	Dyslexia, executive functions, impulsivity, and self-esteem	UK	Individual testing Self-rating scales	60 male prisoners 32 male students	Peer-reviewed article
Asbjørnsen et al.	2007	Innsatte i Bergen fengsel: Lesferdigheter og lesevaner. [Inmates in Bergen prison: Reading skills and reading difficulties.]	Assessment of reading skills and difficulties. Relationship between self-reports and measured skills.	Norway	Questionnaire Individual testing (in groups)	93 (71 for ind. esting) male and female (5) prisoners Years, M = 32.8 SD = 9.55	Report

Table 3. Cont.

Authors	Year	Title	Topic	Nationali	Method	Sample Size/Participar	Publication Type
Einat and Einat	2008	Learning disabilities and delinquency. A study of Israeli prison inmates	Explore the prevalence of learning disorders (LD). Examine the relationship of LD and ADHD with criminal activity.	Israel	Diagnostic tests for assessing reading processes and ADHD.	78 male and 11 female, adult prisoners Aged 21–71	Peer-reviewed article
Asbjørnsen et al.	2008	Innsatte i Bergen fengsel: Delrapport 3: Leseferdigheter og grunnleggende kognitive ferdigheter [Inmates in Bergen prison: Report 3: Reading skills and basic cognitive skills]	Assess basic neurocognitive skills in relation to reading skills	Norway	Questionnaire Individual testing Reading and spelling tests Neuropsychological tests	28 male prisoners Aged 18–51 Years, M = 30.25 SD = 9.0	Report
Snow and Powell	2011	Oral language competence in incarcerated young offenders: Links with offending severity	Assess the prevalence of oral language impairment. Examine associations with severity of offending type, mental health and early risk factors.	Australia	Language tests Cognitive test Mental health scale Self-reports.	100 male prisoners Aged 17–21 years, M = 19.03	Peer-reviewed article
Jones et al.	2011	An examination of the relationship between self-reported and measured reading and spelling skills among incarcerated adults in Norway	Relationship between self-reports and actual reading and spelling skills	Norway	Self-reports Individual testing (in groups) Reading and spelling tests	600 (92 for individual testing) male and female prisoners Years, M = 34.35 SD = 10.46)	Peer-reviewed article
Tuominen et al.	2014	Functional illiteracy and neurocognitive deficits among male prisoners: Implications for rehabilitation	Functional illiteracy and neurocognitive deficits	Finland	Individual testing	72 male prisoners Aged 19–61 Years, M = 32.2 SD = 9.1	Peer-reviewed article

Table 3. Cont.

Authors	Year	Title	Topic	Nationali	Method	Sample Size/Participar	Publication Type
Asbjørnsen et al.	2014	Norske innsatte: Lesevansker og oppmerksomhetsvansker. [Norwegian inmates: Reading difficulties and attention difficulties.]	Reading difficulties and attention difficulties	Norway	Self-reports	1205 prisoners Gender not reported	Report
Asbjørnsen et al.	2017	Norske innsatte: Kartlegging av lesevansker og oppmerksomhetsvansker 2015. [Norwegian inmates: Assessment of reading difficulties and attention difficulties 2015]	Assessment of reading difficulties and attention difficulties	Norway	Self-reports	1402 prisoners Gender not reported	Report
Fitzsimons	2019	Pausing mid-sentence: Young offender perspectives on their language and communication needs	Investigate language abilities.	UK	Language tests Informal vocabulary assessment Semi-structured interview.	10 male prisoners Aged 17.5–22.10 years, M = 20.1	Ph.d. thesis

Samuelsson et al. [63] focused on incidence. They adhered closely to the phonological hypothesis of dyslexia and employed a very narrow definition—requiring phonological decoding skills substantially poorer than a group of reading-matched (12-year-old) students for an inmate’s literacy problems to be classified as dyslexia. In addition, they wanted to be able to disregard experiential factors as the cause of reading problems. The results showed that, overall, inmates did better than or comparable to reading-matched controls on reading, writing, and word decoding. This led the authors to conclude that the incidence of dyslexia in the prison population is comparable to that of the population at large.

Moody et al. [64] explored the rates of dyslexia among a representative sample of prisoners in Texas (USA). The authors hypothesized that poor single-word decoding ability is the primary evidence of dyslexia. They reported that 47.5% of the prisoners showed signs of dyslexia based on a word-attack (non-word reading) test. Moreover, almost two out of three prisoners had poor scores in reading comprehension. The study also reported a relationship between word decoding and reading comprehension, finding that eight out of ten prisoners who scored below the 25th percentile on word attack were also below the 25th percentile on reading comprehension. The authors concluded by emphasizing the value of remediation of literacy problems, underlining the need for programs targeting word attack skills and that reading programs should also serve to foster interest in and desire for keeping up reading.

The primary point of interest for Rasmussen et al. [65] was ADHD in prison inmates. Additionally, personality disorders and reading disabilities were investigated due to their known association with ADHD. Their findings showed that ADHD was very common

and that the stability of ADHD symptoms from childhood into adulthood was higher than expected compared to follow-up studies in the general population. Reading disabilities, as assessed by a word-chain test, were common, with the inmates on average obtaining a score corresponding to grade seven. One out of three inmates performed even poorer, with results corresponding to grade three to four. The findings also revealed a clear association between ADHD and reading problems, especially in terms of scores on retrospective self-reports on core ADHD symptoms, and school data. Among personality traits, the only one covarying with dyslexia was suspicion. The authors concluded in terms of the need for greater awareness of and better intervention for ADHD and its comorbid conditions in the prison system.

Kirk and Reid [66] explored the frequency of dyslexia among a sample of young offenders in Scotland based on a self-report assessment test—The QuickScan Screening Test. The screening test reports on 24 different performance categories. The overall test results were categorized into four sub-categories (displaying “most indicators”, displaying “many indicators”, displaying “some indicators”, and displaying “borderline indicators”). 50% of the sample showed at least some indicators of dyslexia. The authors reported that the difficulties were most noticeable in the two categories sequencing and memory. This study did not report data on the age of participants, apart from labelling the sample “young offenders”. In Scotland, this is a label used for inmates in the age group 16–21. This was used as a basis for including this study into our sample.

Lindgren et al. [67] assessed the frequency of dyslexia in their sample of prison inmates, using an extensive diagnostic battery. In addition, they investigated the comorbidity of dyslexia and ADHD. The results showed that 62% of the participants fulfilled diagnostic criteria for dyslexia and an additional 18% were considered borderline cases. Altogether 55% of the inmates reported childhood ADHD, and for half of these subjects the symptoms persisted into adulthood. The authors suggested that ADHD alone or combined with dyslexia may account for the school failure of juvenile offenders. The need for early diagnosis and treatment for ADHD as well as dyslexia was emphasized.

Along the same lines as Samuelsson, Gustavsson, Herkner and Lundberg [63], Samuelsson et al. [68] tried to disentangle reading and writing problems stemming from dyslexia from those resulting from experiential factors. To this end, they included two control groups, one adult group matched for experiential factors, and one younger reading-matched group. They found that the reading skills of inmates were comparable to those of the experience-matched group, and that there were few indications of any elevated incidence of dyslexic problems. Furthermore, they found that the same picture emerged irrespective of which definition of dyslexia they used for their analyses; based on (a) non-verbal IQ discrepancy, (b) verbal IQ–reading discrepancy, or (c) phonological deficits.

Bryan [8] looked at speech and language, rather than reading and writing. She found that for three of the measures a large portion of the inmates scored significantly below what can be considered acceptable for their age: grammatical competency (73%), naming (43%), and comprehension (23%). For picture description, 47% received more than one rating indicating moderate impairment. For grammatical competency, the author discussed whether the very high percentage with indicated impairment reflected a particularly vulnerable skill, or if the test itself was not appropriate for the group. The study also included a structured interview, which indicated that most participants were to some extent aware of their communication problems.

Rack [69] assessed the incidence of hidden disabilities among a prison population. The author defined hidden disabilities as dyslexia and related specific learning difficulties such as dyspraxia and dyscalculia, attention deficit disorder (ADD), and the milder end of the autism spectrum. It was found that one in five of the prisoners had some form of hidden disability. Moreover, one in three of a sub-sample who were given an in-depth assessment had literacy difficulties but were not showing positive evidence of the characteristics of dyslexia, dyspraxia, or other hidden disabilities. The author concluded that the literacy difficulties of the prisoners were more related to social and experiential factors rather than

a hidden disability. The report further underlined that when planning for prison education one needs to consider that half of the prisoners will need support due to poor literacy and numeracy skills. Systematic screening procedures will be needed, and the adaptation of education must be in line with the prisoners' needs.

Baker and Ireland [70] advocated a broader definition of dyslexia and found an overrepresentation of dyslexic traits in their offender sample—especially in those serving for violent offences. In addition, they investigated executive functioning, impulsivity, and social self-esteem as correlates of dyslexia. The results showed that executive functioning predicted dyslexic traits and was also reduced in the prison group compared to their control group of students. The authors discussed how this, on a symptomatic level, can be perceived as “disruptive behavior” while not being recognized as a problem originating at the cognitive level. In the offender group, they also found an association between dyslexic traits and reduced self-esteem.

Asbjørnsen et al. [71] examined reading skills and reading difficulties among a sample of prisoners from a prison in Norway using a questionnaire and reading and spelling tests (word-chains and nonsense words). The relationship between self-reports and measured skills was assessed. Almost four out of ten reported that they had been referred for assessment of their reading and spelling skills, and three out of ten reported that they had previously received a dyslexia diagnosis. The results on the reading and spelling tests showed that one third of the sample scored within the fourth percentile, i.e., 96% of the norm sample (students) had a better score. These results indicated that the prevalence of specific reading and spelling difficulties was higher than expected in this sample. Low correlations between self-reports and test results were also reported. The authors underlined that the results show a need for further investigation of difficulties and better adaptive education within correctional education.

Einat and Einat [72] explored the frequency of learning disabilities (LD), defined as problems in the acquisition and use of listening, speech, reading and writing skills. Additionally, the relationship of LD and ADHD with criminal activity was investigated. They found that 69.6% of the participants had LD, and out of these 50% were diagnosed as severely impaired. ADHD was identified in 57.3% of the inmates, and 30.3% exhibited both ADHD and LD. A strong and significant correlation between LD, low level of education, and early onset of criminal activity was found. The authors concluded that successful support of students with LD may reduce dropout rates and potentially prevent criminal behavior.

Asbjørnsen et al. [73] examined reading and spelling skills in relation to measures of basic cognitive skills among a sample of prisoners in Norway. In this sample, the reading skills (measured by speed and comprehension) were mainly explained by working memory and RAN. Specific factors such as word recognition and phonological decoding explained very little of the variance in the inmates' word decoding. Summarized, the authors reported that the overall results showed impaired reading and spelling skills, a higher risk for attention deficits, and lack of impulse control. The authors underlined that the difficulties in reading and spelling in this sample were maybe more related to the lack of reading experience and attention deficits rather than to specific phonological deficits.

Snow and Powell [4] focused on oral language competence and associations with offending severity and mental health in a sample of young male offenders. They found that 46% of the participants were identified as language impaired. While lower language skills were related to higher offending scores across both violent and non-violent dimensions, no difference was evident between the language impaired subgroup and the non-language impaired subgroup regarding mental health. The authors underlined the need for targeted interventions for boys who experience learning and behavior problems early in their school careers.

Jones et al. [74] explored the relationship between prisoners' self-reports on the Adult Dyslexia Check List (ADCL) and their performance on standardized reading and spelling tests. The paper consisted of two sub-studies, where sub-study 1 reported the psychometric

attributes of ADCL among a prison population, and sub-study 2 examined the prisoners' score on ADCL and their test scores on the standardized reading and spelling tests. In addition, questions on self-perceived reading and spelling problems and whether the prisoners had been diagnosed with dyslexia were included. One in three (35%) reported having reading and spelling difficulties to some extent, and one in six reported having a dyslexia diagnosis. The authors reported low correlations between the prisoners' scores on the ADCL and their achieved scores on the standardized tests. However, moderate significant correlations were reported between self-report measures and the test scores on some tests (reading speed and comprehension, spelling, and proof-reading). The authors concluded that the ADCL had low predictive validity in this prison sample.

Tuominen et al. [75] focused on the association between, on one hand, reading, spelling, and mathematics difficulties, and on the other hand general neurocognitive functions. They found that 22.7% of the participants had severe and 36% moderate problems in reading. For spelling, the numbers were 25.3% (severe) and 28.6 (moderate). They found that low academic skills—especially reading—were related to poorer performance in verbal and visual memory, attention, and motor dexterity. The authors concluded by recommending a broad neuropsychological assessment as a means of facilitating more effective rehabilitation tailored to the needs of the individual offender.

Asbjørnsen et al. [76] examined how prisoners in Norway described their problems with reading, writing, attention, and hyperactivity. The participants reported whether they had received a diagnosis of dyslexia or ADHD and completed two self-report forms: The Adult Reading Questionnaire (ARQ) and the Adult ADHD Self-Report Scale (ASRS). The results showed that the frequency of diagnosed difficulties varied with age; in the age group 25–34 years 29.1% of the participants reported a diagnosis of dyslexia compared to 9.9% in the age group 45 years and older. The same picture emerged for having an ADHD diagnosis. In the youngest age group (18–24 years), 34.6% reported a diagnosis, compared to 13.9% in the age group 45 years and older. While scores of the ARQ aligned well with the incidence of dyslexia diagnosis; the scores of the ASRS indicated that twice as many participants as those having received a diagnosis presented with serious attention problems. Approximately one in four participants experienced significant difficulties with both reading and attention.

Asbjørnsen et al. [77] investigated skills and difficulties related to reading, attention, and hyperactivity as reported by Norwegian prisoners. Diagnosed difficulties varied with age, with 36.7% of the participants aged 25–34 years reporting a diagnosis of reading difficulties compared to 14.2% of those aged 45 years or older. The scores on a self-report indicated a higher prevalence of reading difficulties than what was indicated by the number of inmates reporting having received a formal diagnosis. In the youngest age group (18–24 years) attention deficits and hyperactivity were diagnosed in 35.6% of the participants, while the same was true for 13.9% in the oldest age group (45 years and older). Self-report scores indicated that serious attention problems were reported by twice as many participants as those reporting to have received a formal diagnosis of ADHD. Almost one in eight participants experienced difficulties in both reading and attention/hyperactivity.

Fitzsimons [78] investigated language and communicative abilities in a small sample of young male offenders combining quantitative and qualitative methods. He found that 44% of the inmates obtained a score indicating language disorders. Out of these, 50% scored in the marginal range, and 50% scored in the very low range for language disorders. Informal assessment of justice-related vocabulary, on the other hand, showed high frequency of correct responses with all participants scoring over 50% correct. The semi-structured interview indicated that the young offenders were able to reflect upon their own language abilities, and that they were aware of their communication problems. The author underlined the importance of available speech and language therapists within the prison service and justice system.

### 3.1. Summary of Results

In line with recommendations by Levac, Colquhoun and O'Brien [62] we will summarize the results first numerically, and then through a thematic analysis.

#### 3.1.1. Numerical Summary

**Publication Year.** The bulk of the research was published in the early part of the included period. We divided the 20-year span into four and found that seven studies were published between 2000 and 2004, five between 2005 and 2009, four between 2010 and 2014, and only two between 2015 and 2019. There were no studies published in 2020.

**Geography.** Most of the studies (10) were conducted in the Nordic region (Norway, Sweden, Finland). Five were conducted in the UK, and USA, Australia, and Israel contributed one study each to the sample. The number of studies from the Nordic region may have been somewhat inflated, due to our ability and choice to include studies in Scandinavian languages.

**Topic.** Six studies addressed aspects of dyslexia specifically, whereas nine studies addressed reading and/or writing skills and problems, but without framing it within dyslexia as a diagnostic category. These latter studies used varying terminology, from broad terms like learning disorders and hidden disabilities to the more specific reading difficulties and functional illiteracy. Three studies focused on different forms of speech and language problems. None of these used SLI or DLD as diagnostic categories.

**Data Collection Methods.** Most of the studies (14) combined two or more approaches in their data collection. Only four studies used one method only. The most common method was various forms of individual testing, mostly in combination with interviews or questionnaires or both. The individual testing targeted a variety of skills and underlying factors.

Only two studies recruited control groups. Samuelsson, Herkner and Lundberg [68] had both age- and reading-matched control groups, whereas Baker and Ireland [70] used student controls. The other studies had either no controls or used norm data for control.

**Samples.** The sample size varied greatly between the studies, from 10 to 1402 participants overall. Quite a few studies had a substantial number of participants in a first phase, including for example surveys, and then went on to more in-depth individual testing with a smaller sub-sample. Of the 18 included studies, six had 10–50 participants, eight had between 51 and 100 participants, two had 100–500 participants, and three had more than 500 participants. Only two studies reported using specifically recruited control groups. Nine studies reported including only male participants, five studies included both genders, and four studies did not specify this variable.

#### 3.1.2. Thematic Analysis

To perform the thematic analysis, we agreed on five categories that would help shed light on our research question. The research question addressed the two broad categories prevalence and nature. The first was selected as a category on its own. Nature was split into four topics: reading and writing, linguistic levels, neurocognitive factors, and association with other disorders. These categories were chosen as they reflect both our original aim in designing this study, as well as central topics in the identified studies.

**Prevalence.** Several included studies are chiefly preoccupied with prevalence. When it comes to reading and writing, some studies are concerned with dyslexia specifically, whereas others talk of reading and writing skills or difficulties in a broader sense. The studies vary substantially in how these issues have been operationalized—irrespective of whether the studies have taken a specific or broad approach. Prevalence estimates also vary greatly. For example, among the studies targeting dyslexia specifically, Samuelsson, Gustavsson, Herkner and Lundberg [63] reported a prevalence on par with the general population (11%), whereas Moody, Holzer, Roman and Paulsen [64] reported a prevalence of almost 50%. Both studies used variations of non-word tasks as indications of dyslexia, but the tasks had somewhat different designs. The main difference, however, is

that Samuelsson, Gustavsson, Herkner and Lundberg [63] also attempted to control for experiential factors by using a norm group of 12-year-olds. The same group followed up with another study [68] including both reading-level matched controls and an adult control group that was matched for educational level, reading habits, and socio-economic status (SES). This study concluded that the problems in reading and writing that can be observed among inmates are rather caused by experiential factors than by dyslexia per se. Rack [69] concluded along the same lines. Baker and Ireland [70], on the other hand, used a broader assessment battery, and found an overrepresentation of dyslexic traits in their sample. This study, however, had a student control group, and did not explicitly control for experiential factors. Among the studies taking a broader approach to reading and writing difficulties, prevalence is generally found to be higher than in the normal population. For example, Tuominen, Korhonen, Hamalainen, Temonen, Salo, Katajisto and Lauerma [75] reported that 36% had at least moderate problems in reading, while 28.6% had at least moderate problems in spelling. Importantly, Asbjørnsen, Jones, Manger and Eikeland [77] pointed out that there was a mismatch between the number of prisoners who reported having a formal diagnosis of dyslexia and those who, according to self-reports, presented with symptoms that are compatible with reading and writing difficulties.

Only three studies [4,8,78] considered oral language skills. All three found indications of a prevalence of problems in oral language of around 50%.

**Reading and Writing.** As indicated, the studies on reading and writing were very diverse. This is in part because they take different perspectives on reading and writing as the object of study, how they define reading and writing difficulties, and how these difficulties are operationalized. One division is, as mentioned, between studies looking at dyslexia and those looking at reading and writing more broadly. Even between those looking at dyslexia, there are differences in how narrowly this is defined. Hence, some studies based their categorization on one sub-skill only, whereas others tested more broadly and more in accordance with the multi-factorial view of dyslexia as opposed to single-deficit theories. Many studies used a limited number of tests, but which tests went into a given battery varied considerably.

Hence, the etiology of the observed difficulties in reading and writing is uncertain. Some studies [63,68,73] suggested that the observed difficulties were mainly explained by experiential and environmental factors, whereas others [64,70] found that the incidence of difficulties that could be attributed to dyslexia was also elevated. Again, there are differences in research design between these studies that do not necessarily make results directly comparable and that make it difficult to draw conclusions about the general nature of reading and writing difficulties in the prison population.

**Linguistic Domains.** The three studies that investigated oral language difficulties looked at multiple linguistic domains. Bryan [8] employed measures of vocabulary, grammatical competence, comprehension, and picture description. She found a high incidence of impairment for all four measures. Snow and Powell [4] used the Clinical Evaluation of Language Fundamentals (CELF-4) [79] to assess the structural sides of language, but also looked at elements of pragmatics and metalinguistics through the Test of Language Competence—Expanded edition (TLC-E) [80]. They found that 50% were defined as language impaired by CELF-4, and 59% were identified as impaired on at least two out of three sub-tests on the TLC-E. This indicates that factors relating to pragmatics and language use can be even more challenging for this group than the structural sides of language. Fitzsimons [78] used the Core Language Score from CELF-4 [81] as indicative of language impairment. This includes sub-tests on recalling sentences, formulating sentences, semantic relationships, and word definitions. On group level, results on these measures were in the bottom end of the average range, with word definitions falling outside this range, indicating a particular problem in vocabulary. Overall, these studies do not provide a clear profile when it comes to impairments in linguistic domains.

Interestingly, both Fitzsimons [78] and Bryan [8] through interviews found evidence of the participants being aware of their communication problems.

**Neurocognitive Factors.** Even though they did relatively broad assessments of linguistic factors, the three studies investigating oral language competence did not assess any neurocognitive factors associated with language impairment. Snow and Powell [4] pointed out that some of the participants that were identified as having language impairment may have met diagnostic criteria for SLI/DLD. However, they contend that the more likely explanation is that the observed difficulties are of a generalized and non-specific nature resulting from environmental factors.

Among the studies looking at reading and writing, several also incorporated different neurocognitive measures. In fact, two studies have neurocognitive factors as their focus of interest [73,75]. Tuominen, Korhonen, Hamalainen, Temonen, Salo, Katajisto and Lauerma [75] found that poor reading skills were related to poor performance in verbal and visual memory, attention, and motor dexterity. The vast majority of participants who exhibited at least one problem area related to literacy skills, also had neurocognitive deficits. Asbjørnsen, Jones and Manger [73] found that working memory and RAN explained most of the variation in literacy skills, with word recognition and phonological processing contributing very little. The authors took this as reflecting that the literacy problems were mainly caused by experiential factors rather than dyslexia. This conclusion rests on an understanding of dyslexia in line with the phonological hypothesis. Lindgren, Jensen, Dalteg, Meurling, Ingvar and Sten [67] based dyslexia diagnosis on discrepancy between verbal and non-verbal academic achievements, as well as on spelling errors. They found no difference between the group with dyslexia and the group without dyslexia in terms of non-verbal intelligence. More than half of their sample reported childhood hyperactivity, which was persistent into adulthood for half of this group. The same study reported significantly poorer performance in the group with dyslexia on short-term and long-term memory, and longer response times on a word-recognition test. Baker and Ireland [70] found that executive functioning predicted the presence of dyslexic traits. Among prisoners with reading disability, Rasmussen, Almvik and Levander [65] found that the only concurrent measure that yielded significant results was “activating and organizing to work”. However, retrospective self-reports on childhood behavior showed significant associations with reading ability. In two studies, Asbjørnsen et al. [76,77] also investigated the association between reading disability and attention problems. In the first study they found that 25% had difficulties in both areas, whereas the ratio was 1:8 in the second study.

**Association with other Conditions.** Several studies focused on the association between reading and writing and other conditions. Of these, the most investigated condition by far was ADHD. Across these studies, an elevated incidence of ADHD was found in the prison samples, and several reported associations with reading and writing difficulties. An interesting point is that Asbjørnsen et al. [76,77] reported, in two different samples, that the number of prisoners reporting already having a formal ADHD diagnosis markedly decreased with age. This could reflect a change in diagnostic practices and attention towards this type of problems.

Other targeted conditions were personality disorders [65], self-esteem [70], and general mental health [4]. Baker and Ireland [70] found a clear association between self-esteem and dyslexic traits, but no association was found with general mental health [4], or personality disorders [65] apart from in the trait suspicion.

#### 4. Discussion

The aim of this study was to map the last 20 years of research into language and literacy disorders in the adult prison population in terms of prevalence estimates and investigations into the nature of these difficulties.

A general impression of the field we mapped in this study was that a lot of the literature is from quite a few years back. In the first phases of our search, we did not specify the time limit. This showed that many relevant studies were from the 70s, 80s, and 90s. When we still chose to limit our search to studies published after the year 2000, this was due to two considerations. First, as stated previously, there has been considerable

development in our understanding of these disorders over the past few decades. Second, there may also have been developments within the population and the justice system, that would influence prevalence rates. Hence, we sought to include studies that as far as possible are relevant for today's situation.

Regarding the prevalence of oral language problems, there were relatively few studies, but they painted a uniform picture, with oral language problems being present in around half of the participants. None of these studies assessed the participants in terms of clinical diagnoses like DLD or SLI. All three studies limited their assessment battery to the symptomatic level. It could have been enlightening to also include cognitive factors and family history. The lack of studies on language impairment can in part be attributed to the lack of appropriate instruments and protocols for investigating language impairments in adults, making it difficult to do high quality assessments. Moreover, it has been well documented that children with language impairments are generally under-diagnosed and underserved, and that the field is generally under-researched [82–85], reflecting a lack of awareness of this phenomenon. However, through our search it became evident that there were considerably more studies done on this topic in juvenile offender populations. A point of interest here is that clear parallels have been shown between younger offenders and the adult population [86].

When it comes to reading and writing, the picture was less clear. Here, the somewhat inconsistent results across studies are likely influenced by different definitions and operationalizations of reading and writing difficulties, as well as by different choices in data collection methods. As shown by Jones, Asbjørnsen, Manger and Eikeland [74], different types of measures do not necessarily give equivalent results. As pointed out in the introduction, single deficit models have been shown to be inadequate in explaining dyslexia [87], leading to a more multifactorial understanding of the disorder. This also entails that some of the studies applying a more limited understanding of dyslexia vs. other difficulties in reading and writing are at risk of “missing the target”. Among the included studies, only a few explicitly addressed neurocognitive correlates of dyslexia, reflecting a more multifactorial understanding [70,73,75]. Overall, the evidence for an elevated incidence of reading and writing difficulties in the broad sense in this population seems rather compelling. Whether the incidence of dyslexia is also elevated is less obvious, due to the lack of studies that apply a multifactorial understanding and at the same time control for variables like education, SES, and reading experience.

Both in terms of oral and written language difficulties, it is important to assess broadly and on all levels of the Morton and Frith [12] model. This helps disentangle disorders like dyslexia and DLD from difficulties first and foremost stemming from environmental influences or from more general learning difficulties. The broader perspective on assessment is essential for both research and clinical work. The importance lies not first and foremost in categorization, but in tailoring intervention to the needs, strengths, and weaknesses of the individual [88]. Ideally, this help should of course be given at an early age [89], helping the child achieve its potential and preventing it from ever reaching the justice system. This does not mean, however, that remediation is useless for adults within in prison. On the contrary, tailored intervention could empower the individual, assist in return to society, and reduce recidivism [64]. This means that any given individual must be understood in terms of their specific challenges. In this perspective, information about associated disorders, such as, for example ADHD, is also essential. This allows for a holistic approach to rehabilitation, maximizing the benefits for the individual and for society at large. Altogether, the included studies corroborate the necessity of a multifactorial approach to these disorders. This should be guiding for both research and clinical practice in the years to come and would facilitate correct identification of language and literacy problems as such, not misinterpreting their effects as behavioral problems, as pointed out by Baker and Ireland [70].

Language and literacy are both complex phenomena, that occur in a complex human context. An important point that can be drawn from this overview is the need for large-

scale studies, perhaps also allowing analyses by sub-groups. The prison population is in many ways heterogenous, and could be sub-divided along many meaningful dimensions, such as level of education, SES background, length of sentence, number of repeated offences, presence of associated disorders, etc. Of course, this also emphasizes the need for thoughtfully designed studies shedding light on the different facets of these phenomena.

Even though we wanted this study to be comprehensive, it does have some limitations. First, we were not able to include studies published in languages other than English and Scandinavian. This means that important studies from other regions may not have been identified. Second, the search for grey literature is not likely to have picked up all relevant items. We had to limit the number of sites to search for contributions, and in that process, we may have missed relevant sites. Third, the variation in terminology and perspective that was evident in the included studies may also have caused us to miss relevant publications. However, the hand-search is a safety measure in this regard, so the number of non-identified studies is not expected to be high.

## 5. Conclusions

The findings of this study have implications for both research and practice. First, the most important insight to be drawn from this study is perhaps the lack of studies on oral language difficulties in the adult prison population. The few studies that have looked at this find a very high incidence of this type of problems, indicating a crying need for more research into this area. For both language and literacy, new studies should build on the current multifactorial understanding of these disorders, taking care to assess on several levels of explanation, while controlling for possible confounding factors. The complexity of the phenomena in question also means that combining several approaches to data collection is beneficial.

Second, like research, clinical practice must employ a multifactorial approach, and again assess on several levels of explanation. Knowledge of the individual profile of each person is key to tailor any intervention measures to their needs. To determine the need for qualified personnel targeting these issues within the prison system, in line with suggestions by Fitzsimons [78], it would be interesting to see large-scale intervention studies examining long-term effects of intervention for language and literacy in prisoners. Well-designed and comprehensive studies could contribute important knowledge that would inform policy and highlight the necessity of systematic assessment and targeted intervention for language and literacy problems in the prison population.

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## Appendix A

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Search Journals Books Multimedia My Workspace Visible Body What's New

▼ Search History (11) View Saved

<input type="checkbox"/>	# ▲	Searches	Results	Type	Actions	Annotations
<input type="checkbox"/>	1	(prison* or jail* or incarcer* or imprison* or correction facilities or inmate* or offend* or convict* or forensic*).tw.	91720	Advanced	Display Results More ▼	<input type="checkbox"/> Contract
<input type="checkbox"/>	2	limit 1 to yr="2000 - 2020"	64581	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	3	((language* or speech* or communicat* or pragmatic*) adj5 (difficult* or disabilit* or disorder* or impair* or problem* or challeng*).tw.	48309	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	4	limit 3 to yr="2000 - 2020"	32921	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	5	((literacy* or read* or writ*) adj5 (difficult* or disabilit* or disorder* or impair* or challeng*).tw.	21205	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	6	limit 5 to yr="2000 - 2020"	14433	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	7	(dyslex* or dyslec*).tw.	8670	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	8	limit 7 to yr="2000 - 2020"	5752	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	9	2 and 4	268	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	10	2 and 6	183	Advanced	Display Results More ▼	<input type="checkbox"/>
<input type="checkbox"/>	11	2 and 8	36	Advanced	Display Results More ▼	<input type="checkbox"/>

Save Remove Combine with: AND OR

Figure A1. Search history and strategies in PsycINFO.

The screenshot shows the Web of Science search history page. At the top, there are navigation menus for various services and user options. The main header displays 'Web of Science' and the Clarivate Analytics logo. Below this is a search bar and a 'Search History' dropdown menu currently set to 'Web of Science Core Collection'. The main content area features a table of search sets, each with a unique ID, a result count, a topic description, and index information. To the right of each row are buttons for 'Edit Sets', 'Combine Sets' (with AND/OR radio buttons and a 'Combine' button), and 'Delete Sets' (with a 'Select All' button and a 'Delete' button with a red X icon). At the bottom of the table, there are additional 'Combine Sets' and 'Delete Sets' buttons.

Set	Results		Edit Sets	Combine Sets	Delete Sets
# 7	29	#4 AND #1 <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, ESCI Timespan=2000-2020</i>	Edit	<input type="checkbox"/> AND <input type="checkbox"/> OR Combine	Select All <input type="checkbox"/> Delete
# 6	203	#3 AND #1 <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, ESCI Timespan=2000-2020</i>	Edit	<input type="checkbox"/> AND <input type="checkbox"/> OR Combine	Select All <input type="checkbox"/> Delete
# 5	316	#2 AND #1 <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, ESCI Timespan=2000-2020</i>	Edit	<input type="checkbox"/> AND <input type="checkbox"/> OR Combine	Select All <input type="checkbox"/> Delete
# 4	9,469	TOPIC: (dyslex* OR dyslec*) <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, ESCI Timespan=2000-2020</i>	Edit	<input type="checkbox"/> AND <input type="checkbox"/> OR Combine	Select All <input type="checkbox"/> Delete
# 3	26,881	TOPIC: ((Literac* OR read* OR writ*) NEAR/5 (difficult* OR disabilit* OR disorder* OR impair* OR problem* OR challeng*)) <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, ESCI Timespan=2000-2020</i>	Edit	<input type="checkbox"/> AND <input type="checkbox"/> OR Combine	Select All <input type="checkbox"/> Delete
# 2	62,641	TOPIC: ((language* OR speech* OR communicat* OR pragmatic*) NEAR/5 (difficult* OR disabilit* OR disorder* OR impair* OR problem* OR challeng*)) <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, ESCI Timespan=2000-2020</i>	Edit	<input type="checkbox"/> AND <input type="checkbox"/> OR Combine	Select All <input type="checkbox"/> Delete
# 1	134,794	TOPIC: (prison* OR jail* OR incarcer* OR imprison* OR "correction facilities" OR inmate* OR offend* OR convict* OR forensic*) <i>Indexes=SCI-EXPANDED, SSCI, A&amp;HCI, ESCI Timespan=2000-2020</i>	Edit	<input type="checkbox"/> AND <input type="checkbox"/> OR Combine	Select All <input type="checkbox"/> Delete

Figure A2. Search history and strategies in Web of Science.

The screenshot displays the ERIC search interface. At the top, there is a navigation bar with options like 'New Search', 'Thesaurus', 'Citation Matcher', and 'Indexes'. Below this, the search area includes a search bar, a 'Search' button, and options for 'AND' and 'OR' search strategies. The main section is titled 'Search History/Alerts' and contains a table of search history entries. Each entry includes a search ID, search terms, search options, and actions like 'View Results', 'View Details', and 'Edit'.

Search ID#	Search Terms	Search Options	Actions
S7	S1 AND S4	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results (19)</a> <a href="#">View Details</a> <a href="#">Edit</a>
S6	S1 AND S3	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results (64)</a> <a href="#">View Details</a> <a href="#">Edit</a>
S5	S1 AND S2	Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results (64)</a> <a href="#">View Details</a> <a href="#">Edit</a>
S4	TX dyslex* OR dyslec*	Limiters - Date Published: 20000101-20201131 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results (2,172)</a> <a href="#">View Details</a> <a href="#">Edit</a>
S3	TX (illiterac* OR read* OR writ*) N5 (difficult* OR disorder* OR impair* OR problem* OR challeng*)	Limiters - Date Published: 20000101-20201131 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results (12,144)</a> <a href="#">View Details</a> <a href="#">Edit</a>
S2	TX language* OR speech* OR communicat* OR pragmatic*) N5 (difficult* OR disabilit* OR disorder* OR impair* OR problem* OR challeng*)	Limiters - Date Published: 20000101-20201131 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results (15,887)</a> <a href="#">View Details</a> <a href="#">Edit</a>
S1	TX prison* OR jail* OR incarcer* OR imprison* OR "correction facilities" OR inmate* OR offend* OR convict* OR forensic*	Limiters - Date Published: 20000101-20201131 Expanders - Apply equivalent subjects Search modes - Boolean/Phrase	<a href="#">View Results (6,007)</a> <a href="#">View Details</a> <a href="#">Edit</a>

Figure A3. Search history and strategies in ERIC.

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